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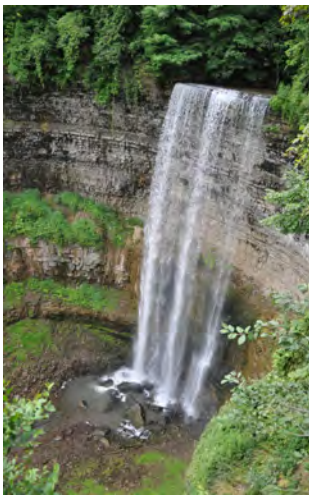
Niagara Escarpment Biosphere Reserve
Periodic Review, 2012



The ten year review of the Niagara Escarpment Biosphere Reserve (NEBR) provides a unique opportunity to document and evaluate how the objectives and values of the Man and the Biosphere Programme (MAB) are being applied in Canada's most biologically diverse biosphere reserve.

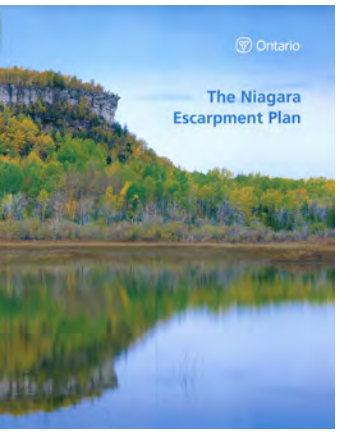
The Niagara Escarpment Biosphere Reserve encompasses a complex and multi-layered network of partners, bound by the biosphere reserve concept as a unifying framework for action.

The many partners of the Niagara Escarpment Biosphere Reserve strive to apply MAB objectives in the work they do in the various governments – federal, provincial and municipal, Conservation Authorities and Non-Governmental Organizations (NGOs) that make up the biosphere reserve network.

Operating both individually and in collaboration, this network of engaged partners carries out an impressive array of conservation projects, communications and public outreach initiatives, land use planning directives, ecological monitoring and research studies.

The geographically diverse Niagara Escarpment Biosphere Reserve thrives on the collaboration, partnerships and contributions of the groups that make up its framework.

Traversing 22 local and upper-tier municipalities from Niagara Region in the south to Bruce County in the north, the Niagara Escarpment Biosphere Reserve crosses the Province of Ontario's most populous regions. The population of all the Escarpment's municipalities is approximately 1,313,000 (2011 Canada census), an increase of 12.5% since the last UNESCO 10-year review.



With a provincial land use plan in place to guide appropriate development in the area prescribed by provincial legislation, the Niagara Escarpment Biosphere Reserve is defined by the Niagara Escarpment Plan Area, an area of some 194,000 hectares in size. In the past decade, we have seen the NEBR land area increase by approximately 2,400 hectares, or 1.26% since the 2002 review, with a *core area increase of 2.51%. In the years since the last Periodic Review of the NEBR, Ontario's provincial government created a 1.8 million hectare Greenbelt around the Greater Toronto Area in southern Ontario, of which the Niagara Escarpment is the centerpiece, and which has regulated comparable land-use zoning and permitted uses. This has expanded the network of public, private and non-governmental interests engaged in the NEBR, and assisted in further buffering the Biosphere Reserve from adjacent high-intensity urban development.

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This Self Study of the NEBR was prepared in collaboration with partners including Niagara Escarpment Commission (NEC), Bruce Peninsula National Park, the Niagara Escarpment Biosphere Inc., the Ontario Ministry of Natural Resources, the Coalition on the Niagara Escarpment, Brock University and the Bruce Trail Conservancy. It is an account of the activities and initiatives that have taken place in the last decade.

Sincerely,

Dana Richardson
Assistant Deputy Minister
Niagara Escarpment Commission

Niagara Escarpment Biosphere Reserve Review
Steering Committee Members:

- Frank Burrows, Bruce Peninsula National Park
- Shawn Davidson, NEC
- Cecil Louis, NEC, Niagara Escarpment Biosphere Inc., Greenbelt Council
- Ray Pichette, Ministry of Natural Resources
- Dana Richardson, NEC
- John Riley, NEC, Nature Conservancy of Canada & Niagara Escarpment Biosphere Inc.

**Core area increase based on calculation using 2002 method of Escarpment Protection Area considered as buffer, not core.*

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Frank Burrows, Bruce Peninsula National Park
Ray Pichette, Ministry of Natural Resources

The success of the Niagara Escarpment Biosphere Reserve in meeting the UNESCO Biosphere Reserve Programme objectives is a result of the many partners identified within the Self Study.

The following Biosphere Reserve partners contributed to the 2012 Self Study:

Brock University
Bruce Peninsula Biosphere Association (BPBA)
Bruce Peninsula National Park & Fathom Five National Marine Park
Bruce Peninsula Bird Observatory
Bruce Trail Conservancy (BTC)
Credit Valley Conservation (CVC)
Conservation Halton (CH)
Coalition on the Niagara Escarpment (CONE)
Escarpment Biosphere Conservancy (EBC)
Giant's Rib Discovery Centre
Grey Sauble Conservation Authority (GSCA)
Halton Region Museum
Hamilton Conservation Authority (HCA)
Niagara Escarpment Biosphere Inc. (NEBI)
Niagara Escarpment Commission (NEC)
Niagara Escarpment Foundation (NEF)
Niagara Peninsula Conservation Authority (NPCA)
Nottawasaga Valley Conservation Authority (NVCA)
Ontario Access Coalition (OAC)
Ontario Ministry of Natural Resources (MNR)
Ontario Ministry of Tourism, Culture & Sport
Ontario Stone, Sand and Gravel Association (OSSGA)
Protect Our Water and Environmental Resources (P.O.W.E.R.)
Royal Botanical Gardens (RBG)
Toronto & Region Conservation Authority (TRCA)
University of Guelph
University of Waterloo – Faculty of Environment & Resource Studies

Table of Contents

NIAGARA ESCARPMENT BIOSPHERE RESERVE

1.0 Introduction and Purpose

As one of the most prominent topographical features in Southern Ontario, the Niagara Escarpment rises wild and beautiful above the farmlands and communities of south-central Ontario. It is one of Canada's most magnificent landforms – a forested ridge extending approximately 725 km from Queenston, near Niagara Falls, to Tobermory, at the tip of the Bruce Peninsula between Lake Huron and Georgian Bay.

The formation of the Niagara Escarpment began 430 to 450 million years ago. Glaciers and water shaped the rock, creating features like caves, cliffs, waterfalls and eroded shorelines. In some areas, the Escarpment is obscured by glacial deposits, which create a rolling, hilly topography. The Biosphere Reserve crosses in their entirety two major ecological regions, both part of Canada's most southern ecozone, its Mixedwood Plain. Flora and fauna change dramatically as one moves northward from the warm, humid Lake Erie-Niagara Peninsula lowlands, across the harsher central highlands of the southern Ontario Peninsula, to the lake-moderated lowlands and limestone plains of the Bruce Peninsula. The southernmost of these ecoregions, the Carolinian life zone, as it is locally called (or the Lake Erie-Lake Ontario lowlands, as it is more formally called) has the highest native species diversity of any region of Canada.

At least 40% of Ontario's rare vascular plants are restricted solely to this region. North of Halton, the Escarpment enters the Great Lakes-St. Lawrence forest region (or the Lake Simcoe-Manitoulin-Rideau region as it is more formally called), where mixed broadleaf-conifer forests of sugar maple, beech and hemlock dominate. Further northward again, on the Bruce Peninsula of Lake Huron, harsher and more exposed conditions prevail and, in some areas, unique assemblages of subarctic, endemic and significantly disjunct species occur.

Features such as caves, valleys, cliffs and crevasses in the weathered Escarpment provide a variety of micro-climates along vertical gradients that add to the diversity. Here, habitat is optimal for old-growth cedars and ancient ferns. Furthermore, in some areas, the unique combination of fissured limestone and extreme climatic conditions produce globally rare alvar habitat, home to an array of specially adapted flora and fauna. The diversity of the varied Escarpment ecosystems is impressive, supporting more than 325 bird species, 55 mammals, 36 reptiles and amphibians, 90 fish and almost 1,200 species of native plants, of which 15 are regional endemics and 40 are regulated Species at Risk. The myriad of organizations and agencies described in this Review work collaboratively across multiple jurisdictions within the NEBR to successfully achieve protection of these features and their functions, and in doing so uphold the principles of the UNESCO Biosphere Reserve Program.

The United Nations Educational Scientific and Cultural Organization (UNESCO) "Statuatory Framework of the World Network of Biosphere Reserves" (1996) requires that each Biosphere Reserve undertake a periodic review every 10 years. The purpose of the Review is to determine if the biosphere reserve continues to be successful in meeting the criteria for inclusion in the world network, as well as to provide updates to background information, and changes taking place in the biosphere reserve.

The Niagara Escarpment Biosphere Reserve Steering Committee for the 10-year Review observes this process as an opportunity to highlight and share the numerous successes and accomplishments of the many Biosphere Reserve partners over the past 10-year period, with the greater biosphere reserve community. The process also allows an opportunity for the biosphere reserve partners to reflect on past successes and consider future goals and objectives, and to identify the next steps to achieving those goals.

2.0 Review Process

To be completed during the next phase of the review process.

3.0 Geographical and Social Context and Updates

3.1. Name of the Biosphere Reserve:

Niagara Escarpment Biosphere Reserve

Niagara Escarpment Biosphere Reserve Designation April 1990

3.2. Please provide a location map, and a map of the zonation for the biosphere reserve (for ease of reference:

3.3. Year designated: 1990
Year of first periodic review: 2002

3.4. Configuration and zoning

3.4.1 Size and Spatial configuration:

The current size of the Niagara Escarpment Biosphere Reserve is 194,555 hectares.

Spatial Configuration:

North end (Tobermory):	45° 15′ N	81° 40′ W
South end (Niagara Falls)	43° 8′ N	79° 5′ W

3.4.2: Composition of core areas, buffer zones, and/or extent of transition area (to that reported on in 2002 Review):

Core Area comprises approximately 34% of the Biosphere Reserve or 66,163 hectares.

Buffer Zone comprises approximately 59% of the Biosphere Reserve or 114,488 hectares.

Zone of Transition comprises approximately 7% of the Biosphere Reserve or 13,904 hectares.

Table 1

Designations	Acres	Hectares	% of NEBR by Designation
All Designations	480,747.59	194,555.89	100.00%
Core Area	163,489.62	66,163.34	34.01%
Buffer Zone	282,899.25	114,487.76	58.85%
Zone of Transition	34,358.72	13,904.78	7.15%

** See Section 3.7 for further discussion on NEP Land Use Designations and recommendations of Self Study for changes to NE Biosphere Reserve Zonations.*

Note: The core area (historically) is defined as lands designated Escarpment Natural Area and portions of Fathom Five and Bruce Peninsula National Parks that are within the Niagara Escarpment Plan.

Buffer Zone is defined as lands designated Escarpment Protection Area and Escarpment Rural Area.

Zone of Cooperation is defined as lands designated Escarpment Recreation Area, Mineral Resource Extraction Area and Urban Area.

3.5. Human Population of the Biosphere Reserve (2011 census data)

The NEBR includes part or all of seven upper tier municipalities, 22 lower tier municipalities and one single tier municipality (City of Hamilton). The combined population of all the upper and single tier areas that span the NEBR is approximately 1,313,000 according to the 2011 Canadian census (Table 2).

Table 2 Census Metropolitan Area (Upper and Single Tier Municipalities) 2011 Census

Official Name	2011 Population	% of NEBR
Burlington	175,779	13.39%
Caledon	59,460	4.53%
Chatsworth	6,437	0.49%
Clearview	13,734	1.05%
Georgian Bluffs	10,404	0.79%
Grey Highlands	9,520	0.72%
Grimsby	25,325	1.93%
Halton Hills	59,008	4.49%
Hamilton	519,949	39.60%
Lincoln	22,487	1.71%
Meaford	11,100	0.85%
Milton	84,362	6.42%
Mono	7,546	0.57%
Mulmur	3,391	0.26%
Niagara Falls	82,997	6.32%
Niagara-on-the-Lake	15,400	1.17%
Northern Bruce Peninsula	3,744	0.29%
Owen Sound	21,688	1.65%
Pelham	16,598	1.26%
South Bruce Peninsula	8,413	0.64%
St. Catharines	131,400	10.01%
The Blue Mountains	6,453	0.49%
Thorold	17,931	1.37%
TOTAL	1,313,126	100.00%

Note: Upper and single tier boundaries correspond to the 2011 census subdivision geography boundaries.

During the 10 year period between the 2001 and 2011 censuses, the population of all municipalities that span the NEBR increased by 145,000 or 12.5% similar to the provincial rate of growth (Table 2).

The City of Hamilton accounts for nearly 40% of the current population at nearly 520,000, followed by the City of Burlington at just over 13% or approximately 176,000. The Town of Milton experienced the greatest increase in population at 168%, while the City of Thorold and the Township of Clearview were the only municipalities within the NEBR to experience a population decrease at -0.65% and 0.45% respectively over the 10 year census period.

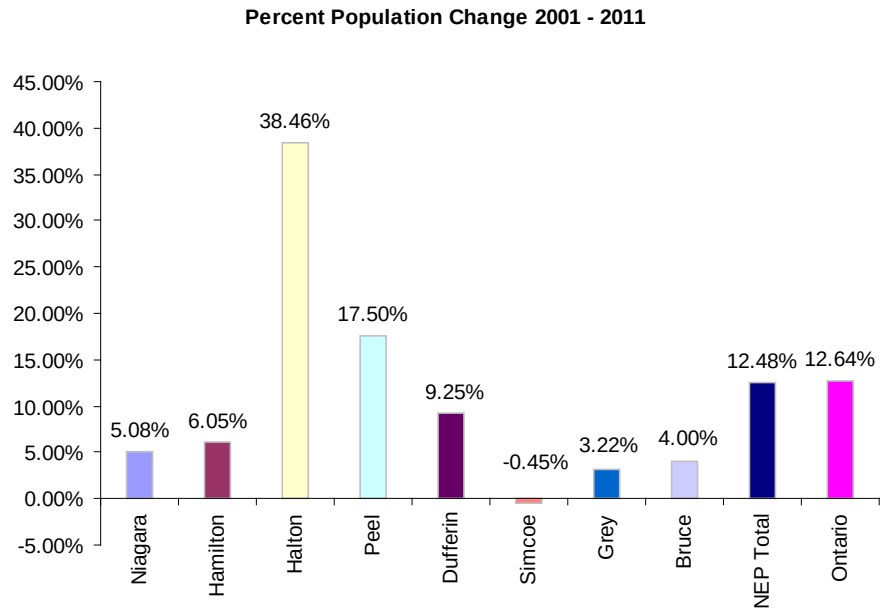
Determining the population within the NEBR designations is difficult to determine using the available geographic boundaries from Statistics Canada. Using the dissemination area boundary file, (which is composed of one or more neighboring dissemination blocks and is the smallest standard geographic area for which all census data are disseminated), we can determine that approximately 200,000 people are living within the boundaries of the NEBR. This represents an estimated increase of over 60% based on a 2002 population estimate of about [1]120,000 people.

[1] The 2002 BR Review which provided the population estimate of 120,000 from which the increase was calculated does not include a source and therefore the 60% increase is estimate.

Table 3 Population Change - Census Metropolitan Area (Upper and Single Tier Municipalities)

County or Region	Population 2011	Population 2001	Population Change 2001-2011	% Population Change 2001-2011
Niagara	312,138	297,053	15,085.00	5.08%
Hamilton	519,949	490,268	29,681.00	6.05%
Halton	319,149	230,491	88,658.00	38.46%
Peel	59,460	50,605	8,855.00	17.50%
Dufferin	10,937	10,011	926.00	9.25%
Simcoe	13,734	13,796	-62.00	-0.45%
Grey	65,602	63,556	2,046.00	3.22%
Bruce	12,157	11,689	468.00	4.00%
NEBR Total	1,313,126	1,167,469	145,657	12.48%
Ontario	12,851,821	11,410,046	1,441,775	12.64%

Figure 1 Population Change - Census Metropolitan Area (Upper and Single Tier Municipalities)



The NEBR land area has increased by approximately 2,400 hectares or 1.26 % since the 2002 Review (see Table 4). While all designations have seen a change in land area, the core area[2] increased the greatest by 2.51%. The majority of the increases have occurred in the Region of Halton and the City of Hamilton (see Table 4) and are the result of several approved Niagara Escarpment Plan Amendments to add lands to the NEP Area (see Section 4.5 for details).

[2] Core area based on Natural area designation only. See Section 3.7 for further discussion of changes.

Table 4 Change in Niagara Escarpment Biosphere Reserve Area 2002-2012 by designations

Designations	Acres	Hectares	% of NEBR by Designation
All Designations	6,003.95	2,429.76	1.26%
Core Area	4,000.76	1,619.09	2.51%
Buffer Zone	-172.96	-70.00	0.78%
Zone of Transition	-235.28	-95.22	-0.50%

Table 5 Change in Niagara Escarpment Biosphere Reserve Area 2002-2012 by municipalities

County or Region	Land Area (2002)	Land Area (2012)	Units	Difference	% Difference
Region of Niagara	465,005.22	464,923.21	acres	-82.01	-0.24%
	188,185.04	188,151.85	hectares	-33.19	
City of Hamilton	278,243.72	281,425.71	acres	3,181.99	11.83%
	112,603.69	113,891.42	hectares	1,287.74	
Region of Halton	239,497.05	242,397.49	acres	2,900.44	5.24%
	96,923.13	98,096.92	hectares	1,173.79	
Region of Peel	310,565.02	310,565.02	acres	0.00	0.00%
	125,683.94	125,683.94	hectares	0.00	
Dufferin County	369,584.43	369,585.63	acres	1.20	0.00%
	149,568.77	149,569.25	hectares	0.48	
Simcoe County	1,141,374.64	1,141,374.64	acres	0.00	0.00%
	461,907.99	461,907.99	hectares	0.00	
Grey County	1,119,557.18	1,119,560.05	acres	2.87	0.00%
	453,078.59	453,079.75	hectares	1.16	
Bruce County	988,089.57	988,089.07	acres	-0.49	0.00%
	399,874.37	399,874.17	hectares	-0.20	
Totals	4,911,916.84	4,917,920.82	acres	6,003.98	N/A
	1,987,825.51	1,990,255.29	hectares	2,429.78	

3.6 Updated background information about the Biosphere Reserve

3.6.1 Changes or corrections to be made in the information for the UNESCO/MAB Biosphere Reserve Directory

The changes required to the current information contained at the UNESCO/MAB directory are as follows:

2012 Surface area: 194,555 ha

Administrative divisions: 7 upper tier municipalities, 1 (single tier) City, 22 lower tier (local) municipalities.

Protection classifications: 141 Niagara Escarpment Parks and Open Space System (NEPOSS) Parks (includes Provincial Parks and Federal Parks).

Core: 34%, Buffer: 59%, Zone of Cooperation: 7%[3]

[3] Minor changes in % calculated for each BR zone may be reflective of the additions of land to the NEBR Area. This is calculated as percentage of the entire NEBR area not % gained or lost.

3.6.2 Brief summary of the follow-up actions taken in response to each of the UNESCO recommendations from the first periodic review (where applicable).

Recommendations from 2002 Biosphere Reserve Review

RECOMMENDATION 1. Community-based linkages and networks

STATUS

- Bruce Peninsula Biosphere Reserve Association continues to be an active community based BR organization representing the Bruce Peninsula portion of the Biosphere Reserve. BPBA is successful in fundraising and collaborating with community partners in order to continue to undertake valuable research, monitoring, education and community outreach within the Bruce section of the NEBR. Initiatives undertaken at the local level by the BPNP are being shared with other jurisdictions and the broader Escarpment BR community through a collaborative and supportive BR network. An example of support for the local level initiatives to the broader BR scale is the BPBA's Dark Sky Community initiative, which is now being promoted with the assistance of the NEC through a brochure developed that will now be shared with landowners receiving a NEC Development Permit. The BPBA continues to be a model for other local jurisdictions to form local associations.
- The NETSMART initiative – established by the NEC, MNR, and the Niagara Escarpment Biosphere Inc. to provide a forum for coordination, integration, information sharing and management with both government and non-government organizations that are involved in monitoring and research in the NEBR and to provide a central organized forum for the sharing of data. The network maintains various experts to arrange or provide for technical expert advice that is accessible to all members.
- NEC Leading Edge Conference Series provides a forum for a wide variety of shared research projects and networking opportunities for BR partners.
- Academic institutions – continued linkages with academic programs and faculties specifically providing coursework based in Escarpment ecology, planning, and communications. Examples include Brock University's Environmental Sustainability Research Centre (ESRC) and the University of Waterloo/NEC ecological monitoring partnership.

RECOMMENDATION 2. Further development of comprehensive management-oriented monitoring

STATUS

- The NEC's ONE Monitoring Program continues to support an ecosystem approach to monitoring with results and analysis to be used towards future policy review and provision of recommendations for management actions.
- Ecological Monitoring and Assessment Network (EMAN) Forest Biodiversity Plot Network established to share data, and discuss analysis and reporting, use of the long-term monitoring for the 2015 Plan Review.
- Escarpment Conservation Authorities have expanded upon the research, monitoring and inventories being conducted, including enhanced and expanded natural areas inventories which are all applied to the management of protected areas and development planning processes.
- Niagara Escarpment Parks and Open Space System (NEPOSS) - the creation of the NEPOSS Council comprised of a diverse group of partners, the release of the updated NEPOSS manual for Park Management Plans, increase in number of Park Management plans being completed and approved.
- Expanded network of NGO groups (e.g. P.O.W.E.R. & BPBA), working on citizen science research and monitoring initiatives which feed into existing government and academic research.
- Parks Canada continues to lead long-term monitoring within park lands, and uses this information to prepare Park Management Plans which guides and directs land uses within in Bruce Peninsula and Fathom Five National Parks.
- With passage of the Endangered Species Act in 2008, the Ontario MNR has increased capacity for staffing Species-at-Risk (SAR) Biologists to support the provisions of the ESA by undertaking inventories and monitoring, preparing Recovery Plans which identify management actions, and assess development proposal impacts on SAR habitat.

RECOMMENDATION 3. Extension of the application of the "transition area / zone of cooperation" concept to related watersheds and to the Upper Bruce Peninsula Ecosystem

STATUS

- This recommendation remains to be explored and would be best directed by a non-government group.
- The 2015 NEP Plan Review will also provide an opportunity for consideration of any additional areas for inclusion into the NEP Area.

RECOMMENDATION 4. Determining the most useful role for NEBR in the context of "eco-tourism" and agricultural tourism activities that are developing.

STATUS

- The NEC's Leading Edge Conference Series 2011 provided a specific focus on these themes to bring emerging economic trends to light and provided a forum for discussion of how regional tourism organizations are marketing the Niagara Escarpment in their promotional efforts. The conference was a first step to building a dialogue that can be carried forward.

RECOMMENDATION 5. Need for staff capacity devoted to the Niagara Escarpment Biosphere Reserve.

STATUS

- The Niagara Escarpment Biosphere Inc. (NEBI), a registered charity, was established in 2009. The federal government's 2009 contribution agreement between Environment Canada and 16 Canadian Biosphere Reserves saw an approximate $250,000 transfer to the Niagara Escarpment Biosphere Inc., a registered charity. This funding was earmarked for capacity-building, Biosphere Reserve projects and community outreach.
- NEC staff have continued to devote time and resources to Biosphere Reserve research, monitoring, education and communications efforts. NEC has supported a number of research and monitoring related projects, and has assisted in securing funds for NEBR projects (e.g. restoration, species at risk monitoring).

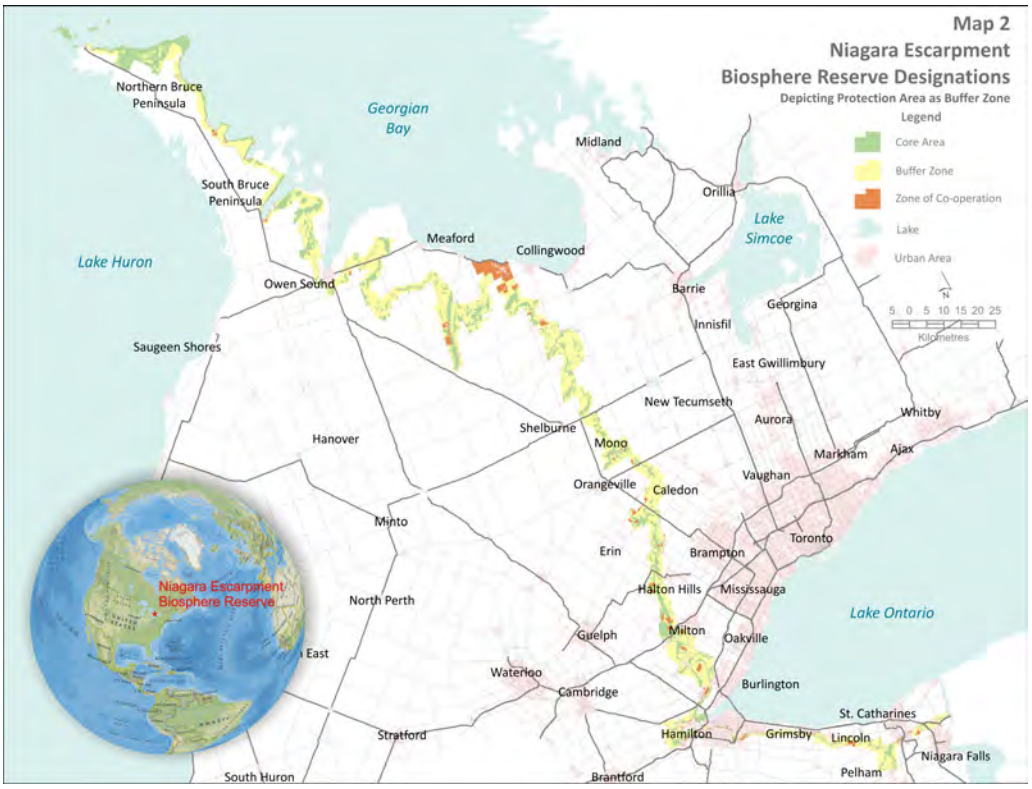
3.7 Other observations or comments on the above:

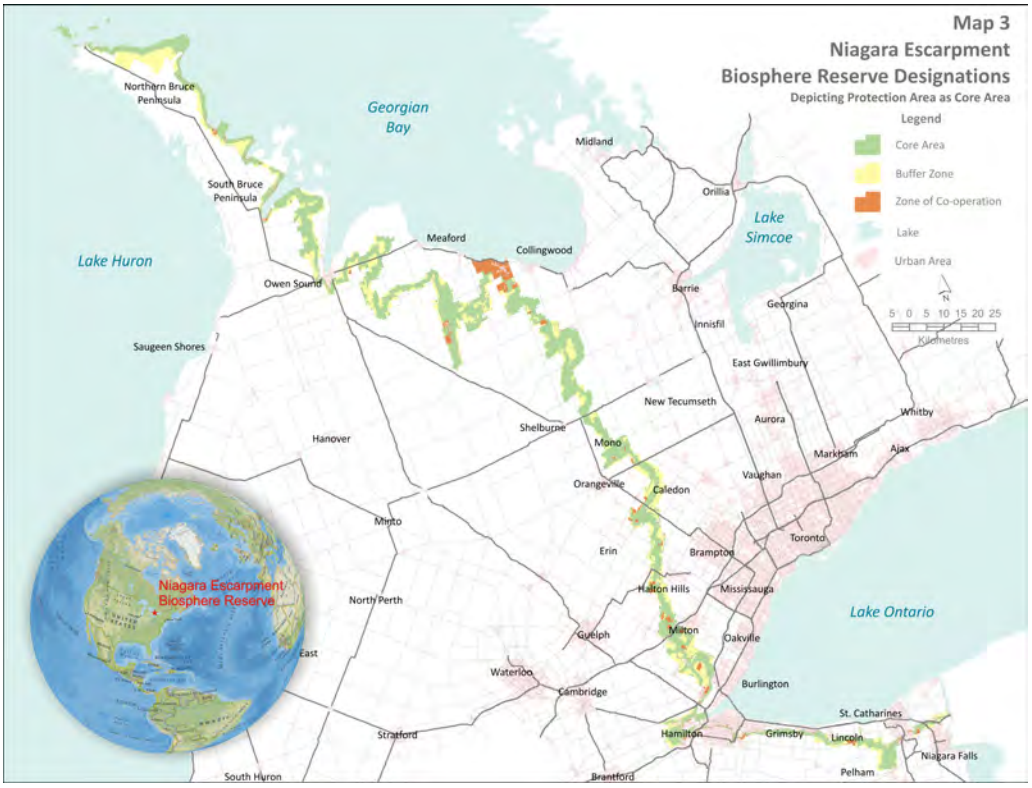
Historically, the Niagara Escarpment Plan Escarpment Natural Area designation has been classified as the core area of the Biosphere Reserve (together with the Federal Park lands), and the Escarpment Protection Area designation has been considered as the Biosphere Reserve buffer zone. The 2002 Review calculated the areas of each Biosphere Reserve zone based on the inclusion of the Escarpment Protection Area within the buffer zone.

The Land Use Designation Criteria in the NEP identifies that Escarpment Protection Areas include remaining natural features and the open, rural landscape character of the Escarpment. Escarpment Protection Areas also contain a number of significant natural features and areas, including Regionally Significant Areas of Natural and Scientific Interest and lands designated as environmentally sensitive by regional municipalities or conservation authorities.

Natural heritage systems planning efforts in the NEBR are increasingly including both the Escarpment Natural Area and Protection Area designations as the core green lands, with the highest levels of protection applied within their respective natural heritage systems. Additionally, the Escarpment Protection Areas are frequently identified and included in a number of land acquisition priorities for conservation and parkland purposes.

The Self Study 2012 is recommending a new approach to core areas of the NEBR be adopted going forward – that the Escarpment Protection Area be considered in the core area of the NEBR. The following tables and maps provide an update to the size of the various Biosphere Reserve zones, based on the application of this new approach. The following Maps 2 and 3 and Figures 2 and 3 reflect a review of the relevant land use designations, their permitted uses, the results of the BR Review, and general usage among partners within the biosphere reserve.





3.7 cont'd - Escarpment Protection Areas as BR Core Area

Existing NEBR Designations			
Designations	**Acres**	**Hectares**	**% of NEBR by Designation**
All Designations	480,747.59	194,555.89	100.00%
Core Area	163,489.62	66,163.34	34.01%
Buffer Zone	282,899.25	114,487.76	58.85%
Zone of Cooperation	34,358.72	13,904.78	7.15%

Note: total area of Biosphere Reserve designations include the area of water-bodies that are within the boundary of the NEPA

Proposed NEBR Designation			
Designations	**Acres**	**Hectares**	**% of NEBR by Designation**
All Designations	480,747.59	194,555.89	100.00%
Core Area	334,155.44	135,230.86	69.51%
Buffer Zone	112,233.43	45,420.25	23.35%
Zone of Cooperation	34,358.72	13,904.78	7.15%

Note: Wooded Area – 2002 dataset source – Southern Ontario Land Resource Information Systems – 2000- 2002 and include forest, coniferous forest, mixed forest, deciduous forest, plantation – tree cultivated and hedgerows classes

Figure 2

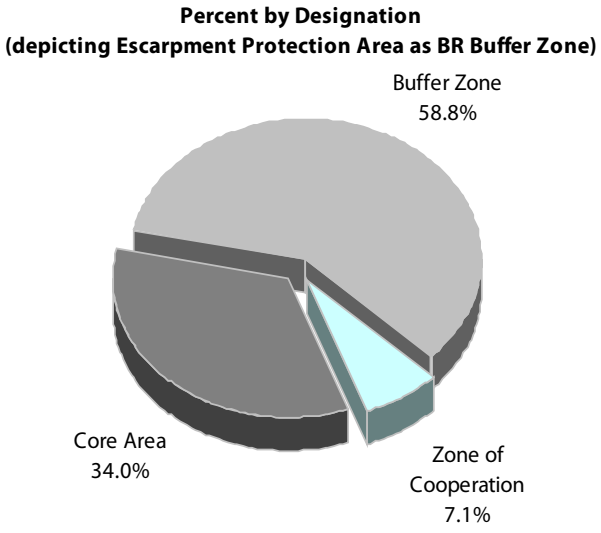
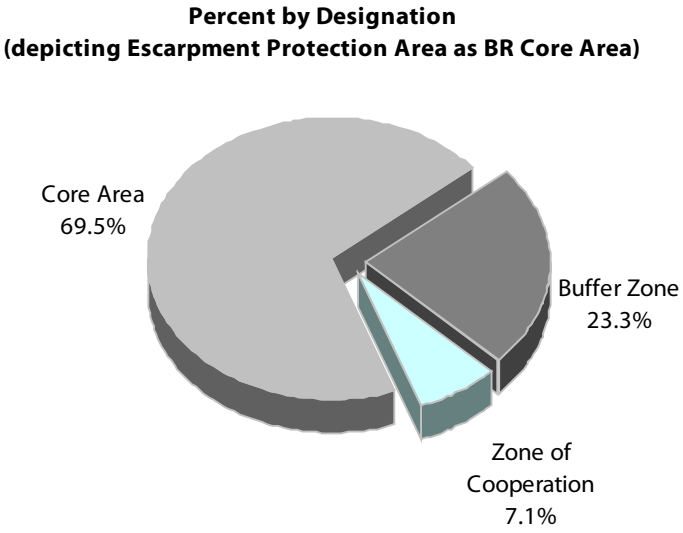


Figure 3



4.0 The Conservation Function

4.1 Protection regime of the core area and possibly of the buffer zone

4.1.1 Type (e.g. under national legislation and date since when the legal protection came into being). Provide justifying documents (summary of the main features).

Niagara Escarpment Planning and Development Act (NEPDA) and the Niagara Escarpment Plan (NEP)

Public concern about unregulated growth on the Escarpment led to the enactment of the 1973 Niagara Escarpment Planning and Development Act (NEPDA). The legislation strives to protect the region for future generations. Its Purpose 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." At its inception, the Act also provided for the establishment of the Niagara Escarpment Commission (NEC) (See Section 6.0), and the preparation of a provincial Niagara Escarpment Plan (NEP) to administer development control through a Development Permit system.

The Escarpment and lands in its vicinity are protected by the NEP. In 1985, the Ontario government adopted this visionary environmental plan. As Canada's first large-scale environmental land use plan, the NEP presents a connected series of policies and objectives that focus on ecosystem planning principles. The NEP Area covers portions of 22 local municipalities within eight regions and counties and aims to conserve Ontario's Niagara Escarpment as a continuous natural environment. Development within the NEP Area, which aligns with the Biosphere Reserve boundaries, must be compatible with this objective. Human activity on the Escarpment is guided and shaped by the NEP's land use policies and objectives.

The objectives of the Act are:

1. to protect unique ecologic and historic areas;
2. to maintain and enhance the quality and character of natural streams and water supplies;
3. to provide adequate opportunities for outdoor recreation;
4. to maintain and enhance the open landscape character of the Niagara Escarpment in so far as possible, by such means as compatible farming orforestry and by preserving the natural scenery;
5. to ensure that all new development is compatible with the purpose of this Act as expressed in section 2;
6. to provide for adequate public access to the Niagara Escarpment; and
7. to support municipalities within the Niagara Escarpment Planning Area in their exercise of the planning functions conferred upon them by the Planning Act.

When the UNESCO designated the Niagara Escarpment as a World Biosphere Reserve in 1990, the decision was influenced by the Plan's vision of reconciling preservation, conservation and sustainable development – a goal upheld by biosphere reserves around the globe. The Plan Area is especially well suited for the Biosphere Reserve designation. There is a backbone of heavily protected lands at and near the Escarpment brow. Moving away from this area, there is a series of land-use designations with decreasing levels of protection, corresponding to the core, buffer and co-operation zone of a biosphere reserve.

The NEP outlines land use designations, Development Criteria and related permitted uses for each of the designations. The zonation concept at the foundation of the biosphere reserve designation is expressed through the land use designations of the NEP. The seven land use designations, which include Escarpment Natural Area (BR core area), Escarpment Protection Area (BR [4]core area), Escarpment Rural Area (buffer zone), Escarpment Recreation Area, Mineral Resource Extraction Area, Urban Area and Minor Urban Centres (zones of cooperation/transition area), with their corresponding Development Criteria and permitted uses, aim to protect the Escarpment and surrounding lands, while accommodat-

4 Core Area as proposed in 2012 Self-Study, see Section 3.7

ing competing resource and recreation priorities by permitting opportunities for such uses as mineral resource extraction, ski resorts and farming.

In 2008, the NEC developed a compliance plan to monitor and address public compliance with the land use policies of the Niagara Escarpment Plan. A Compliance Officer on staff educates the public on Niagara Escarpment planning requirements, providing public outreach and direction on regulatory processes. Working in partnership with provincial ministries, local conservation authorities, municipalities, contractors, builders and land owners, the Compliance Officer undertakes joint investigations, when necessary issuing "stop work" orders and tickets for non-compliance development. This program is designed to raise public awareness of the policies and directives of the Niagara Escarpment Plan, and at the same time educate the public on the unique landscape and ecological significance of the Niagara Escarpment Plan Area.

The NEP also provides the framework for a linear system of more than 140 Niagara Escarpment Parks and Open Spaces (NEPOSS) (see Section 4.5), which supports the establishment and coordination of a system of publicly owned lands on the Escarpment as well as the Bruce Trail. The Park zonation and management plans, which are a legislative requirement for all NEPOSS Parks, also supports the zonations of the Biosphere Reserve.

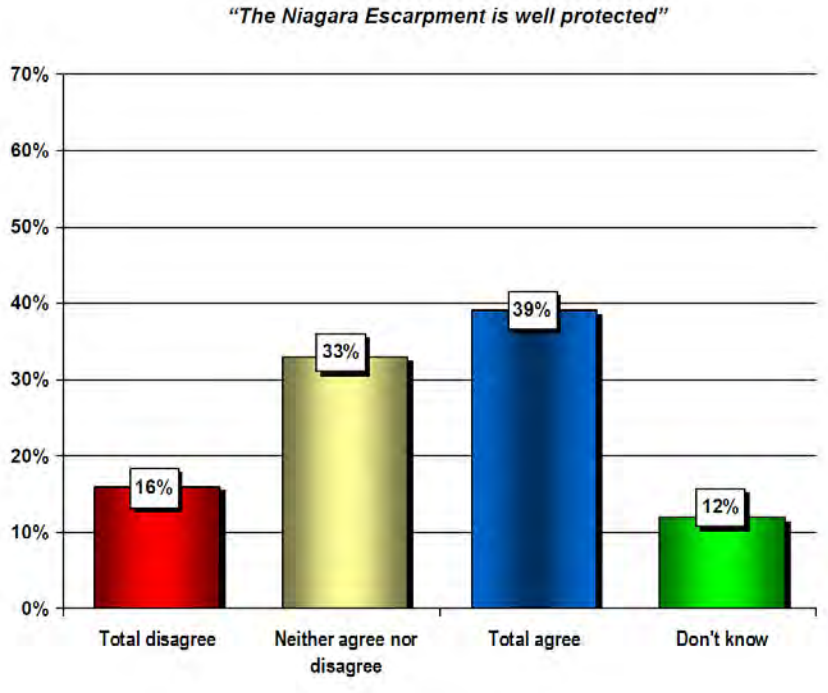
In the last decade the land use planning landscape of Ontario has changed substantially with the establishment of the Greenbelt Act, 2005. The Ontario Greenbelt is a 1.8 million hectare area surrounding the Greater Toronto Area, of which the Niagara Escarpment is the cornerstone, comprising twenty-three per cent of the total land area. The Greenbelt Plan identifies where urbanization should not occur in order to provide permanent protection to the agricultural land base and the ecological features and functions occurring on the landscape.

GREEN BELT
Possibility grows here.

This land use plan is administered by Ontario's Ministry of Municipal Affairs and Housing (MMAH). The Greenbelt Plan includes lands within, and builds upon the ecological protections provided by the Niagara Escarpment Plan and the Oak Ridges Conservation Plan. Several Ontario municipalities are currently seeking to add lands in their urban boundaries to the Greenbelt Plan. The Greenbelt Plan, along with the Niagara Escarpment Plan and Oak Ridges Moraine Conservation Plan, will be reviewed in 2015 by the provincial government. The purpose of the review is to assess the effectiveness of the policies contained in the land use plans, using information gained in ecological monitoring programs.

The following represents the findings from a public opinion survey by Oraclepoll Research Limited about the Niagara Escarpment Biosphere Reserve and commissioned by the Niagara Escarpment Biosphere Incorporated (NEBI) in 2009.

In the first survey wave, a total of 800 randomly selected residents of the Niagara Region and select parts of the Greater Toronto Area were interviewed. These surveys were conducted between the days of May 19, 2009 and June 3, 2009. In the second survey wave, a total of 250 randomly selected residents from the following areas of the NEBR were interviewed: Hamilton, Region of Peel, Dufferin County, Grey County & Bruce County. These surveys were conducted between October 21, 2009 and October 26, 2009.



All respondents were asked to agree or disagree with the following statement using a scale from one, strongly disagree to five, strongly agree: "The Niagara Escarpment is well protected." A total of 39% of those surveyed agreed that the Escarpment is well protected, compared to only 16% that disagreed, while a significant 33% had a neutral opinion (neither agree nor disagree) and 12% did not know.

The survey then asked respondents: "Please rate the effectiveness of each of the following (organizations/agencies) in their efforts to protect the Niagara Escarpment" using a scale from one being not at all effective to five very effective. Non-governmental environmental organizations (55%) and the Niagara Escarpment Commission (54%) rated the highest by those surveyed for their efforts in protecting the Escarpment. Next highest rated by 41% were municipalities, followed by 40% that said the Friends of the Greenbelt Foundation (although a high 42% were unaware or did not know). These results can be used to shape future education and outreach initiatives by all agencies working in the NEBR.

4.2 Land tenure of each zone (all values are in hectares)

4.2.1. [5]Core Area(s)

Designations	Federal	Provincial	Local	CA	Private
Core Area	9,061.05	8,314.22	2,191.13	7,615.54	29,510.29

4.2.2. Buffer Zones(s):

Designations	Federal	Provincial	Local	CA	Private
Buffer Zone	3,669.15	9,504.16	1,907.34	4,341.80	97,941.53

4.2.3. Transition Area(s):

Designations	Federal	Provincial	Local	CA*	Private
Zone of Transition	31.93	680.87	653.05	122.96	11,147.81

** Conservation Authority*

Note: Source of tenure data – Municipal Property Assessment Corporation (MPAC), 2012. MPAC data does not include tenure information for bodies of water and transportation features. Therefore the information provided in section 4.2 does not take these features into account.

Summary of Land Tenures:

Table 6 Land tenure of each zone – combined (all values in hectares)

Designations	Federal	Provincial	Local Government	CA	Private
All Designations	12,762.14	18,499.25	4,751.52	12,080.30	138,599.63
Core Area	9,061.05	8,314.22	2,191.13	7,615.54	29,510.29
Buffer Zone	3,669.15	9,504.16	1,907.34	4,341.80	97,941.53
Zone of Transition	31.93	680.87	653.05	122.96	11,147.81

[5]Core area calculated using only Escarpment Natural Area Designation to compare with 2002 review. See Section 3.7 for further discussion.

Table 7 Percentage of ownership in terms of national, provincial, local government, private, etc.

Land-use Designations	Federal	Provincial	Local Government	CA	Private
All Designations	6.86%	9.95%	2.56%	6.50%	74.54%
Core Area	16.06%	14.73%	3.88%	13.49%	52.29%
Buffer Zone	3.14%	8.13%	1.63%	3.71%	83.78%
Zone of Transition	0.25%	5.40%	5.18%	0.97%	88.35%

4.3 Percent of ownership in terms of national, provincial, local government, private, etc.

4.3.1 Core Area(s)

Designations	Federal	Provincial	Local	CA	Private
Core Area	16.06%	14.73%	3.88%	13.49%	52.29%

4.3.2 Buffer Zone(s)

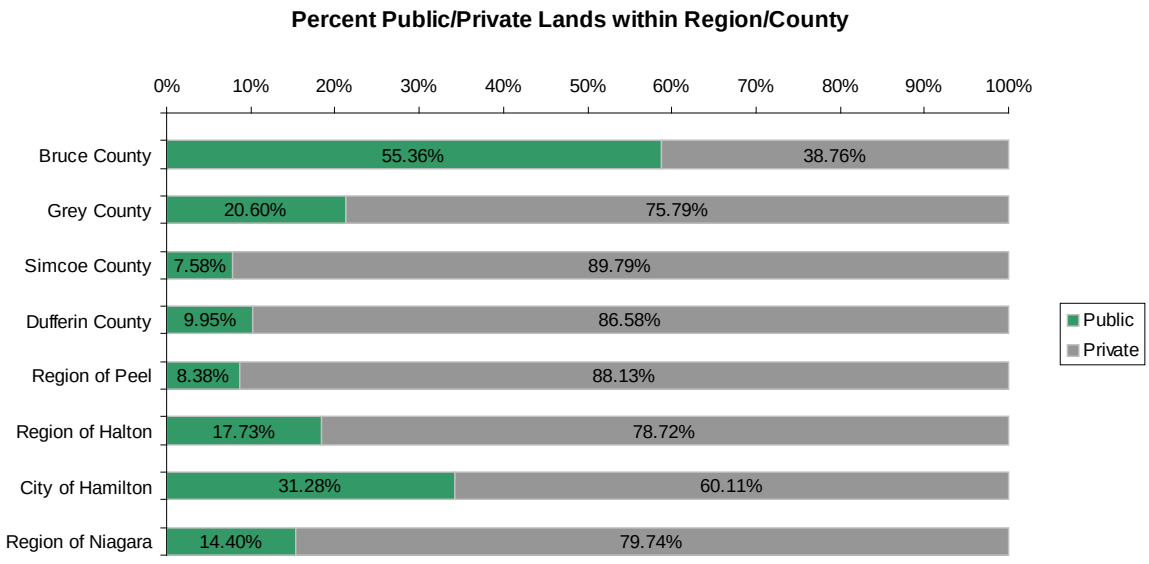
Designations	Federal	Provincial	Local	CA	Private
Buffer Zone	3.14%	8.13%	1.63%	3.71%	83.78%

4.3.3 Transition Area(s)

Designations	Federal	Provincial	Local	CA	Private
Zone of Transition	0.25%	5.40%	5.18%	0.97%	88.35%

Note: CA - Conservation Authority
Note: Due to rounding values may not add up to 100%

Figure 4 Summary of percentage of ownership in terms of public or private within Region/County of the NEBR



Note: Source of tenure data – Municipal Property Assessment Corporation (MPAC), 2012. MPAC data does not include tenure information for bodies of water and transportation features. Therefore the information provided in section 4.2 does not take these features into account.

4.4 Significant changes (if any) in the main habitat types identified for the biosphere reserve, including natural processes or events, main human impacts, and/or relevant management practices). The comparison is with the situation described during the last periodic review, 10 years ago.

At 48% wooded area coverage[6], the Niagara Escarpment is the largest contiguous stretch of largely forested land in south-central Ontario, transecting and connecting the deciduous forest of Southern Ontario with the Great Lakes - St. Lawrence Forest further north. The Biosphere Reserve includes the greatest topographic variability in southern Ontario, with habitats ranging over more than 430 metres in elevations, and including Great Lakes coastlines, cliff edges, talus slopes, wetlands, woodlands, limestone alvar pavements, oak savannas, conifer swamps, and many others, which collectively boast the highest level of species diversity among Canadian Biosphere Reserves.

However, in Ontario, past management and planning practices related to urban development and related infrastructure, agriculture, aggregate extraction and forestry have resulted in the destruction of woodlands, and the draining and filling of wetlands and loss of vernal pools (temporary pools of water).

The NEP strives to protect the natural features of the biosphere reserve through only permitting compatible development. The intent is to maintain and enhance natural areas such as Escarpment woodlands. In order to identify if this is being achieved, and to effectively implement programs aimed at sustainable management and conservation of natural lands, an understanding of the type, extent and trends of change occurring on the landscape due to natural processes or human activities must be understood. A number of NEBR organizations are recognizing this need and are focusing on the analysis of landscape scale studies which seek to understand change over time processes. These types of digital landscape scale analysis, when paired with site specific assessments, can also assist in focusing rehabilitation and restoration exercises within the NEBR, by allowing identification of priority sites for enhancement.

The Southern Ontario Land Resource Information System (SOLRIS) project undertaken by the Ontario Ministry of Natural Resources is a landscape-level digital land classification based on the Southern Ontario Ecological Classification (ELC). SOLRIS maps a number of natural features on the landscape including wooded areas, wetlands, alvars, open cliff and talus, open shoreline, tallgrass prairie as well as built-up areas. Inventory of wooded areas in Southern Ontario was the first land classification released. SOLRIS was developed to support landscape-scale planning initiatives in southern Ontario such as Source Water Protection, Biodiversity Conservation, Natural Heritage Planning, and State of the Resource Reporting (MNR, 2008).

The NEC's environmental Monitoring Program (Ontario's Niagara Escarpment – ONE – Monitoring Program), is using the SOLRIS dataset to report on state of the Escarpment natural features, and to assist in tracking change over time of various natural features. Forest patch size, percent forest cover, fragmentation and connectivity have been identified as a measurable landscape scale indicators in the NEC Monitoring framework, to assess whether NEP polices pertaining to the protection of forest cover and landscape connectivity are working effectively. These monitoring indicators were selected with the understanding that they can be monitored and regularly reported on and the data generated through analysis will contribute to future NEP and periodic Biosphere Reserve Reviews.

Much of the SOLRIS wooded area source data was derived from the MNR Natural Resources and Values Information System (NRVIS) wooded area datasets (which in turn was derived from the digital topographic data base) and was updated via SOLRIS with digital orthophotography and satellite imagery that ranges in date from 2000 to 2002. Image resolution varies from 20 cm to 5 m, depending upon the image source.

[6]Derived from the Southern Ontario Land and Resource Information System (SOLRIS) wooded area dataset clipped to the NEP Area.

The SOLRIS wooded area represents the boundary of forest cover and classifies the forest cover into three types: wooded area, plantations and hedgerows. The following wooded area and wetland area statistics have been calculated to illustrate present day (2012) baseline data for these habitat types with the various zonations of the NEBR together with the 2002 calculation:

Wooded Area – 2012

Designations	Acres	Hectares	% Wooded Area	% Wooded Area in NEBR
All Designations	231,579.79	93,719.06		48.2%
Core Area	127,079.41	51,428.33	54.9%	26.4%
Buffer Zone	94,352.55	38,183.96	40.7%	19.6%
Zone of Transition	10,147.83	4,106.77	4.4%	2.1%

*Note: Wooded Area dataset source – Ontario Ministry of Natural Resources/Land Information Ontario, 2012 and include treed, plantation and hedgerow classes. Please refer to the **Land Information Ontario Metadata Management Tool** for more information.*

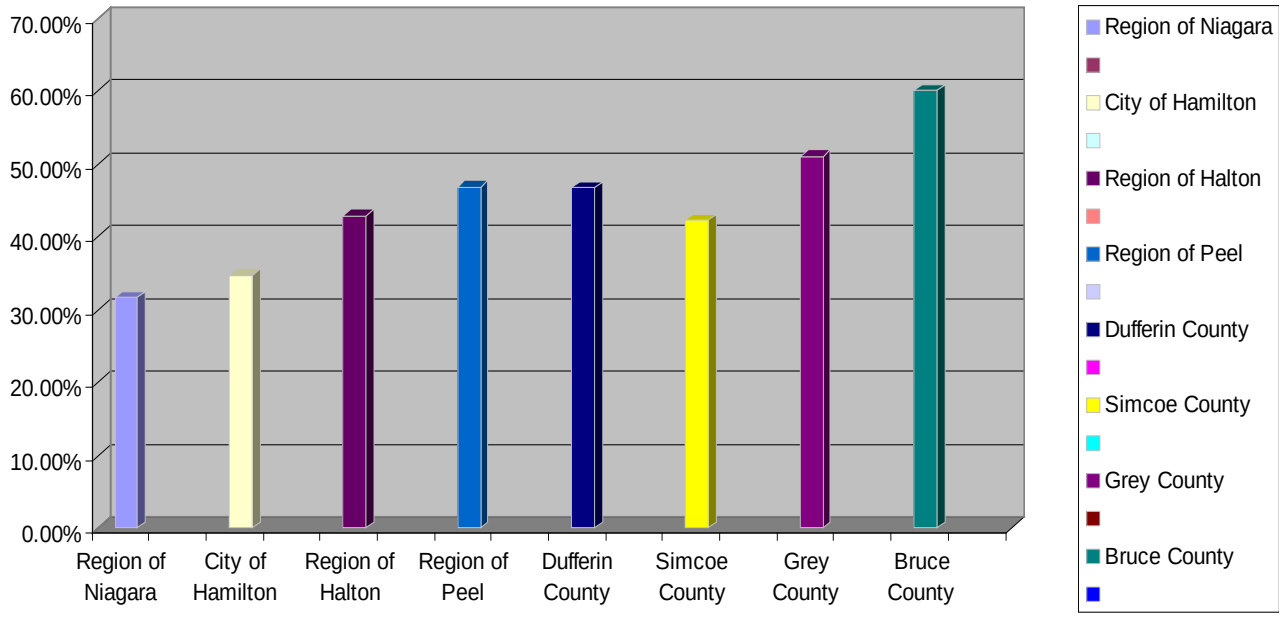
Wooded Area – 2002

Designations	Acres	Hectares	% Wooded Area	% Wooded Area in the entire NEBR
All Designations	186,645.33	75,534.33		39.3%
Core Area	84,230.19	34,087.49	45.1%	17.7%
Buffer Zone	93,859.89	37,984.58	50.3%	19.8%
Zone of Transition	8,555.24	3,462.26	4.6%	1.8%

Note: Wooded Area – 2002 dataset source – Southern Ontario Land Resource Information Systems – 2000- 2002 and include forest, coniferous forest, mixed forest, deciduous forest, plantation – tree cultivated and hedgerows classes. Please refer to the Land Information Ontario Metadata Management Tool for more information.

Figure 5

2012 Wooded Area within the NEBR by Municipality



Wetland Area – 2012

Designations	Acres	Hectares	% Wetland Area	% Wetland Area in the entire NEBR
All Designations	41,534.85	16,808.92		8.6%
Core Area	23,991.54	9,709.24	57.8%	5.0%
Buffer Zone	16,148.11	6,535.05	38.9%	3.4%
Zone of Transition	1,395.21	564.63	3.4%	0.3%

*Note: Wetland Area dataset source – Ontario Ministry of Natural Resources/Land Information Ontario, 2012 and include swamp, fen, bog and marsh classes. Please refer to the **Land Information Ontario Metadata Management Tool** for more information.*

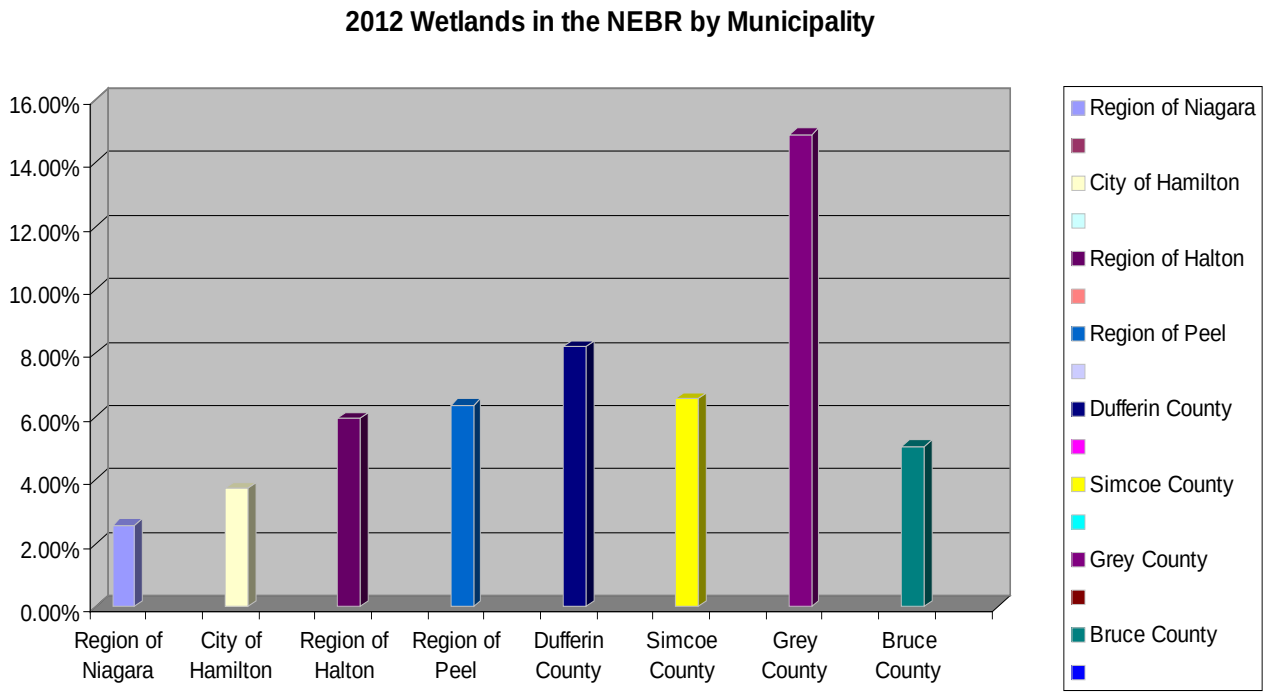
Wetland Area – 2002

Designations	Acres	Hectares	% Wetland Area	% Wetland Area in the entire NEBR
All Designations	43,929.85	17,778.17		9.2%
Core Area	25,437.21	10,294.30	57.9%	5.4%
Buffer Zone	16,954.81	6,861.52	38.6%	3.6%
Zone of Transition	1,537.83	622.35	3.5%	0.3%

*Note: Wetland Area – 2002 dataset source – Southern Ontario Land Resource Information Systems – 2000 - 2002 and include swamp, fen, bog and marsh classes. Please refer to the **Land Information Ontario Metadata Management Tool** for more information.*

The statistical information provided for wetlands/wooded areas are considered to be independent features and are not suitable for change over time comparison due to the methodology used to delineate features.

Figure 6



The following provides additional examples of collaborative Biosphere Reserve initiatives undertaken by various BR agencies and organizations, which focus on aspects of habitat trends in the NEBR:

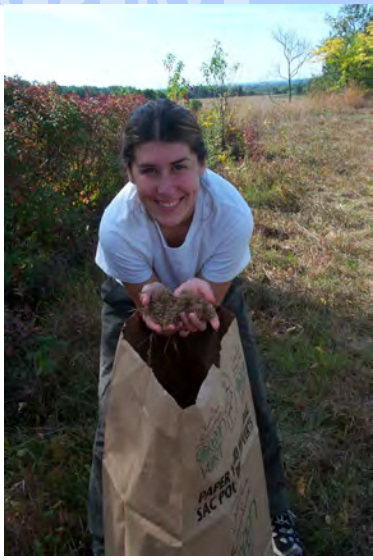
Niagara Escarpment Species Atlas Project

There is a vast array of information and knowledge about species occurrences in southern Ontario, and various publications and databases which attempt to summarize this data. The Ecological Survey of the Niagara Escarpment Biosphere Reserve (Riley et al., 1996), is one such repository that captures all of the species data specifically related to the Niagara Escarpment areas identified as Life Science Areas of Natural and Scientific Interest. In 2005, the MNR Land Use Coordination Section captured all the species data relating to the Niagara Escarpment - a snap shot in one central project location. The "Species Atlas Project" was initiated in order to build a database on known wildlife species and their occurrences on the Niagara Escarpment (in the NEP Area), using as a priority the largest data sets available for the area.

Sources of major data sets used to compile the Species Atlas included:

- Bird Studies Canada
- Canadian Wildlife Service
- Ecological Survey of the Niagara Escarpment Biosphere Reserve (1996)
- Fisheries and Oceans Canada fish distribution database, Ministry of Natural Resources
- Natural Heritage Information Centre (NHIC) database
- Ontario Breeding Bird Atlas
- Woodland Heritage of Southern Ontario (B.M. Larson, et al., 1999)

General trends showed a concentration of observation sites in the northern portion of the NEBR (Bruce Peninsula) and the southern portion (Halton Region and the Niagara Peninsula). Translated to NEP land use designations and the Biosphere Reserve zones, higher concentration of data exists within the Escarpment Natural Area (core area), Escarpment Protection Area (2012 proposed core area) and Escarpment Rural Area (buffer zone). This could be interpreted to show a higher presence of species and biodiversity in these areas, as might be expected, however, this could also indicate that there is a lack of data within in the other land use designations and zones of the biosphere reserve. As a result of this analysis one recommendation could be that additional species monitoring efforts are focused in the zone of transition of the biosphere reserve.



Habitat Restoration

In 2002 a partnership of the Hamilton Conservation Authority and the NEC successfully undertook restoration of interior forest and prairie and oak savanna habitat within the Dundas Valley. The Dundas Valley, which is part of the Carolinian Forest zone, is situated along the southern portion of the NEBR in the City of Hamilton. Oak savanna is a globally, nationally, provincially and regionally rare habitat type. Historical records indicate that prairie and savanna were once widespread in the Hamilton area prior to human settlement. Today, less than 1% of its original extent remains (Goodban et al., 1998). The project was financially supported by the Ontario Ministry of Natural Resources, the Ontario Power Generation, the EJLB Foundation, Management of Abandoned Aggregate Properties (MAAP) and Rotary International.

Nine sites totaling 31 ha were selected for the restoration using through Geographic information System (GIS) analysis. Seed was collected from remnant prairie and savanna habitats existing near the restoration sites and along roadsides for germination. This ensured that native species appropriate to the area were being used for the restoration. The MAAP Program, administered by The Ontario Aggregate Resources Corporation, is dedicated to the rehabilitation of abandoned pits and quarries. MAAP completed the work of grading the terraced slopes and planting a cover crop within the former gravel pit.

As part of the monitoring and maintenance, the restoration sites have undergone prescribed burns every year conducted by the Hamilton Conservation Authority with volunteer participation. The burns are an ecological tool to restore tall grass habitats as they are

timed so that invasive grass species have already started to grow but native tall grass species are still dormant. Cool season grasses and weeds are suppressed by the fire which promotes the growth of native prairie grasses and forbs.

An Analysis of the Effectiveness of the Niagara Escarpment Plan in Maintaining and Enhancing Natural Corridors and Linkages in the Township of Mulmur, Dufferin County, Ontario

This study, undertaken in 2003 by Alan Ernest for the Niagara Escarpment Foundation and the Coalition on the Niagara Escarpment, examined how effective the NEP has been in maintaining and enhancing natural areas, corridors and linkages long one portion of the Escarpment in Dufferin County. Using 2004 and 2000 satellite imagery, changes in forest cover between 1974 and 2001 were assessed for lands within the NEP Area and compared to a study area outside of the NEP Area with similar landscape characteristics and land uses. NEC partnered in the project by providing access to the aerial photographs and satellite imagery used in the study.

The project results identified a net gain in forest cover between 1974 and 2000, with an increase of 21.5 % within the NEP Area and 9.4% outside of the NEP Area, in all of the corridor and linkage areas identified in the study area. There were very few losses of forest cover within the NEP Area with the total deforested area found to be approximately 10 ha (Ernest, 2003).

The gains in forested areas were found to result in less gaps and fragmentation with the study area and the linkages were strengthened and widened, expanding into adjacent natural areas. The study attributed this gain in part to development within the NEP Area being sited so as to minimize the impact on forested and other significant natural areas, in keeping with the Objectives of the NEP. Additionally, it was identified that actively farmed land had decreased over time as the viability of less productive lands has become marginal, with an increase in purchase of lands for recreational purposes and reforestation, together with natural regeneration and reforestation being chosen as low cost preferences to the landowners.

The study recognized that notwithstanding the success of the NEP being implemented effectively, this success could not have been achieved without private landowners making decisions to naturalize their lands. The NEC and other government and non-government programs have also likely played an important role in encouraging and supporting private landowners in their stewardship activities. An important recommendation of the study was to undertake future studies of this nature on a broader scale so as to provide further insight into the effectiveness of the NEP in maintaining and enhancing natural corridors throughout the Biosphere Reserve.

Forest Re-Sampling in the Niagara Escarpment Biosphere Reserve

From 1979 to 1989, a series of 110 forest stands in NEBR Natural (core) Areas were inventoried extending from the Niagara Gorge to the Flowerpot Islands off Tobermory. This represents an extraordinary suite of quantitative forest data at an outstanding set of natural areas. To add to the significance of this sampling, some of the sample sites were at that time being re-sampled from earlier sampling by Dr. Paul Maycock in 1957. Hence, these data reflect the full range of forest phytosociology from 25 years ago and, for some sites, 50 years ago.

These data present a picture of forests across a huge transect of Southern Ontario 25 to 50 years ago and also show the condition of the forest before and at the time of the designation of the NEBR and implementation of the NEP and other overarching land management initiatives.

A partnership between the Niagara Escarpment Commission, the Niagara Escarpment Biosphere Inc., the Ontario Ministry of Natural Resources, the University of Toronto (Faculty of Forestry) and the Niagara Escarpment Fund was created to undertake a project to re-sample a representative subset of the 110 data points originally measured, using the same methodology, the "Point-Quarter Method". An additional method "Vegetation Sampling Protocol" (VSP), was also employed at each site. The project is a demonstration in collaboration and capacity building amongst NEBR agencies, organizations and the public. A large number of sites were located on private property and landowner permissions were required and obtained to access those sites. An educational information brochure was provided to landowners explaining the work required to be undertaken and how the information would be used to support the NEBR. Landowners were invited to participate in the field work if desired. Funding was provided by the McLean Foundation, the NEC, MNR (Land Use Planning Section and the Species at Risk Stewardship Fund), the MNR and the Niagara Escarpment Fund (NEF).

Collection of this data will assist in identifying if and where Escarpment forests have been lost and how the forests have changed over 18, 25, or even 50 years, which will lead to an analysis and conclusions about the effectiveness of existing management and policies within the NEBR. The relationship between the early original survey data and the contemporary data will ultimately allow an evaluation as to whether there have been any changes in forest structure and plant species composition during the intervening 30 plus years.

The Point-Quarter method was the standard of Ontario Parks in its inventory of vegetation-landform representation in the park and Areas of Natural and Scientific Interest (ANSI) system (Maycock, 1979), and was the source of the mass of the data used to establish the Ecological Land Classification (ELC) for southern Ontario (Lee et al. 1998). It was also the method used in a more recent study of southern Ontario older-growth forests (Larson et al. 1999). The specific data from the original points on the Niagara Escarpment were published in 1996 as the Ecological Survey of the Niagara Escarpment Biosphere Reserve (Riley et al. 1996).

In addition to the Point-Quarter method, the VSP method developed by the Ontario MNR (Puric-Mladenovic et al. 2011), is also being applied at each of the sites. The VSP is a quantitative, integrative and adaptable method of vegetation and habitat sampling that places an emphasis on recording the spatial location of a sample. The VSP collects baseline vegetation and soil information in a standardized manner in fixed area plots. Data collected following the protocol can be used to support different applications and needs, but an emphasis is placed on collecting data that can be used to develop vegetation inventories and mapping in southern Ontario. VSP plot samples have known geographic coordinates, which enables vegetation mapping following a number of different methods.

The data from the new sampling will be comparable to those from a wide variety of other locations, as well being comparable to past conditions quantitatively measured on the Niagara Escarpment.

The summer of 2011 was the first season of a two-year field survey to sample the forested vegetation communities along the NEBR. In total there are 156 plots of which 71 sites were re-sampled in 2011 (See Map 4).

Results to date indicate that a few sample sites had very different plant community types compared to those originally sampled in the late 1970s, including Mount Nemo (Halton Region), where recent wind storms blew down a number of shallow rooted trees below the Escarpment. In successive years, shrubs such as mountain maple *(Acer spicatum)* and red elderberry *(Sambucus racemosa ssp. pubens)* have regenerated into these sites, including a rich herbaceous layer. At Mount Nemo the resulting vegetation community comprised a mosaic of widely spaced basswood, sugar maple trees, and dense understory shrub thickets.

Most historic sample locations were immediately identifiable by the dominant or canopy tree species in the forest stand. In most cases the same tree cover originally documented by was still there, only a little older. In a few cases, understory tree species documented in the 1970s had reached the canopy, and in some other cases canopy trees had fallen and were lying on the ground (usually with early successional poplar, cedar or birch species). At most sites, any readily apparent changes to canopy species composition were primarily a result of natural succession. In a few stands, disease was observed to have caused or to be causing changes to the stand, especially where Butternut had been a major component of the forest, or where beech bark disease was currently killing beech. At some sites, human related disturbance to the ground flora had removed some of the native species previously documented, and in one case in the northern section, logging had changed much of the stand.

Field observations to date have also indicated that a number of invasive plants have established along the Niagara Escarpment (Table 8). While observations are still relatively low, of particular concern are two herbaceous species, garlic mustard *(Alliaria petiolata)* and coltsfoot *(Tussilago Farfara)*, and two medium-sized shrubs common buckthorn *(Rhamnus cathartica)* and tartarian honeysuckle *(Lonicera tatarica)*.

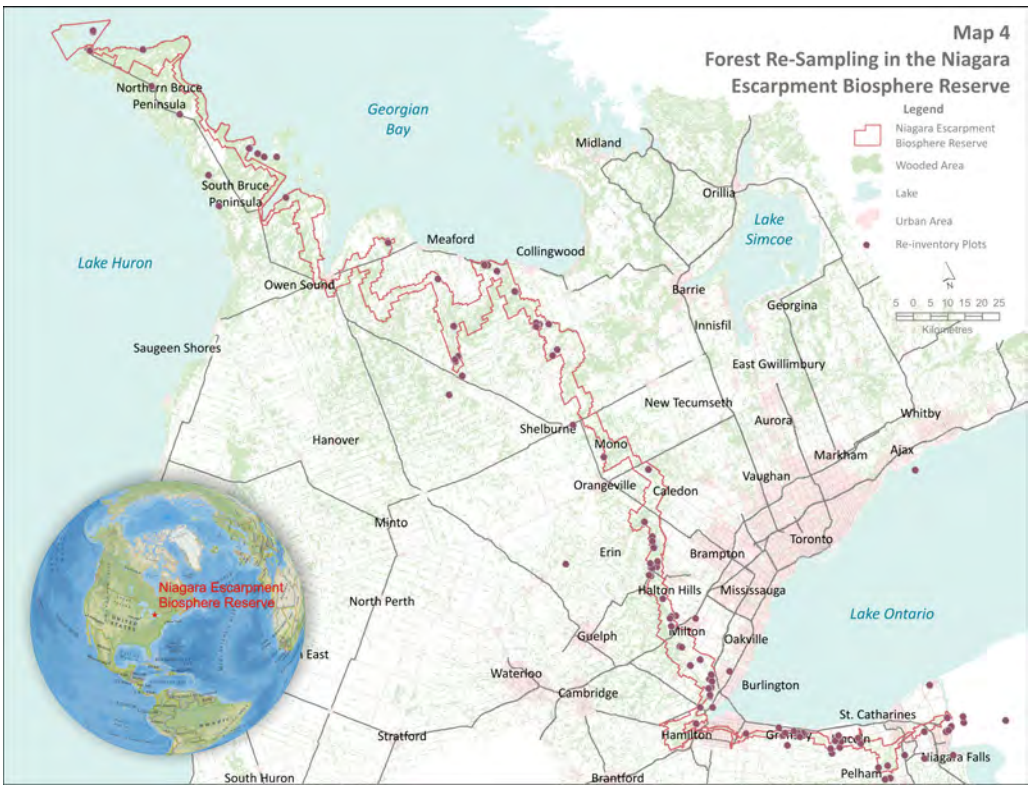


Table 8 Examples of exotic plants observed in the NEBR in summer 2011

Common Name	Scientific Name
Garlic Mustard	*Alliaria petiolata*
Common Buckthorn	*Rhamnus cathartica*
Tartarian Honeysuckle	*Lonicera tatarica*
Coltsfoot	*Tussilago farfara*
Black Locust	*Robinia pseudo-acacia*
Common St. John's-wort	*Hypericum perforatum*

The second field season is currently underway, with some of the 2011 sites revisited to collect ephemeral herbaceous groundcover data. Upon completion of the field data collection at all sites a complete analysis will be undertaken in order to achieve a number of study objectives and answer questions related to whether the overall diversity of the forests in the NEBR been maintained over the measurable period including:

- What are the overall 30-year trends in forest-change, such as in composition, maturation, species additions or losses, forest health (pathogen activity), invasives, site condition, etc.

- Are the 30-year changes in forest vegetation occurring differently in particular parts of the BR, such as by latitude, by proximity to urban development, or by the combination of both?

- Which of the factors that are associated with, or are influencing, forest change-over-time relate to particular land-uses and resource-use practices, and if any of those are considered to have had negative impacts on native forest diversity or health, what recommendations might be tabled regarding those land or resource uses.

Monitoring Landscape Diversity and Change in the Credit River Watershed Area of the Niagara Escarpment Biosphere Reserve

The Credit Valley Conservation Authority manages over 1100 sq km of land in the Credit River watershed which drains from Orangeville in the north to Lake Ontario in the south. The Credit River watershed is under a number of development pressures including urbanization from the Greater Toronto Area and conversion of agricultural lands to other uses. In a partnership project between the CVC and the University of Guelph, with financial support provided by the Ontario Heritage Trust, landscape change was evaluated with one of the objectives of determining how land cover types and land use intensity have changed in the NEPA before and after its implementation, and are these changes consistent with the objectives of the biosphere reserve designation.

An additional identified objective of the project which was successful was to strengthen already established partnerships among the CVC, the University of Guelph and the NEC.

Using aerial photography and Ecological Land Classification (ELC) for Southern Ontario, natural communities were classified for the year 1977, and the comparative year 1996. The report summarized that agriculture uses remained the dominant land use within the study area, increasing between 1977 and 1996 by 1, 135 ha. Conversely, urban land use was found to also increase by 490 ha. Plantations increased by 179 ha, upland forest by 234 ha and wetland by 509 ha. Results of the study provided evidence that the NEP is indeed functioning to maintain (and increase) wooded and wetland area and decrease fragmentation within the Credit River watershed study area of the NEBR, notwithstanding the expected limitations of this type of analysis (Mersey et al., 2001).

Recommendations of the study included that reforestation should be encouraged in areas targeted to improve upon the landscape level measures of environmental quality, and that more emphasis should be placed on assessing potential impacts of land use activities at the landscape scale.

NEC Development Permit Tracking System

Conversion of all of the NEC's archival land use planning information (paper mapping) is fundamental to under¬standing change and evaluating and improving environmental pro¬tection in the NEBR. Archival and ongoing Niagara Escarpment land use information has been digitized by the NEC for query and analysis. This digitized information provides for accurate analysis of development trends over time, and will allow additional public re¬porting that can be integrated into monitoring activities, for a more comprehensive and regular evaluation of how the policies of the NEP are being applied, and the objectives of the BR designation being upheld. As well, enforcement and compliance issues may be more effectively addressed and tracked with this system.

Funding of the conversion project was provided by the Friends of the Greenbelt Foundation through the Coalition on the Niagara Escarpment's Niagara Escarpment Foundation.

4.5 Describe the main conservation programs that have been conducted in the biosphere reserve during the past ten years as well as current on-going ones. Note their man goals and the scope of activities (e.g., biotic inventories, species-at-risk, landscape analyses, conservation stewardship actions, land acquisition, purchase plans. Cross reference with other Sections below where appropriate.

Land Additions and Re-designations

As described in Section 3.7 of this report, a positive accomplishment over the past decade is that the NEBR land area has increased by approximately 2,400 hectares or 1.26% since the 2002 review. The NEC, as the agency that administers the NEP, has the responsibility to ensure that the NEP land use mapping reflects the most accurate and appropriate land use designations, and that this is achieved based on an assessment of the features on the ground against the NEP's Designation Criteria (and complementary BR zones).

The majority of the increases in land area to the NEBR (and NEP Area) since the 2002 Review have occurred as a result of Amendments to the NEP initiated by the NEC and approved by the Minister of Natural Resources in 2012. These Amendments have added and designated lands within the Region of Halton the City of Hamilton to the NEP Area; and increasing the Biosphere Reserve area. A number of these lands, as a result of the Amendments, have also been added to the Niagara Escarpment Parks and Open Space System, providing additional opportunities for public access and recreation in the NEBR.

In addition to the lands described above, certain lands already within the Biosphere Reserve and area have undergone changes in the NEP land use designations, which is reflected in changes to the Biosphere Reserve zonation (e.g. zone of transition to core and buffer areas). These additions and changes in zonation since 2002 are described below.

"Amendment 71 – Escarpment Link Lands" – Additions to the Core, Buffer & Zone of Cooperation/Transition

In February 2005 the Greenbelt Act (GA) received Royal Assent. This Act included amendments to the Niagara Escarpment Planning and Development Act (NEPDA) which immediately transferred 2215 hectares of lands in the Cities of Burlington and Hamilton from the jurisdiction of the Parkway Belt West Plan (PBWP) to the Niagara Escarpment Plan Area (and therefore the Biosphere Reserve). The subject lands added through this process are geologically part of the Niagara Escarpment and include the brow (i.e. the steep slopes associated with the face of the Escarpment) and toe and contain a number of unique natural features associated with the Niagara Escarpment and land in its vicinity.

The lands added are part of an environmentally connected landscape, which is linked through forest cover, stream valleys and similar natural corridors. According to the features and land uses within these areas, approximately 2051 ha of lands were added to the core area, 13 ha to the buffer area and 150 ha to the zone of cooperation of the biosphere reserve.

"407 Gap Lands" – Additions to the Buffer Zone

In February 2012, approximately 108 ha of privately and publicly owned lands in the City of Burlington, were approved by the Government of Ontario to be added to the NEP (and therefore the NEBR) as Escarpment Natural Area and Escarpment Protection Area (BR core area), with a portion of the lands identified as Public Lands (in the Parks and Open Space System).

Approximately 31 ha of subject lands added to the biosphere reserve are forested and include the Nelson Slope Forest Life Science Area of Natural and Scientific Interest and the Nelson Escarpment Woods Environmentally Sensitive Area. A wetland traverses the subject lands in the north, along with four streams flowing off of the Escarpment to Lake Ontario.

From a physical and visual perspective, the lands are part of the continuous Escarpment corridor that spans the area.

"Cootes Paradise" – Additions to the Core Area and Buffer Zone, City of Hamilton

The subject lands added to the Biosphere Reserve core area encompass an area of approximately 93 ha in the City of Hamilton. For the most part the lands are owned by the Royal Botanical Gardens (RBG) and the City of Hamilton as public open space/parkland. Two hydro lines on easements exist north and south of the subject lands and are managed by Hydro One.

Approximately 40 ha of the subject lands are forested, with a portion in the north east connected to the larger wooded core area within the Cootes Paradise Life Science Provincial Area of Natural and Scientific Interest (ANSI). Approximately 10.17 ha of wetland extend from the Cootes Paradise Provincially Significant Wetland (PSW) in the

south and traverse the subject lands. Warm water and cold water tributaries originating in Cootes Paradise flow through the subject lands. The remainder of the property consists of wooded ravines (approximately 50%), hedge row plantations and successional abandoned agricultural fields (approximately 30-40 years old).

The majority of the subject lands have also been added to the Niagara Escarpment Parks and Open Space System within the Natural Environment Park classification.

Dufferin Aggregates, Town of Milton – Addition of core area (related to historic aggregate extraction approval)
Also approved in February 2012, this Amendment resulted in the addition and designation of approximately 70 hectares of land north of an existing quarry in the Town of Milton (Dufferin Aggregates Milton Quarry), in order to maximize the natural landscape corridor in the vicinity of an expanded mineral resource extraction operation, in accordance with the Government of Ontario's direction that was given as part of the approval process for the quarry.

The lands were added to the core area and buffer zone of the Biosphere Reserve. The inclusion of the lands within the core areas (Escarpment Natural Area and Escarpment Protection Area) was determined to be appropriate as the lands include Escarpment related landforms associated with the underlying bedrock which are in a relatively natural state, are identified as part of a Provincially Significant Life Science Area of Natural and Scientific Interest, include provincially significant wetland, form part of a significant stream associated with the Escarpment and form part of a environmentally sensitive area.

"Duff Pit" – Re-designation of lands from zone of cooperation/transition area to Escarpment Natural Area and Escarpment Rural (core and buffer areas)
Approximately 42 ha of lands in the Town of Halton Hills were re-designated after the former sand and gravel pit's operation ceased. The sand and gravel extraction operation occurred on an intermittent basis since the late 1950s. Licensed aggregate sites within the NEBR have a limited life span (the extraction operation itself), given that mining within approved NEP Mineral Resource Extraction Areas (zone of cooperation/transition area) will eventually cease. Such sites where extraction has been complete are expected to be rehabilitated and then re-designated to the appropraite land use designations in to allow for other compatible after uses.

The lands were re-designated from Escarpment Mineral Resource Extraction Area (zone of cooperation/transition area) to Escarpment Natural Area, Escarpment Protection Area and Escarpment Rural Area, (BR core and buffer zones), consistent with the surrender of the Aggregate Resources Act licence on the subject lands. After a review of the natural features adjacent to the site (wetland and Environmentally Sensitive Area), some land use designations were also amended from the Escarpment Protection Area and Escarpment Rural Area to Escarpment Natural Area (BR core area), in order to better reflect the appropriate NEP land use Designation Criteria and Objectives.

"Lafarge Pit" – Re-designation of lands from zone of cooperation/transition area to Escarpment Natural and Escarpment Protection Area (core area)
This Amendment proposes to change the Designation of Mineral Resource Extraction Area (zone of cooperation/transition area) to Escarpment Natural Area and Escarpment Protection Area (BR core area[7]), on an 82 ha property in the Town of Mono, following the surrender of the licence on this pit.

The property's most significant features are two man-made lakes, a forest/wetland complex and some reforestation/plantation that were developed/introduced as part of the pit rehabilitation plan. The remainder is rolling grassed fields interspersed with some returning tree growth (i.e., successional scrub). Trees and shrubs are also found along

[7] *Core area as per 2012 Self-Study recommendation. See Section 3.7.*

property boundaries and fence lines. Local birders have informed that the grasslands on the property are Bobolink habitat, a recently listed Species at Risk in Ontario. It is also assumed given the age of the man-made lakes and wetlands that there are likely aquatic dependent species that have returned to these lands.

The proposed Amendment has been forwarded to the Minister of Natural Resources with a recommendation to approve the land use re-designations.

Bruce Peninsula National Park / Fathom Five National Marine Park (Parks Canada)

Located in the heart of the NEBR, the 'Bruce' is a place of global significance Bruce Peninsula National Park lies at the tip of the 1700 km^2 Bruce Peninsula and the most prominent feature is the Niagara Escarpment which runs along the entire eastern edge. Within the park, the escarpment forms the Georgian Bay shoreline and is part of the core area of the Biosphere Reserve. The park was established by the federal government to protect a representative example of the Great Lakes/St. Lawrence Lowlands natural region. Under a federal-provincial agreement, Cyprus Lake Provincial Park (established in 1966) and portions of provincial nature reserves were transferred to the federal government in 1987 to form the core of the new national park. Lands are still being assembled to complete establishment of the park; it could become up to 156 km^2 when fully established. BPNP collaborates with First Nations, Métis, local communities, and conservation partners to achieve common interests in ecological and cultural resource protection within the Biosphere Reserve.

As a large protected area in southern Ontario, BPNP is a critically important stronghold for native species. The park is comprised of an array of habitats from rare alvars to dense forests and clean lakes. The rugged cliffs of the park are inhabited by 1000+ year old cedar trees. Together with Fathom Five National Marine Park, the park facilitates access to the shores of Lake Huron, the fifth largest freshwater lake in the world.

The Park is in the traditional territory of the Saugeen Ojibway Nations (SON). Stories of the SON and early settlers living on the land are integrated with park activities and research to build respect and understanding for the natural and cultural heritage of the peninsula. Proposed management strategies identified by the BPNP includes a key strategy of "Building a Future with the Saugeen Ojibway Nations" aims to forge a partnership between Parks Canada and the SON that is based on respect, trust and principles of equity and empowerment. The SON have a significant interest in the natural and cultural resources in their traditional territory which includes the park. Recognizing that an enduring partnership with the SON will be the foundation for mutually beneficial projects and programs in the park, the BPNP endeavours toexplore co-operative management approaches that will engage SON more in park management and operations. Through both formal and informal ways, park staff and members of SON will share knowledge of the peninsula's natural and cultural heritage

which will contribute positively towards protection, visitor experience and public outreach education (BPNP Draft Management Plan, 2012).

Fathom Five National Marine Park

The deep and sparkling waters at the mouth of Georgian Bay are home to Fathom Five - Canada's first National Marine Conservation Area. The park preserves a rich cultural legacy that includes 22 shipwrecks and several historic lightstations. Fathom Five's freshwater ecosystem contains some of the most pristine waters of the Great Lakes. The rugged islands of the park are a reminder of the impressive lakebed topography found beneath the waves The following is a sampling of the research, monitoring and outreach that the BPNP has been undertaking over the past 10 years:

1. Research and Monitoring

Research Projects:

- Lakebed Geology and Submerged Prehistoric Shoreline
- Black Bear Population and Home Range
- Thermal Ecology of Massasuaga Rattlesnakes
- Colonization of Alvars
- Paleozoic Geology of Niagara Escarpment
- Underwater Archaeological Investigations
- Cave Mapping
- Diatom-Environmental Relationship of Inland Lakes
- Fish Community Change of Inland Lakes
- 70 Years of Beaver Impact on the Landscape
- Endophytic Fungi in Native and Non-Indigenous Grasses
- Comparative Landscape and Conservation Genetics of Threatened Snakes
- Habitat for Migrating Bats
- Conservation Genetics of Hill's Thistle
- Ecological Integrity Monitoring Program:
- Forest Bird
- Frog Chorus
- Beaver Density
- Lake and Stream Benthic Invertebrates
- Black Bear Population
- Forest Health
- Forest Fragmentation
- Inland Water Quality (Nutrients, Metals, Temperature)
- Marsh Bird
- Pollinators (Bees)
- Salamanders
- Stream Fish
- White-Tailed Deer Winter Survivorship
- Coastal Wetlands (Fishes, Water Quality, Aquatic Plants)
- Lake Trout
- Lake Hydrology
- Citizen Science Monitoring:
- Breeding Bird Survey
- Butterfly Count
- Christmas Bird Count
- Spring Bird Arrival Dates
- Social Science Monitoring:
- Annual Attendance Statistics
- Visitor Surveys (2000, 2007)
- Public Opinion Poll (2002)
- Visitor Information Program (2007)
- Patterns of Visitor Use (2007)
- Visitor Experience Assessment (2009)

2. Biological Inventories

Species at Risk Inventories:

- Dwarf Lake Iris
- Eastern Prairie-Fringed Orchid
- Queen Snake
- Hill's Pondweed
- Shortjaw Cisco
- Tuberous Indian Plantain
- Massasauga Rattlesnake
- Hill's Thistle
- Lakeside Daisy

Other Biological Inventories:

- Alvars (prepared compendium)
- Arthropod Taxonomy
- Ancient Tree Atlas
- Ecological Land Classification
- "Barcode of Life" Project (i.e., Plants, Invertebrates)
- Lake and Stream Invertebrates
- Inland Lake Fishes
- Lichen Inventory
- Bryophyte Inventory
- Ixodid Ticks
- Re-Inventory of the Niagara Escarpment Biosphere Reserve Forest Biodiversity Plots
- Ecosystem Land Classification

3. Restoration and Rehabilitation of Ecosystems

- Disturbed Cliff Edge Forest
- Invasive Species Control (e.g., Garlic Mustard, Phragmites, Spotted Knapweed, Purple Loosestrife, Scot's Pine)
- Building Removals and Site Restorations
- Improvements to Restrict Access (e.g., Gates)
- Cyprus Lake Road Ecopassage
- Dark Sky Lighting Conversion Program

The Niagara Escarpment Parks & Open Space System (NEPOSS)

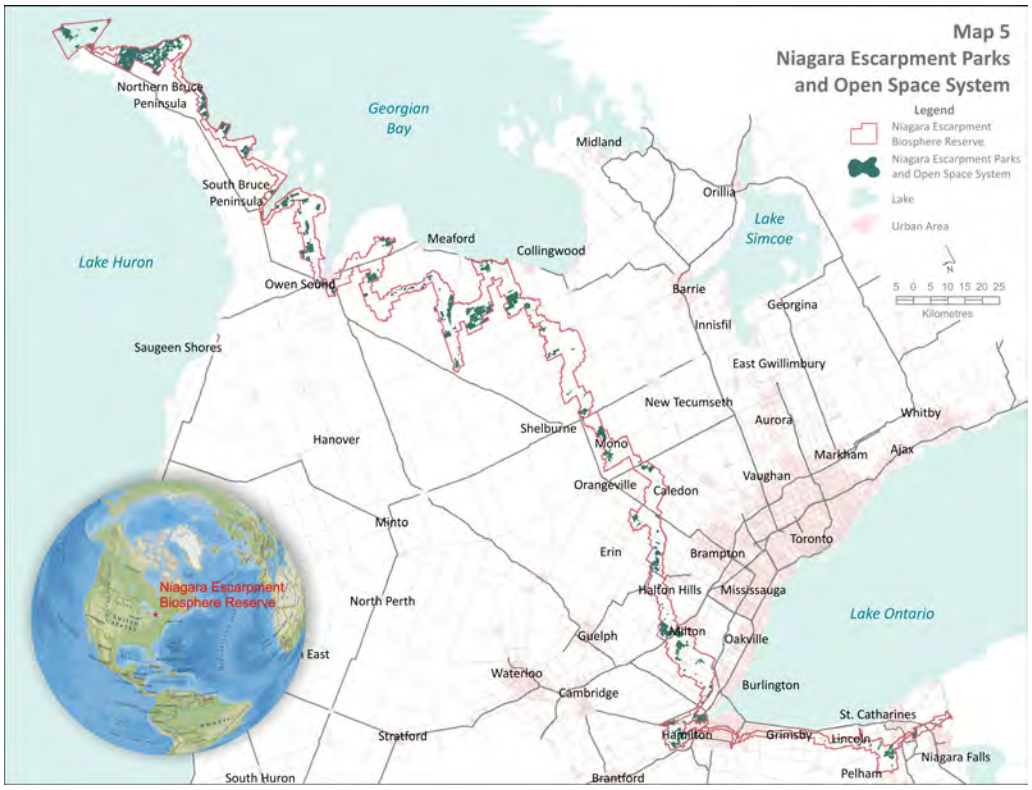
The Niagara Escarpment Parks and Open Space System (NEPOSS) is a linear system of public lands, largely connected by the Bruce Trail, that have been acquired to protect distinctive natural and historical features and significant areas along the Niagara Escarpment. These lands include core protected landscapes and significant natural heritage features and provide public access to the Escarpment as well as opportunities for passive recreation where environmentally compatible. The NEPOSS also aims to demonstrate leadership in supporting and promoting the principles of the Escarpment's UNESCO World Biosphere Reserve designation through sustainable park planning, ecological management, community involvement, environmental monitoring, research and education (NEC, 2005).

The proportion of publicly-owned lands within the NEP Area is approximately 18.7%. Public lands within the NEPOSS are owned and/or managed by various partner agencies including Conservation Authorities, municipalities, the Ministry of Natural Resources, the Ontario Heritage Trust, Parks Canada, the Niagara Parks Commission, the St. Lawrence Seaway Management Corporation, the Royal Botanical Gardens, the Bruce Trail Conservancy, the Escarpment Biosphere Conservancy and other bodies capable of managing parks and open spaces in the public interest.

One of the objectives of the NEPOSS is to complete a public system of major parks and open space through additional land acquisition and park and open space planning. New parks and additional lands are added to the system through land securement by partner agencies facilitated through purchase agreements or land donation or through lands being added to the NEP through Amendment or legislation. From January 2001 to May of 2012, 23 new parks were added to the NEPOSS, increasing the total number of parks in the system from 118 to 141. The majority of these additions were added to the System through the Greenbelt Act (Escarpment Link) which was approved in June of 2005 by the provincial Cabinet. The largest of these is the Royal Botanical Gardens park lands in Cootes Paradise at nearly 600 hectares. Other sizable additions include Borer's Falls Conservation Area (175 ha), Seymour Property in The Town of The Blue Mountains at nearly 80 hectares, and the Len Gertler Memorial Loree Forest additions at approximately 62 hectares. More recent additions include the Jackson Cove owned by the Escarpment Biosphere Conservancy at nearly 14 hectares, the Cheltenham Badlands managed by the Bruce Trail Conservancy (36.5 ha) and Nelson Escarpment Woods (67 ha). New lands added to the NEPOSS since 2001 are illustrated in Map 5.

The total area of parkland currently in the system is approximately 36, 297 hectares. The total area of parkland within the NEPOSS, which includes new parks and land acquisition adjacent to existing parks, increased by more than 2350 ha (6.92%) since the 2002 NEBR Review. In addition to new parks, this figure includes land acquisition adjacent to existing parks within the NEPOSS. For example, in 2012, Llewellyn Smith and Helderleigh Holdings Inc. donated approximately 22.2 ha of land to the Hamilton Conservation Authority in the vicinity of Vinemount Conservation Area. This was a significant addition to this particular area of the System, since the former configuration of Vinemount Conservation Area was quite linear.

Conservation Organizations, Nature Preserves, Private Trusts, conservancies and charitable conservation agencies secure lands as partners to enhance the NEPOSS. This role was enhanced by policy changes to the NEP which promote this activity. Such agencies include the Bruce Trail Conservancy, Ontario Heritage Trust and the Escarpment Biosphere Conservancy. These and other non-government conservation agencies respond to challenges faced by government with respect to funding resources to secure key Escarpment lands for the future.



Nodal Parks

The NEP identifies ten focal areas or "nodal parks" within the system which represent various geographic areas of the Escarpment. These parks are regional destinations that perform the function of visitor orientation and information dissemination related to park and open spaces activities, points of interest, recreational activities and attractions in surrounding Escarpment areas and communities (NEC, 2005). These parks also focus on education and interpretive activities related to the Biosphere Reserve and its natural and cultural values.

The nodal parks within the system, from north to south, are:

- Bruce Peninsula National Park
- Spirit Rock Conservation Area
- Inglis Falls Conservation Area
- Pretty River Valley Provincial Park
- Mono Cliffs Provincial Park
- Terra Cotta Conservation Area
- Crawford Lake Conservation Area
- Rattlesnake Point Conservation Area
- Royal Botanical Gardens
- Dundas Valley Conservation Area
- Ball's Falls Conservation Area

Since the 2002 review of the NEBR, several new visitor centres have been established for nodal parks within the NEPOSS. In 2006, a new visitor centre for Bruce Peninsula National Park opened its doors for the first time. Located in the town of Tobermory and connected to the Bruce Trail, this modern, $7.8 million dollar facility features a high-definition theatre for virtual tours of the park, multiple exhibits including a full-size lighthouse, a rock "flowerpot" formation and displays on local shipwrecks and the Bruce Trail. Located immediately outside of the visitor centre, a tower provides panoramic views of the park and Georgian Bay.

In 2008, the Ball's Falls Centre for Conservation was established in the Ball's Falls Conservation Area; a nodal park within the NEPOSS which was previously without a visitor centre. This award-winning building features interactive exhibits related to the natural and cultural history of the Escarpment and includes workshop and special event space. Environmental exhibits highlight the human impact on nature as well as watershed management and conservation programs of the Niagara Peninsula Conservation Authority. As a certified Leadership in Energy and Environmental Design (LEED) Gold Building, the Centre is a showcase for sustainable construction, design and energy conservation.

In 2010, a new Visitors Welcome Centre was established in the Terra Cotta Conservation Area. In addition to visitor orientation, this Centre provides snacks, merchandise and equipment rentals such as cross-country skis and snowshoes in a rustic environment.

Master/Management Plans

Agencies that own and/or manage lands within the NEPOSS are required to develop a master or management plan, in consultation with the NEC and the MNR that aligns with the objectives and policies of the NEP and the NEPOSS. The exception is parks owned by federal agencies (e.g. Parks Canada) since these agencies are not subject to provincial legislation. However, federal agencies are partners in the NEPOSS and have indicated that their park planning, management and development will conform to the greatest degree possible with the general purpose and intent of the NEP and the NEPOSS (MNR, 2012). NEC and MNR staff review and provide comments on management plans developed by these agencies.

Part 3 of the NEP includes policies specific to the development of management plans for parks in the NEPOSS. In accordance with these policies, management plans should protect ecological and historical features, create outdoor recreation opportunities and/or provide public access to the Escarpment (MNR, 2012). Each park within the system is classified based on the predominant characteristics of the property (i.e. Nature Reserve, Natural Environment, Historical, Escarpment Access or Recreation). Park classification is confirmed through the management planning process to ensure that the appropriate classification is applied. Based on an inventory of natural and cultural resources to identify opportunities and constraints, park managers are also required to develop park zoning and associated zone policies that guide the long-term protection, development and management of the park or open space area. Permitted activities must be environmentally appropriate and align with the park classification objectives. As per the policies in the NEP, park management plans must also recognize that the area is part of the UNESCO Niagara Escarpment World Biosphere Reserve and must include policies to recognize the Biosphere Reserve designation (NEP, 2005).

The NEC and the MNR work collaboratively with partner agencies to ensure that management plans are consistent with the objectives and policies of the NEP, the BR and the system. Once stakeholders and the public have reviewed the final draft management plan and NEC and MNR staff advisors are satisfied that all outstanding conformity issues have been resolved, the management plan is submitted to the NEC for endorsement, and subsequently to the MNR for approval.

Over the past decade, the MNR has approved twelve management plans for parks within the NEPOSS. In addition, the preparation of management plans for nine additional parks is currently underway, and management plans are being updated for two parks in the system. The section below highlights some of the most recently approved park management plans:

Terra Cotta – Silver Creek Complex Management Plan (2008)

Credit Valley Conservation Authority (CVC) owns and manages land within the Credit River watershed, including Terra Cotta Conservation Area (Natural Environment), Silver Creek Conservation Area (Natural Environment) and Terra Cotta Forest (Nature Reserve). These parks form one of the most environmentally and aesthetically significant areas in the watershed. A management plan was developed in 2008 for these three areas (known as the "Terra Cotta – Silver Creek Complex"). The management plan focuses on providing a "Landscape for Learning" for residents and visitors through the protection of the Niagara Escarpment with opportunities for enhanced educational programs, natural heritage appreciation and sustainable recreation. The development of a new management plan for Terra Cotta Conservation Area, as well as management plans for two additional CVC-owned parks within the NEPOSS (Belfountain Conservation Area and Ken Whillans Resource Management Area) was initiated in 2012.

Delphi Point Municipal Park Management Plan (2009)

Delphi Point is a 4 hectare Escarpment Access park owned and managed by the Town of the Blue Mountains. This mainly forested site provides public access to Georgian Bay and opportunities for education (e.g. interpretative signage) and passive recreation such as picnicking and nature appreciation. In addition to providing low-impact recreational opportunities, the goal of the 2009 management plan is protect the unique fossil formations and other natural heritage features within the park. Subsequent to the approval of this management plan, the Town acquired additional lands adjacent to the site to increase connectivity and public access opportunities in the area and to further protect shoreline areas. These lands are in the process of being added to the NEPOSS.

Battlefield Park National Historic Site Master Plan (2012)

This 13.3 hectare Historical Park, owned and managed by the City of Hamilton, marks the location where the Battle of Stoney Creek took place (a pivotal battle in the War of 1812). The site includes several features of cultural importance. The overall goal of the 2012 Master Plan is to conserve, interpret and present the site to a wide range of users. While past master plans focused on restoration, the most recent plan aims to conserve, interpret and present all of the elements on the site and significant historical layers with an emphasis on interpretative and educational values.

Burlington City Park Master Plan (2010)
Burlington City Park is a 67 hectare park in Halton Region situated on the edge of the Niagara Escarpment. The park features bluffs, tablelands, diverse woodlots, talus slopes, gently rolling fields and karst features typical of Escarpment landscapes. The site was purchased by the City of Burlington in 2002. It was later added to the NEPOSS and classified as a Recreation Park through the master planning process. In addition to natural features on the site, the park includes recreational uses and facilities and the Bruce Trail. The goal of the 2010 Master Plan is to create a naturalized, environmentally friendly sustainable design, balancing the need for play fields with the restoration of natural environments and the creation of a natural landscape character for all ancillary park landscapes. The Master Plan includes multi-use playfields, baseball diamonds and two open spaces for passive uses. The balance of the lands is dedicated to general access and protecting existing natural environments or creating new natural areas.

NEPOSS Planning Manual
To provide additional guidance to partner agencies with respect to the design, development, implementation and maintenance of park management plans, the MNR developed a NEPOSS Planning Manual (2012) in consultation with the NEC and other key partner agencies. This manual, which updates the draft 1996 version, outlines six phases that agencies should follow to produce a management plan. Although it is not a legislative requirement, the NEPOSS Planning Manual (2012) strongly advocates the need for public consultation to be included in the park planning process. This provides an opportunity for the public and partner groups to be directly engaged during various stages of the process. The input gathered can be used as a valuable tool to better understand community interests and to build support for the park planning process.

NEPOSS Council
During the 1990 review of the Niagara Escarpment Plan, the Hearing Officers recommended that a coordinated council be established to facilitate a cooperative approach whereby park managers could learn from each other's experiences. A council was initiated in the early 1990s to discuss common issues and exchange information; however, the council was discontinued in 1996 (MNR, 2012). In 2009, the NEPOSS Council was re-established to advance the NEPOSS objectives with the belief that more could be accomplished in NEPOSS as a collective rather than as individual parks and open spaces (MNR, 2012). The NEPOSS Council is comprised of park agencies responsible for the management of public land in the NEPOSS within the Biosphere Reserve as well as non-voting advisors from the MNR and NEC.

As described in the Council's Terms of Reference, the Council will:

- Report and respond to the MNR as requested;
- Report to their respective organizations on Council initiatives;
- Provide effective leadership for coordinated park management and stewardship;
- Protect natural and cultural heritage features of the NEPOSS;
- Support the growth of the NEPOSS through land securement activities;
- Develop a centralized strategic marketing and communication process;
- Build strong relationships with key stakeholders and Aboriginal Communities to address common park and open space issues and interests; and
- Work together to provide an interconnected system of trails and educational and recreational opportunities.

The development of the NEPOSS Council supports the Escarpment's designation as a UNESCO World Biosphere Reserve by facilitating the collaboration of efforts among park managers to promote sustainable development, conservation and stewardship within the NEPOSS.

The Bruce Trail

A key component of the NEPOSS is Canada's oldest footpath, the Bruce Trail, which extends approximately 892 kilometres (with 438 kilometres of side trails) from Queenston, Niagara in the south to Tobermory in the Bruce Peninsula. The Bruce Trail Corridor (which includes the main Bruce Trail, side trails and "optimum" route i.e. the most desirable route for the Bruce Trail) serves as the common public linkage tying the parks, open space areas and distinctive natural features and landforms together into one system (NEC, 2005). Where it traverses through the NEPOSS, park agencies are required to manage the trail in cooperation with the Bruce Trail Conservancy (BTC).

One of the objectives of the NEPOSS is to secure a permanent route for the Bruce Trail. The BTC is working to secure this corridor by receiving donations of land or by purchasing land, spending $1-2 million annually to purchase properties along the trail system. At the present time, 52% of the Bruce Trail Corridor is on privately owned land and is accessed through landowner agreement (BTC, 2012).

The Bruce Trail Conservancy is described in more detail below.

Close to nature.
Close to home.

Conservation Authorities (CAs)

Created in 1946 by an Act of the Ontario Provincial Legislature, Conservation Authorities (CAs) are mandated to ensure the conservation, restoration and responsible management of Ontario's water, land and natural habitats through programs that balance human, environmental and economic needs. CAs are governed by representatives of municipalities within the watershed.

There are seven CAs operating within the NEBR, with the objectives to: protect, manage and restore Ontario's woodlands, wetlands and natural habitat; develop and maintain programs that will protect life and property from natural hazards such as flooding and erosion and; to provide opportunities for the public to enjoy, learn from and respect Ontario's natural environment.

Table 8 CAs in the NEBR

Conservation Authority (CA)	Hectares	% CA Area	% CA Area in NEBR
Credit Valley Conservation	14,899.00	9.16%	7.66%
Grey Sauble Conservation Authority	64,200.25	39.46%	33.00%
Halton Region Conservation Authority	20,949.30	12.88%	10.77%
Hamilton Region Conservation Authority	9,704.94	5.97%	4.99%
Niagara Peninsula Conservation Authority	13,722.74	8.44%	7.05%
Nottawasaga Valley Conservation Authority	34,233.65	21.04%	17.60%
Toronto and Region Conservation Authority	4,556.43	2.80%	2.34%

Conservation Authorities develop and deliver programs that protect land resources and promote watershed stewardship practices that lead to healthy, sustainable communities and industries. Through the lands they own and manage, as well as the educational programs they deliver, CAs provide opportunities for NEBR citizens to understand and appreciate the value of their natural environment as well as the social and economic benefits of protecting that environment.

In addition to the conservation programs, CAs are responsible for the review of planning applications (eg. subdivisions, building lot creation through zoning by-law amendments, minor variances) affected by natural environmental hazards and/or natural heritage features, and provide valuable advice and technical assistance to municipalities and applicants on environmental matters and assessment of impacts (associated with valleys, floodplains, wetlands, stormwater management, erosion, etc.). The NEC works closely with their partner CAs in planning and policy matters in the NEBR. Escarpment CAs are circulated and requested to comment on NEC Development Permit Applications and proposed Plan Amendments.

The network of Escarpment CAs are also engaged as partners in a number of NEC ONE Monitoring Program initiatives, and monitoring and research data is frequently collected and shared between organizations where appropriate, to be sued in decision making processes.

The following provides an overview of the key initiatives of the seven NEBR CAs. The valued work of the Escarpment CAs is highlighted throughout this report.

Conservation Halton

Conservation Halton is the community based environmental agency that protects, restores and manages the natural resources in its watershed. Conservation Halton is committed to preserving native biodiversity and protecting species at risk through activities such as protection of natural heritage systems, the creation of wildlife corridors, and increased public awareness through education, outreach and partnerships with local organizations.

The agency is recognized for its stewardship of creeks, forests and Niagara Escarpment lands through science-based services and sustainable recreation programs. Conservation Halton's mandate includes, but is not limited to, environmental protection, water resources management, forest resources management and lifelong education and recreation.

The Halton Children's Water Festival (HCWF) provides elementary students in grades two through five with the opportunity to learn about the importance of water resources. The Festival is co-hosted by Conservation Halton and Halton Region in partnership with the Halton District School Board, the Halton Catholic District School Board, the City of Burlington, the Town of Halton Hills, the Town of Milton and the Town of Oakville in order to create a successful and financially sustainable water festival in Halton. A number of community sponsors also support the Festival.

Since 2006, Conservation Halton has been running "Trees for Watershed Health," a community outreach program that involves engaging watershed residents and community groups in tree planting. The program is designed to bring communities and nature together to increase forest cover in the watershed through volunteers planting trees at selected sites. This program is made possible in part by a multi-year grant given to Conservation Halton by a provincial granting foundation, the Trillium Foundation.

In 2005 Conservation Halton formalized a long term Environmental Monitoring Program, to guide the collection of information on species, ecosystems and changes to the environment over time. Designed to monitor species, ecosystems and changes to the watershed over time, it ensures that Conservation Halton's mission of "protecting and enhancing the natural environment from lake to escarpment for the benefit and enjoyment of present and future generations" is being fulfilled. It helps ecologists and land use planners in obtaining the quantitative information they need to establish targets and make informed decisions for the planning, management and/or rehabilitation of our natural resources. Good data is of great assistance in making decisions regarding biodiversity.

Niagara Peninsula Conservation Authority (NPCA)

The Niagara Peninsula is a unique and complex watershed, bordered on three sides by water, and with the Niagara Escarpment cutting across its length, the peninsula's diverse climactic and biotic zones are unique in North America. The NPCA is caretaker to over 2,870 hectares (7,091 acres) of sensitive natural areas on the peninsula. The NPCA conservation areas combine nature, culture and adventure to create limitless opportunities for discovery. Outdoor adventures can include natural history, spectacular views, unique trails, fascinating rock formations, aquatic resources, and abundant wildlife.

The NPCA has developed a comprehensive land acquisition strategy for the entire watershed with the main objective to complete the NEPOSS through Niagara Region and to assist in securing the optimum route for the Bruce Trail.

NPCA is active in habitat protection and enhancement projects for species at risk including vegetation heal monitoring, growth and yield plots and invasive species removal and control (including Buckthorn) in order to maintain habitat for native species.

Credit Valley Conservation (CVC)

Situated within one of the most-densely populated regions of Canada, the Credit River Watershed contains some of the most diverse landscapes in southern Ontario. In this area, the Carolinian Forest zone meets the Deciduous Forest zone, both of which contain unique species not found in other zones. The Niagara Escarpment and the Oak Ridges Moraine also run through the watershed, further increasing the number and diversity of plants, animals, and communities.

The CVC has a comprehensive natural heritage and planning section which is engaged in a number of initiates related to inventories and assessments of natural features and areas including: species at risk population and habitat assessments, Natural Areas Inventories (NAI). The NAI work contributes to conservation land management planning and offers recommendations for ecosystem management opportunities on privately owned lands. CVC develops periodic monitoring reports which summarize research, track trends and is used to guide future monitoring.

The goal of CVC's education program which was re-established in 2007, is to enhance ecological literacy across the Credit River Watershed, including: a) fostering public understanding and appreciation of the Credit River Watershed's natural heritage, and
b) encouraging and supporting public involvement in priority stewardship activities. The scope of Credit Valley Conservation's education program includes presentations, workshops, outdoor programs, and events throughout the Credit River Watershed in conservation areas, communities, and schools reaching about 25,000 participants per year (as of 2010).

The Countryside Stewardship Program engages watershed farm and non-farm rural landowners and residents in rural towns and villages in stewardship actions using a variety of outreach, educational and incentive programs. Landowners learn about local land and water management issues and are supported with technical advice, restoration services and/or incentives to facilitate private land stewardship activities that protect or restore watershed health.

Programs offered to rural landowners on Escarpment lands within the rural watershed include:

- Peel Rural Water Quality Program: technical assistance and cost-share program for farms properties (in Peel)

to implement beneficial management practices that protect water quality.

- Caring for Your Horse and Farm: environmental stewardship workshop for horse farm owners to help them better manage pastures and manure to protect water quality. Four workshops are offered annually.
- Caring for Your Land & Water: workshop for rural non-farm landowners that explore the issues facing the watershed, discuss land management practices that protect land, water and wildlife, foster communities of stewardship. Six workshops are offered annually.
- Your Guide to Caring for the Credit: a specially designed manual developed for the rural landowner to help inventory the natural features on their property, assess land management practices and create an action plan to address any issues that are identified. The guide itself consists of a series of worksheets that cover all aspects of managing a rural property from septic systems to forest management, energy conservation and construction activities. Your Guide to Caring for the Credit is available through participation at any Caring for Your Land & Water workshop.
- Property Site Visits: Caring for Your Land & Water workshop participants are eligible to sign-up for a site visit with one of our Stewardship Coordinators. This provides an opportunity for landowners to meet one-on-one with CVC's experts to discuss areas of interest or concern on their property.
- Caring for the Countryside Workshop Series: these advanced workshops are designed for rural landowners who have completed Your Guide to Caring for the Credit and have particular areas of interest that require expert advice. Workshop topics such as woodlot management, caring for your pond, managing invasive species, and septic system management are covered. Between five and eight workshops are offered annually.
- Your Green Yard Workshops: Ecological landscaping and gardening workshops geared more towards residents with smaller lots or residential properties in town. Workshops cover three main activities: native plant gardening, environmental maintenance and green outdoor building. Usually 1-2 workshops offered annually.

To promote private land reforestation and stewardship, CVC offers inexpensive tree planting services and plant materials to eligible landowners. CVC's experienced staff will assist private landowners to restore and improve their property by planting and supplying trees, shrubs and seedlings. There are three different tree planting programs available to landowners living within the boundaries of the Credit Valley watershed:

- Reforestation Planting (95,000 seedlings planted annually)
- Naturalization Planting (6000 units planted annually)
- Naturalization Stock Direct Sale (600 units sold annually)
- Community plantings (3000 planted annually)

In 2004, the CVC developed and began implementing a Greenlands Securement Strategy for the Credit River Watershed. CVC is working with Halton and Peel Regional Municipalities to develop Regional scale securement programs that include annual funding, landowner contact, and staff support and are working with the Bruce Trail Conservancy (BTC) and the Ontario Heritage Trust on landowner contact and to secure more green lands. Accomplishments on land acquisitions to date include acquiring 125 acres as part of the Terra Cotta-Silver Creek Complex and completing management plans for Terra Cotta, Silver Creek, and Terra Cotta Forest Conservation Areas that includes land acquisition targets

Grey Sauble Conservation

Grey Sauble Conservation is a community-based environmental agency which owns and manages over 11,000 hectares of some of the most scenic and environmentally sensitive lands in Grey and Bruce Counties. Working with multiple partners (other agencies, service clubs, municipalities, Provincial and Federal governments and private landowners), Grey Sauble strives to protect and enhance a healthy watershed environment through our various programs and services with the Mission:

In partnership with the stakeholders of the watershed, is to promote and undertake sustainable management of renewable natural resources and to provide responsible leadership to enhance biodiversity and environmental awareness.

Nottawasaga Valley Conservation Authority

The Nottawasaga Valley Conservation Authority (NVCA) watershed is a large geographic area, approximately 3700 sq. km, with jurisdiction within 18 municipalities. The

NVCA has five major objectives including to: protect, enhance and restore water, protect, enhance and restore land protect life and property from flooding and erosion, to provide educational and recreational opportunities for the public, to partner with our watershed Municipalities, provincial/federal agencies, Conservation Ontario, and other interested stakeholder to achieve mutual goals .

In 2007, the NVCA released its first set of user-friendly Watershed Report Cards that provide a broad overview of forest, stream and wetland health within the Nottawasaga Valley watershed. The report cards communicate the state of ecosystem health and provide recommendations for the protection of healthy systems and restoration of degraded areas. Watershed Report Cards provide an evaluation of watershed conditions and an action plan for future improvements. Forest and wetland conditions in the Nottawasaga Valley watershed are reported as being generally good - they currently meet Environment Canada's minimum guidelines for healthy watersheds and achieve a "B" grade; however, forest and wetland cover are under pressure from urban development and farmland expansion in some areas of the watershed.

In partnership with the community, the Land and Water Stewardship Program of the NVCA works on local projects that protect and restore the environment, and helps ensure the future of healthy water. The Conservation Lands program consists of three main components: Land Acquisition, protection through management, and recreational education. The land acquisition strategy developed in 2007 focuses on lands that have been deemed significant by local, provincial or international agencies, and have demonstrated abilities that offer protection to both ground and surface waters as well as significant flora/fauna habitat. The land acquisition is achieved through purchase and holding rights to property thereby removing ecological areas from potential future development and incompatible uses. Where possible, the rehabilitation and restoration of land that has or is experiencing degradation will be implemented by the NVCA and other partners (NVCA, 2007).

Hamilton Conservation Authority

The Hamilton Conservation Authority (HCA) is situated at the western end of Lake Ontario. For over 50 years HCA has led grassroots environmental efforts to help ensure a safe and sustainable community. The HCA owns, leases or manages about 4,400 hectares of environmentally significant land which is home to rare plants, birds and mammals.

HCA is dedicated to the conservation and enjoyment of watershed lands and water resources through the four main program areas of watershed stewardship, planning and permits, protecting water and protecting land.

Hamilton-Halton Watershed Stewardship Program for Landowners - The Hamilton Harbour Remedial Action Plan (RAP) recommends that citizens in urban and rural areas take responsibility for restoring and maintaining the quality of the environment in which they live. This is the foundation upon which the Hamilton and Halton Conservation Authorities and the Bay Area Restoration Council initiated the Hamilton-Halton Watershed Stewardship Program (HHWSP). The HHWSP's purpose is to protect, enhance and restore environmentally significant natural areas and watercourses in the watersheds of HCA and Conservation Halton through developing an educated, empowered group of landowners.

The program has been proactively contacting landowners of natural areas and watercourses encouraging them to be good stewards of their land. This initiative is an example of Biosphere Reserve partners collaborating across their respective watershed boundaries on projects of common interest. As of 2009, over 329 landowners have made verbal agreements to consider the effects of their land management practices on the health of the watershed. These landowners have been publicly recognized and are recipients of the Watershed Steward Award.

Toronto and Region CA

At 2.34% of the NEBR, the TRCA has the smallest portion of watershed area situated in the NEBR (includes the Region of Peel and the Town of Mono). TRCA's area of jurisdiction includes 3,467 square kms: 2,506 on land and 961 water-based comprised of nine watersheds. TRCA has a strong history in watershed management and leadership in applying sustainability practices.

As the "Living City" - healthy rivers and shorelines and regional biodiversity are key elements of the Toronto & Region Conservation Authority's strategic business plan. The Regional Watershed Monitoring Program (RWMP) is a sci-

ence based, long term monitoring initiative focusing on key components of the terrestrial and aquatic ecosystems. The RWMP was developed by the TRCA with the purpose to collect aquatic and terrestrial ecosystem data at the watershed and sub-watershed scale. The data collected are shared with partner municipalities and agencies (including academic institutions), and are used for planning, implementation and reporting purposes. Community outreach and education are incorporated into data collection, and this is accomplished through the involvement of trained volunteers and partnerships with community groups and NGOs.

TRCA is a leader in environmental education and has been delivering innovative learning programs since 1954. TRCA Education for Sustainability Goals (Based on A Systems Thinking Curriculum for Learning in The Living City) identifies that learning should be:

- Locally Based or "Grassroots": designed for or by a particular population which values their specific geographical, socio-cultural, economic and physical needs;
- Relevant to Learners: personal meaning is powerful, for example, learning is much more likely to endure when students clean up a ravine they play in, rather than watch a video of a similar clean-up in a place they will never visit; Experiential: when engaged in learning programs, people retain about 10 per cent of what they read, 20 per cent of what they hear, 50 per cent of what they hear and see, 70 per cent of what they say (in presentations or answering questions etc.) and 90 per cent of what they do themselves;
- Life-Long: the joy of learning doesn't end with graduation, but continues throughout a person's personal and professional life; and
- Systems Thinking: is one important tool that can help learners and teachers simplify the relational and interconnected issues of our times, and thereby help them to identify effective, realistic and sustainable solutions (TRCA, 2011).

Bruce Trail Conservancy (BTC)

The Bruce Trail provides the only continuous public access to the Niagara Escarpment. The Bruce Trail Conservancy (BTC), established in 1967, is a charitable organization committed to establishing a conservation corridor containing a public footpath along the Niagara Escarpment, in order to protect its natural ecosystems and to promote environmentally responsible public access to the NEBR. The corridor is secured through land donations or by purchase of lands by the BTC.

A Board of Directors governs the BTC and volunteers from nine Bruce Trail Clubs are responsible for maintaining, stewarding and promoting the Trail. The governance model of the BTC exemplifies the capacity building function of biosphere reserves as it is supported by more than 1,000 volunteers and 8,500 members across the Escarpment. The BR principles are also mirrored in the Vision of the BTC which states:

"The Bruce Trail Conservancy and its partners will secure a conservation corridor along the entire Niagara Escarpment that contains the Bruce Trail. Our steadfast commitment to responsible land stewardship will significantly contribute to the preservation and enhancement of the Escarpment ecosystem" (http://brucetrail.org/pages/land-conservation).

Included in the BTC's core values, is the recognized value of the donors, landowners and public agencies who partner with BTC to continually expand the conserved lands along the Niagara Escarpment and the restoration and stewardship of the lands under their care.

A key success story of the BTC over the past 10 years is their land securement program. Between January 2002 and June 2012 the BTC has been directly responsible for the preservation of 107 properties, resulting in permanent protection of 4,282 acres of Niagara Escarpment Biosphere landscape, and securement of 54 kms of Bruce Trail Optimum Route (the preferred route for the Bruce Trail). The majority of the funds for these acquisitions came from BTC donors and supporters, as well as land donations (See Figure 7 and Table 9).

Figure 7

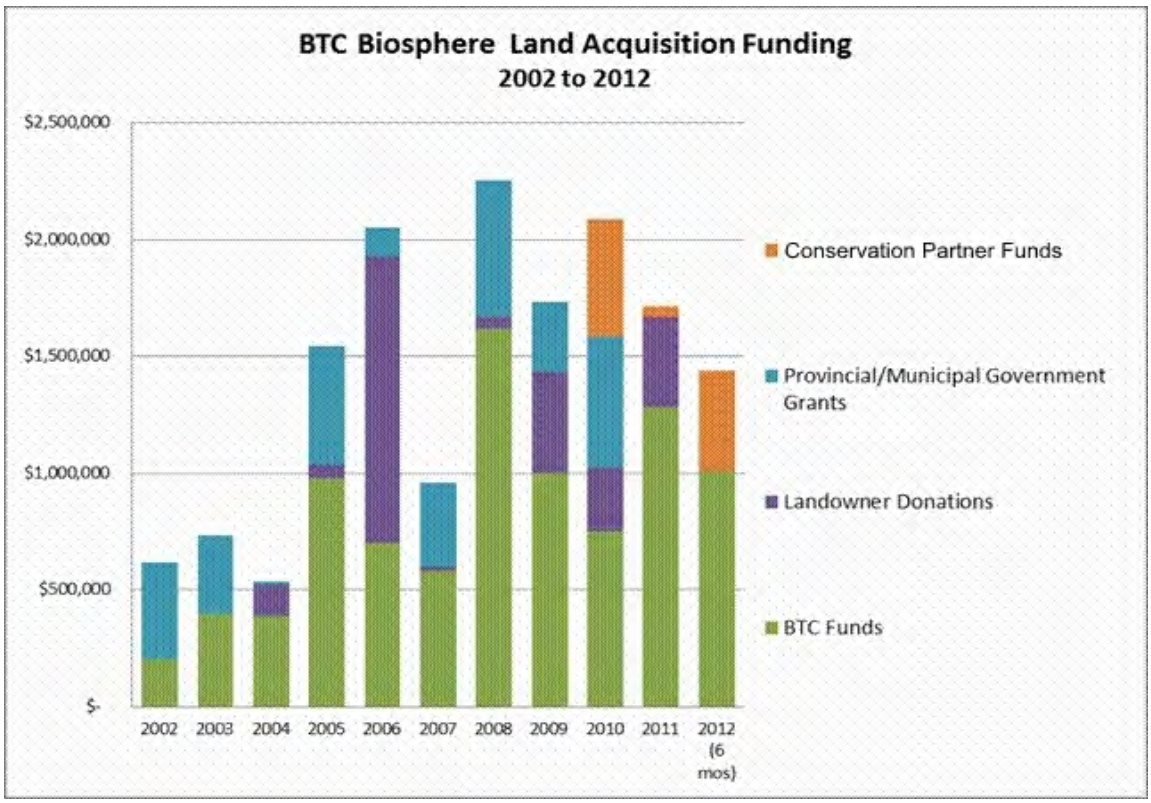


Table 9 Land Acquisitions by the Bruce Trail Conservancy

Time Period	Number of Biosphere Properties Secured by the BTC	Property Value Secured	Ha Secured	Acres Secured	Bruce Trail Optimum Route Secured (m)
2002	6	619,967.00	72	179	5.2
2003	9	731,619.00	95	234	4.5
2004	7	536,564.00	45	111	1.4
2005	16	1,542,864.00	126	312	6.2
2006	5	2,050,330.00	38	95	2.9
2007	9	959,375.00	133	329	3.5
2008	18	2,256,960.00	347	857	10.3
2009	18	1,735,788.00	228	564	7.6
2010	8	2,089,972.00	357	883	5.9
2010	7	1,713,440.00	160	396	3.5
2012 (6 mos)	4	1,439,500.00	130	321	3
	107	15,676,379.00		4,282	54

Table 9 highlights the land acquisition successes of the BTC, and particularly how this work is being achieved through funding from a variety of sources. It also shows while a decline in Provincial support, there has been an increase in support from individual private donors.

Escarpment Biosphere Conservancy (EBC)

The Escarpment Biosphere Conservancy (EBC) is a registered charity whose mission is to establish, maintain and manage a system of nature reserves in the area of the NEBR, including the maintenance of physical features of scientific and/or ecological, cultural, historic or scenic interest; to maintain, enhance or restore areas of native species or natural habitat: to encourage and support scientific research and educational services related thereto; and to educate the public about conservation and preservation of the landscape, ecology and wildlife of the Niagara Escarpment partly through providing low impact, ecologically sustainable recreational opportunities which complement and do not substantially conflict with this objective.

The EBC was established to preserve the landscape, ecology and wildlife of the Niagara Escarpment by developing and managing a system of nature reserves on which only ecologically sustainable recreational activities would be permitted. For each property that is acquired, a management plan is developed which maps the ecological zones and identifies significant species and features and compatible permitted uses. Compatible used are usually include passive hiking and rarely includes motorized vehicles, except as required for approved forest management activities. The EBC uses conservation agreements as a tool to protect significant lands. A conservation agreement is a voluntary agreement between a land owner and a qualified agreement holder such as a land trust or conservation organization that limits the amount and type of development which can occur on a property in order to preserve its natural character.

Typical agreements may rule out additional severances or subdivisions, gravel pits, water taking and golf courses, while allowing the landowner to continue farming on agricultural lands. The owner can bequeath the land to their children or eventually sell the land, while the restrictions bind all future owners to the same rules.

In 2006, the EBC was approved as a "Conservation Organization" for the purposes of the NEP. Nature Preserves, owned and managed by an approved conservation organization are recognized as a "Permitted Use" within the Escarpment Natural Area (BR core area) of the NEP. In addition, lot severances are permitted under the NEP as part of, or following, the acquisition of lands by an approved conservation organization for the purpose of establishing a nature preserve.

The following are a list of lands acquired by the EBC over the last 10 years for the purposes of conservation:

2002:

Martin Property - Donated to the EBC, this 40 ha property is located approximately 0.5 km northwest of the Smoky Head – White Bluff Life Science Provincially Significant ANSI. The property includes the Bruce Trail and consists of cedar forest, deciduous forest and wetland. The property has been added to the NEPOSS and is classified as Escarpment Access.

Mantec Bates - This 13.8 ha property was purchased with provincial funding to protect the Area of Natural and Scientific Interest west of Duntroon including a trail access parking lot. The Bruce Trail crosses the property.

Jackson Cove - This 13 ha parcel is in the Cape Dundas Regionally Significant Life Science ANSI. The property was acquired to protect the bluffs above Jackson Cove, with funds from the Province. The Bruce Trail traverses the northwest boundary of the property.

2004:

Tomboulian Property - This 20 ha property is located south of Lion's Head within the Barrow Bay South Regionally Significant Life Science ANSI. The property was donated to protect the globally rare Hart's Tongue Fern found in Escarpment crevasses. The US Nature conservancy partnered to complete this project. The Bruce Trail follows the southern property line. This property was added to the NEPOSS as a Nature Reserve.

2005:

Schulz Property - This dramatic 1.8 ha property protects 150 m of Escarpment cliffs and provides a route for the Bruce Trail on top of the Escarpment at North Cape Chin. The lands are now part of the NEPOSS classified as Nature Reserve

2006:

Edwards/Lindenwood - This 25 ha property was acquired by the EBC with thanks to a generous cash donation. The property includes Escarpment outcrops, Indian Creek wetlands, forests, former agricultural lands that have been reforested and a portion of the Bass Lake Regionally Significant Life Science Area of Natural and Scientific Interest.

The Bruce Trail is located just west of the property in the adjacent Spirit Rock Conservation Area. The property has been added to the NEPOSS, classified as Escarpment Access.

Farquharson Property - This 42 ha property includes Escarpment slopes and four tributaries of Mud Creek. The lands have been added to the NEPOSS as Escarpment Access.

Protect Our Water and Environmental Resources (P.O.W.E.R.)

P.O.W.E.R. is a thriving not-for-profit community-based organization committed to protecting the environment and the quality of life in North Halton and beyond. P.O.W.E.R. was formed in 1987 by citizens concerned about potentially unsustainable land use practices occurring within the NEBR.

With a vision that a healthy environment is the foundation for a bright future, P.O.W.E.R. and its broad-based membership and partners work to educate, foster capacity for actions, and influence land use decisions which prevent unsustainable patterns and approaches that affect the quality of life and health of the NEBR. P.O.W.E.R. works to develop proactive projects, programs, directions and policies that recognize the necessity, importance, value and role of natural spaces, native species and ecosystem function and flows for sustainable communities and a sustainable planet. P.O.W.E.R. has delivered roughly 7,500 student outdoor education days on the Escarpment, restored 9 ha of habitat in Halton Hills with 11,000 native plants, and has established three Forest Biodiversity plots on the Escarpment.

The connection to the international level, including the United Nations Commission for Sustainable Development and the United Nations Convention on Biological Diversity, have shaped the way P.O.W.E.R. operates – seeking to bring the international directions to the local level and making the connections from policy to action at the local level. P.O.W.E.R. is currently formulating plans on how to incorporate Multilateral Environmental Agreements (i.e. Convention on Biological Diversity, Ramsar Convention), and other international directions (i.e. United Nations Forum on Forests, Integrated Water Resource Management) into their work related to the NEBR. The group is also working on positions that directly relate to the objectives of Biosphere Reserves as stated from the Man and the Biosphere Programme. P.O.W.E.R. is endeavouring to use the Aichi Targets and 10 Year Plan of Work for the Convention on Biological Diversity http://www.cbd.int/sp/ as the basis to form initiatives related to the NEBR. Nested within the Decade on Biological Diversity (2011 -2020) this is a strategic direction for P.O.W.E.R. leading to 2020.

P.O.W.E.R.'s outreach on the Escarpment directly reflects the three core functions of the Biosphere Reserve designation, and is tied in with their work and efforts on sustainable development and biological diversity. Generally their outreach includes and underscores conservation, sustainable development and logistics as defined through the MAB Programme. P.O.W.E.R. seeks to work with all stakeholders and partners to enable the functions of both the MAB program and the natural functions of the Biosphere Reserve as considered through the lens of sustainable development and biodiversity.

The primary mechanism P.O.W.E.R employs for this outreach is the methodology used for National Biodiversity Strategies and action plans through the implementation of Communications, Education and Public Awareness (CEPA). A link to the methodology documentation can be found here: http://www.cbd.int/cepa/.

P.O.W.E.R has developed formal education and cross curricular lessons to enable outdoor education for youth in Halton Hills. Using a service learning model, P.O.W.E.R.'s Millennium Forest project began in 2000 with the goal to engage students in Halton Hills in outdoor education and service learning through restoration. The project was intended to be a one year effort but the response and need resulted in the development of P.O.W.E.R.'s Engaging Youth in the Environment for Sustainability (EYES) program, which includes 3 major components – Half Day environmental programs, Youth Conferences and Future Forests. Over the past three field seasons, through the generous support of Environment Canada, Trans Canada Energy, Credit Valley Conservation, the Town of Halton Hills and Earth Day Canada, approximately 1,200 youth have participated in the Future Forest program. Using Terra Cotta Conservation for education and working on publicly owned land behind the Acton Arena and in the Hungry Hollow, the 800 volunteers have participated in thousands of biodiversity education hours and planted thousands of native species.

In February, 2012, P.O.W.E.R. and partners hosted Biodiversity Matters BDM3, at a local Halton Hills High School. The goal for BDM3 was to create a hub for schools and students to develop capacity for leadership to mainstream Biodiversity during the United Nations Decade on Biodiversity (2011–2012). This student led and adult enabled conference hosted students between grades 7–12 from North Halton and Peel. The program for BDM3 was developed by P.O.W.E.R. 's Youth Caucus over the summer and youth from four schools make up the steering committee for BDM3. While P.O.W.E.R. facilitates the meetings and some of the work for the conference, the steering committee is responsible for the development and delivery of the conference. From technology to session development, to promotional material, to food, and more, students are involved in all elements of the conference, taking on leadership roles. BDM3 was an interactive event that explored and developed an understanding of the issues affecting BioDiversity and the links to a sustainable future. Sessions included "BioDiversity Literacy," "Speak Up and Speak Out," "We Are All Connected" and "Biodiversity as Muse and News." Guests include International Youth, Animal Ambassadors, workshop experts and special guests.

2011 – 2020 has been designated as the United Nations Decade on Biological Diversity. The goal of the decade is to raise awareness in the public at large about the benefits and values of Biodiversity and to stop the loss of Biodiversity. The vehicle for enabling the decade is to mainstream Biodiversity across all groups. In 2002 the world set as a goal to stop the loss of Biodiversity and designated 2010 as the International Year on Biological Diversity. On the Escarpment, the Strategic Plan and Aichi Targets are a critical and key to supporting the Biosphere Reserve designation, and the Niagara Escarpment Plan. By incorporating the Strategic Plan and Targets, through the development of a Biodiversity Strategy and Action Plan specific to the Escarpment, the Niagara Escarpment Biosphere Reserve will be enabling, meeting and forwarding its role as a focal point for sustainable development as indicated through the MAB program and designation. P.O.W.E.R. is integral in enabling such an exercise for the Escarpment.

Ministry of Natural Resources (MNR)

The Ministry of Natural Resources is the steward of Ontario's provincial parks, forests, fisheries, wildlife, mineral aggregates, petroleum resources and the Crown land and waters that make up 87 per cent of the province. MNR's mandated activities include: biodiversity management; natural heritage and protected-areas management; Crown land, water and non-renewable resource management; renewable energy; forest management; and emergency and forest fire management. The ministry fulfills its mandate through a broad range of laws and programs that reflect its diverse responsibilities (MNR, 2012).

Species at Risk Stewardship Fund

The Ontario MNR Species at Risk Stewardship Program includes education and outreach, incentive programs to support private landowners, and funding for stewardship activities. With many of Ontario's Species at Risk found on private lands, voluntary conservation efforts are essential to the recovery of species at risk. The program's fund supports greater public involvement in all kinds of species-at-risk protection and recovery activities, providing $18 million to eligible projects.

Examples of projects funded from 2009 to present include:

- Inventory of Selected Species at Risk in the Niagara Escarpment Biosphere Reserve
- Jefferson Salamander Inventory and Habitat Assessment within the Regional Municipality of Niagara
- The Niagara Species at Risk Eco-Program for stewardship outreach and recovery actions for the Common Hoptree, Swamp Rose-mallow, Butternut and Eastern Flowering Dogwood
- Lathrop SAR Stewardship: Outreach, Restoration, Recovery and Monitoring Project
- Natural Areas Inventory of Niagara and Haldimand
- Spoon-leaved Moss Recovery
- Niagara Species at Risk Outreach & Recovery

5.0 The Sustainable Development Function

5.1 Prevailing trends over the past decade in each main sector of the economic base of the biosphere reserve. Briefly describe trends based on the land, water and resource uses in the biosphere reserve (at the landscape level) (e.g. agriculture, renewable uses in the biosphere reserve (at the landscape level) (e.g., agriculture, renewable resources, non-renewable resources, manufacturing and construction, tourism and other service industries, etc.

Economic development in the Niagara Escarpment Biosphere Reserve varies along the Escarpment's varied landscapes, natural resources, and cultural attractions. Economic development through the Escarpment's recreational opportunities has grown substantially in the last decade, with increased infrastructural development of ski and snowboard centres, golf courses, campgrounds, and culinary destinations adjacent to Escarpment wineries. Eco-tourism based on the Escarpment's recreational opportunities supports rural community economic growth, and has led to additional infrastructure development in construction and visitor services.

Mineral resource extraction continues to be a significant economic driver in many Escarpment communities, as market demand for high-quality mineral resources continues to grow in Ontario. The Niagara Escarpment, with its availability of aggregate resources, close to the fastest growing communities of southern Ontario, is under continued pressure as an industry source. Mineral resource extraction is a permitted use in the Niagara Escarpment Plan by Plan Amendment. Mineral resource extraction areas constitute approximately 1.8% of the Niagara Escarpment Plan Area.

With the advent of the Ontario Greenbelt in 2005, efforts to promote and enhance the production of local food and connect producers with urban vendors have also increased. Farm markets, farm-gate sales, and viticultural production in Niagara Escarpment areas has grown extensively in the past decade. Agricultural close-to-market specialty businesses are an increasing trend given the proximity to urban areas (i.e. pick your own apples).

5.2 Community economic development initiatives.

Programs to promote comprehensive strategies for economic innovation change, and adaptation, and the extent to which they are being implemented within the BR by local business or others. Are there specific "green" alternatives being undertaken to address sustainability issues? Relationships (if any) among these different activities.

The NEBR provides significant economic value to the Province of Ontario. A recent study of Ontario's Greenbelt by the Suzuki Foundation suggests that the Greenbelt provides $2.7 billion annually to Ontario. The Niagara Escarpment encompasses twenty-three per cent of the Greenbelt's total land area of 1.8 million hectares.

The Escarpment's natural features, including watercourses, hiking trails and ski hills, account for many of Ontario's outdoor recreational opportunities, forming the basis for a thriving eco-tourism market. Hiking, caving, skiing, mountain biking and kayaking are a few of the recreational opportunities provided.

There are approximately 36 golf courses and driving ranges, 22 campgrounds, and 10 ski resorts within the boundaries of the NEBR.

The Escarpment's landscapes also provide agri-tourism opportunities through viticulture and mixed farming, which create local food specialties and culinary destinations along the various rural communities of the NE Biosphere Reserve. Niagara Region in particular has developed an extensive infrastructure of wineries, culinary festivals and events and accommodations to bolster local economic development through tourism.

The Niagara Escarpment forms the geological and climactic foundation for Ontario's robust wine industry. Statistics from the Grape Growers of Ontario indicate that the Niagara Peninsula, i.e. the Niagara Escarpment, accounts for over 90% of Ontario's grape-growing volume. As a tourism destination, Niagara attracts nearly 20 million visitors annually; more than 1 million people visit the province's wineries each year.

- The Ontario wine industry's overall economic contribution to the Province of Ontario in 2010 rose to $191M.
- 1300 additional jobs were created by the VQA wine sector from 2007 to 2011.
- The value of Ontario's VQA wine industry impact on tourism stood at $10M in 2010.

There are numerous public events designed to promote the approximate 65 wineries of the Niagara Escarpment Biosphere Reserve to the public, including:

- Images of Winter Icewine Evening – An annual event held in January to unveil and showcase the previous harvest's Icewine.
- Cuvée – An annual industry awards gala where the year's best wines are chosen. Held in March in Niagara-on-the-Lake.
- New Vintages Niagara – Held in June, this evening is dedicated to the first tasting of newly uncorked vintages from Ontario's top wineries.
- Niagara Grape & Wine Festival – Held in September, this 10-day festival attracts more than 100,000 tourists who sample regional cuisine and fine wines, and enjoy world-class entertainment and family attractions. The Grape Growers of Ontario is a founding sponsor of this festival, which grows in popularity year after year.

Wine Country Ontario™

The Wine Council of Ontario developed a program called Sustainable Winemaking Ontario: An Environmental Charter for the Wine Industry, which lays out best-practice guidelines, drawing on the breadth of knowledge and experience within the industry. This all-encompassing program, which received recognition from the Minister of the Environment's Award of Environmental Excellence, is the first of its kind in Canada, and it focuses on all aspects of wine production, from vineyard water usage to energy conservation, pesticide use and community relations. The program goal is to encourage wineries to look at the impact of their day-to-day operations, in terms of environmental, economic and social responsibility.

Many of the Niagara Escarpment's vineyards and wineries are exploring other innovative options, such as earning biodynamic and organic certification, constructing LEED-certified buildings, using geothermal or solar heating, and participating in Local Food Plus and other environmental programs.

An outstanding winery in the NEBR that is leading efforts in sustainable practices is Featherstone Estate Winery, which utilizes grazing sheep to trim vineyard branches, and employs birds of prey as well for pest control. Featherstone Estate Winery was honored with a Niagara Escarpment Achievement Award in 2010 for its efforts in employing sustainable production methods.

The most recent Niagara Escarpment Commission Leading Edge Conference (May, 2011) focused on regional economic development and tourism in the biosphere reserve, and provided a forum for demonstration projects and networking. (See below in Section 6.3 for a listing of research presentations.)

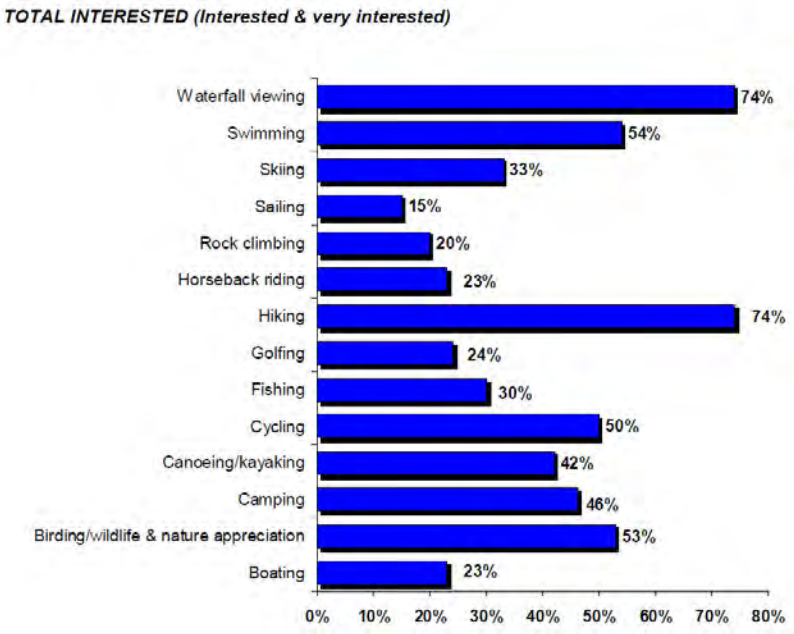
There are a number of compatible "green" outdoor recreational experiences which take advantage of the Escarpment's varied landscapes. These activities, which are primarily focused in the Niagara Escarpment Parks and Open Space System include hiking, cycling, canoeing, kayaking, wildlife viewing, swimming, fishing, hunting, camping, cross country/downhill skiing, snow shoeing, rock climbing, and golf. Ski and snowboard destinations are found throughout the NEBR, and developments for ski hills and golf courses are often proposed by application to the Niagara Escarpment Commission for approval.

Regional Tourism Promotion

The NEBR covers 22 municipalities throughout the Province of Ontario, and many cross-municipal and regional tourism organizations have grown in the past decade, promoting the local culinary, recreational, heritage and natural features of the regions.

When asked in the 2009 Oracle Opinion Poll; "Do you consider the Niagara Escarpment Biosphere Reserve to be a tourism destination?" More than three quarters or 76% of respondents said that they consider the NEBR to be a tourism destination, only 17% did not and 7% responded that they did not know.

The 2009 Oraclepoll survey then asked respondents which Niagara Escarpment Biosphere Reserve tourism activities appealed to them on a scale of 1 (not interested) to 5 (very interested). Enjoyment of the NEBR's natural features scored prominently among respondents, indicating broad public support for continued preservation efforts.



The most named tourism activity or destination in the Niagara Escarpment Biosphere Reserve was Niagara Falls (17%), followed by hiking/walking trails (14%), parks or conservation areas (13%), trails in general (6%), camp grounds (4%), vineyards/farms (4%) and the Bruce Trail (3%). A total of 30% did not know.

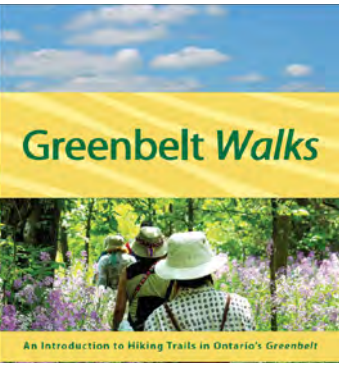
Examples of NEBR tourism initiatives and opportunities include:

- The Hills of Headwaters Tourism Association – a regional, non-profit network of Bed & Breakfasts, small businesses, churches, heritage organizations and restaurants promoting visitation to the central sector of the Escarpment in Dufferin County and Peel Region.
- Explore the Bruce – creators of the "Explore the Bruce Passport" trip planner to promote Niagara Escarpment features including scuba diving, trails, rock climbing and canoeing.
- Gateway to Grey – a local tourism initiative of the County of Grey promoting local events, Grey Roots Museum and Archives, and local food, including the popular "Apple Pie Trail," a themed travel route through the Escarpment's largest apple-producing microclimate region.
- Tourism Hamilton – a prominent section of the local government of the City of Hamilton, the Escarpment's largest urban municipality, promoting the events and destinations of this Escarpment hub. Tourism Hamilton has successfully branded Hamilton as the "City of Waterfalls" for its 126 documented Escarpment waterfalls.
- Tourism Niagara – connecting visitors with arts & cultural activities, day-trips and culinary/winery tourism in the southern-most sector of the NEBR, the organization has branded Niagara Region as "Niagara Original" for its many local attractions.
- The Winona Peach Festival - an annual community festival celebrating local food and the arts in Niagara Region.

Escarpment Conservation Authorities work towards promoting awareness and tourism opportunities within their respective watersheds. Examples of initiatives included the Niagara Peninsula Conservation Authority's Twenty Valley Tourism Project, which promotes tourism in the Twenty Mile Creek Watershed, focusing on agri-tourism and eco-tourism of the valley system linking the Niagara Escarpment to Lake Ontario.

Conservation Halton owns and manages approximately 4,450 hectares of conservation lands including six major parks primarily on the Niagara Escarpment. The parks include spectacular natural features such as cliffs, waterfalls, lakes, forests, creeks and more than 100 km of trails for hiking, biking, nature appreciation and snowshoeing. More than 600,000 people visit the conservation areas annually:

- Kelso Conservation Area and Glen Eden Ski and Snowboard Centre - a popular ski and snowboarding destination for school groups with Halton Region Museum on-site offering public programs and exhibits on the area's cultural history.
- Crawford Lake Iroquoian Village and Conservation Centre – The reconstructed 15th century Iroquoian village with longhouses, palisade, artifacts and exhibits, this location is one of the most accurately dated pre-contact archaeological sites in Canada. Educational programs are offered year-round.
- Hilton Falls Conservation Area - this spectacular natural area with beautiful waterfall has ruins from three pioneer saw mills. The first mill was constructed by Edward Hilton in 1835 followed by mills built in 1856 and 1863. An interpretive viewing area allows visitors to see how early settlers were able to generate power from moving water.
- Rattlesnake Point Conservation Area – visitor centre and spectacular lookouts off the Escarpment's dolostone cliffs; rock climbing and trails.
- Mount Nemo Conservation Area – visitor centre and walking trails and lookouts.



The Friends of the Greenbelt Foundation partnered with the Liquor Control Board of Ontario (LCBO) to circulate a publication called "Greenbelt Walks" on the Bruce Trail. Highway signage promoting Bruce Trail walks followed in 2011.

The Greenbelt Foundation has also promoted the local food of the region, including the Niagara Escarpment, through grant programs to support local farmers, and promotional efforts to link food producers with urban vendors. Its "Friend of the Greenbelt" award honours individuals and groups for outstanding efforts to promote the Greenbelt's objectives, and 2012's recipients include the Wine Council of Ontario, Grape Growers of Ontario and Vintners' Quality Alliance. All three groups work extensively in the Niagara Escarpment Biosphere Reserve.

The Tobermory Maritime Association was formed to promote tourism and enhance scuba diving activities in the Tobermory area, highlighting the Niagara Escarpment's underwater geological formations and historical shipwrecks.

Current plans include:

- Conceptual planning for future major dive site development.
- Discussions with Parks Canada regarding the establishment of additional dive sites within the Park.
- Interfacing with Parks Canada on issues such as the location of the Diver Registration Centre to ensure that the best interests of divers are served.
- Designing, placing and maintaining moorings at dive sites beyond the Fathom Five National Marine Park boundary.

In 2004, the Municipality of Northern Bruce Peninsula was designated as a Dark Sky community, and is one of the very last places in southern Ontario that still has dark skies. The Bruce Peninsula Biosphere Association and the Sources of Knowledge Committee provided support for this project as part of their collaboration on a community-wide Dark Skies project.

The NEC supports this initiative by cross-promoting the project to its clients and partners, assisting the Bruce Peninsula Biosphere Association in its outreach efforts. The Municipality of the Northern Bruce Peninsula and the Bruce Peninsula Environment Group were both recognized by the NEC with Niagara Escarpment Achievement Awards in 2010 for their work in promoting dark skies.

One of the goals of the Bruce Peninsula Biosphere Association's "Dark Sky Demonstration Project" was to foster sustainable economic development (See Section 6.0 for details on the BPBA).

The Bayside Viewing Platform has been built in Lion's Head to serve as the site for the Bayside Astronomy Program and for cliff viewing during the day. Funding was achieved through a grant application to the "Spruce the Bruce Program," along with municipal support and additional Biosphere Association fundraising.

5.3 Community support facilities and services: programs in/for the BR that address issues such as job preparation and skills training, health and social services, and social justice questions. Refer to relations among them and with community economic development initiatives.

Niagara College in Niagara-on-the-Lake has developed Canada's first and only commercial teaching winery, educating students in effective soil and nutrient management and viticultural processes. The college also hosts the Canadian Food and Wine Institute, highlighting local food and wine of this sector of the Niagara Escarpment. The college's applied programs are leading examples of innovation and adaptation to promote emerging agri-tourism opportunities and tourism trends. This program provides skills training and hands-on job preparation, and operates in collaboration with local wineries, food producers and tourism operators.

5.4 No further comment

***5.5 Describe the biosphere reserve's communications strategy. Include different approaches and tools geared towards the region's communities and/or towards soliciting outside support.**

Many agencies, groups, educational institutions, Conservation Authorities and municipalities participate in communicating the story of the NEBR.

Increasingly, the tools and approaches used in communicating the biosphere reserve have been web-based, with online resources and social media reaching out to partners and the public in greater numbers than ever before.

Web content and printed materials are developed and circulated by the various agencies and non-governmental organizations (NGOs) that own or manage lands on the Niagara Escarpment, including Parks Canada, Ontario Parks and the Bruce Trail Conservancy.

In 2009, the Niagara Escarpment Biosphere Inc. produced a series of online episodes, in association with the Friends of the Greenbelt Foundation, promoting the local food and recreational, natural and agricultural attractions of the Niagara Escarpment. This series, called "Flavours of the Biosphere," is featured at the charity's website.

Halton Region Museum produced an online virtual Niagara Escarpment Hike website, called "Jeff's Home," launched in 2011. The website takes visitors on an interactive hike exploring the Niagara Escarpment Biosphere Reserve in this famously scenic region of the Escarpment. The website focuses on youth and families, and features an animated Jefferson Salamander, "Jeff," a provincially endangered species, as a virtual hike leader guiding the website user through the online exploration of the region's unique flora, fauna, and geological features.

The website was developed in collaboration with Ontario's Ministry of Tourism, Niagara Escarpment Commission, Halton-North-Peel Naturalists, Conservation Halton, Toronto Bruce Trail Club, Limehouse Kiln Society, Country Heritage Park, the Bruce Trail Conservancy, City of Burlington, Norval Heritage Society and Royal Botanical Gardens.

The NEC is typically the public's first point of contact for information and resources on the Niagara Escarpment, and the agency's website receives approximately 56,000 visits annually. The website at www.escarpment.org features a prominent section on the Biosphere Reserve, with a map of Canadian Biosphere Reserves, historical data on the NEBR's 1990 designation, and links to Biosphere Reserve associations and resources.

The NEC's online "Teacher's Corner" includes resource materials on the Niagara Escarpment for classroom use. The site also hosts the Giant's Rib Discovery Centre's "Rocks and Minerals of the Niagara Escarpment" Grade Four program, as well as a Grade Ten GIS exercise using the Niagara Escarpment as a case study for a mapping project in-

**Please note new Section 5.5 replaces Template Section 6.3*

volving a proposed aggregate operation in the Niagara Escarpment Plan Area. Students are required to consider the kinds of complex environmental and resource criteria the Niagara Escarpment Commission applies in its operations.

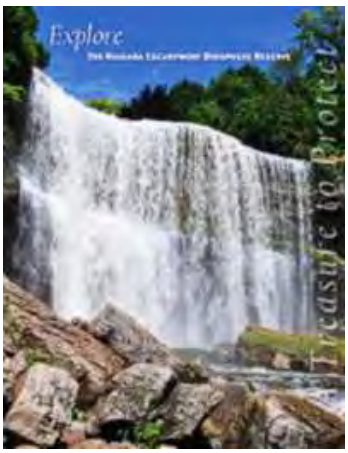
The NEC launched a social media initiative in 2011 as a vehicle to share information and updates to clients, partners and the public, and to provide another portal for two-way communication. The agency now has 430 followers, with partners the Coalition on the Niagara Escarpment and Ministry of Natural Resources collaborating on promotional circulations to their respective followers. Social media will continue to be broadened in the future as an important communications tool to promote the Niagara Escarpment Biosphere Reserve.

Since 2009, the NEC has circulated a quarterly e-newsletter to approximately 600 partners, providing land use planning updates, information on Biosphere Reserve events, and ecological monitoring reports. The e-newsletters are also posted at the agency's website for broader public accessibility.

In addition to electronic communications and social media, approximately 17,000 print copies of the NEC's "Niagara Escarpment Explorer" brochure series are circulated annually, with parallel website versions available for viewing and download.

The NEC has produced a 2012 brochure entitled "Dark Skies over the Niagara Escarpment Biosphere Reserve" to encourage environmentally-sensitive lighting practices to help to preserve the unique species of the Niagara Escarpment. Copies of the brochure will be circulated alongside a general informational brochure on the Niagara Escarpment Biosphere Reserve to the NEC's partners and directly circulated to the approximate 500 Development Permit applicants who do business with the NEC annually.

Over the past decade the NEC has assisted in the production of interpretive signage for various parks of the Niagara Escarpment, providing text and graphics for use in new trail and visitor centre signage at Mono Cliffs Provincial Park, Royal Botanical Gardens, and Craigleith Visitor Centre.



Exhibiting Niagara Escarpment displays and attending public events including Ball's Falls Centre for Conservation Thanksgiving Festivals, the International Greenbelt Conference, and the Coalition on the Niagara Escarpment's open houses, the NEC interacts with the public on an ongoing basis, and shares information to promote the Niagara Escarpment Biosphere Reserve.

NEC representatives have presented research presentations on the NEC's ecological monitoring program at Conservation Ontario's annual Latornell Conference. A 2009 presentation to the Canadian Institute of Planners conference was made by NEC staff alongside a representative of the Ontario Stone, Sand and Gravel Association on aggregate resources in the Niagara Escarpment Biosphere Reserve, highlighting the collaborative efforts of the aggregate industry in land use planning.

Celebrations of the 25th and 30th anniversaries of the Niagara Escarpment Plan in 2005 and 2010 raised public and partner awareness of the land use planning system that forms the foundation of the Niagara Escarpment Biosphere Reserve. Public gatherings hosted by the NEC marked these occasions, in which included approximately 500 guests and presentations by provincial politicians and a former provincial Premier took place.

The NEC works with the NEPOSS Council, a network of Conservation Authorities, parks agencies and municipalities, to promote the Niagara Escarpment Parks and Open Space System, a string of 141 parks that connect Canada's longest footpath, the Bruce Trail, throughout the length of the Niagara Escarpment. A communications plan is in development to brand Niagara Escarpment Parks and to provide visitor accessibility information. A new website at www.niagaraescarpmentontario.ca has been created by the NEPOSS Council to host parks management plans, provide public information and updates about parks projects, and a significant portion of the NEC's website will be devoted to the promotion of Niagara Escarpment Parks, with plans for online mapping tools and mirrored visitor accessibility information.

Giant's Rib DISCOVERY Centre

The Giant's Rib Discovery Centre in Hamilton, Ontario, is a volunteer-driven, not-for-profit organization whose goal is to "tell the story of the Niagara Escarpment." It pursues this goal through the provision of the following communications initiatives:

- Website and quarterly e-newsletters
- The Bruce Duncan Lecture Series on the Niagara Escarpment focusing on the geology, parks, cultural history and ecology of the Biosphere Reserve
- Educational programs on the Escarpment including an Ontario curriculum-based "Rocks and Minerals" program for Grade Four students
- Annual "Summer Solstice" fundraiser at Royal Botanical Gardens

The NEC's biennial "Niagara Escarpment Achievement Award" series is another communications outreach initiative aimed at raising public awareness of the Biosphere Reserve. Since 1987, the Achievement Award series has recognized individuals and groups for outstanding initiatives undertaken in the Niagara Escarpment Plan Area, including wetland restorations, park enhancement projects, leading examples of land stewardship, and lifelong contributions to the Biosphere Reserve.

Projects may be submitted for consideration by the NEC by members of the public, and nominations are evaluated based on their linkages and support of Biosphere Reserve objectives. Lifetime Niagara Escarpment Achievement Awards have been given to Canadian artist and naturalist Robert Bateman, and to the founder of the Coalition on the Niagara Escarpment, Lyn MacMillan. The Achievement Award presentations are public events with selected invited guests, and include media circulation and website promotion.

The NEC has hosted a biennial conference on the Niagara Escarpment Biosphere Reserve since 1994. The conferences bring together delegates from across Ontario and Canada, as well as guests from the U.S. and Europe who discuss their work and experience in making the concept of the biosphere reserve work in practice. In the decade since the last UNESCO Periodic Review, there have been four installments of the series, with approximately 700 delegates attending in total.

The Leading Edge Conference series is a forum for researchers, policy makers, academics, consultants and the public to share their work on the Escarpment, and to network and pursue professional partnerships that can further their projects.

During the past decade the conference's themes and research presentations were as follows:

2004: The Working Biosphere

- State of the Park Reporting in an Open Ecosystem: An Evaluation of Fathom Five National Marine Park of Canada
- Building the Great Arc Initiative in Canada and the U.S.
- Escarpment Biosphere Conservancy: A Partner in the Understanding and Protection of Ontario's Niagara Escarpment
- Niagara's Water Quality Protection Strategy
- An Analysis of the Effectiveness of the NEP in Protecting the Georgian Bay Shoreline
- Moving Beyond Face Value: Rethinking the Role of Values in Sustainability Planning
- Agri-Tourism and Sustainability in Niagara
- Living on the Edge: Using Permaculture to Foster Sustainability on Escarpment Land
- A Comparative Analysis of Land Values Within and Adjacent to the NEP
- Towards a Sustainable Niagara Foodshed: Learning from Experience
- New Fossils Indicate Prehistoric Pollution of Crawford Lake
- Archaeological Research in the Crawford Lake Area
- A GIS Probability of Occurrence Model for the Niagara Escarpment in Southwestern Ohio
- Long Point World Biosphere Reserve Foundation Forest Corridor Project: An Effective Means of Ensuring Biodiversity Conservation
- Bruce Peninsula Biosphere Association: The Niagara Escarpment's First Biosphere Community Committee
- New Stewardship and Conservation Opportunities from a Biosphere Reserve Perspective
- Urban Bioregional Planning for Working Landscapes: Biosphere Reserves of Melbourne and the Niagara Escarpment
- Traditional Knowledge: Its Potential Relevance to Fisheries Conservation and Native Fishing Issues on the Saugeen-Bruce Peninsula
- Biosphere Reserves and Aboriginal Cultural Landscapes
- A Community Based Environmental Values Typology for the Niagara Escarpment
- Community Based Ecosystem Monitoring: A Tool for Development and Promoting Ecosystem Based Management
- Credit Valley Conservation Greenlands Securement Strategy
- Partnerships in Action: Hamilton Harbour Remedial Action Plan (RAP)
- Giant's Rib Discovery Centre
- Increasing Citizen Involvement in Sustainability-Centred Environmental Assessment Follow-up
- Volunteering for Nature: Building Capacity for Nature Conservation Volunteering
- University of Waterloo's Niagara Escarpment Field Monitoring Course: Success through Partnerships
- Bruce Peninsula National Park of Canada's Disturbed Areas Monitoring and Restoration Program
- Monitoring Ecosystem Change in Carolinian Forests and Oak Savannas
- Cliff Face Vegetation Communities: Microsite Limitations and the Impact of Climbing
- National Monitoring Protocol for Plenthodontid Salamanders

- Ontario's Benthos Biomonitoring Network
- The Niagara Escarpment's Black Bear: Conservation Challenges and Opportunities
- Land Ownership and Other Landscape-Level Effects on Biodiversity in Southern Ontario's Niagara Escarpment Biosphere Reserve
- Niagara Escarpment Monitoring: Comprehensive, Integrative and Collaborative?
- Forest Biodiversity Monitoring
- Monitoring Tree Health on the Niagara Escarpment
- Winter Avian Populations
- Assessing Health in Canadian Forests Using Tree Mortality Rates
- Credit Valley Conservation's Terrestrial Monitoring Program

2006: Understanding Our Resources

- Who's driving what where? Challenges of community-driven nature conservation
- The Cartwright Nature Sanctuary - an innovative conservation partnership
- Alan Ernest and Robert Edmondson, Hamilton Naturalists' Club and
- Sustainable urban/suburban woodlands: are municipal planning policies effective in mitigating residential human activity edge effects?
- Setting the terms for the creation of Canadian Biosphere Reserves: from science-driven to citizen-driven
- Principles for community conservation networks in Canada - the Frontenac Arch Biosphere Reserve model
- Community-based decision making in support of the UNESCO designation of the Clayoquot Sound Biosphere Reserve
- The Giant's Rib Discovery Centre: an ongoing saga
- Water and wastewater efficiency: optimizing the land planning, energy, ecological and agricultural dimensions
- Content analysis of Leading Edge conference abstracts 1994-2006: highlights and trends
- Thirty years too soon: the demise of the preliminary proposals of the Niagara Escarpment Commission
- Conservation of Ontario's Niagara Escarpment
- Land securement for the Niagara Escarpment Parks and Open Space System, 1985-2006
- It's a matter of compatibility. a Jefferson salamander habitat adjacent to a proposed new open pit mine. Will Jeff survive?
- An assessment of forest restoration outcomes and the instruments used to evaluate ecosystem recovery in the Regional Municipality of Waterloo, Ontario
- Quarry rehabilitation provides a public asset in the greenbelt
- Novel approaches to quarry restoration: rehabilitation research and practice
- Status report on the implementation of the Oak Ridges Moraine Conservation Plan: implications for the Greenbelt Plan
- Stewardship and the rural (non-farm) landowner of southern Ontario
- Nature count$: the socio-economic benefits of southern Ontario's greenspace

2008: Escarpment Roots

- Detecting Land Cover Change in the Niagara Escarpment Plan Area with Satellite Remote Sensing
- Legends and Folklore Tourism in Niagara
- Monitoring and Reporting Ecosystem Health: A Report Card on the Health of the Humber River Watershed
- Manitoulin's Emerging Escarpment Trail
- Digital Discovery and Electronic Explorations: Promoting Sustainable Tourism in the Niagara Greenbelt

- Eco Cities
- The Niagara Escarpment Commission's Development Permit Tracking System
- An evaluation of the effectiveness of the Niagara Escarpment Plan in protecting Provincially Significant Life Science Areas of Natural & Scientific Interest (PS LS ANSIs)
- Visual Assessment Guidelines for the Niagara Escarpment
- Forest Cover on the Niagara Escarpment

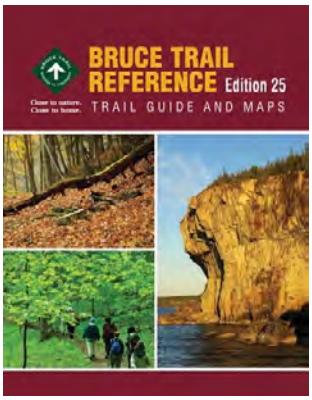
2011: Sustainable Tourism and Economic Development in the Niagara Escarpment Biosphere Reserve

- Niagara Escarpment - sacred space
- Cultural mapping in Niagara Region
- A conservation byway: fostering stewardship through a biodiversity awareness trail
- Environmental entrepreneurship in the Ontario wine industry
- The big picture: possibilities for Ontario tourism
- Conservation geology: a geopark for the Niagara Escarpment?
- Celebrating the Niagara Escarpment
- Leveraging a Biosphere Reserve
- The Bruce Trail Conservancy: perspectives in preservation of natural heritage
- Cultural eutrophication of Crawford Lake - a palynological perspective
- The submerged early postglacial beach off Flowerpot Island - implications for major climate-driven changes in lake level and water quality in the recent geologic past
- Tourism on the edge: Grey County tourism
- Building sustainability and resilience in social-ecological systems through innovation in Biosphere Reserves
- Tourism and policy planning studies at University of Waterloo
- Niagara Parks' environmental approach
- Climbers' perceptions toward sustainable bouldering at the Niagara Glen Nature Reserve
- The Niagara Escarpment in the decade of biological diversity: relevance and opportunities for Escarpment engagement
- Landforms of Louth
- Changing Niagara weather and the use of weather contracts in tourism
- Environmental entrepreneurship in the Ontario (Canada) wine industry
- Discover Escarpment parks and natural spaces
- Sustaining tourism in paradise: Royal Botanical Gardens as Canada's biodiversity hotspot
- Developing Region 7's sustainable tourism destination development plan
- Agri-environmentalism in the Niagara Escarpment Plan Area: management approaches to tender fruit farming in Niagara Region
- Forest plot monitoring on the Niagara Escarpment: a discussion of trends as a tool for assessing natural heritage protection
- Avian Populations on the Niagara Escarpment and Credit Valley Watershed
- Challenges of integrating tourism and conservation of natural and cultural heritage resources: case study - Battlefield Park National Historic Site, Hamilton
- Values as linkages: opportunities for sustainability planning

In addition to the NEC's Leading Edge conference series, the Bruce Peninsula Biosphere Association's "Sources of Knowledge" Forum, established in 2008, explores research projects, biosphere research and ecological monitoring with a focus on the Bruce Peninsula region. Held in association with the Bruce Peninsula National Park, at the Tobermory Visitor Centre, the forum shows how research in Bruce Peninsula National Park, Fathom Five National Marine Park, and the surrounding community contributes to knowledge of the Bruce Peninsula's natural and human history.

In the past decade there has been an increase in the number of lifestyle magazines that highlight local tourism, land use planning issues, heritage preservation, environmentalism and local food and wine in Escarpment regions. Examples include: Escarpment Views, a lifestyle magazine and blog launched in 2007, Hamilton Magazine, In the Hills, On the Bay magazine, and Sideroads of Halton Hills. These publications promote the Niagara Escarpment and the countryside lifestyles associated with it, and have become popular marketing vehicles for promotion of regional tourism.

As the stewards of Canada's oldest and longest footpath, the Bruce Trail Conservancy (BTC) is a charitable organization committed to establishing a conservation corridor containing a public footpath along the Niagara Escarpment, in order to protect its natural ecosystems and to promote environmentally responsible public access to the Biosphere Reserve.



The BTC undertakes extensive public outreach to promote conservation and public enjoyment of the Bruce Trail. Marketing staff produce communications materials including the "Bruce Trail Reference Guide," website content, public events and an Annual General Meeting, newsletters, educational resources and magazines. This year (2012) marks the fiftieth anniversary of the Bruce Trail Conservancy, with special events planned for the next five years marking key events in the organization's history.

The Bruce Trail Conservancy's "Friendship Trails Program" consists of pairing or matching one section of the Bruce Trail with a section of trail on an international hiking trail.

The goals of the Friendship Trail program are:

- To create a venue for sharing of information internationally,
- To promote the importance of hiking trails
- To recognize the international significance of creating an ongoing relationship with hiking trails around the world
- To increase publicity for the Bruce Trail

There is currently one Friendship Trail on the Bruce Trail. The Jeju Olle Friendship Trail is located in the Caledon Hills Club in the Hockley Valley. This Friendship Trail opened in September 2011. A short video can be found on the BTC website at http://brucetrail.org/pages/trail/friendship-trail. There will be two friendship trails opening in September 2012.

The BTC's "Explore Your Bruce Trail" project promotes the Bruce Trail and raise hiking awareness in youth. Made possible through partnership funding from a number of partners including the provincial Ministry of Health, the Ontario Heritage Trust and the Greenbelt Foundation, the program connects students from urban areas to experience the natural heritage of the Niagara Escarpment.

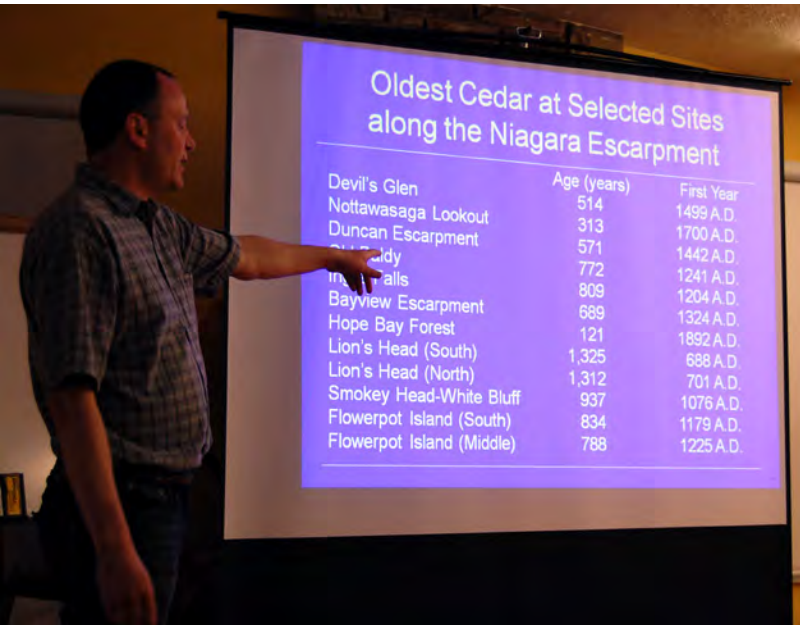
"Bruce Trail Day" is another public event to engage the public in the organization's conservation and land securement efforts. These annual events are hosted by the Bruce Trail Conservancy and each of its nine Bruce Trail Clubs. Each Club of the Bruce Trail Conservancy provides free guided hikes and family activities to help visitors explore the Bruce Trail and discover the amazing variety of life along the Niagara Escarpment.

The BTC's "Family Fun" webpage provides activities for children and families and educational resources including the "Biodiversity and Me" booklet, produced in partnership with Ontario Power Generation, introducing students to the Niagara Escarpment's ecosystems and species.

The Coalition on the Niagara Escarpment (CONE) is a non-profit alliance of environmental groups, conservation organizations, and concerned citizens and businesses founded in 1978 to promote the protection of Ontario's Niagara Escarpment. Between 2000-2008, CONE successfully partnered with municipalities and grantors to place more than 70 road signs from Niagara Region to the North Bruce Peninsula to informing visitors that they are entering the Niagara Escarpment Biosphere Reserve.

CONE monitors the public meetings of the Niagara Escarpment Commission and updates its member groups with land use planning decisions and program updates. CONE has increased its membership base and added four new member groups in the past two years to a total of 32 member groups.

The organization circulates e-newsletters, hosts a website, and holds annual "Escarpment Celebration Days" in communities throughout the Escarpment Plan Area. The organization re-branded itself in 2009 and has since developed a social media presence on Facebook and Twitter.



CONE volunteers have provided presentations at Leading Edge Conferences, and at a variety of public meetings and events including Earth Day Hamilton. The Board of CONE developed a video entitled "The Great Wall" in 2010 that depicts the geological formation of the Niagara Escarpment, the provincial land use system in place to administer development in its area, and the UNESCO Biosphere Reserve designation in 1990. The video has been featured extensively at events over the past two years.

Niagara Nature Tours offers presentations, public programs, workshops, guide services, tours, hikes and walks in the Escarpment's southern sector. The company bases its programs on the premise that the geological history of the Great Lakes basin has had a major influence on the physical and human geography of the Niagara Peninsula. Tours examine the patterns of wildlife and First Nations migration to this area after the last ice age, look at how the European settlers influenced the type of agriculture the region sees today and the industries that have developed; and how all these things were influenced by the physical geography of the Escarpment.

Protecting Escarpment Rural Land (PERL) is a citizen group, formed in Burlington, Ontario to protect and enhance Burlington's Niagara Escarpment and rural land in the Region of Halton by: preserving vital ecosystems and natural habitats, and creating a Mount Nemo Natural Heritage System (NHS) and Cultural Heritage Landform area to be permanently preserved. The group also aims to preserve and enhance quality of life in Ontario, with special focus on the Niagara Escarpment area by advocating for sustainable aggregate resource legislation for Ontario. The group is working to prevent the licensing of a new quarry on the Niagara Escarpment in Burlington Ontario.

Nemo 7G is a committee under the PERL umbrella. Nemo 7G was formed to gather community input and form a 7-generation vision for the Mount Nemo plateau. The group has held public meetings to discuss the community's vision for Mount Nemo, considering the area's history and events, important features, trends and values.

Outreach initiatives in the Niagara Escarpment Biosphere Reserve are varied and largely partnership-driven. With many agencies, NGOs, and volunteer organizations undertaking individual projects that support biosphere reserve program goals, there are many opportunities engage the public in the various recreational activities, conservation projects and events that are available year-round in the Niagara Escarpment.

6.0 The Logistics Function: Research, Monitoring, Education, Governance and Community Engagement

The Niagara Escarpment Commission (NEC)

The Commission is Ontario government agency with 17 Commission members representing the public-at-large and municipal counties, regions and cities on the Niagara Escarpment. The Commission reports to the Minister of Natural Resources (MNR) and is supported by a staff of 23 operating from offices in Georgetown and Thornbury.

The Commission's responsibilities include administration of Development Permits, processing amendments to the Niagara Escarpment Plan, providing Plan interpretation and promoting Niagara Escarpment and Biosphere Reserve objectives.

In addition to considering Niagara Escarpment permit applications and administering the related land use regulations, the Commission also reviews and participates in hearings on applications for severances, subdivisions, official plans, zoning bylaws, environmental assessments, park plans, transportation corridors and undertakings by other government agencies, within and adjacent to the Niagara Escarpment Biosphere Reserve, and also assesses and comments on proposed provincial and federal legislation, regulations and policies that have the potential to affect the Biosphere Reserve.

Consistent long-term monitoring information is essential to ensure that the Biosphere Reserve objectives are being achieved and maintained. During the last Plan Review the provincial Government recognized the importance of an environmental monitoring program and established a responsibility for the Commission to deliver on ensuring that the purpose and the objectives of the NEPDA re being met by the Plan.

Ontario's Niagara Escarpment (ONE) Monitoring Program

In September, 2006 the Niagara Escarpment Commission approved a revised comprehensive O.N.E. (Ontario's Niagara Escarpment) Monitoring (ONE MP) framework, which will guide environmental monitoring activity on an annual basis. The Monitoring program uses a systems approach to land use planning, and was developed with an applied research process, which included an extensive review of monitoring concepts consultation with community stakeholders, investigation of existing monitoring programs and use of workshops and meetings with experts. The Monitoring framework identifies distinct indicators that are being used to assess whether the policies of the NEP and the BR status are achieving their objectives, as required by the 2005 NEP.

The ONE Monitoring Program is administered by NEC staff and observes linkages between land use change and ecosystem status, examining whether the NEP is achieving the goal and objectives of the NEPDA. The monitoring program supports the Biosphere Reserve designation by implementing research and monitoring and by providing education and training to biosphere reserve communities. In carrying out indicator monitoring, the ONE MP ensures that each project is aligned with Biosphere Reserve objectives, and engages BR partners in the collection and sharing of data wherever possible.

Escarpment Monitoring and Research Project Metadata Database

An "Escarpment Monitoring and Research Project Metadata Database" was created to provide a central repository to store metadata (data about data) on research and monitoring activities (past and present) within the Biosphere Reserve. Due to the vast geographic extent of the Escarpment, it was difficult to have a complete understanding of the type and location of these activities being implemented by partner agencies.

The development of a central repository for Escarpment metadata facilitated cooperation between agencies in the form of data and information sharing and provided an opportunity for "gap analysis" to identify where few or no monitoring activities occur. This information is important in order to direct priorities for future monitoring under the Ontario's Niagara Escarpment (ONE) Monitoring Program and to identify potential partnership opportunities. The collected information may also stimulate further Biosphere Reserve research and monitoring by agencies and researchers. To date, 121 projects, which include more than 800 Escarpment locations, are stored in the database.

Areas of Natural and Scientific Interest (ANSIs)

Provincially Significant Life Science (PS LS) ANSIs represent some the Biosphere Reserves most significant natural heritage features and landscapes outside of Provincial Parks and conservation reserves. The NEP strives to protect these areas through its development criteria and by including them in the Escarpment Natural Area designation. This report evaluates the effectiveness of NEP policies in protecting PS LS ANSIs by examining where ANSI boundaries have been reduced as a result of permitted development. These results are compared to land use change within ANSIs outside of the Niagara Escarpment Plan Area within a defined boundary. Several key findings emerged from this study:

Since the NEP policies have been in place, 93% of PS LS ANSIs inside the NEPA did not experience a reduction in area due to development. Where boundary reductions did occur, they were the result of single dwellings being permitted within the Escarpment Natural Area designation or the encroachment of a ski hill operation into an ANSI with a less restrictive Plan designation. In the absence of detailed information on site-level conditions, it was assumed that ANSI features and functions were protected if its boundary was not reduced. Additional findings included:

- Residential subdivision development occurred within PS LS ANSIs where the NEP policies did not apply i.e. outside the NEPA.
- 82% of PS LS ANSIs inside the Plan Area contained NEP designations other than Escarpment Natural Area, although these less restrictive designations typically occurred in small proportions relative to the size of the entire ANSI. This reflects the need for updated NEP mapping.
- Natural regeneration was observed within several PS LS ANSIs in the Plan Area over the study period, resulting in increased landscape connectivity.

The results of land use change analysis show that NEP policies have generally been working to protect PS LS ANSIs in the NE Biosphere Reserve and appear to have made a difference on the landscape in terms of ANSI protection. The study also identified where improvements could be made, including a Plan-wide update of NEP mapping through a Plan Amendment to ensure that PS LS ANSIs are captured in their entirety within the Biosphere Reserve core area designation (Escarpment Natural Area); and a further consideration as to whether or not "minor encroachments" should be permitted within PS LS ANSIs. A project is currently underway using a similar methodology to examine change over time in Regionally Significant Life Science ANSIs.

Forest Biodiversity Monitoring in the NEBR

From 1987 to 1991, the Smithsonian Institute Monitoring and Assessment of Biodiversity Program (formerly the Man and Biosphere Programme), in collaboration with the UNESCO, developed methods for the establishment and inventory of permanent one-hectare forest biodiversity plots in the tropics. The program recognized that it was difficult to make informed management decisions without basic scientific information. Through the documentation of long term data on species diversity, growth, mortality, regeneration and dynamics, the plots were designed to provide an information base for research and education to contribute to the conservation and management of biosphere reserves and other protected areas (Dallmeier, 1992).

From 1994 to 2010, the Ecological Monitoring and Assessment Network (EMAN) of Environment Canada was established as a Canadian network of organizations involved in monitoring ecosystem change, including government and non-government organizations, academic institutions and

community groups. EMAN promoted the use of standardized monitoring protocols to facilitate data sharing and to better detect, describe and report on ecological change across Canada. EMAN adapted the Smithsonian Institute's protocols as the national standard for monitoring forest biodiversity in Canada's temperate forests.
In 1995, the first EMAN plot in Canada was set up as an experimental training plot in Kejimkujik National Park within the Southwest Nova Biosphere Reserve. The first plot in southern Ontario was established during the same year in the Long Point Biosphere Reserve. Over 30 one hectare plots currently exist in southern Ontario, although some of these plots may not be actively monitored. Where time and/or resource constraints are an issue, some agencies have opted to establish smaller (20m x 20m) plots.

Through a long-standing partnership with the University of Waterloo, the NEC has established five one-hectare monitoring plots across the NEBR (see Map 6). These plots have been monitored for the past 15 years on a five year rotational basis. Data collected in these plots can allow for the evaluation and refinement of land use and management practices and policies and can serve as a baseline references from which other monitoring and inventories of Escarpment forests can be compared.

Map 6 Location of one-hectare EMAN monitoring plots monitored through the Niagara Escarpment Commission – University of Waterloo partnership

NEBR EMAN Plot Network

A number of agencies are also actively monitoring EMAN plots within or in close proximity to the Biosphere Reserve. These agencies include Bruce Peninsula Biosphere Association, Conservation Halton, Credit Valley Conservation Authority, Toronto and Region Conservation Authority and Brock University. In addition, Hamilton Conservation Authority is in the initial planning stages of developing a terrestrial monitoring program for their watershed that includes EMAN plot monitoring.

With EMAN no longer in operation, due to federal government budget cuts in the late 2000s, the NEC recently initiated the formation of an "Escarpment EMAN Plot Network," a supportive network for partner agencies monitoring EMAN plots within or in close proximity to the Niagara Escarpment Biosphere Reserve. The purpose of this group is to share data and information on EMAN monitoring activities, including successes and challenges, facilitate data sharing and to discuss strategies for data management, analysis and reporting. The first meeting of this group was held in May of 2012. The group discussed developing a centralized data management system identifying plot locations along the Escarpment and other pertinent information. This will allow for "gap analysis" to identify areas where additional EMAN plots could strategically be placed to better detect change in Escarpment forests. The group will also contribute to a similar network (Southern Conservation Authority Terrestrial Monitoring Network) to connect to those undertaking EMAN plot monitoring outside of the Biosphere Reserve.

The long term vision of the Escarpment EMAN Plot Network is to work together to develop a report that analyses trends in forest biodiversity and tree health change across the Biosphere Reserve. The section below highlights some of the EMAN plot monitoring activities currently undertaken by partner agencies within the Biosphere Reserve.

Bruce Peninsula Biosphere Association

In partnership with Parks Canada, the Bruce Peninsula Biosphere Association implements a forest ecosystem monitoring program on the Northern Bruce Peninsula. Using EMAN protocols, the purpose of this program is to compare the state of the forests in the protected core area within Bruce Peninsula National Park with the surrounding working landscapes of the Municipality of Northern Bruce Peninsula. Since 2002, sixteen permanent plots have been established on both private and protected lands throughout the municipality. The plots are monitored for changes in forest trees (i.e. structure, composition and health), as well as seedling and sapling regeneration and decomposition.

Conservation Halton

Conservation Halton (CH) has established 12 EMAN plots, of which two are one-hectare in size. The remaining plots are 20m x 20m and distributed throughout the watershed using a panel design to monitor spatial and temporal change in trees, shrubs and ground vegetation. Six of CH's plots are located within the Biosphere Reserve. The first plot was established in 2006 at Waterdown Woods to monitor potential impacts resulting from a nearby residential development in Waterdown South.

Royal Botanical Gardens

The Royal Botanical Gardens (RBG) implements a Forest Monitoring Program whereby baseline data is collected over the long term to help identify changes or stressors in the terrestrial ecosystem. Both tree and breeding bird data are collected within fifteen 20m x 20m plots located within RBG's nature sanctuaries. Thirteen of these plots are within the Niagara Escarpment Biosphere Reserve. The collected information is intended to guide future management decisions.

Credit Valley Conservation Authority

Credit Valley Conservation Authority (CVC) has a series of 20m x 20m plots distributed throughout their watershed. They currently monitor tree biodiversity, tree health, regeneration, ground vegetation, birds and salamanders. They are aiming to establish and monitor a total of 30 plots to report on the health of their watershed. CVC also collects hourly soil moisture and temperature data throughout the year at the plots. Soil chemistry and heavy metal analysis is conducted every five years.

Toronto and Region Conservation Authority

In 2008, the Toronto and Region Conservation Authority (TRCA) established twenty-six 20m x 20m EMAN plots across their jurisdiction (nine watersheds), including one plot within close proximity to the Niagara Escarpment Biosphere Reserve. The sites were distributed in order to reflect the various forest types and physiographic regions within TRCA's jurisdiction. The TRCA's monitoring program is designed to assess the health of the region's watersheds and natural heritage features. The fixed terrestrial plots will be monitored over the long-term to detect spatial and temporal trends in the vegetation, breeding bird, amphibian and Plethodontid salamander communities.

Brock University

An EMAN plot was established on the southern edge of Brock University campus in 1999 by Brock's Department of Tourism and Environment. The plot is used as a learning tool for Brock biology and environmental classes to learn how to implement EMAN plot monitoring. The plot is designed to be used in conjunction with a second plot located within Short Hills Provincial Park in order to compare data in disturbed and relatively undisturbed forests. Brock University plans to add additional EMAN plots (20m x 20m) in 2012. As the only university located within the Niagara Escarpment Biosphere Reserve, Brock's Department of Tourism and Environment promotes this special UNESCO designation through its website and includes coursework discussions on sustainable living within the Biosphere.

NEBR Forest Biodiversity Monitoring Analysis

These Escarpment forest biodiversity monitoring plots have been established to gain a better understanding of temporal changes in forest biodiversity, growth, mortality, regeneration and dynamics to assess the short and long term impacts of human disturbance within the NEBR. Some of these monitoring plots are now at a point where enough data has been collected to begin analysis of short term trends.

The NEC ONE Monitoring Program staff undertook an analysis of the first fifteen years of data collected in the NEC plots. The results of this data analysis suggest that the NEBR plots consist of healthy, sugar maple dominated forests that represent stable cores of the greater forested landscape, with little change in biodiversity between monitoring intervals. This conclusion is based on observations of species composition, forest health parameters, growth rates and forest dynamics. All of the plots exhibited a high proportion of native flora relative to other natural areas in southern Ontario, although the presence of three highly invasive exotic species (i.e. dog strangling vine, common buckthorn and garlic mustard) at one site is of concern. Although there was overall stability, subtle trends were detected in stem replacement and basal area which highlight natural canopy gap replacement as the forests mature as well as recovery from historic disturbances. General presence of canopy species in the understory suggests that trees are successfully regenerating. The majority of the forests showed some indication of approaching an older growth state, and with protection from human disturbance they will eventually provide mature forest conditions not commonly found in southern Ontario.

All of the plots exhibited a relatively high proportion of native flora in all strata of the forest (canopy, small tree, shrub/sapling and ground cover layers) and most of the exotic species present were non-invasive and infrequent. This

suggests that compared to other natural areas in southern Ontario, these core protected forests have not been highly impacted from invasive exotic species to date. However, the presence of some species (i.e. common buckthorn, dog-strangling vine and garlic mustard) are early warning signs of potential stress and their spread should be monitored and management strategies altered to contain these species. In relation to this threat, most of the plots support a number of conservative species and rare flora. It is recommended that continued monitoring to track changes in the population of these species is implemented to assess any potential threats to their integrity.

The forest communities represented by the plots are recovering from one or more major historic disturbances such as fire, tree harvesting and/or livestock grazing. These disturbances have resulted in changes to forest structure and composition, including species and structural homogenization and the introduction of non-native taxa. Current human use of the sites, which varies with location, is generally limited to low impact recreational activities along designated trails. Based on known site history, species composition and the relative diameter of trees, the forest communities studied appear to be intermediate in age, although some sites are showing signs of approaching a more advanced stage of succession. If left undisturbed, these forests will eventually provide older growth conditions not commonly found in southern Ontario.

A general trend to larger stems and increased total basal area is indicative of overall forest growth. The presence of canopy species in the understory for most plots suggests that the forests are regenerating successfully and have reached a stage of stability in which the canopy is maintaining its integrity. Changes in canopy species diversity and structure can be attributed to gap replacement that is a known natural process of forest succession. There was some variation in species richness between the southern and northern Escarpment plots mainly due to the position of the Halton plot within an ecozone between two forest zones. The combination of northern and southern species increased biodiversity at this site.

Indicators of tree health (i.e. mortality and crown dieback rates) were well within the threshold values established by the Canadian Forest Service (CFS). Mean annual mortality never exceeded 5% and most crown dieback was temporary with renewed growth by the following year. However, there was cause for concern regarding the loss of Butternut, a Species at Risk. All canopy specimens of this species recorded within the plot exhibited evidence of butternut canker and all but one stem died over the study period. This emphasized the need to monitor forest health within BR core protected areas to prepare to adapt management strategies to emerging outbreaks of pests and diseases.

Moving forward, the study results demonstrate the importance for land managers (e.g. conservation authorities, Ontario Parks) within the NEBR to continue to work with the NEC and private land owners to further develop management and stewardship plans that are consistent with the conservation objectives of the BR, in order to ensure that the Escarpment environment is protected while maintaining opportunities for compatible recreation and economic development. Recommendations out of this study are that continued monitoring of the state of NEBR forests is essential in order to provide an early indication of adverse impacts in order to allow for immediate intervention including changes to land management practices.

Overall, the results of monitoring highlight the successful protection of natural forest communities within core protected areas along the Escarpment. In the absence of forest management and other human influences, these forests will continue to mature with minimal environmental disturbance and eventually progress to an old growth state. Short-term trends indicate that current land use and management activities do not appear to be adversely impacting the Escarpment forests represented by the plots, although the presence of exotic invasive species must be immediately addressed to avoid degradation of the quality of natural areas. The integrity of conservative and rare species and any evidence of forest pests or diseases should continue to be tracked as part of the monitoring program to contribute to informed land management decisions.

Jefferson Salamander Research

Starting in 2003, the NEBR and the NEC, in partnership with the University of Guelph have been collaborating to undertake research in order to establish the presence and absence and distribution of Jefferson Salamander *(Ambystoma jeffersonianum)* in the NEBR. Jefferson Salamander

is listed as an Endangered species by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the Committee on Status of Species at Risk in Ontario (COSSARO).

Jefferson Salamanders require undisturbed woodland habitat adjacent to fishless breeding ponds. Major threats to the Jefferson Salamander in Ontario include habitat loss, habitat fragmentation and degradation/alteration,

road mortality, impairment of wetland/hydrologic function and the introduction of fish to breeding ponds. The Canadian range of A. jeffersonianum is restricted to southern Ontario, particularly within the NEBR, within the forested habitat along the Niagara Escarpment at approximately 27 sites from the Hamilton area to Orangeville and within isolated localities in Halton and Peel Regions and Dufferin County East of the Escarpment (MNR, 2009).

The identification of Jefferson Salamander is problematic because of its association with morphologically similar, oven polyploidy, female "nuclear hybrids". Genetic analysis is required to identify Jefferson Salamander females. Dr. Jim Bogart, Professor Emeritus in the Department of Integrative Biology at the University of Guelph, is the foremost leading expert on this species having studied the Jefferson Salamander for more than 30 years. In the early 1990's Dr. Bogart undertook a comprehensive survey of Ambystoma salamanders, including Jefferson Salamander along the Niagara Escarpment (Bogart, 1991). The NEBR distribution study expanded upon Bogart's original study by investigating potential ponds on the Escarpment and returning to some of the historic ponds previously identified in order to achieve an increased understanding of where this species exists within the NEBR. The information collected was shared with the MNR (who track rare species in Ontario), and the provincial Jefferson Salamander Recovery Team. The Provincial Recovery Team includes Dr. Jim Bogart, NEC staff, MNR staff and Conservation Authority staff working together to ensure that the species is protected in the NEBR.

Funding was granted to the NEBR from the Canadian Wildlife Federation and the Oracle Corporation, and the University of Guelph provided training, assistance with site selection, field work and conducted the genetic analysis. NEC staff undertook field work and provided GIS assistance.

In 2012, the City of Burlington and Halton CA closed a section of road to traffic in Burlington for a 3 weeks period, to allow the endangered Jefferson Salamander safe passage during its annual migration to the ponds fed by spring run-off in order to lay eggs. Research conducted by Conservation Halton on the impact of vehicular traffic on the salamander during breeding season. This research assisted in the efforts to close the road.

Flying Squirrel Distribution Study

In 2004, the NEC Monitoring Program, in partnership with the Aurora District MNR participated in a monitoring study to determine the presence and absence of Southern Flying Squirrels, Glaucomys volans in selected sections of the NEBR. Glaucomys volans are cavity nesters found in deciduous and mixed forests, not a true flier but glides from tree to tree using furry membranes between the front and back feet as sails.

Volunteers were heavily relied upon to undertake this study, and the project resulted in new and enhanced partnerships between the NEC and the Aurora District MNR, the Credit Valley Conservation Authority, Conservation Halton, Halton–Peel Woodland and Wildlife Stewardship, the Town of Caledon and the Halton/North Peel Naturalists Club. The project also received exposure in the local newspapers.

The squirrel is listed as Special Concern both provincially and nationally. A ranking of special concern means that it is a species with characteristics that make it sensitive to human activities or natural events. The historic clearing and current fragmentation of southern Ontario forests is thought to have caused the decline in the population of this species (Stabb, 1998). The project continued in 2005, 2006 and again in 2010.

Niagara Escarpment Baseflow Study

In 2009, the NEC partnered with the Nottawasaga Valley Conservation Authority (NVCA) to undertake the "Niagara Escarpment Baseflow Study". The study endeavoured to define baseflow indices in several watercourses within

the NVCA watershed, largely through the use of baseflow index. Through the baseflow index, correlations on baseflow conditions can be made to key groundwater contributing areas as defined by these geological formational boundaries to watercourses on the Niagara Escarpment. Understanding groundwater contributions to Niagara Escarpment water courses is necessary for the long-term effective management of this resource.

Discharge of groundwater plays an important role in maintaining stream flows, moderating thermal regimes, and providing habitat for flora and fauna. Groundwater discharge on the Niagara Escarpment face is inferred to be influenced by the porosity/permeability of the geological units that make up the Niagara Escarpment. For example,

the Amabel Formation yields significant groundwater discharge to the escarpment streams while the underlying Clinton-Cataract Group acts as a regional aquitard and is a poorly transmissive unit. Significant groundwater discharge is believed to occur at the contact between the porous Amabel Formation and the underlying relatively impermeable shales of the Clinton-Cataract Group.

The demonstration project is a model for a multi-year stream flow monitoring program that could eventually cover the length of the Niagara Escarpment. Results generated have potential to lead to the delineation of key areas of groundwater contribution tied to the geology (bedrock, surficial), land use, etc. These results will be used to calculate groundwater contributions along the Niagara Escarpment and will form the foundation to address changing climatic conditions, source water protection, and implications for long-term sustainability of this resource. This information could benefit water budgeting exercises undertaken as part of various development proposals.

The results generated from this study provide a general framework for groundwater contributions to significant water courses in the NVCA watershed of the NEBR. Although this study provided a preliminary understanding of the baseflow and streamflow conditions on the Niagara Escarpment water courses, there are outstanding questions revolving around the impact that the overburden and topography and secondary land use and permitted water taking have on the degree of groundwater contributions to these water courses.

Recommendations of the study suggested that future work should target existing field sites to develop long term understanding of the water courses in terms of stream flow, groundwater contributions, and general water quality characteristics. In addition, it is envisioned that the project area be expanded to cover the length of the Niagara Escarpment. This approach will enable a robust understanding of the surface water-groundwater signature on the Niagara Escarpment while complementing the objectives of the Biosphere Reserve designation.

Bruce Peninsula Biosphere Association

The Bruce Peninsula Biosphere Association (BPBA) is a grassroots registered charity, established in 2000 and dedicated to implementing the principles of World Biospheres within the Bruce Peninsula portion of the NEBR. The first community committee to implement the concepts of UNESCO World Biosphere Reserves along the Niagara Escarpment, the BPBA develops community support and builds capacity to enable their community to fulfill the functions of the MAB programme. The BPBA does not employ staff but is governed by a representative Community Board comprised of volunteers from multi-disciplinary backgrounds with roots in the community.

The Association exemplifies the BR mandate of capacity building. The BPBA has no source of core funding, however has been hugely successful in their fundraising efforts having obtaining a number of donations from various private local companies and grants from the province (Trillium Foundation), in addition to fostering collaborative partnerships with private landowners and business owners in order to achieve their numerous accomplishments.

The BPBA believes that good decisions based on good information are ultimately what building capacity is in the Biosphere Reserve concept, and therefore focuses their objectives on the four primary program areas of: ecological monitoring and restoration, community engagement,

youth and education and sustainable economic development. The Association operates under a number of conservation and education based objectives including; sponsoring public awareness through community forums and dialogues, to acknowledge and promote the importance of private land stewardship and pride in heritage, while learning from traditional forms of land use. To achieve these goals, the BPBA fosters strong relationships with a wide variety of community partners from various sectors. The BPBA is an outstanding model of a successful NEBR community in operation.

The following is a sampling of initiatives that the BPBA has successfully accomplished over the past 10 years in the areas of monitoring and research:

Ecological Monitoring and Restoration

In 2002, a long term monitoring program was initiated to assess the health of forest ecosystems on the Bruce Peninsula. Monitoring these plots over an extended period of time allows the community to better understand forest ecosystems, detect local and regional environmental changes, and furthermore, make informed land management decisions. Several aspects of trees are inventoried, including structure and composition of mature trees, tree health, seedling and sapling regeneration, and decomposition and monitoring of lichens (also see Section X). The BPBA has identified future direction for the forest monitoring work which includes initiating communication and data exchange with other UNESCO Biosphere Monitoring Programs.

Salamander Monitoring

An exemplary approach to a citizen-based science approach, the BPBA salamander monitoring program was initiated in 2003 in partnership with Parks Canada. The field investigations with the use of cover boards take place on both private lands and within parks and protected areas. Changes in ecosystem health can be detected over time using salamanders such as the Eastern Red-back Salamander as an indicator species. Salamanders respire through their skin, therefore making them susceptible to disturbances. The data collected is submitted to Parks Canada to be combined with other monitoring plot information to create a complete picture of the ecological health of the forests.

Since 2003, the BPBA has been undertaking a benthic monitoring program within three local coldwater streams to monitor the health of these aquatic ecosystems. Benthic monitoring involves collecting bottom samples from the streams to identify and count the macroinvertebrates, or bottom dwelling organisms, present in the water. Since some of these species are sensitive to disruptions in their environment they are good indicators of the health of the aquatic ecosystems. This work is being undertaken through a partnership with the Ontario Benthos Biomonitoring Network (OBBN). Collection of this data not only provides an understanding of local aquatic ecosystems, but it also contributes to a provincial wide database managed by the OBBN.

This monitoring program can also provide valuable information on the management of these aquatic ecosystems and can indicate the success of current restoration projects conducted by Parks Canada and local Sportsmen's Associations, and furthermore, the effectiveness of current management practices on private lands.

Dark Sky Community

As mentioned above, the Municipality of Northern Bruce Peninsula passed a proclamation which proclaimed the Municipality as a "Dark Sky Community." The municipality passed the proclamation in recognition of the Bruce Peninsula being a unique location where people can still experience the wonders and benefits of the dark night sky.

The proclamation noted that the use of dark sky-compliant lighting practices will preserve, protect and enhance the community's use and enjoyment of the natural environment of the night by eliminating hazardous and annoying glare; reduce light trespass; minimize light pollution which results in the degradation of the night-time environment and will conserve energy and resources.

The Bruce Peninsula Environment Group was the inspiration behind the educational efforts that lead to the Dark Sky proclamation. The group continues to assist the municipal proclamation through of the publication of a Dark Sky Brochure, fundraising to contribute to the replacement of lighting with dark sky compliant lighting at the Lions Head marina, encouraging and supporting the municipality in the replacement of lights along Highway 6, and at Tobermory and creating educational portable display boards for use at peninsula events, etc.

The Municipality of Northern Bruce "Dark Sky Proclamation" and implementation of the Proclamation sets high standards in protecting the night sky from excessive or "stray" lighting. In doing so this extensive part of the Escarpment will be protected from an aspect of the impact of development not often considered. It preserves the natural scenery of the night sky along this section of the Escarpment. The value to the NEBR is significant in that it creates an additional measure of protection in accordance with the NEP objective: to maintain and enhance the open landscape character of the Niagara Escarpment as far as possible by such means as compatible farming or forestry and by preserving the natural scenery.

The NEC supports the principles of the dark sky communities throughout the NEBR and has produced an educational brochure highlighting the benefits of practicing night sky lighting that will be circulated to landowners with their NEC Development Permits.

Bruce Peninsula Bird Observatory (BPBO)

The Bruce Peninsula Bird Observatory is a non-profit organization dedicated to the birds of the Bruce Peninsula section of the NEBR. Actively involved in monitoring, research and education projects, their goal is to promote and foster the study, appreciation and conservation of birds and their habitats on the Bruce Peninsula. BPBO's core program is migration monitoring of passerines at the Cabot Head Research Station. Migration monitoring is carried out in the Spring, from mid-April to early June, and again in the Fall, from mid-August to the end of October. A daily census, six hours of mist net captures, and incidental observations all go towards establishing the number of birds of all species moving through the area. 2010 marks the 10th year of BPBO monitoring using standardized protocols, and the 8th year as members of the Canadian Migration Monitoring Network. The BPBO is linked to more than a dozen partner organizations.

Royal Botanical Gardens (RBG)

Royal Botanical Gardens' mission is to promote the public's understanding of the relationship between the plant world, society and the environment. Royal Botanical Gardens is a recognized and supported global leader in how we use plants in bringing people, place and sustainable behaviours together. The people of Ontario through The Ontario Ministry of Tourism, Culture and Sport, City of Hamilton, Regional Municipality of Halton, Royal Botanical Gardens members, The Auxiliary of Royal Botanical Gardens, and many corporations, foundations and individuals fund Royal Botanical Gardens.

RBG facilitates both research with external researchers and undertakes onsite studies. External Research partners include multiple universities and government agencies on a broad range of topics. The most frequent projects include archeology, contaminant studies, and invasive species. On site research primarily focuses on topics related to the health of the natural areas.

RBG scientific and conservation activities are aimed at understanding and protecting biodiversity: both the biodiversity of wildlife and wild plants and also the human-made diversity of horticulture. Monitoring and inventory programs to maintain status information on the state of the sanctuaries include:

- Spring and summer biweekly water quality at multiple sites
- Annual fish community monitoring (Cootes Paradise Fishway, and August year of young (YOY) survey)
- Forest and wetland plant community plots and multiple locations
- Forest soil quality at selected forest monitoring plots
- Breeding bird surveys
- Ongoing inventories of the flora of the Nature Sanctuaries (840 ha.)
- Various Species at Risk (Turtles, Butternut, Clubrush, American Columbo, Jefferson Salamander, Red Mulberry)
- Deer abundance
- Ecological Land Classification through 50% of their properties.
- Butterfly and Dragonfly surveys
- Emerald Ash Borer inventories

RBG restoration and rehabilitation initiatives include a wetland restoration program for the two river mouth coastal wetland systems, invasive species removal from the old growth forest areas, Prairie/Savannah Restoration at multiple sites.

The RBG location has multiple designations to incorporate in promotion, including Royal Botanical Gardens and National Historic Site. The biosphere designation has been utilized as a value-add to RBG and is currently the lead piece for marketing the biodiversity of the nature sanctuary portion of the property.

6.2 Environmental sustainability education. Note the main educational institutions ("formal" – schools, colleges, universities, and "informal" – services for the general public) in the biosphere reserve, or conducting working in the biosphere reserve. Describe their programs, including special school or adult education programs, as these contribute towards the functions of a biosphere reserve. Comment on organization changes (if any) in institutions and programs that were identified in the biosphere reserve ten or so years ago (e.g. closed down, redesigned, new initiatives). Note programs of UNESCO Associated Schools where applicable, and contributions towards the UN Decade of Education for Sustainable Development.

Outdoor Education & Learning Centres

Education plays a vital role in preserving the Escarpment for future generations. A number of field centres for outdoor education and/or environmental studies have been built and maintained within or near areas within the Biosphere Reserve (and NEPOSS) by School Boards or Conservation Authorities. These centres provide an opportunity to learn firsthand about the Biosphere Reserve's natural and cultural environment by directly engaging students in Escarpment-based outdoor learning activities.
In recent years, reduced funding available for some outdoor centres has resulted in scaled back activities and closures. Shortly after the 2002 periodic review of the Niagara Escarpment Biosphere Reserve, several Toronto District

School Board outdoor education centres along the Escarpment were closed indefinitely due to a lack of provincial funding (e.g. Pine River Outdoor Education Centre, Boyne River Natural Science School and Noisy River Outdoor Education Centre). The section below highlights some of the Escarpment-related outdoor education and related facilities that are currently in operation:

Institute for Outdoor Education & Environmental Studies

This Institute, which is designed to primarily serve approximately 4000 students each year, is located on a 130 ha former farm property and is operated by the Bluewater District School Board. Although the centre is located near Oliphant in Grey County, away from the Escarpment, the centre includes programs that focus on the nearby natural areas within the Biosphere Reserve, such as Bruce's Caves and Spirit Rock. Hikes are also led along the Bruce Trail. In the summer and on weekends, the centre offers extended learning for adults in cooperation with agencies such as Bruce Peninsula National Park and the MNR. In 2004, the Institute received the Robin Dennis Award by the Council for Outdoor Educators of Ontario. This award recognizes excellence and outstanding contributions in the field of outdoor education.

Grey and Bruce County Conservation Education Programs
Grey Sauble Conservation and Saugeen Conservation have partnered to offer conservation education programs to school groups with up to 40 participants. Topics include the Niagara Escarpment and Lakeshore Processes.

Highlands Nordic Outdoor Education Centre

Located 11 km southwest of Collingwood near Duntroon, this centre provides programs for elementary school students that focus on a variety of topics such as the Escarpment's natural habitats and communities, rocks and minerals and wayfinding. Winter field trips involve cross-country skiing, snowshoeing, winter ecology and survival skills. All programs are run out of the Highlands Nordic Lodge which features three classrooms and a cafeteria. The centre advertises the Biosphere Reserve designation through their program descriptions and on their web site.
Mono Cliffs Outdoor Education Centre

Mono Cliffs Outdoor Education Centre is owned and operated by the Toronto District School Board as part of the School Board's "Mud Between the Toes" program. The centre offers year round, outdoor education experiences for up to 80 students and is located along the Escarpment on the edge of Mono Cliffs Provincial Park (a nodal park in the NEPOSS) near Orangeville, Ontario. Programs include an ecology hike that advertises the Escarpment as a World Biosphere Reserve. Facilities and workshop space is also available to other groups during non-school periods.

Halton Region Museum

Located within the Kelso Conservation Area, the Halton Region Museum offers Escarpment-related environmental programming for school groups, day camps and adult tours. Programs such as Escarpment Discoveries, Pond Study and TREE-mendous Escarpment provide the opportunity to explore the interactions of natural and human systems.

Crawford Lake Conservation Area

Crawford Lake Conservation Area, which is owned and managed by Conservation Halton, is a nodal park in the NEPOSS located in Halton Region. In a reconstructed 15th century Iroquoian longhouse village, students can experience a variety of unique cultural and environmental programs with interpretation focused on the First Nations. Guided hikes around a meromictic lake or along Escarpment trails introduce the students to the natural environment and significance of the Niagara Escarpment.

Watershed Learning Centre & Jack Smythe Field Study Centre

This facility is located within the Terra Cotta Conservation Area (a nodal park within the NEPOSS) which is owned by the Credit Valley Conservation Authority. A "Landscapes for Learning" outdoor education program is run through the centre which allows students and adults to connect with nature. Just north of the Conservation Area, the Peel District School Board operates the Jack Smythe Field Study Centre. Elementary and secondary school students in the Peel Board area can participate in tree, bird, insect and stream studies as well as cross-country skiing and maple syrup making. Other groups, such as Scouts, can arrange to use the facility on the weekends. The biosphere reserve designation adds value to this site, and Niagara Escarpment messaging is incorporated into most programming occurring on site.

Christie Lake Outdoor Education Centre & Dundas Valley Conservation Area

These facilities are located within the NEPOSS in the City of Hamilton. The Hamilton Conservation Authority offers a variety of outdoor programs on a fee per visit basis for elementary school groups related to topics such as biodiversity, water systems and birds of prey.

Giant's Rib Discovery Centre

Since 2006, this not-for profit Discovery Centre has operated out of the Trail Centre in the Dundas Valley Conservation Area (a nodal park within the NEPOSS) in the City of Hamilton. Since 2006, programming has been initiated by distributing materials related to the Dundas Valley and other parts of the Escarpment to Trail Centre visitors. The organization was created to tell the story of the Niagara Escarpment and promote uses that will ensure preservation of its natural state for future generations. Public educational lecture series are offered regularly by experts on natural and cultural topics related to the Escarpment. Artists and photographers are invited to display environmental works on weekends and throughout the year. A web site has been developed that offers educational materials based on the Niagara Escarpment for use in Ontario schools.

Woodend Outdoor Education Centre

Located within an old estate home, this centre is operated by the District School Board of Niagara and hosts over 10,000 students each year. It is located in the 45 hectare Woodend Conservation Area, which is owned by the Niagara Peninsula Conservation Authority. The District

School Board of Niagara is currently developing a new vision called the "Walker Woodend Living Campus". This initiative will allow students to observe various features and components of energy efficiency and sustainable building practises which will be exposed and featured in various locations throughout the Living Campus.

St. John's Outdoor Education Centre

The St. John's Outdoor Education Centre, which is adjacent to Short Hills Provincial Park, was established in 1969 by the District School Board of Niagara. The centre offers a wide variety of programs and hosts approximately 14,000 students every year, from Kindergarten to Grade 12. The centre is also rented to other groups such as Brock University and the local Bruce Trail club.

Bruce Peninsula Regional Envirothon:

Since 2002 students from the Bruce Peninsula have participated in "Envirothon", a competition that challenges youth to work as a team exporting a myriad of environmental topics in the NEBR including forestry, soils, wildlife and aquatic ecology. A number of local community based organizations and businesses sponsor the event including the Lion's Club, the TD Friends of the Environment and the Bruce Peninsula Biosphere Association.

Bruce Peninsula Bird Observatory

While unique to birds and their environment, the observatory represents a very deep learning opportunity. A number of educational programs are offered including the popular "Weekends on the Bruce". The observatory also acts as a research station and conducts educational projects many of which are published.

Royal Botanical Gardens

The Royal Botanical Gardens, located in the City of Hamilton, owns and manages various natural areas within the NEBR. Educational programs designed to encourage environmental stewardship are offered to students, adults and families.

UNESCO Schools

St. Edmonds Public School

A UNESCO ASPnet designated school at the tip of the Bruce Peninsula, this school embraces the four theme areas of the ASPnet program, ASPnet and UN priorities, Education for Sustainable Development, Peace and Human Rights, and intercultural Learning through the following initiatives:

"Biosphere Betty" – This classroom character was created to assist students in learning about the special BR designation of the Niagara Escarpment. "Biosphere Betty" is incorporated into many learning activities including trips home with the students, where she is included in photographs which students take to assist in sharing lessons learned about the Escarpment environment.

"If you're not From the Bruce…" – This book produced in 2010 by students with the goal of assisting student in learning about their diverse biosphere reserve communities, has been shared with over 40 UNESCO schools across Canada, with an invitation to participate in creating a similar book with the intent to be shared across the country.

Bruce Peninsula District School

With a motto of "We are unique, we are a school within a Biosphere", this UNESCO school in Lion's head, supports the BR designation through the following initiatives:

UNESCO Assemblies – the school hosts major UNESCO assemblies where students of all grades are provided opportunities to share their UNESCO-related activities taking place within their classrooms.

Footprints Conference – this conference has been running for the past four years and provides various practical skills-based learning opportunities for students interested in an environmentally-based career path.

Ecology Study Group – This group started in 2009 and supports students meeting with Park Ecologists from the Bruce Peninsula National Park. In June of 2010, the students completed a conservation plan for the purpose of protecting the Cameron and Cyprus Lake systems from non-native invasive species. The Ecology Study group receives financial support from the Bruce Peninsula Biosphere Association and the local Lion's Club.

Universities

University of Waterloo

Since 1996, the Department of Environment and Resource Studies (ERS) of the University of Waterloo (UW) has offered a 10 day 3rd year environmental monitoring field course (held every year in late August; class size approximately 12-14 students). The course focuses on biodiversity monitoring in permanent, one hectare forest plots to assist the NEC with their Monitoring Program (also see Section 6.1).

The UW monitoring course was created and developed through a partnership with government at various levels: the NEC as the primary partner, the Ecological Monitoring and Assessment Network Coordinating Office (EMAN-CO) of Environment Canada as support for research design and with equipment and various NEC partner organizations for land access permissions.
The NEC provides in-kind support through staff time dedicated to organizing and teaching the monitoring course. Various guest speakers and presenters from the Biosphere Reserve community also provide in-kind support. EMAN-CO initially provided training and equipment when the course was being established. UW students involved in the course pay a course fee which covers travel, accommodations (i.e. camping) and food. Students are responsible for running and maintaining their own field camp, including assisting with meal preparation and clean-up.

A number of students who graduate from the ERS Faculty go on to have successful careers in the field of environmental conservation and education, many with the agencies and organizations within the NEBR.
Brock University

Brock University in St. Catharines, Ontario is located in the Niagara Escarpment Plan Area. With a student population of approximately 18,000, and 600 faculty members, Brock is a comprehensive university with an expansive undergraduate system as well as advanced research, post-graduate and doctoral programs.

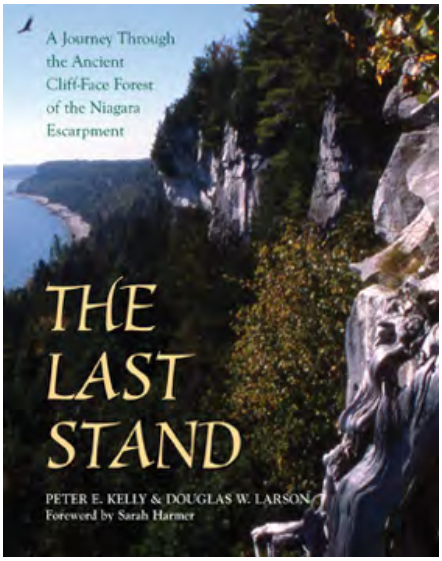
Brock is home to the Environmental Sustainability Research Centre (ESRC), a research group pursuing innovative and interdisciplinary research concerning the environment, sustainability and social-ecological resilience. A comprehensive list of research activities of the centre are listed in Appendix A.

A university for "both sides of the brain," Brock University views community involvement as crucial to developing intelligent, well-rounded members of society. Its rigorous undergraduate, graduate and doctoral programs include experiential learning opportunities and one of Canada's largest co-op programs. Cross-disciplinary and interdisciplinary programs offer multi-faceted degrees that help students build careers and get jobs.

In January 2012, Brock celebrated its connection to the Niagara Escarpment Biosphere Reserve in a U.N. flag-raising ceremony on campus. The flag-raising was followed by a research seminar presentations by centre researchers looking at issues such as the changing landscape of water governance in Canada and the Niagara region, and the politics of water in irrigation economies. The session also included an update on an ESRC initiative known as the Niagara Migrant Children's Educational Award. The award is a community-based partnership among Niagara's agricultural workers, the City of St. Catharines, Brock University, Niagara College and the Niagara Community Foundation.

University of Guelph

The Cliff Ecology Research Group lead by Dr. Doug Larson, Professor Emeritus is based at the University of Guelph and consists of graduate students, research associates and summer students who undertake research into understanding cliff ecology. To date, the Cliff Ecology researchers have shown that cliffs have numerous fascinating characteristics previously unknown, including the fact that they support the least disturbed and oldest forest ecosystem in North America. Research Associate Peter Kelley has undertaken research on the ancient cedars on the Niagara Escarpment, with the locations of the ancient trees being mapped to provide an inventory of the tree component of this ancient forest. This work has been chronicled in Kelly, P., & D.W. Larson's 2007 book "The Last Stand."



"The Last Stand" reveals the complete account of the discovery of this ancient forest, of the miraculous properties of the trees forming this forest (eastern white cedar), and of what it was like for researchers to live, work and study within this forest. The unique story is told with text, with stunning colour photographs and through vivid first-hand accounts. This book will stand the test of time as a testament to science, imagination and discovery.

6.3 Describe the Biosphere Reserve's communications strategy: see new Section 5.5 above.

6.4 No further comments/observations.

6.5 What is the overall framework for governance in the area of the biosphere reserve?
Identify the main components and their contributions to the biosphere reserve.
See also Sections 4.1 and 6.0 for details.

6.5.1 Local jurisdictions (e.g. townships/districts, Aboriginal communities, Rural Municipalities, town and cities, etc).

See list below .

6.5.2 Main government agencies and programs (federal, provincial, regional) that related to the functions of a biosphere reserve.

The Niagara Escarpment Biosphere Reserve's governance framework is unique among Canadian Biosphere Reserves. Functioning as effectively as it does without a formalized or centralized governance structure, the NEBR thrives on the partnerships of its interconnected agencies, collaborating in its network.

Covering many overlapping and parallel jurisdictions of federal, provincial and municipal oversight, the NEBR benefits greatly from these levels of stewardship at work in its parameters.

Its watersheds, park lands and trails are administered by dedicated agencies and organizations maintaining the various aspects of the Biosphere Reserve.

At the heart of the NEBR's governance framework is the Niagara Escarpment Commission, the provincial land use planning agency responsible for the administration of the Niagara Escarpment Plan, directing land use decisions in the 194,555 hectares that comprise the NEBR. As an important component of the NEBR's structure, the NEC along with all NEBR partners, strives to promote the Biosphere Reserve programme objectives through its mandated activities.

The list below outlines the NEBR's governance network:

Federal Departments & Agencies
Environment Canada
Environmental Monitoring and Assessment Network (EMAN) (Environment Canada)
Canadian Wildlife Service (CWS)
Parks Canada
Bruce Peninsula National Park & Fathom Five National Marine Park

First Nations
Alderville First Nation
Curve Lake First Nation
Chippewas of Nawash First Nations
Hiawatha First Nation
Mississaugas of Scugog Island First Nation
Mississaugas of the New Credit First Nation
Mohawks of Akwesasne First Nation
Oneida Nation of the Thames
Six Nations of the Grand River
The Mohawks of the Bay of Quinte (Tyendinaga) First Nation
Wahta Mohawks First Nation

Ontario Ministries, Agencies & Commissions
Niagara Escarpment Commission
Ministry of Natural Resources
- Natural Heritage Information Centre (Species at Risk tracking)
- Aggregate Resources Act (ARA)
- Land Use Planning Section (NEPOSS)

Ontario Heritage Trust
Ministry of Aboriginal Affairs
Ministry of Agriculture, Food and Rural Affairs
Ontario Parks
Niagara Parks Commission
Royal Botanical Gardens
Ministry of Municipal Affairs and Housing
Ministry of Tourism
Ministry of Transportation
Ministry of Tourism, Culture and Sport
Ministry of the Environment

Regional Government
Regional Municipality of Niagara
City of Hamilton
Regional Municipality of Halton
Regional Municipality of Peel
County of Dufferin
County of Grey
County of Simcoe
County of Bruce
Town of Milton
Town of Caledon
City of Owen Sound
Municipality of Northern Bruce Peninsula
Town of the Blue Mountains
Town of Halton Hills
Township of Mulmur
City of Burlington
City of St. Catharines
City of Thorold
Town of Grimsby
Town of Lincoln
Town of Niagara-on-the-Lake
Town of Pelham
Township of Clearview
Town of South Bruce Peninsula
City of Niagara Falls
City of Owen Sound

Town of Mono
Association of Municipalities of Ontario

Conservation Authorities
Nottawasaga Valley Conservation Authority (NPCA)
Credit Valley Conservation (CVC)
Conservation Halton (CH)
Niagara Peninsula Conservation Authority (NPCA)
Toronto Region Conservation Authority (TRCA)
Hamilton Region Conservation Authority (HRCA)
Grey Sauble Conservation Authority (GRCA)

Non-Government Public Interest Groups
Coalition on the Niagara Escarpment (CONE)
Bruce Trail Conservancy (BTC)
Niagara Escarpment Foundation (NEF)
Federation of Ontario Naturalists
Heritage Halton Hills
Niagara Escarpment Biosphere Incorporated (NEBI)
Protect Our Water and Environmental Resources (P.O.W.E.R.)
Beaver Valley Heritage Society
Caledon Ratepayers Association
Grey Association for Better Planning
Save the Oak Ridges Moraine (STORM)
Bay Area Restoration Council
Bruce Peninsula Biosphere Reserve Association (BPBA)
Earthroots
Friends of the Earth
Friends of the Escarpment (Grimsby)
Friends of the Red Hill Valley (Hamilton)
Ontario Access Coalition
The Ontario Environment Network
Niagara Falls Nature Club
Halton/North Peel Naturalists Club
Peninsula Field Naturalists
Owen Sound Field Naturalists
Hamilton Field Naturalists
Toronto Field Naturalists
Saugeen Field Naturalists
Upper Credit Field Naturalists
Canadian Parks & Wilderness Society
South Peel Naturalists' Club
Caledon Countryside Alliance
Ontario Streams
Hamilton Harbor Remedial Action Plan (RAPP)
Escarpment Biosphere Conservancy
Blue Mountain Watershed Trust Foundation
Carolinian Canada
Bruce Peninsula Bird Observatory
Federation of Ontario Cottagers' Association Inc.
Ontario Society for Environmental Management
Hike Ontario
Ontario Trail Riders Association
Coalition of Concerned Citizens
Preservation of Agricultural Lands Society (PALS)
Ontario Federation of Anglers and Hunters
Protect our Escarpment Rural Land (PERL)

Professional Associations
Ontario Institute of Agrologists
Ontario Professional Planners Institute (OPPI)
Canadian Institute of Planners (CIP)

Business & Industry
Aggregate Producers Association of Ontario (APAO)
Ontario Stone, Sand and Gravel Association (OSSGA)
Wine Council of Ontario
Ontario Forestry Association
Ontario Federation of Agriculture
Grey Bruce Bed and Breakfast Association
Headwaters Country Tourism Association
Niagara Nature Tours
Bruce Peninsula Outfitters
Grape Growers of Ontario

National Non-Government Organizations
Canadian Nature Federation
Canadian Environmental Law Association
Ducks Unlimited Canada
Nature Conservancy of Canada, Ontario Office
Sierra Club of Canada, Eastern Canada Chapter
Sierra Legal Defense Fund
Wildlands League
Wildlife Habitat Canada

Academic Institutions
University of Guelph, Centre for Land and Water Stewardship
University of Waterloo, Heritage Resource Centre, Faculty of Environment and Resource Studies
University of Toronto (Faculty of Forestry, Planning))
Brock University (St. Catharines)
Ryerson University (Planning)

6.6 Management plan/policy. Does a management plan or policy exist for the overall biosphere reserve? If yes, briefly describe the main characteristics of this plan.

See sections 4.1 and 6.0

6.7 The Biosphere Reserve administration: see section 6.0

6.8 Authority in charge of administration:

6.8.1 for the biosphere reserve as a whole
6.8.2 for the core area(s)
6.8.3 for the buffer zone(s)
6.8.4 for the transition area(s)

See Sections 4.2 & 4.31 and Table 6

6.9 What has been the main changes in overall governance for the biosphere reserve during the past 10 years?

Since the 2002 review the NEBR's governance structure has continued as a network of partners, without significant alteration. The Niagara Escarpment Commission's role as the land use planning agency for the NEBR has been a constant, and partner agencies have continued to contribute greatly to the NEBR's activities, particularly in the areas of scientific research, ecological monitoring, and public outreach.

The federal government's 2009 contribution agreement between Environment Canada and 16 Canadian Biosphere Reserves saw an approximate $250,000 transfer to the Niagara Escarpment Biosphere Inc., a registered charity. This funding was earmarked for capacity-building, Biosphere Reserve projects and community outreach.

6.10 What general experience has the biosphere reserve organization had in fostering collaborative endeavours to enhance the governance capacity in the biosphere reserve?

The collaborative efforts of the myriad of Biosphere Reserve partners within various government and non-government roles have been highlighted throughout this Report in describing the numerous monitoring, research, regulatory and education and communications initiatives presented.

An additional example of NEBR partners fostering collaborative approaches is demonstrated through a partnership between the Niagara Escarpment Commission (NEC), the Ontario MNR, Niagara Escarpment Biosphere Reserve Inc (NEBI), the Nottawasaga Valley Conservation Authority, and the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA) which was formed in 2009, to lead a collaborative monitoring and research Network in the NEBR and adjacent lands.

The purpose of the Niagara Escarpment Terrestrial and Stream Monitoring and Research Team (NETSMART) is to provide a forum for coordination, integration, information sharing and management with both government and Non-Government Organizations that are involved in monitoring and research on the Escarpment and surrounding lands. The network recognizes the advantages of collaboration in order to maximize the value of individual data sets, and enable a landscape perspective, in order to better inform decision-makers such as municipalities, other government agencies such as conservation authorities and communities.

This is in keeping with the role of biosphere reserves to support research and education and to build capacity in communities through the coordination of non-aligned scientific research. The role of the Biosphere Reserve is limited to bringing parties to the table and to future capitalization, as a neutral body that can accept, hold and distribute funds for implementation.

Forty participants attended the first meeting of the NETSMART group held in June 2009. Attendees included representatives from all Escarpment Conservation Authorities, the MNR, Bruce Trail Conservancy, Non-Government Organizations, Ministry of Municipal Affairs and Housing, and private industry. This meeting introduced the concept of the network approach and allowed individual organizations to showcase current monitoring and research efforts. A follow up survey was undertaken in order to assess priorities and the focus of the network.

The NETSMART group focused on monitoring and research taking place within the Niagara Escarpment Plan Area, however, will also include a geographic area outside of the Plan Area, in order to facilitate landscape scale trend analysis for the monitoring programs and to provide for a comparison between processes and policies in place outside of the boundaries of the Niagara Escarpment.

Summary of objectives:

- Provide a central organized forum for the sharing of data
- Maintain a network of experts to arrange or provide for technical expert advice that is accessible to all members
- Provide a forum to assist in coordinating responses to emerging issues that result from monitoring studies
- Connect Monitoring Programs in a nested study design, avoid duplication
- Build capacity and allow for coordination of large scale Escarpment-wide monitoring studies – lend support to fundraising for such projects
- Encourage and facilitate standardization of monitoring protocols being implemented and data management
- Connect Monitoring Programs in a nested study design
- Increased support for data analysis

Summary of Potential Outcomes:

- Avoid duplication in studies being undertaken (through gap analysis and identification of priorities)
- Ensure that non-aligned science is more effectively incorporated into policy development
- Leverage resources
- Lend support to OMB hearings (through availability and access to larger data sets)
- Defend significant habitats with scientifically sound information
- Improved data archiving system
- Pool resources to address common issues, which will result in diffusing costs

A gap analysis exercise is the next step, utilizing known data sets. The objective of maps created illustrating data sets will be to provide a framework of existing understanding of research and monitoring taking place in the NEBR and to identify areas where data gaps exist. It is also anticipated that the mapping can be used as a first communication tool to identify the current state of the assessment and monitoring on the Escarpment and its watersheds with the partner agencies and the general public.

Continuation of this initative will provide organizations and Industry with the opportunity to contribute their data sets to the exercise in order to provide for a more comprehensive complete gap analysis and assessment of priorities going forward.

6.11.1 Particular vision and approaches adopted for addressing the socio-cultural context and role of a biosphere reserve (e.g., promotion of local heritage resources, history, cultural and cross – cultural learning opportunities; cooperation with Aboriginal people; reaching out to recent immigrant groups, etc.).

The Niagara Escarpment's rich socio-cultural history is an integral part of the Biosphere Reserve's story. Given First Nations' historical connections to the Niagara Escarpment Biosphere Reserve, and communities' interests in land use planning matters, the Niagara Escarpment Commission circulates First Nations' communities on land use planning matters pertaining to natural, cultural, archaeological and related interests.

Local and regional heritage organizations promoting and interpreting the socio-cultural history of the Niagara Escarpment include Local Architectural Conservation Advisory Committees (LACACs), volunteer-based organizations active throughout the biosphere reserve. For example, the Town of Mono's LACAC has inventoried local architectural styles of historic buildings, providing documentation of the early 1830s-1850s European settlement of this section of the Escarpment.

Many Escarpment municipalities have heritage committees that perform similar work to LACACs, documenting the area's historical settlement patterns, promoting local museums and events, cataloguing local architectural styles and designating heritage structures and communities.

Community museums and heritage organizations abound in the Niagara Escarpment Biosphere Reserve. Grey Roots Museum & Archives in the City of Owen Sound is one of the many Escarpment heritage centres that promote the preservation, understanding and communication of the heritage an Escarpment community. Local and regional museums throughout the Escarpment's 22 municipalities deliver public programming, exhibits and collections research telling the stories of the rural and urban communities along the Escarpment from pre-history to today.

Ball's Falls Centre for Conservation opened in 2008 and was the recipient of a Niagara Escarpment Achievement Award in 2010 for its outstanding environmental building design. The centre features interactive exhibits and learning centres that showcase the natural and cultural history of the Niagara Escarpment, including an exhibit on UNESCO World Biosphere Reserves, comparing the NEBR with other global biosphere reserves. Environmental exhibits highlight the human impact on nature, as well as watershed management and conservation programs of the Niagara Peninsula Conservation Authority. The centre's event programming encourages visitors to become stewards for natural and cultural resources.

At Crawford Lake visitor centre in Milton, Ontario, a full-scale reconstructed 15th century reconstructed Iroquoian village provides public programming and education on the area's rich First Nations history. With education programming for students on Aboriginal community life, Niagara Escarpment geology and biodiversity, the conservation area contributes to the public's understanding of the socio-cultural history of the Escarpment.

Hamilton Civic Museums
Owned and operated by the City of Hamilton
www.hamilton.ca/museums

The City of Hamilton has 23 local museums and heritage organizations ranging from the Museum of Steam and Technology to Westfield Heritage Village, which both relate to the Niagara Escarpment's role in shaping early settlement, industrial development and pioneer life.

The Royal Ontario Museum, Ontario's largest museum, with 215,000 annual student visits and more than a million visitors annually, features Niagara Escarpment biodiversity information in its online collections and on-site in its Natural History Galleries and the Schad Gallery of Biodiversity.
In addition to heritage promotion, sustainability planning has become an increased focus of many municipalities in the past decade, with most municipal governments hosting sustainability committees or planning staff devoted to sustainability planning. Activities centre on the provision of advisory services to local councils on matters requiring assessments of broader sustainability initiatives.

TOWN OF HALTON HILLS
Working Together Working for You!

The Sustainability Advisory Committee of the Town of Halton Hills, for example, serves as an umbrella committee, bringing a number of stakeholders together at one table to ensure that Halton Hills becomes a model sustainable community. It seeks to bridge the Town's corporate sustainability objectives with the wider community's sustainability priorities. It also sets the agenda for sustainability initiatives that should be pursued by the Town.

Ontario's traditional camping excursions are often unfamiliar pursuits for many new Canadians. In a unique outreach initiative to encourage immigrants to explore recreational and camping opportunities, Ontario Parks and Ontario's Ministry of Natural Resources have partnered to develop the "Learn to Camp" program to encourage new Canadians of diverse backgrounds to explore the province's natural areas, including Niagara Escarpment parks. Information on camping rules, what to pack, and other pertinent visitor information is communicated via print materials and online.

Another prominent program aimed at engaging immigrant groups is the Friends of the Greenbelt Foundation's and Toronto Food Alliance's "Greenbelt Grown Cultural Food Guide," linking Chinese, South Asian, Middle Eastern, African and Caribbean communities to producers in the Greenbelt area, including the Niagara Escarpment.

7.0 and 8.0 Summary and Conclusion

The Niagara Escarpment Biosphere Reserve encompasses a complex and multi-layered network of partners, bound by the MAB Programme's objectives as a unifying framework for action. Looking forward, the NEBR is well-positioned to build on the strengths of the past decade, and to continue to follow and implement UNESCO MAB objectives.

In the area of park lands, trails, and land securement, there is more work to be done to add lands to the NEPOSS, and to complete the optimum route for the Bruce Trail, Canada's longest and oldest footpath.

With the upcoming 2015 provincial government reviews of the Niagara Escarpment Plan, Greenbelt Plan, and Oak Ridges Moraine Conservation Plan, there are many opportunities to more closely align Biosphere Reserve principles with the objectives and purpose of the Niagara Escarpment Plan, possibly resulting in changes to the core, buffer and zones of transition/cooperation.

Efforts to link local community outreach and ecological initiatives, such as the successful "Dark Sky Community" of the Bruce Peninsula, should extend to communities

throughout the NEBR. The coordination of increased communication and collaboration on such projects is a priority. This goal could be facilitated by the creation of more local Biosphere Reserve associations.

Another positive direction for the next 10 years of the NEBR would include marketing initiatives to provide a brand association for local businesses and organizations to promote their partnership in the NEBR. For example, communications materials denoting "A proud partner in the Niagara Escarpment Biosphere Reserve" could be utilized to brand NEBR businesses.

In addition to marketing efforts, the NEBR could also be considered as a vital study area for climate change. With the Escarpment's diverse ecozones, altitudinal variations (430 m elevation), and high percentage of conservation lands, there are unique opportunities for climate change research to take place. Some isolated regional studies have taken place to date (see Appendix A), but a large-scale , Escarpment-wide research model could be explored.
As well as its value as a potential climate change study area, the NEBR's impressive economic value (ecosystem services) provided to the Province of Ontario should be explored for evaluation and reporting to the public on the implications of placing a quantitative value on the almost immeasurable resources of the Escarpment.

As the population of southern Ontario continues to grow, and related development pressures also increase, there is a renewed importance of promoting and communicating the benefits of the unique and complex Niagara Escarpment Biosphere Reserve. There is a recognition of this need among all NEBR partners in the various Escarpment communities, and demonstrated dedication to achieving this.

7.2 Summarize the roles of the biosphere reserve organization in the (changing) activities of the region (e.g., convener or co-sponsor of conferences and workshops, leader in networking processes, member of advisory boards, funded project activities, project management, participated as a stakeholder in some larger endeavour, etc.). Create a table to display this summary.

The Niagara Escarpment Biosphere Reserve provides a framework for research activities, conservation efforts, land use planning initiatives and community outreach that take place in Niagara Escarpment municipalities. The following chart outlines the key roles undertaken by biosphere partners.

Biosphere Partner	Land use planning & regulation	Conference coordination	Advocacy & partnership-building	Ecological monitoring
Niagara Escarpment Commission	✔	✔	✔	✔
Ministry of Natural Resources	✔	✔	✔	✔
Conservation Authorities	✔	✔	✔	✔
Giant's Rib Discovery Centre		✔	✔	
Niagara Escarpment Biosphere Inc.			✔	✔
Niagara Escarpment Parks and Open Space System Council	✔		✔	
Bruce Trail Conservancy	✔	✔	✔	✔
Coalition on the Niagara Escarpment	✔	✔	✔	✔
Bruce Peninsula National Park	✔	✔	✔	✔
Bruce Peninsula Biosphere Association		✔	✔	✔
Friends of the Greenbelt Foundation		✔	✔	✔
Escarpment Biosphere Conservancy			✔	
Protect our Water and Environmental Resources (POWER)			✔	
Protect our Escarpment Rural Land (PERL)			✔	
Royal Botanical Gardens		✔	✔	✔

7.3 Briefly describe particular accomplishments and challenges over the last 10 years and identified steps being taken to address these challenges.

The NEBR's challenges are shaped by its diverse geographical, demographical and resource composition. Crossing 22 diverse municipalities, each with varying public interests, types of development pressures, and resource uses, the NEBR's strength is in its diversity and its unique network of partners working together to address issues of common concern. Many of its challenges can also be viewed as opportunities for public engagement, and as potential areas for increased collaboration. The previous sections of this Report provide numerous examples of the many successes the NEBR has seen over the past decade.

Shape & Size of the Area

Ontario's Niagara Escarpment is a linear landform, extending approximately 725 km (an approximately 6.5-hour drive from end to end). Communications, particularly face-to-face, can be difficult. Assembling scientific data, coordinating interconnected community projects, information sharing, establishing common standards for research projects etc., becomes more difficult and more costly as distances increase. The scientific advantage to covering such a great span is that the Escarpment represents a significant transect for data collection and data sharing. The NEBR EMAN plot network (see section X) is an example of how collaboration across such a large jurisdiction can be accommodated.

Recent advances in remote sensing technology combined with open source data sharing opportunities has allowed for landscape level analysis of NEBR features and change over time studies that were previously not feasible.

Partner Diversity & Numbers

There is a vast array of stakeholders in the Biosphere Reserve across the protection and sustainable development spectrum. Included in these partner agencies and organizations are government ministries, First Nations, non-government organizations (NGOs) and other land managers at multiple jurisdictional levels. For example, during the review of the NEP in 2000, the core parties consulted numbered more than 450. Communications becomes challenging with so many partners across such a large jurisdiction. However there are multiple examples of collaboration amongst these groups which has yielded great success and results has proven to be effective way for Biosphere Reserve partners to pool limited resources.

A key operational performance goal the NEC strives to achieve is a commitment to communicate the Niagara Escarpment Biosphere mandate to the public. The NEC measures this commitment by providing a variety of public outreach initiatives to increase awareness of the NEBR and the NEC's role in achieving the BR objectives (see Section 6.3). The NEC uses "green" communications methods to achieve this such as online conference proceedings, website, tracking media coverage, website usage trends, publications circulation and exhibits. These methods ensure that the message reaches the broadest possible audience.

Proximity to Population & Sprawl

There is significant pressure to expand urban boundaries into the rural landscape, especially in the Escarpment's southern section, which constitutes the heavily populated "Golden Horseshoe" at the west end of Lake Ontario. As development encroaches, there is also pressure for more roads and highways and infrastructure like hydro lines and utility corridors across the Escarpment. As well, there is pressure throughout the NEBR for recreational and vacation property development. The Niagara Escarpment Plan explicitly states that residential, commercial, industrial and tourism development be directed to Urban Areas, Minor Urban Centres and Escarpment Recreation Areas. These three NEP designations are the Biosphere Reserve zone of cooperation/transition. Additionally, subdivision-style housing projects in the Escarpment Rural Area were prohibited by the revised 1994 Plan, further confining development and intensification of existing, built-up areas.

Part 1.7 of the NEP identifies land use policies for the Urban Area designation. The Objective is "to minimize the impact and further encroachment of urban growth on the Escarpment environment." Part 1.6 identifies land use policies for Minor Urban Centres with Objectives which include: "To recognize, maintain and enhance existing rural settlements or provide concentration points for development and growth in rural areas" and "To generally direct the growth of villages, hamlets, and settlement areas away from Escarpment Natural Areas and Escarpment Protection Areas into Escarpment Rural Areas in a logical manner with the least possible environmental and agricultural disruption. The boundaries of Urban Areas within the NEBR generally reflect areas identified for development in municipal official plans. These provisions make it clear that urban development and growth should avoid encroaching on the biosphere reserve core areas (Escarpment Natural

and Protection Areas), which represents the most ecologically significant components of the NEBR. An Amendment to the NEP is required to expand any Urban Area (Zone of Transition) boundaries.

A 2004 study titled "Review and Evaluation of the Effectiveness of the Niagara Escarpment Plan Regarding Proposals to Expand Urban Areas and Minor Urban Centres" (Ernest, 2004) was commissioned by the Niagara Escarpment Foundation and the Coalition on the Niagara Escarpment. The purpose of the study was to examine how proposals to expand Urban Areas or Minor Urban Centres (BR zones of transition/cooperation), have been addressed under the NEP and the broader planning processes (municipal official plans). To do this, all NEP Amendments related to proposals for urban expansion were reviewed and analysed.

In summary, the study concluded that while good progress had been made in working with municipal government to define the boundaries of Minor Urban Centres, and that no significant encroachments of urban development into the Escarpment Natural Areas (BR core area) had been permitted (during the time span of the study up to 2003), the NEP has been only partially successful in minimizing the extent and impact of urban expansion on the Escarpment environment and in achieving objectives for Urban Areas and Minor Urban Centres. The report identified that many of these challenges were a result of decisions made by the Ontario Municipal Board or the Joint Board.

A positive response to this challenge was an outcome of the passage of the government's Greenbelt Act in February 2005. The Greenbelt Act has, for the time being, eased development pressure on the Niagara Escarpment as the expansion of urban areas or urban uses is prohibited in the area of the Greenbelt Plan, which includes the Niagara Escarpment Plan Area. The expansion of urban areas or uses can only be considered, comprehensively and cumulatively, when the Greenbelt Plan is reviewed, together with the NEP, in 2015.

Compatible Recreational Uses

As a result of existing and increasing human settlement; there is increased pressure on the NEBR as a recreational resource. One of the objectives of the NEP, and a principle of the NEBR, is to provide public access to the Escarpment. Some of the more intensive recreational uses, such as rock climbing and motorized vehicles, are known to have negative effects on sensitive Escarpment ecosystems. An example is decreased tree regeneration at cliff edges and in other trail areas and habitat destruction by rock climbers in undesignated areas. In addition, conservation authorities are under pressure to generate revenue through alternative sources, which creates a challenge to balance the need for operational dollars without compromising the natural environment.

However, these challenges also provide opportunities to increase awareness and education and share information with a wider audience. Management Plans for Parks and Open Spaces have increased their attention to the impacts some forms of recreational uses can have on the parks system and have responded by restricting these uses in some of the more sensitive escarpment ecosystems. The development of park zoning and associated management policies in accordance with Part 3 of the NEP ensures that recreational activities continue to be appropriate to the environmental sensitivities within the respective parks.

In addition, the NEPOSS Council provides a forum for discussion among the various park agencies on how to strategically balance recreational demand and revenue with protection. An example of an active NEBR group working on this challenge is the Ontario Access Coalition (OAC) is a volunteer, non-profit group that works with the climbing community, landowners and land managers to keep climbing and bouldering areas open in an environmentally responsible manner. OAC has a number of climbing management initiatives underway across the NEBR within National Parks, Nature Reserves and conservation and protected areas which includes the design interpretive educational signage and promotion of best practices.

Sustainable Resource Use

The NEBR is a source of natural resources such as mineral aggregates (sand, gravel and limestone), forestry products

and water (especially for bottling). There is a complex history of public discussion, and controversy around the issues of sustainability and best practices for these types of operations within the NEBR.

Aggregate extraction operations are permitted in areas designated for Mineral Resource Extraction (zone of cooperation/transition), subject to the NEP Development Criteria, and a licence under the Aggregate Resources Act (ARA). The NEP allows for the consideration of Amendments to the Escarpment Rural Area Designation of the NEP (BR buffer zone), to permit new or expanded extraction areas, subject to meeting a number of tests as set out in the NEP. Applications for mineral extraction within the NEBR are often subject to controversy and public debate. The process of aggregate extraction can result in impacts on the natural environment and on associated wildlife. Many of the desired "close to market" extraction areas in southern Ontario either lie in very close proximity to or actually overlap with natural features, and the present or historical range of species that are considered at risk in Ontario. The aggregate industry is the subject of comprehensive policies and legislative guidance. The ARA came into force in 1990, replacing the former Pits and Quarries Act.

The NEC and the MNR, together with the municipality and conservation authority in which the aggregate proposal is proposed, work together to undertake a thorough review of the numerous technical reports related to ecology, hydrogeology, hydrology, visual impact, noise, transportation and traffic and planning. In certain jurisdictions in the NEP Area, the use of a Joint Aggregate Review Team (JART), made up of representatives of the various regulatory agencies is formed to review, analyze and comment on the completeness of technical submissions associated with the application. The JART team prepares a report to inform the public about JART's findings. The report also details the process undertaken and advises of any outstanding issues related to the completeness of the technical submissions as well as stating which issues have been dealt with satisfactorily.

The Ontario Stone, Sand and Gravel Association recently completed a report studying rehabilitated aggregate sites in Ontario. A major focus of the study was the NEP Area and the results give us great insight on the status of rehabilitated aggregate sites in the NEP. Twenty-six sites were identified and studied along the Niagara Escarpment, of which the predominant current land use has been returned to natural settings(48%), followed by open space (13%), bodies of water (12%) and agricultural land uses (9 %).

Adaptive Management Plans (AMPS) are an emerging tool being used to address the uncertainty often associated with aggregate extraction and the after state (typically large man-made lakes). AMPs identify various mitigation and monitoring measures that will be employed over the long-term (sometimes in perpetuity), to ensure that surrounding natural features that rely on groundwater will be supported and continue to function as natural systems.

The issue of wind turbines and wind farms has become increasingly contentious in recent years. Some areas of the NEBR are highly suitable for this type of resource development due to the open, plateau landscape. This type of development is coupled with the added need for new roads and transmission lines, and issues related to proximity of migratory bird pathways, etc. The presence of wind turbines and wind farms, and the demand for additional infrastructure has been raised in some Escarpment communities as having a negative impact on tourism, and caused concern over potential for depreciating land values, especially given the promotion of the NEBR as a place of natural beauty and tourism opportunities. The visual impacts of the turbines (and wind farms) on the open landscape character of the NEBR are difficult if not impossible to mitigate. Mitigation measures for screening that have are being explored include vegetative screening, setbacks and the use of muted colors, rather than the typical off-white for the towers and blades.

Recognized as a "green" energy source, wind power, under certain conditions, may be environmentally appropriate development as envisioned by the UNESCO Biosphere Reserve designation as a solution to reduce carbon emissions by reducing dependence on fossil fuels.

As such, the NEC has permitted the development of small wind turbines associated with private residences or farms, if they can be demonstrated to be environmentally and visually compatible. In 2009 the Ontario government's Green Energy Act amended the NEP by making wind power a permitted use. It did so by changing the definition of a utility by adding "generation, transmission and distribution of electrical power" as a permitted use in the Plan Area. However these uses are still subject to the NEP Development Control and the NEC must still undertake a thorough review of any application to ensure the proposal is compatible with the environmental and visual policies of the NEP.

Solar farms although not generally as intrusive as wind farms, have faced many of the same challenges. Smaller developments related to private residences and farms have generally been positively received by the NEC.

Sustainable Communities / Changing Communities

As ex-urban dwellers migrate to the Escarpment countryside in increasing numbers, a clash of values may occur with those landowners who have lived there for generations. As well, land-use choices by new, non-farming residents may have an impact on the environment, for example, by increasing or decreasing open, working landscapes.

Some Escarpment Biosphere Reserve communities are facing changes in lifestyle as new economies grow in their areas; for example, the rapid growth of wine tourism in the south and huge capital investment by four-season resort operators in the north. While other communities, with static, decreasing or aging populations are searching for new ways to keep their areas economically viable and culturally alive. Continued outreach and education on the value of the BR designation at the community level will continue to assist in overcoming challenges related to population growth.

Appendix A

Research Conducted in the Niagara Escarpment Biosphere Reserve in the Last 10 Years

Laurence, A.M. 2011. Monitoring Forest Biodiversity, Health and Dynamics along the Escarpment - Analysis of Results: 1996-2010. Ontario's Niagara Escarpment Monitoring Program, Niagara Escarpment Commission, Georgetown, Ontario. www.escarpment.org

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McAfee, N. 2004. Monitoring Aquatic Benthic Ecosystems of the Bruce Peninsula. Bruce Peninsula Biosphere Association, Ontario, Canada.

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Hamilton Conservation Authority

Impacts of Trail Use in the Dundas Valley Conservation Area (ongoing research since 1996)

Credit Valley Conservation Authority

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Bennett, L. and R.J. Milne. 2005. Results of EMAN Anuran Studies in the Credit River Watershed. Credit Valley Conservation. 53 p.

Nottawasaga Valley Conservation Authority

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Rodie A. & R. Post. 2009. Niagara Escarpment Baseflow Study. Submitted to the Niagara Escarpment Commission by the Nottawasaga Valley Conservation Authority. 59pp.

Grey-Sauble Conservation Authority

Water Quality monitoring (BioMap Program)

Conservation Halton

- Halton Natural Areas Inventory (2003-2004)
- Forest trees, regeneration and ground cover in 6 Ecological Monitoring and Assessment Network (EMAN) plots (2 one hectare plots and 4 20m x 20 m plots) within the Niagara Escarpment Biosphere Reserve (ongoing)
- Aquatic Monitoring: fish communities, benthos, in-stream habitat and temperature, water quality and groundwater
- Frog and Marsh Bird Monitoring
- Forest Bird Monitoring
- Forest Pest Monitoring (Gypsy Moth)

Niagara Peninsula Conservation Authority

- Ongoing stream flow and rainfall monitoring
- Monthly water quality sampling (annual reporting)
- Groundwater study (2005)
- Natural Areas Inventory (2006-2009)

Association for Canadian Educational Resources (ACER)

Butt, S. 2010. South Central Ontario Forest Biodiversity: Monitoring Plots. Association for Canadian Educational Resources (ACER). http://acer-acre.ca/wp-content/uploads/2011/12/SCOFBP.pdf

Weiler, J. 2009. Niagara Escarpment Project. Association for Canadian Educational Resources (ACER). http://acer-acre.ca/wp-content/uploads/2011/12/NEP.pdf

Bruce Peninsula Bird Observatory, Cabot Head Research Station

Various publications available at http://bpbo.ca/, some of which are published through BPBO's "Beakon" Newsletter, including:

- Migration monitoring
- Red-necked Grebe Survey Results
- Bat Research
- Herptile Road Kill Studies

Wildlands League (a Chapter of the Canadian Parks and Wilderness Society)

Northern Bruce Peninsula Community Atlas (2002-2005).

Hamilton Naturalists Club

- Nature Counts Project, Hamilton Natural Areas Inventory (2003)
- Atlas of the Mammals of Hamilton (2002)
- Ongoing annual surveys: Christmas Birds, Fall Birds, Butterflies, Odonates

City of Hamilton Waterfall Group

- Ongoing documentation and photos of waterfalls along the Escarpment (research commenced in 2000)

Canadian Wildlife Service, Environment Canada

- Forest Bird Productivity Study on the Niagara Escarpment (ongoing sine 1997)
- Forest Bird Monitoring Program (ongoing since 1987)

Royal Ontario Museum

- Ontario Nest Record Scheme (ongoing since 1956)

Bird Studies Canada

- Marsh Monitoring Program (ongoing since 1994)
- Project Feederwatch (ongoing since 1976)

Frogwatch-Ontario, Nature Watch

- Frog and toad monitoring (ongoing since 1999). Publication (2008).

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Niagara Escarpment Toe Restoration Project. Ongoing Niagara College student project to restore the Escarpment Toe to a self-sustaining ecosystem and a forest edge buffer zone. D. Gustaw & B. Kilpatrick (Research Assistants, 2010), A. Sinclair & M. Smith (Faculty Advisors), Niagara College.

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Special Presentations

Canadian Association of Geographers, Annual Meeting (2012), Wilfrid Laurier University

Presentation by Dr. R. Milne: "Environmental Management Challenges in an Urbanizing Watershed and the Niagara Escarpment".

Bruce Peninsula National Park Sources of Knowledge Forums (2009, 2010, 2011, 2012):

- 2009 Costal Heritage Forum.
- 2010 Wildlife, Research, Management and Planning Forum.
- 2011 Dark Skies Bright Minds Forum.
- 2012 Climate Change Forum.

ESRC 1st and 2nd Annual Sustainability Science Seminar Presentations at Rodman Hall, St. Catharines, Ontario (2011, 2012).

Research presentations on "Children of Niagara's Migrant Worker Educational Award" (in partnership with St. Catharines Mayor Brian McMullan, Niagara Community Foundation, and ESRC colleague David Fancy) 26 January, 2012 and findings from Brock's first carbon footprint audit. "Brock University Carbon Audit Executive Report" (in partnership with HRCarbon Consultants)" 9 March, 2011.

Leading Edge Conference (2004, 2006, 2008, 2011)

The Leading Edge Conference Series is a biennial event showcasing recent or proposed activities for sustainable communities, research, ecological monitoring and conservation on Ontario's Niagara Escarpment, a UNESCO World Biosphere Reserve. Summary presentation titles are listed in section 6.1.

Brock University Workshop: Social-ecological Inventories: Building Resilience to Environmental Change within Biosphere Reserves (2011).

Chaired 2-Day Experts Workshop with Swedish and Canadian climate change scientists/social scientists/students in partnership with Environment Canada Adaptation and Impacts Research Section (AIRS), Stockholm Environmental Institute, and Brock Environmental Sustainability Research Unit colleagues.

World Fit for Children, United Nations Mid-Decade Review (2007).

R. Mitchell, Brock University. Non-Governmental Representative on behalf of UNICEF Canada attending Commemorative High-Level Plenary Meetings during United Nations General Assembly Summit and UNICEF Headquarters New York, NY 10-12 December, 2007.

Parks Research Forum Ontario, Waterloo, Ontario (2006)

Presentation by P. Lyons: "Is there a statistical association between Ferns and Garlic Mustard (Alliaria petiolata) in forest stands along the Niagara Escarpment?"

Research grants pertaining to the Biosphere Reserve

- Weger, Krista E. 2008 SSHRC Doctoral Fellowship. York University, Toronto. Growing a Greenbelt: the making of Ontario's Niagara Escarpment. (awarded $40,000.00)

- Hutson, G. 2011. Supplemental Funding Award. Office of Research Services/Faculty of Applied Health Sciences, Brock University, St. Catharines. Exploring Solutions to Outdoor Recreation Sustainability Challenges along the Niagara Escarpment (awarded $5000).

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- Hutson, G. 2008. Brock Social Sciences and Humanities Research Council Institutional Grant. Stakeholder views towards the Niagara Escarpment as an outdoor recreation resource (awarded $1057).

- Larson, D.W. 2002. NSERC Research Grant. Ecology of Cliff Ecosystems. College of Biological Science, University of Guelph (awarded $36,000)

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Artistic Exhibitions, Performances or Related Activities

Aldershot Escarpment Gardens

The Aldershot Escarpment Gardens, which opened in 2010, is located adjacent to the main entrance of the Royal Botanical Gardens in the City of Burlington. Constructed from limestone, this courtyard garden features a spectacular waterfall representative of the many waterfalls in Hamilton and Halton. The garden also features a 5.4 m steel and sandcast glass relief sculpture which symbolizes the Escarpment's fragile environment. The gardens provide spaces for visitor orientation as well as music concerts and other artistic events.

Core Gallery, Ball's Falls Centre for Conservation

The Core Gallery was created in 2008 as the focal point for the Ball's Falls Centre for Conservation in Vineland, Ontario. The gallery introduces each visitor to the natural and cultural history of the site and the activities of the Niagara Peninsula Conservation Authority. The gallery includes a 7.6 m long aerial view of the Escarpment from Niagara to Tobermory.

Cogeco Escarpment Hall, Milton

The Cogeco Escarpment Hall provides central access to the performing, visual, media and literary arts and features a limestone wall mirroring the rocks of the Niagara Escarpment.

Sarah Harmer, Singer/Songwriter – "I Love the Escarpment" Tour

Award-winning singer-songwriter, Sarah Harmer's love for the Escarpment stemmed from her childhood years living on a Niagara Escarpment farm. The I Love the Escarpment Tour in 2005 featured Sarah and her gang of musicians spending several hours a day hiking and stopping at night to perform concerts in various communities along the way between Tobermory and Burlington. The tour was documented in a film by the same name, broadcast on Ontario's public television network. Sarah Harmer's annual concert helps to raise funds for a citizen's environmental group known as Protecting our Escarpment Rural Lands (PERL).

The Grimsby Festival of Art

This annual, one-day festival features more than 200 artists and artisans from the Niagara Region and surrounding area who exhibit and sell original, handmade creations.

Giant's Rib Discovery Centre: Celebrate Art & Photography of the Niagara Escarpment

Each Saturday and Sunday, the art of the natural and cultural heritage of the Niagara Escarpment is celebrated in the Dundas Valley Conservation Area. A new local artist is featured every month.

Monarch Butterfly Festival, Bruce Peninsula Visitor Centre

Bruce Peninsula Visitor Centre and the Escarpment Biosphere Conservancy Alvar Bay Reserve co-host a Monarch Butterfly Festival event. Held in August, this festival includes tagging, a nature walk, a film on Monarchs and a concert featuring music from the winter grounds of the Monarchs.

Coalition on the Niagara Escarpment (CONE): Escarpment Celebration Day

This one-day event held at different locations within the Biosphere Reserve every year celebrates the wonder and beauty of the Niagara Escarpment. Various Escarpment-related topics are presented and the event features demonstrations, exhibits and guided hikes for participants to gain a greater appreciation for the Escarpment environment.

Niagara Escarpment Art Dress

At the 12th annual STRUTT wearable art show held in 2011, this dress was one of fifty unique art expressions by artists from southern Ontario. The fabric is a design representative of the limestone layers of the Escarpment with a blue shoulder detail to represent the Escarpment's waterfalls. Cedar branches at the bodice and hip symbolize the ancient thousand-year old cedar trees rooted on the Escarpment cliff face.

The dress was designed and fashioned by Don Alexander, a Niagara Escarpment Commission member and member of the Niagara Artists Centre. More than 1,200 people attended this show.

Peak to Peak Escarpment Challenge Hike-a-thon, Collingwood

The annual Peak to Peak Escarpment Challenge hike-a-thon is an all-ages fundraising event hosted by the Clearview Community Coalition. The event provides a chance to entice hikers of all abilities to explore, celebrate and help protect the Niagara Escarpment. This event also includes a silent auction of Niagara Escarpment-themed art donated by the Georgian Bay Association for Creative Arts, and live music by local musicians.

Robert Bateman, Artist

Renowned Canadian artist and naturalist Robert Bateman's realist paintings have included scenes from the Niagara Escarpment Biosphere Reserve. He has produced approximately six books devoted solely to his paintings. In 2009, Bateman was the recipient of a Niagara Escarpment Commission Lifetime Achievement Award.

Judy Mayer-Grieve, Artist

Through her paintings, artist Judy Mayer-Grieve strives to let loose and understand on a personal level what separates the Canadian landscape from other geographic locations. One of her series in entitled: Canadian Landscape - Location: The Niagara Escarpment.

Susan Powell, Artist

Award-winning Susan Powell's passion is painting scenic landforms such as the Niagara Escarpment, the Bruce Peninsula and the rolling vistas and hills of Caledon, Erin, Mono and Mulmur. Her belief is that art can effect positive change through the power of its imagery. Her paintings have been exhibited in group and solo shows, juried shows across Ontario, including the Headwaters Arts Festival in Alton, Ontario. Susan received an Award of Excellence from the Dufferin Arts Council for her painting depicting the Mulmur Hills.

Heide Rohde, Artist

Heidi Rohde's expressive, colourful landscape creations in watercolour, pasture or acrylic capture the beauty of the Niagara Escarpment. Her work has been accepted in juried shows in Ontario and British Columbia and is represented in private collections as well.

Floyd Elzinga, Artist

With this studio nestled on the Niagara Escarpment in Beamsville, Floyd Elzinga is inspired by rotten stumps, broken branches, invasive species and dysfunctional objectives. He highlights these types of things through three-dimensional metal sculpture, relief work and environmental installations that feature broken landscapes, portraits of trees and the aggressive nature of seeds.

Jan Yates, Artist

Jan Yates spent her childhood in the agricultural region of Niagara. Her work is held in collections throughout North America, Southern Ireland, France, England and Australia and she has been awarded numerous grants from the Ontario Arts Council. For the past decade, Yates has created work directly from the land. Inspired by Emily Carr, Yates paints almost entirely plein air, enabling her to engage in a dialogue with the natural and agricultural world. Protection and the importance of maintaining ecological integrity is also a focus of her work. In 2009, Yates presented a solo exhibit at the Sunrise Gallery in Hamilton, Ontario entitled: Niagara Escarpment.

Suzanne Morrison, Artist

While her early work focused on abstract landscapes, after spending time on the Niagara Escarpment as an Artist in Residence for the Credit Valley Conservation Authority in Terra Cotta, award-winning Suzanne Morrison turned her attention to a more focused, particular view of the landscape. A series based on the Niagara Escarpment was featured in public galleries and museums in Ontario and Manitoba and completed its tour at Justina Barknicke Gallery, Hart House, University of Toronto.

Richard Herman, Artist

Richard Herman is a self-taught artist who began experimenting with oil paint in his early teens. He has been inspired by Chinese and Japanese traditions of painting and calligraphy. Over the last decade, he has explored the idea and history of the "Sublime Landscape", introducing figures and narrative into some of his paintings. He works have included scenes of the Niagara Escarpment landscape. In 2007, he exhibited a show called The New Sublime in Toronto, where he featured a painting entitled, "Niagara Escarpment at Georgian Bay". In 2012, he completed "The Beaver Valley, Ontario."

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Photo Credits

Pg. 4 – Farm, Niagara Region, NEC
Pg. 5 – Biosphere Reserve Designation ceremony, NEC
Pg. 7 – Webster's Falls – NEC
Pg. 19 – Hart's-Tongue Fern, Nigel Finney, Conservation Halton
Pg. 22 – Prairie Seed Collection, Dundas Valley, NEC
Pg. 22 – Saw-Whet Owl, Brendan Toews, MNR
Pg. 25 – Bruce Peninsula shoreline, NEC
Pg. 28 – Orthophoto, Duff Pit, Town of Halton Hills – First Base Solutions, 2002
Pg. 29 – Bruce Peninsula Flowerpot Island (2), NEC
Pg. 31 – Rock climbers, Halton Region, NEC
Pg. 33 – Tobermory Visitor Centre (top), NEC
Pg. 33 – Ball's Falls Visitor Centre, NEC
Pg. 34 – Terra Cotta Conservation Area (top), Credit Valley Conservation
Pg. 34 – Battlefield Park, www.vanntravels.com
Pg. 35 – NEPOSS Manual, MNR
Pg. 36 – Bruce Trail signpost, Mono Cliffs Provincial Park, NEC
Pg. 41 – Bruce Trail, Bruce Trail Conservancy
Pg. 45 – Swamp Rose-Mallow, Rob Tervo, MNR
Pg. 46 – Cross country skier, NEC
Pg. 47 – Henry of Pelham Estate Winery (left),NEC
Pg. 47 – Featherstone Winery sheep, NEC
Pg. 49 – Greenbelt Walks brochure, Friends of the Greenbelt Foundation
Pg. 50 – Viewing Platform, Lions Head, Bruce Peninsula Biosphere Association
Pg. 52 – Bruce Trail hikers, Halton Region, NEC
Pg. 53 – NEC Achievement Awards presentations, NEC
Pg. 57 – Bruce Trail Friendship Day, Bruce Trail Conservancy
Pg. 58 – Coalition on the Niagara Escarpment (CONE)
Pg. 59 – Niagara Escarpment Commissioners and staff, NEC
Pg. 62 – Monitoring, Nigel Finney, Conservation Halton
Pg. 63 – ONE Monitoring Program, NEC
Pg. 64 – ONE Monitoring Program, NEC
Pg. 65 – Jefferson Salamander, Leo Kenney, MNR
Pg. 66 – Stream, NEC
Pg. 68 – Cootes Paradise Marsh, Royal Botanical Gardens
Pg. 68 – Bruce Peninsula Bird Observatory
Pg. 69 – Royal Botanical Gardens Sign, NEC
Pg. 71 – Halton Region Museum, Region of Halton
Pg. 71 – Iroquoian Longhouse, Crawford Lake, NEC
Pg. 72 – St. Edmunds School, Bruce County, NEC
Pg. 73 – ONE Monitoring Program, NEC
Pg. 74 – The Last Stand, P. Kelly and D. Larson
Pg. 74 – Tew's Falls, City of Hamilton, NEC
Pg. 81 – Ball's Falls, Niagara Region, NEC
Pg. 84 – Quarry Operation, NEC
Pg. 85 – Wind Turbine, Avon Maitland District School Board
Pg. 86 – Simcoe County, NEC
Pg. 99 – Strutt Art Show, Don Alexander