

# STRATEGIC PLAN 2006



# **CREDIT VALLEY CONSERVATION**

## **Strategic Plan 2006**

**Draft Prepared: August, 2006**  
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## FOREWORD

The environmental face of the Credit Valley Watershed has changed dramatically over the years. Mounting development pressures have replaced large areas of natural vegetation and nearby urban populations have altered the Credit River landscape. An increasing proportion of the watershed is now covered by rapidly growing urban settlements as the urban-based population spills over from the Greater Toronto Area in search of more affordable housing. In addition to urbanization, other pressures such as agriculture, aggregate extraction, contamination and water taking are affecting the natural environment.

At this time, the Credit Valley Conservation Authority (CVC) is challenged to protect existing environmental integrity while recognizing mounting pressures from a growing population. The CVC faces many of the same pressures as other conservation agencies in southern Ontario but, at the same time, we have unique environmental challenges that set the watershed apart from all others.

The Credit River has many natural endowments that are worthy of conserving for future generations. For instance the Credit Watershed boasts a unique geology with both the Niagara Escarpment and Oak Ridges Moraine. The Credit is the most diverse cold water fishery in Ontario – if not eastern North America. Unlike other river systems in the GTA, the Credit cannot withstand broad-based and substantive impacts from development. As primarily a cold water ecosystem, it has a lower threshold to change – unlike some warm water systems. For this and other reasons, we are challenged to look at the watershed holistically – to carefully weigh the pressures on the watershed and, at the same time, as resource managers, to look at providing opportunities for other uses and users.

The land the Credit River drains is intrinsically just as important as the river in terms of environmental integrity. We currently have about half the forest and wetland cover recommended by the federal government for environmental health.

This Strategic Plan, and the information it contains on the State of the Resource, contributes to the growing awareness of the shape of our physical environment and the underlying causes of environmental change. It provides an overview of the resource at both regional and watershed levels and summarizes the main agents of change and how we at the CVC, who are mandated to manage all natural resources within the Credit Watershed, will respond.

It is my hope as Chair of CVC that this *Strategic Plan 2006* will highlight the pressures we are facing in the watershed and will serve to illuminate the need for collaborative action to maintain the resources we have and to protect the Credit River Watershed for generations to come.



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Chair  
Credit Valley Conservation



## ACKNOWLEDGEMENTS

We greatly appreciate the work of all the CVC employees over the last 10 years (since the approval of our 1996 Business Plan) whose work contributes to this report.

In the last year those participating in preparing the report were led by the Team Leaders and Managers as well as the CVC Board of Directors. Kari Van Allen, Lindsay Stroud, Rose Fitzpatrick and Maureen Pogue helped prepare the final State of the Resource and Strategic Plan 2006 reports. Karen Wianeki of Planning Solutions Inc. assisted with the report and facilitated consultation sessions. A number of people contributed to the SWOT interviews.

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## 1.0 INTRODUCTION

### 1.1 WHAT IS THE STRATEGIC PLAN?

There are a number of strategic planning models. Generally a strategic plan is not the same as an operational plan. The former should be visionary, conceptual and directional in contrast to an operational plan which is likely to be shorter term, tactical, focused, implementable and measurable. As an example, compare the process of planning a vacation. The “where, when, how long, how much, who goes, and how to travel” are all strategic issues. Tasks, deadlines, funding, weather, packing are operational matters.

CVC has not undertaken any form of strategic planning since 1996 when it developed a “business plan” (which was partially a strategic and a business plan) to deal with provincial budget cuts. Also of necessity, CVC is currently undertaking its annual business plan. Hence CVC’s Strategic Plan 2006 is really a cross between a strategic plan and the higher levels of a business plan. It has the elements of a strategic plan: mission (purpose of the organization (as set out in the objects of the Conservation Authorities Act)); vision (pen picture of what the organization would like to achieve in the long term); mission; goals (specific interim or ultimate time-based measurements to be achieved by implementing strategies in pursuit of the organization’s mission); objectives (results the organization wants to achieve in the medium/long term); principles or values (govern the operation of the organization and its conduct and relationships); a strengths, weakness, opportunities and threats analysis (SWOT); a global and local scale environmental scan; and strategies (plan or policy to achieve something). Strategic plans normally also contain programs which set out the key “strategies” (in this case “tactics”) covering resources, objectives, time scales, deadlines, budgets and performance targets. Some of CVC’s tactics are more detailed than would normally be used in strategic plans in order to provide guidance to staff for business plans.

The Strategic Plan is based on exhaustive research in such areas as water management (water quality, water budget, water monitoring), natural heritage, fisheries, stewardship, land management, conservation areas and so on.

The Strategic Plan provides detailed information on the current state of the biophysical components of the environment (i.e. air, land, water resources) and on the social, economic and political activities that impact these resources.

The CVC Strategic Plan 2006 provides:

- Access to environmental information that has been integrated, analyzed and interpreted to enhance decision making and long range planning;
- Information for monitoring and assessing change in the watershed;
- Information to increase public awareness of environmental and development issues; and
- An enhanced understanding of environmental issues and challenges and offers a comprehensive list of actions to encourage the CVC and its partners to work together to preserve and even improve the natural environment in the Credit Watershed for this and future generations.

## 1.2 WHY DO WE NEED A STRATEGIC PLAN?

This Strategic Plan allows us to report on environmental issues and illuminates the progress that is being and will be made to combat the pressures being faced in the watershed. It allows us to identify those 'hot spots' – areas/issues of concern that warrant attention now. It allows us to focus on the watershed with an understanding of the state of the resource at both regional and watershed levels. It offers an opportunity to focus on the achievement of key objectives through a series of management actions. It allows us, based on this common understanding, to: develop a plan of collaborative action; think about the issues facing the watershed now; and adopt a proactive and strategic approach for the future.

This report will guide CVC programs and projects for at least 5 years and with updates, possibly 10. The more detailed annual CVC business plans will be derived in accordance with the strategic plan. It is anticipated that the strategic plan will be reviewed every 4 years with each new CVC Board of Directors but that this review will not need to be as extensive as was undertaken in 2006.

## 1.3 HOW TO READ THIS REPORT

The Strategic Plan describes the environmental issues in terms of the following key categories:

**Driving Forces:** These are the underlying social and economic activities that lead to environmental change. Population growth provides a good example.

**State:** This section describes the current state of the resource and recent trends in environmental quality, both from a regional and a watershed basis.

**Pressures:** These are issues or pressures on the environment that result from the driving forces, for example: pollution of air, water, and soil and use of natural resources as a result of human activity.

**Responses:** This section describes the human responses to environmental change, including policies and management tactics to reduce environmental damage and encourage ecosystem sustainability.

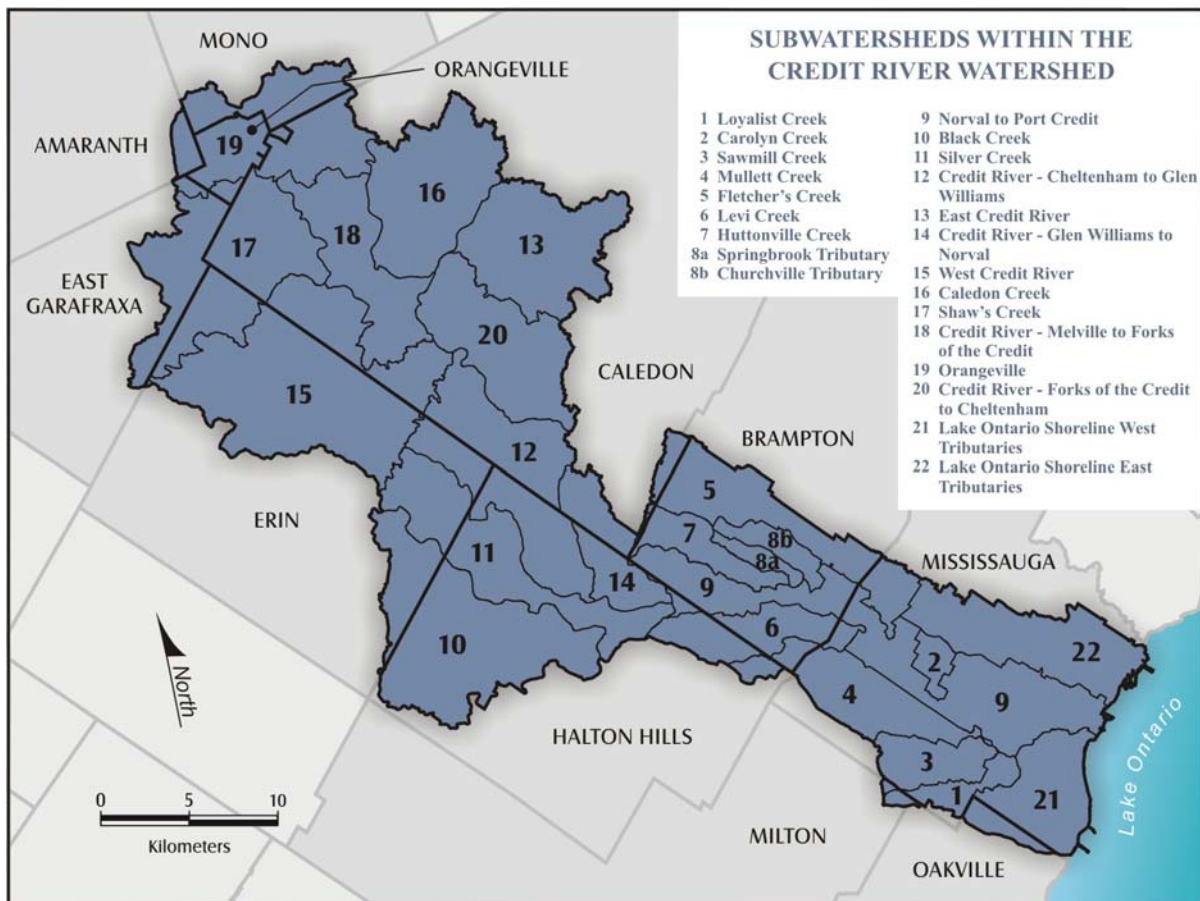
## 1.4 WHERE DID THE INFORMATION COME FROM?

The information was compiled from more than 10 years of exhaustive research on the natural environment within the Credit Watershed (the area drained by a river – in this case the Credit River). The studies that have contributed to the background for this strategic plan include:

- Credit River Water Management Strategy Update (2006)
- Credit River Water Quality Strategy (2006)
- Credit River Water Budget Study (in progress)
- Watershed Monitoring Programs:
  - Integrated Watershed Monitoring Program
  - Fletchers Creek Monitoring Program

- 
- Northwest Brampton Effectiveness Monitoring Strategy
  - Provincial Water Quality Monitoring Network
  - Provincial Groundwater Monitoring Network
  - Ontario Benthos Biomonitoring Network
  - Gauging Stations
  - Various Subwatershed Studies (Credit River Watershed is divided into 20 Subwatersheds, in addition CVC has jurisdiction over 2 additional watersheds, which drain directly into Lake Ontario see Figure 1.4.1):
    - Gateway West Subwatershed Study (Subwatershed 4,6,9) (1999 updated 2005)
    - Headwaters of the Credit River (Subwatershed 19) (1997 currently being updated)
    - Churchville Tributary (Subwatershed 8b)- Existing Conditions and Headwater Diversion Assessment Study (December 1998)
    - Caledon Creek and Credit River (Subwatersheds 16 and 18) (1999)
    - West Credit (Subwatershed 15) (1997 update in progress)
    - East Credit (Subwatershed 13) (started 2002)
    - Silver Creek (Subwatershed 11) (2003)
    - Credit Valley (Huttonville Creek (7), Springbrook Creek (8a), Churchville Tributary (8b) (2003)
    - Shaws Creek (Subwatershed 17) (in progress)
    - West Credit River Update (Subwatershed 15) (1997 update in progress)
  - Island Lake Water Budget (phase 1 2005, phase 2 in progress)
  - Credit River Fisheries Management Plan (2002)
  - Caring for the Credit: Credit Valley Conservation Stewardship Strategy (2002)
  - Credit Watershed Natural Heritage Strategy (2002)
  - A Conservation Areas Strategy for the Credit Watershed (1994)
  - Greenlands Securement Strategy (2004)
  - Preliminary Draft, Watershed Characterization Report for the Credit River Watershed (2006) i.e. Clean Water Act Characterization Report

Please see the reports and data bases for more detailed information.

**Figure 1.4.1 Subwatersheds within the Credit Valley Conservation's Jurisdiction**

## 1.5 HOW WAS THE STRATEGIC PLAN DEVELOPED?

In the Fall of 2005, an initial list of key environmental issues or pressures facing the Credit River Watershed was produced by CVC's Team Leaders (a group consisting of managers and program area leads). This list was further developed by a committee of CVC staff, experts representing various disciplines within the organization, to create the current list of 32 key environmental issues that have been used to create the core of the "State of the Resource" document. The detailed "State of the Resource" document is an internal CVC document available upon request, however it has been summarized in this strategy. A description was written and agreed upon for each issue.

### Prioritizing the Issues

A set of weighted criteria was developed to prioritize the key environmental issues for the purposes of providing public education. These criteria are defined below:

- *Human Health and Safety:* Does this issue impact the human health and safety in our watershed (e.g. dams, septic systems, flooding, water quality/pollution)?

- *Degree of Impact:* What is the severity of this issue on our watershed (what is the magnitude of the issue, e.g. rural vs. urban pollution)? What is the geographic scope of impact (i.e. does it impact the whole watershed or is it confined to localized areas within the watershed e.g. lack of water supply in Orangeville, aggregates)?
- *Ecosystem Health:* Does this issue impact the health/function of ecosystem?
- *Liability:* Will CVC be held accountable if this issue is not addressed?
- *Expertise:* Are we the best? Do we have the expertise? Do we have the credibility? Are we the appropriate body?
- *Mandate:* Are we authorized within the legislation/ regulations?
- *Quality of Life:* Does it improve/maintain quality of life? Does this issue have a socio-economic impact?
- *Time Sensitivity:* Is it important that we address this issue now? If this issue isn't addressed immediately, is there the potential for the impact to become more severe, or irreversible?

Each issue was then assessed against each criterion and given a ranking of 1-3 (with a score of 3 meaning that the issue strongly corresponded to the criterion and a score of 1 meaning that the issue only weakly met the criterion as described above). The weighting and the ranking were multiplied to give each issue a total score. Scores of 330-230 were given a Priority Ranking of 1 (most important), 230-190 were given a Priority Ranking of 2 and scores below 190 were given a Priority Ranking of 3. This data is found in Table 1.5.1, Priority Ranking of CVC Issues Using Identified Criteria. The issue "Lack of Environmental Awareness" was obviously implied given the focus on public education. For purposes of this broad-based strategic plan issues of Air Pollution and Waste Reduction were also similarly included.





**Table 1.5.1 Priority Ranking of CVC Issues Using Identified Criteria**

Please note: This table was originally created in November 2005 as part of CVC's Education Strategy. Final scores (which determined high, moderate and low priority for the education program) do not conform completely with the priorities established in the Strategic Plan and State of the Resource documents prepared in 2006. Also, new issues such as Lack of Environmental Awareness, Air Pollution and Waste Reduction do not appear in this ranking because they were added to the Strategic Planning process.

Priority Ranking of CVC Issues Using Identified Criteria																									
Total Score	CRITERIA	Human Health & Safety			Degree of Impact			Ecosystem Health			Liability			Expertise			Mandate			Quality of Life			Time Sensitivity		
		Weight	Rank	RW	Weight	Rank	RW	Weight	Rank	RW	Weight	Rank	RW	Weight	Rank	RW	Weight	Rank	RW	Weight	Rank	RW	Weight	Rank	RW
ISSUE																									
330	Drought and Flooding	20	3	60	15	3	45	20	3	60	20	3	60	10	3	30	15	3	45	5	3	15	5	3	15
310	Lack of Adequate Development Standards	20	3	60	15	3	45	20	3	60	20	2	40	10	3	30	15	3	45	5	3	15	5	3	15
310	Deteriorating Urban Environment	20	3	60	15	3	45	20	3	60	20	2	40	10	3	30	15	3	45	5	3	15	5	3	15
310	Impervious Surfaces	20	3	60	15	3	45	20	3	60	20	2	40	10	3	30	15	3	45	5	3	15	5	3	15
305	Natural Hazards (CVC Regulations)	20	3	60	15	3	45	20	2	40	20	3	60	10	3	30	15	3	45	5	3	15	5	2	10
305	Sediment and Erosion	20	2	40	15	3	45	20	3	60	20	3	60	10	3	30	15	3	45	5	2	10	5	3	15
305	Dams: Liability & Environmental Impact	20	3	60	15	2	30	20	3	60	20	3	60	10	3	30	15	3	45	5	1	5	5	3	15
300	Prohibited Use	20	3	60	15	3	45	20	2	40	20	3	60	10	3	30	15	3	45	5	1	5	5	3	15
290	Loss of Habitat & Need for Protected Spaces	20	2	40	15	3	45	20	3	60	20	2	40	10	3	30	15	3	45	5	3	15	5	3	15
290	Water Supply	20	3	60	15	3	45	20	3	60	20	1	20	10	3	30	15	3	45	5	3	15	5	3	15
290	Neighbourhood & Development Pressures	20	3	60	15	2	30	20	2	40	20	3	60	10	3	30	15	3	45	5	2	10	5	3	15
280	Disease and Pests	20	3	60	15	3	45	20	3	60	20	1	20	10	2	20	15	3	45	5	3	15	5	3	15
270	Biodiversity	20	2	40	15	3	45	20	3	60	20	1	20	10	3	30	15	3	45	5	3	15	5	3	15
270	Fragmentation, Corridors & Connectivity	20	2	40	15	3	45	20	3	60	20	1	20	10	3	30	15	3	45	5	3	15	5	3	15
270	Spills	20	3	60	15	2	30	20	3	60	20	1	20	10	3	30	15	3	45	5	2	10	5	3	15

Priority Ranking of CVC Issues Using Identified Criteria																									
Total Score	CRITERIA	Human Health & Safety			Degree of Impact			Ecosystem Health			Liability			Expertise			Mandate			Quality of Life			Time Sensitivity		
		Weight	Rank	RW	Weight	Rank	RW	Weight	Rank	RW	Weight	Rank	RW	Weight	Rank	RW	Weight	Rank	RW	Weight	Rank	RW	Weight	Rank	RW
265	Rural Pollution	20	3	60	15	2	30	20	3	60	20	1	20	10	3	30	15	3	45	5	2	10	5	2	10
260	Septic Systems and Municipal Servicing	20	3	60	15	3	45	20	2	40	20	1	20	10	3	30	15	3	45	5	2	10	5	2	10
250	Species At Risk	20	2	40	15	2	30	20	3	60	20	1	20	10	3	30	15	3	45	5	2	10	5	3	15
230	Invasive Species	20	1	20	15	3	45	20	3	60	20	1	20	10	3	30	15	2	30	5	2	10	5	3	15
230	Aggregate Extraction	20	2	40	15	2	30	20	2	40	20	1	20	10	3	30	15	3	45	5	2	10	5	3	15
230	Landform Conservation	20	2	40	15	2	30	20	2	40	20	2	40	10	2	20	15	3	45	5	2	10	5	1	5
225	Soil Quality and Quantity	20	2	40	15	3	45	20	3	60	20	1	20	10	1	10	15	2	30	5	2	10	5	2	10
205	Fisheries - Genetics, Stocking and Harvesting	20	1	20	15	2	30	20	2	40	20	1	20	10	3	30	15	3	45	5	2	10	5	2	10
200	Pesticides	20	3	60	15	2	30	20	2	40	20	1	20	10	1	10	15	2	30	5	1	5	5	1	5
195	Great Lakes & Shoreline	20	2	40	15	2	30	20	2	40	20	1	20	10	2	20	15	2	30	5	2	10	5	1	5
170	Need for Cultural Heritage Management	20	1	20	15	2	30	20	1	20	20	3	60	10	1	10	15	1	15	5	2	10	5	1	5
165	Harvesting/Hunting	20	1	20	15	1	15	20	2	40	20	2	40	10	2	20	15	1	15	5	2	10	5	1	5
165	Climate Change	20	2	40	15	2	30	20	2	40	20	1	20	10	1	10	15	1	15	5	1	5	5	1	5

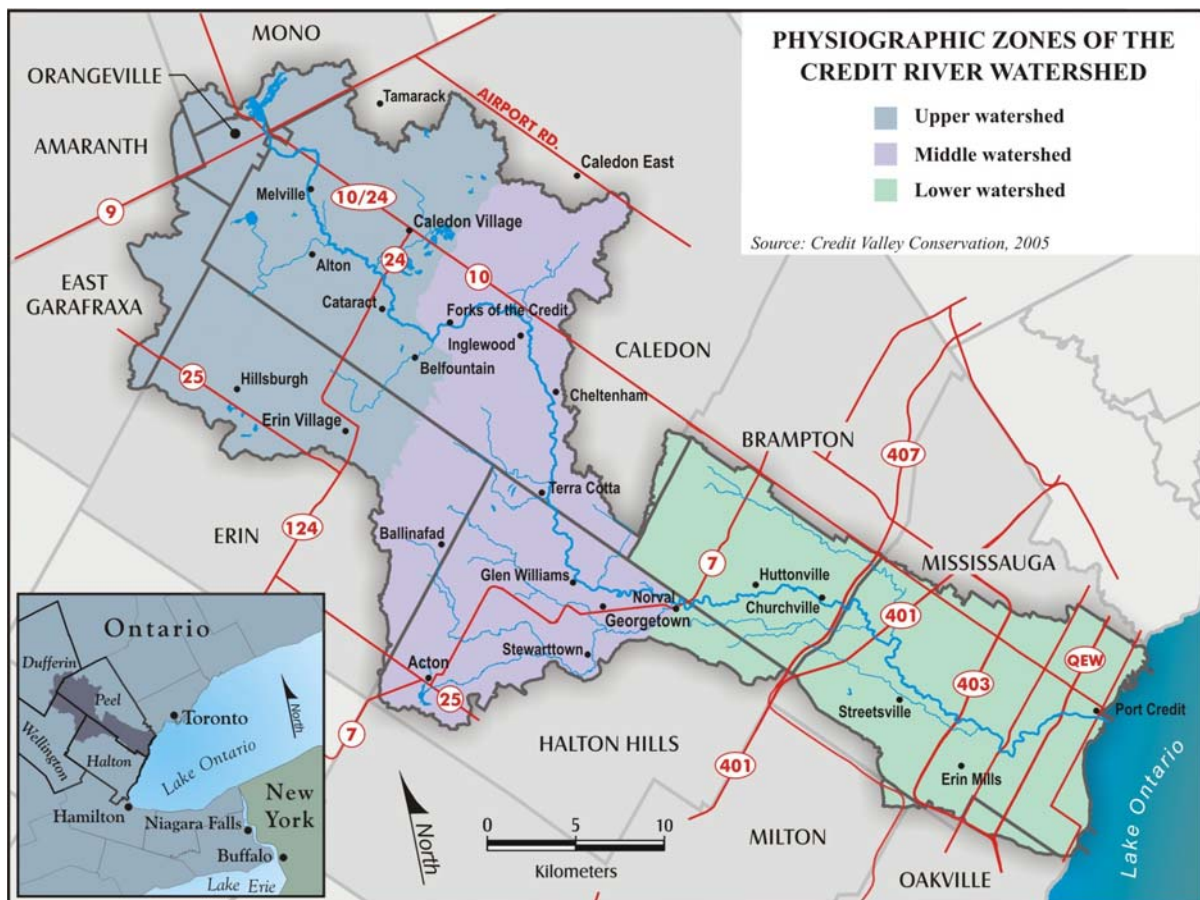
### Determining the State of the Resource

For each of the key environmental issues staff described the “State of the Resource” in a regional and watershed context, and provided input on how to address each of these issues by answering the questions, “Ideally how would you deal with the issue” and “What are we currently doing”? This information was compiled into a draft State of the Resource document which was used as a resource document for this Strategic Plan.

## 2.0 BACKGROUND ON THE CREDIT RIVER WATERSHED

A watershed is an area of land that drains into a river or stream. The Credit River Watershed is located in southern Ontario on the north shore of Lake Ontario (Figure 2.0.1). The Credit River is almost 90 km long and its watershed includes an area of approximately 860 km<sup>2</sup>, which is drained by the Credit River and its tributaries. Credit Valley Conservation has jurisdiction over this area of land as well as the two watersheds located to the east and west of the Credit River (depicted as Subwatersheds 21 and 22 in Figure 1.4.1). When combined, these three watersheds equal an area of almost 1,000 km<sup>2</sup>.

**Figure 2.0.1 Credit River Watershed**



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. The Credit River meanders southeast from its headwaters in Orangeville and Mono, through nine municipalities, finally draining into Lake Ontario at Port Credit in Mississauga. Nearly 1500 km of streams and creeks empty into the Credit River along this route including: Black Creek, Silver Creek, Shaw's Creek, Fletchers Creek, Caledon Creek and the East and West Credit Rivers.

The Credit River Watershed is bounded to the south by Lake Ontario, to the east by the watersheds of the Humber River and Etobicoke Creek, to the north by the Nottawasaga River and the Grand River, and to the west by Sixteen Mile Creek.

More than half of the Credit River Watershed is found within the Regional Municipality of Peel, though portions of it are also within Dufferin County, Wellington County and the Regional Municipality of Halton. Lower-tier municipalities in the watershed include the Town of Caledon, City of Brampton, City of Mississauga, Town of Halton Hills, Town of Erin, Township of Amaranth, Township of East Garafraxa, Town of Mono and Town of Orangeville.

The Credit River Watershed is subdivided into three generalized physiographic regions – the upper watershed, the Niagara Escarpment (middle) and the lower watershed (Figure 2.0.1).

### **Upper Watershed**

The upper watershed includes areas to the north of Erin Village. This section of the Credit River Watershed is located "above" (to the north and west of) the Niagara Escarpment, where the main stem of the Credit River and most of the tributaries remain in a relatively natural (and undeveloped) condition. The surface topography of the upper watershed is undulating, and the area is generally well drained. The soils in this area are moderately to highly permeable and are able to permit a significant amount of infiltration to support the regional groundwater system. Water quality in the area is generally good.

Approximately 60% of the upper watershed is heavily forested. Common vegetation associations include sugar maple-dominated deciduous forests and white cedar-dominated swamps. The river valley varies from a complex and highly developed system around the upper end of the Escarpment to flat marshy areas in the headwater regions. The main land use in the area has traditionally been agriculture, however, in the past decade the amount of land under cultivation has decreased significantly, and the number of small hobby farms has increased. Some areas are being considered for rural estate development and/or golf courses.

The major urban centres in the upper watershed include Orangeville, Erin Village, Alton, Caledon Village and Hillsburgh. These towns are experiencing growth pressures due to the close proximity of the Greater Toronto Area.

### **Middle Watershed (Niagara Escarpment)**

The middle portion of the watershed includes the area between Inglewood in the north, and Norval and Georgetown in the south. The most prominent physiographic feature of this section of the watershed is the Niagara Escarpment, though the eastern portion of the middle watershed is drained by the East Credit River. This latter area includes the western

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limits of the Oak Ridges Moraine, which is dominated by sandy till soils.

The top of the Escarpment is a relatively flat plateau, though steep slopes, significant rock outcrops and thin overburden conditions also characterize this area. Average slopes exceed 0.5 m/km and in some areas the Escarpment is sharply defined by a cliff face. This topography leads to relatively high runoff volumes and velocities, though forest cover in the middle portion of the watershed slows the runoff and increases infiltration. The Credit River in this area flows through a steep-walled narrow valley. Numerous small spring-fed creeks drain over the Escarpment plateau into the main branch of the Credit River.

The major tributaries of the Credit River in the middle watershed include Silver Creek, Black Creek and the East Credit River. Most tributaries in this area develop in large headwater wetland complexes which cover approximately 40% of the Escarpment plateau. Below (east of) the Escarpment, the Credit River cuts through clay till plains and is characterized by steep-walled valleys with floodplains of varying widths.

The Escarpment plateau is heavily forested with mixed deciduous stands in upland areas and white cedar swamps in lowland regions. Land use along the Escarpment is regulated by the Niagara Escarpment Commission, though numerous recreational areas exist in this portion of the watershed. In addition, a section of the Bruce Trail runs through this portion of the watershed, along the edge of the Escarpment.

Townships in the middle watershed include Inglewood, Cheltenham, Terra Cotta, Ballinafad, Acton, Georgetown and Norval. As was the case in the upper watershed, these towns are experiencing growth pressures due to the close proximity of the Greater Toronto Area.

### **Lower Watershed**

The ground surface topography of the lower part of the watershed (south of Norval and Georgetown) is relatively flat, with a gentle southward slope toward Lake Ontario. The physiographic regions in the area, consisting of the Peel Plain, South Slope, and Lake Iroquois Plain, are characterized by surficial soils that have low infiltration rates (when compared with the upper and middle portions of the watershed). That said, localized pockets of sand and gravel (e.g. sand lenses) do exist in certain areas and these lenses feed local creeks and streams.

The lower watershed includes the western half of Brampton, most of Mississauga and the eastern edge of Oakville. This portion of the watershed is already highly urbanized, with 87% of the watershed's 750,000 plus inhabitants living there. Very few wetlands and woodlands remain in this area. Many of the tributaries have been channelized and water quality in the main stem of the Credit River and its tributaries is considered to be generally poor.

## **3.0 MANDATE OF THE CREDIT VALLEY CONSERVATION AUTHORITY**

The Credit Valley Conservation Authority was established on May 13, 1954 by an Order in Council from the provincial legislature, pursuant to the Conservation Authorities Act. The objects of an authority as described in the Conservation Authorities Act are to: *“establish and undertake, in the area over which it has jurisdiction, a program designed to further the*

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*conservation, restoration, development and management of natural resources other than gas, oil, coal and minerals.”*

Although the Credit Valley Conservation Authority has no specific mandate in the Act to manage cultural heritage it owns about 2450 hectares of land for conservation purposes and 56 properties, some of which have cultural heritage values. CVC acquired these lands to protect them for conservation purposes in perpetuity.

Powers defined in the Act are:

- To study and investigate the watershed and to determine a program whereby the natural resources of the watershed may be conserved, restored, developed and managed;
- To acquire by purchase, lease or otherwise and to expropriate any land that it may require and to sell, lease or otherwise dispose of land so acquired;
- To control the flow of surface waters in order to prevent floods or pollution or reduce the adverse effects thereof;
- To alter the flow of any river, canal, brook, stream or watercourse and divert or alter... the course of any river, stream, road, street or way, or raise or sink its level...;
- To use the lands that are owned or controlled by the authority for purposes not inconsistent with its objects, as it considers proper;
- To use lands owned or controlled by the authority for park or other recreational purposes...;
- To collaborate and enter into agreements with ministries and agencies of government, municipal councils and local boards and other organizations;
- To plant and produce trees... and on other lands with the consent of the owner, for any purpose;
- To cause research to be done;
- Generally to do all such acts as are necessary for the due carrying out of any project.

Conservation Authorities are commenting agencies under the Planning Act relating to all aspects of the objects under the Conservation Authorities Act. In addition a Memorandum of Understanding (MOU) with the Ministry of Municipal Affairs and Housing (MMAH) and the Ministry of Natural Resources (MNR) clarifies the role of Conservation Authorities under the One Window Planning System. Basically for natural hazards including flooding and erosion, Conservation Authorities are the provincial commenting body. Conservation Authorities review policy documents and development proposals processed under the Planning Act to ensure the application is consistent with the Provincial Policy Statement and these comments can be provided directly to MMAH on request.

Under the Conservation Authorities Act, Conservation Authorities administer Ontario Regulation 160/06, “Regulation of Development, Interference with Wetlands and Alterations

to Shorelines and Watercourses". The regulation is generally permissive and governs how/whether development will occur in areas of natural hazards such as the floodplain, areas subject to erosion, wetlands, Lake Ontario shoreline and other hazardous lands. The aim of the regulation is to protect life and property.

As Conservation Authorities are reviewing development applications under the Conservation Authorities Act and Planning Act for their own purposes under the objects, they have also entered into agreements to provide natural heritage advice to many member municipalities.

Many Conservation Authorities including CVC have entered into agreements with the federal Department of Fisheries and Oceans (DFO) to review development applications for DFO. This reduces duplication and ensures that DFO does not reverse development applications after the provincial system has approved them.

CVC's jurisdiction applies to the watershed as described in the previous section as well as to the center of Lake Ontario.

Conservation Authorities are governed by a Board of Directors appointed by municipalities in the watershed. CVC has 12 members. Each municipality is entitled to representation on the basis of population. Conservation Authority Boards have the ability to levy member municipalities for operating and capital expenses.

## **4.0 MISSION/OBJECTIVES/PRINCIPLES**

### **4.1 VISION**

A vision is a pen picture of the organization's business with a view to the long-term future. In CVC's case this vision would describe the state of the natural resources in the Credit River Watershed. In accordance with a more detailed vision, a succinct vision could be:

An environmentally healthy Credit River Watershed for the present and future generations.

### **4.2 MISSION**

The mission is the purpose of the business of an organization. A mission statement is something that is sometimes confused with value statements. A mission statement should be hard-nosed while the latter can be soft. For example a hard statement would be that the organization designs, develops, assembles and markets systems or the Ministry of Natural Resources mission is to manage the natural resources of the Province of Ontario. A soft statement would be our mission is to enhance our customer's business by providing the highest quality products.

CVC's mission is as stated previously in the objects for Conservation Authorities in the Conservation Authorities Act.



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## 4.3 GOALS

Goals are the specific interim or ultimate time-based measurements to be achieved by implementing strategies in pursuit of the organization's mission.

### **Water Quantity**

To manage the hydrological system of the watershed in a manner that emulates natural processes while recognizing human needs.

### **Water Quality**

To protect and enhance the quality of surface and subsurface water for environmental and human uses.

### **Terrestrial and Aquatic Species, Communities and Ecosystems**

To protect, enhance and restore the ecological integrity of the watershed's natural features, functions and systems.

### **Natural Hazards**

To protect public safety and minimize property damage from natural hazards including flooding, erosion, wetlands and dynamic beaches.

### **Social and Economic**

To promote the social and economic health of the community through effective watershed management.

## 4.4 OBJECTIVES

Objectives are the results the organization wants to achieve in the designated time frame – in this case time frames of 1-2, 3-5 and 6-10 years.

In addressing **Water Quantity**, CVC shall:

- Preserve and re-establish the natural hydrological cycle.
- Maintain, enhance or restore natural stream processes to achieve a balance of flow and sediment transport.
- Manage stream flow to reduce erosion impacts on habitats and property.
- Minimize risk to human life and property due to flooding.
- Maintain groundwater levels and baseflows (groundwater discharge to streams) to sustain watershed functions, human uses and climatological changes.

In addressing **Water Quality**, CVC shall:

- Maintain or enhance water and sediment quality to achieve ecological integrity.
- Protect drinking water sources.
- Protect groundwater quality to support watershed functions.
- Reduce toxics through pollution prevention.
- Improve water quality in rivers and Lake Ontario for body contact.
- Improve water aesthetics including odor, turbidity and clarity.

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In addressing **Terrestrial and Aquatic Species, Communities and Ecosystems**, CVC shall:

- Protect, restore or enhance integrity of the watershed ecosystem, through an integrated network of natural areas, habitats and connection links.
- Protect, restore or enhance native terrestrial and aquatic plant and animal species, community diversity and productivity.
- Promote integrated resource management of aquatic and terrestrial systems and areas within the watershed for plant, animal and human areas.
- Protect, enhance and restore natural systems as a priority within the urban environment and throughout the watershed.
- Ensure that the complete range of representative and significant natural features, functions and linkages distributed within the watershed are protected in perpetuity.
- Secure representative and sensitive environmental land to protect it in perpetuity.

In addressing **Natural Hazards**, CVC shall:

- Identify and protect potentially hazardous river or stream valleys, flood plains and Lake Ontario shoreline.
- Identify and protect watercourses (including their meander belt) and wetlands.
- Implement Ontario Regulation 160/06, as may be amended from time to time, in a manner that protects the public and minimizes property damage.
- Update and refine hazard land mapping over time as new information becomes available.
- Recommend to watershed municipalities proactive approaches within the planning and development process that reflect the dynamic nature of the hazards.
- Work with watershed municipalities and other partners to reduce the severity of natural hazards, where possible, recognizing the importance of natural processes.

In addressing **Social and Economic** factors, CVC shall:

- Demonstrate through research and identify and promote the community benefits of the watershed system (recreational, educational, cultural, psychological, tourism, economic).
- Protect human physical, social and economic health as they relate to the natural environment.
- Provide appreciation and compatible recreational opportunities on protected land.

## 4.5 PRINCIPLES/VALUES

Values govern the operations of the business and its conduct or relationships with society at large and how it treats suppliers, employees, local communities, stakeholders, etc.

- Recognize inextricable link between human health and the natural environment.
- Maintain a watershed scale perspective and consider the implications of our cumulative actions on the watershed as a whole.
- Recognize that healthy communities require a *sustainable* balance between economic, social, natural and human uses in the watershed.

- Take a preventative, proactive and integrative approach to watershed management based on the principles of adaptive management. Where there is uncertainty, risk or irreversibility we are cautious and err on the side of protecting the environment.
- Make decisions and take action based on our knowledge, skills, and experience. We work to continually improve our understanding of the watershed.
- Implement watershed management by providing services to many clients. Our success in achieving our goal depends on the quality of services we provide. We will strive to meet the needs and expectations of our clients.
- Recognize that responsibility for the health and natural resources of the watershed is shared by everyone. Successful watershed management within the Credit River Watershed can only be achieved through active and sustained partnerships with (all levels of government) agencies, groups and individuals.
- Pursue reasonable, practical approaches to water and natural resource management based on sound science, creativity and innovation for effective solutions.
- Promote ecologically sustainable lifestyles and behaviours through sustainable urban design approaches and conservation practices.
- Ensure CVC conservation lands are managed primarily for protection and appreciation. Recreation can occur where it is consistent with the primary goals.

## **5.0 FORCES DRIVING CHANGE**

### **5.1 MILLENNIUM ECOSYSTEM ASSESSMENT REPORT (UNITED NATIONS)**

Developing a long range vision for the Credit River Watershed necessitates consideration of broad-based agents of change – those causal factors that are bringing about both substantive and incremental alterations at both the local and regional level. Today, more so than at any other time in history, the impact of human action on our environment has never been more profound.

The chapter that follows documents some of the significant demographic, socio-cultural, environmental, political and technological factors that will influence the highly probable future. These factors will have a substantive impact on the functioning of the Credit River Watershed and on our ability as watershed managers and residents to respond effectively.

We are intricately linked to the world around us. It has become very apparent that the state of our human health is tied to the health of our environment. This important recognition is particularly well documented by the U.N. in its Millennium Ecosystem Assessment Report. Released in March 2005, the Millennium Report assesses the consequences of ecosystem change related to human well being. The report compiles the accumulated wisdom of over 1350 experts in 95 countries. It examines how ecosystems globally have changed based on underlying causal factors and the impact of that change on human health and well-being. The Millennium Report adopts an important strategic focus in that it postulates on the

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anticipated future ecosystem changes and purports options available to collectively enhance ecosystem conservation.

The Report is available for download at [www.millenniumassessment.org](http://www.millenniumassessment.org) and draws a fascinating conclusion by stating that demands for food, fresh water, timber, fiber and fuel have resulted in more salient human impact on the ecosystem in the past 50 years than at any other time in history.

Presenting compelling evidence of the need for heightened environmental awareness and perhaps more importantly, the need for collaborative action, the Report makes several noteworthy observations. In particular, it notes that between 1960 and the year 2000:

- The world population doubled;
- The global economy has increased six-fold;
- Food production has increased 2.5 times;
- Water use has doubled;
- Wood harvest for pulp and paper has tripled;
- Hydropower capacity has doubled; and
- Timber production has increased by more than one-half.

Escalating pressures from more uses and users on a finite resource base has resulted in substantive ecosystem change. The Report contains a number of significant findings, not the least of which suggests that 60% of ecosystem services are being degraded or used unsustainably. The inherent danger is that ecosystem changes are increasing the likelihood of nonlinear changes – accelerating, abrupt and potential irreversible change – evidenced by the emergence of new and different forms of disease, abrupt change in water quality, creation of ‘dead zones’ in coastal waters, the collapse of fisheries and shifts in regional climate. The Report predicts a 2-4 fold increase in per capita income, leading to increased levels of consumption and resource demand. It suggests land use change and the expansion of agriculture (to support an ever expanding human population) will act as the key driver of change. High nutrient levels in water will become an increasing problem in developing countries in particular and the effects of climate change will continue to be more pronounced as time passes, leading to significant temperature variations, changes in precipitation patterns, impacts on vegetation, sea levels and an increase in the frequency and duration of extreme weather events.

Linking these projections to human well being, the Millennium Report notes that the issue of water supply will not be related so much to ‘water to drink’ as it will be related to ‘water to grow food.’ Demand for food crops is projected to grow 70-85% by the year 2050. From an ecosystem management perspective, the future is bleak for fisheries, food production in dryland areas and the quality of fresh water.

There are many studies and reports that document ecosystem change. The U.N. Millennium Report provides a comprehensive and exhaustive view of the changes that have occurred from an ecosystem perspective over time. It demonstrates not only the rapid pace of change but the impact collectively of human activity on the landscape. It provides a global perspective of the documented changes and the potential for more far reaching implications if our strategic management actions are not better aligned with the ecosystem in mind.

U.N. Millennium Ecosystem Assessment Report  
Some Key Findings

More land converted to cropland since 1945. Cropland now covers 25% of terrestrial surfaces.

Since 1960, the water behind dams has quadrupled and water withdrawals have doubled.

Since 1960, flows of nitrogen in terrestrial ecosystems have doubled and the flows of phosphorous have tripled.

Since 1990, 66%+ of the world's 15 major terrestrial biomes have been converted to agriculture.

Across a range of the world's taxonomic groups either the population size or range or both of the majority of species is declining.

The distribution of species on earth is becoming more homogeneous.

The number of species on the planet is declining with freshwater systems tending to have the highest portion of species threatened. Genetic diversity has declined globally.

There is an overwhelming need to look at the economic consequences of ecosystem change and link this directly to human well being.

Many of the changes that are well documented in the U.N. Report are mirrored at the local level in the changes that have been noted within the Credit River Watershed. Action is needed to offset the continuing spiral of irreversible change. The following chapter traces the causal agents of change at the international, national, provincial and regional level and demonstrates the importance of thinking globally and acting locally.

## 5.2 DEMOGRAPHIC AGENTS OF CHANGE

Globally, the world's population is growing by 80-85 million people each year. Leading demographers predict world population in 2050 to be between 7.3 billion and 10.7 billion, even assuming a significant decline in fertility levels in the future.

Rapid growth is occurring in China and in India while countries like Russia and Germany may never recover from currently low birth rates and markedly high rates of suicide. In the U.S., currently high fertility rates may be expected to continue, with Canada finding itself somewhere mid-way between the rapidly growing countries and those likely to experience population decline.

**Table 5.2.1 Countries Ranked By Population Projections to 2031**

1	China	1,461,985,702
2	India	1,431,897,798
3	United States	366,692,653
4	Indonesia	313,341,713
5	Pakistan	247,052,669
6	Nigeria	236,286,504
7	Brazil	223,672,390
8	Bangladesh	222,710,887
9	Mexico	136,085,471
10	Philippines	126,932,873
11	Russia	125,667,471
12	Congo (Kinshasa)	121,487,394
13	Ethiopia	117,571,307
14	Japan	115,575,612
15	Egypt	110,127,249
40	Canada	39,293,620

Most of the growth is expected to come from the developing nations. The United States presents a single exception to this rule, with the population of the U.S. forecast to rise by more than 40% from 293.6 million currently to almost 420 million by the year 2050. The predicted rate of natural increase for Canada is 0.3%, while the predicted rate of natural increase for the U.S. is 0.6%. Canada is expected to experience a 16% increase in population from the 31.9 million currently (2004) to an anticipated 36.9 million by mid-century.

Simply put, the world's population is growing because there are more people being born than are dying. One of the most salient reasons for this growth, despite a projected decline in fertility levels, is due to the fact that over 50% of the world's population is under the age of 25.

By the year 2015, demographers estimate the world population will hit 7.2 billion and that in most countries, life expectancy will increase. Most estimates suggest that over 90% of projected population increases will be in the developing countries and nearly all of that growth will occur in rapidly expanding urban areas around the globe.

Momentous demographic changes (particularly in age structure) are in store, from an international perspective. Viewed comprehensively, current fertility rates suggest the proportion of the population below the age of 15 is expected to shrink, with the population projected to swell in the above 60-age category. The absolute number of children is expected to remain relatively stable over the next 40 years, according to demographers at the UN and the U.S. Census Bureau; however their number relative to the total global

population is expected to decline to 20%. The number of women of childbearing age is expected to increase but their number relative to the total global population is expected to decrease.

A number of significant trends are beginning to emerge with respect to global population growth:

- Both rich and poor nations are on a markedly different population path and these existing and emerging trends may be expected to bring with them radical consequences.
- A reduction in the relative size of the working population will have significant impacts for the work force as a whole as the aging population and, in the western world, the baby boom generation moves into retirement. Attracting and retaining employees will be a top priority for the public and private sector agencies and organizations.

### **Economic Drivers & Trends**

The information age continues to act as a key agent driving economic change. The rapid transfer of information and technology has linked us globally and this globalization phenomenon may be expected to dominate the economic scene in years to come. The digital divide has created a chasm between the developed world and the developing nations where agrarian style economies continue to dominate.

Economic factors have always played a significant role but their prevalence is becoming more profound over time. The globalized economy and the support afforded by technological innovation require even public sector organizations to consider their corporate bottom line. Increasingly, companies are choosing where to locate increasingly based on the price of both energy and labour costs.

### **Environmental Drivers & Trends**

Water will factor prominently on the global scene. By the year 2025, nearly half the world will experience water shortages. Viewed from an international perspective, more than 80 countries now face water shortages to some degree. Many aquifers and river systems have been seriously depleted by water withdrawals for human use. It has been estimated that at present, over 1 billion people still lack access to safe water.

Globally, water consumption is doubling every 20 years. By 2025, if present water consumption rates are maintained, 5 billion out of the world's 7.9 billion people will be living in areas where it will be nearly impossible to meet basic requirements for drinking, cooking and sanitation (Global Population and Water: Access and Sustainability, UNFPA, 2003).

Urbanization and the redistribution of the global population will directly impact water consumption and demand. Looming water crises can be expected and as some predict, water shortages will eventually lead to conflicts and "water wars".

Recent media images of catastrophic damage left behind by extreme weather events like the hurricanes in the Southern United States, floods in Europe, extreme and prolonged droughts in Africa and Australia have resulted in a "reality check" around the world. For many, the situation elicits feelings of trepidation and vulnerability. Who is next, and when will it happen?

Over the 20th century, the global average temperature has risen by about 0.6 °C, and the mean temperature in Europe has increased by more than 0.9 °C. Globally, the 10 warmest



years on record all have occurred after 1991. For water resource managers, climate change adds another dimension to the uncertainties under which they must operate.

### **Socio-Cultural Drivers & Trends**

Technology is squeezing distances and bringing us closer together; time is becoming compressed. Geography and space similarly seem to be contracting. The world, for the most part, operates in virtual time and virtual space.

The global landscape is marked by volatility and unrest. Recent and mounting violence in France, social unrest in Albania, ongoing conflict in Israel and Afghanistan and mounting concerns with homeland security particularly across the United States has presented a focus of concern since 9-11.

From a socio-cultural point of view, there are several key trends that are becoming apparent and will likely continue to dominate the world scene. Women as a specific component of the population have reached a critical mass, within the economy and from a political perspective.

From a values point of view, there remain wide disparities around the globe between the values of the developing nations and those of the western industrialized world. Seemingly aligned with Maslow's Hierarchy of Needs, world values surveys suggest that in the developing world, concern rests first and foremost with food, water and basic shelter. As the economy grows and becomes more sophisticated, these needs change and the population as a whole places greater value on externalities – those factors not directly related to basic human survival. Among the western nations, researchers have noted that as the economy grows in strength, greater public attention focuses more and more on issues of environmental quality.

Globally, there is an overall trend toward rapid urbanization. Certainly among the developed nations there is a tendency for the population to concentrate in large urban centres. Among the developing nations, however, there is some evidence to suggest a pattern of ruralization is emerging. In the developing world, evidence points to a rapid growth in smaller hamlets and villages.

Around the world, political change is bringing about radical socio-cultural shifts. The breakdown of political barriers is bringing about the emergence of new cultural and religious groups. In addition, rapid growth in the developing world is creating pressure on the industrialized nations to adopt more open immigration policies.

The chasm between the developing and the industrialized nations will grow even more pronounced over time. Among the western industrialized nations, the rapid pace of societal change is expected to continue. New expectations, shifting priorities and a blur of ambiguity are likely to continue. Some have referred to the rapid pace of change as 'high velocity change'. New technologies and global competition are influencing the reshaping of organizations and the kind of work that is being done. As a result, there are evidentiary shifts away from 'employment security' and a corresponding move toward 'job security.' We live in a radically changing world – one that is characterized by perpetual motion. The environment will remain fiercely competitive – restructuring, outsourcing and downsizing will be commonplace. Given this competitive edge, organizations (whether public or private) will likely have to focus on developing an entrepreneurial/business mindset. Employees will be

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expected to act like owners.

### **Political Drivers & Trends**

The 21<sup>st</sup> century has seen an elevation of concern with natural resources. Having a reliable and sustainable supply of energy to fuel the growing economy has dominated the mindset of the developed and the developing world. Mounting political concern with energy security in particular has spawned a number of efforts under the guise of homeland security, led in particular by the U.S. In a similar pattern, the politics of unrest frequently prevail. There are interesting trends that are emerging on a jurisdictional basis. In the U.S., the balance of power is shifting to the American southwest and issues of concern to the arid, dry southwestern states can be expected to take a front seat on the national and international stage. Similarly, shifts in the balance of power across South America are becoming evident and extensive.

### **Technological Drivers & Trends**

The information age and computer technology has had a profound impact on the way we do business and the kind of business we are in. For those in the business of managing the resource base, technology will continue to impact traditional operations in many different ways. Technology offers instantaneous transfer of information and knowledge. It subjects organizations to instant scrutiny and offers an opportunity for a wider constituency to have access to information and data. It supports a better educated and more engaged public. From a business management perspective, technological innovation not only provides for real time transfer of information but also supports operational efficiencies.

How are these broad global trends reflected across North America?

### **North America**

#### **Demographic:**

Across continental North America, the population is becoming older and more culturally diverse. In comparison, the U.S. is growing faster than Canada. Birth rates in the U.S. are higher and the fertility rate in the U.S. averages 2.1335 births per woman, the highest since 1971. By comparison, Canada's fertility rate is 1.4 (the U.K. has a 1.7 fertility rate while Germany's fertility rate is a notable 1.3). The U.S. is growing bigger – evidenced by higher fertility levels. The population of both Canada and the United States is aging.

Canada, like the U.S., is on the brink of an elderly boom. When compared with the world population, Canadians comprise a 1:200 ratio. Within Canada intra-regional migration is occurring from the east coast to the booming western cities of Alberta – Calgary, in particular. There is also evidence to suggest population movement from the “rust belt” of the Great Lakes to the “rest belt” of the Rockies. (These trends are mirrored in the U.S. with similar patterns attributing to the rapid growth of the arid, dry southwestern states.) Although Ontario continues to remain a ‘destination of choice’ for in-migration from other Provinces, trend analysis for the past three decades reveals a mixed pattern of several years of gains, followed by several years of losses. The two western-most provinces (particularly British Columbia), are gaining population more quickly than the others – attributed in part to the aging population and a desire to move to areas of Canada that exhibit fewer weather extremes. Overall, Canada's population is becoming increasingly concentrated in the urban fabric of southern Ontario, extending into Quebec through to Montreal and in the three western centres – Edmonton, Calgary and Vancouver.

On a regional scale, Ontario is expected to experience continued robust growth from 2004-2031, largely due to net migration which will account for close to 70% of total population growth between 2004 and 2010. While all areas of Ontario will experience growth, the Greater Toronto Area (including Durham, Halton, Peel and York Regions) will receive the largest proportion of population growth as a result of international migration. In fact, between 1994 and 2004, Ontario received 55% of all immigrants that came to Canada.

Looking at the U.S. in particular, the total foreign-born population is over 31 million – a record 57% increase since 1990. Almost 25% of the foreign born population is living in the U.S. illegally. As a result of current racial and ethnic diversity, the population composition will become substantially more diverse over time. These trends are important, given the critical role the U.S. has played on the world stage from an economic, political and socio-cultural perspective.

In terms of its geographic distribution, the U.S. population, for the most part, is located along the coastal areas. The Northeastern seaboard averages 767 people per square mile. (Haiti by comparison, averages 580 people per square mile.) The distribution of the U.S. population, however, is shifting.

The number of people age 65 and older has been gradually increasing since the 1950s but the proportion of those 65 and older will markedly increase beginning in 2011 and the baby boom generation (those born between 1946 and 1964) begin to turn 65. By 2030, when the entire American baby boom generation has reached age 65, the older population will consist of one in five (up from one in eight presently). By 2050, the proportion of the population over the age of 65 will be equivalent to slightly more than one in five. By comparison, this is characteristic of Florida's population today. In the U.S., the fastest growing segment of the population consists of the very elderly – those age 85 and older. As early as 2010, this group is projected to reach 6 million Americans – twice their 1990 total. By 2031, when the baby boomers will begin reaching the age of 85, the number of people 85 years of age and older is expected to grow fivefold – from 4 million in 2000 to 21 million by mid-century.

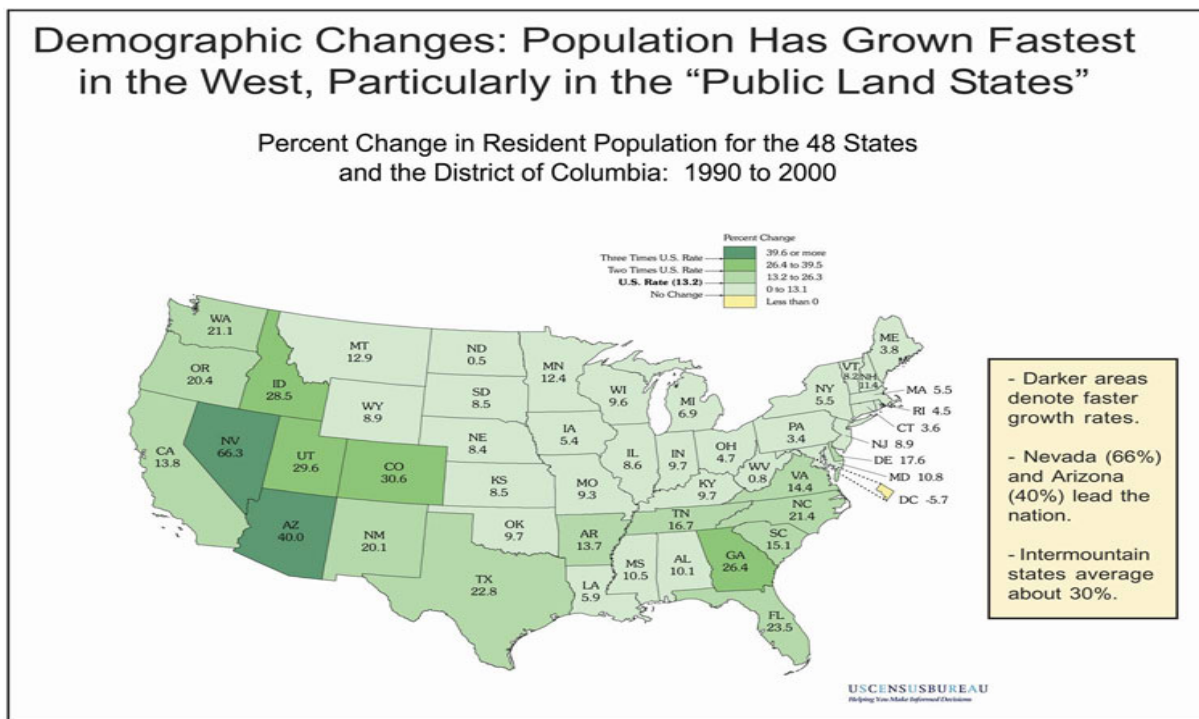
There is evidence that the population distribution across the U.S. is changing. Some regions, traditionally exhibiting high growth are showing signs of slow growth and some are losing population. The nation's Hispanic and Asian populations may be expected to triple by the year 2050 while non-Hispanic whites are expected to grow more slowly to represent some 50% of the nation's population. From now until the mid-century, the population of Hispanic origin will increase from 36 million to 103 million while their proportion of the total population will virtually double from 13% presently to 24% at the end of 2050. The Asian population, by comparison, may be expected to triple from 11 million to 33 million, resulting in an associated doubling of their population share from 4% presently to an anticipated 8% by 2050.

**Table 5.2.2 Growth Rates in the Four U.S. Regions: 1970-1980 and 1980-1990**

Time Frame	The Northeast	The Midwest	The South	The Southwest
1970-1980	0.2%	4.0%	20%	23.9%
1980-1990	3.4%	1.4%	13.4%	22.3%

(Source: StatsCan: <http://www.statcan.ca/english/freepub/61-532-XIE/14-dumas.html>.)

**Figure 5.2.1 U.S. Growth Distribution**



As evident from the above map, the southwestern states have continued to exhibit strong growth as the population has moved away from the “rust belt” states of the Great Lakes and the Northeastern Seaboard, in favour of the “Sun Belt”. These intra-regional population shifts can be attributed initially to the changes in production technologies and a shift toward certain consumer goods and the raw materials used in their production. Now, these trends can be more directly attributed to the aging population base and the associated migration of older Americans (and seasonal Canadians) to the hot, arid southwestern states. Over the next 30 years, net population change (births minus deaths plus net migration) will be most evident in California, Texas and Florida. Each of these three states stands to gain more than 6 million people who will in total account for 45% of the net population change in the U.S.

In Canada, the population is projected to grow to 36 million, up from 31.8 million presently. The golden horseshoe continues to attract immigrants given the diverse employment base and the established cultural and ethnic connections that are vital for new arriving immigrants. Outside of the golden horseshoe, growth continues to be strong in Alberta, with exponential growth rates in evidence in Calgary – largely attributed to intra-regional migration from the east coast. (Source: Population Reference Bureau. 2004.)

All states in the U.S. will have more people, a more culturally diverse population and a growing aging cohort as the baby boomers approach the age of 65. Although all areas of the U.S. will continue to experience growth, substantial growth is expected in the South and West. In Canada, rates of growth will be slower by comparison. Areas that have proven attractive to immigrants may be expected to demonstrate continued growth although some intra-regional population shifts to areas of British Columbia (and also to areas of the U.S. at least on a seasonal basis) may be expected to continue as baby boomers approach retirement and opt to reside in areas of the country where a more moderate climate prevails.

Population change is a key and critical driver, particularly from a water management and electricity demand perspective. From the viewpoint of hydropower, these paradigm shifts are particularly significant since the growth is occurring in the arid, dry southwestern parts of the United States – existing and emerging trends suggest that this exponential growth will continue in an area of the country where the evaporation rates are the highest.

Population growth and redistribution has an incredible impact on development activity and pressure, municipal infrastructure, water use and electricity demand.

#### **The Ontario Picture:<sup>1</sup>**

Between 1986 and 2004, Ontario's population increased from 9.4 million to 12.4 million or by 31%. For comparative purposes, Ontario's level of population growth put Ontario well ahead of Quebec (12.4%), at about the level as Alberta (31.7%) but below British Columbia (39.7%).

During this period, 164,000 people were added to Ontario's population each year – about the equivalent of a Census Metropolitan Area (CMA). Growth spurts in Ontario occurred at the end of the 1980s and also during early 2000. Average annual growth rate was just over 1.5%.

The Ontario population grows in one of three ways over time:

1. Net natural change (difference between births and deaths);
2. Inter-provincial migration (the flow of people coming from other province's and territories); and
3. International migration (movement of people from beyond other countries and Canada.

Between 1986 and 2004, net natural change added about 62,000 people to Ontario's population. Births were the driving factor, particularly from the 1980s until 1992. This is as a result of the tail end of the baby boom generation having children. From 1992, the number of

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<sup>1</sup> Ontario demographic data supplied by Dr. R.A. Loreto. RAL Consulting Ltd.

births has fallen and the number of deaths increased, largely a result of the aging population.

For Ontario, international migration has factored prominently as a source of population growth. Between 1986 and 2004, international migration added 97,000 people to Ontario's population. On average, inter-provincial migration contributed 6,442 people each year.

Ontario's population is not only growing, but it is also aging. The baby boom generation are approaching retirement. Growth in the under 35 age cohort is declining while exponential growth is occurring in the over 55 and in particular, the over 65 age groups.

Some key findings with respect to Ontario's demographic picture include the following:

1. Ontario's population is growing and aging. Population growth has been most pronounced in the late 1980s and in the early part of 2000.
2. A substantial increase in Ontario's population – particularly the GTA – comes from international migration. In recent years, migration has been particularly evident from Asia and the Pacific Rim and also from Africa and the Middle East.
3. Growth has been most substantial in the Greater Toronto Area. The Northeast and the Northwest have shown evidence of decline, largely in response to regional economics.
4. Ontario's aging population is evident province-wide but is most noticeable in those parts of the Province where international migration is not as strong a source of population growth.

In the next 20 years, Ministry of Finance predicts Ontario's population will continue to grow as a result of international migration but the actual rate of population growth will decline to 2026. By 2026, Ontarians 50 years of age and older will constitute 40% of the total population. The Greater Toronto Area is expected to contain just less than half of the province's residents. Northern populations are expected to continue to decline. Although the aging population will be less pronounced in the GTA, it is expected that 36% of the GTA's population will be over the age of 50 by the year 2026. Visible minorities and Aboriginal populations will continue to grow and offer a different age structure to the rest of the province as they represent a more youthful profile.

The distribution and concentration of population in Ontario will also be affected by recent provincial legislation. The Province of Ontario, in June 2005, enacted the Places to Grow Act which provided the legislative framework to establish a growth plan area and the preparation of growth plans. The growth plan for the Greater Golden Horseshoe (first growth plan under the legislation) provides policies to develop compact, transit supportive, sustainable communities; to direct growth to built-up areas; and to provide for intensification targets. The demographics of the communities within the Credit River Watershed will be affected by this legislation, and in fact they already have. It must be recognized that the GGH Growth Plan will be a major factor in the location and character of development within the Credit Watershed into the future.

## Credit River Watershed Demographics:<sup>2</sup>

### General Population Trends

The Credit River Watershed consists of all or portions of eleven municipalities: Halton Hills, Mississauga, Brampton, Caledon, Orangeville, Mono, Oakville, Milton, Erin and townships of Amaranth and East Garafraxa. The watershed had an estimated population of 758,000 people in 2001. The population has grown by a rate of approximately 16% between 1991 and 2001, with the majority of the growth concentrated in large urban centers such as Mississauga and Brampton. Brampton and Orangeville have the fastest growing population and rates of urban development of all municipalities within the watershed. Mississauga contains the majority of the watershed's population at about 68%.

In 2001, the areas of greatest population growth within the watershed (in descending order) were: Brampton, Orangeville, Mississauga and Halton Hills. These four areas within the watershed accounted for 78.9% of the population growth between 1996 and 2001 (see table below). Within the watershed, northern and central Mississauga; western, southern and northern Brampton; and south Caledon recorded the highest population growth. The number of people living in Brampton's portion of the watershed increased by 33%, making it the fastest growing municipality. Subsequently these areas also experienced the greatest influx of new immigrants.

**Table 5.2.3 Population Percentage Change by Municipality**

Population Percentage Change from 1996 to 2001 by Municipality			
Municipality	1996 Population	2001 Population	% Change, 1996 - 2001
Mississauga	453,263	517,229	14.11
Brampton	80,801	107,996	33.66
Caledon	21,191	23,827	12.44
Orangeville	21,498	25,248	17.44
Mono	6,552	6,922	5.65
Oakville	14,319	14,062	-1.79
Milton	3,212	3,181	-0.97
Halton Hills	42,390	48,184	13.67
Town of Erin	10,657	11,052	3.71
Entire Watershed	653,883	757,701	15.88

The watershed is currently receiving 21,000 new immigrants per year – the main source of new population growth. The majority of new immigrants arriving between 2001 and 2006 are from (in descending order): India; Pakistan; China and Hong Kong; the Philippines; and Poland, whereas between 1980 and 2001 it was: India, Poland, United Kingdom, Portugal, Jamaica, Pakistan, and Italy. In 1991, the total watershed population consisted of 36% immigrants; by 2001 this had increased to 43%. In actual numbers the immigrant population settling within the watershed increased from an estimated 65,475 people between 1980 and

<sup>2</sup> It is important to note that this brief demographic summary is based on data from the census tracts, some of which extend beyond the watershed boundary. Therefore, there are limitations in terms of the level of detail and precision. The raw data likely over-estimates the population numbers, however the trends can be considered reasonably accurate. The data and analysis has been provided, in part, by the Region of Peel Planning Department Data Center.



1991 to approximately 114,150 between 1991 and 2001. On average, the Credit River Watershed received close to 21,000 new immigrants per year, since 2001. The population is very diverse. There are over 150 languages spoken within the watershed, and it is home to 301,680 immigrants representing 136 different countries.

Overall, the watershed consists of an aging population. The vast majority of people (250,260 people) are between the age of 25 and 44, accounting for 33% of the entire population. There has been a 5.4% decline in people in their twenties between 1986 and 2004; in fact, the median age for the population of males and females shifted from between 25-34 in 1991, to 35-44 years of age in 2001. In contrast, seniors and retirees make up the smallest portion of the watershed population: about 8%.

### **5.3 ECONOMIC AGENTS OF CHANGE**

Overall, the North American economy has shown strong growth, both nationally and on the international scene. Between 2000 and 2004, productivity grew 0.9% per year on average in Canada and 3.5% per year on average in the U.S.

Globalization is a major player on the economic front both in Canada and the U.S., as it is world-wide. In Canada there are notable paradigm shifts with respect to the structure and organization of the economy. Since 2000, the National Post reports that more than 100,000 manufacturing jobs have disappeared. Despite these reductions, output from the manufacturing sector has grown on average 0.3% per year. Unemployment has dropped to a 30-year low of 6.4% and the economy can be described as particularly robust in western Canada. The loonie, closely tied to the price of oil, currently sits at 85 cents – marking a 14-year high. The loonie actually peaked at 86.10 cents on December 14, 2005 – the highest since January 1992.

Over the 30-year period from 1974 – 2004, Canadian GDP per capita grew by 1.8% per year on average. The changing composition of the population needs to be explored from an economic perspective. By the year 2015, the aging population will result in shrinkage of the labour pool – at the present time, we are under-utilizing many of our cultural groups. It has been estimated that while 55% of the population 15 years of age and older in Ontario specifically have a post-secondary education, 65% of immigrants are similarly educated. In Canada as a whole, 18% of the total population holds a university degree; 42% of the immigrant population holds similar post-secondary credentials – more than half of the base Canadian population. There is a need to consider these implications and begin work now to integrate the immigrant population into the workforce; waiting until 2010 when the signs of a labour shortage are already evident may be too late.

Among the more interesting trends beginning to emerge across North America is the impact of globalization and the increasing important role that cost competition is playing on the economic front.

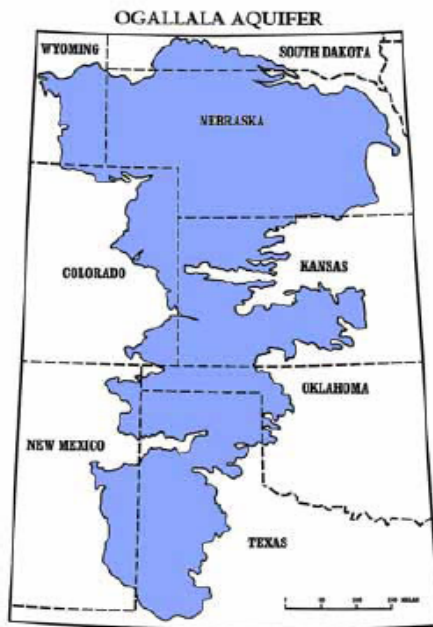
In the U.S. strong economic growth may be expected to continue and the U.S. will likely continue to play a dominant role on the world stage from an economic perspective just given its size and the projected rates of growth across the U.S. However, recent catastrophic events have created tremendous pressure on the U.S. to make decisions that recognize the swelling fiscal deficit. The effects of Hurricane Katrina and the devastation that tore through the Gulf States suggest that fiscal resource management will be a top-of-mind concern for

key decision makers. The impacts of climate change, the ensuing atmospheric instability and the increased incidence of extreme flood events suggest that the catastrophic events that plagued the U.S. this past year may very well continue into the near future.

## **5.4 ENVIRONMENTAL AGENTS OF CHANGE**

In addition to a more culturally diverse and growing population base, the geographic distribution of the population (and future trends relating to spatial distribution) is of particular concern. Viewed in aggregate terms, the majority of the North American population is urban-based, a trend that is evident globally. The trend toward increasing patterns of urbanization is important, particularly when viewed from the perspective of energy demand. Pimentel and others have noted that the current rates of urbanization are contributing to a loss of arable cropland in the U.S. Some estimates suggest that every year, more than 2 million acres of prime agricultural land are lost as a result of erosion, salinization and water logging. In addition, more than one million acres are removed to meet the needs of urbanization, transportation networks and industry. In a comprehensive analysis of Food, Land, Population and the U.S. Economy, David Pimentel (Cornell University) and Mario Giampietro (Istituto of Nazionale delta Nutrizione, Rome) estimate that the groundwater that provides over 30% of the water used in agriculture is being depleted up to 160% faster than its recharge rate.

One prime example of extensive water consumption is the current situation involving the Ogallala or High Plains aquifer that stretches across parts of South Dakota, Nebraska, Wyoming, Colorado, Kansas, Oklahoma, New Mexico and Texas.

**Figure 5.4.1 Ogallala Aquifer**

One of the world's largest aquifer systems and the largest groundwater system in North America, the Ogallala Aquifer underlies about 174,000 square miles (450,658 square kilometres) of the U.S. Great Plains. In 1990, the Ogallala contained 1.06 quadrillion gallons (4 quadrillion liters) of water (High Plains Water District No. 1, 2004). Over time and in response to changing climatic conditions and changes in erosion patterns, the Ogallala has been cut off from its original supply of water. In fact, the southern portion of the Ogallala formation in Texas and New Mexico has been completely cut off on all sides. According to Zwingle (1993), thousands of years of rain and snow have resulted in this accumulation and if completely drained, it would take more than 6000 years to refill. In some areas, water levels show a decline of 100 feet and at present, the annual overdraft is 130% to 160% above its replacement rate. Experts have projected that the Ogallala aquifer (under Nebraska, Oklahoma and Texas) will likely become unproductive in the next 40 years. This is particularly of concern for the Great Lakes as there have been proposals in the past to divert water from the Great Lakes to this area.

Concerned with a looming water scarcity, the U.S. Department of the Interior launched the Water 2025: Preventing Crises and Conflict in the West to encourage greater inter-state collaboration on water use issues. These existing concerns, coupled with the potential impacts of more extreme weather events (longer periods of drought and catastrophic flooding) are a particular cause for concern.

From a water use perspective, agriculture in the U.S. is by far the highest water user – accounting for 85% of all U.S. freshwater resources pumped from storage. In the U.S., Pimental and Giampietro estimate that 60% of the water used in irrigation comes from surface water, with the remainder coming from groundwater supplies. It is worth noting that less than 0.1% of the stored groundwater mined annually by pumping is replaced by rainfall.

Currently, Americans use about 1450 gallons/day/capita (g/d/c) for their needs, with by far

the largest expended in agriculture. At the present time, combined crop and pastureland occupy 50% of the U.S. total land area. This amount of land is needed to supply the U.S. population with nutritional diversity. The implications of less water and less arable crop and pastureland may lead to a less varied diet as a result.

In the U.S., if water management is substantially improved, the projected population will have about 700g/d/c in the year 2050. Hydrologists consider 700 g/d/c to be minimal for human needs, including water for adequate food consumption. As a result, it may be expected that in the future:

- The U.S. will have to make major adjustments in their water use, particularly in the arid dry southwest;
- Irrigation will decrease as groundwater resources continue to be mined at rates that exceed their recharge rates and, as existing resources have to be shared among more people;
- Given the current water shortages being experienced in the western and southwestern states, agricultural production may shift from these regions to the American Midwest and to the northeastern seaboard where current rainfall is more abundant.

In Canada, 90% of Canadians live in a narrow band along the extreme southern edge of Canada. More than 60% of the water supply is located to the north of this settlement area and practically speaking, most of this water flows north – away from the populated areas. Concentrated pockets of growth and the emergent settlement patterns mean that local water supplies are under tremendous pressure. Across Canada, 8 million people (one in four Canadians) rely exclusively on groundwater.

Canadians use more water per capita than any other country, other than the U.S. Since 1980, overall water use in Canada has increased by 25.7%. Canada ranks 28<sup>th</sup> out of 29 OECD nations in terms of per capita water use. Since 1996, water use has increased partly as a result of new water supply systems being built for areas that previously had unreliable access to clean water. Although the use of water metres in some Canadian municipalities has helped reduce water usage, across Canada, nearly all water used by municipal water systems comes from lakes and rivers, with 12% coming from groundwater supplies.

Demands for water from other uses and users is of direct concern to conservation agencies like the CVC. Climate change, along with its uncertainties, depleting surface water supplies and rapidly depleting aquifers will affect water levels.

Clearly in North America, one of the areas of critical concern is the largely unknown effect of global warming and climate change.

Climate change and global warming result in greater energy in the atmosphere. This atmospheric instability has the effect of altering the patterns of precipitation overall. Warmer winters, more extreme weather events (denoted by longer periods of drought and incidents of catastrophic flood events) have significant implications for water resource managers. Early snow melt as a result of an increase in temperature and drier summer periods will put more demands on reservoirs. Net efficiencies will drop as a result. From a scientific perspective, the debate on climate change continues. From the North American context, more severe summer droughts could increase agricultural irrigation demands and exacerbate water supply issues in largely urbanized areas, particularly California and Texas. Water supply and demand issues may be intensified across the continental U.S. and

Canada as a result of climate change. Polarized positions could very well emerge as a warmer climate could increase demand for irrigation water by agricultural interests and for industrial cooling water at the same time that urban growth pressure will be calling on additional municipal water supplies.

North America's position on Kyoto can be best described as ambiguous. The Kyoto Protocol, the global pact to address global warming that would go into effect in 2008, was ratified by Canada but not by the U.S. Canada's approach to meeting its Kyoto obligations – referred to as the Canada Climate Plan – focused on an initial government investment of \$10 billion between the year 2005 and the year 2012. The objective is to reduce greenhouse gas emissions by 6% from their 1990 levels and thus far, the focus of effort has been on Canada's large final emitters – those companies primarily in the oil and gas, mining, manufacturing and thermal electricity sectors – who are responsible for producing over 50% of Canada's greenhouse gas emissions. By all accounts, there are many critics who claim the objectives cannot be realized under the current initiatives. The fact that the Kyoto Protocol has not been ratified by the U.S. raises a number of issues, not the least of which focuses on the successful implementation of the pact.

To date, however, the focus of interest in climate change and global warming has been on global impacts.

From an environmental perspective, it is clear that North Americans are making the link between the state of the environment and the state of their own personal health. While there have been water-related tragedies such as Walkerton (resulting in a number of deaths in that Canadian community) and tainted water scandals affecting many First Nation communities, broader issues such as the SARS crisis and looming concerns over an avian flu pandemic are pointing to these inter-relationships in a direct way. These issues are demonstrating the significance of considering environmental impacts – a concern of particular interest to resource managers and conservation agencies like CVC. As time goes on, we are learning more about the complexities of our ecosystem and the need for environmental monitoring and compliance. Environmental regulations and compliance requirements play a pivotal role in North America not just from a resource management perspective, but from the viewpoint of development generally.

## **5.5 SOCIO-CULTURAL AGENTS OF CHANGE**

In addition to an aging population base, the U.S. is growing more culturally diverse. Across the continental U.S., existing and emerging trends relating to future childbearing, mortality and international migration suggest a potential cultural shift. Viewed in absolute terms, the U.S. population has entered the post-transitional phase in which natural increase is low, mortality rates are dropping and the population is aging. In addition to these notable trends, the composition of the population may also be expected to change over time.

International immigration will continue to play a dominant role in the structure and composition of the population in Central Canada and in British Columbia, in particular, though it will have a more marginal effect in the Prairie Provinces.

Throughout North America, issues of energy security and supply (particularly in the U.S.) are expected to dominate the political and international agenda. Issues of homeland security remain a top-of-mind concern though it is becoming increasingly apparent in the U.S. that

the overriding concerns focus on a secure and reliable energy supply to support a growing economy. The robust economy in North America is likely to continue and with it, public concern with a healthy and sustainable environment is expected to remain a top of mind issue publicly. For resource managers, this overriding concern with environmental quality and the necessary linkages that have been drawn between human well-being and a healthy environment will likely hold conservation agencies like the CVC in a positive place in the future. Issues of environmental concern are discussed more fully in the chapter that follows.

## **5.6 POLITICAL AGENTS OF CHANGE**

Across Canada, the predictability of voter preference is less easy to determine than the patterns that are emergent across the U.S. The recent results of the 2006 federal election witnessed a dramatic change in political lines of affiliation. Apart from the changeover in political party and the shift from a 12-year Liberal party stronghold at the federal level, voting patterns demonstrated an interesting urban-rural bias. Characteristic of traditional voting patterns, the Prairie Provinces remained Conservative and the rise to power of Stephen Harper's Conservative party can be attributed to that established presence, particularly in Manitoba, Saskatchewan and Alberta. Perhaps most evident in the recent election results was the failure by Stephen Harper's Conservatives to gain any additional seats in three of Canada's largest cities: Toronto, Montreal or Vancouver. Some of the change in voter preference may be attributed to the government advertising scandal that plagued the Chrétien and later Paul Martin's Liberals. It may also be the result of positions taken in the House on such emotive issues as gun control and same sex marriage. Regardless of the rationale behind the changing tide, it is clear that the winds of political change were blowing at gale force across Canada.

In the U.S., the centre of political gravity is shifting south and west – a paradigm shift that has been reflected in each Presidential election. Since George Bush Sr. was elected, 27 Electoral College votes have shifted to the southwestern states – now accounting for 59% of national growth in eligible voters since the last presidential election. Leading political strategists have suggested by January 20, 2009, all the elected presidents for 44 consecutive years will have come from four states: Texas, Arkansas and Georgia (and southern California). Population shifts in the U.S. have already altered the composition of the House of Representatives. After the 2000 Census, reappointment of the 435 seats in the House fell in favour of the southern and southwestern states: Arizona, Florida, Texas, Georgia all gained two seats. Colorado, Nevada, North Carolina and California each gained one. Also of note is that every U.S. Great Lake State lost at least one seat except for Minnesota.

From the perspective of the future, it would appear the U.S. southwest will find itself in an increasingly strong political position in terms of congressional issues and with respect to its influence on the public policy agenda. If water is viewed as an issue at the forefront of concern among the southwestern states, it is very likely that those issues will find their way to the political forefront nationally and possibly internationally.

## **5.7 TECHNOLOGICAL AGENTS OF CHANGE**

One of the most salient issues facing resource managers in North America is aging infrastructure. Over the next 20 years, it is estimated that in the U.S., 85% of dams will turn 50 years old, raising maintenance and rehabilitation issues. More critically, an aging

physical plant will require agencies such as CVC to make important decisions around capital upgrades versus maintenance.

Heightened public concern with the human imprint on the environment will continue to place an onus on the development and application of environmentally-effective engineering designs.

So, in summary, what are the factors that are most likely to shape the future?

### **The Economic Sphere**

- Growth is exponential in developing countries such as India and China.
- Oil and gas being finite resources will continue to increase in price over time.
- Energy needs of the developed world continue to grow.
- There is a dichotomy in the industrialized countries between a desire to protect the environment and reluctance to give up the life style luxuries afforded by reliable and affordable energy/electricity.
- Countries that currently lag behind economically will face deepening economic stagnation – the economic & digital divide will grow.
- Exponential economic growth.
- Globalization becomes the dominant force regionally, nationally and internationally.

### **The Environmental Sphere**

- Water is spatially finite. We cannot simply create more. We have what we have, where we have it.
- Better organized and “professional” environmental lobbyists will continue to factor prominently.
- Linkages between our own human health and the health of our environment are scientifically proven.
- While climate change is now a widely accepted phenomenon, there is no scientific consensus as to its origin, its long term impacts, and the severity or predictability of weather variations associated with it.
- Though GHG emissions are a world concern, the Kyoto protocol has not yet proven very effective in curbing GHG emissions, and what will happen after 2012 has not been determined.
- Forms of ‘smart growth’ (the likes of which we are beginning to see emerge across continental N.A.) are becoming the norm – compact urban form and energy efficiencies.

### **The Social Sphere**

- Water belongs to everyone and to no one. Its management is coming under increasing scrutiny from a better educated and more demanding public.
- Current water consumption rates, particularly in the US and Canada are not sustainable – Canada ranks 28<sup>th</sup> out of 29 OECD countries in terms of per capita water consumption – only the US uses more water than Canada
- 30 nations receive more than 1/3 of their water from outside of their boundaries.
- Population is aging and so too is the labour pool.
- By 2015, 50% of the global population will reside in ‘water stressed’ countries (already seeing evidence of changing climate patterns and longer more extensive periods of drought in South Africa).
- Globally, 80-85 million people are added to the world’s population each year.
- Information flows globally and instantly – negative events have immediate impacts.

- Conflicts are beginning to emerge between water uses and users (e.g. water for growing food versus water for electricity).
- Both Europe and the US have concerns over the long-term security of their energy sources.
- Rapid pace of urbanization continues – 75% of the world's population live in urban centers.

## **6.0 STATE OF THE RESOURCE**

Please see Section 5.0 for the global and North American state of the resource as well as some of the key forces driving change.

The following are highlights of the regional and watershed analysis. Please see the CVC “State of the Resource” internal document for more detailed information on the state of the watershed and region.

### **6.1 EXTERNAL FACTORS**

#### **6.1.1 Climate**

- The Region's climate is expected to become considerably warmer in both summer and winter. Although average annual precipitation may not change much, projected changes in seasonal precipitation patterns are more distinct: winter and spring precipitation is expected to increase while summer rain could decrease by as much as 50% (Environment Canada, 2005).
- Heavy summer downpours are likely to become more frequent with dry periods in between.
- Soil moisture and stream flow will reflect rainfall changes and lake levels are expected to drop overall.
- Based on the results of the 5-year monitoring review for hydrology, a decrease of approximately 7% in mean annual precipitation was observed for the watershed for the last 5 years (1999-2004) in comparison to the last 30 years (1968-1998).
- This resulted in a 17% decrease in mean annual streamflow values based on data collected at the Norval gauge when compared to the period of record for the last 20 years.
- This decrease in mean annual precipitation and streamflow can be attributed to the fact that within the last five years the watershed has experienced severe drought conditions for three out of five years with improvements in 2003.
- A 30 year low for precipitation was observed within the watershed in 1998.
- An increasing trend in maximum annual temperature was observed for each climate station along with an increase in mean monthly temperature within the watershed, indicating warming climatic conditions.
- The results of the trend analysis are consistent between the climate data, streamflow data and physiographic information for the upper and mid watersheds.
- Within the floodplain there are 22 Flood Damage Centers and a minimum of 619 residential structures and 29 commercial structures. In addition there is major infrastructure in the floodplain such as roads, bridges, trunk sewers, gas lines, etc.



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## **6.2 RESOURCE CHANGE/USE**

### **6.2.1 Impacts of Urbanization**

- The quality of groundwater in urban areas is poorly understood but the understanding improves in smaller urban areas. In general, it is believed groundwater quality is impaired in urban areas as compared to non-developed areas.
- Physical extent of growth is exponentially exceeding population growth. For example, the State of Michigan has predicted a population growth of 12% while its physical growth is projected to increase 87%. The US Environmental Protection Agency (1997) found that continued growth of major metropolitan areas and the sprawl of residential areas and other development has had a severe social, environmental and economic impact that threaten the sustainability of the Great Lakes Basin. They also concluded that urban sprawl: contributes to polluted runoff by replacing green open spaces and farmland with paved surfaces and requiring the building of additional roads and commuter highways; contributes to air pollution by boosting commuter distances and vehicle miles traveled; and results in loss of viable habitat for animals and plants.
- In 2003, Garfield et al found that urban expansion remains one of the major threats to water quality in the U.S. and is linked to chronic and acute illnesses from exposure to drinking water and contact recreation.
- The Environmental Health Committee for the Ontario College of Family Physicians (2005) also concluded that sprawl areas produce 43% more urban runoff than more densely populated areas, contributing to chronic and acute illness.
- Urbanization impacts wastewater disposal, stormwater run-off, combined sewer overflow and industrial wastewater.
- Impacts of urban stormwater generally include: increased run-off volumes and peak flows; sediment erosion and deposition; geomorphic changes; aquatic habitat degradation; increase in receiving water temperature; reduced groundwater discharge; ecological degradation; impaired water uses (recreation, fishing, drinking water); dissolved oxygen depletion; eutrophication; high nutrient loads; discharge of toxins and pathogens into receiving waters; and degradation of benthic diversity and populations.
- The Credit River Water Management Strategy Update has characterized existing watershed conditions and found that if current planning practices and infrastructure management continue, the watershed will go from impaired in urban areas to significantly impaired. Furthermore, no subwatershed (20 in total) in the Credit River Watershed will be unimpaired. The CRWMSU also shows:
  - Current planning and development practices are not sustainable.
  - Growth can occur with changes in current planning and development; and restoring and retrofitting land uses.
  - Regardless, there is a limit to growth.
  - Monitoring data collected in urban areas across CVC specifically is showing increased water temperatures and increased concentrations of nutrients, bacteria, metals, and polycyclic aromatic hydrocarbons.

### **6.2.2 Impervious Surfaces**

- Current impervious cover is about 15% of the watershed and is expected to increase to 25%.

- Sediment and erosion control by developers continues to be an issue in the watershed although there have been recent improvements.

### **6.2.3 Aggregate Extraction**

- There are a number of aggregate operations in the upper part of the watershed, especially the Region of Halton, Town of Caledon, and to a lesser degree, the Town of Erin. There are proposed gravel pits in East Garafraxa. The industry continues to expand.
- Clay and shale quarries exist in the lower watershed.
- Existing land use mapping for the watershed indicates that 4% of the watershed area is associated with pits and quarries with Subwatershed 16 (Caledon Creek) having the greatest percentage of land associated with aggregate extraction.
- There is good documentation regarding existing and potential impacts to fisheries and wetlands in areas of Subwatersheds 16 and 18 (Credit River-Melville to Forks of the Credit), Acton Quarry, Caledon Creek and the proposed Rockfort Quarry.
- In addition to removal of natural areas in the establishment of aggregate operations, dewatering for the purposes of extraction below the water table can decrease baseflows to rivers and creeks, leading to degraded surface water quality, loss of natural habitat, and fisheries impacts. Lowering the water table can also cause negative impacts on nearby ponds and wetlands. Ponds associated with quarrying can also raise water temperatures and may impact coldwater fisheries.
- Some abandoned quarries and pits in parts of the watershed are serving as waste disposal sites.

### **6.2.4 Water Supply**

- Georgetown and Orangeville are having difficulty finding adequate groundwater supplies for rising populations. Water taking for golf courses, new residential subdivisions, quarry operations and other groundwater takings are competing with available groundwater supplies for these communities and others.
- Currently there is no water allocation plan in the watershed that would give precedence to communities for water supply over other water takers such as golf courses, water bottlers or aggregate operations.
- Coldwater fisheries at greatest risk include areas downstream from Orangeville, Georgetown, Alton, Inglewood and Erin.

### **6.2.5 Soil Quality and Quantity**

- Soil degradation is one of the largest threats to environmental sustainability worldwide.
- Watershed soil quality is unknown.

### **6.2.6 Landform Conservation**

- There are a number of prominent landforms which are protected at both the regional and provincial scale such as the Oak Ridges Moraine and the Niagara Escarpment. A number of regulations and policies apply to the Great Lakes to permit protection of its waters and shoreline areas. River and stream valleys are protected through the Provincial Policy Statement but are subject to challenges from a variety of development proposals.

- In the watershed, major structural modifications have been carried out in the name of flooding and erosion protection with many river and stream valleys being manipulated or completely lost.
- The traditional approach to urban development has had a significant impact on natural land forms through cutting and filling. The result is that often a variable landform has been replaced by a steady grade which better facilitates traditional urban servicing.
- Historical agricultural land uses have also had a significant impact on the natural environment of the Credit Watershed in terms of clearing and re-shaping of land.

### **6.2.7 Dams**

- A large number of historical dam structures were built in the Greater Golden Horseshoe for varying purposes. The issue of public safety and liability is increasingly an issue.
- There are 418 minor dams (on-line ponds with a barrier structure) and 35 major dams across the watershed. Many of these structures vary in size and condition from excellent to poor.
- CVC owns and operates 12 dam structures and manages 1 dam on privately owned land.

## **6.3 POLLUTION**

### **6.3.1 Spills**

- Ministry of Environment Spills Action Center receives 4,000 to 5,000 reports of spills each year province-wide.
- Spills have resulted in direct impacts to local communities and environment by impacting air, land or water.
- Since 1982 there have been over 6000 spills reported within the watershed's municipalities.
- CVC has no historical record or database of historical spills in the watershed.
- A major spill occurred in the Georgetown WWTP in 1994. Other spills experienced by CVC include vehicle accidents near river bridges. There is also widespread disposal of hazardous chemicals down local storm sewers causing widespread, cumulative impacts.
- Sediment spills are a major problem.

### **6.3.2 Rural Pollution**

- Rural pollution emanates from agriculture, landfill sites, golf courses and residential subdivisions.
- Intensive agriculture is limited in the watershed and is not a significant environmental factor as compared to urbanization. The watershed is about 29% intensive agricultural land, however livestock use is limited.
- There are no farms in the watershed over 300 nutrient units as identified by the Nutrient Management Act. There are, however, a number of fruit orchards, horse farms and hobby farms.
- Key issues generally in the rural environment include: excess nutrients, organic pollution, overuse/misuse of pesticides, and livestock access to waterways.
- In some areas of the watershed, there is evidence of fertilizers contaminating groundwater aquifers.

### **6.3.3 Septic Systems and Municipal Servicing**

- There are four municipal point sources from Waste Water Treatment Plants (WWTP) that discharge into the Credit River: Orangeville, Acton, Georgetown and Inglewood.
- One WWTP in Mississauga discharges directly into Lake Ontario.
- A number of spills occur from by-passes from WWTPs in the watershed.
- CVC has found impacts of septics in small communities with a dense septic system network and plumes of contaminants including: ammonia, nitrate, chloride, and E. coli loadings to waterways.
- There may be evidence of fisheries health impairment from WWTPs and septics at various locations.
- The Credit River is currently above the Provincial Water Quality Guideline for phosphorus in part due to contributions from WWTPs and septic systems.

### **6.3.4 Pesticides**

- Due to the current level of knowledge of impacts from pesticide use on links to chronic disease and impacts on reproduction and fetal and child development, reductions in pesticides have been encouraged by some municipalities through by-laws requiring permits.
- Brampton, Mississauga and Peel Region do not have municipal by-laws banning or restricting pesticide use.

## **6.4 ECOSYSTEMS, SPECIES**

### **6.4.1 Habitat, Natural Areas and Need for Protected Spaces**

- With respect to habitat regionally, the watershed reflects a subset of what is happening in the Greater Golden Horseshoe and across southern Ontario and the Great Lakes Basin. In a 1999 report by Ontario Nature, it was estimated that in Peel Region, there had been an 89% loss of non-wetland communities. Wetland loss is in the order of 70% or more in southern Ontario (Environment Canada, 2004).
- The loss of natural areas has translated into a loss of species, populations and communities generally in the Greater Golden Horseshoe.
- Designations such as “Greenbelt”, “Oak Ridges Moraine”, “Niagara Escarpment” and “Provincially Significant Wetlands” help to provide some protection for habitat but they do not speak to protection of space for recreation. Public open space is under increasing pressure.
- The pre-settlement vegetation of the Credit River Watershed consisted approximately of 65% upland forest, 21.7% lowland forest and swamp, 7% non-forest wetland and aquatic (watercourse and water bodies) and 1% early succession habitats.
- Based on 2002 interpretation of aerial photography, the dominant land uses in the watershed include agriculture (35.5%); and urban development, rural development and associated land uses (27%). Natural features make up less than 25% of the Credit Watershed. 15% of the area is forested, 6.1% is wetland, 1.2% is aquatic, and only trace natural savannah and prairie remain.
- In order to maintain a number of ecosystem functions and services, Environment Canada (2004) recommends a minimum of 30% forest cover at the watershed level. They also recommend that either the wetland habitat be restored to original levels or to greater than 10% coverage at the watershed scale with

subwatersheds containing greater than 6% of wetland habitat. Consequently the CVC watershed has about ½ of the wetlands and forests needed for ecosystem health.

- Loss of Lake Ontario shoreline habitat is a concern with roughly 80% of coastal wetlands in the Great Lakes being lost.

#### **6.4.2 Fragmentation, Corridors and Connectivity**

- Particularly around the western end of the Greater Golden Horseshoe, connectivity is decreasing due to such things as larger highways, as well as expanding urban areas (houses, roads and fences). Many species have a hard time moving to new areas, partially because there is less habitat on the landscape and partly because of barriers.
- In the aquatic community, connectivity is maintained through watercourses, the Credit River being the largest. CVC conducted a dam inventory in 2005, in order to determine where aquatic species might encounter barriers (443 were documented).
- To date, CVC has not conducted a watershed-scale analysis of terrestrial connectivity, although corridor analyses have been conducted as part of CVC's subwatershed studies.

#### **6.4.3 Disease and Pests**

- Within the watershed, the following pests and diseases are currently considered threats to the woodland system: Gypsy moth, oak decline, beech bark disease, butternut canker.
- In aquatic ecosystems the following are disease and pests: round goby, purple loosestrife, Eurasian water milfoil, West Nile Virus.
- If they appear in the watershed, Emerald Ash Borer and Asian Longhorn beetle would be two of the most serious threats as 100% of host species would die.
- Whirling disease is having a devastating effect on North American cold water species.

#### **6.4.5 Invasive Species**

- Numerous invasive species are known in the Great Lakes ecosystem.
- New invasive species introductions seem to be ongoing.
- As climate change occurs, we should expect an increase in exotic species and southern species.
- The invasive species that have most commonly been encountered by CVC staff conducting terrestrial monitoring and ecological land classification in the watershed include: garlic mustard, common buckthorn, Canada thistle, Tartarian honeysuckle, smooth brome grass, dog-strangling vine and Manitoba maple. A watershed level review of terrestrial species has not been conducted.
- The aquatic invasive species include: carp, round goby, water flea, zebra mussels and rusty crayfish.

#### **6.4.6 Biodiversity**

- The rate of biodiversity loss in Canada is slower than in other areas of the world due to the large Boreal forest. However, in the Greater Golden Horseshoe area (Carolinian forest & Great-Lakes St. Lawrence forest), biodiversity losses are occurring at a greater rate than in the Boreal forest. The Carolinian Canada area

- of southwestern Ontario is considered a rare ecosystem in Canada. Biodiversity continues to decline.
- The Great Lakes-St Lawrence Ecosystem of Ontario contains the largest freshwater bodies in the world. Biodiversity losses in the region have been due to pollution, land use changes, and invasive species introductions. Continued urban expansion and land conversion is not being offset by forest succession or reforestation efforts.
  - On a positive note, pollution loads have decreased in southern Ontario's freshwater systems when compared to historic loadings from the latter part of the 20th century. Unfortunately, persistent chemicals remain in sediments and the continual disturbance of these chemicals hinders the recovery of freshwater ecosystems.
  - The Credit River is the most diverse cold water fishery in Ontario if not eastern North America.
  - Based on the best available information, the species composition of the watershed includes the following: 17 amphibian species, 244 bird species, 81 fish species, 48 mammal species, 14 reptile species and 1255 vascular plant species.
  - An assessment of the status of these species has not been conducted for the watershed, although we know which species are considered federally or provincially at risk, rare, or uncommon.
  - Causes of biodiversity loss include: habitat removal or alteration, habitat fragmentation, degradation of habitats, non-native or invasive species.

#### **6.4.7 Species at Risk**

- The watershed is in both the Carolinian and Great Lakes-St. Lawrence forest regions. The loss of species and habitats was originally due to land conversion to agriculture and is currently due to urbanization and invasive species.
- There are a greater number of species at risk in the Carolinian System in Ontario than anywhere else in Ontario and the number is increasing. In the Carolinian region, 4 species are extinct, 7 extirpated, 58 endangered, 37 threatened and 38 of special concern.
- In the Great Lakes – St Lawrence Region, 5 species are considered extinct, 3 extirpated, 30 endangered, 27 threatened and 24 of special concern.
- The number of species in the watershed of Federal listed "Species at Risk" is: 6 endangered, 6 threatened, and 13 of special concern. Using provincial assessments there are 2 extirpated species, 8 endangered, 8 threatened and 14 of special concern.
- Areas of the watershed that have exhibited particularly large species losses include the Peel Plain and the Great Lakes Shoreline. An area of high diversity is the Niagara Escarpment and some northern areas of the watershed.

#### **6.4.8 Prohibited Use on Conservation Land**

- CVC land is acquired primarily to protect ecosystem form, function and species in perpetuity. Where recreation occurs, CVC tries to control it in order to prevent damage to ecosystems. Most CVC properties have some form and degree of neighborhood and development pressure.
- There is an increase in demand for public open space and recreation facilities which can conflict with land protection.

- Encroachments and trespassing is occurring, to some degree, on every CVC property.
- There is an increase in unsanctioned activities on properties in the northern part of the watershed; horseback riding on 30% of the properties; mountain biking on 65%; motorized vehicular traffic on 36%.
- Dangerous and illegal activities occur more often on the southern-owned properties due to ease of accessibility. Inappropriate activities occur on 76% of the properties and 43% have unsanctioned fire pits.

#### **6.4.9 Fishing and Hunting**

- Hunting and fishing issues are generally the same throughout southern Ontario.
- The Credit River Fisheries Management Plan guides provision and management of fishing opportunities in this watershed.
- Lake Ontario stocking is directed by MNR's Lake Ontario Management Plan.
- Hunting is not permitted on CVC lands for recreational purposes however illegal hunting is occurring.

### **6.5 OTHER**

The following are important environmental issues but CVC either does not have a clear mandate in these areas, lacks expertise, has current higher priorities in its mandate, or there are other agencies better suited as lead.

#### **6.5.1 Cultural Heritage**

- CVC does not have a mandate for cultural heritage but as a landowner we manage a number of culturally significant sites such as Belfountain and Limehouse.
- Some of these cultural heritage sites are degenerating and in some cases pose a risk to the public if not properly managed. In some cases these sites can be a drain on CVC's limited funding.

#### **6.5.2 Energy Conservation**

- Energy demand in the watershed is continuing to grow which will require energy conservation and new sources of power which are hopefully environmentally friendly.

#### **6.5.3 Air Pollution**

- The air quality in the Credit Watershed is similar to that of all Southern Ontario and the Greater Golden Horseshoe.
- Almost 50% of GTA air pollution comes from trans-boundary air pollution from the U.S. (Regional Municipality of Peel, 2003) the rest is from local emissions within the watershed and those from neighboring areas. As a result, the lower watershed is one of the worst air pollution areas, reflective of the Greater Golden Horseshoe.
- Air quality has fluctuated since 1995 but has not improved vastly due to increasing urbanization and industry in the lower watershed, despite stricter air quality standards and emission reduction agreements.

#### **6.5.4 Waste Reduction**

- In 2004, 12 million tons of waste was produced in Ontario, an amount that continues to increase annually.
- Ontario has set a target of diverting 60% of waste from landfills by 2008. The Region of Peel has a target of 70% by 2016 and in 2006 the Region of Peel launched its “Conservation Challenge” supporting the Province’s waste reduction and diversion efforts.

#### **6.5.5 Agricultural Land Protection**

- Southern Ontario’s limited supply of agricultural land is going out of production at an increasing rate. Urban sprawl and farmland severances contribute to the loss of thousands of acres of productive agricultural land in Ontario each year.
- Between 1976 and 1996 more than 150,000 acres of farmland in the GTA (or 18% of Ontario’s Class 1 farm lands) were lost from food production.
- Since 1976, the number of farms in Peel has dropped 35%, with the majority of the losses being experienced in Mississauga and Peel.

### **7.0 PRESSURES AFFECTING THE CREDIT VALLEY WATERSHED**

#### **7.1 PRIORITY 1**

##### **7.1.1 Drought and Flooding**

Drought and flooding can have impact on water quality, water quantity, habitat and biodiversity, public safety (loss of life) and socio-economic condition (e.g. property damage due to flooding and lack of water for irrigation in the case of drought). An increase in the frequency and severity of extreme weather events is expected to accompany climate change.

##### **7.1.2 Lack of Adequate Development Standards**

Development standards direct how urbanization takes place through such practices as zoning of land use, road widths, lot sizes, construction processes, and Best Management Practice (BMP) requirements. Municipal standards are often adopted from provincial agencies (e.g. Ministry of Transportation (MTO) road widths standards) to address public safety concerns (e.g. road widths to accommodate emergency vehicles, snow plows, etc). In order to provide concise and consistent direction to development proposals, municipalities have to date been unwilling to review standards or provide flexibility in standards to protect natural features/functions, public and ecosystem health.

##### **7.1.3 Deteriorating Urban Environment**

Urban environments can be considered to be deteriorating as a result of many factors. In terms of groundwater quality, urban environments can be impacted when metals, organic chemicals and other contaminants migrate to the groundwater system. Chloride (from road salting) is one of the most difficult groundwater pollutants to control as it moves through soil without being attenuated. Urbanization can also lead to increased impervious area which can cause a decrease in groundwater recharge, thereby impacting baseflows and aquatic habitat, and can also reduce groundwater supplies for municipal groundwater wells.



Since urbanization alters hydrology, it also impacts surface water quality. The watershed's ability to filter pollutants through infiltration is reduced by increased impervious cover. Increased impervious cover (>10%) leads to higher peak flows and pollutant loads, and reduces infiltration and baseflows in receiving waterways. Increased sediment loads in runoff also carry higher concentrations of metals (aluminum, zinc, copper), bacteria (fecal coliform, E. coli), and nutrients (e.g. phosphorus) into streams.

Urbanization can result in higher water temperatures, increased amounts of trash and debris jams, increases in pesticides (insecticides, herbicides), and increased hydrocarbons (resulting from fossil fuel combustion) in both surface water and stream sediments. Poor water quality and sediment quality, along with habitat disturbances lead to degraded biological communities (benthic invertebrates and fish) in urban streams.

In terms of the effects of urbanization on terrestrial environments, the loss of natural areas, as a result of land clearing and conversion for housing and infrastructure, can have a number of impacts. Natural areas, and therefore habitats for plant and wildlife species, are lost in urban environments as a result of land clearing for development and roads, with remaining "green spaces" often becoming fragmented. This kind of habitat loss and fragmentation has been linked to local species extirpation. In addition, land conversion practices can reduce ecosystem function of (and therefore the ecological services provided by) species, communities and populations. Urban environments have also been linked to increased levels of air pollution, increased temperatures in the vicinity of cities (Urban Heat Island Effect) and decreasing soil quality.

Populations living within urban environments require recreational areas for human health and well-being. The loss of natural areas, coupled with concentrated populations often result in an overuse & misuse of existing urban and near-urban natural areas. Therefore, additional natural spaces are often needed, not only for plant and wildlife species, but also to provide more opportunities for public appreciation of the environment, which ultimately resulting in protection. The environmental disconnect makes it difficult for people to realize their practices (e.g. pesticide use, littering, illegal dumping/spills, car washing, car maintenance, lawn care, etc) may be harmful to the environment.

#### **7.1.4 Impervious Surfaces**

In an urban area, the change in land use from natural (pervious) ground cover to paved surfaces and rooftops typically reduces infiltration and recharge by 25 to 60% for shallow aquifers and 33 to 80% for deep aquifers. This reduction in infiltration to shallow aquifers can lower the water table which in turn can reduce or eliminate springs and discharge to surface waters. Reductions in the volume of upwelling areas in streams can effect spawning areas and coldwater fisheries. Baseflow reduction can cause losses of marsh and fen vegetation and can reduce biodiversity and quality of both upland (e.g. forest, woodland, meadow) and lowland (e.g. marsh fen and swamp) communities.

Reduced infiltration and evapotranspiration (which is the result of increased impervious surfaces) leads to increased runoff and pollutant loads to receiving

waterways. Urban sediment from runoff contains contaminants such as Pb, Zn, Cd, nutrients and bacteria, which have impacts on aquatic and human health. Additional effects of impervious cover include direct loss of terrestrial habitat and increase in heat island effect. Trees reduce runoff by intercepting precipitation and reduce local temperatures by providing shade. [In a 24-hour period, one large tree can lift up to 100 gallons of water out of the ground and discharge it into the air (Trees Canada, 2006).]

### **7.1.5 Natural Hazards**

Natural hazard (flooding and erosion) management in Ontario is a matter of Provincial interest and CVC has been designated as the lead implementing agency for natural hazard policies within the Credit Watershed. Orderly land use planning (e.g. through applications made under the Planning Act) and the regulations of development (e.g. through applications made under the Conservation Authorities Act) represent the preventive or proactive approach to hazard land management. Under this preventative approach, the primary objectives are to prevent the loss of life and to minimize property damage. Under Ontario Regulation 160/06, areas subject to a Conservation Authority's regulation include watercourses, hazardous lands, river or stream valleys, the shoreline of Lake Ontario and wetlands. There is a need for improved public understanding of natural hazard land management including terminology, planning approaches, construction measures for prevention of loss of life and property damage.

### **7.1.6 Sediment and Erosion**

Erosion problems associated with construction activities include water pollution, flooding, stream channel damage, decreased groundwater storage, slope failure, damage to adjacent and/or downstream properties, and the time and costs associated with addressing these issues.

Sediment loading of a watercourse can cause the following problems:

- Obstruction of navigation – If sediment from fast-moving rivers is deposited downstream, it eventually builds up and may make the water too shallow for boats or ships to navigate.
- Damage to fish/aquatic habitat – Sediment in streams directly affects fish in several ways:
  - Suspended sediment can irritate fish gills and lead to death. It can also destroy the protective mucous covering the eyes and scales of fish, making infection and disease more likely.
  - It cuts down on the light penetrating the water. This affects fish feeding and can reduce fish survival.
  - Settling sediments can bury and suffocate fish eggs.
  - Sediment particles absorb warmth from the sun thus increasing water temperature. This can stress some species of fish.
- Sediment can also destroy wetlands and their functions for water storage and purification. Wetland habitats are also the most sensitive, diverse and productive fish and wildlife habitats. The Credit River Fisheries Management Plan (CRFMP) has identified sediment from construction sites as a primary problem in the destruction of fish habitat that needs to be addressed.

### **7.1.7 Dams, Liability and Environmental Impact**

Dams are natural (e.g. log jam) or artificial (human-made) barriers that control the flow of water. Typically, natural dams are short-lived and have negligible long-term environmental effects on riverine ecology. Human-made barriers were originally built to provide a form of social or cultural benefit (e.g. hydro power for milling operations), but the physical footprint can last for 50 or more years. It is important to protect public safety by providing safe design, construction, operation and maintenance of dam infrastructures. A dam break can result in destruction of downstream properties and infrastructure, loss of life and violation of downstream landowners' riparian rights. Dam owners are liable for property damages downstream as well as environmental impacts (e.g. Fisheries Act fines for impacting the fishery can exceed \$1 million).

The impacts of such water control features (and their failures) can have long-term impacts on water quantity and quality related to their impounded waters. Fish and all aquatic, riparian and wetland life downstream are ultimately impacted. As examples, dams can prevent or reduce fish and wildlife movement, thereby isolating populations. They increase water temperature to the detriment of many cold water species, and replace upstream species with more lake-like species. They can enrich nutrient status in the waterways thereby causing excessive plant/algae growth and loss of oxygen. Dams may also affect sedimentation processes, causing a build-up upstream & loss of sediment loading downstream. This commonly also results in increased erosion downstream of dams.

### **7.1.8 Loss of Habitats, Natural Areas and a Need for Protected Spaces**

#### *Habitat*

Habitat refers to the environmental conditions in which plant and animal species breed, feed, move, grow and conduct other activities. Often habitats are characterized by physical features (such as soil and water) and biotic features (such as vegetation structures). Habitat loss (or loss of natural areas) occurs when habitat is converted to other human-dominated land uses.

The amount and size of a habitat can strongly limit population size. Generally speaking, an increase in habitat, by increasing habitat size or number of habitat areas, will result in an increase in population. Larger, "more robust" populations are less susceptible to environmental events (e.g. weather, disease, and predation) and variability in population growth rates from season to season. Therefore, in order to protect species, one needs to protect the habitat(s) in which they reside.

In addition to preserving species and populations, natural areas help maintain surface water quality by reducing sedimentation, maintaining desirable water temperatures and absorbing pollutants (nutrients, metals, etc.). As an example, CVC's monitoring program has shown that sites in the lower portion of Fletchers Creek with a greater area of surrounding forest cover, rank higher in terms of water quality versus those in the upper portion that have less forest cover.

Natural areas also help maintain surface water quantity. Loss of natural areas through urbanization leads to a decrease in overall recharge to the groundwater system (and an increase in runoff to streams). Decreasing overall recharge can then

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lead to decreased base flows to rivers and creeks, causing degraded surface water quality, loss of natural habitat and impact to fisheries.

#### *Protected Spaces*

A significant issue associated with CVC's Conservation Areas and the watershed's overall health is in fact providing awareness about the need to secure and provide protected areas, and providing an understanding as to why these areas are so important. The reasons for protection and securement can be broken down into ecological, economic and social reasons. Environmental reasons include awareness about protected spaces as significant habitats, their role in protecting significant species, providing connectivity in the landscape and securing natural ecosystem functions. Economic reasons include the value the natural environment provides, such as improvements to air & water quality, flood attenuation, temperature regulation (e.g. shade), and contributions to food & medicines. Social reasons can include awareness about the importance of recreation in healthy living, providing areas for family and friends to be outdoors, providing communities with a sense of place and balancing urban growth. As the population increases, so too does the demand for protected spaces.

### **7.1.9 Water Supply**

Groundwater and surface water taking has the potential to decrease baseflows to creeks, rivers, and wetlands, which can negatively impact surface water quality, natural areas, and the health of cold and cool water fisheries (e.g. higher temperatures, increased concentration of pollutants). Rising populations lead to increased demand on ground and surface water resources for domestic potable water, as well as industrial, commercial, recreational and other uses.

### **7.1.10 Disease and Pests**

A disease is a malady that is caused by a microscopic pathogen (bacteria, yeast, fungi, and virus) or an internal biological malfunction that is harmful. Diseases generally have an impact on the resilience of a species or even a population. Pest species are those that adversely affect habitat functions, either by preying on, or directly competing with native species, thereby disrupting ecosystem function. Depending on their severity, both diseases and infestations of pest species can decrease fitness, impair reproductive ability, and even cause outright death in other organisms (e.g. Dutch Elm disease, West Nile Virus, and Asian Long-horned Beetle). Climate change is expected to increase the occurrence and spread of pests and diseases.

Often, the root cause of this problem has been accidental importation of a pest or disease from outside North America and infection of a living population with no or little natural resistance. Native diseases and pests are still a concern given that ecosystem health and vigor may be compromised by climate change, resulting in conditions that could support severe breakouts.

### **7.1.11 Prohibited Use**

CVC lands, like many other protected areas, have a number of different uses allowed on them. Unfortunately, there are also a significant number of uses occurring on CVC lands that are prohibited which can detrimentally affect protection of species and habitat. Education about these prohibited uses is an important tool towards

managing these areas properly in terms of protection, appreciation and recreation and in managing our liabilities. Education about these uses needs to focus on the rationale for rules and awareness of them. Some of the major immediate concerns on conservation authority-owned lands are encroachments, motorized uses, environmentally and socially inappropriate trail uses, hunting, illegal fishing, plant harvesting, squatting, dangerous activities, camping and activities that may indirectly or directly impact upstream and downstream landowners (e.g. tree cutting and/or removal of buffer vegetation, excessive water-taking and illegal effluent discharge).

#### **7.1.12 Neighbourhood and Development Pressures**

Conservation Lands are experiencing significant pressures from existing neighbouring communities and developing ones as well. These pressures come in many forms including inappropriate access, encroachments, capacity conflicts and use requests. Awareness and understanding of these pressures from planning, public and partner perspectives is needed in order to address some of the serious implications of balancing public access to protected areas and watershed growth.

#### **7.1.13 Biodiversity**

Biodiversity refers to the number and abundance of species, populations, individuals and genes within an ecosystem. All species depend on each other (to some extent) for survival, so that if one or more become extinct, other species that rely on it will be negatively affected. For example, various butterflies, bats, and other mammal species pollinate 90% of the world's flowering plants. Without their pollinator(s), these flowering plants would not be able to reproduce themselves. All levels of biodiversity (e.g. genes, populations and species) make up an ecosystem. If a component of the biodiversity is removed from an ecosystem, the health of that system will suffer. The ecosystem becomes less resilient to environmental change (e.g. climate change), and other parts of it become susceptible to extinction.

#### **7.1.14 Fragmentation, Corridors and Connectivity**

Fragmentation refers to the loss of contiguous ecological communities (habitat), which results in an isolation of plant, fish, and wildlife populations. As an example, roadways often fragment the landscape and have led to the death of numerous frogs, turtles and snakes that have tried to cross from one habitat patch to another.

Corridors are a mechanism which permits individuals and populations to move across the landscape through or around other land uses. Connections between habitats are important for maintaining plant, fish & wildlife species, communities and populations. Without connectivity, small, isolated populations are driven towards local extinction by many factors (including inbreeding depression and local catastrophic events). Connectivity between populations allows several small populations to function as a group. Dispersers from one population can settle in other populations, increasing the numbers, and introducing new genes. Because they are then behaving more like a single large population, many of the deleterious small population events are mitigated.

In the southern portions of the Credit River Watershed, connectivity is mostly maintained along riparian corridors (north-south), resulting in populations of many species being limited to these areas. East-west connections are rare. It is expected that climate change will reinforce the importance of corridors by allowing for species

migration as a coping mechanism. Climate change will also likely alter habitats and how they function, which in turn may lead to increased habitat fragmentation.

#### 7.1.15 Spills

A “spill” refers to a discharge to the natural environment from a structure, vehicle or other container, that is abnormal in quality or quantity in light of all the circumstances of the discharge (EPA, 1990). As noted previously, since 1982 there have been over 6000 spills reported by watershed municipalities.

- Spills – be they to air, land or water – have serious potential to harm human health, impact the environment and their associated terrestrial and aquatic resources.
- Spills may include industrial, private residential, gas stations, wastewater treatment plant bypass, landfill, etc.
- Impacts could include upsetting the biological process within a Waste Water Treatment Plant (WWTP); direct spilling to a watercourse or groundwater recharge area leading to deterioration in ecological communities and human health.

#### 7.1.16 Rural Pollution

Rural pollution focuses upon the land use activities that contribute bacteria, nutrients and phosphorus to surface and groundwater sources across the rural landscape. These sources include point and non-point sources and occur across economic and social sectors. CVC’s Sourcewater Protection Characterization Study notes that nitrate/nitrate contamination from rural sources including septic and agricultural sources has increased in Erin, Georgetown and Orangeville. Key land uses that contribute to rural pollution include:

- Residential subdivisions,
- Landfill sites,
- Golf courses,
- Agriculture (Intensive & Non-Intensive).

#### 7.1.17 Species at Risk

Species at risk are those species and/or populations considered to be rare or at threat of extirpation or extinction. Species can be considered to be at risk federally (i.e. it is rare in Canada) or provincially (i.e. the species is rare in Ontario). Examples of species occurring in the Credit River Watershed that are considered to be both federally & provincially at risk include: redbreasted dace (*Clinostomus elongates*), Blanding's turtle (*Emydoidea blandingii*), milksnake (*Lampropeltis triangulum*), American ginseng (*Panax quinquefolius*) and Jefferson salamander (*Ambystoma jeffersonianum*).

As noted in Section 7.1.13, many of the reasons to be concerned about species abundance (or alternately the presence of species at risk) relate to biodiversity (i.e. the interdependence of species of each other, and that the loss of a species may have a greater impact on the ecosystem it inhabited). Some roles that a particular species may serve include: acting as a food source, or transportation mechanism for another species, acting as population control (through predator-prey interactions), and providing habitat. Some examples include: butterfly-milkweed relationship, insect pollinators, raptor-rodent species relationships, and goldenrod-goldenrod gall-fly relationships.

In addition to serving a role in the ecosystem, changes in species abundance (or alternately, the appearance of species at risk) can indicate that environmental changes are occurring. For example, fish and benthic species are indicators of water quality and their communities reflect surrounding land use practices (i.e. watersheds with high impervious cover have low species diversity and poor water quality; such waterways act more to convey water than to provide habitat).

### **7.1.18 Septic Systems and Municipal Servicing**

*Municipal Servicing issues include:*

- Bypasses
- Excessive loadings into waterways. The Credit River is currently above the Provincial Water Quality Guideline for phosphorus due in part to contributions from Wastewater Treatment Plants (WWTPs).
- Cumulative effects occur as the number of WWTP increase on the Credit River.
- WWTPs do not treat compounds such as Pharmaceuticals, Hormones etc. Over time these compounds could have cumulative effects on human and aquatic life.

*Septic System issues include:*

- Groundwater impacts from failing and improperly maintained septic. Major concerns include: ammonia, nitrate, chloride, and E. coli loadings to shallow aquifers.
- Landowners give very little attention to maintaining septic systems until it becomes obvious (i.e. septic pooling on their lawn).
- WWTP's are not economically feasible for small communities.
- Education and enforcement is lacking.

### **7.1.19 Invasive Species**

Invasive species are those that increase in abundance or distribution beyond natural controls. Usually these species are non-native. The spread of invasive species displaces native or natural species resulting in a decrease in biodiversity and productivity. As an example, garlic mustard will aggressively spread and out-compete numerous herbaceous species native to deciduous forests in the Credit River Watershed.

### **7.1.20 Aggregate Extraction**

Aggregate extraction refers to extraction and use of gravel, sand, limestone and shale. Aggregate mining most commonly converts undeveloped or agricultural land, to an open pit. Mining of the aggregate can result in erosion; sedimentation; disruption to groundwater flow and stream hydrology, and habitat loss.

When new aggregate areas are established, removal of natural areas can cause disruption to baseflows. In addition, dewatering practices for purposes of aggregate extraction below the water table can decrease baseflows to rivers and creeks, leading to degraded surface water quality, loss of natural habitat, and impact to fisheries resources. Lowering of the water table can also cause negative impacts on nearby ponds and wetlands.

Ponds associated with quarrying can also raise water temperature leaving the site, which may impact coldwater fisheries. These ponds also increase evaporative losses.

Quarry activities may also impact nearby residents through increased truck traffic, noise, dust, as well as aesthetic impacts to the landscape (e.g., construction of berms, etc.). Rehabilitation of the quarry and its use following operations may also cause environmental issues.

### **7.1.21 Lack of Environmental Awareness**

In a growing and developing watershed, there is a need for increasing the awareness of the watershed community on general environmental principles. These principles can act as the building blocks to a community committed to protecting the natural resources of their surroundings. They are the building blocks because they act as a foundation of environmental awareness that begins the difficult process of fostering the need, and practices, for protection. In general there tends to be a disconnection between humans and the natural environment around them. We often fail to recognize that our health is directly linked to the health of the environment of which we are part. In communities with diverse populations, expanding urban development, limited focus on green spaces and few remaining natural areas, there can be a disregard for the natural environment and its protection. Before behaviors concerning environmental protection can be changed consistently and effectively, people need to understand more about the features and functions affected if change does not occur.

In many cases, specific environmental policies or concerns can be effectively communicated and enforced only if basic environmental themes are understood. Using conservation area visitors as an example, it is much more effective to protect natural resources such as a wetland plant from being picked, when the value of that resource is understood through basic environmental principles; wetland plants support the role that wetlands play in water quality protection, water quantity management (i.e. through retention) and significant species habitats. As long as there is general understanding by visitors or watershed residents, informed decisions can be made and further issues addressed. There needs to be a greater role played in fostering awareness of general environmental, natural and earth science themes such as, but not limited to, habitats, species, landscapes, functions, influences and ecosystem services.

## **7.2 PRIORITY 2**

Note: These are not lower priority environmentally but within CVC ranking system of mandate and expertise.

### **7.2.1 Soil Quality and Quantity**

Soil is that substrate composed of living and non-living components that provides nutrients to plant life, decomposes organic matter, and retains and filters water. Soil is to terrestrial ecosystems what water is to aquatic ecosystems.

The natural services (e.g. air and water quality, flooding and erosion control and climate change mitigation) provided by terrestrial ecosystems (wetlands, forests,



meadows) are dependent on maintaining soil quality and quantity on the land and reducing soil loads into wetlands and water bodies. Carbon, water & nutrient cycles (e.g., nitrogen and phosphorus) cycles all rely on the ability of soil fauna (bacteria and fungi) to decompose organic matter into useable forms for plant growth. Healthy soil fauna also retain and filter water.

Soils may be degraded or enhanced both through natural processes and human activities (e.g. erosion). Human activities can influence soil properties by causing increases in bulk density and compaction from agricultural tillage, urban development and road operations. Soil acidification occurs from inorganic fertilizers and acid rain.

### **7.2.2 Landform Conservation**

Landform is based largely on underlying surficial geology. In southern Ontario, this geology is a result of the last glaciation period (approximately 12000 years ago). Key landform characteristics of elevation, aspect and degree of slope are, when combined with climate, the main controlling factors in ecosystem processes (both terrestrial and aquatic).

Landform conservation is the protection and wise use of the land base, including its form, soils and associated biophysical processes. Conservation of landform is an approach that encourages planning, design and construction practices that minimizes disruption to natural form and related ecological processes, and enhances the protection of biophysical features in a natural state while keeping a greater portion of the site in an open-space character. Landform conservation practices also indirectly maintain the visual character and identity of the landscape.

The Conservation Authorities Act prescribes the ability to regulate development if, in the opinion of the Conservation Authority, the conservation of land may be affected. CVC has been involved in landform conservation efforts with regards to the preservation and/or conservation of stream & river valley features, which are advocated within current provincial and organizational (i.e. CVC) policies. Landform conservation is an ongoing topic that requires continual discussion and education of the development community, municipalities and landowners in order to facilitate identification and protection of natural heritage features, minimize disruption to the ecological integrity of these systems, and enhance restoration opportunities where degraded landscapes can be returned to a more natural state.

### **7.2.3 Fishing and Hunting**

In this context fishing refers to management of fish species and populations (native and non-native) for recreational and commercial purposes. Only recreational and commercial fish habitat is protected under the Fisheries Act by the Department of Fisheries and Oceans (DFO) and Conservation Authorities (CAs). CVC highly values the protection of fish as ecological watershed indicators. Wildlife tends to be more widely valued for aesthetic and ecological functions. Over harvesting may threaten passive and consumptive uses. In some cases "nuisance" fish or wildlife may require targeted removal/hunting/trapping and it may also be done for commercial or recreational benefits.

Hunting remains in the domain of MNR. CVC has provided limited hunting opportunities in the past on CA-owned lands. Other CAs also provide some limited opportunities through the CA Act which allows for regulation of this activity. Hunting is often considered to be a more complex issue than fishing, given to some emotional optics (bambi-ism) and safety/liability concerns related to guns. CVC will consider hunting in unusual cases backed by biological principals for "controlled" hunts. These situations would normally involve pests causing significant social or economic costs (e.g. crop loss) combined with ecological needs such as loss of natural balance between vegetative food/cover, prey and predators (e.g. overgrazing; overpopulation; disease; migration from land clearing for urban expansion). In rural areas, where firearm discharge by-laws allow hunting, it is permitted on private land with permission.

Pest control services are available in urban areas and may involve poisoning, trapping and removal. Relocation is now more strictly controlled by MNR. Beaver trapping and alternative methods of control and conservation are, next to fisheries, the most active program areas for CVC given the direct relationship between beavers, fisheries and water resource planning such as flooding and wetlands. There are licensed trappers that cover the entire watershed.

There are fisheries concerns related to the need to preserve native genetic stocks for future socio-economic, ethical and biodiversity goals. Threats to genetic stocks include habitat losses, competition with exotic species as well as "exotic" genetic strains of the same species. The latter concern is primarily a fisheries issue given the widespread stocking activity by MNR and private pond aquaculturists. Stocking activities are generally supported by CVC, who also stocks a few ponds on a "put and take" basis for recreational opportunities in conservation areas. Stocking for rehabilitation and replacement of lost species for ecological purposes can be justified, but some recreational & commercial demands are sometimes debated. Unintentional and bait fish introductions (including e.g. gobies, zebra mussels and rusty crayfish) are also a concern.

Harvest rates, stocking and licensing of anglers and hunters is regulated by MNR.

#### **7.2.4 Pesticides**

Pesticides are a suite of insecticides, fungicides and herbicides that are chemicals or organisms (e.g., *Bacillus thuringiensis* bacteria) that are used to control the outbreak of pests and diseases (e.g. West Nile Virus mosquito larvicide through methoprene pellets in stormwater catch basins) in the ecosystem and on food and ornamental plants, including lawns and agricultural crops.

These chemicals can be naturally-derived from plants that produce their own chemical toxins to ward off insect predators (e.g., pyrethrins) or they can be artificially produced in a laboratory as nerve agents to kill insects (i.e., sprayed organophosphates like malathion for West Nile Virus adult mosquitoes) or to interfere with photosynthesis in growing plants (e.g. glyphosate).

### 7.2.5 Great Lakes Shoreline

Lake Ontario is the smallest of the Great Lakes (310 kilometres long and 85 kilometres wide, with 1168 kilometres of shoreline). Its average depth is 283 feet (~86 metres), and its maximum depth is 802 feet (~245 metres).

Lake Ontario is not only significant because it is one of the largest freshwater ecosystems in the world, but because it also contains unique terrestrial communities along its shoreline (such as coastal wetlands). Great Lakes coastal wetlands are highly productive and diverse communities of plant and animal life. They are essential to the well-being of the Great Lakes ecosystem. Their unique vegetation provides cover and food for wildlife, helps protect shorelines from erosion, and helps improve water quality by filtering pollutants and trapping sediment. These wetlands are home to a wide variety of wildlife species – some of which are classified as rare, endangered, or threatened.

Wetlands are critical for waterfowl as both nesting and migration habitat. In fact, it is estimated that 68 bird species are either totally or partially dependent on Great Lakes basin wetlands ([www.ec.gc.ca/water/en/info/pubs/primer/e\\_prim09.htm](http://www.ec.gc.ca/water/en/info/pubs/primer/e_prim09.htm)). In addition, it is estimated that each spring 40 species of migratory bird (from the tropics) fly along the shores of Lake Ontario, resting overnight in small woodlots, grassland and agricultural areas (<http://www.nysgextension.org/qlhabitat/epacd/pages/wildlife/migratorybirds.htm>). Many fish species also depend on Great Lakes wetlands for spawning, resting, and feeding, as do species of mammals, herpetofauna and insects. The freshwater and wetland ecosystems of the Great-Lakes-St. Lawrence have undergone major historic declines in biodiversity from land uses as well as pollution and invasive species introduction.

Watersheds contribute ~1% of Great Lakes water (with the remaining 99% coming from the glacial era) therefore cumulative water takings beyond 1% will not be renewed (i.e. lake levels will drop). Current water taking legislation and management do not account for cumulative water takings to assess if we are drawing beyond 1%. Climate change is expected to lower lake levels which will have negative impacts on water intake, shoreline property and water quality. The US Environmental Protection Agency has ranked urban storm water runoff as the second largest source of impairment of lakes and estuaries in the United States (Lee and Jones-Lee, 1994). In terms of shoreline protection, this issue refers to the understanding and management of the watershed to protect public and ecosystem health.

Since the Credit River flows into Lake Ontario, the health of the Credit River and its tributaries impact the Lake Ontario Shoreline. CVC's area of jurisdiction includes not only the 15 kilometres of Lake Ontario Shoreline, but also to a limited extent, the area out to the international border.

## 7.3 PRIORITY 3

Note: These are not lower priority environmentally but were lower within the CVC ranking system related to either/or/and: CVC mandate, CVC expertise to deal with the issue, or the mandate of other agencies.

### **7.3.1 Need for Cultural Heritage Management**

Cultural Heritage refers to those sites, areas or structures which have been identified as being historically and/or socially important at a local, provincial, national or international level. The Credit River Watershed contains numerous significant local, regional, national and international historic sites and structures. CVC does not have a mandate for cultural heritage, but has acquired several culturally-significant sites through the Greenlands Securement Program (which targets sites in order to protect their natural heritage features and functions). At the present time CVC has insufficient resources to manage both natural and cultural heritage.

### **7.3.2 Climate Change**

Climate change is a change in the “average weather” and variability in weather that a given region experiences. Average weather includes all the features we associate with the weather such as, temperature, wind patterns and precipitation. It is believed that climate change is mainly being modified by human activities, particularly deforestation and the use of fossil fuels.

The theory is that the temperature on Earth is regulated by a system known as the “greenhouse effect”. Greenhouse gases primarily water vapour, carbon dioxide, methane, and nitrous oxide, trap the heat of the sun, preventing radiation from dissipating into space. Without the effect of these naturally occurring gases, the average temperature on the Earth would be  $-18^{\circ}\text{C}$ , instead of the current average of  $15^{\circ}$  (Environment Canada, 2005). Life as we know it would be impossible. Over the past 200 years, emissions of “greenhouse gases” associated with human activities have accumulated in the atmosphere, where, because of their long life, they remain for anywhere from decades to centuries. As a result, since the Industrial Revolution, concentrations of carbon dioxide have increased by 30 per cent, methane by 145 per cent, and nitrous oxide by 15 per cent (Environment Canada, 2005). In effect, by increasing the amount of these heat-trapping gases, we have “enhanced” the natural greenhouse effect to the point that it has the potential to warm the planet at a rate that has never been experienced in human history. Already, the average global temperature has increased by about  $0.5^{\circ}\text{C}$  in the past 100 years, and temperature increases over the next 100 years are expected to significantly surpass any such change of the past 10,000 years (Environment Canada, 2005).

The impacts of climate change include: excess runoff volumes resulting from intense precipitation events and/or snowmelt, which can have variable impacts on water quality by washing in higher than normal levels of sediments, nutrients, metals and micro-organisms into our watercourses and waterways, and more frequent periods of drought (during this period water levels are low, reducing the supply of water usage and reducing the potential for mixing and dilution of effluent runoff). Climate change may also cause a loss of native species and biodiversity as all species will have to adapt to both changes in weather and the increase in adaptable and competitive species. Predictions have already been published that will directly see a decrease in coldwater fish species and an increase in aquatic invasive species.

Climate change will likely result in a decline in local air quality. All industries will be affected by climate (users as well as producers of energy). Policies relating to climate change may affect the manner in which business is conducted in the 21st century. Current estimates are that current  $\text{CO}_2$  levels will warm the mean global

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temperature between 1.4 & 5.8 degrees Celsius (Intergovernmental Panel on Climate Change, IPCC).

Climate can also impact health due to higher temperatures, more frequent storms, and increases in air pollution episodes. Changes in the transmission of insect- or water-borne diseases could also have an impact on Canadians' health. As well as affecting the health of individual Canadians, these projected changes would place additional stresses on the health-infrastructure and social-support systems (World Health Organization and Environment Canada, 2005).

### **7.3.3 Energy Conservation**

For years, governments have often dealt with energy shortages either by producing or purchasing more energy. When energy prices were low, few people noticed a significant change in their monthly bills. In recent years, electricity and natural gas prices have consistently reached record highs during peak use periods. All sectors of the marketplace are feeling the impacts. Not only is there a demand for change, there is a realization that changes must come from everywhere – government, industrial, commercial, institutional, and residential. Many feel this change must be accomplished in two areas – demand versus conservation and alternative energy sources.

For the foreseeable future an increase in energy demand is inevitable. However, there needs to be a balance between constantly producing more energy to meet demand and energy conservation. As energy demand increases, so do pressures and impacts on the environment. Even though Ontario's current electricity generation comes from a variety of sources such as nuclear, coal, and gas, less than 2% of the energy generated comes from renewable alternatives such as wind and solar. Not even all hydro-electric power generation is guaranteed to have minimal environmental impacts. Although demand for clean energy will increase as technologies to generate clean wind, solar, and hydro electricity become cheaper, government and private sector companies need to commit an appropriate portion of their budget to research, development, and promotion of alternative energy sources.

### **7.3.4 Air Pollution**

Air pollution is the accumulation of excess emissions from burning fossil fuels that produce carbon dioxide (a greenhouse gas contributing to climate change), nitrous oxides and sulfur oxides (that cause acid rain) and ground level ozone that cause smog and damage vegetation and soils when they are deposited through precipitation and wind. Air pollution also contributes to water pollution via precipitation, overland runoff, and degrading urban, rural and natural environments.

Certain chemicals, chlorofluorocarbons (CFCs) in particular, pose a threat to the ozone layer, which protects the earth's surface from damaging ultra-violet radiation. Thinning of this protective layer in the atmosphere can lead to a number of negative health effects including decreased effectiveness in human and animal immune systems, increased rates of skin cancer, and the alteration of specific plant structures associated with photosynthesis.

Ground-level ozone is a major component of smog and is generated through photochemical reactions between nitrogen and volatile organic compounds (30% of

which come from transportation modes such as automobiles, airplanes and trains). Ozone causes agricultural crop loss and noticeable leaf damage in many garden plants and trees (Ministry of the Environment, 2006).

The Credit River Watershed in particular is subject to air pollution due to the level of industry and car use through fossil fuel burning, as well as our location across from the Ohio Valley industrial corridor which transmits air pollution carried in the wind, around and across Lake Ontario.

Prevention of air pollution is achieved through better planning to reduce car use, cleaner emissions, as well as use of alternative energy sources, e.g. wind and biomass. Mitigation of air pollution is achieved through vegetation and soils.

Each healthy tree can reduce airborne dust particles by as much as 7000 particles per litre of air while simultaneously absorbing carbon dioxide. On a carbon-saving basis alone, urban trees provide greater benefits than rural trees because they reduce carbon emissions by reducing energy consumption associated with heating and cooling the environment. Researchers estimate that an urban tree can save five to ten times more overall carbon than a rural tree (Tree Canada, 2006).

### **7.3.5 Waste Reduction**

As Ontario's economy and population continue to grow, it becomes increasingly difficult to manage and mitigate the environmental impacts associated with growth. Direct environmental impacts range from use of non-renewable resources, like oil and gas, to the destruction of forest and wetlands to accommodate urban expansion. Indirectly, large-scale consumption of such resources produces tons of waste that finds its way into landfills, pollutes the air and contaminates drinking water. Similar to energy conservation issues, all sectors – government, industrial, commercial, institutional, and residential - are feeling the impacts of waste management and implementing waste reduction programs.

Similar to energy conservation issues, all sectors – government, industrial, commercial, institutional, and residential – are feeling the impacts of waste management and implementing waste reduction programs.

In 2004, 12 million tons of waste was produced in Ontario, an amount that continues to increase every year. Despite reducing, reusing, and recycling millions of tons of waste every year, it is, unfortunately, cheaper to send waste to landfills than to develop and implement waste reduction and diversion programs. For many, it is difficult to recognize the economic benefits of waste diversion and reduction because developing infrastructure for these programs is costly. Consider that Ontario waste management businesses employ thousands of people and generate over a billion dollars in revenue or consider that waste diversion would reduce the need for landfills.

### **7.3.6 Agricultural Land Protection**

Ontario is home to some of the best agricultural land in Canada. Because of the rich soils and favourable climate that is found in many parts of Ontario, the province boasts over half (52%) of all of Canada's class 1 farmland and most of Canada's land with high agro-climatic ratings. Prime farmland is capable of producing a wide

variety of agricultural products at an optimum level with very few constraints. It is important to protect farmland as a resource so that agriculture in Ontario and Canada can continue to evolve to meet market demands.

Prime farmland is classified in Canada according to a national classification system that is entitled the Canada Land Inventory (CLI). The CLI classifies land according to seven general classes. Best or 'prime' agricultural land refers to class one to three lands. According to the Canadian Census, the amount of land in productive agriculture in Canada reached its historical peak in 1951 and has been declining ever since. As farmland has continued to disappear in Canada, it has become evident that, "despite the vast size of Canada, only 11% of the land is of any agricultural use, and only one half of 1% is class one agricultural land". This fact, combined with the knowledge that several major urban centres are located directly on the best land in Ontario, highlights the importance of protecting high-quality agricultural land.

The Provincial Policy Statement (PPS) indicates that Prime agricultural areas shall be protected for long-term use for agriculture. The PPS defines Prime agricultural areas as areas where prime agricultural lands predominate. The PPS gives Specialty crop areas the highest priority for protection, followed by Classes 1, 2 and 3 soils, in this order of priority.

## **8.0 STRENGTHS, WEAKNESSES, OPPORTUNITIES & THREATS**

Client and staff surveys can provide an indispensable source of information. Surveys, particularly those that focus on an organization's strengths, weaknesses, opportunities and threats form an important and an integral part of any strategic plan. They provide a systematic methodology for collecting data on service outcomes and are inherently valuable because they:

- Are service/program oriented;
- Seek information about values/outcomes;
- Can be tailored to meet the specific needs of the organization;
- Are systematic;
- Offer an opportunity for clients and partners to provide feedback; and
- Are used as the basis for operational efficiencies and effectiveness improvements.

A Strengths-Weaknesses-Opportunities and Threats Analysis (SWOT) is frequently conducted using survey techniques. It is used as the basis to better understand those areas where an organization is functioning effectively as well as those areas where enhancements are needed. It allows strategic opportunities to be identified and at the same time provides important insight about threats that require consideration. It allows an organization to consider how it sees itself; how others see it and to design and implement management strategies that allow its strengths to be capitalized on and its weaknesses and threats to be overcome.

As with all outcome indicators, however, surveys should never be the sole method used to obtain this type of information. While they can provide valuable insight, they are not the preferred method when data can be more easily, more accurately and/or more inexpensively, collected from other sources. There are in fact, a number of limitations

associated with the use of client/staff surveys generally and some limitations that must be recognized with respect to the SWOT surveys that were conducted for the CVC.

Some of the more general limitations associated with the use of staff/client & partner surveys are that:

- Individuals are required to recollect perceptions of experiences or events that transpired in the distant past, which may or may not distort their current views;
- Questions may require complicated or detailed answers or explanations;
- Information may be requested that relates to the experience of others about whom the survey respondents may not be particularly well informed – in other words, experience dealing with the agency may be limited or restricted to a few scattered encounters;
- Some questions may necessitate the disclosure of sensitive information that may be either directly or peripherally relevant;
- Client & partner surveys can be time consuming and often costly to undertake;
- A reasonable sample size is needed in order to validate the results. While many clients, partners and staff will have an interest in providing feedback and input, it is not always a simple task to obtain a high enough level of response to ensure that the survey results provide a valid representation of client and staff experience. Success rests almost entirely on good survey techniques and a random, representative sample.

Apart from the general limitations noted above, there is also the overriding concern that while the primary purpose of a client/staff survey is to assess the benefits that are being provided and to identify those areas where improvement is warranted, it is critical that the purpose and intended use of the data be made clear at the outset. In conducting surveys, therefore, it is important not to raise expectations among respondents and further to ensure that any negative comments are not misinterpreted or misused.

## **8.1 METHODOLOGY**

In carrying out the SWOT analysis, the methodology that was used to carry out the data collection followed a standard approach that involved three distinct stages: design/develop; survey administration and data analysis.

During the initial design/develop stage, several critical decisions were made, specifically:

- What information was needed;
- Who could provide this information;
- How the data should be collected.

It was determined that specific information about the Agency's strengths, weaknesses, opportunities and threats was required. It was further determined that perspectives should be obtained from staff and others who work within the CVC and from clients and partners who offer an outsider's view. In this way, a mirror image could be developed of the Agency – a view from the inside looking out (Internal SWOT) and a view from the outside looking in (External SWOT).

A list of key informants was developed by senior management and a consultant was retained to complete all interviews. A standard list of questions was developed for the Internal SWOT and a separate list of questions was developed for clients and partners. These questions formed the basis for the External SWOT. Copies of the questionnaire templates are included in Appendix A.



Seven key informants were interviewed for the Internal SWOT Analysis. Three staff also provided input in electronic format. By comparison, 6 key informants were interviewed as partners and clients. A letter of introduction was first sent from the CVC General Manager to all identified participants and a follow up call was made by the consultant to arrange a mutually satisfactory interview time. With few exceptions, all who were contacted made the effort to be available to offer their perspectives and insight.

All interviews were conducted by telephone, with one exception and in this instance, a hard copy response to the standard questions was provided by the respondent. Several key informants also opted to provide additional input in hard copy following the conclusion of the interview. Generally speaking, all interviews were conducted in 30-60 minutes. Several key informants spoke for longer but on average, the interviews took 45 minutes to complete. All interviews were completed in the two week period between May 1<sup>st</sup> and May 13<sup>th</sup> and again, all interviews were conducted by one (1) individual, a consultant retained to assist the CVC with the Strategic Plan.

All respondents were advised that individual comments would be kept strictly confidential and that all insights would be collectively assessed and presented in overview format. The perspectives shared with the consultant were examined and the common linkages were identified. Specific comments that offered individual insight were noted by the consultant. This process was used for both the Internal and the External SWOT analysis.

## **8.2 LIMITATIONS**

Readers are cautioned when drawing conclusions in relation to the SWOT analysis. On a positive note, respondents were particularly straightforward in their responses and, as a result, offered valuable insight with respect to the operational effectiveness of the CVC. However, it must be realized that their perspectives and insights represent their views at one point in time. In order to be truly representative, a much larger sample size is required. In addition, regular interviews should be conducted over time to avoid a static perspective and in order to be able to effectively compare the results secured. That said, the SWOT interviews offered an opportunity to glean insight from insiders as well as those who have worked with the CVC and who have opinions and suggestions for continuing to focus on those areas of strength as well as those areas where improvements are possible.

## **8.3 CONCLUSIONS**

In conclusion, there were few salient differences between the responses received from the internal SWOT and those received during the external SWOT analysis. In fact, many of the key areas of strength were duly noted by both staff and external clients and partners.

### **8.3.1 Strengths**

In assessing the Agency's strengths, it was noted that:

- The focus rests on the right priorities;
- The issues list is realistic and well-placed;
- The Agency has an excellent track record of providing superb service;
- The watershed offers an excellent resource with which to work; and
- Management decisions made by the Agency are based on sound science.

Comments offered particularly by clients and partners focused on the Agency's track record of success; its dedicated and devoted staff and the superb leadership under which the CVC operates. Virtually all external partners and clients commented on the professionalism of staff and management and the visionary leadership that formed such an integral part of the Agency. Staff were viewed as knowledgeable and highly trained, credible, dedicated and competent and in short, most felt the Agency staff were focusing on the right priorities. Some offered the view that CVC staff are often rigid in their approach however, many felt this rigidity was necessary in light of the mandate and role of the Agency.

### **8.3.2 Weaknesses**

In considering areas of weakness, it was again evident that the views of those within the CVC largely mirror the perspective of those outside of the Agency. On the whole it was noted that the CVC is stretched to the limit and as a result are sometimes seen as overly rigid in its approach with respect to individual land use decisions. Funding pressures and the uncertainties associated with the current funding formula were noted as perhaps the single most critical area of weakness.

Fiscal challenges are frequently complicated by the Agency's broad mandate the fact that new areas of responsibility continue to be off-loaded from the Province to the CVC. Some felt the current governance structure was dysfunctional in that there were at times, polarized positions at the Board level and in some instances, Board Members were not always supportive of CVC mandate. Many felt the role of the Agency was not well understood, particularly by the general public and further that there were a number of cultural issues that warranted stronger community outreach by the Agency. In addition, there was some evidence to suggest that the role and mandate of the Agency was not well understood by all partners and clients. Many felt the decision making process itself was not well understood – for example, how funding priorities are established and the relationship between the Agency and the municipalities in the watershed.

In summary, some critical areas of weakness included:

- Human and fiscal resource limitations;
- Fiscal uncertainties and ongoing funding pressures;
- Broad mandate and new responsibilities from the Province.

### **8.3.3 Opportunities**

When questioned about areas of potential opportunity, internal Agency staff and management as well as external clients and partners agreed that there is a need to better demonstrate the value of the watershed among the general public as well as corporations. Some suggestions focused on the need to develop an economic value of the watershed as the basis for its valuation; others suggested a more muscular foundation for land acquisition was required. All were in agreement that there is tremendous opportunity to better engage stakeholders and to educate and increase awareness of the value of the watershed and its resources. Some suggested more focused cultural outreach to new immigrants who are moving into the area; others suggested focusing education and outreach among young people while others suggested focusing on the role that residents can play in effective watershed management. A number of suggestions were made that focused on the need to strengthen existing alliances and build new partnerships at the community level,

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among the general public, with municipalities, residents and special interest groups and stakeholders including the farming community.

Among those who responded, several key messages emerged as areas of potential opportunity. These include the following:

- *Educate urban dwellers about the importance of rural stewardship.* This was noted as particularly critical given the pressures on the watershed from urban growth at both the north and south end of the watershed reach. In addition, it was noted that the population is predominantly located in the southern end of the watershed but there is a need to demonstrate the unequivocal importance of headwater stewardship as we are all connected and the impact of upstream activity will be pronounced for downstream uses and users.
- *Shift the focus away from fish habitat and toward water quality.* It was noted by several respondents that to date, efforts to demonstrate water quality have been aligned with a fisheries habitat message – frequently difficult for the lay person to understand. However, if the message ties water quality and water conservation to water scarcity and drinking water and, by association, to human health, this is a message that will more clearly and more profoundly resonate with the vast majority.
- *Consider undertaking a proactive water strategy.*
- *Focus on the role and responsibility that residents can play.* Identify the important role they have in watershed management and ecosystem conservation.

In all, there was general concurrence among staff and clients that there is a real opportunity to better engage watershed residents and stakeholders and to focus greater effort on effective engagement, marketing and outreach.

#### **8.3.4 Threats**

There are several notable threats that have had and will likely continue to have an impact on the Credit River Watershed. Perhaps the most critical threat is the unrelenting growth pressures that have traditionally focused on the southern reaches of the watershed but in recent years, have been pronounced at both the north and southern perimeter. This unrelenting growth will continue to place significant pressure on the watershed and its resources and will present challenges for watershed managers to maintain current watershed health.

Another noted area of concern was the current climate crisis. While the climate change debate continues in academic and scientific circles, there appears more resounding evidence to suggest that global warming has been more pronounced in the last decade, and that climate change will bring with it profound changes from a watershed perspective. Higher energy levels in the atmosphere create more atmospheric instability which in turn results in changes in the level and rates of precipitation, evidenced by more catastrophic weather events and greater and more frequent periods of drought.

The inability to factor a dollar value on the watershed was also viewed as a real threat, both with staff and with clients and partners. The continued dominance of economic forces suggests that there is a real need to consider resource valuation. In addition, the lack of provincial direction concerning the overall role and function of Conservation Authorities was seen as an area that warrants attention. As mentioned previously, limited fiscal and human resources present a real threat from an enforcement perspective and many noted the limitations associated with a three-year electoral term and the subsequent inability to promote long range planning based on this cycle.

### **8.3.5 Summary & Conclusions**

Despite the limitations associated with the data set, the SWOT interviews provided valuable insight with respect to those areas where the Agency is performing well. The views of those 'on the inside' varied little from the views held by external clients and partners. The CVC enjoys a stellar reputation for quality service and adherence to its mandate. This is attributed in large measure to the excellent caliber of staff and the leadership and vision of management. While some felt the Agency was frequently viewed as too rigid in its approach, others felt it was this consistency and commitment that set the CVC apart. Duly recognized by staff and external clients, the Agency suffers from limited fiscal and human resources and there was general recognition both from those 'on the inside' and those looking 'from the outside in' that there are real opportunities to better engage watershed residents, community groups, special interest organizations, municipalities and corporations in the value of the watershed. Marketing, outreach and education provided a consistent focus for those who responded and several suggestions were made to focus on selected watershed residents, corporations and municipalities in this regard. While there are a number of notable threats facing the Agency, the time is right to take advantage of the many opportunities that present themselves; to capitalize on those areas of strength and at the same time, to focus on those areas where improvement is possible.

## **9.0 TACTICS**

"Strategies" in strategic planning jargon can be comprehensive plans, policies or tactics to deal with long-term or large-scale goals or issues. CVC has traditionally used "strategy" only for a comprehensive plan such as the Natural Heritage Strategy or Water Management Strategy. To avoid confusion, this strategic plan uses the term "tactic" for the term "strategy" normally used in strategic planning and restricts the use of the word "strategy" to a comprehensive plan as is currently in use at CVC. In this document therefore, "tactics" include "strategies".

For tactics organized by Pressure (or Issue) please see the "State of the Resource" internal report.

The Tactics Table (Appendix B) provides a detailed list of tactics. They have been organized under various themes or strategies designed to address a range of pressures (or issues). In the table, the "Tactic Priority" column refers to the priority of the tactic not priority of the pressure or issue it addresses. The "Tactic Priority" column lists either 1 (immediate); 2 (as soon as possible); or 3 (as time and resources permit in the future). The "Pressure Number"

column refers to the pressure (or issue) as it appears in Section 7.0 of this report in order that the reader can connect the description of the pressure with the response tactic.

## 10.0 PERFORMANCE MEASUREMENT

It is important to determine whether or not strategies are making a difference in improving environmental conditions. CVC has not developed a comprehensive set of performance measurements for each strategy, but the plan to provide them is described in the next paragraph. Performance measurement requires development of measurable targets (e.g. water quality targets). It is important to note that CVC practices adaptive management which means to plan, monitor and adapt if necessary.

It is anticipated that CVC staff will develop measurable targets in the next few years through the Credit River Water Management Strategy and Terrestrial Modeling. The next Integrated (across professional disciplines) Monitoring Strategy results in 5 years will also be a tool for determining whether the natural environment is improving or deteriorating.

## 11.0 SUMMARY AND CONCLUSIONS

CVC's Strategic Plan 2006 is a cross between a strategic and business plan and is intended to guide annual business planning for the next 5 years. It incorporates 10 years of extensive research on all natural resources in the Credit River Watershed. It also attempts to incorporate predictions about our economic, socio/cultural and environmental future given drivers and trends. However, it can not take into account unforeseen crises such as pandemics, results of terrorism, unforeseen economic collapse, etc. This plan assumes that our mandate will remain constant.

CVC's vision is to improve the environmental health of the Credit River Watershed for this and future generations. The CVC mandate is the objects of the Conservation Authorities Act which is: *"to establish and undertake, in the area over which it has jurisdiction (Credit River watershed and to the middle of Lake Ontario), a program designed to further the conservation, restoration, development and management of natural resources other than gas, oil, coal and minerals."*

This Strategic Plan was developed by senior environmental staff experts at the Credit Valley Conservation Authority in the following functional areas: water, natural heritage, stewardship, planning, fisheries, land management, education, conservation areas, administration, and the CVC Foundation. Representatives from industry, environmental groups, municipalities, and Board members also participated in a "Strengths, Weakness, Opportunities and Threats" analysis.

A strategic planning professional assisted with facilitated sessions; provided advice; conducted the SWOT analysis and interviews; and compiled portions of this report.

The Strategic Plan identified more than 30 pressures (issues) affecting the natural environment of the Credit River Watershed. These were rated using a complex rating system. Twenty-one were identified as a high priority to address.

Tactics for tackling each of the issues were devised for the serious environmental problems and will guide CVC annual business planning for the life of the strategic plan.

## **11.1 DEMOGRAPHIC, ECONOMIC, SOCIO/CULTURAL, ENVIRONMENTAL SETTING**

The environment is complex and interrelated globally, nationally, regionally and locally. The United Nations Millennium Ecosystem Assessment Report tells us 60% of the ecosystems humans rely on for human health are being degraded or used unsustainably: fresh water supply; air and water purification; regulation of regional and local climate; natural hazards and pests; waste treatment and detoxification; and regulation of erosion. It says the inherent danger is that ecosystem changes are increasing the likelihood of nonlinear changes – accelerating abrupt, and potentially irreversible, change which is being evidenced by different forms of disease, abrupt change in water quality, the collapse of fisheries and shifts in regional climate. It predicts that nutrient levels in water will become an increasing problem and the effects of climate change will become more pronounced. It predicts that climate change will lead to significant temperature variations; changes in precipitation patterns; impacts on vegetation and sea levels; increase frequency and duration of extreme weather events; and extinctions. The future is bleak for fisheries, food production in dry land areas and fresh water quality. Twenty-five percent of global freshwater use exceeds long-term accessible supplies.

More than two-thirds of the world's terrestrial biomes and more than half of the area of the other four biomes have been converted to non-natural use. Across a range of the world's taxonomic groups, either the population size or range or both of the majority of species is currently declining. The distribution of species on earth is becoming more homogenous. The number of species on the planet is declining with freshwater systems tending to have the highest proportion of species threatened. Genetic diversity has declined globally.

The Millennium Report attributes these changes to rapidly growing demands for food, fresh water, timber, fiber and fuel, which have significantly transformed the world through human action.

Demographics is one of the main drivers of environmental change. Globally the world's population is growing and by 2050 should be between 7.3 and 10.7 billion. Canada's population is expected to increase from 32 million in 2004 to 37 million by mid-century. The U.S., which greatly influences Canada, will likely grow from 294 million now to 420 million by 2050. It is expected that the proportion of the population below the age of 15 will shrink with the over-60 age category swelling globally as well as in North America. Life expectancy in Canada and the U.S. is increasing. It is expected that the work force will decrease with an aging population. In fact, Canada and the U.S. are on the brink of an elderly boom. The fastest growing segment of the population in the U.S. is those older than 85 (expected to total 21 million by 2050).

In the next 20 years, Ministry of Finance predicts Ontario's population will continue to grow as a result of international migration, but the actual population growth will decline by 2026 when Ontarians 50 years of age and older will constitute 40% of the total population.

In the U.S., the population is moving to the south and arid, dry southwestern states. This means that there is also a political control shift federally to these areas which is problematic

because these areas lack sufficient water supply in the long term (as describe below) and have proposed taking Great Lakes water. In the U.S. it is estimated that the groundwater that provides over 30% of the water used in agriculture is being depleted up to 160% faster than its recharge rate. This means that agriculture will have to move to the states with greater water (northeast), water will have to be brought to the dry areas from other locations and/or there will need to be major water conservation programs. The U.S. is currently the largest per capita water consumer in the world with Canada second.

Water will factor prominently not only in the U.S. but also on the global scene, with nearly half the world experiencing water shortages. By 2025, if present water consumption rates are maintained, 5 billion out of the world's 7.9 billion people will be living in areas where it will be nearly impossible to meet requirements for drinking, cooking and sanitation. It is expected that extreme weather events will continue throughout the world.

In Canada, more than 90% of Canadians live in a narrow band along the extreme southern edge of Canada, largely in urban pockets. The Greater Golden Horseshoe is located on one of the largest freshwater systems in the world, and will continue to be one of the most rapidly growing parts of Canada. It is significant that most of Ontario's drinking water comes from lakes and rivers as opposed to groundwater. The bottom line is that there will likely be pressures on Great Lakes and CVC watershed water.

Most of the Greater Golden Horseshoes growth is from international migration. Interestingly, 42% of the immigrant population in Canada holds a post secondary degree. Thus this segment of the population is both an opportunity to educate people about complex environmental problems and to incorporate them into the work force. Currently the Greater Golden Horseshoe contains 38% of Ontario's population and 15% of Canada's population. It has also experienced 90% of Ontario's growth between 1996 and 2001. According to the Ministry of Municipal Affairs and Housing, the population of the Greater Golden horseshoe is expected to grow by 4 million people in less than 30 years.

Urbanization is still occurring and it is expected that North America will continue to be relatively prosperous and therefore, be concerned with the environment. There is a dichotomy, however, in industrialized countries between a desire to protect the environment and a reluctance to give up the lifestyle luxuries afforded by reliable, affordable energy and electricity. There is also an increasing demand for all resources such as aggregate and timber given the increases in many economies worldwide.

Throughout North America, energy security and supply are expected to dominate the political and international agenda. Energy will very likely continue to increase in price.

Aging infrastructure is also a concern in North America, including dams.

In 2001 the Credit River Watershed had an estimated population of about 758,000 people. (This figure will be refined in the future as current figures include some of the population outside the watershed). The growth was about 16% between 1991 and 2001, with the majority in large urban centers such as Mississauga and Brampton. Brampton was the fastest-growing municipality in the watershed during the same period.

The watershed is currently receiving about 21,000 new immigrants per year; the main source of the new population growth. The majority of new immigrants arriving between 2001

and 2006 in descending order of abundance were: India; Pakistan; China and Hong Kong; the Philippines; and Poland. In 1991, the total watershed population consisted of 36% immigrants; by 2002 this had increased to 43% (114,150). There are over 150 languages spoken in the watershed and it is home to 301,680 immigrants from 136 countries. Overall the population is aging with 33% of the population between 25 and 44 (250,260). Seniors and retirees make up 8% of the population. It will be important to develop tactics to reach this segment of the population for environmental purposes.

## **11.2 STRENGTHS, WEAKNESSES, OPPORTUNITIES AND THREATS ANALYSIS (SWOT)**

A SWOT can never be heavily relied on unless one had the time and resources to interview thousands of knowledgeable and representative people. A SWOT is used only as a very rough check on a moment in time.

CVC strengths were described as:

- The focus is on the right priorities
- The issues are realistic and well-placed
- CVC has an excellent track record of providing superb service
- The watershed offers an excellent resource with which to work
- Management decisions are based on sound science
- Staff were viewed as highly trained, credible, dedicated and competent with visionary leadership

CVC weaknesses were described as:

- Human and fiscal resource limitations
- Fiscal uncertainties and ongoing funding pressures
- Broad mandate and new responsibilities from the Province (e.g. Source Water Protection, Permit-To-Take Water)
- Lack of understanding of the agency by the public
- Seemingly rigid in its approach (this was qualified as possibly being attributable to being "stretched to the limit")

Opportunities were described as:

- A need to better demonstrate the value of the watershed among the general public as well as corporations
- Need to develop an economic value of the watershed as the basis for its valuation
- A need to better engage stakeholders and to educate and increase awareness of the value of the watershed and its resources
- A need to reach out to different cultures and new immigrants
- Strengthen existing alliances and build new partnerships
- Educate urban dwellers about the importance of stewardship
- Shift the focus from fish habitat to water quality
- Focus on the role and responsibility that residents can play

Threats were described as:

- Unrelenting growth pressures on the watershed and resources
- Climate crisis
- Dominance of economic concerns over environmental costs as the latter are not quantified in economic terms



- Limited fiscal and human resources

### **11.3 REGIONAL AND WATERSHED STATE OF THE ENVIRONMENTAL RESOURCE**

The climate of the Greater Golden Horseshoe region is expected to become considerably warmer in both summer and winter. Although average annual precipitation may not change much, projected changes in seasonal precipitation patterns are more distinct: winter and spring precipitation is expected to increase while summer rain could decrease by as much as 50%. Heavy summer downpours are likely to become more frequent with dry periods in between. Soil moisture and stream flow will reflect rainfall changes and lake levels are expected to drop.

Based on the results of the 5 year monitoring report for hydrology, a decrease of approximately 7% in mean annual precipitation was observed for the watershed for the last 5 years (1999-2004) in comparison to the last 30 years (1968-1998). This resulted in a 17% decrease in mean annual streamflow when compared to the last 20 years. The watershed has experienced severe drought conditions for three out of five years. A 30 year low for precipitation was observed for the watershed in 1998. An increasing trend in maximum annual temperature was observed with an increase in mean monthly temperature indicating warming climatic conditions. CVC does not have a position on climate change but if these trends continue, there will likely be consequences for the watershed.

Within the floodplain there are 22 Flood Damage Centers and a minimum of 619 residential structures and 29 commercial structures. In addition there is major infrastructure in the floodplain such as roads, bridges, trunk sewers and gas lines. There are 418 minor dams (on-line ponds with a barrier structure) and 35 major dams across the watershed. Many of these structures vary in size and condition from excellent to poor. CVC operates and owns 12 dam structures and manages 1 dam on privately owned land. This infrastructure and people are at risk, especially if weather patterns continue.

In a significant way, urbanization has negatively impacted the natural environment. In general, it is believed that the quality of groundwater is impaired in urban areas. Urban sprawl contributes to pollute run-off by replacing green open spaces and farmland with paved surfaces and building of additional roads and commuter highways; contributes to air pollution by boosting commuter distances and vehicle miles traveled; and results in loss of viable habitat for animals and plants. Research has found that urban expansion remains one of the major threats to water quality and therefore human health. Impacts of urban stormwater generally include: increased run-off volumes and peak flows; sediment erosion and deposition; geomorphic changes; aquatic habitat degradation; increased receiving water temperature; reduced groundwater recharge; ecological degradation; impaired water uses (recreation, fishing, drinking water); dissolved oxygen depletion; eutrophication; high nutrient loads; discharge of toxins and pathogens into receiving waters; and degradation of benthic diversity and populations.

The Credit River Water Management Strategy Update (CRWMSU) has characterized existing watershed conditions and found that if current planning practices and infrastructure management continue, the watershed will go from "impaired" in urban areas to "significantly impaired" in most urban areas and no subwatershed will be unimpaired. The CRWMSU also shows:

- Current planning and development practices are not sustainable
- Growth can occur with changes in current planning and development, and restoring and retrofitting land uses
- Regardless, there is a limit to growth
- Monitoring data collected in urban areas is showing increased water temperatures, increased nutrient concentrations, bacteria, metals, and polycyclic aromatic hydrocarbons.

Current impervious cover is about 15% of the watershed and is expected to increase to 25%

Sediment and erosion control by developers continues to be an issue in the watershed although there have been recent improvements.

Aggregate extraction is associated with 4% of the watershed area. In addition to removal of natural areas in the establishment of aggregate areas, dewatering of natural areas below the water table can decrease baseflows to rivers and creeks, leading to degraded surface water quality; loss of natural habitat; fisheries impacts; negative impacts on ponds and wetlands. It may raise water temperatures, impacting cold water fisheries.

Georgetown and Orangeville are having difficulty finding adequate potable groundwater supplies for urban growth. There is competition for water from golf courses, subdivisions, quarries and other water takings with no allocation plan in place. Coldwater fisheries at greatest risk include streams in the areas of Orangeville, Georgetown, Alton, Inglewood and Erin.

With regard to landform conservation, there are a number of prominent landforms that are protected such as the Niagara Escarpment and Oak Ridges Moraine. Major structural modifications have been carried out in the name of flooding and erosion protection with many river and stream valleys being manipulated or completely lost. The traditional approach to urban development has had a significant impact on natural land forms because of cutting and filling to produce steady grades which facilitate municipal servicing.

Since 1982 there have been over 6,000 spills in the CVC watershed, with at least one major spill from a sewage treatment plant in 1994. The Credit River is generally unsafe for contact recreation.

Identified rural pollution exists from agriculture, landfill sites, golf courses and residential subdivisions. Intensive agriculture is limited in the watershed and is not as significant an environmental factor as urbanization. Key issues in the rural environment are: excess nutrients, organic pollution, loss of agricultural land, overuse/misuse of pesticides, and livestock access to waterways.

There are four municipal point sources of Waste Water Treatment Plant (WWTP) discharge into the Credit at Orangeville, Acton, Georgetown and Inglewood with one large treatment facility in Mississauga discharging into Lake Ontario. A number of spills occur from these plants in the watershed. There are also impacts of septics in small communities with a dense septic system network and plumes of contaminants including: ammonia, nitrate, chloride, and E.coli which increase loadings to waterways. The Credit River is currently above the Provincial Water Quality Guideline for phosphorus in part due to contributions from WWTPs and septic systems.

With respect to habitat, natural areas and the need for protected spaces, the watershed reflects a subset of what is happening in the Greater Golden Horseshoe. It is estimated that in Peel Region there has been an 89% loss of non-wetland communities which translates into a loss of species, populations and communities. Public open space is under increasing pressure of overuse. Natural features make up less than 25% of the Credit Watershed with 15% forested, 6.1% wetland and 1.2% aquatic. The Credit Watershed has about half the wetland and forested area at the watershed level needed to maintain a number of ecosystem functions and services.

Connectivity, on which survival of species and populations depend, is decreasing due to such things as larger highways and expanding urban areas (houses, roads, fences).

Within the watershed, the following pests and diseases are currently considered threats to the woodland system: gypsy moth, oak decline, beech bark disease, and butternut canker. In aquatic systems the following are diseases and pests: round goby, purple loosestrife, Eurasian water milfoil, West Nile Virus. If Emerald Ash Borer and Asian Longhorn Beetle appear in the watershed, they would be a serious threat as 100% of host species would die.

Numerous invasive species are known in the Great Lakes ecosystem with new invasive species introductions ongoing. This could increase with climate change.

In general, biodiversity is decreasing. The watershed is in the Great Lakes-St. Lawrence Ecosystem of Ontario. It is also part of the Carolinian Canada area of southwestern Ontario which is considered a rare ecosystem. The Credit River is the most diverse cold water fishery in Ontario if not eastern North America. Based on the available information, the species composition of the watershed includes the following: 17 amphibian species, 244 bird species, 81 fish species, 48 mammal species, 14 reptile species and 1255 vascular plants. The number of federal listed "Species at Risk" is: 6 endangered, 6 threatened, and 13 of special concern. Using provincial assessments there are 2 extirpated species, 8 endangered, 8 threatened and 14 of special concern.

CVC land is acquired primarily to protect ecosystem form, function and species in perpetuity. Most CVC properties have some form and degree of neighbourhood and development pressure and encroachment, or dangerous or illegal activities.

The quality of the air in the watershed is similar to that of all southern Ontario and the Greater Golden Horseshoe. Almost 50% of the air pollution comes from trans-boundary air pollution from the U.S., with the rest from local emissions within the watershed and neighboring areas.

CVC does not have a mandate for cultural heritage but has acquired a number of properties with cultural features when the land was purchased primarily for natural heritage purposes. This cultural heritage is largely unevaluated and in some instances, deteriorating. CVC does not have adequate resources to deal with cultural heritage generally on its properties.

## 11.4 OBJECTIVES

Objectives flow from the organization's mission and goals (see Sections 4.2 and 4.3). They are the results the organization wants to achieve in the designated time frame – in this case, time frames of 1-2, 3-5 and 6-10 years.

In addressing **Water Quantity**, CVC shall:

- Preserve and re-establish the natural hydrological cycle.
- Maintain, enhance or restore natural stream processes to achieve a balance of flow and sediment transport.
- Manage stream flow to reduce erosion impacts on habitats and property.
- Minimize risk to human life and property due to flooding.
- Maintain groundwater levels and baseflows (groundwater discharge to streams) to sustain watershed functions, human uses and climatological changes.

In addressing **Water Quality**, CVC shall:

- Maintain or enhance water and sediment quality to achieve ecological integrity.
- Protect drinking water sources.
- Protect groundwater quality to support watershed functions.
- Reduce toxics through pollution prevention.
- Improve water quality in rivers and Lake Ontario for body contact.
- Improve water aesthetics including odor, turbidity and clarity.

In addressing **Terrestrial and Aquatic Species, Communities and Ecosystems**, CVC shall:

- Protect, restore or enhance integrity of the watershed ecosystem, through an integrated network of natural areas, habitats and connection links.
- Protect, restore or enhance native terrestrial and aquatic plant and animal species, community diversity and productivity.
- Promote integrated resource management of aquatic and terrestrial systems and areas within the watershed for plant, animal and human areas.
- Protect, enhance and restore natural systems as a priority within the urban environment and throughout the watershed.
- Ensure that the complete range of representative and significant natural features, functions and linkages distributed within the watershed are protected in perpetuity.
- Secure representative and sensitive environmental land to protect it in perpetuity.

In addressing **Natural Hazards**, CVC shall:

- Identify and protect potentially hazardous river or stream valleys, flood plains, and Lake Ontario shoreline.
- Identify and protect watercourses (including their meander belt) and wetlands.
- Implement Ontario Regulation 160/06, as may be amended from time to time, in a manner that protects the public and minimizes property damage.
- Update and refine hazard land mapping over time as new information becomes available.
- Recommend to watershed municipalities proactive approaches within the planning and development process that reflect the dynamic nature of the hazards.
- Work with watershed municipalities and other partners to reduce the severity of natural hazards, where possible, recognizing the importance of natural processes.

In addressing **Social and Economic** factors, CVC shall:

- Demonstrate through research and identify and promote the social benefits of the watershed system (recreational, educational, cultural, psychological, tourism, economic).
- Protect human physical, social and economic health as they relate to the natural environment.
- Provide appreciation and compatible recreational opportunities on protected land.

## 11.5 TACTICS

CVC is optimistic that the details of the following tactics (see Tactics Table, Appendix B), if fully-funded and resourced and barring any unforeseen eventualities or severe climate change, will maintain and improve the existing natural environment in the Credit River Watershed for the benefit of the community and the ecosystem.

To protect **groundwater**, CVC proposes to develop tools to assess watershed groundwater conditions (quality and quantity) to work towards a decision-support system to address issues such as deteriorating urban environment, increased impervious surfaces, water supply, decreasing base flows, aggregate extraction and water taking.

CVC would implement the findings of the **Credit River Water Management Strategy Update** through a series of projects, working committees, and policy and guideline development to address issues on quantity associated with lack of adequate development standards, deteriorating urban environment, increased impervious surfaces and sediment and erosion control. Stream flow targets and a water allocation plan would be provided for the watershed. As well, we would produce a set of watershed policies and guidelines on development form, sustainable practices, development standards and development charges. Staff would undertake successful pilot projects that show good use of sustainable practices in new and existing developments. A sub-strategy will also be developed to specifically address the control of peak flows throughout the watershed to ensure that there is no risk of increased flooding as the watershed urbanizes. A key deliverable would include setting stormwater management control criteria by subwatershed.

To protect **water quality**, CVC would continue to assess watershed surface quality conditions by developing tools and approaches to assess private septic and municipal wastewater servicing, urban and rural pollution resulting from land use changes, land management practices and spills. Deliverables would be instream flow targets, an action plan for spills and a decision support system on how water quality targets will be allocated throughout the watershed.

To start to do its part to protect **Lake Ontario**, CVC would prepare and implement a strategy to improve the water quality and quantity in Lake Ontario partially as it is influenced by the CVC watershed and by working with other partners who are influencing the lake. Specifically with regard to lake levels, CVC would develop a series of tools that relate to the shoreline as well as the cumulative contribution of the watershed to Lake Ontario. CVC would also formulate a shoreline ecosystem management strategy that provides guidance on restoration and protection efforts to address factors such as shoreline processes, Lake Ontario near-shore fisheries and terrestrial connections.

To deal with potential **climate change**, CVC would undertake a series of actions and projects to address the issues of heavy rainfall events resulting in significant flooding and

extended drought conditions, both of which are causing significant stresses on the watershed.

In the area of **natural heritage**, CVC would undertake a series of initiatives that will continue to build our knowledge of the watershed natural systems (features, functions and linkages) and enhance our ability to restore, enhance and protect them. Key tactics include: an updated natural areas inventory; development of an integrated model (water and terrestrial) of the watershed's natural heritage system; continued progress on protection and enhancement of the fishery; conservation of species and their habitats; and development of approaches to deal with disease, pests and invasives.

CVC needs to work diligently on **watershed restoration** by developing a combined approach on how efforts will be coordinated watershed-wide for stewardship and infrastructure upgrades to address issues in existing urban and rural land uses. Issues to be addressed include: loss of habitat; degraded watercourses; flooding due to undersized infrastructure; dam safety; increased impervious area; deteriorating urban environments (pollution, urban heat island, etc.); invasive species; degraded natural areas; and lack of habitat connectivity. Deliverables include increasing the amount of urban forest and natural areas and increasing stakeholder participation.

**Planning and hazard regulation** would remain high priorities. CVC needs to continue to develop policies and tools to assess land use planning documents and applications to ensure development within the watershed proceeds in an environmentally sustainable form. A key deliverable would be a comprehensive policy to improve existing documents that would incorporate the following themes: water quality, water quantity, natural heritage, development standards and hazard land management. The policy would provide direction for implementation through plan input (review of planning policy documents), plan review of development applications and the regulation permitting process. Throughout the plan input and review process and administering the regulation, CVC would: continue advisory partnerships with municipalities; achieve full cost recovery through plan review fees; appeal unacceptable decisions; provide timely responses to review requests; process permit approvals consistent with policies to be developed; and enforce those decisions.

The watershed-wide **Integrated Watershed Monitoring Program** to measure, assess and publish watershed conditions over time would continue. This will test over the long-term whether different practices are needed. CVC would also develop an approach to track the relationships between key environmental resource variables and their socio-economic implications for the watershed community. CVC would continue to produce a watershed report card every 5 years, presenting watershed conditions.

In the **conservation areas/land management** functions, CVC will develop and implement a comprehensive program of land management that provides for natural heritage protection, education, and safe public use opportunities on Authority-owned lands.

Education is critical to protect the natural environment over time. CVC will develop and implement an **education and communications** strategy that achieves environmental awareness, motivates community participation, targets audiences and utilizes effective partnerships. We will not duplicate efforts, but will transmit our messages as much as possible through others.

CVC will work in partnership with governments and other potential partners for watershed protection through **securement** of significantly important conservation lands by use of a variety of tools (i.e. donation, conservation easement, management agreement, fee-simple purchase). This will contribute to a connected system of greenlands that provide natural heritage protection, appreciation and recreational benefits for a healthy ecosystem and healthy communities.

CVC will be more proactive in developing **partnerships** with agencies, non-government organizations, landowners, and the academic community. We will continue to support the CVC Foundation. We will pursue creative funding alternatives such as revenue strategies and grants.

In terms of **agricultural land protection**, CVC will continue to work with municipal partners to implement the Provincial Policy Statement requirements, the Greenbelt Act & Plan, Places to Grow and other provincial initiatives that protect agricultural land uses. We will also provide natural resource information and technical review upon request to municipalities to assist them in making decisions related to agricultural land protection.

**Air pollution, waste management and energy conservation** are key environmental issues. For the short-term CVC's response will be modest and we will rely on other agencies to lead strategies to tackle these problems on a large scale. CVC will pursue energy conservation and waste reduction on its properties. Our planting and restoration program will contribute to reducing air pollution. CVC will advocate environmentally responsible actions related to these issues in education and communication endeavors.

**Cultural heritage** is not CVC's mandate but it has acquired significant cultural heritage features in some natural resource purchases. CVC will continue to operate Belfountain as a cultural heritage site. We will develop a strategy to address other sites in the long-term working with interested partners. In the meantime, we will ensure public safety on these sites.

While not specifically identified as a tactic in Appendix B it is very important that CVC marry the results of its research in water and land through the development of a "**Credit Watershed Plan**" which will guide protection of the Credit Watershed for the longer term. Key to this will be completing and updating, as appropriate, the 20 subwatershed studies.

These tactics will be pursued by CVC's best resource – its **staff resources**, who will continue to be treated fairly in pay, benefits, working conditions and policies, while also being given opportunities for job training and professional development. CVC will continue to be absolutely meticulous in wise, accountable and transparent use of our **monetary resources**. We will place highest priority on the health and safety of our staff and visitors to our properties and parks.

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**Appendix A**

**Strengths-Weaknesses-Opportunities-Threats**

**Sample Questionnaires**

**Interview Questionnaire for Board Staff & Board Members  
Credit Valley Conservation Authority**

**Introduction**

The Credit Valley Conservation Authority is developing a Strategic Plan. Part of any strategic planning exercise involves undertaking an analysis of the strengths-weaknesses-opportunities-threats facing the Authority. Speaking with Conservation Authority staff and Board members about their strengths, weaknesses, opportunities and threats, allows us to develop a view 'from the inside looking out.' Speaking with Authority partners and clients about strengths, weaknesses, opportunities and threats, allows us to develop a view 'from the outside looking in.' By putting this information together, we can paint a mirror image and identify those areas that the Authority should continue to focus on and those areas of opportunity and challenge.

The end result will be a Strategic Plan that captures a common vision for the future and an Action Plan that identifies priorities for the Authority over the short term (1-3 years); medium term (3-5 years) and longer term (5-10 year period).

Before we begin, I would like to thank you for your time and assure you that when the material is presented to Board members, I will aggregate the information provided so all individual comments remain confidential.

We have a standard list of questions we would like to address but we certainly view this as an opportunity to not only ask questions of you, but to respond to questions you may have in relation to the project. We would like to obtain your views about your involvement and perspectives in relation to the Credit Valley Conservation Authority.

We have allocated approximately 30 minutes for our conversation, however, if you would like to share additional insights with us after this call, your input will be most welcome.

To begin then,

**Name:**

**Please describe your area of expertise:**

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1. What do you think are the key issues facing Conservation Agencies in general and the Credit Valley Conservation Authority in particular?

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2. Are there specific issues that the Authority will have to address in relation to?

Environmental Issues:

Economic Issues:

Social/Cultural Issues:

Demographic Issues:

Technological Issues:

3. The following is a list of environmental issues identified by CVC and prioritized in a ranking from 1 (most urgent/important) to 3.

**Water:** Drought and Flooding (1), Lack of Adequate Development Standards (1), Deteriorating Urban Environment (1), Impervious Surfaces (1), Sediment and Erosion (1), Dams (1), Water Supply (1), Spills (1), Rural Pollution (1), Septic Systems and Municipal Servicing (1), Aggregate Extraction (2), Pesticides and Insecticides (2)

**Natural Heritage:** Deteriorating Urban Environment (1), Loss of Habitat and Need for Protected Spaces (1), Biodiversity (1), Fragmentation, Corridor & Connectivity (1), Species at Risk/ Species Abundance (1), Invasive Species (1), Soil Quantity & Quality (2), Landform Conservation (2), Fishing & Hunting (2), Pesticides and Insecticides (2)

**Land Management:** Prohibited Use (1), Neighbourhood/Development Pressures (1)

**Education:** Lack of General Environmental Awareness (2)

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**Cultural Heritage Management (2)**

**Climate Change (2)**

**Energy Conservation (3)**

**Air Pollution (3)**

**Agricultural Land Protection (3)**

a) From these environmental issues, are there any others that should be added?

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b) Are there opportunities to partner in addressing these issues?

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4. What advantages/resources does the CVCA have? What in your view, does the Authority do well?

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5. Are there areas where the Authority needs to improve? Please explain.

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6. a) What obstacles/challenges does the Authority currently face?

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b) What obstacles/challenges will the Authority face in the future?

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7. What and where are the strategic opportunities for the Authority?

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8. Are there areas of the Authority's business that are not well understood?

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9. What would you hope the natural environment of this watershed would be like in 20 years, 50 years (e.g. swimmable beaches, cold water fisheries, wildlife, and safe groundwater)?

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10. a) Do you feel you have sufficient resources to respond to environmental issues facing your community?

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b) What are the top 3 environmental issues you hear of in your municipality and do you see the Conservation Authority working with you to resolve these issues?

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c) How do the people in your municipality/community rank these environmental issues?

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Thank you for your time and for your assistance. Are there any additional thoughts or comments you would like to offer at this time? Are there any questions you have that I may be able to answer? If there are other issues or thoughts that may come to mind after this call, please feel free to reach me directly either by phone (905) 428-6113 or by email at karen.wianecki@sympatico.ca.

Again, we would like to reiterate that all comments will be kept confidential and that your name and your perspectives will not be shared with others.

Additional Thoughts/Comments:

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**Interview Questionnaire for Partners & Clients  
Credit Valley Conservation Authority**

**Introduction**

The Credit Valley Conservation Authority is developing a Strategic Plan. Part of any strategic planning exercise involves undertaking an analysis of the strengths-weaknesses-opportunities-threats facing the Authority. Speaking with Conservation Authority staff and Board members about their strengths, weaknesses, opportunities and threats, allows us to develop a view 'from the inside looking out.' Speaking with Authority partners and clients about strengths, weaknesses, opportunities and threats, allows us to develop a view 'from the outside looking in.' By putting this information together, we can paint a mirror image and identify those areas that the Authority should continue to focus on and those areas of opportunity and challenge.

The end result will be a Strategic Plan that captures a common vision for the future and an Action Plan that identifies priorities for the Authority over the short term (1-3 years); medium term (3-5 years) and longer term (5-10 year period).

Before we begin, I would like to thank you for your time and assure you that when the material is presented to Board members, I will aggregate the information provided so all individual comments remain confidential.

We have a standard list of questions we would like to address but we certainly view this as an opportunity to not only ask questions of you, but to respond to questions you may have in relation to the project. We would like to obtain your views about your involvement and perspectives in relation to the Credit Valley Conservation Authority .

We have allocated approximately 30 minutes for our conversation, however, if you would like to share additional insights with us after this call, your input will be most welcome.

To begin then,

**Name:**

1. Please describe your area of expertise:

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2. Can you provide me with a better sense of how your organization interacts with the Credit Valley Conservation Authority?

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3. What do you think are the key issues facing Conservation Agencies in general and the Credit Valley Conservation Authority in particular?

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4. Are there specific issues that the Authority will have to address in relation to:

Environmental Issues:

Economic Issues:

Political Issues:

Social/Cultural Issues:

Demographic Issues:

Technological Issues:

5. The following is a list of environmental issues identified by CVC and prioritized in a ranking from 1 (most urgent/important) to 3.

**Water:** Drought and Flooding (1), Lack of Adequate Development Standards (1), Deteriorating Urban Environment (1), Impervious Surfaces (1), Sediment and Erosion (1), Dams (1), Water Supply (1), Spills (1), Rural Pollution (1), Septic Systems and Municipal Servicing (1), Aggregate Extraction (2), Pesticides and Insecticides (2)

**Natural Heritage:** Deteriorating Urban Environment (1), Loss of Habitat and Need for Protected Spaces (1), Biodiversity (1), Fragmentation, Corridor & Connectivity (1), Species at Risk/ Species Abundance (1), Invasive Species (1), Soil Quantity & Quality (2), Landform Conservation (2), Fishing & Hunting (2), Pesticides and Insecticides (2)

**Land Management:** Prohibited Use (1), Neighbourhood/Development Pressures (1)

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**Education:** Lack of General Environmental Awareness (2)

**Cultural Heritage Management (2)**

**Climate Change (2)**

**Energy Conservation (3)**

**Air Pollution (3)**

**Agricultural Land Protection (3)**

a) From these environmental issues, are there any others that should be added?

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b) Are there opportunities to partner in addressing these issues?

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6. What advantages/resources does the CVCA have? What in your view, does the Authority do well?

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7. Are there areas where the Authority needs to improve? Please explain.

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8. a) What obstacles/challenges does the Authority currently face?

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b) What obstacles/challenges will the Authority face in the future?

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9. What and where are the strategic opportunities for the Authority?

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10. Are there areas of the Authority's business that are not well understood?

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11. What would you hope the natural environment of this watershed would be like in 20 years, 50 years (e.g. swimmable beaches, cold water fisheries, wildlife, and safe groundwater)?

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12. a) Do you feel you have sufficient resources to respond to environmental issues facing your community?

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b) What are the top 3 environmental issues you hear of in your municipality and do you see the Conservation Authority working with you to resolve these issues?

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c) How do the people in your municipality/community rank these environmental issues?

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Thank you for your time and for your assistance. Are there any additional thoughts or comments you would like to offer at this time? Are there any questions you have that I may be able to answer? If there are other issues or thoughts that may come to mind after this call, please feel free to reach me directly either by phone (905) 428-6113 or by email at karen.wianecki@sympatico.ca.

Again, we would like to reiterate that all comments will be kept confidential and that your name and your perspectives will not be shared with others.

Additional Thoughts/Comments:

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**Appendix B**  
**Tactics Table**

TACTICS		PRESSURE NUMBER	TACTIC PRIORITY	TIME LINE		
				YEARS		
				SHORT (1-2)	MED (3-5)	LONG (6-10)
<b>1) GROUNDWATER STRATEGY</b>						
<b>Continue to develop tools to assess watershed groundwater conditions (quality and quantity) to work towards a decision support system to address issues such as deteriorating urban environment, increased impervious surfaces, water supply, decreasing baseflows, aggregate extraction and water taking. Key deliverables include developing stream flow targets and a water allocation plan for the watershed.</b>						
<b>Water Supply</b>	Continue to : 1) develop and refine water budget assessment on a watershed and subwatershed basis 2) work with MOE to ensure that long-term water supplies are available for urban and rural communities 3) develop a plan for : a) decision support system to assess issues on water allocation on a watershed basis b) ensure MOE takes advice from CVC on water-taking applications	7.1.9	1	X	X	X
<b>Drying Up of Streams</b>	Develop : 1) guidelines for improved water-takings related to fisheries protection 2) water conservation approaches	7.1.8	2		X	
		7.1.9				
<b>Wells</b>	Comment on Permits to Take Water	7.1.9	1	X	X	X
	Abandon well program	7.1.16	2		X	
	Private well protection	7.1.16	2		X	
<b>Climate Change: Lower Recharge</b>	Develop adaptation plans to cope with climate extremes	7.1.1, 7.3.2	2		X	
<b>Aggregate Extraction</b>	Set up a methodology to assess potential to have thermal impacts on coldwater systems if in the vicinity of the proposal	7.1.20	2		X	
<b>Baseflow</b>	Develop: 1) instream flow targets 2) water allocation plan for the watershed	7.1.1, 7.2.5				
		7.1.9				

TACTICS		PRESSURE NUMBER	TACTIC PRIORITY	TIME LINE		
				YEARS		
				SHORT (1-2)	MED (3-5)	LONG (6-10)
<b>2) WATER MANAGEMENT IMPLEMENTATION STRATEGY</b>						
Implement the findings of the Credit River Water Management Strategy Update through a series of projects, working committees, and policy and guideline development to address issues on quantity associated with lack of adequate development standards, deteriorating urban environment, increased impervious surfaces and sediment and erosion control. Key deliverables include developing a set of watershed policies and guidelines on development form, sustainable practices, development standards, development charges, and successful pilot projects that show good use of sustainable practices in new and existing developments.						
<b>Land Use Form in Greenfields</b>	Develop: 1) criteria development forms 2) design manual for low impact development 3) common policies for OP's and Secondary Plans	7.1.2, 7.1.4	1	X		
<b>Existing Urban Areas Including Brownfields</b>	Establish a working group with municipalities to establish and prioritize retrofitting opportunities	7.1.2, 7.1.3, 7.1.4	1	X		
<b>Best Management Practices</b>	Work with municipalities to: 1) develop incentives/credit system 2) develop standards for new and existing developments 3) expand effectiveness monitoring to include BMPs	7.1.2, 7.1.3, 7.1.4	1	X		
<b>Flow Management: Peak Flow &amp; Volume</b>	Establish criteria for stormwater to address control of peak flows throughout the watershed to ensure there is no risk of increased flooding as the watershed urbanizes. A key deliverable would include setting stormwater management control criteria by subwatershed stormwater management guidelines.	7.1.1, 7.1.3	1	X		
<b>Water Takings</b>	Need to develop: 1) tool for assessing cumulative impacts 2) instream flow targets	7.1.9, 7.1.18 7.1.1, 7.1.8	2		X	
<b>Lake Levels</b>	Maintain awareness with respect to what is being discussed with the Binational Committees and comment on issues when asked	7.2.5	1	X	X	X
<b>Subwatershed Planning</b>	Complete all 20 subwatershed studies	7.1.3, 7.1.8, 7.1.13, 7.1.14, 7.1.16, 7.1.17, 7.1.19, 7.1.20, 7.2.2				

TACTICS		PRESSURE NUMBER	TACTIC PRIORITY	TIME LINE		
				YEARS		
				SHORT (1-2)	MED (3-5)	LONG (6-10)
<b>3) LAKE ONTARIO STRATEGY</b>						
To prepare and implement a strategy to improve the water quality and quantity in Lake Ontario partially as it is influenced by the CVC watershed and by working with other partners who are influencing the lake. Specifically with regard to lake levels, to develop a series of tools that will address the lower lake levels as they relate to the shoreline as well as the cumulative contribution of the watershed to Lake Ontario (e.g. storm water). Formulate a shoreline ecosystem management strategy that provides guidance on restoration and protection efforts to address factors such as shoreline processes, Lake Ontario near-shore fisheries and terrestrial conditions. (also see 9) Monitoring Strategy and 2) Water Implementation Strategy)						
<b>Drought &amp; Flooding: Lower Lake Levels</b>	Develop a tool for assessing cumulative water takings/stormwater management and climate change conditions to ensure a sustainable ecosystem within the Credit watershed and its contribution to Lake Ontario	7.1.1, 7.2.5, 7.3.2	1		X	X
<b>Shoreline Erosion Management Strategy</b>	Develop Shoreline Management Strategy – erosion control should be on a reach basis not on an individual basis	7.1.5, 7.2.5	1	X	X	
<b>Shoreline Inventory and Enhancement</b>	Characterize CVC's shoreline similar to Environment Canada's Atlas (which should be co-ordinated with TRCA and CH) and enhance shoreline habitat	7.1.8, 7.1.13, 7.2.5			X	



TACTICS		PRESSURE NUMBER	TACTIC PRIORITY	TIME LINE		
				YEARS		
				SHORT (1-2)	MED (3-5)	LONG (6-10)
<b>4) CLIMATE STRATEGY</b>						
Involves a series of actions and projects that address the issues of heavy rainfall events that result in significant flooding and extended drought conditions, both of which are causing significant stresses on the watershed. Some key deliverables will include a more streamlined emergency response to floods, developing and adopting adaptation strategies, a water allocation plan for the watershed, and establishing instream flow targets throughout the watershed.						
<b>Climate Change Working Group</b>	Develop alliances with expert agencies to monitor climate and determine how changing climate will affect the watershed.	7.1.1, 7.1.8, 7.1.9, 7.1.13, 7.1.19, 7.3.2				
	Continue to incorporate findings in various programs					
<b>Drought Strategy</b>	Develop: 1) a formalized Low Water Response Team	7.1.1, 7.1.9, 7.2.5, 7.3.2	1	X	X	
	2) a working relationship with all member municipalities to address ways of increasing adaptive capacity of urban and rural communities to repond to drought e.g. methods of collecting and harvesting rain to supplement irrigation					
	3) further the work currently being done to understand rainfall patterns etc by teaming up with partners such as Environment Canada					
	Develop adaptation plans	7.1.1, 7.1.9, 7.2.5, 7.3.2	2		X	
<b>Flood Strategy</b>	Develop and maintain: 1) A real time flood forecasting model 2) Establish an incident management program 3) Create a flood information database 4) Keep flood duty officers updated with training 5) Maintain clear communication with municipalities through direct lines, workshops, etc	7.1.1, 7.3.2	1	X	X	

TACTICS		PRESSURE NUMBER	TACTIC PRIORITY	TIME LINE		
				YEARS		
				SHORT (1-2)	MED (3-5)	LONG (6-10)
<b>5) WATER QUALITY STRATEGY</b>						
<b>Continue to assess watershed surface quality conditions by developing tools and approaches to assess private septic and municipal waste water servicing, urban and rural pollution resulting from land use changes and land management practices and spills. A key deliverable includes developing instream flow targets, an action plan for spills and a decision support system on how water quality targets will be allocated throughout the watershed.</b>						
<b>Spills Response</b>	Establish a role for CVC as:  1) communicator to notify other agencies/users of the river of the event of a spill 2) information provider of information on travel time, sensitive areas, potential clean up spots along the river, etc. 3) organization that monitors after a spill to assess impacts 4) flow regulator to assist with clean up (e.g. regulating flow out of Island Lake)	7.1.15	1	X	X	X
<b>Source Water Protection &amp; Nutrient Management</b>	Implement recommendations from Source Water Protection and Nutrient Management Act	7.1.16, 7.1.18	1	X	X	X
<b>Septic Systems &amp; Municipal Servicing</b>	Map septic system densities and biosolid land application sites	7.1.16, 7.1.18, 7.3.5	1	X		
	Scientific assessment should include:  1) monitoring data to characterize types of impacts and locations 2) use complex models to assess cumulative impacts and locations 3) develop effluent criteria for new sewage treatment facilities and highlight need for upgrades at existing facilities 4) analysis of data from existing plants	7.1.16, 7.1.18	1	X	X	X
	Establish communications with:  1) MOE regarding Certificates of Approvals and setting criteria for conditions 2) municipalities to assist with design constraints with respect to effluent criteria and physical creek impacts e.g. fluvial geomorph requirements	7.1.18  7.1.3	1	X	X	X
<b>Great Lakes Shoreline:</b>	1) Be aware of binational issues concerning water quality parameters and be ready to address them through our work	7.2.5	1	X	X	X
	2) become more familiar with the Canada-Ontario Agreement as it relates to projects and workplans to phase out contaminants	7.2.5				
<b>Climate Change</b>	Develop a plan that identifies opportunities for upgrading sewage treatment plants, private septic and non-point pollution from urban and rural areas	7.1.3, 7.1.16, 7.1.18	1	X	X	X

TACTICS		PRESSURE NUMBER	TACTIC PRIORITY	TIME LINE		
				YEARS		
				SHORT (1-2)	MED (3-5)	LONG (6-10)
<b>6) NATURAL HERITAGE STRATEGY</b>						
This strategy serves as an update to one developed in 2002. It involves a series of initiatives that will continue to build our knowledge of watershed natural systems (features, functions and linkages) and enhance our ability to restore, enhance and protect them. Key tactics include a natural areas inventory, development of an integrated model of the watershed's natural heritage system, continued progress on protection and enhancement of the fishery, conservation of species and their habitats and developing approaches to deal with diseases, pests and invasives.						
<b>Natural Areas Inventory (NAI)</b>	Gather baseline data about species and habitat including significant wildlife, significant woodlands, valleylands	7.1.8, 7.1.13, 7.2.2	1	X	X	
	Complete species inventories reptiles, mammals and produce updated species lists (vascular plants, amphibians, birds)	7.1.13, 7.1.17	1	X	X	
	Determine locations of Significant Wildlife Habitat	7.1.8, 7.1.13, 7.1.14, 7.1.17	2		X	
	Collect baseline information about Species at Risk in watershed	7.1.13, 7.1.17	1	X	X	
	Identify known locations of invasives	7.1.19	1	X	X	
<b>Benthic Invertebrates</b>	Carry out benthic invertebrate community study	7.1.3, 7.1.4, 7.1.6, 7.1.10, 7.1.19	1		X	X
<b>Terrestrial Ecosystem Enhancement Model (TEEM)</b>	Create Terrestrial Model (TEEM) for watershed and integrate with Credit River Water Management Strategy (CRWMS) to result in a comprehensive "Credit Watershed Environmental Plan"	7.1.3, 7.1.8, 7.1.13, 7.1.14, 7.1.17	1	X	X	X
	Phase 1 – Terrestrial Landscape Model - Baseline Conditions		1	X		
	Phase 2 – Research on Integration		2	X	X	
	Phase 3 – Develop Integrated Model		2		X	
	Phase 4 – Develop Restoration Model		2		X	
	Identify Significant Valleylands	7.2.2	2		X	
	Investigate use of Urban Forests Effects Model as part of TEEM	7.1.3, 7.1.8	2		X	
<b>Diseases and Pests</b>	Inventory CVC properties then monitor annually	7.1.10, 7.1.19	2	X	X	X
	Identify wetlands, forests, successional area and other communities that have the potential for disease or insect problems on non-CVC lands		2		X	X
	Develop in-house capacity for controlling small pest break-outs and working group to communicate insect and disease issues		2		X	X

TACTICS		PRESSURE NUMBER	TACTIC PRIORITY	TIME LINE		
				YEARS		
				SHORT (1-2)	MED (3-5)	LONG (6-10)
<b>6) NATURAL HERITAGE STRATEGY (continued)</b>						
<b>Fisheries</b>	Continue to implement Fisheries Management Plan and revise as necessary	7.1.6, 7.1.7, 7.1.10, 7.1.14, 7.2.3	1	X	X	X
	Develop best management practices and education strategies with a fisheries focus	7.1.6, 7.1.7, 7.1.10, 7.1.14, 7.2.3	2	X	X	
	Integrate findings of Fisheries Management Plan and appropriate subwatershed studies to establish appropriate restoration opportunities for after-use (e.g. for aggregate rehabilitation)	7.1.13, 7.1.14, 7.1.20	2	X	X	X
<b>Species of Conservation Concern</b>	Determine habitat requirements for wildlife species throughout life cycle	7.1.8, 7.1.13, 7.1.14, 7.1.17	1	X		
	Implement applicable provincial or federal Species at Risk strategies through restoration, protection and stewardship	7.1.13, 7.1.17	1	X	X	X
	Determine watershed species of high conservation importance		1		X	X
<b>Invasive Species Strategy</b>	Develop strategy with input from NAI	7.1.10,	2	X	X	
	Encourage BMP which minimize transport of invasive species; discourage planting of invasive species	7.1.19	1	X	X	X
	Encourage use of native species that are seed-sourced	7.1.8, 7.1.13, 7.1.19	1	X	X	X
	Develop procedures for removal of invasive species on CVC property	7.1.10, 7.1.19	1		X	X
<b>Soil Conservation</b>	Monitor soil quality through Terrestrial Monitoring Program	7.1.3, 7.1.16, 7.2.1	2	X	X	X
	Calculate the amount of soil loss in the watershed	7.1.6, 7.2.1	3		X	X
	Monitor soil compaction activities on CVC lands and encourage municipal partners to conduct similar monitoring	7.1.3, 7.2.1	2	X	X	X
	Conduct surveys for sediment loading in Orangeville Reservoir and near other designated dam sites	7.1.6, 7.2.1	2	X	X	

TACTICS		PRESSURE NUMBER	TACTIC PRIORITY	TIME LINE		
				YEARS		
				SHORT (1-2)	MED (3-5)	LONG (6-10)
<b>7) WATERSHED RESTORATION STRATEGY (STEWARDSHIP)</b>						
Develop a combined approach on how efforts will be co-ordinated watershed-wide. Stewardship and infrastructure upgrades to address issues in existing urban and rural land uses. Issues to be addressed include: loss of habitat; degraded watercourses; flooding due to undersized infrastructure; dam safety; increased impervious area; deteriorating urban environments (pollution, urban heat island, etc.); invasive species; degraded natural areas; and lack of habitat connectivity. Deliverables include increasing the amount of urban forest and natural areas and increasing stakeholder participation.						
<b>Naturalization/Restoration</b>	Implement Naturalization and Restoration strategies from subwatershed studies, TEEM, NAI and Green Cities	7.1.3, 7.1.8, 7.1.13, 7.1.14, 7.1.16	1	X	X	X
	Increase CVC's capacity to supply and/or install plant material	7.1.3, 7.1.8, 7.1.13,	1	X	X	
	Make use of CVC's seedling and Naturalization Services	7.1.14, 7.1.19	1	X	X	X
	Identify demonstration projects that could include wetland creation/restoration, utilize CVC's seedling and Naturalization Services		1	X	X	
	Restore habitat complexity (see Natural Heritage Strategy)	7.1.3, 7.1.8, 7.1.13, 7.1.14, 7.1.17	2	X	X	X
	Conduct soil assessments prior to restoration and enhancement projects and where necessary enhance	7.1.3, 7.1.6, 7.1.13, 7.1.16	2		X	X
	Attempt to improve soil quality and quantity					
	Develop rehabilitation plans to protect Natural Heritage Features in existing developments and identify and implement enhancements.	7.1.3, 7.1.13, 7.1.19	1	X	X	
<b>Wetlands</b>	Wetland restoration strategy developed based on recent watershed study and watershed hydrology	7.1.3, 7.1.8, 7.1.13, 7.1.14, 7.1.16	2	X		
<b>Streams</b>	Stream rehabilitation strategy expanded	7.1.3, 7.1.6, 7.1.13, 7.1.16,	1		X	
	Carry out remedial in-stream works	7.2.3	1	X	X	X
	Erosion protection should be done on a reach basis not on an individual landowner basis	7.1.6	1	X	X	X

TACTICS		PRESSURE NUMBER	TACTIC PRIORITY	TIME LINE		
				YEARS		
				SHORT (1-2)	MED (3-5)	LONG (6-10)
<b>7) WATERSHED RESTORATION STRATEGY (continued)</b>						
<b>Urban Ecology</b>	Green Cities Initiative: Build partnerships with urban municipalities, funders, landowners, corporate sector and partner NGO's to implement large scale restoration projects related to urban enhancement, low impact development, riparian enhancement	7.1.1, 7.1.2, 7.1.3, 7.1.4, 7.1.6, 7.1.8, 7.1.13, 7.1.14, 7.1.19, 7.2.1	1	X	X	X
	Improve urban design practices ensuring habitat for wildlife		2	X	X	
	Improve urban design practices (CRWMSU) e.g. Low Impact Development		1	X		
<b>Outreach</b>	Communicate to landowners and municipalities the assistance available through CVC and stewardship agreements with private landowners	7.1.3, 7.1.4, 7.1.6, 7.1.7, 7.1.8, 7.1.13, 7.1.14, 7.1.16, 7.1.21	1	X	X	
	More "We Care" models especially Sub 19 in near future		2		X	
	Implement Rural Water Quality program in whole watershed	7.1.16, 7.1.21	1	X	X	
<b>CVC Lands</b>	Stewardship on CVC land through Conservation Area Strategies	7.1.8, 7.1.13, 7.1.19	1	X	X	X
	Implement ongoing stewardship projects as "pilots"; Ken Whillans Area Wetland, Rattray Marsh (Priority 1) and erosion projects (Priority 2)	7.1.6, 7.1.8, 7.1.13, 7.1.19, 7.2.1	1 & 2	X	X	X
<b>Dams: Liability &amp; Public Safety</b>	Develop: <ul style="list-style-type: none"> <li>1) communication protocols with MNR</li> <li>2) a process for undertaking dam safety reviews</li> <li>3) emergency response plans for individual CVC owned structures</li> <li>4) CVC's current Flood Forecasting and Warning program to include dam breaks</li> <li>5) a process to undertake preventative maintenance</li> <li>6) guidelines to conduct dam safety inspections on a regular basis</li> </ul>	7.1.7	1	X	X	X

TACTICS		PRESSURE NUMBER	TACTIC PRIORITY	TIME LINE		
				YEARS		
				SHORT (1-2)	MED (3-5)	LONG (6-10)
<b>7) WATERSHED RESTORATION STRATEGY (continued)</b>						
<b>Dams: Liability &amp; Public Safety</b>	Provide: <ul style="list-style-type: none"> <li>1) information package to dam owners</li> <li>2) criteria to prioritize and prescribe management options for dams and ponds</li> <li>3) potentially develop a stewardship program with financial incentives to landowners</li> <li>4) implement management options (CVC will need to develop internal protocols on who takes the lead)</li> </ul>	7.1.7, 7.1.14, 7.1.21, 7.2.3	2	X	X	X

TACTICS		PRESSURE NUMBER	TACTIC PRIORITY	TIME LINE		
				YEARS		
				SHORT (1-2)	MED (3-5)	LONG (6-10)
<b>8) PLANNING AND REGULATION STRATEGY</b>						
Continue to develop policies and tools to assess land use planning documents and applications to ensure development within the watershed proceeds in an environmentally sustainable form. A key deliverable would be developing a comprehensive policy document that would incorporate key themes (e.g. water quality and quantity, natural heritage, development standards, hazard land management) and provide direction for implementation through plan input (review of planning policy documents) and plan review of development applications and the regulation permitting process. Throughout the plan input and review process and administering the Regulation, the key deliverables would be continuing the partnerships with municipalities with regard to advisory services, achieving full cost recovery through plan review fees, appealing unacceptable decisions, providing timely responses to review requests and processing permit approvals consistent with the policies to be developed and enforcing those decisions.						
<b>8 a) Policy Development</b>						
Comprehensive update existing planning polices under key policy themes below:						
<b>Water Quantity</b>	Maintain base flow and groundwater levels, promote stream flow management to reduce erosion impacts	7.1.1, 7.1.6, 7.1.9	1	X	X	X
<b>Water Quality</b>	Protection of surface and groundwater quality to support watershed functions	7.1.3, 7.1.6, 7.1.15, 7.1.16, 7.1.18	1	X	X	X
<b>Natural Heritage Communities/System</b>	Protect, restore or enhance terrestrial and aquatic plant/animal species, community diversity and productivity	7.1.3, 7.1.8, 7.1.13, 7.1.17	1	X	X	X
	Establish policy to reduce the number of ponds and or restore wetland habitat in existing ponds	7.1.7, 7.1.8, 7.1.13	2		X	X
	Develop policy to protect significant wildlife habitat	7.1.7, 7.1.8, 7.1.13, 7.1.14, 7.1.17	1		X	X
	Develop policy that encourages no net loss of natural areas		1		X	X
	Use natural heritage inventory to develop policies which protect Species at Risk & locally significant species		1		X	X
	Develop policy to protect significant woodlands		2		X	
	Encourage connectivity and discourge barrier creation		1	X	X	X
	Protect a series of natural and remnant habitats across the watershed		1	X	X	X
	Protect a variety of habitats (young, mid-age and mature)		1	X	X	X
	Protect natural heritage in accordance with the Provincial Policy Statement		1	X	X	X



TACTICS		PRESSURE NUMBER	TACTIC PRIORITY	TIME LINE		
				YEARS		
				SHORT (1-2)	MED (3-5)	LONG (6-10)
<b>8) PLANNING AND REGULATION STRATEGY (continued)</b>						
<b>Development Standards</b>	Ensure standards include best management practices for municipal infrastructure and stormwater management	7.1.1, 7.1.2, 7.1.3, 7.1.4, 7.1.6, 7.1.9, 7.1.16	1	X	X	X
<b>Landform and Soil Protection</b>	Conservation of land through maintenance of valley and stream integrity	7.2.2	1	X	X	X
	Develop policies and protection activities that conserve soil quality/quantity	7.1.3, 7.1.6, 7.2.1	2		X	X
	Ensure development standards include best management practices for soil conservation	7.1.3, 7.1.6, 7.2.1				
	Policies and procedures promoting protection of landform functions and features including supporting low impact development	7.1.2, 7.1.3, 7.1.4, 7.2.1	2		X	X
<b>Hazard Land Management</b>	Prevent loss of life and property damage as a result of flooding and erosion	7.1.1, 7.1.5	1	X	X	X
<b>Municipal Servicing</b>	Advance full municipal servicing services and guide transportation and infrastructure corridors to protect natural heritage system and minimize impacts to natural hazards	7.1.5, 7.1.2	1	X	X	X
<b>Mineral Aggregate Resources</b>	Ensure development proposals address issues of public health and safety and avoid environmental impact	7.1.5, 7.1.20	1	X	X	X
<b>8 b) Plan Input &amp; Review</b>						
<b>Agreements/MOUs</b>	Continue in accordance with CVC's mandate and agreements with municipalities, DFO, MNR, MOE and MMAH	7.1.5, 7.1.9, 7.1.18, 7.2.3	1	X	X	X
<b>Cost Recovery</b>	Achieve full cost recovery of plan review fees under the CA Act to reduce levy burden to municipalities	N/A	1	X	X	X
<b>Appeals</b>	Challenge environmentally unacceptable applications at OMB and use appeal mechanisms as approved by CVC Board of Directors	N/A	1	X	X	X
<b>Plan Input/Review Responses</b>	Provide timely response to plan input and review requests	N/A	1	X	X	X
	Develop plan review checklist; develop protocols and guidelines to improve review efficiency	N/A	1	X	X	X

TACTICS		PRESSURE NUMBER	TACTIC PRIORITY	TIME LINE		
				YEARS		
				SHORT (1-2)	MED (3-5)	LONG (6-10)
<b>8) PLANNING AND REGULATION STRATEGY (continued)</b>						
<b>8 c) Regulations</b>						
<b>Permits</b>	Administer a permitting process to allow various scale developments while protecting the natural environment including and enforcement capability	N/A	1	X	X	X

TACTICS		PRESSURE NUMBER	TACTIC PRIORITY	TIME LINE		
				YEARS		
				SHORT (1-2)	MED (3-5)	LONG (6-10)
<b>9) MONITORING STRATEGY</b>						
Continue with the watershed-wide Integrated Watershed Monitoring Program to measure, assess and publish watershed conditions over time. This will test, over the long-term, whether different practices are producing the expected improvements to the watershed or whether adjustments in management practices are needed. We will also develop an approach to track the relationships between key environmental resource variables and their socio-economic implications for the watershed community. A key deliverable will be the generation of watershed report cards every 5 years that presents watershed conditions.						
<b>Integrated Monitoring Program</b>	Continue CVC comprehensive integrated monitoring program for water quality and quantity and terrestrial aspects (includes effectiveness monitoring for implementation of all programs as well as 5-year reports)	7.1.1, 7.1.2, 7.1.3, 7.1.4, 7.1.6, 7.1.8, 7.1.9, 7.1.10, 7.1.13, 7.1.16, 7.1.18, 7.1.19, 7.1.20, 7.2.1, 7.2.3, 7.2.4, 7.2.5, 7.3.2	1	X	X	X
<b>Socio-Economics</b>	Carry out research on socio-economic values associated with watershed features and functions – ecosystem services	7.1.8, 7.2.3	1	X	X	
	Develop indicators and targets for socio-economic monitoring	7.1.8, 7.2.3	2		X	
<b>Diseases and Pests</b>	Monitor for pests as part of Disease and Pest Strategy (see Tactics listed under Natural Heritage Strategy)	7.1.10, 7.1.19	2	X	X	X
<b>Conservation Areas &amp; Lands Effectiveness Monitoring</b>	Monitor CVC land	7.1.11, 7.1.12, 7.2.3	1	X	X	X
	Includes effectiveness monitoring for implementation of all programs	7.1.21	1	X	X	X

TACTICS		PRESSURE NUMBER	TACTIC PRIORITY	TIME LINE		
				YEARS		
				SHORT (1-2)	MED (3-5)	LONG (6-10)
<b>9) MONITORING STRATEGY (continued)</b>						
<b>Restoration Effectiveness Monitoring</b>	Develop a Monitoring Program for the Restoration Strategy (See Tactic 7)	7.1.1, 7.1.2, 7.1.3, 7.1.4,	2		X	X
	Develop and implement a restoration plan (database) model which would allow prediction of the long term benefit of restoration effects and assist in prioritization of restoration sites	7.1.6, 7.1.8, 7.1.9, 7.1.10, 7.1.13,	2		X	X
	Develop monitoring sites to retrofit pilot sites and allow for adaptive environmental management	7.1.16, 7.1.18,	1	X	X	X
	Fletcher's Creek monitoring	7.1.19, 7.1.20, 7.2.3, 7.2.4, 7.2.5, 7.3.2	1	X	X	X
	NW Brampton Effectiveness Monitoring Strategy expanded	7.1.1, 7.1.2, 7.1.3, 7.1.4, 7.1.6, 7.1.8, 7.1.9, 7.1.10, 7.1.13, 7.1.16, 7.1.18, 7.1.19, 7.1.20, 7.2.3, 7.2.4, 7.2.5, 7.3.2	1	X	X	X
	Increased enforcement/presence on construction sites	7.1.2, 7.1.4, 7.1.5, 7.1.6, 7.1.20, 7.2.1, 7.2.2, 7.3.5	1	X	X	X
<b>Lake Ontario</b>	Funding is given to Areas of Concern. Shorelines on either side of CVC have received funding. CVC needs to conduct some monitoring to establish any parameters of concern as part of Shoreline Management Strategy	7.2.5	3			X

TACTICS		PRESSURE NUMBER	TACTIC PRIORITY	TIME LINE		
				YEARS		
				SHORT (1-2)	MED (3-5)	LONG (6-10)
<b>10) CONSERVATION AREAS/LAND MANAGEMENT STRATEGY</b>						
<b>Assist in achieving corporate objectives through development and implementation of a comprehensive program of authority Land Management that provides for natural heritage protection, education and safe public use opportunities on Authority-owned lands.</b>						
<b>Safety</b>	Ensure absolute safety of people on CVC properties	7.1.7, 7.1.11, 7.1.12	1	X	X	X
<b>Habitat</b>	Incorporate habitat needs of species	7.1.8, 7.1.11, 7.1.12, 7.1.13, 7.1.14	1	X	X	X
<b>Protection</b>	Protection first, appreciation second, recreation where compatible (implement in management plans and agreements) supporting an "Environment First" policy	7.1.8, 7.1.11, 7.1.12, 7.1.17, 7.2.3	1	X	X	X
<b>Signage Plan</b>	Develop signage plan for all lands re health and safety, rules and regulation, education	7.1.8, 7.1.11, 7.1.12, 7.1.21, 7.2.3	1	X	X	X
<b>Biodiversity</b>	Implement practices that encourage maintenance of biodiversity	7.1.8, 7.1.13, 7.1.17	1	X	X	X
<b>Invasive Species</b>	Attempt removal of invasive species	7.1.10, 7.1.13, 7.1.19	2	X	X	X
<b>Enforcement</b>	Enforcement strategy including enhanced and routine enforcement	7.1.7, 7.1.8, 7.1.11, 7.1.12, 7.2.3	1	X	X	X
<b>Lands Policies</b>	Policies, standards, guidelines to govern authority –owned lands (eg. Buffers and open space policies, hazards and enforcement).	7.1.8, 7.1.11, 7.1.12, 7.1.19, 7.1.21, 7.2.3	1	X	X	X
<b>Management Plans</b>	Management plans for all CVC lands to set goals, management and classification	7.1.8, 7.1.11, 7.1.12, 7.1.13, 7.1.14, 7.1.17, 7.1.21, 7.2.3	1	X	X	X

TACTICS		PRESSURE NUMBER	TACTIC PRIORITY	TIME LINE		
				YEARS		
				SHORT (1-2)	MED (3-5)	LONG (6-10)
<b>10) CONSERVATION AREAS/LAND MANAGEMENT STRATEGY (continued)</b>						
<b>Re-confirm Ownership</b>	Hire surveyor to assess property lines	7.1.8,	2		X	X
	Confirm fence lines	7.1.11,	2	X	X	X
	Increase staff presence	7.1.12	1	X	X	X
	Strategy to deal with existing and future encroachments		1	X		
<b>Communication, Education &amp; Monitoring</b>	Conduct regular user surveys and analyse as appropriate	7.1.8,	1	X	X	X
	Outreach and education programs in active CA areas	7.1.11, 7.1.21	1	X	X	X
	Partnerships with communities for funding , monitoring, etc. "Friends of" model	7.1.8, 7.1.12	1	X	X	X
	Develop recreation program by increasing revenues over expenses	N/A	1	X	X	X
	Actively seek new funding (grants, foundations including CVC, local partners)	N/A	1	X	X	X
	Explore eco-tourism when and where appropriate opportunities exist	7.1.8, 7.1.21	2		X	X
<b>Infrastructure Creation and Maintenance Strategy</b>	Improve infrastructure related to highest priority program administrative facility	N/A	1	X	X	X
	Complete headquarters administration building	N/A	1	X	X	
	Infrastructure for recreation to be considered only on a no-cost scenario	N/A	2		X	X
	Improve communication link to Terra Cotta	N/A	1	X		
	Land management data base on CVC owned land (input land inventory and real estate information)	7.1.11, 7.1.12	1	X		

TACTICS		PRESSURE NUMBER	TACTIC PRIORITY	TIME LINE		
				YEARS		
				SHORT (1-2)	MED (3-5)	LONG (6-10)
<b>11) EDUCATION/ COMMUNICATIONS STRATEGY</b>						
<b>Develop and implement an Education and Communications Strategy that achieves environmental awareness, motivates community participation, targets audiences and utilizes effective partnerships.</b>						
<b>Education</b>	Create education strategic program guided by completed education strategy	7.1.21	1	X	X	X
	Natural areas inventory and habitat restoration education	7.1.13, 7.1.21	1	X	X	X
	Socio/economic benefits of environment (when aspects of socio-economic study complete)	7.1.8, 7.1.21, 7.2.3	1	X	X	X
	Support high priority CVC programs and projects	7.1.21	1	X	X	X
	Start education program at Terra Cotta and working with existing partners	7.1.21	2		X	X
	Develop partners (Riverwood, Willow Park, School Boards) and implement education program largely through them	7.1.21	1	X	X	X
	Help develop education signage plan in conservation areas	7.1.8, 7.1.11, 7.1.21, 7.2.3	1	X	X	X
	Educate on status of pests and disease	7.1.10	2	X	X	X
	Educate public about the value of complex habitats, the importance of maintaining connectivity and the effects of adjacent land uses	7.1.8, 7.1.14, 7.1.17	1	X	X	X
	Educate on invasive species	7.1.19	2	X	X	X
	Develop funding strategies and conduct fund raising; increase funding	N/A	1	X	X	X
	Develop a toolbox of advice and practices such as guidelines, sample municipal topsoil by-laws, training course, etc for sediment control	7.1.6	1	X	X	X
	Raise awareness with rural landowners re rural pollution	7.1.2, 7.1.3, 7.1.16	2	X	X	X
	<b>International Assistance</b>	Continue to assist other nations such as Mexico if fully funded from new sources other than municipal levy and approved by the CVC Board of Directors	N/A	1	X	X

TACTICS		PRESSURE NUMBER	TACTIC PRIORITY	TIME LINE		
				YEARS		
				SHORT (1-2)	MED (3-5)	LONG (6-10)
<b>11) EDUCATION/ COMMUNICATIONS STRATEGY (continued)</b>						
<b>Communications</b>	4 on-line newsletters per year	N/A	1	X	X	X
	Website		1	X	X	X
	2 <i>Currents</i> publications annually		1	X	X	X
	1 Annual Report	N/A	1	X	X	X
	Support for all CVC programs on a priority basis	N/A	1	X	X	X
	Market and promote conservation areas	7.1.8	1	X	X	X



TACTICS		PRESSURE NUMBER	TACTIC PRIORITY	TIME LINE		
				YEARS		
				SHORT (1-2)	MED (3-5)	LONG (6-10)
<b>12) GREENLAND SECUREMENT STRATEGY</b>						
Work in partnership with governments and other potential partners for watershed protection through securement of significantly important conservation lands, by use of a variety of tools (e.g. donation, conservation easement, management agreement, fee-simple purchase) while minimizing risk to public agencies (e.g. on-line dams). This will contribute to a connected system of greenlands that provide natural heritage protection, appreciation and recreational benefits for a healthy ecosystem and healthy communities.						
<b>Securement</b>	Look at potential to purchase lands for habitat restoration	7.1.3, 7.1.8, 7.1.9, 7.1.17	2	X	X	X
	Agreements Halton and Peel finalized (working relationship and funding partnership)	N/A	1	X		
	Protect known unique populations and/or reconnect isolated populations and their habitats	7.1.13, 7.1.17	1	X	X	X
	Protect a series of mature and remnant habitats across watershed	7.1.8, 7.1.13	1	X	X	X
<b>13) PARTNERSHIPS FOR ASSISTANCE AND FUNDING</b>						
Achieve corporate strategic objectives through proactive partnerships developed with agencies, non-governmental organizations (NGOs), landowners, academic community as well as partnership with the CVC Foundation. Achieve objectives through creative funding alternatives such as revenue strategies and grants.						
<b>Partnerships</b>	Partnerships in education and stewardship	7.1.21	1	X	X	X
	"Friends of" model in CAs	7.1.12	1	X	X	X
	"We Care" model expanded	7.1.12, 7.1.16	2		X	X
	Credit River Water Management Strategy partnership development for implementation	7.1.2, 7.1.4	1	X	X	X
<b>Funding</b>	Increase CA revenues from park fees, plan input and review (also build in inflation)	N/A	1	X	X	X
	Seek grants from agencies and private foundations	N/A	1	X	X	X
	Funding from plan input and review, park fees, regulations fees (Ensure adequate and cover cost of living)	N/A	1	X	X	X
<b>Foundation Enhancements</b>	Achievement of current fund raising goals including: 1) Gala event 2) Island Lake Trails Project 3) Unrestricted Green Journeys 4) Rattray Marsh (Living Discover Center)	N/A	1	X		
	Recruit 6 new Board members	N/A	1	X		
	Annual Giving Campaign established	N/A	1	X	X	X
<b>Marketing</b>	Market and promote Conservation Areas	N/A	1	X	X	X

TACTICS		PRESSURE NUMBER	TACTIC PRIORITY	TIME LINE		
				YEARS		
				SHORT (1-2)	MED (3-5)	LONG (6-10)
<b>14) CVC RESOURCES</b>						
<b>Human Resources</b>	CVC's best resource: continue to be treated fairly in pay (market), benefits, working conditions, policies	N/A	1	X	X	X
	Continue to ensure absolute safety for employees	N/A	1	X	X	X
	Continue training plans to ensure skills and expertise are current	N/A	1	X	X	X
<b>Monetary Resources</b>	Continue honest, responsible effective use of funds	N/A	1	X	X	X
	Continue to ensure spending guided by strategic plans and business plans approved by CVC Board of Directors	N/A	1	X	X	X
	Continue to ensure appropriate checks and balances and standard approved accounting systems controlled by appropriate financial polices and processes	N/A	1	X	X	X
<b>15) ADDITIONAL TACTICS FOR FUTURE CONSIDERATION</b>						
There is an identified need for cultural heritage management, energy conservation, waste reduction and control of air pollution as priority 3's not because they are not environmental priorities but for other reasons. CVC will not be developing comprehensive strategies to deal with these issues as other agencies have a greater capacity and the mandate to deal with them.						
<b>Agricultural Land Protection</b>	CVC will work with municipal partners in implementing Provincial Policy Statement requirements, the Greenbelt Act & Plan, Places to Grow and other provincial initiatives that protect agricultural land uses.	N/A	2	X	X	X
	CVC will provide natural resource information and technical review assistance to municipalities to assist in making decisions on agricultural land protection	N/A	2	X	X	X
<b>Energy Conservation, Waste Reduction &amp; Air Quality</b>	CVC will attempt to save energy and reduce waste in its own operations.	7.3.2, 7.3.3, 7.3.5	3	X	X	X
	Air quality affects water quality and will be addressed through planting.	7.3.2, 7.3.4	3		X	X
	CVC will support other agencies in their lead in air, energy, encourage LEEDS, transportation-friendly development practices, energy efficient developments, linked open spaces and green space.	7.3.3, 7.3.4, 7.1.3, 7.1.8	2		X	X
	CVC will support public transit and energy efficiency in municipal design.	7.3.4, 7.3.5	3		X	X
<b>Cultural Heritage</b>	Cultural heritage is not CVC's mandate except as a landowner and will need to be low priority for the short to medium term.	7.3.1	3	X	X	
	CVC will investigate divesting cultural heritage management and possibly sites to partners and agencies who are better able to manage the sites.	7.3.1	3		X	X