Integrated Watershed Management

Navigating Ontario's Future

Overview of Integrated Watershed Management in Ontario



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INTEGRATED WATERSHED MANAGEMENT

Navigating Ontario's Future

Integrated Watershed Management in Ontario: Phases I, II, III

EXECUTIVE SUMMARY

Introduction

This summary document is part of a shared undertaking between Conservation Ontario (representing Ontario's 36 Conservation Authorities), the Ontario Ministries of Natural Resources and Environment and the Department of Fisheries and Oceans Canada to explore jointly our understanding of IWM in Ontario, assess it against other IWM work occurring globally and nationally to identify gaps, and recommend strategic shifts needed to address the identified gaps in working towards a Provincial Integrated Watershed Management Framework. This work is intended to update our understanding of Integrated Watershed Management (IWM) in Ontario.

As part of this initiative, a series of three reports were developed:

· Integrated Watershed Management in Ontario

Phase I: Status of Integrated Watershed Management

Phase II: Defining Integrated Watershed Management in Ontario

Phase III: Updating Integrated Watershed Management in Ontario

- · A Water Management Framework for Ontario
- · A Water Budget Overview for Ontario

Water is needed in all aspects of our life and in order to ensure ongoing sustainability of this important resource, a more integrated approach needs to be adopted using the watershed as a managing unit.

For the purposes of these reports, Integrated Watershed Management is defined as: managing human activities and natural resources in an area defined by watershed boundaries aiming to protect and manage natural resources and their functions today and into the future. The reports begin by updating our understanding of Integrated Watershed Management (IWM) in Ontario, assessing it against IWM being conducted globally and nationally, identifying gaps, and recommending strategic shifts needed to address these gaps. From this research, we are able to categorize a set of tools that could be applied to Ontario for planning and decision-making.

The myth of water abundance in Ontario is a key challenge and must be overcome to fully protect our resources. Agencies need to work together to protect our watersheds for the well being of all Ontarians. There is a need to develop a shared vision by all stakeholders in order to effectively manage impacts from our changing climate, population growth, increased urbanization and aging infrastructure. In the future, water frameworks will need to address risk-based approaches and aspects of adaptive environmental management And, there is some urgency to addressing these challenges as reversing negative impacts becomes more difficult and expensive with time.

In addition to looking at IWM in Ontario, these reports also explore the development of a Water Management Framework and Water Budget Overview for Ontario. The IWM approach identifies water management and ecosystem issues that must be evaluated to determine their relative importance and to decide which issues will be addressed. Under the umbrella of IWM, the water management framework is intended as a practical guide that assists agencies with a mandate for water management to work together to fulfill their collective mandates to ensure a sustainable water resource for the Province of Ontario. The water budget assessment would be one component (of many) within the water management framework. Given this hierarchical relationship and the underlying principle of adaptive environmental management, many feedback loops exist between these approaches.

This report summarizes the research and information contained in all of the reports' executive summaries. Considerations for next steps are also addressed.



PHASE I Status of Integrated Watershed Management in Ontario

Canadian watershed managers (practitioners) face significant challenges in maintaining Canadian water quantity and quality today. Managing the expected hydrologic impacts of climate change and the resourceneeds of a sustainable ecosystem must be balanced with managing intensified population growth and urbanization, changing uses of water, pollution from air and land and introductions of exotic & invasive species.

The initiative consists of three phases;

Phase I - Status of Integrated Watershed Management

• Assess the IWM approach from a global, national, great lakes basin and local watershed perspective;



 Condense the work carried out in Ontario to date in IWM;

Phase II - Defining Integrated Watershed Management in Ontario

- Identify the legislative requirements for IWM in Ontario;
- · Identify connections to other initiatives ongoing in Ontario and Canada
- Identify key issues facing Ontario (e.g. climate change, infrastructure needs, sustainable practices)
- · Identify the gaps in IWM in Ontario

Phase III - Updating IWM in Ontario

- · Identify strategic shifts needed to address gaps
- · Make recommendations for next steps

According to the Canadian Chamber of Commerce, the past several years have provided us with numerous examples of the need for a national water strategy. "The floods, droughts, Great Lakes pollution problems, the variability of our climates and the impact of our activities on that climate all speak to the need for a coordinated effort between the federal, provincial and municipal governments to develop national policies and practices for one of our most precious resources." ¹

Water is needed in all aspects of our lives and in order to ensure ongoing sustainability of this important resource and linkages, a more holistic – or integrated – approach needs to be adopted using the watershed as a managing unit. Integrated Watershed Management is managing human activities and natural resources in an area defined by watershed boundaries aiming to protect and manage all natural resources and their functions today and into the future.

This approach recognizes and operates based on the interconnectedness of ecology, economy and society. In this way, we are able to ensure that adequate supplies of good quality water are maintained for the entire population while preserving the hydrological, biological and chemical functions of ecosystems, adapting human activities within the capacity limits of nature. (United Nations)

Although it is widely understood that water should be holistically managed, it wasn't until the Dublin Conference on Water and the Environment in 1992 that the global community called for a more comprehensive approach to water management in order to achieve sustainable development.

Globally

Reviewing how IWM has evolved around the world, in such key areas as Australia, Brazil and Europe, we find there are a number of major shifts that occurred over time among policy makers and water managers. This could lend some ideas to the shifts that may be needed in Canada, and specifically, in Ontario.

Nationally

From a national perspective, two processes currently being used by some departments of the Federal Government are examined. These include Regional Environmental Assessment (REA) and Large Ocean Management Area (LOMA). While there is no single approach to REA and a range of approaches exist, the process is often thought to be designed to facilitate multiple project-based assessments within a common geographic region. LOMAs have been established to advance collaborative management amongst all levels of government to develop strategic and long-term plans so that ecosystem health and economic development issues can be suitably managed.

There are a number of important contributions from non-government organizations which deserve review and

Global View

Global shifts from traditional policy perspectives included:

- · Sectoral to integrated management
- Top down to stakeholder and demand responsive change
- · Supply fix to demand management
- Command and control to more cooperative or distributive forms of governance
- Closed, expert-driven management organizations to more open, transparent and communicative bodies





recognition for the contribution they make to the process of IWM in Canada. Key conclusions made by organizations such as the Canadian Water Resources Association, Polis and Pollution Probe call for changes to enhance the abilities of ecosystem managers to manage water and the ecosystem ensuring critical connections to social and economic considerations.

Many of the non-government organizations see IWM as a fundamental tool in addressing principles on sustainability and ecosystem-based management. Calls for federal and provincial water policies and strategies were consistently raised along with the need for improved inter-agency coordination with clear governance structures. The concept of shared responsibility was also raised in engaging and connecting with the watershed community. Stable funding for expertise, planning and implementation for water management, precautionary principle and pollution prevention were seen as underpinning principles. Economic instruments such as polluter pay and recognizing the economic value of water were raised as a source of management costs.

Great Lakes

International and domestic agreements pertaining to protection and restoration of the Great Lakes Basin ecosystem support watershed management. Much of the work of the International Joint Commission consists of assisting the Governments of Canada and the United States to achieve their goal of cleaning up the Great Lakes



and preventing further pollution in the system. In recommending changes to the Great Lakes Water Quality Agreement, the International Joint Commission's fourth recommendation reads as:

The Commission recommends that the Agreement specify that watersheds be the geographic units to coordinate, integrate and implement programs called for by the Agreement and set out in the Binational Action Plan.

As per the Canadian Department of Foreign Affairs & International Trade, News Release dated June 13th, 2009:

"...the Great Lakes are still at risk from current and emerging challenges such as increased population and urbanization, land use practices, invasive species, new chemicals and the impacts of climate change. Negotiations over the coming months will aim to strengthen and modernize the Agreement to better address these perils."

Provincially

We are able to look at a number of current approaches espousing the concepts of IWM and ecosystem based planning in the provinces of British Columbia, Alberta, Manitoba and Quebec. The effectiveness of new and existing watershed planning initiatives, policies and practices, including the provincial approaches from Quebec and Alberta offer improved opportunities for inclusiveness and shared responsibility.

Work to date in Ontario, stems primarily from three sets of watershed planning documents released as guidance tools in 1992. Since that time, many watershed and subwatershed studies have been carried out as well as some interim work evaluating IWM in 1997. In 2004, the lessons learned from the work completed to date in Ontario were published by Conservation Ontario in a study entitled





Watershed Management in Ontario: Lessons Learned and Best Practices. This report evaluates case studies from three of the 36 Conservation Authorities in Ontario.

Ontario is a world leader in the area of integration of different scientific disciplines as a result of the work done by the Ontario government and local Conservation Authorities. Working alongside their municipal counterparts, Conservation Authorities implement local solutions in response to a variety of issues.

Tools for Planning and Decision-Making

From this research, we are able to categorize a set of tools that are needed in Ontario for planning and decisionmaking. Such tools can be categorized into the following components (Global Water Partnership):

- Management Instruments
- Enabling Environment
- Institutional Framework

Management Instruments include tools such as Integrated Watershed Management plans that characterize watersheds, predict impacts from various scenarios and develop implementation plans for a watershed that will achieve outcomes such as sustainable growth etc. An Enabling Environment includes developing tools such as policies, a legislative framework and financial structures. Institutional Frameworks include developing governance models that outline how agencies will work together to make decisions by developing solutions and implementing results.

The success of the Flood Damage Reduction Program and the Source Water Protection programs in Ontario are good examples of how these tools were applied and continued to be applied with considerable success.

Integrated watershed management promotes sustainability, integrated management, transparent decision-making and engagement of a variety of stakeholders. Identifying the gaps in our approach to Ontario's IWM concept will help us to determine the shifts that need to be made in order to ensure the health of our watersheds and the people who live within them.

PHASE II Defining Integrated Watershed Management in Ontario

Ontario's watershed managers strive to minimize harmful impacts and influences on water and related natural resources in order to ensure the environmental, social and economic well being of Ontario on a sustainable basis. Watershed management is a tool to aid water and land use decision makers.²

Evolution of IWM in Ontario

Our knowledge and perspectives around the connectivity between water and related land resources has shifted considerably from the 1960s to the present. In the 1960s and 1970s, the issues around water were focused primarily on quantity and related mainly to flooding of property and erosion of streams. The 1980s saw the beginnings of attempts to manage stormwater runoff and improvements to the design of new and existing infrastructure such as culverts. With the increase in development in the mid-to late 1980s, we needed to also focus our attention on erosion and sediment control emanating from construction sites.

Later in the 1980s, aquatic habitat came under scrutiny because of the impact stream conditions were having on fish habitat and fish populations. At the same time water quality concerns arose as connections became evident between stormwater runoff and increased pollution in streams.

Throughout the 1990s, the list of concerns grew to include aquatic habitat, water temperatures, baseflow, riparian systems and natural infrastructure (wetlands, woodlots, wildlife, etc.). As watershed management plans began to develop in the 1990s we became more aware of the need to integrate the different fields of study along with economic and social science components. As these plans progressed, we incorporated scenario testing, information management and clear implementation strategies to the process. Throughout the 2000's, we have been grappling with the impacts of climate change, the need for social marketing, green infrastructure and more sustainable tools for watershed assessments. Considerations around IWM today are now concerned with the urgent need to establish more effective collaborations to promote better governance in order to share responsibilities and ensure sustainable outcomes.

Key Issues and Challenges Facing Ontario

Consultations in the form of surveys, workshops and research revealed that most issues and challenges are related to concerns over improved management of Ontario's natural resources. The myth of water abundance in Ontario held by the public is a key challenge and must be overcome to fully protect our water resources. Another challenge was the need for agencies to work more closely, sharing knowledge, information and decision-making in order to protect our watersheds and the well-being of Ontarians. Developing a shared vision by all stakeholders through a watershed-based approach to manage impacts from our changing climate, population growth, and aging infrastructure was also seen as a key issue. Not having policies and associated practices using a risk-based approach that support adaptive environmental management and the precautionary principles to foster creativity and innovation for improved environmental protection was seen as a key challenge that must be overcome. There is some urgency to addressing these challenges as reversing negative impacts becomes more difficult and expensive with time.

Over the longer term, there is a need to build social capital with ongoing education for those in a decision-making role and those who live, work and recreate in our watersheds so that the above challenges can be fully addressed through appropriate change.





Integrated Watershed Management as a Decision-Making Process

Integrated watershed management is the process of managing human activities and natural resources in an area defined by watershed boundaries. It is an evolving and continuous process through which decisions are made for the sustainable use, development, restoration and protection of ecosystem features, functions and linkages. IWM allows us to address multiple issues and objectives; and enables us to plan within a very complex and uncertain environment.

One of the keys of successful IWM is the integration of scientific components with multiple stakeholder and agency responsibilities, requiring us all to understand exactly what is going on in our local watersheds in the big picture and what has to be done to ensure a sustainable future. IWM can be applied at different scales, however, implementation always take place at a local level – in other words, in our own backyards.

IWM has evolved over the years – both on global scale and here in Ontario. As part of the process of developing IWM plans we need to consider the impacts of a variety of watershed stressors such as climate change and growth pressures. This ultimately leads to better management decisions that help to set priorities, pool limited resources and increase efficiency among governments. IWM links human behaviour and environmental impact and by planning within this context, we can ensure healthy, safe environments that provide a good quality of life.

The underlying principle behind the IWM process is Adaptive Environmental Management which is the continuous and cyclical process of carrying out a plan that addresses identified issues and concerns that is then implemented, monitored, reported on and updated as required in order to adapt to changing or new emerging stressors.



Status of IWM in Ontario

In Ontario, practitioners integrate different science disciplines. Traditionally, water policies or programs have been 'feature' or activity-specific. As well, interpretation of policies referring to IWM varies across Ontario. Generally, water and associated environmental resources governance is shared by many agencies across different geographic scales in the province.

For the purposes of this report, two surveys were conducted in 2008 and 2009 assessing the understanding and involvement in IWM by Ontario's 36 Conservation Authorities and a variety of government agencies. This report provides the results of these surveys.

Survey information indicated that IWM is practiced by Conservation Authorities. Legislated under the *Conservation Authorities Act* since 1946, these agencies have been using watershed plans since this time. The particular approach they use today dates to the 1990s. However, implementation of Watershed Plans across Ontario is varied and there is an actual decline in the number of plans and associated implementation actions due to a lack of funding.

Survey input indicated that water and associated envirionmental resources are generally shared by many agencies across different geographic scales in the province. However, there is a lack of collaboration on IWM amongst stakeholders, therefore the role and contribution of IWM is not fully realized in Ontario.

Barriers to IWM in Ontario

One of the first barriers we run across is the actual attitudes of the general public around water. A recent survey conducted in 2008 by RBC and Unilever Canada found that there is a long way to go to raise the profile of water as a top environmental concern for Canadians.³ Three quarters of those surveyed said that they were confident that Canada has enough freshwater supply for the long term. Although this number has declined marginally from previous surveys, this is still a large majority of Canadians buying into the myth that we have an abundant supply of freshwater. Compared to other parts of the world, Canada does have a larger supply of freshwater but – like everywhere else, it is being seriously impacted by climate change, increased urbanization, as well as multiple and changing water uses.

A number of barriers were identified from a Conservation Authority perspective:

- **Insufficient staff and resources** hamper the ability of these agencies to produce watershed plans;
- Ever-emerging provincial legislation centered around single issues have the potential to create planning & implementation duplication and conflicting objectives. Examples include Oak Ridges Moraine Act, Greenbelt Plan, Growth Plan and Lake Simcoe Act;
- **Data gaps** there is a lack of data or access to data required to develop comprehensive watershed plans;
- Social and Economic Science linkages specific to Ontario are lacking. This area provides a real opportunity for Ontario be a national leader;
- **Funding limitations** often reflect the lack of public and political understanding and support;
- Sustainable public and political support for work whose outcomes are long term.

As a result of these barriers, Conservation Authority watershed planning and implementation has actually declined in Ontario today.

Barriers identified in the survey completed by government agencies centered on their lack of knowledge and decisionsharing, inadequate funding, no common vision for using an integrated approach, no champions and no definition of or available best practices for the IWM concept.

While there are many barriers that agencies strive to work around today, watershed and subwatershed studies and plans also provide important opportunities for Conservation Authorities to build their scientific knowledge of local watersheds and to share this knowledge with residents, landowners, and other agencies such as through watershed report cards.

The implementation that follows a watershed plan is viewed by Conservation Authorities as an opportunity for them to build and/or strengthen local partnerships through plan development and implementation, gaining mutual trust and influence key areas such as budgets and land use change. Involving local stakeholders greatly helps to streamline and set watershed priorities and to obtain implementation funding. Their participation is critical.



Gaps in IWM in Ontario Today

Science, Computer Modelling & Mapping

Gaps around current IWM practices generally identified by Conservation Authorities focused around science, computer modelling and mapping. Specifically these agencies identified gaps around surface water and groundwater interaction; the role of groundwater across all disciplines; water quality protocols, data management & dissemination; and the inability to accurately predict fish populations based on habitat and their relationship with biodiversity. As well more GIS and analysis data is needed particularly around interactions between different types of land uses and corridors/habitats. Conservation Authorities would also like to see improvements in the regional data and analysis available for stream structure and functions in order to better predict changes and drivers. There have been significant improvements made around mapping and data management, particularly in the ability of digital data to be overlaid to more accurately illustrate overall integration in Ontario watersheds. However, the availability of base mapping in digital form is limited.

Another important gap identified by Conservation Authorities is the lack of Canadian-specific information and data around economic - environmental linkages – specifically, we are short of templates, frameworks and models – tools that would help to link our natural environmental with economic models to further illustrate their connectivity and associated values.

A similar gap exists between the social sciences and our world of environmental science. We need a better understanding of the science of people - of public attitudes, values and knowledge - in order to begin to influence their ecological awareness and behaviour.

Process

The process followed in typical watershed and subwatershed studies has evolved over the years.

Photo Credit: Jackie O'Neill



Program

The research carried out in Phase I identified the broad shifts that were occurring nationally in water management as follows (Pollution Probe):

- from process to outcomes;
- · from water management to watershed management
- · from regulating to shared responsibility; and
- from government to governance ⁴

It was determined that Ontario's IWM concept should be evaluated using a set of tools with a view to updating and formally recognizing its role in Ontario to include Management Instruments, Enabling Environment and Institutional Framework.

We need to take a look at governance. In this context, governance can be defined as "an effort to build, manage and maintain inter-organizational networks". In other words, we need to develop an *institutional ecosystem*. The challenges facing us are to develop coordination and decision-making frameworks that are resilient and allow for adaptation.



PHASE III Updating Integrated Watershed Management in Ontario

Strategic shifts are needed to address gaps and update our approach to integrated watershed management for Ontario today.

Integrated watershed management is a process based on the concept of Adaptive Environmental Management. This approach aims to improve the understanding of the ecosystems being managed and the institutions charged with their management.

Integrated watershed management should not be seen as another layer in addition to that which already exists in Ontario. IWM is being done in Ontario by Conservation Authorities and serves to assess watershed functions and the potential impacts from change in order to ensure sustainability. The watershed unit provides context so that we can understand how impacts are felt and how they can accumulate.

Shifts in IWM Scientific Assessment

Phase II Summary Report identified a number of barriers and gaps from the Conservation Authority perspective. A brief summary of these includes:

- lack of scientific data, models, protocols and analyses
- Insufficient resources (time, funding, expertise) for planning & implementation (setting targets, monitoring & evaluation implementation, updating plans)
- Lack of up to date mapping;
- Ever-emerging provincial legislation that was single issue or sector based
- Lack of research around social and economic linkages specific to Ontario

- Funding limitations
- Sustained public and political support.
 Need a better understanding of the science of people

 their attitudes, values and knowledge of our
 ecology and how it relates to their lives
 and priorities

Most significant are the gaps that are associated with the mapping / data management, and the economic, social and ecological integration components. Improvements can be made to mapping and data management by providing resources for methodologies, platforms, ongoing training and easy dissemination. Some collaborations have begun to develop among key partners including provincial, conservation authorities, municipalities and nongovernment organizations. This work needs to become more consistent and broader in scope.

If we agree that ultimately the goal of IWM is to maintain and enhance watershed health which, in turn, links to human well being, then we need to shift towards greater economic, social and environmental integration if sustainability is to be achieved. We need to model how societies and economies function in the environment with each other and not independently. To achieve this, tools and methodologies need to be developed and key to the success is collaboration among all stakeholders (e.g. key levels of government, academia, and organizations with business interests).





In the Phase II Summary Report, Conservation Authorities reported that as they develop watershed and subwatershed studies, they rely on a number of typical components: scoping, characterization, management alternatives and plan development. However, they report there are clear gaps in the process having to do with developing targets, monitoring and evaluation implementation and updating plans. A shift to placing greater emphasis for setting and utilizing scientifically sound targets, monitoring and evaluation implementation as well as updating plans is needed. This can be achieved by recognizing at the initial stages that time, funding and expertise must be accommodated. This will shift from being focused on just getting the watershed plan done to actually getting the plan implemented and being able to measure progress against goals, objectives and targets over time.

Shifts in Governance

As reported in the Phase I Summary Report, global shifts are occurring that can act as a catalyst for us to review and update the IWM concept.

We need to take look at governance which, for the purposes of this study, is defined as "an effort to build, manage and maintain inter-organizational networks... develop an institutional ecosystem". Various governance options are presented in Phase III Summary Report but the best fit appears to be an approach that recognizes the complementary roles of organizations involved in water management and associated natural resources – Adaptive Co-Management approach.

The key elements of Adaptive Co-Management include learning by doing, information sharing, collaboration and shared decision-making, partnering at regional and national levels and finally, flexibility in management approaches. This approach fits us best, given that the Ontario approach to IWM is already rooted in Adaptive Environmental Management.

Phase III Summary Report discusses details around how IWM should be used in Ontario, A series of questions are posed: What are the goals? Who should be involved and why? What information will be used and how? How will decisions be made? How will decisions be implemented? How will accomplishments be measured? What provisions will be made for learning and adaptation?

In addition to ensuring the environmental sustainability of our watersheds, it is equally important to note that IWM helps to build 'social capital' – the trust and relationships within and between social networks.

Considerations for Next Steps

The following considerations are offered following the work completed in Phases I, II and III of this initiative. They provide the next logical steps required to move the yardsticks forward in Ontario for managing on a watershed basis to ensure watershed health and human well being. Collaborative Initiatives between Federal Departments, Provincial Ministries, Conservation Authorities and Municipalities:

1. Create a Watershed Management Working Group

- A quarterly forum for discussion on water issues that could include various levels and organizations such as the province's water directors, conservation authorities, municipalities and environmental non-government organizations about the use of tools addressing Enabling Factors, Management Instruments, Institutional Arrangements, and opportunties for IWM.
- Review and evaluate various collaborative governance models such as Adaptive Co-Management, Basin Agency etc. applicable to Ontario.
- Monitor the effectiveness of new and existing watershed planning initiatives, policies and practices, including international activities on Basin Planning in Australia and the European Union and provincial approaches from Quebec and Alberta.
- · Reports on progress of working group.

2. Steps for further understanding Opportunities for federal/provincial agencies and their partners:

- Use existing forums for interagency discussions on how IWM could be applied. Examples include Great Lakes assessments, impacts of climate change at a provincial and local watershed level, data and data management, and connections to other initiatives e.g. Species at Risk Management Plans, Source Water Protection Plans.
- Host a Symposium on IWM every two years. See Appendix 7 on the results of the 2009 attendee survey which provides information on the content, duration, format etc. that a future symposium should take.

- Consult and evaluate with stakeholders on existing water policies to meet the needs of today and in the future.
- Hold discussions across departments on the models being used to assess the cumulative impact (ie: Ecosystem Based management, water budgets, Large Ocean Management Areas, etc.) with a view to updating and evaluating aproaches on an ongoing basis.

3. Local Level Opportunities for Conservation Authorities and Municipalities

Hold working forums to:

- Educate staff and build a full understanding of IWM and opportunities and approaches developed over the last 10 years.
- Bring consistency to the IWM process amongst Conservation Authorities by reviewing and, if needed, improving standard approaches.
- Brainstorm on how to address barriers to IWM and utilize opportunities.
- Work with province and academia to carry out research needed to address gaps in IWM scientific components especially in the areas of target setting, social, economic and integration.
- Work with municipalities to assess local fit with Official Plans, Secondary Plans etc., develop effluent criteria for sewage treatment plants to meet assimilative capacities of receiving streams etc., develop stormwater retrofits etc.
- Work with Environmental Non-Government Organizations (ENGOs) on implementation of long term projects and on issues of common concern.
- Work with interested parties to build a library of success stories where IWM is being used.



Report PHASE I

Status of Integrated Watershed Management



1.0 | Introduction

In Ontario a series of three Guidance documents were completed in 1992. Since that time many watershed and subwatershed studies have been carried out. Some interim work has been done to evaluate the Integrated Watershed Management (IWM) process in 1997 and later in 2004, the lessons learned from the work completed to date in Ontario were published. Since that time many pieces of provincial legislation have been approved that require and support the need for IWM (e.g. *Oak Ridges Moraine Act, Lake Simcoe Act*). This current work is intended to update our understanding of IWM in Ontario, assess it against other IWM work occurring globally and nationally to identify gaps and recommend strategic shifts. Key to this work is looking at ongoing and future water and environmental challenges that will be addressed by IWM.

The workplan for this project was divided into three distinct phases as follows:

Phase I

- Assess the IWM process from a global, national, great lakes basin and local watershed perspective;
- Condense the work carried out in Ontario to date in IWM;
- Produce Summary Report.

Phase II

- Identify the legislative requirements for IWM in Ontario;
- · Identify connections to other initiatives ongoing in Ontario and Canada e.g. Source Protection, LOMA
- Identify key issues facing Ontario (e.g. climate change, infrastructure needs, sustainable practices etc.)
- · Identify the gaps in IWM in Ontario;
- · Produce Summary Report.

Phase III

- · Identify strategic shifts needed to address gaps;
- · Make recommendations for next steps;
- Produce a Report on an Integrated Watershed Management Framework for Ontario.

This work will proceed with input from the collaborative partners Conservation Ontario, Ministry of Natural Resources and Department of Fisheries and Oceans) as well as an informal group of individuals who have had significant experience with IWM in Ontario.

What follows in this report provides first, a definition of what we mean by Integrated Watershed Management (IWM) in Section 2. Section 3 provides a global perspective on how IWM has evolved since 1992 to present day. Section 4 presents key components of the approaches to IWM from three geographically distinct regions of the world (Australia, Europe and Brazil). In section 5, a Canadian national perspective is provided regarding current approaches taken that espouse the concepts of IWM and ecosystem based planning. Given the important contributions from non government organizations, a chapter is included on recently completed reports that offer insights and advice on furthering IWM in Canada. Section 6 provides a Great Lakes perspective. Section 7 examines examples of IWM related strategies from four provinces in addition to Ontario. Section 8 presents a synthesis of the all the information provided in this report that pertains to furthering IWM in Ontario.

Note on terminology: Please note that the term Integrated Watershed Management (IWM) is used in Ontario when referring to ecosystem based watershed processes and analyses. Alternatively, globally and in some parts of Canada, the term Integrated Water Resources Management (IWRM) is used when referring to ecosystem based watershed processes and analyses. Within this report, these terms are used interchangeably and each is used, as appropriate, to match a given circumstance.

2.0 | What is IWM?

A search has been carried out on the evolution of the definition of Integrated Watershed Management since the 1990's. The following is representative of how the definition first emerged with water being the emphasis and eventually taking on a more holistic meaning as the experience and knowledge base grew.

Integrated Water Resources Management is based on the perception of water as an integral part of the ecosystem, a natural resource and social and economic good. *(United Nations Development Program, 1990).*

Watershed Management refers to a process which provides direction to human activities in the protection and rehabilitation of water, and associated aquatic and terrestrial resources within the watershed while recognizing the benefits of orderly growth and development. The goal is to contribute to the environmental, social and economic well being of the area on a sustainable basis. Watershed Management is a tool to aid land and water use decision makers. (A Preliminary Evaluation of the Watershed Management Initiative, Watershed Planning Implementation Project Management Committee, January 1996)



The Ecosystem Approach is a comprehensive regional approach that integrates ecological protection and restoration with human needs to strengthen the fundamental connection between economic and social prosperity and environmental well being. (*Ramsar Convention on Wetlands- Freshwater Ecosystem Conservation – Background Paper, 1998*).

The River Basin Management Plan - The Plan is a detailed account of how the objectives set for the river basin (ecological status, quantitative status, chemical status and protected area objectives) are to be reached within the timescale required. The plan will include all the results of the following analyses: the river basin's characteristics, a review of the impact of human activity and of the status of waters in the basin, estimation of the effect of existing legislation and the remaining "gap" of meeting these objectives; and a set of measures designed to fill the gap. One additional component is that an economic analysis of water use within the river basin must be carried out. This is to enable there to be a rational discussion on the cost-effectiveness of the various possible measures. It is essential that all interested parties are fully involved in this discussion, and indeed the preparation of the river basin management plan as a whole. (Introduction to the new EU Water Framework Directive European Commission, adopted 2000)

Integrated Water Resource Management is a process that promotes the coordinated development and management of water, land related resources, in order to maximize the resultant economic and social welfare in an equitable manner without compromising the sustainability of vital ecosystems (*Global Water Partnership*, 2000)

Water Approach: A framework to guide watershed management that: 1) uses watershed assessments to determine existing and reference conditions; 2) incorporates assessments results into resources management planning; 3) fosters collaboration with all landowners in the watershed. The framework considers both ground and surface water flow within a hydrologically defined geographical area. (US Army Corps of Engineers, 2000)

A watershed is an area of land that is drained by a river and its tributaries into another area or body of water. Along the way, the quality and supply of water resources are impacted by both natural and human activities. Watershed Management is the process of managing human activities and natural resources in an area defined by watershed boundaries; aims to protect and manage natural resources (including their functions and linkages) for this and future generations; reflects the local environmental and social context; uses an integrated interdisciplinary approach; considers the environment, the economy and communities; uses a partnership approach to plan and manage; uses adaptive environmental management approaches that aim for continuous improvement. (*Watershed Management in Ontario: Lessons Learned and Best Practices, 2003*)

An **Integrated Water Resources** perspective ensures that social, economic, environmental and technical dimensions are taken into account in the management and management of water resources. (*World Bank, 2003*)

Integrated Water Resources Management is a coordinated, goal-directed process for controlling the development and use of river, lake, ocean, wetland, and other water assets. (Journal of Contemporary Water Research & Education, Issue 135, p8-18, December 2006)

Like marine **Ecosystem Based Management** (EBM), the management of watersheds consists of spatially bounded, regional initiatives. In general, watershed management oversees the land, vegetation and water resources of a drainage basin in accordance with predetermined objectives, such as conservation and sustainable development. Again, like EBM, it is often conceptualized as a holistic, integrated way of managing resources. (*Marine Ecosystems and Management, International News and Analysis on Marine Ecosystem-based Management, Marine Affairs Research and Education, Washington, June-August 2008*) **Integrated Management:** A continuous process through which decisions are made for the sustainable use, development, protection of areas and resources. Recognizes the interrelationships among resource users and the environments/ecosystems they potentially affect; overcomes fragmented management approaches; analyzes the implications of development/conflicting uses; promotes harmonization of activities. (*presentation DFO*, *March 2008*)

Ecosystem Based Approach: Management of human activities so that ecosystems (structure, function, composition) are maintained at appropriate temporal and spatial scales. (*presentation DFO, March 2008*)

For the purposes of this report the definition developed in Ontario in the *Watershed Management in Ontario: Lessons Learned and Best Practices, 2003*, will be used. It is fully expected that this definition will be revisited as this work progresses.





3.0 | Global Perspective

The following presents a chronology of how IWM has evolved globally. This information is presented such that the evolution shows what strategic shifts in approach were taken over time. This could lend some ideas to the shifts that may be needed in Canada and Ontario.

3.1 United Nations

In 1992 the International Conference on Water and the Environment was held in Dublin, Ireland. A key result of this conference was the establishment of the **Dublin Principles** which formed the foundation for the freshwater resources component of the UN agenda for the protection of freshwater resources and Agenda 21.

The Dublin Principles:

Principle 1

Freshwater is a finite and vulnerable resource, essential to sustain life, development and the environment.

Principle 2

Water development and management should be based on a participatory approach, involving users, planners and policy makers at all levels.

Principle 3

Women play a central part in the provision, management and safeguarding of water.

Principle 4

Water has an economic value in all its competing uses and should be recognized as an economic good.

Agenda 21 is a comprehensive plan of action to be taken globally, nationally and locally by organizations of the United Nations System, Governments, and Major Groups in every area in which human impacts on the environment. Agenda 21, the Rio Declaration on Environment and Development, and the Statement of principles for the Sustainable Management of Forests were adopted by more than 178 Governments at the United Nations Conference on Environment and Development (UNCED) held in Rio de Janerio, Brazil, June 3 to 14, 1992. The General Assembly adopted the Program for further implementation of Agenda 21 at 11th plenary meeting on June 28, 1997. Agenda 21 identified seven program areas for action in freshwater, helped to initiate change and the beginning of the still very slow evolution in water management practice.

Of particular interest to this work is Chapter 18 of Agenda 21. Chapter 18 is entitled Protection of The Quality And Supply of Freshwater Resources: Application Of Integrated Approaches To The Development, Management And Use Of Water Resources.

This chapter states:

- 1. Freshwater resources are an essential component of the Earth's hydrosphere and an indispensable part of all terrestrial ecosystems. The freshwater environment is characterized by the hydrological cycle, including floods and droughts, which in some regions have become more extreme and dramatic in their consequences. Global climate change and atmospheric pollution could also have an impact on freshwater resources and their availability and, through sea-level rise, threaten low-lying coastal areas and small island ecosystems.
- 2. Water is needed in all aspects of life. The general objective is to make certain that adequate supplies of water of good quality are maintained for the entire population of this planet, while preserving the hydrological, biological and chemical functions of ecosystems, adapting human activities within the capacity limits of nature and combating vectors of water-related diseases. Innovative technologies, including the improvement of indigenous technologies, are needed to fully utilize limited water resources and to safeguard those resources against pollution.
- 3. The widespread scarcity, gradual destruction and aggravated pollution of freshwater resources in many world regions, along with the progressive encroachment of incompatible activities, demand integrated water resources planning and management. Such integration must cover all types of interrelated freshwater bodies, including both surface water and groundwater, and duly consider water quantity and quality aspects. The multisectoral nature of water resources

development in the context of socio-economic development must be recognized, as well as the multi-interest utilization of water resources for water supply and sanitation, agriculture, industry, urban development, hydropower generation, inland fisheries, transportation, recreation, low and flat lands management and other activities. Rational water utilization schemes for the development of surface and underground water-supply sources and other potential sources have to be supported by concurrent water conservation and wastage minimization measures. Priority, however, must be accorded to flood prevention and control measures, as well as sedimentation control, where required.

- 4. Transboundary water resources and their use are of great importance to riparian States. In this connection, cooperation among those States may be desirable in conformity with existing agreements and/or other relevant arrangements, taking into account the interests of all riparian States concerned.
- 5. The following program areas are proposed for the freshwater sector:
 - Integrated water resources development and management;
 - · Water resources assessment;
 - Protection of water resources, water quality and aquatic ecosystems;
 - · Drinking-water supply and sanitation;
 - · Water and sustainable urban development;
 - Water for sustainable food production and rural development;
 - · Impacts of climate change on water resources.

In March 2000, the 2nd World Water Forum (The Hague) resulted in The Hague Ministerial Declaration which identified seven challenges for future action to achieve water security:

Meeting basic needs: to recognise that access to safe and sufficient water and sanitation are basic human needs and are essential to health and well-being, and to empower people, especially women, through a participatory process of water management.

Securing the food supply: to enhance food security, particularly of the poor and vulnerable, through the more efficient mobilisation and use, and the more equitable allocation of water for food production.

Protecting ecosystems: to ensure the integrity of ecosystems through sustainable water resources management.

Sharing water resources: to promote peaceful cooperation and develop synergies between different uses of water at all levels, whenever possible, within and, in the case of boundary and trans-boundary water resources, between states concerned, through sustainable river basin management or other appropriate approaches.

Managing risks: to provide security from floods, droughts, pollution and other water-related hazards.

Valuing water: to manage water in a way that reflects its economic, social, environmental and cultural values for all its uses, and to move towards pricing water services to reflect the cost of their provision. This approach should take account of the need for equity and the basic needs of the poor and the vulnerable.

Governing water wisely: to ensure good governance, so that the involvement of the public and the interests of all stakeholders are included in the management of water resources.

IWRM was seen as one of the key tools to meeting the above challenges.

On September 8, 2000, a Resolution was adopted by the General Assembly of the United Nations at the 8th plenary for the United Nations Millennium Declaration. Under the heading of "Protecting our common environment" it states that:

To stop the unsustainable exploitation of water resources by developing water management strategies at the regional, national and local levels, which promote both equitable access and adequate supplies.

The United Nations World Water Report is released every 3 years in conjunction with the World Water Forum. They provide comprehensive reviews of the state of the World's fresh water resources and aims to provide decision makers with tools to implement sustainable use of water. The United Nations in 2003 released the first triennial World Water Development Report entitled Water for People, Water for Life. The Report highlights the seven adopted challenges from The Hague Ministerial Declaration and an additional four challenges for action as follows: **Water and Industry** – promoting cleaner industry with respect to water quality and the needs of other users.

Water and Energy – assessing water's key role in energy production to meet rising energy demands.

Ensuring the knowledge base – so that water knowledge becomes more universally available.

Water and cities – recognizing the distinctive challenges of an increasingly urbanized world.

The Report states that under the Challenge of Protecting Ecosystems: 'We have come to accept two important concepts in the past decade: firstly, that ecosystems not only have their own intrinsic value, but also provide humankind with essential services; secondly, that the sustainability of water resources requires participatory, ecosystem-based management.'

The following table from the report speaks to the pressures on our freshwater ecosystems.

Human activity	Potential impact	Function at risk
Population and consumption growth	Increases water abstraction and acquisition of cultivated land through wetland drainage; increases requirement for all other activities with consequent risks	Virtually all ecosystem functions including habitat, production and regulation functions
Infrastructure development (dams, dikes, levees, diversions etc.)	Loss of integrity alters timing and quantity of river flows, water temperature, nutrient and sediment transport and thus delta replenishment; blocks fish migrations	Water quantity and quality, habitats, floodplain fertility, fisheries, delta economies
Land conversion	Land conversion eliminates key components of aquatic environment; loss of functions; integrity; habitat and biodiversity; alters runoff patterns; inhibits natural recharge; fills water bodies with silt	Natural flood control, habitats for fisheries and waterfowl, recreation, water supply, water quantity and quality
Overharvesting and exploitation	Depletes living resources, ecosystem functions and biodiversity (groundwater depletion, collapse of fisheries)	Food production, water supply, water quality and water quantity
Introduction of exotic species	Competition from introduced species; alters production and nutrient cycling; and causes loss of biodiversity among native species	Food production, wildlife habitat, recreation
Release of pollutants to land, air or water	Pollution of water bodies alters chemistry and ecology of rivers, lakes and wetlands; greenhouse gas emissions produce dramatic changes in runoff and rainfall patterns	Water supply, habitat, water quality, food production; climate change may also impact hydropower, dilution capacity, transport, flood control

Table 1: Pressures of freshwater ecosystems.

PHASE I Integrated Watershed Management - Navigating Ontario's Future IWM in Ontario: Phase I - Status of Integrated Watershed Management

A wide range of human uses and transformations of freshwater or terrestrial environments have the potential to alter, sometimes irreversibly, the integrity of freshwater ecosystems. Source: IUCN, 2000

In Part IV, Fitting the Pieces Together, of the report, a section on Governing Water Wisely for Sustainable Development states that:

There is a wide acceptance of IWRM as the appropriate management tool for sustainable use of our water resources and for improved delivery of water services. IWRM promotes participatory approaches, demand and catchment-area management, partnerships, subsidiarity and decentralization, the need to strike a gender balance, the environmental, economic and social value of water and basin or catchment management (GWP, 2000). It replaces the traditional, fragmented sectoral approach to water management that has led to poor services and unsustainable resource use.

The following simple framework was proposed by The Global Water Partnership as the starting point for IWRM. Concurrent development and strengthening of three elements is needed: an enabling environment, appropriate institutional roles and practical management instruments.

Table 2: Integrated Vision

Social Equity	Environmental Sustainability	Economic Efficiency
Integrate	ed Tools for Planning and Decisi	on-making
Management Instruments	Enabling Environment	Institutional Framework
Assessment	Policies	Central-local
Information	Legislation	River Basin

and integrated framework for provision of water service

Source: Based on GWP, 2002b

In 2006, the United Nations released its World Water Development Report 2 entitled Water, A Shared Responsibility. The conclusions in the report were:

- Water is central to alleviating poverty;
- Water insufficiency is primarily caused by inefficient supply rather than by water shortages;
- Many of the solutions to water problems lie in better governance;
- Social and economic resilience is the key to sustaining development and meeting societal goals;
- · Reliable data is essential for IWRM;
- · Strong indicators are needed to monitor progress;

- · The water sector needs greater investment;
- Greater transparency, accountability and stakeholder involvement is needed;
- International and national cooperation is required to meet the Millenium Development Goals (MDGs) related to poverty and water;
- · There are many instances in improvement ;
- Without access to secure water supplies, development will stall and the MDG targets will fall short.

Future publications are scheduled for production in 2009, 2012 and 2015. The third report was released at the Water Forum in Istanbul, Turkey on March 16, 2009. Among the number of themes will be included such as climate change, the Millennium Development Goals, groundwater, biodiversity, water infrastructure, biofuels etc.



Summary of United Nations

It has been ten years since the Earth Summit, that was held in Rio de janeiro, released Agenda 21. Chapter 18 focused on sustainable use of freshwater resources and introduced the need to manage water resources in an integrated manner. The Millenium Development Goals developed in 2000 set out a series of actions that were intended to be achieved by 2015. The Bonn Action Plan released in 2001 grouped a series of actions under the following headings:

- · Governance;
- · Mobilizing financial resources;
- · Capacity-building and sharing knowledge; and
- · Roles (of different types of institutions).

The Framework for Action formulated at the Hague in 2000, contains several further actions which are relevant here in Canada:

- The economic value of water should be recognized and fully reflected in national policies and strategies by 2002.
- The implementation of comprehensive IWRM policies and strategies should be underway in 75 percent of countries by 2005.
- National standards that ensure the integrity of ecosystems should be instituted in all countries by 2005.

3.2 Global Water Partnership

Although it is widely understood that water should be holistically managed, it was not until the Dublin Conference on Water and the Environment in 1992 and the United Nations Conference on Environment and Development held in Rio de Janeiro in 1992 that a more comprehensive approach to water management was judged necessary for sustainable development. This awareness, together with the need for participatory institutional mechanisms related to water, called for a new coordinating organisation. In response to this demand, the World Bank, the United Nations Development Program (UNDP) and the Swedish International Development Agency (Sida) created the Global Water Partnership (GWP) in 1996. Today, this comprehensive partnership actively identifies critical knowledge needs at global, regional and national levels, helps design programs for meeting these needs, and serves as a mechanism for alliance building and information exchange on integrated water resources management.

The following excerpt is taken from a publication entitled *IWRM Toolbox V2 - Sharing Knowledge for Equitable, Efficient and Sustainable Water Resource Management, GWP 2003.*

As a process of change, which seeks to shift water development and management systems from their currently unsustainable forms, IWRM has no fixed beginnings and will probably never end. The global economy and society are dynamic and the natural environment is also subject to change, IWRM systems will, therefore, need to be responsive to change and be capable of adapting to new economic, social and environmental conditions and to changing human values. IWRM is not an end in itself but a means of achieving three key strategic objectives:

- Efficiency, since, given scarcity of resources (natural, financial and human), it is important to attempt to maximise the economic and social welfare derived not only from the water resources base but also from investments in water services provision.
- **Equity** in the allocation of scarce water resources and services across different economic and social groups is vital to reduce conflict and promote socially sustainable development.
- Environmental sustainability, as ultimately all attempts at water management reform will fail if the water resources base and associated ecosystems continue to be regarded as infinitely robust and we continue to put at risk 'the water system that we depend on for our survival' (World Water Commission 2000)

The report goes on to emphasize the major shifts that policy makers must consider in looking at changes from traditional approaches:

- · Sectoral to integrated management;
- Top-down to stakeholder and demand responsive change;
- Supply fix to demand management;
- Command and control to more cooperative or distributive forms of governance; and
- Closed expert driven management organizations to more open, transparent and communicative bodies.

Consideration of water resources problems can be due to multiple causes and as a result several tools for problem resolution are needed.



4.0 | IWM Approaches from Selected Countries

In an effort to highlight approaches to IWM, three geographically distinct locations around the world were selected for their innovation in using IWRM concepts to address their issues and challenges. Similar to Ontario, many of the issues focus around water but the process is holistic as in every instance ecosystem considerations and connections are made.

4.1 Australia

Australians live on the driest inhabited continent in the world. Rainfall is variable and droughts are common. Water is essential to maintaining our health, to producing our food and to sustaining our quality of life.

Drought, climate change and water shortages make water reform and improved water management more necessary than ever. It was realized that Australians need to balance their use of this precious resource with our responsibilities toward the environment.

The Intergovernmental Agreement on a National Water Initiative (NWRI) was signed at the 25 June 2004 Council of Australian Governments meeting. Under the NWI, governments have made commitments to:

- prepare water plans with provision for the environment
- \cdot deal with over-allocated or stressed water systems
- $\cdot\,$ introduce registers of water rights and standards for water accounting
- · expand the trade in water
- · improve pricing for water storage and delivery
- meet and manage urban water demands.

The overall objective of the National Water Initiative is to achieve a nationally compatible market, regulatory and planning based system of managing surface and groundwater resources for rural and urban use that optimises economic, social and environmental outcomes. At its highest level, implementation of the National Water Initiative will achieve:

- clear and nationally-compatible characteristics for secure water access entitlements
- · transparent, statutory-based water planning
- statutory provision for environmental and other public benefit outcomes, and improved environmental management practices
- complete the return of all currently over-allocated or overused systems to environmentally-sustainable levels of extraction
- progressive removal of barriers to trade in water and meeting other requirements to facilitate the broadening and deepening of the water market, with an open trading market to be in place
- clarity around the assignment of risk arising from future changes in the availability of water for the consumptive pool
- water accounting which is able to meet the information needs of different water systems in respect to planning, monitoring, trading, environmental management and on-farm management
- policy settings which facilitate water use efficiency and innovation in urban and rural areas
- addressing future adjustment issues that may impact on water users and communities
- recognition of the connectivity between surface and groundwater resources and connected systems managed as a single resource

Each state and territory government is required to prepare an NWI implementation plan. To date the Commission has accredited nine implementation plans. When governments signed the NWI, they agreed to outcomes and specific actions to be undertaken across eight inter-related elements of water management. Progress in implementing the NWI is assessed against these key elements:

- 1. Water access entitlements and planning framework
- 2. Water markets and trading
- 3. Best practice water pricing
- **4.** Integrated management of water for the environment
- 5. Water resource accounting
- 6. Urban water reform
- 7. Knowledge and capacity building
- 8. Community partnerships and adjustment

Water for the Environment and Water Reform

Striking a balance between the consumptive use of water and environmental health is a key element of the NWI, which calls for:

- environmental and other public benefit outcomes for water systems to be identified with as much specificity as possible in water plans
- management practices and institutional arrangements to be put in place to achieve environmental outcomes
- accountable environmental water managers to be established and equipped with necessary authority and resources to provide sufficient water at the right times and places to achieve identified outcomes, including across state/territory boundaries where relevant
- cost-effective measures to provide water for environmental outcomes
- recovery of water for the environment in over-allocated surface and groundwater systems

Environmental Water Management and Water Reform

The NWI requires the identification of specific environmental outcomes for water systems in each jurisdiction. It also calls for the implementation of management practices and institutional arrangements that will achieve those outcomes. These practices and arrangements include:

- establishing environmental water managers and giving them the necessary authority and resources to provide sufficient water at the right times and places
- allowing environmental water managers to trade water
- ensuring that environmental water management is cost-effective and that the new environmental water managers are fully accountable for their work
- managing environmental aspects of interconnected groundwater and surface water systems jointly where necessary
- delivering environmental water across state boundaries where required
- making special arrangements for high conservation value rivers, reaches and groundwater areas
- conducting periodic independent audits of environmental achievements and publicly reporting the results

Murray-Darling Basin Authority

The *Water Act* 2007 establishes an independent Murray-Darling Basin Authority with the functions and powers, including enforcement powers, needed to ensure that Basin water resources are managed in an integrated and sustainable way.

Key functions of the Authority include:

- preparing a Basin Plan for adoption by the Minister, including setting sustainable limits on water that can be taken from surface and groundwater systems across the Basin
- advising the Minister on the accreditation of state water resource plans
- developing a water rights information service which facilitates water trading across the Murray-Darling Basin
- $\cdot\,$ measuring and monitoring water resources in the Basin
- · gathering information and undertaking research
- engaging the community in the management of the Basin's resources

The Authority will report to the Commonwealth Minister for Climate Change and Water.

The Authority members must have significant relevant expertise to be eligible for appointment, for example in fields such as water resource management, hydrology, freshwater ecology, resource economics, irrigated agriculture, public sector governance and financial management.

The Act requires the Authority to prepare a strategic plan for the integrated and sustainable management of water resources in the Murray-Darling Basin. This plan is referred to as the Basin Plan. The Act establishes mandatory content for the Basin Plan, including:

- limits on the amount of water (both surface and ground water) that can be taken from Basin water resources on a sustainable basis - known as long-term average sustainable diversion limits. These limits will be set for Basin water resources as a whole and for individual water resources
- identification of risks to Basin water resources, such as climate change, and strategies to manage those risks
- requirements that a state water resource plan will need to comply with if it is to be accredited under this Act
- an environmental watering plan to optimise environmental outcomes for the Basin by specifying environmental objectives, watering priorities and targets for Basin water resources
- a water quality and salinity management plan which may include targets
- rules about trading of water rights in relation to Basin water resources

The Basin Plan will be complemented through water resource plans prepared by Basin States and provided to the Commonwealth Minister for accreditation. The Authority will provide advice to the Minister on whether to accredit such plans. Water resource plans will only be accredited if they are consistent with the Basin Plan, including the long-term average sustainable diversion limits.

The Basin Plan will also play an important role in identifying responsibilities for managing risks associated with reductions in water availability and changes in reliability. Where the Basin Plan specifies a reduction in the long-term average sustainable diversion limit, the Basin Plan will also identify the percentage of that reduction for which the Australian Government is responsible. This percentage relates to the risk sharing arrangements set out in the Act, which are modelled on those agreed by the Commonwealth and state and territory governments through the National Water Initiative in June 2004.

The Australian Government has made a commitment to respect water sharing arrangements that are provided for in existing water resource plans. This commitment is implemented through the transitional arrangements set out in the Act.

The Basin Plan will be prepared in consultation with Basin States and communities.

4.2 Europe

On 23 October 2000, the "Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy" (the EU Water Framework Directive (WFD)) was adopted. Demand by citizens is one of the main reasons why the Commission made water protection one of the priorities of its work. The new European Water Policy is intended to get polluted waters clean again, and ensure clean waters are kept clean. In achieving these objectives, it is intended that citizens and citizens' groups play a key role. The Commission presented a Proposal for a WFD with the following key aims:

- expanding the scope of water protection to all waters, surface waters and groundwater
- $\cdot \,$ achieving "good status" for all waters by a set deadline
- · water management based on river basins
- "combined approach" of emission limit values and quality standards
- · getting the prices right
- · getting the citizen involved more closely
- streamlining legislation

The following shows how these elements are made operational within the Directive.

A single system of water management: River basin management

The best model for a single system of water management is management by river basin - the natural geographical and hydrological unit - instead of according to administrative or political boundaries. Initiatives taken forward by the States concerned for the Maas, Schelde or Rhine river basins have served as positive examples of this approach, with their cooperation and joint objective-setting across Member State borders, or in the case of the Rhine even beyond the EU territory. While several Member States already take a river basin approach, this is at present not the case everywhere. For each river basin district - some of which will traverse national frontiers - a "river basin management plan" will need to be established and updated every six years.

Co-ordination of objectives - good status for all waters by a set deadline

There are a number of water quality objectives including general protection of the aquatic ecology, specific protection of unique and valuable habitats, protection of drinking water resources, and protection of bathing water. All of these objectives must be integrated for each river basin. The last three - special habitats, drinking water areas and bathing water - apply only to specific bodies of water (those supporting special wetlands; those identified for drinking water abstraction; those generally used as bathing areas). In contrast, ecological protection would apply to all waters: the central requirement of the Treaty is that the environment be protected to a high degree, holistically.

SURFACE WATER

Ecological protection

A general requirement for ecological protection, and a general minimum chemical standard, was introduced to cover all surface waters. These are the two elements "good ecological status" and "good chemical status". Good ecological status is defined in Annex V of the Water Framework Proposal, in terms of the quality of the biological community, the hydrological characteristics and the chemical characteristics. As no absolute standards for biological quality can be set which apply across the Community, because of ecological variability, the controls are specified as allowing only a slight departure from the biological community which would be expected in conditions of minimal anthropogenic impact. A set of procedures for identifying that point for a given body of water, and establishing particular chemical or hydromorphological standards to achieve it, is provided, together with a system for ensuring that each Member State interprets the procedure in a consistent way (to ensure comparability). The system is somewhat complicated, but this is to be expected given the extent of ecological variability, and the large number of parameters.

Chemical protection

Good chemical status is defined in terms of compliance with all quality standards established for chemical substances at the European level. The Directive also provides a mechanism for renewing these standards and establishing new ones by means of a prioritisation mechanism for hazardous chemicals. This will ensure at least a minimum chemical quality, particularly in relation to very toxic substances, everywhere in the Community.

Other uses

As mentioned above, the other uses or objectives for which water is protected apply in specific areas. Such objectives are applied specific protection zones within the river basin. The overall plan of objectives for the river basin will then require ecological and chemical protection everywhere as a minimum, but where more stringent requirements are needed for particular uses, zones will be established and higher objectives set within them.

There is one other category of uses which does not fit into this picture. It is the set of uses which adversely affect the status of water but which are considered essential on their own terms - they are overriding policy objectives. Key examples include flood protection and essential drinking water supply. The problem is dealt with by providing derogations from the requirement to achieve good status for these instances, as long as all appropriate mitigation measures are taken. Less clear-cut cases are navigation and power generation, where the activity is open to alternative approaches (transport can be switched to land or other means of power generation can be used).

GROUNDWATER

Chemical status

The overall approach to groundwater is that it should not be polluted. Therefore, setting chemical quality standards may not be the best approach, as it gives the impression of an allowed level of pollution. Few standards have been established at the European level for particular issues (nitrates, pesticides and biocides), and these must always be adhered to. For general protection, a precautionary approach has been taken. It comprises of a prohibition on direct discharges to groundwater, and (to cover indirect discharges) a requirement to monitor groundwater bodies so as to detect changes in chemical composition, and further to reverse any anthropogenically induced upward pollution trend.

Quantity Status

Quantity is also a major issue for groundwater. There is a fixed amount of recharge into a groundwater system annually, and a portion is needed to support connected ecosystems (surface water bodies, terrestrial systems such as wetlands, etc.). Only that portion of the overall recharge not needed by the ecology can be abstracted - this is the sustainable resource, and the Directive limits abstraction to that quantity.

One of the innovations of the Directive is that it provides a framework for integrated management of groundwater and surface water for the first time at the European level.

Co-ordination of measures

There are a number of measures taken at the Community level to address specific pollution problems. Key examples are the Urban Waste Water Treatment Directive and the Nitrates Directive, which together adress the problem of eutrophication (as well as health effects such as microbial pollution in bathing areas and nitrates in drinking water); and the Integrated Pollution Prevention and Control Directive, which deals with chemical pollution. The aim is to co-ordinate the application of these Directives so as to meet the objectives established above.

The approach taken establishes objectives for the river basin as outlined in the previous section. Next, an analysis of human impact is conducted so as to determine how far from the objective each body of water is. If the existing legislation solves the problem, then the objective of the framework Directive is attained. However, if it does not, the Member State must identify a plan outlining additional measures needed to satisfy all of the established objectives. These might include stricter controls on polluting emissions from industry and agriculture, or urban waste water sources.

The combined approach

In the past, there has been a dichotomy in approach to pollution control at the European level, with some controls concentrating on what is achievable at source, through the application of technology; and some dealing with the needs of the receiving environment in the form of quality objectives. Each approach has potential flaws. Source controls alone can allow a cumulative pollution load which is severely detrimental to the environment, where there is a concentration of pollution sources. And quality standards can underestimate the effect of a particular substance on the ecosystem, due to the limitations in scientific knowledge regarding dose-response relationships and the mechanics of transport within the environment.

Therefore, a consensus has developed that both are needed in practice - a combined approach. The Water Framework Directive formalises this. With respect to source, it requires as part of the basic measures, all existing technology-driven source-based controls must be implemented as a first step. It also sets out a framework for developing further controls. The framework comprises the development of a list of priority substances for action at the EU level, prioritised on the basis of risk; and then the design of the most cost-effective set of measures to achieve load reduction of those substances, taking into account both product and process sources. With respect to effects, it co-ordinates all the environmental objectives in existing legislation, and provides a new overall objective of good status for all waters, and requires that where the measures taken on the source side are not sufficient to achieve these objectives, additional ones are required.

The river basin management plan

The river basin plan is a detailed account of how the objectives set for the river basin (ecological status, quantitative status, chemical status and protected area objectives) are to be reached within the timescale required. The plan includes all the results of the above analyses: the river basin's characteristics, a review of the impact of human activity on the status of waters in the basin, estimation of the effect of existing legislation and the remaining "gap" to meeting these objectives; and a set of measures designed to fill the gap. One additional component is an economic analysis of water use within the river basin. This allows for a rational discussion on the cost-effectiveness of the various possible measures. It is essential that all interested parties are fully involved in this discussion, and the preparation of the river basin management plan as a whole.

Public participation

Public participation is viewed as an important element because decisions on the most appropriate measures to achieve the objectives in the river basin management plan will involve balancing the interests of various groups. It is essential that the process is open to the scrutiny of those who will be affected. It was also seen that greater transparency in the establishment of objectives, imposition of measures, and reporting on standards, would encourage Member States to implement the legislation in good. The power of citizens to influence the direction of environmental protection, whether through consultation or, through the complaints procedures and the courts, was seen to be important. Caring for Europe 's waters will require more involvement of citizens, interested parties and non-governmental organisations (NGOs). To that end the Water Framework Directive will require information and consultation when river basin management plans are established: the river basin management plan must be issued in draft, and the background documentation on which the decisions are based must be made accessible. Furthermore, biannual conferences were proposed in order to provide for regular exchange of views and experiences in implementation. Too often in the past, implementation has been left unexamined until it is too late (i.e. until Member States are already woefully behind schedule and out of compliance.) The Framework Directive, by establishing very early on a network for the exchange of information and experience between water professionals throughout the Community, will ensure this does not happen.

PHASE I Integrated Watershed Management - Navigating Ontario's Future IWM in Ontario: Phase I - Status of Integrated Watershed Management

Streamlining legislation: seven old directives to be repealed

One advantage of the framework directive approach that it will replace seven of the "first wave" directives: those on surface water and two related directives on measurement methods and sampling frequencies and exchanges of information on fresh water quality; the fish water, shellfish water, and groundwater directives; and the directive on dangerous substances discharges. The operative provisions of these directives will be taken over in the framework directive, allowing them to be repealed.

Getting the prices right

The need to conserve adequate supplies of a resource for which demand is continuously increasing is also one of the drivers behind what is arguably one of the Directive's most important innovations - the introduction of pricing. Adequate water pricing acts as an incentive for the sustainable use of water resources and thus helps to achieve the environmental objectives under the Directive. Member States will be required to ensure that the price charged to water consumers - such as for the abstraction and distribution of fresh water and the collection and treatment of waste water - reflects the true costs. Whereas this principle has a long tradition in some countries, this is currently not the case in others. However, deviations are allowed (e.g. provide basic services at an affordable price).

Conclusion

The Water Directive Framework brings major changes in water management practices including:

- sets uniform standards in water policy throughout the European Union and integrates different policy areas involving water issues;
- introduces the river basin approach for the development of integrated and coordinated river basin management plans for all of European river systems;
- includes public participation in the development of river basin management plans encouraging involvement of interested parties including stakeholders, non-government organizations and citizens;
- stipulates a defined time-frame for the achievement of good status of surface water and groundwater;
- requests a comprehensive ecological assessment and classification on the basis of the composition and abundance of the aquatic fauna and flora taking onto account the type-specific reference conditions of the water body;
- includes the definition of lower environmental objectives for heavily modified water bodies;
- introduces the economic analysis of water use in order to estimate the most cost-effective combination of measures in respect to water uses.



4.3 Brazil

In 1977 the National Water Resources Act - Law 9.433, the "Water Law", came into force, therefore allowing integrated water resources management principles to become part of Brazilian law. This Law establishes a National Water Resources Policy and a National Water Resources Management System.

The National Water Resources Policy is based on the following principles:

- · Water is a public good.
- Water is a limited natural resource and has economic value in situations of scarcity, priority goes to water use for human consumption and the watering of animals.
- Water resources management must always allow the multiple use of water.
- The water basin is the territorial unit for the implementation of the National Water Resources Policy and for actions of the National Water Resources Management System.
- Water resources management shall be decentralized and shall involve the participation of Government, users and communities.

The National Water Resources Policy defines as its instruments:

- · water resources plans
- classification of water bodies according to predominant uses
- granting of water use rights
- · charging for water use
- · compensation to municipalities
- · information system on water resources

Given that there were many water resources problems requiring action at the federal, state and municipal level, a national organization was created with the authority to find integrated solutions for such pressing problems as:

- deterioration of water quality in the major urban centers caused by unplanned urban expansion and the low level of wastewater treatment, and,
- lack of reliable water supply in the northeastern semi-arid zone, which regularly experiences periods of natural scarcity, thereby causing serious economic and social problems.

The National Water Agency of Brazil (ANA) was established in June 2000. The establishment of ANA was mandated by the National Water Resources Policy. ANA has administrative and financial autonomy, linked to the Ministry of Environment, run by a five-member Board of Directors, one of whom is the President-Director and is responsible for implementing the instruments of the National Water Resources Policy and coordinating the National Water Resources Management System.

Implementation of Integrated Water Resources Management (IWRM) in Brazil

Strengthening the civil society participation

Transparency in the electoral process and the increase of representation from citizens in the National Water Resources Council (CNRH) are considered important achievements. Today, efforts to reach a balance between representation of the Federal Administration, States, Users and Civil Society Organizations, has been achieved.

Financial support for the participation of civil society

The National Water Resources Act set up the principle of cogovernance for water management, with the participation of the civil society and users together with public entities. Moving from the command and control management towards shared governance has been an achievement. Another important in-road for civil society was allowance for financial support for the participation of representatives of non government organizations, technical societies and academia in the National Water Resources Council meetings. These sectors of civil society are receiving financial support to be present in the Plenary and Technical Committees' meeting, where the implementation of National Water Policy and IWRM might be consolidated.

Access to information on water quality

Decree 5.449 provides rules, administrative mechanisms and information tools to allow social control on water quality for human uses. It is mainly related to consumer rights. Strengthening the Implementation of the National Water Policy and the National Water Resources Management System.

1. Transparency in the Decision-Making Process

The transparency of practices in the National Water Resources Management System is a clear achievement for the Democracy and enhancing the implementation of the *National Water Policy Act* and the IWRM principles. Meetings are open to the public and all may voice opinions and demands. It is a very transparent and participatory procedure, in accordance of National Council Rules of Procedures. Implementation must go through the National Water Management System, from the River Basin Committee up to the CNRH. However, it is not an easy task to settle disputes, because of the diverse interests of stakeholders, and to bring balance to unbalanced situations, mostly related to representation and legitimacy of interest.

2. Participatory Decision-Making Process with IWRM as a Key Principle

It has been a challenge to go from a command/control approach to a decentralized and participatory approach to water management. For civil society, two key roles are played: to act in the surveillance and monitoring of all activities concerned – social control and the second and newest, as a stakeholder in the implementation of the National Water Policy and the National Water Management System.

3. Water Basin Committees, State Water Resources Councils and Municipalities

Since 1997 almost all of the 26 States and the Federal District of Brazil have established their legal framework on water management in accordance with the National Water Policy. This is a key achievement for the implementation of the IWRM. The States have jurisdiction on watercourses and ground water repositories within their limits and are applying the principles of IWRM in watercourses under federal jurisdiction which cross their territories. At a water basin level, municipalities in the boundaries of the basin have jurisdiction on the issues related to human settlements, land use management and human needs, such as sanitation, water supply and waste management. Forestation is under shared responsibility of the Union, State and Municipalities. Municipalities have been participating in water management at a watershed and State Water Council levels.

4. National Water Resources Plan

The Government of Brazil, by Presidential Decree, has instituted the Brazilian Decade of Water, as part of the World 'Water for Life' Decade, established by the United Nations in 2005. The aim of this initiative is to call attention to the importance of water, with a view to contributing toward attainment of the Millennium Development Goals, and consolidating the National Water Resources Policy, as it relates to themes such as health, children, women, reducing poverty, and combating hunger. Furthermore, in order to fulfill the Millennium Development Goals, as they relate to the field of water resources, it will be necessary to implement management instruments that promote integrated water resources management through mechanisms for fostering sustainable development. One of the commitments assumed by countries that pledged to institute plans for attainment of goals, set at the Johannesburg World Summit on Sustainable Development, was preparation, by 2005, of integrated water resources management and efficient water-use plans. Such international commitments must now be incorporated into the Brazilian legal framework, in view of the fact that Water Resources Plans are the first instrument of the National Water Resources Policy, instituted by Law 9.433/1997.

In the light of the legal responsibility and the challenges raised by the commitments assumed, the National Water Resources Plan (PNRH) was drawn up and approved by the National Water Resources Council, on January 30, 2006. The question for governance, reflected by the participative and decentralized nature of the process of drafting of the PNRH, made it possible to establish, for the 2020 time horizon, guidelines, programs, and goals, with ample social and political consensus, by means of a comprehensive process of public discussion, with provision of consistent technical premises as inputs for deliberations and the establishment of proposals.

The nationwide scope of the PNRH and its imminently strategic nature must be underscored because, besides providing inputs upon which to base actions of the National Water Resources Management System in its capacity as an instrument of the National Water Resources Policy, it provides support for thematic orientation in line with the Multi-Year Action Plan (PPA), and seeks to promote coordination and convergence with actions of government on themes of significant interest for water resources management. Thus, aside from their focus on the area of water resources, programs of the PNRH were conceived from a cross-cutting perspective, in articulation with other public policies and programs of the various areas of government, with a view to promoting support for integrated water resources management.

The general aim of the National Water Resources Plan is: to establish a national pact for the definition of guidelines and public policies targeted at improving the supply of water, in quality and quantity, and managing demands, considering water as an essential element for implementation of sector specific policies, from a sustainable-development and social-inclusion standpoint.

5. Economic Valuation of Water and Application of the User/Payer Principle

As provided by the National Water Policy, water is a public good with economic valuation (Act 9433/97). Socio-environmental justice can be implemented through the application of this principle, which is a corollary of the polluter payer principle: user / payer principle. Paying for water use is a key principle for sustainable water management. This instrument of water management has been applied to the Paraíba do Sul River Basin, since 2003, and priority was given to the great users such as water supply and sanitation utilities, energy utilities and other users. That is an achievement for the IWRM. The economic valuation of water imposed relevant and profitable changes in water management for many users such as industry. Re-use and better practices in water management are current subjects on the agenda of all users.



6. Capacity Building: Program and Networks

A new political environment to empower civil society and to promote its capacity to deal with IWRM has been detected in Brazil. The revival of cooperation between the Minister of Environment and Minister of Education reaffirms the joint efforts to build capacity which reflects on the whole educational policy applied all over the Country. Social inclusion and new opportunities for income generation are in the background of this Program.

Some key events like the National Environment Conference held in November/ December 2003 help to contribute to the implementation of IWRM. It was an exercise in a democratic participatory process. Indigenous people, water users, landless people, people living with water stress and others living on the water such as Amazonians, and other stockholders were in plenary to practice dialogue, cooperation and to find common ground to deal with environmental and water related issues.

7. Gender Mainstreaming in IWRM

The Brazilian Government has been committed to mainstream gender principle in the water management policy. Since March,2003, the Special Secretary on Women's Rights is a member of the CNRH. The gender perspective is a real key recommendation to dealing with IWRM since any paradigm change must go through gender involvement and commitment. Women as householders and mothers play an extremely important role in this respect.

Challenges for Implementation IWRM in Brazil

Balancing sustainable development goals and fiscal constraints

This is a crucial matter for developing countries, particularly those from Latin America. The international financing community and related organizations must look forward to a sustainable pact with balance between economic stability, social inclusion, poverty mitigation and income generation mostly to give opportunities to people who are looking for sustainable living conditions and dignity. Balance between the socio and environmental priorities and the economic and fiscal constraints is crucial. It must be creative and take advantage of the environmental services provided by nature, creating new jobs and economic activities.

Regional integration through waters

While water may cause struggles, it must actually be a vehicle for dialogue, cooperation, alliance and integration and for Peace. Brazil shares seventy four (74) transboundary waters. This is a challenge for Brazil and its neighbours. International legal frameworks are in force, like the Treaty of Brasilia, (1978) which deals with the Amazonian Water Basin. Historically, Brazil consolidated its boundaries through agreements with neighbors. Now, it is time to expand this cooperation beyond these boundaries and to gather the countries and people living in the Latin America Region.

Building capacity and fostering empowerment

A Capacity Building Program should be tailored, respecting socio-economic diversity. In general, communities do not have any idea or feeling about IWRM. This includes stakeholders in the decision-making process, government officials, users and civil society. Dealing with paradigm changes, the target should be promoting the empowerment of weaker communities. The great challenge is to practice the participatory decision-making process and to redefine the role of state and civil society in respect to water management.

Setting up the culture of water security

Cultural changes to deal with water security, risk management related to water, particularly, the vulnerabilities from climate change, and environmental misuses such as deforestation and water pollution should be incorporated into people's minds from early childhood. A culture of water security embodies principles of prevention, mitigation and compensation in respect to critical events, guarantee of water supply and water solidarity. Social, environmental, economic, and political risks are in almost all of the cases related to water issues, such as lack or abundance of water, droughts and floods, in addition to climate change which impose environmental risks at a global level. Alert systems and emergency and preparedness should be part of the strategies to implement IWRM.

Water and Sanitation

One of the critical challenges facing Brazil is to adopt a regulatory framework for water supply and sanitation. The current Federal Constitution set up provisions for the Union in respect to General Rules for water supply and sanitation. Implementation of the IWRM requires key rules related to these more relevant water uses, mostly in a very urbanized setting. Furthermore, market forces and multilateral financing entities, like The World Bank, directly involved in the State reforms, recommend more presence of the market forces in the infrastructure sector, including the water supply and sanitation sector.

Decade of Millennium Goals and Johannesburg implementation targets

The United Nations declared 2005-2015 the International Decade of Water. Following this, Brazil declared the Brazilian Decade of Water, starting in 2005. To deal with this, IWRM must have those cross cutting issues such as food and nutrition, sanitation etc. in the agenda. The first step is to have involvement of stakeholders who are not involved in the decision process on water matters, particularly financing sectors, and insurers among others. Additionally, professionals of Law, such as judges, attorneys, lawyers and legal consultants, should be brought into the process. They will need to build capacity regarding IWRM.
5.0 | National Perspective

5.1 Federal Government

The following discussion centers around processes which are currently being used by some departments of the Federal Government that take into account IWRM.

Regional Environmental Assessment (REA)

Defining Regional Environmental Assessment

Regional Environmental Assessment (REA) is often conceptualized as a process designed primarily to facilitate multiple project-based assessments within a common geographic region. Cumulative effects are seen as an essential addition to the process, and interpreted as the culmination of multiple project stresses played out at the regional scale. In other instances, the "state of the region" analysis is viewed as no more than a single component of a much larger strategically-oriented, regional planning and assessment process. This approach emphasizes future conditions and delineation of desirable outcomes through alternatives assessment and scenario analysis. Rather than an "add-on" to the assessment process, cumulative effects underlie the entire assessment model; at the regional scale all impacts are considered the result of cumulative processes and interactions. The focus is on cumulative "disturbance" or "perturbations" as opposed to additive project-specific impacts. There is no single approach to REA, rather a range of approaches exist. (Noble and Harriman 2008)



Typical characteristics of regional environmental assessment:

- operates on a broad spatial scale with boundaries appropriate to the problem
- examines a broad range of ecological and socio-economic effects, focusing on cumulative effects and regional issues
- considers a full range of projects, policies, plans, programs or other activities that contribute to environmental conditions in the region
- cooperative, depending on participation by and partnerships among agencies, industry, NGOs, First Nations and the public
- may take several years to complete due to comprehensive information needs
- includes an on-going monitoring component to gauge the effectiveness of management systems in achieving defined outcomes and measurable indicators
- provides consistent requirements and direction for planning and development
- promotes sustainable development and achievement of regional management goals

(Abraham 1998)

Approaches to Regional Environmental Assessment

Under "bottom-up" or EIA-influenced definitions and understanding, REA is often conceptualized and formulated as an area-wide baseline study or regional effects monitoring program. Emphasis is placed on identifying and mitigating key environmental issues arising from the development of several projects in close proximity to one another. Regional EA is designed to complement project-by-project assessment by providing a framework to make the process for assessing projects within a single development or administrative region more efficient, predictable, and consistent (Pollution Probe 2000). Under "top-down" definitions and understanding, REA is seen as part of the Strategic Environmental Assessment (SEA) family of tools. Questions addressed by REA thus focus on broader environmental perspectives such as what are the options for development and which regional and sectoral impacts may occur in the future development of the region (Partidario 1998). Under this interpretation, REA is characterized by a more "forward looking" or proactive approach to systematically planning for the future, or determining whether development will even be permitted in areas where no development has yet occurred. (Noble and Harriman 2008).

At the Federal Regional Environmental Assessment Workshop (March 2008) it was discussed that methodologically, no single theory or methodology is appropriate for conducting REA, rather the approach must be fitted to purpose and context. In general terms, however, a REA is likely to contribute most to measuring cumulative effects when it takes the form of an integrated ecosystem assessment and is informed or situated within an accepted scientific framework of analysis. For example, DFO Science recommends the internationally accepted DPSIR model (drivers, pressures, states, impacts, responses) to undertake an ecosystem-based approach and to account for cumulative effects.

DPSIR-based REA also provides a framework that can incorporate other DFO tools, such as pathways of effects and risk-based management, and can relate them to ecosystem-scale trends and changes, permitting better understanding of cumulative effects and more targeted applications of the no net loss policy. The components and characteristics of the DPSIR model are outlined in relation to REA to indicate how this approach can be undertaken to address cumulative effects.

DPSIR model of REA

- Multi-activity, area-wide focus [drivers, relationships to valued ecosystem components]
- Trend and change orientation [pressures, early warning signs of cumulative effects]
- · Baseline and effects-based [state of the resource]
- Synoptic perspective; data and knowledge synthesis [understanding critical ecosystem features and functions]
- Impact analysis [from preliminary CRA to prediction of potential changes of different development options]
- Decision linkage [response to findings, from development approvals to planning/management strategy]

Potential Benefits from REA

Potential benefits include (Noble and Harriman 2008):

- · Increased efficiency for project-based assessment
- · Assessment of cumulative effects
- · Regional baseline and monitoring support
- Framework for public involvement and broader policy debate
- Futures-oriented approach to planning and development

Elements of a Successful REA

Responds to and anticipates pressing, policy relevant issues by:

- identifying uncertainties in information base
 what we know, what we don't know and what we need to know and focus work on;
- leading to better understanding of ecosystem functions, integrating knowledge across different disciplines;
- empowering stakeholders to take responsibility for breaking the chains of cumulative effects not just to provide information which helps others to act;
- providing robust forecast of potential changes and future states including identification of risks and impacts worth worrying about;
- informing strategic decision making whether these take the form of development approvals (e.g. regional pre-clearance) or management strategies (e.g. for LOMA);
- establishing adaptive, precautionary safeguards for valued ecosystem components (VEC) such as critical habitat, species at risk, resource stocks; and
- imparting a level of environmental sustainability assurance (e.g. using a risk-matrix to relate the level of threat to key thresholds and indicators).

Conclusion

In reviewing available literature and the results of the recently held Federal Regional Environmental Assessment Workshop in March 2008, the following conclusions can be drawn:

- REA has a number of potential benefits for improved regulatory efficiency and better addressing cumulative effects, although certain enabling conditions need to be in place to ensure their delivery.
- Key institutional pre-conditions are currently absent in the federal system. More positively, there are a number of REA-like processes within the federal government and DFO specifically that can be used as entry points or building blocks for undertaking this approach.
- Such an approach will be easier to develop further in areas within the single jurisdiction of the federal government (namely oceans) but are no less and perhaps even more important for fish habitat management in complex, multi-jurisdictional systems.
- In either event, what seems critically needed is to undertake pilot applications as and where circumstances, issues and opportunities allow both within and beyond the federal government.
- It should be recognized that effective REA to be requires both sustained commitment and resources justified against the savings netted across numerous specific assessments and approvals.

Ecosystem-Based Management (EBM) Framework for Integrated Ocean Management

In the Canadian marine context, the EBM approach can be defined operationally as one that makes marine ecosystem health its primary consideration in managing human activities-including land-based activities-that affect marine and coastal areas. The approach ensures that the ecosystem components crucial to maintaining ecosystem structure, functions, and environmental quality are not significantly affected by human activities and are maintained at appropriate temporal and spatial scales. EBM becomes operational when significant components (areas, species, properties) identified as management conservation priorities are translated into ecosystem objectives in Integrated Management (IM) plans for Large Ocean Management Areas (LOMA) to define the bounds within which sustainable development objectives must be set. This operational definition follows a series of guiding principles:

(1) EBM is holistic and cross-disciplinary; (2) it is based on the best knowledge available; (3) it is a phased implementation process; (4) it is developed nationally and implemented subregionally, at LOMA scale; (5) it is area-based; (6) it is objective-based; and (7) it is applied within the broader context of IM, incorporating the precautionary approach and adaptive management principles (Siron et al).

Large Ocean Management Area (LOMA)

History

In the past ocean management has focused on managing a single ocean activity independent of other human activities. Such an approach has failed to consider the cumulative impacts of all of these activities on the ecosystem, advantages that could be achieved through regulatory efficiency and opportunities for cooperation. As a result, decisions about ocean resources typically proceeded independently of each other.

Canada's commitment to integrated management was first formulated in the *Oceans Act*, which came into force in 1997, recognizing that the concept was being applied by coastal communities well before this date. The Minister of Fisheries and Oceans Canada, on behalf of Canada, leads implementation of integrated management.

Purpose

LOMAs are established to advance collaborative management. For each LOMA, all levels of government, Aboriginal groups, industry organizations, environmental and community groups, and academia work together to develop a strategic and long-term plan for sustainable management of resources within its boundaries. LOMAs are delineated so that ecosystem health and economic development issues within their boundaries can be addressed and suitably managed. This can be best accomplished using an integrated ocean management approach which is based on addressing the socioeconomic needs of humankind while preserving the health of the marine ecosystem.

Operational Framework for Integrated Management

There are three considerations under the Operational Framework regarding Integrated Management:

- 1. Governance Model
- 2. Management by Area
- 3. Integrated Management Bodies
- 4. The Integrated Management Process

Governance Model

Management and planning for sustainable development will be based on collaborative processes involving Integrated Management bodies, whose function will vary over time and according to the particular stage of the planning process. These structures will help balance coastal and ocean uses in a manner that maximizes protection, maintains conservation efforts and rehabilitates marine ecosystems and their resources while providing opportunities for social, cultural and economic benefits.

As the process develops, the Integrated Management body's function may evolve from an initial focus on information and consultation through to providing advice in the development of the management plan. Following approval of the management plan by the mandated authorities, the Integrated Management body's role may shift to an "overseer" function as the plan is implemented, monitoring is initiated and assessment of the plan's effectiveness is evaluated.

Collaboration is the governance model proposed for Integrated Management. It draws on the Co-Management Guide developed by the National Roundtable on the Environment and the Economy (1998). For the purposes of the *Oceans Act*, the collaborative approach includes:

- ocean management decisions based on shared information, on consultation with stakeholders, and on their advisory or management participation in the planning process;
- institutional arrangements that bring together governments, user groups and other interests also responsible for resource management, conservation and economic development;
- management systems in which governments, user groups and other interests take an active part in designing, implementing and monitoring the effectiveness of coastal and ocean management plans; and
- institutional arrangements in which governments, user groups and other interests enter into agreements on oceans management plans with specific responsibilities, powers and obligations.

At the heart of Integrated Management is a commitment to citizen engagement in the broadest sense; that is governments at all levels, Aboriginal groups, corporate and sectoral interests, community interests, non-governmental organizations, and Canadians generally. The overall objective is to create governance mechanisms that foster a greater involvement of the people most affected by decisions. In certain cases, Integrated Management and planning may be achieved through co-management. For instance, such a structure might be used to develop and implement Integrated Management plans in areas where legislative provisions provide for the sharing of management responsibilities.

Management by Area

The proposed Integrated Management planning framework will extend from the large to the small scale – from Large Ocean Management Areas to Coastal Management Areas. There will also be a range of connected and nested structures that provide options for different scales of response within this spectrum. The intent over the long term is to establish a system of Large Ocean Management Areas and smaller Coastal Management Areas. These would cover all marine waters within Canadian jurisdiction. Initial efforts will focus on areas currently under pressure, or soon to come under pressure, from human activities.

Large Ocean Management Areas (LOMAs)

In Canada, implementation of the integrated-management approach begins by defining a physical area to be managed, based on ecosystem, and practical considerations. Five areas have been selected to pilot the integrated-management approach. These areas are called large ocean management areas (LOMAs). They include: Pacific North Coast, Beaufort Sea, Gulf of St. Lawrence, Eastern Scotian Shelf and Placentia Bay/Grand Banks. Activities typically found within each LOMA include renewable and non-renewable energy development, shipping, fishing, conservation, maritime defence, telecommunications, eco-tourism and scientific activities.

While LOMAs primarily address large-scale ecosystem and economic development issues, they also provide the context for nesting a network of smaller Coastal Management Areas (CMA). One of the main considerations of CMAs is how they relate both to adjacent coastal landmass and waters and to the Large Ocean Management Area where they are nested. Likewise, management plans for ocean waters must consider those the coastal communities nested inside them.

Integrated Management Bodies

In general, an Integrated Management body will be composed of both governmental and non-governmental representatives with interests in a prescribed ocean space, and committed to the Integrated Management process. Even without the full endorsement or participation of some interests, some management actions will still proceed to meet existing jurisdictional responsibilities. For example, actions necessary for conservation can proceed under the authority of the Minister of Fisheries and Oceans. Integrated Management bodies may, under specific circumstances, have additional roles and responsibilities. For example, they could be made responsible for a specific task such as the acquisition, management and dissemination of data, or permit processing in accordance with specific agreements. These agreements however, would not affect the ultimate responsibility of the mandated regulatory body.

The Integrated Management Planning Process

The Integrated Management Planning Process (taken from the Beaufort Sea LOMA) include:

- 1. Defining and Assessing a Management Area
 - Ecosystem Overview and Assessment Report
 - Social, Cultural and Economic Overview and Assessment Report (pending)
- 2. Engaging affected interests
 - · Development of the governance structure
 - · Community and stakeholder consultations
- **3.** Developing an Integrated Ocean Management Plan for the Beaufort Sea
 - Draft Plan being developed by the Secretariat in collaboration with the Working Groups
 - · Synthesis of Overview and Assessment Reports
 - Vision is defined
 - Identification of sustainable development (governance, conservation, social, cultural, and economic) objectives, management strategies, and indictors.
 - Development of action plans that identify strategies needed to advance objectives, the agencies responsible for implementing component pieces of the plan, and indicators.
- 4. Receiving Endorsement of the Plan
 - · Support from governance bodies
 - · Support from local communities
 - Approval by the Minister of Fishers and Oceans Canada
- 5. Implementing the Plan
 - Responsible agencies will be encouraged to implement components of the Plan within their jurisdiction.
- 6. Monitoring and Evaluating Outcomes
 - · Check if the Plan is working
 - $\cdot\,$ Lessons learned
 - · Revise plan to achieve goals and objectives

Conclusions

1. Canada's long term goal is to develop a system of nested Integrated Management plans for all of its marine waters, and to establish within these a network of marine protected areas. However, there is clearly a need to establish shorter term priorities

2. Such an approach will be easier to develop further in areas within the single jurisdiction of the federal government (namely oceans) but are no less and perhaps even more important for fish habitat management in complex, multi-jurisdictional systems.

3. Experience with the LOMA process is growing as the five LOMAs move through the process. Currently the ESSIM LOMA is furthest along and lessons learned will be important to pass update knowledge and experience with the process. To date no CMAs have been initiated.

4. Consideration of impact models to assess future conditions as a result of future changes have not been accounted for in the planning steps.

5. Due consideration on how downscaling (to smaller subareas) can occur to ensure that key knowledge and understanding from the bigger picture is not lost, is not currently a part of the planning process.





5.2 International Joint Commission

The work carried out by the International Joint Commission (IJC) will be identified in this chapter of the report as well as the chapter under Great Lakes. In addition to the Great Lakes-St. Lawrence River system, the International Joint Commission assists Canadian and American governments in managing other waters along the border.

The Commission has continuing responsibilities in several areas. In the west, the Commission has established conditions for dams on the Kootenay, Osoyoos and Columbia rivers, which cross through the states of Washington, Idaho and Montana, and the province of British Columbia. The Commission has also helped to set rules for sharing the St. Mary and Milk rivers in Alberta, Saskatchewan and Montana.

In the midwest the Commission has been involved in how the Souris River is shared among Saskatchewan, Manitoba and North Dakota. It also sets emergency water levels for the Rainy Lake system, which crosses through Minnesota, Manitoba and western Ontario, and has helped protect water quality in the Rainy River.

In the east, the Commission plays a role in regulating dams on the St. Croix River, which flows through New Brunswick and Maine, and in protecting the quality of the river.

Under the International Watersheds Initiative, the Commission is working to strengthen the capacity of existing boards through:

- employing a broader, ecosystemic perspective;
- expanding outreach and cooperation among organizations with local water-related interests and responsibilities;
- promoting the development of a common vision for each basin;
- · developing a better understanding of the water-related resources; and
- creating conditions for the resolution of specific watershed-related issues.

The International Watersheds Initiative (IWI) promotes an integrated, ecosystem approach to issues arising in transboundary waters through enhanced local participation and strengthened local capacity. The initiative was conceived to facilitate the development of watershedspecific responses to emerging challenges such as intensified population growth and urbanization, global climate change, changing uses of water, pollution from air and land, and introductions of exotic species.



5.3 Non Government Organizations

Many prominent non-government organizations have waded into the issue of IWM related activities and reports in Canada. A few of the most recent reports are highlighted here and key conclusions calling for changes to enhance the abilities of ecosystem managers to manage water and the ecosystem into the future.

Canadian Water Resources Association

(Fitzgibbon 2006)

Revised Sustainability Principles for Water Management in Canada, 2006

Sustainability Ethic

Wise management of water resources must be achieved by genuine commitment to:

- ecological integrity and biological diversity to ensure a healthy environment;
- · a dynamic economy;
- · social equity for present and future generations; and
- \cdot value of water to humans and to other species.

Water Management Principles

According to this Sustainability Ethic, we will:

Practice integrated water resource management (IWRM) by:

- using IWRM as a tool for water stewardship to achieve a shared vision for sustainable water management;
- applying IWRM in the use and development of surface and groundwater; using river basin and aquifer boundaries to define spatial management units; connecting hydrological, ecological, social and institutional systems;
- linking water quality, quantity and the management of other resources;
- incorporating attention to public health and safety, and ecosystem health; and,
- promoting innovative technologies that provide solutions which are mutually reinforcing from environmental, social and economic perspectives.

Encourage water conservation and the protection of water quality by:

- recognizing the value and limits of water resources and the cost of providing it in adequate quantity and quality;
- acknowledging its consumptive and non-consumptive values to both humans and other species;
- balancing education, market forces, and regulatory systems to promote choice and recognition of the responsibility of beneficiaries to pay for use of the resource; and,
- using social marketing to motivate people to change their mind set so that their range of choices and their propensity for making more environmentally sound choices are broadened.

Resolve water management issues by:

- employing planning, monitoring and research to facilitate adaptive management;
- providing interdisciplinary perspectives and information for decision making;
- encouraging active consultation and participation among all affected parties and the public;
- using negotiation and mediation to seek consensus

Federal Government

Pearse, Bertrand and MacLaren (1985) completed their report from the Inquiry on Federal Water Policy in September 1985, and, two years later, the Minister of the Environment tabled in Parliament a new Federal Water Policy incorporating most of the recommendations from the Inquiry. Ten years later, however, Pearse and Quinn (1996) expressed concern about a contraction in the capacity of the federal government relative to water, and observed that the federal government was on a path that would result in it being "without the capability to administer even a modest water policy" (Pearse and Quinn, 1996: 339). In that context, we recommend that the federal government should:

Renew and refresh the federal water policy, in close consultation and co-operation with the provinces and other stakeholders, to ensure a national framework for sustainable water management. The national framework should:

- define a vision, goals and objectives for water management in Canada;
- require the development of integrated water resource management plans that support sustainability principles throughout Canada;
- set national standards for water quality and environmental monitoring;
- define the federal role in providing research, data collection, analysis and monitoring;
- outline cost-sharing arrangements for funding IWRM initiatives;
- encourage each province and territory to develop a provincial or territorial water policy that specifies its role in developing consistent standards, implementation procedures, regulations and enforcement measures to ensure performance at the local level;
- develop guidelines for state of IWRM reporting on a regular basis; and,
- establish a program for determining appropriate environmental, economic and social measures of river health, including both ground and surface water.

Take the lead role in coordinating the development of IWRM for aquatic systems that cross provincial, territorial and/or national boundaries. In that regard, the federal government should actively use the *Canada Water Act* as a tool to encourage integrated water resource management, building on its ecosystem initiatives such as the Atlantic Coastal Action Program, Georgia Basin Ecosystem Initiative, the Great Lakes Action Plan, the St. Lawrence Vision 2000 Program and the Northern Rivers Ecosystem Initiative.

Renew its commitment to ensure high quality monitoring of aquatic systems, including water quantity and quality, as well as high level capacity for scientific excellence related to aquatic systems.

Provincial Governments We recommend that provincial governments:

Develop a provincial water policy which promotes sustainability principles and IWRM where they do not exist, or enhance existing policies and practices, in order to:

- promote research into water issues and development of decision support tools to ensure the best science, technology and management practices are shared and available for local application;
- support an adequate monitoring program to measure, change and adapt policies and programs accordingly;
- support the improvement, maintenance and accessibility of resource data for effective local watershed management;
- ensure and facilitate collaboration among provincial agencies and stakeholder participation in matters dealing with water to ensure an interdisciplinary and coordinated approach to water management; and,
- $\cdot\,$ secure adequate and stable sources of funding to finance IWRM.

Municipal Governments We recommend that municipal governments:

Promote and participate in integrated water resource management initiatives.

Formulate land use policies in urbanizing areas on the basis of a watershed or subwatershed plan that address how natural features and functions will be retained and improved as development proceeds. Promote the experimentation with and use of innovative green technologies which reduce water consumption, increase water efficiency and improve water quality.

Collect and share resource data for input into the watershed planning process.

Encourage and support local community groups, businesses, individuals, institutions, and other watershed partners to participate in IWRM

Acknowledge, share and celebrate community successes in improving watershed health.

Some of the above recommendations for municipal governments are not unique to this level of government, and also should be considered by federal and provincial governments

Polis

The following is an excerpt from the report entitled At a Watershed: Ecological Governance and Sustainable Water Management in Canada, May 2005.

To develop sustainability, four key concepts must guide water planning and management:

1. Prevention and Precaution

To maintain ecosystem integrity, prevention of harm is better than subsequent compensation or remediation. A precautionary approach is the best hedge against an uncertain future.

2. Ecosystem-based management

Ecosystem-based management adapts economic, political and social processes to fit within the ecosystem, instead of the reverse. Rather than managing a watershed as an adjunct to human needs, ecosystem integrity sets the context for management decisions.

3. Matching authority to jurisdiction

Watershed governance recognizes that local people and institutions are best situated to monitor environmental feedback and respond with tailored solutions. However, local powers must also be "nested" within higher level institutions that hold them accountable, coordinate with other local institutions, and participate in broader collective actions.

4. Adaptive management

Plans and policies should be continually modified to respond to ecological, economic and social feedback through an ongoing process of informed "trial and error." Decisions that are provisional and reversible can create and apply critical knowledge to refine decision making in an uncertain world.

Key Components of a national water strategy

Working together, federal and provincial governments can promote the tools and institutions to allow all local interests—suppliers, businesses, consumers and local governments—to take effective action in developing water sustainability. Real world experiences in many jurisdictions can provide signposts for Canadian authorities along the path to a sustainable water future.

Allocating water in the 21st Century

Ecosystem-based management starts at the source to protect ecological function and ecosystems. Only after ecological needs are met can water then be accessed for human activities. Once the ecological limit of an aquifer, river basin or watershed is reached, future water demands must be met through increased water "productivity." This liberates the full potential of demand management.

Enabling local water planning and conservation

Senior governments can uniquely address the institutional inertia of the supply-side paradigm that now prevents the long-term planning and decision making needed to implement DSM. They can ensure local governments have a sustainability strategy based on longterm water conservation planning and an integrated approach to water management. Patterns of supply and demand, ground and storm water use, energy and land use decisions can all be shaped and transformed. Specific tools and practices to foster such transformation include funding, guidelines, data and information, building and sharing technical knowledge, increasing staff resources, providing incentives for innovative management and ensuring widespread public education.

Facilitating urban water demand management

Demand management programs can reduce infrastructure costs and ecological impacts. However, water conservation does not just happen. Success requires coordinated efforts from all stakeholders and an environment where demand management is the primary focus of water managers. Senior governments can facilitate a demand-oriented focus through the creation of model bylaws and standardized Best Management Practices (BMPs). They can act as a central clearinghouse of information and undertake research, pilot projects and educational programs. They can also move forward specific DSM opportunities such as product labelling, social marketing, conservationbased pricing and reuse and recycling technologies.

Thinking like a watershed

Sustainable water management requires managers, in effect, to "think like a watershed"—to consider the complex interaction of human activities and natural processes in planning and decision-making. Ecological governance is only possible where management focus shifts away from manipulating the watershed and toward managing human activities within the watershed. Demand management is a foundational tool for watershed managers. When applied not only within the urban sector but in all sectors—including power generation, industry, manufacturing and agriculture—up and down the watershed a broader social process of ecological governance begins to take root.

The report concludes:

Canada has the opportunity to break from its historical pattern of wasting water. A future different from the past is possible. Financial, technological, legal and social tools are available to grapple with water issues before they reach crisis proportions. But the long-term solution requires a fundamental shift to watershed or ecosystem governance. It requires an institutional shift towards ecologically-based water allocations, the soft path for water, ecosystem-based management, and innovative urban water management.

The challenge now is to ensure that these new approaches, resources and institutional arrangements are implemented across the country. Senior government must provide the leadership to make this happen and take steps to ensure water agencies have the capacity and incentives to implement comprehensive solutions at the local level.



Conference Board of Canada

The following is an excerpt from the report *Navigating the Shoals - Assessing Water Governance and Management in Canada*, April 2006.

Canada's water governance and management institutions and incentives will help tomorrow's water managers steward the nation's freshwater resources in a manner that can sustain the ecosystem and economic growth. To do this, water managers need:

- clear governance structures to establish consistent and consonant policy goals within a watershed;
- **a "nested" approach** to watershed governance to incorporate the knowledge and expertise of managers at all levels into watershed decision-making;
- **improved inter-agency coordination** to limit and cope with the competing interests of government departments at all levels;
- integrated management of groundwater and surface water to establish the long-term availability and limitations of a watershed's resources;
- adequate information and sufficient budgets to conduct the monitoring and measuring required for effective and sustainable management and stewardship of Canada's water resources; and
- to explore greater use of market-based instruments as a means of allocating increasingly scarce resources to their highest social and economic value.

This case study research analysis reveals that Canadian water managers face significant challenges in maintaining Canadian water quantity and quality today. And managing the expected hydrologic effects of climate change and the resource needs of a sustainable ecosystem – in addition to managing growing demographic and economic pressures - will prove even more challenging as we approach the second and third decades of the 21st century.

Pollution Probe

The following is an excerpt from the report *A New Approach* to Water Management in Canada, March 2008.

A New Approach to Water Management must contain the following elements:

- An inclusive watershed-based approach to governance;
- A stewardship ethic that motivates Canadians in all walks of life to contribute to sustainable watershed management;
- A knowledge base that informs effective decision making; and,
- Financial investment to ensure full implementation of the New Approach.



Eight fundamental principles guide the New Approach to Water Management.

1. Precaution —Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost effective measures to prevent environmental degradation.

2. Shared Responsibility –A stewardship ethic emerges through an aware, educated, engaged and animated public. Connecting people with watersheds and the environment provides a driving force for integrated water resources management.

3. Living off the Interest – We must recognize the environmental value of water, and rather than degrading and depleting this precious natural capital, we should work to live off the interest of the ecological services that water provides, leaving water resources intact for the use of future generations.

4. Right to Know —The public has a right to know about the use and management of water. There should be a presumption in favour of a public right to access data and information about water quality and quantity.

5. Net Gain — To achieve restoration and the long-term sustainability and integrity of watersheds, we need to redress past abuses and strive for a Net Gain in ecological assets when economic development and other activities are undertaken.

6. Jurisdiction Best-Placed — Policy development should take place at all jurisdictional levels, but implementation should be the responsibility of the level most appropriate to resolving the issue. The "jurisdiction best-placed" principle should be supported with adequate money, data, human resources and legal authority.

7. Pollution Prevention – It is better for the environment and more cost effective to prevent pollution than to clean it up after the fact.

8. Polluter Pays – The polluting party should pay for the restoration of damage done to the natural and built environments.

Canadian Chamber of Commerce

The following is an excerpt from the report *Water for Sustainability*.

In an effort to sustain quality of life, healthy water quality and economic well being, the Canadian Water Resources Association has circulated "Sustainability Principles" for Water Resources management. The Canadian Chamber of Commerce is concerned how best to deal with "significant pressures" that Canada is facing on its water resources. The past several years have provided us with numerous examples of the need for a national water strategy. The floods, the droughts, the Great Lakes pollution problems, the waterborne infectious diseases, the issue of water exports, the variability of our climates and the impact of man's activities on that climate all speak to the need for a coordinated effort between the federal, provincial and municipal governments to develop national practices and policies for one of our most precious resources.



Recommendations

That the federal government:

1. Take a leadership role in bringing the provinces and territories together to place an urgent and high priority on water management issues in the country.

2. Reintroduce the federal fresh water strategy from 1998 as a foundation for the creation of a national water management strategy.

- Include the Provinces, Territories and water use stakeholders in the strategy development stage.
- Obtain comments and feedback from all stakeholders in the development of detailed action plans.

3. Place a high priority on development and implementation of a reporting structure that will inform Canadians annually on:

- A comprehensive inventory of the quality and quantity of all Water reserves;
- The uses by activity (e. g. residential water use, agricultural irrigation, enhanced oil recovery, power generation, etc.);
- The quantity and quality of Water returned, if any, from the various uses.

4. Support research and data collection for proper forecasting of upstream flows and possible long-term changes which may impact activities in the areas of water management.

5. Ensure that water apportionment agreements do not prejudice future developments in the watershed providing the Water.

6. Commit that costs for access to expertise and financial requirements for planning, implementing and measuring are not downloaded as primary responsibilities of municipalities:

- Take a proactive role with respect to feasibility studies, infrastructure development, water supply, and conservation projects.
- Support research and data collection for proper forecasting of stream flows and possible long-term flow changes, which may impact development activities in the areas of water management.

7. Encourage the associated federal government departments to introduce a national water management strategy developed in concert with the provinces, territories and water use stakeholders. **8.** Utilize a cross ministry team approach, which would assist both the federal government and the users in their quest for consolidation of information and resources.

9. Take an active role in communicating and promoting conservation measures (such as watershed protection) and awareness to increase the understanding of the various water management responsibilities of municipalities, irrigation districts, conservation authorities, and provinces and territories throughout the country.

10. Work on water issues in a manner that supports and adds value to the water management activities being undertaken by the provinces [i.e. Alberta, Water for Life; Ontario, Source Water Protection] via partnerships and funding support that will promote regional, placebased, stakeholder-driven solutions.

11. Strive to obtain cooperation with United States federal and state governments in these initiatives so that they are not undermined by conflicting activities in the United States

Common Messaging Among Non Government Organizations

The need and support for IWM was commonly expressed in response to matters pertaining to water resources management with connections to social and economical considerations. Many of the non-government organizations saw IWM as a fundamental tool to be used in addressing principles on sustainability and ecosystem based management. Calls for federal and provincial water policies and water strategies were consistently raised along with the need for improved inter-agency coordination with clear governance structures. The idea of jurisdiction based implementation speaks to a nested approach and shared responsibility where policy development is done at the appropriate jurisdictional level and implementation is carried out at the level most appropriate for resolving the issue. The concept of shared responsibility was also raised in engaging and connecting with the water resources community. Stable funding for expertise, planning and implementation for water management was also raised. Key concepts based on adaptive environmental management, precautionary principle and pollution prevention were seen as underpinning principles. Economic instruments such as polluter pay and recognizing the economic value of water were raised as a source of management costs.

International and domestic agreements pertaining to protection and restoration of the Great Lakes Basin ecosystem support integrated watershed management.

Great Lakes Water Quality Agreement (GLWQA)

Much of the work of the International Joint Commission consists of assisting the Governments of Canada and the United States to achieve their goal of cleaning up the Great Lakes and preventing further pollution in the system.

In 1972 Canada and the United States signed the first Great Lakes Water Quality Agreement. The two countries agreed to work to control pollution in these waters and to clean up waste waters from industries and communities. In 1978, they signed a new agreement, in which they added a commitment to work together to rid the Great Lakes of "persistent toxic substances." These substances remain in the environment for a long time and can poison food sources for animals and people. In 1987 the governments signed a Protocol promising to report on progress and calling on the Commission to review "Remedial Action Plans" in what are described as 43 "Areas of Concern." The Plans are prepared by governments and communities and contain strategies to clean up problem areas and promote sustainable development in the Great Lakes region. The Protocol also calls on the Commission to review "Lakewide Management Plans" that propose actions to improve the quality of the water in Lakes Superior, Huron, Michigan, Erie and Ontario.

In a special report from the IJC to the Governments of Canada and the United States (August 2006), the following was a comment followed by a recommendation to update the current Water Quality Agreement:

During it evolution over the past 3 decades, the Agreement has taken steps toward recognizing the importance of watershed management in protecting and restoring Great Lakes water quality. In many respects, however, this development has been too tentative and the current Agreement has not kept pace with emerging efforts across the basin. This in turn has made the Agreement somewhat less relevant to the many activities undertaken by governments, stakeholder groups and local communities.....

Watershed planning occurs at local levels. Annex 13 requires the parties to develop and implement watershed plans in conjunction with state and provincial governments. Instruments should be devised to enable the Agreement to better facilitate watershed planning. Therefore the recommendation from the IJC reads as follows:

Recommendation 4

The Commission recommends that the Agreement specify that watersheds be the geographic units to coordinate, integrate and implement programs called for by the Agreement and set out in the Binational Action Plan.

On Saturday, June 13th, 2009, at the Niagara Falls bi-national celebrations of the 100th Anniversary of the Canada-U.S. Boundary Waters Treaty, Hillary Clinton (U.S. Secretary of State), and the Honourable Lawrence Cannon (Minister of Foreign Affairs) announced that the Governments of Canada and the United States have agreed to update the Great Lakes Water Quality Agreement (GLWQA). As per the Canadian Department of Foreign Affairs & International Trade, News Release dated June 13th, 2009:

"...the Great Lakes are still at risk from current and emerging challenges such as increased population and urbanization, land use practices, invasive species, new chemicals and the impacts of climate change. Negotiations over the coming months will aim to strengthen and modernize the Agreement to better address these perils."

Canada-Ontario Great Lakes Agreement

Since 1971, Canada-Ontario Agreements Respecting the Great Lakes Basin Ecosystem have guided the Parties in their work to improve the environmental quality of the Basin. Along with the efforts of the Basin's residents, these agreements have contributed to:

- reducing the amount of pollution that enters the Basin;
- improving and protecting the habitat of fish and wildlife;
- $\cdot\,$ working toward the goal of water that is safe to swim in and to drink; and
- fostering a sense of stewardship throughout the region for the Basin Ecosystem.

Watershed planning occurs at local levels.

The principles of the current 2007 - 2010 Canada-Ontario Agreement will direct and guide the actions of the Parties under the Agreement. The principles include:

(a) Accountability – remain accountable to citizens by establishing clear goals, results and commitments for this Agreement and reporting regularly on progress in relation to environmental conditions.

(b) Adaptive Management – conduct activities with openness, continuous learning, innovation, and improvement ensures effective and efficient management of the Agreement.

(c) Collaboration and Cooperation – ensure that the decisionmaking process incorporates consideration of public and Great Lakes community opinions and advice, and provide the Great Lakes community with meaningful opportunities to consult, to advise and to participate directly in activities that support the Agreement.

(d) Communication – ensure effective methods are used to inform the public of the importance of the Great Lakes, the increasingly complex environmental challenges faced by the Great Lakes and ongoing efforts to overcome the challenges, and to encourage collaborative and individual action and stewardship to protect the Great Lakes.

(e) Conservation – promote the conservation of energy, water and other resources to sustain the physical, chemical and biological integrity of the Basin Ecosystem.

(f) Ecosystem Approach – make decisions that recognize the interdependence of land, air, water and living organisms, including humans, and seek to maximize benefits to the entire Basin Ecosystem.

(g) Free Exchange of Information – data will be collected once, closest to the source, in the most efficient manner possible and will be shared.

(h) Net Gain – design human development and management actions to maximize environmental benefits rather than acting only to minimize environmental costs.

(i) Pollution Prevention — use processes, practices, materials, products, substances or energy that avoid or minimize the creation of pollutants and waste and reduce the overall risk to the environment or human health.

(j) Pollution Reduction – continue to work towards the virtual elimination of persistent toxic substances and reductions in other types of pollution.

(k) Precautionary Principle – where there are threats of serious or irreversible environmental damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

(*I*) Rehabilitation – restore environmental quality where it has been degraded by human activity.

(*m*) Science-Based Management – provide advice to establish management priorities, policies and programs based on best available science, research and knowledge including traditional ecological knowledge.

(*n*) Sustainability – consider social, economic and environmental demands to balance the needs of the present without compromising the ability of future generations to meet their own needs.

In March 2009, the Ministers of the Environment, Natural Resources and Agriculture, Food and Rural Affairs posted a discussion paper on *Ontario's proposed Vision, Goals, and Strategies to help protect and restore the Great Lakes* for public comment on the Environmental Bill of Rights Registry (EBR #010-6105). The stated intent was to engage the public in discussions around a long-term vision for the Great Lakes so that the Province is well equipped for negotiations with the federal government on the renewal of the Canada-Ontario Agreement. One of the nine proposed Strategies is to "Enhance Lake-based and Watershed-based Planning and Action". The EBR public consultation closed on May 19, 2009, and the Ontario Vision is currently being finalized.

7.0 | Provincial Perspective

Four examples of ecosystem-based Strategies and Policies from the provinces of Alberta, British Columbia, Manitoba and Quebec are presented here. These provinces were selected as their work was relatively recent and provide examples that would be of assistance to Ontario. Work to date in Ontario in IWM is also summarized in what follows.



Photo Credit: Jackie O'Neill

7.1 Alberta

STRATEGY

Water for Life: Alberta's Strategy for Sustainability is the Government of Alberta's response to develop a new water management approach and outline specific strategies and actions to address these issues.

NEED

Alberta is facing significant pressures on its water resources. Population growth, droughts and agricultural and industrial development are increasing demand and pressure on the province's water supplies, and the risk to the health and well-being of Albertans, our economy and our aquatic cosystems.

PRINCIPLES

- All Albertans must recognize there are limits to the available water supply.
- Alberta's water resources must be managed within the capacity of individual watersheds.
- Citizens, communities, industry and government must share responsibility for water management in Alberta, and work together to improve conditions within their local watershed.
- Knowledge of Alberta's water supply and quality is the foundation for effective decision-making.
- Albertans must become leaders at using water more effectively and efficiently, and will use and reuse water wisely and responsibly.
- Alberta must preserve the "first-in-time, first-in-right" principle for granting and administering water allocations, but water allocations will be transferable to ensure societal demands and needs can be met.
- Healthy aquatic ecosystems are vital to a high quality of life for Albertans and must be preserved.
- Groundwater and surface water quality must be preserved in pursuing economic and community development.
- Alberta will continue to be a leader in drinking water quality and standards to ensure Albertans have safe, secure drinking water.

GOALS

Throughout the extensive consultation process, Albertans reaffirmed three goals of a provincial water strategy:

- · Safe, secure drinking water supply
- · Healthy aquatic ecosystems
- Reliable, quality water supplies for a sustainable economy

OUTCOMES

Water for Life is based on the following commitments to Albertans:

- · Albertans will be assured their drinking water is safe.
- Albertans will be assured that the province's aquatic ecosystems are maintained and protected.
- Albertans will be assured that water is managed effectively to support sustainable economic development.

ACTIONS

Safe, Secure Drinking Water Supply

Short-Term (2004/05 to 2006/07)

• Alberta has a comprehensive strategy to protect Albertans' drinking water.

Medium-Term (2007/08 to 2009/10)

- Albertans have full and complete knowledge of drinking water issues.
- Albertans have real-time access to information about drinking water quality in their community.

Long-Term (2010/11 to 2013/14)

- Alberta's drinking water infrastructure meets emerging standards and is managed for long-term sustainability.
- Albertans have the knowledge, tools and motivation to implement actions that will maintain or improve the province's water resources.

Healthy Aquatic Ecosystems

Short-Term (2004/05 to 2006/07)

• Efforts to protect aquatic ecosystems in critical areas are underway.

Medium-Term (2007/08 to 2009/10)

 Water management objectives and priorities for sustaining aquatic ecosystems are established through watershed plans.

Long-Term (2010/11 to 2013/14)

- Water is managed and allocated to sustain aquatic ecosystems and ensure their contribution to Alberta's natural capital and quality of life are maintained.
- Albertans have the knowledge and tools to implement actions to maintain or improve Alberta's water resources.
- Communities are demonstrating leadership in watershed management.

Reliable, Quality Water Supplies for a Sustainable Economy

Short-Term (2004/05 to 2006/07)

- A broad range of water management tools and techniques are implemented.
- Albertans understand the value of water to the economy and quality of life.

Medium-Term (2007/08 to 2009/10)

- Water management objectives and priorities to support sustainable economic development are established through watershed plans.
- All sectors are demonstrating best management practices and improving efficiency and productivity associated with water use.

Long-Term (2010/11 to 2013/14)

- Water is managed and allocated to support sustainable economic development and the strategic priorities of the province.
- The overall efficiency and productivity of water use in Alberta has improved by 30 per cent from 2005 levels by 2015 (firm targets to be determined by the Provincial Water Advisory Council).
- Albertans have the knowledge, tools and motivation to implement actions that will maintain or improve the province's water resources.

7.2 British Columbia

STRATEGY

Living Water Smart is British Columbia government's vision and plan to keep water healthy and secure for the future. Through the plan, the government commits to new actions and targets and builds on existing efforts to protect and keep water safe. The plan draws on a variety of policy 'tools' including planning, regulatory change, education, and incentives like economic instruments and rewards. A fresh and flexible approach is required to deal with competing demands and climate risks. The plan outlines how to get involved and make positive changes to attitudes and actions. The government commits to safeguarding water and suggests some actions that can be taken.

NEED

In the next 25 years, the province's population will grow by another 1.4 million people so the same amount of water will have to go a lot further, without compromising nature's needs. The impacts of a changing climate is also a key reason for a new water plan



PRINCIPLES

- · doing business differently
- we take care of our water, our water takes care of us...
- nature is the best teacher the best architect, and the best engineer when it comes to storing, treating, and filtering our water
- · living within our means
- · groundwater is our hidden treasure
- · get together decide together
- · we can't manage what we don't measure
- · our farms need water
- · conserve and restore
- · preparing communities for change
- · our climate is changing
- · smart spending on smart infrastructure
- rivers need room to meander
- · green development makes sense
- · leading the way
- · safe water from our taps
- · being water smart in British Columbia
- · reduce your use!
- · are you water smart?
- · learning about water
- · keeping our traditions and knowledge
- · getting smarter with science
- recognizing our water smart heroes
- · be part of the solution!

ACTIONS

1. By 2012, all land and water managers will know what makes a stream healthy, and therefore be able to help land and water users factor in new approaches to securing stream health and the full range of stream benefits.

2. By 2012, water laws will improve the protection of ecological values, provide for more community involvement, and provide incentives to be water efficient.

3. Legislation will recognize water flow requirements for ecosystems and species.

4. Government will require all users to cut back their water use in times of drought or where stream health is threatened.

5. Government will limit all new licences to 40-year terms in areas where there is high demand and pressure on water.

6. The Ground Water Protection Regulation will protect the quality and quantity of our groundwater.

7. By 2012, government will regulate groundwater use in priority areas and large groundwater withdrawals.

8. Government will support communities to do watershed management planning in priority areas.

9. By 2020, water use in British Columbia will be 33 percent more efficient.

10. By 2012, government will require all large water users to measure and report their water use.

11. Government will require more efficient water use in the agriculture sector.

12. Government will secure access to water for agricultural lands.

13. Government will work with the private sector and support communities to conserve and restore stream function.

14. Government and partners will restore ecological health to 30 km of stream between Vaseux Lake and Osoyoos Lake.

15. Government will fund the Mount Washington mine remediation project with \$4.5 million, restoring the health of the Tsolum River.

16. To enhance some watersheds, government will examine the potential of decommissioning dams.

Preparing Communities for Change

17. By 2012 new approaches to water management will address the impacts from a changing water cycle, increased drought risk and other impacts on water caused by climate change.

18. Government will work with other provinces to share ideas and resources to improve water conservation and collectively help communities adapt to climate change.

19. Community development strategies will be developed to recognize the importance of riparian zones in adapting to climate change.

20. Adapting to climate change and reducing our impact on the environment will be a condition for receiving provincial infrastructure funding.

21. Where new development on flood plains is unavoidable, it will be flood-proofed to high provincial standards.

22. The government will provide \$100M for flood protection over 10 years to help communities manage flood losses.

23. Wetland and waterway function will be protected and rehabilitated.

24. Government will provide incentives for restoration of streams or wetlands.

25. Green developments waiting for provincial environmental approvals will be fast-tracked and given priority.

26. Government will develop new protocols for capital planning that will look at the lifecycle costs and benefits of buildings, goods and services.

27. Government will improve the quality and protection of drinking water sources.

28. The government will cooperate with Canada to ensure the quality of drinking water in all Aboriginal communities will meet the same provincial standards applied across British Columbia by 2015.

Choosing to be Water Smart

29. Fifty percent of new municipal water needs will be acquired through conservation by 2020.

30. Government will look at new ways to help promising water conservation technology succeed.

31. Government will fund household evaluations of water, energy and transportation use.

32. The Green Building Code will require water conservation plumbing fixtures such as low flush toilets.

33. By 2010, government will mandate purple pipes in new construction for water collection and re-use.

34. In partnership with industry, government will develop a water efficiency labelling system for water consuming products.

35. By 2012, all students in B.C. will have completed at least one stream-health assessment.

36. Government will award a youth water-science prize or scholarship for excellence in water stewardship.

37. Government will provide summer jobs for youth between the ages of 16 to 22, to undertake twenty stream restoration projects across the province.

38. Government and First Nations' treaty water negotiations and other related agreements support providing a clean and safe domestic, agricultural and industrial water supply for First Nation communities.

39. Government will continue to work toward preserving First Nations' social and cultural practices associated with water.

40. Tools to incorporate traditional ecological knowledge into information and decision making will be developed by 2015.

41. By 2010, a strategy to set the direction for water science in B.C. will be implemented.

42. Government is expanding British Columbia's hydrometric and other climate-related networks.

43. Government will publish a report on the state of our water by 2012 and every five years after that.

44. Government will celebrate examples of successful water stewardship by awarding annual water awards to individuals or groups.

45. The government of British Columbia will work with our Olympic partners to use sports and the Olympic Games spotlight to engage British Columbians and support smarter water choices.



PHASE I Integrated Watershed Management - Navigating Ontario's Future IWM in Ontario: Phase I - Status of Integrated Watershed Management

7.3 Manitoba

STRATEGY

Manitoba's *Water Strategy (April 2003)* is comprised of actions that have been undertaken or proposed, to address specific issues in the six different policy areas: water quality, conservation, use & allocation, water supply, flooding and drainage. Implementation has begun and will continue to be a priority. A three-part implementation framework has been created to integrate and coordinate the strategy. The three elements of this framework are:

- I. the development of an integrated water planning and management system
- II. the review and consolidation of water legislation
- III. the development of the mechanisms for financing water management and planning

Watershed plans will be brought together so priorities for the entire basin can be established. Basin planning will be done within the context of Manitoba's vision and mission. Partnerships and agreements are imperative to guaranteeing the fulfillment of these plans. It is also imperative to the success of watershed planning that environmental stewardship, our quality of life and the viability of our economy be included. This will be done with legislation to ensure the future of water resources remain an important part of Manitoba's environment and economy.

NEED

Manitobans currently face a number of complex and challenging water policy areas. The Manitoba government is taking action due to the necessity for finding immediate solutions. The Manitoba government is working towards a more holistic and integrated water strategy to guide actions into the future. To manage sustainably, all of the important components within a watershed must be considered.

PRINCIPLES (as described in 1990)

1. Integration of environmental and economic decisions: requires that we ensure economic decisions adequately reflect environmental impacts including human health. Environmental initiatives shall adequately take into account economic consequences.

2. Stewardship: requires that we manage the environment and economy for the benefits of present and future generations. Stewardship requires the recognition that we are caretakers of the environment and economy for the benefit of present and future generations of Manitobans. A balance must be struck between today's decisions and tomorrow's impacts. **3.** Shared responsibility: requires that all Manitobans acknowledge responsibility for sustaining the environment and economy, with each being accountable for decisions and actions, in a spirit of partnership and open cooperation.

4. Prevention: requires that we anticipate, prevent or mitigate significant adverse environmental (including human health) and economic impacts of policy, programs, and decisions.

5. Conservation: requires that we maintain essential ecological processes, biological diversity, and life-support systems of our environment; harvest reusable resources on a sustained yield basis; and make wise and efficient use of our renewable and non-renewable resources.

6. Waste minimization: requires that we endeavour to reduce, reuse, recycle, and recover the products of our society.

7. Enhancement: requires that we enhance the long term productive capability, quality, and capacity of our natural ecosystems.

8. Rehabilitation and reclamation: requires that we endeavour to restore damaged or degraded environments to beneficial uses. Rehabilitation and reclamation require ameliorating damage caused in the past. Future policies, programs, and developments should take into consideration the need for rehabilitation and reclamation.

9. Scientific and technological innovation: requires that we research, develop, test, and implement technologies essential to further environmental quality including human health and economic growth.

10. Global responsibility: requires that we think globally when we act locally. Global responsibility requires that we recognize there are no boundaries to our environment, and that there is ecological interdependence among provinces and nations. There is a need to work cooperatively within Canada and internationally to accelerate the merger of environment and economics in decision making and to develop comprehensive and equitable solutions to problems.

VISION

An abundance of high quality water to support and maintain our ecosystems and provide for the present and future needs of all Manitobans

ACTIONS

- The Drinking Water Safety Act passed in 2002 is among the most comprehensive pieces of drinking water legislation in North America.
- Legislation to ban bulk water removal was passed in 2000 to protect both the quality and quantity of our water.
- Manitoba has challenged the Devils Lake and Garrison Diversion projects at the highest levels to prevent the inter-basin transfer of harmful organisms into the Hudson Bay drainage basin.
- Flood protection for both rural and urban Manitobans has been given top priority.
- Actions to protect Lake Winnipeg, including greater protection of riparian areas and tightened sewage and septic regulations have been announced.
- More resources have been added to address water quality and water management issues.

7.4 Quebec

There are two components to Quebec's approach to a water strategy, namely, the *Government Sustainable Strategy 2008-2013* and the *Water Policy*. Both are detailed in the following sections.

STRATEGY

Government Sustainable Development Strategy 2008-2013, December 2007

The Sustainable Development Act assented to on April 19, 2006, gives the government one year to adopt a sustainable development strategy. Under the Act, this strategy governs primarily the public service, targeting government departments, agencies and enterprises and eventually applying to municipal bodies, educational establishments and health and social services institutions, thereby improving Quebecers' quality of life. It must help better integrate sustainable development into government policies, programs and measures to ensure coherent action in this area.

The government wishes to address these sustainable development challenges while taking into account the inextricable nature of their environmental, social and economic dimensions. The three issues: 1) develop knowledge, 2) promote responsible action and 3) foster commitment will be addressed in each of the following directions:

Direction 1 Inform, make aware, educate, innovate

Direction 2 Reduce and manage risks to improve health, safety and the environment

Direction 3 Produce and consume responsibly

Direction 4 Increase economic efficiency

Direction 5 Address demographic changes

Direction 6 Practice integrated, sustainable land use and development

Direction 7 Preserve and share the collective heritage

Direction 8 Promote social involvement

Direction 9 Prevent and reduce social and economic inequality

NEED

The Strategy was developed as a result of the passing of the *Sustainable Development Act* in 2006.

PRINCIPLES

Under the Sustainable Development Act, all departments and agencies must incorporate the following principles, which also served to draft the Government Sustainable Development Strategy, into their different actions. All sixteen principles must therefore be taken into account in the interpretation and implementation of each of the Strategy's directions and objectives.

a) HEALTH AND QUALITY OF LIFE: People, human health and improved quality of life are at the centre of sustainable development concerns. People are entitled to a healthy and productive life in harmony with nature;

b) SOCIAL EQUITY AND SOLIDARITY: Development must be undertaken in a spirit of intra- and inter-generational equity and social ethics and solidarity;

c) ENVIRONMENTAL PROTECTION:To achieve sustainable development, environmental protection must constitute an integral part of the development process;

d) ECONOMIC EFFICIENCY: The economy of Québec and its regions must be effective, geared toward innovation and economic prosperity that is conducive to social progress and respectful of the environment;

e) PARTICIPATION AND COMMITMENT: The participation and commitment of citizens and citizens' groups are needed to define a concerted vision of development and to ensure its environmental, social and economic sustainability;

f) ACCESS TO KNOWLEDGE: Measures favourable to education, access to information and research must be encouraged in order to stimulate innovation, raise awareness and ensure effective participation of the public in the implementation of sustainable development;

g) SUBSIDIARITY: Powers and responsibilities must be delegated to the appropriate level of authority. Decision-making centres should be adequately distributed and as close as possible to the citizens and communities concerned; h) INTER-GOVERNMENTAL PARTNERSHIP AND COOPERATION: Governments must collaborate to ensure that development is sustainable from an environmental, social and economic standpoint. The external impact of actions in a given territory must be taken into consideration;

i) PREVENTION: In the presence of a known risk, preventive, mitigating and corrective actions must be taken, with priority given to actions at the source;

j) PRECAUTION: When there are threats of serious or irreversible damage, lack of full scientific certainty must not be used as a reason for postponing the adoption of effective measures to prevent environmental degradation;

k) PROTECTION OF CULTURAL HERITAGE:

The cultural heritage, made up of property, sites, landscapes, traditions and knowledge, reflects the identity of a society. It passes on the values of a society from generation to generation, and the preservation of this heritage fosters the sustainability of development. Cultural heritage components must be identified, protected and enhanced, taking their intrinsic rarity and fragility into account;

I) BIODIVERSITY PRESERVATION: Biological diversity offers incalculable advantages and must be preserved for the benefit of present and future generations. The protection of species, ecosystems and the natural processes that maintain life is essential if quality of human life is to be maintained;

m) RESPECT FOR ECOSYSTEM SUPPORT CAPACITY: Human activities must be respectful of the support capacity of ecosystems and ensure the perenniality of ecosystems;

n) RESPONSIBLE PRODUCTION AND CONSUMPTION: Production and consumption patterns must be changed in order to make production and consumption more viable and more socially and environmentally responsible, in particular through an ecoefficient approach that avoids waste and optimizes the use of resources;

 o) POLLUTER PAYS: Those who generate pollution or whose actions otherwise degrade the environment must bear their share of the cost of measures to prevent, reduce, control and mitigate environmental damage;

p) INTERNALIZATION OF COSTS: The cost of goods and services must reflect all the costs they generate for society during their whole life cycle, from their design to their final consumption or disposal

VISION

A society in which the citizens' quality of life is and remains a reality. A responsible, innovative society able to excel in all of its achievements. A society based on harmony between economic vitality, environmental quality and social equity. A society inspired by a State whose spirited and enlivened leadership leads it to reach this vision.

STRATEGY

Québec Water Policy is built around the following five key orientations:

- Orientation 1: Reform of water governance;
- Orientation 2: Integrated management of the St. Lawrence River;
- Orientation 3: Protection of water quality and aquatic ecosystems;
- Orientation 4: Continuation of water clean-up and improved management of water services;
- Orientation 5: Promotion of water-related recreotourism activities.

NEED

A symposium was therefore held in 1997, followed by the widespread rallying of citizens in the context of public consultations in 2000. These activities laid the groundwork for implementation of this Policy, for which the primary start-up mechanisms include government coordination, grassroots participation, and Québec's expectations as concerns the federal government. The Policy also gives concrete form and forceful expression to the government's commitment to provide Quebecers throughout the province with excellent quality water in sufficient quantity to meet all their basic needs.

PRINCIPLES

- · Water is part of Québec society's heritage.
- The protection, restoration, and development of water demand a commitment from society as a whole.
- The precaution principle must guide society's initiatives in respect of water.
- Every Quebecer must have access to high-quality, affordable drinking water.
- Users must be accountable for the use and deterioration of water, according to the user-pays and polluter-pays approach.
- Water must be managed in a sustainable and integrated manner, with a view to efficiency, fairness, and openness.
- The acquisition and dissemination of information on the state of water and on the pressures to which it is subject are an essential component of integrated water management.

ACTIONS

- adoption of the *Regulation respecting the quality of drinking water*;
- adoption of the *Regulation respecting groundwater catchment*;
- adoption of the Regulation amending the Regulation respecting wastewater disposal for isolated dwellings;
- adoption of the *Regulation respecting agricultural operations*;
- adoption of the *Act to amend the Water Resources Preservation Act*;
- the commitment to making water a part of our collective heritage;
- the government commitment to develop and implement a system of charges for the use of Québec's water resources;
- maintenance of municipal control over drinking water purification and distribution as well as wastewater treatment;
- the signing of two historic agreements with the Cree and Inuit nations;
- appointment of a Minister of State for the Environment and Water.

7.5 Ontario

Ontario has a rich legacy in watershed-based natural resource planning and management. A total of 36 Conservation Authorities comprise a network called Conservation Ontario. Conservation Authorities are local watershed-based management agencies that deliver services and programs protecting and managing water and other natural resources in partnership with all levels of government, landowners and other organizations.

Legislated under the *Conservation Authorities Act* (1946), these agencies provide science-based advice, services and programs including input and review to municipal Official Plans and planning processes to approximately 400 municipalities.

Conservation Authorities have been developing and implementing watershed plans and/or studies since their inception. Recent approaches were developed in the 1990's.

In 1992, three sets of watershed planning documents were released by the Province of Ontario. These included: *Water Management on a Watershed Basis: Implementing an Ecosystem Approach; Subwatershed Planning;* and *Integrating Water Management Objectives into Municipal Planning Documents.* These documents were prepared in response to increasing recognition through the 1980's for the concepts of Ecosystem Management and Sustainable Development. These three documents set the stage for a more modern approach to integrated watershed management.

In 1995, Ministry of Natural Resources and Ministry of the Environment carried out a survey that identified the extent of watershed and subwatershed planning being carried out in the province between 1990 and 1995. Twenty three of 36 Conservation Authorities responded. However, clear definitions were not provided and the lead agencies included municipalities and MNR led projects where Conservation Authorities did not exist. It was identified that Conservation Authorities were involved in 81 of the 87 identified projects.

In 1996, the Province conducted *A Preliminary Evaluation* of the Water Management Initiative in which three task groups were formed to assess subject areas related to: the state of the science and technology; coordination, resources and effectiveness; relevance and responsiveness. This work was subsequently reviewed by two public forums as well as by symposium attendees. The conclusions of this work included:

1. The majority of stakeholders supported the concept of watershed management.

2. Some stakeholders suggested areas requiring improvement in future applications of watershed management including: the need to properly scope studies and reduce costs; the need for strong study leadership and coordination; and, the need to ensure the process allows for meaningful involvement of all stakeholder interests.

3. The majority of stakeholders agree that where development is imminent, site specific or development-specific approaches are acceptable or necessary alternatives to comprehensive watershed management. Incorporation of ecological principles should be universally required.

4. There is broad support among stakeholders for continuing a voluntary process of watershed management supported financially by the Province, including the suggestion that the Guidance Documents be revised to draw upon the lessons learned over the last two years and should ultimately take the form of a Watershed Management Kit.

5. Data needs to be accessible, current and in a consistent format.

6. With the present focus of the provincial government on deficit reduction, fiscal restructuring and redefinition of its key business, its partners in watershed management expect the Province and individual ministries to define and communicate their expectations and intentions around future involvement.

7. It has been suggested that the Province establish a standing forum for the exchange of information and experience; support the continued advancement of the science of watershed management; and, provide policy scientific and technical support to watershed management initiatives.

8. Ministries, conservation authorities, municipalities and non-government organizations collectively need to look for opportunities to integrate and use existing service delivery programs to assist and to facilitate the implementation of watershed management recommendations.

In 2000, with financial assistance from MNR and MOE, Conservation Ontario repeated the survey. Full survey responses of new projects and status updates to the 1990-1995 projects were received from 11 of 36 Conservation Authorities. However, the remaining Conservation Authorities were contacted by telephone and were given the opportunity to report on the number of projects initiated. The results of the 1995 and 2000 surveys are presented below.

Conservation Authority	No. of Studies 1990-1995	No. of Studies 1996-2000
Ausable-Bayfield	1	0
Cataraqui Region	1	0
Central Lake Ontario	3	5
Credit Valley	6	13
Ganaraska	0	1
Grand River	29	7
Halton	10	4
Hamilton	1	2
Kettle Creek	4	2
Lake Simcoe Region	7	3
Lakehead Region	2	0
Long Point Region	0	2
Lower Thames	0	1
Lower Trent	1	1
Maitland Valley	1	3
Mattagami Region	1	1
Mississippi Valley	1	3
Niagara Peninsula	2	2
North Bay-Mattawa	2	1
Nottawasaga Valley	1	1
Otonabee Region	4	5
Quinte (formerly Moira, Napanee and Prince Edward)	0	5
Raisin Region	0	5
Rideau Valley	3	0
St. Clair Region	0	4
South Nation	1	0
Toronto Region	12	11
Upper Thames Region	6	4
MNR	2	1

In 2003, Conservation Ontario with financial support from the Province of Ontario conducted a study entitled *Watershed Management in Ontario: Lessons Learned and Best Practices.* The purpose of this report was to examine the lessons that have been learned in the last ten years and to identify the best practices being used in watershed management by evaluating case studies from three of the 36 Conservation Authorities in Ontario who had significant experience in watershed management.

The report concluded that Watershed Management:

- has four elements: planning, implementation, monitoring and reporting, and periodic review;
- · requires a science of planning that is fairly mature;
- · requires more rigorous and extensive implementation;
- requires that monitoring, reporting and periodic review become better developed as concepts and in practice;
- needs to thoroughly address social and economic issues in addition to issues related to the natural environment;
- is comprehensive in that it considers all facets of the environment, addresses social and economic;
- is built on the concept of shared responsibility for environmental protection and enhancement;
- shares implementation of plans across jurisdictional agencies;
- strives for continuous improvement in environmental performance through the use of Adaptive Environmental Management;
- is "place-based", using boundaries that are ecological; and
- uses a broad spectrum of tools including regulation, the land use planning process, best management practices, incentives, education and volunteer actions.

Watershed planning has four elements: planning, implementation, monitoring/reporting, and periodic review.

8.0 | Synthesis of Information Collected to Date

From a global view, there is clearly a shift from traditional policy perspectives and approaches. For example:

- · Sectoral to integrated management
- Top-down to stakeholder and demand responsive change
- · Supply fix to demand management
- Command and control to more cooperative or distributive forms of governance
- · Closed expert driven management organizations to more open, transparent and communicative bodies

If we look at an integrated vision for managing on a watershed basis, a set of tools are needed for Planning and Decision-making. Such tools can be categorized into (GWP 2003):

- · Management Instruments
- · Enabling Environment
- · Institutional Framework

Consideration of watershed problems can be due to multiple causes and, as a result, several tools for problem resolution are needed. The following provides a list of suggestions that can be used under each of the three categories listed above.

The Enabling Environment

- Policies setting goals for water use, protection and conservation.
- Legislative framework the rules to follow to achieve policies and goals.
- Financing and incentive structures allocating financial resources to meet needs

Institutional Roles

- Creating an organizational framework - forms and functions.
- Institutional capacity building developing human resources.

Management Instruments

- Water resources assessment understanding resources and needs.
- Plans for IWRM combining development options, resource use and human interaction.
- · Demand management using water more efficiently.
- Social change instruments encouraging a water-oriented civil society.
- · Conflict resolution managing disputes, ensuring sharing of water.
- Regulatory instruments allocation and water use limits.
- Economic instruments using value and prices for efficiency and equity.
- Information management and exchange- improving knowledge for better water management.

From a provincial perspective many of Canada's provinces have adopted policies and strategies that embrace sustainability, integrated management, transparent decision making and involvement of citizens. Ontario, in concert with local Conservation Authorities, has done work in furthering the science of integrated watershed management. Working alongside their municipal counterparts, Conservation Authorities have implemented local solutions in response to a variety of issues.





Report PHASE II

Defining Integrated Watershed Management in Ontario





10.0 | Introduction

This report follows Phase I Report - Status of Integrated Watershed Management in Ontario. This report summarizes the work researched for Phase II in which the following components of the workplan were assessed:

- Defining Integrated Watershed Management (IWM) in Ontario in Ontario;
- Identify the legislative requirements for IWM in Ontario;
- · Identify key issues facing Ontario; and
- · Identifying gaps in IWM in Ontario.

11.0 | Defining IWM in Ontario

11.1 Evolution of IWM

In the 1940's the provincial government believed that a new strategy termed "river valley development" was needed to better manage renewable natural resources (Ontario Department of Planning and Development). The goals of river valley development were to be realized through Conservation Authorities and six principles were developed in support of the concept and the agencies that were being created. Three of the explicit principles included watershed, local initiative and provincial-municipal partnership. Three implicit principles included a healthy environment being necessary for a healthy economy, a comprehensive approach and coordination and cooperation. The *Conservation Authority Act* was passed in 1946.

The 1960's saw a change in Ontario to a "new conservation" approach which placed greater concern on the natural environment and less emphasis on traditional engineering and forestry solutions. During the 1960's and 1970's water was beginning to be recognized as a resource that was in need of management. The issues around water were focused primarily on quantity and related mainly to flooding of property and erosion of streams. The 1980's saw the beginnings of attempts to manage stormwater runoff and improvements to design of new and existing infrastructure such as culverts. With the increase in land use change activities in the mid to late 1980's erosion and sediment control emanating from construction sites became an issue of concern with respect to impacts to streams including fish habitat. Later in the 1980's water quality became an additional concern as connections

between stormwater runoff and increased pollution in streams became evident. Through the 1990's aquatic habitat became a consideration and parameters associated with water temperatures, baseflow, riparian systems and natural infrastructure (e.g. wetland, woodlots, wildlife etc.) were added to the list of concerns. Watershed plans in the 1990's also brought to light the need for integration of scientific disciplines and additional considerations such as economic and social study components. In terms of overall study process the impact assessment (scenario testing), information management and clear implementation plans were added. In the early 2000's lessons learned from over ten years of integrated watershed planning experience precipitated the inclusion of and emphasis on social marketing, climate change, green infrastructure, and sustainable tools into watershed assessments. Further additions to the process included evaluation of existing studies and updating them. This history has led us to our current situation where considerations for a way forward on Integrated Watershed Management (IWM) have more to do with collaboration to deal with governance that look at shared responsibilities and sustainable outcomes. Watershed governance can be defined as an effort to build, manage and maintain inter-organizational networks; in other words, develop an "institutional ecosystem". The challenges facing us are to develop coordination and decision-making frameworks that are resilient and allow for adaptation. Figure 1 shows a schematic of the progression of IWM since the early 1980's to the present.

Figure 1



History of Watershed Planning in Ontario

11.2 IWM as a Decision-Making Process

The following was developed as a result of consultation with the Aquatic Resource Management Advisory Committee working group on Watershed Management and input received from a workshop that was held with agencies on IWM in November 2008 (see Appendix 1). The group agreed that the following would suffice as a working definition of IWM.

What is Integrated Watershed Management?

Integrated Watershed Management is the process of managing human activities and natural resources in an area defined by watershed boundaries. It is an evolving and continuous process through which decisions are made for the sustainable use, development, restoration and protection of ecosystem features functions and linkages. It addresses a multiplicity of issues and objectives and enables planning for multiple outcomes which are needed given the complexity and uncertainty associated with the natural environment. It requires the integration of scientific components and identification of agency and stakeholder responsibilities as part of the process, leading to social learning which is key to sound implementation. IWM must account for spatial and temporal scales from its initiation and results can therefore be applied at different scales, depending on the question and the need.

Why do we do it?

As part of the IWM process, impact assessments of a variety of watershed stressors (e.g. climate change, growth pressures etc.) and alternative management approaches are evaluated. This ultimately leads to better management decisions that help to set priorities, pooling of limited resources and increased efficiency amongst governments. There has also been a growing legislative basis for IWM by the Ontario government (e.g. Source Water Protection Planning, Lake Simcoe Act).

What do we use it for?

Integrated Watershed Management has evolved over the years in Ontario and has expanded to include assessments that broadly link human behaviour and environmental impact, by promoting healthy environments, safety and a good quality of life by protecting natural infrastructure, linking land and water and protecting water supply and promoting wastewater treatment

12.1 IWM as a Process

The Integrated Watershed Management process and plan components have progressed over the years. The underlying principle in IWM is Adaptive Environmental Management. There is a continuous and cyclical process of developing a Plan (addressing identified issues and concerns) that is implemented, monitored and reported upon, reviewed and evaluated to measure success and failures, and then updated. The Plan itself has a series of steps which encompass a set of scientific components. The Plan is designed to address the issues raised and has as its underlying principles the fundamental elements of using sound science, utilizing the state of the practice and a governance model that is inclusive of all stakeholders. The details of Figure 2 are discussed fully in the document Watershed Management in Ontario: Lessons Learned and Best Practices.

Figure 2

Integrated Watershed Management Process



Overall Status of IWM in Ontario

A survey was carried out as part of this work with 33 out of 36 Conservation Authorities over the period between October and November 2008. The purpose of the survey was to assess the status of IWM within the Conservation Authority realm of practice. A second survey was conducted in April 2009 with provincial and federal agencies (53 out of 69 people responded) to assess their understanding and involvement with IWM. The full Conservation Authority and Agency surveys can be found in Appendices 2 and 3, respectively. The following offers some insights into both surveys.

- The concept of IWM is practiced in Ontario by Conservation Authorities.
- Water and associated environmental resources governance is shared by many agencies across different geographic scales in Ontario. There is a lack of collaboration on IWM amongst stakeholders, therefore the role and contribution of IWM is not fully realized in Ontario.
- Ontario is a world leader in the area of integration of the sciences (surface water/groundwater/ fisheries/geomorphology etc.).
- There is a lack of comprehensive water policies in Ontario and in particular, existing policies/legislation on IWM are either general (e.g. Provincial Policy Statement) or site specific and prescriptive (e.g. *Lake Simcoe Act*). Interpretation of policies referring to IWM varies across Ontario.
- Implementation of IWM plans across Ontario is varied and there is a decline in the number of plans and associated implementation actions due to lack of funding.

12.2 Barriers to IWM

Conservation Authority Perspective

With respect to **Plan Development** (or study as it is sometimes referred to), the following four major barriers were identified:

- Staff Capacity Having sufficient numbers of staff with the capacity to develop and implement watershed plans (or interpret those plans completed by consultants) was a key issue. Staff resources are stretched thin as a result, slowing down the ability of the local Conservation Authority to produce Plans. The issue of succession was also identified as it was suggested that people tend to move on (in the case of smaller Conservation Authorities), and coupled with the fact that key staff with capacity will be retiring within a few years continue to be an issue.
- Ever emerging provincial legislation Examples included Oak Ridges Moraine Conservation Plan, Greenbelt Plan, and the Growth Plan. The issue being that some of these plans contained specific assessments or deliverables that would not have been part of the watershed/subwatershed plan which resulted in having to review and adjust prior to completing the watershed/subwatershed plan. In the case of the Growth Plan (which does not have a requirement for watershed/subwatershed studies) additional scenario testing would have had to be undertaken to assess the implications of the proposed growth within a subwatershed. While it was not the intent by the Conservation Authorities to suggest that they did not support the Provincial Plans (especially since most supported the need for watershed/ subwatershed plans) it was the timing of these initiatives that proved to "upset" the flow of the watershed/subwatershed work.
- Data Gaps Data continues to be an issue with developing the Plan. It should be noted that the issue of data availability had a geographic influence with those Conservation Authorities in the Greater Toronto Area (GTA) having more data than those outside of the GTA. The Conservation Authorities in Northern Ontario were particularly affected by the lack of existing data. Other key issues around data had to do with having it available in an accessible and useable format.
- Science While much of the science around the traditional components of hydrology/hydraulics, aquatics, terrestrial etc. is well in hand, much of the science around social and economic components is lacking. In spite of this, Ontario is a world leader

with respect to integrating the sciences in a meaningful manner.

With respect to **Plan Implementation** a number of Conservation Authorities expressed concerns in three main areas:

- Funding Many Conservation Authorities reported that the cost of undertaking the implementation actions, developed through watershed/subwatershed Plans, was significant and often time-consuming.
- Staff Capacity As in the case of developing the Plans, staff resources are stretched thin which limits the ability to carry out multiple projects.
- Lack of public and political support Some of the work needed can be long-term and results are not always immediate as the natural environment takes time to react to changes.

For those Conservation Authorities that had not done watershed/subwatershed plans or had not done them in some time, the reasons given include:

- number of plans are tapering off due to budget constraints;
- · lack of available funds and insufficient staffing;
- the issues have not got to the point that warrant these studies to be done;
- Source Protection has allowed data bases to be built and improve staff capacity but concern remains over focus on drinking water and longterm capacity; and
- move towards local community driven, Conservation Authority led action oriented plans which can be done quickly without costly monitoring and scientific assessments.

Agency Perspectives

A workshop hosted by the Watershed Management Working Group of the Aquatic Resources Management Advisory Committee was held with agency staff from federal, provincial, municipal and conservation authority sectors. Notes from this workshop can be found in Appendix 1. When asked what they thought the barriers to IWM were their responses included:

- No compelling reason to protect water resources and implement the watershed plan
- No effective mechanism for linking IWM to decisionmaking processes such as land use planning
- · Lack of adequate funding
- $\cdot \,$ Lack of a common vision for IWM
- · No well known champion
- No communication strategy or use visual reminders (e.g. signage), to reinforce the concept
- · No definition of available best practices for IWM

12.3 Opportunities Provided by IWM

From a Conservation Authority perspective, the opportunities that were brought to light were fundamental to their business.

The watershed/subwatershed plan provided the opportunity to build staff capacity. This was especially true where the Conservation Authority internalized the work carried out for the plan and consultants were not used to develop the plan. This approach allowed staff to gain knowledge of the ecosystem of their watershed as well as understand how assessments were done. An added advantage was that the stakeholders including the public were exposed to staff and staff in turn, was able to address their needs and questions as opposed to a consultant fulfilling this role.

The implementation that followed the plan development was also viewed as an opportunity by Conservation Authorities. Conservation Authority profile was improved by building partnerships through the plan development which allowed stakeholders to gain mutual trust and influence key areas such as budgets and land use change. Since the implementation plan was developed with the involvement of stakeholders, setting priorities for various actions and obtaining funding was facilitated.

12.4 Lessons Learned

The following points were raised by Conservation Authorities based on their collective experiences in the development and implementation of watershed/subwatershed plans:

- Purpose of the study should connect to the issues in the watershed;
- One size does not fit all. Need flexibility in approach to met expectations;
- · Importance of community champions;
- Mindset at Conservation Authority is to settle for what you can get, there is a need to be more proactive and plan ahead;
- Communication is key. Need to use an open process, consider all perspectives, and therefore, garner more 'buy-in';
- · The work must be resourced to meet expectations;
- Need a coordinator with a lot of time to spend on relationship building;
- · Need long-term stable funding in place;
- Need staff capacity value of having more staff with expertise to get the work done;
- Implementers must be involved and own their piece of the plan;
- These plans are not static and need to be updated over time based on good environmental monitoring and monitoring of the implementation;
- Studies have been well received but conflict exists where recommendations do not fit with individual desires.

12.5 Overall Trends

Conservation Authority perspective

On the question of whether or not watershed/subwatershed studies were being or have been carried out, about two-thirds of the Conservation Authorities responded that they had. For the remaining one-third, most responded that they had not done so because of a lack of funding and a few responded that they did not see the need for these plans to date. However all Conservation Authorities interviewed felt that plans are needed given the growing number of issues in Ontario such as climate change and growth pressures.

Figure 3

Are you carrying out watershed/subwatershed studies or have you done so in the past?



When asked about the types of watershed/subwatershed plans that were being developed, the majority of plans were centered on environmental resource management and land use change. The types of themes considered for the "Other" category were on watershed-based fisheries management plans. Definitions on the types of plans are provided following Figure 4.

Figure 4



If yes, which type of watershed/subwatershed studies are you undertaking now or have you undertaken in the past ? (see definitions on the following page) **Types of Watershed Plans** (*Final Report of the Watershed Planning Initiative Science and Technology Task Group, 1995*) include:

- Environmental Resource Management

 Watershed Plans that emphasize environmental protection and management.
- Land Use Change Environmental/Land Use Strategies are carried out to determine where land use changes will occur in urbanizing watersheds. These studies focus on minimizing the impact that land use change has on the environment. Land Use Impact Assessment analyses are used to determine how land use changes will occur in areas that have already been designated for change but not yet developed.
- Land Management Change Watershed planning can also be carried out in areas where there is no expected major change in land use, but where land use management changes are expected.
- **Redevelopment and Restoration** Watershed planning is also beneficial in areas which are already largely developed. In such areas, the emphasis will be on improving ecosystem health including habitat restoration.

When asked about the duration of the plan development the range given was from anywhere between one to five years with three years being the most popular response.





What is the typical length of time it takes to develop your studies?

When asked about the participation of various stakeholders, Conservation Authorities responded with the answers shown in Figure 6. High ratings were given to support from within the Conservation Authority (i.e. participation of other Conservation Authority departments), municipal partners and non-government organizations (angling clubs, local organizations). Lower ratings were given to provincial agencies although there seemed to be a geographic influence in that provincial involvement outside of the GTA seemed to be stronger. Involvement of academia and aboriginal peoples were weak with some Conservation Authorities expressing a need to improve these relationships.

Figure 6

How would you categorize the participation of:

Note: In this case, stakeholders refer to non-government groups (e.g. angling groups, industry such as water users, etc.)



When Conservation Authorities were asked whether or not their watershed/subwatershed studies considered Great Lakes Objectives, 30% responded that they had and these seemed to be linked to the presence of an Area of Concern in the watershed.

Figure 7

Do your watershed studies consider Great Lakes management objectives?


Agency Perspective

On the question on whether IWM was considered important to Great Lakes Management the majority of agency respondents felt that it was.

Figure 8



When asked whether they had participated in watershed/subwatershed studies, just under half of the respondents indicated that they had.

Figure 9



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When asked how they participated, the majority of the respondents indicated they had attended steering committee meetings, followed by providing data and information or commented on the watershed/subwatershed studies. Under the "Other" category respondents gave other examples of how they participated, for example, some people indicated that their experience with watershed/subwatershed plans came from previous jobs with Conservation Authorities.

Figure 10



When asked about the types of watershed/subwatershed studies they participated in, respondents suggested that Environmental Resource Management type studies were prevalent. Re-development and Restoration types were the next category; however, upon reading the type of workbeing done, information provided does not conform to the parameters of a watershed/subwatershed study. This brings up an issue of whether or not there is consistent understanding of what a watershed/subwatershed study process is.





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- Land Management Change Watershed planning can also be carried out in areas where there is no expected major change in land use, but where land use management changes are expected.
- **Redevelopment and Restoration** Watershed planning is also beneficial in areas which are already largely developed. In such areas, the emphasis will be on improving ecosystem health including habitat restoration.

Respondents were asked to rate the participation of their agency in the IWM process. The majority of the responses rate their agency participation as fair to poor. It should be noted here that the Conservation Authorities rated the provincial agencies' involvement as fair to poor. In figure 12, the "n/a" category mostly referred to the fact that the respondent could not identify their participation due to limited exposure.





When asked about the obstacles or barriers to participating in watershed/subwatershed studies, agency respondents felt that time to participate and staff capacity were the most significant barriers next to not having sufficient data. Most of the examples listed under "Other" were related to these three barriers.

Figure 13 When participating in watershed/subwatershed studies, what obstacles or barriers did you face and what were they related to:



Figure 14 shows responses to the question of how often the respondent's agency used the watershed/subwatershed study. The typical response was once in a while. Agency respondents were asked if they did not participate in IWM, why not. One key reason was that respondents felt that it was not within their agency's top priorities. The other reason was lack of time to participate. The "Other" category contained responses that could be related to either of the first two reasons.

Figure 14



Figure 15





13.0 | Existing Legislative/Policy Requirements Supporting IWM

The following provides a summary or excerpts from various policies and Acts that have pertinent information on Integrated Watershed Management. There is no explicit Legislation or Policies on IWM either at the federal, Great Lakes or provincial levels except for some provincial feature oriented geographic areas.

13.1 Federal

In reviewing the *Canada Water Act*, while not referring to IWM specifically, it is conceivable that support for IWM is consistent with the intent.

Provisions of the Canada Water Act

The following is a summary of the major provisions of the Act.

Part 1, Section 4, provides for the establishment of federal-provincial consultative arrangements for water resource matters. **Sections 5, 6, and 8** provide the vehicle for cooperative agreements with the provinces to develop and implement plans for the management of water resources. **Section 7** enables the Minister, directly, or in cooperation with any provincial government, institution, or person, to conduct research, collect data, and establish inventories associated with water resources.

Part II provides for federal—provincial management agreements where water quality has become a matter of urgent national concern. It permits the joint establishment and use of federal or provincial incorporated agencies to plan and implement approved water quality management programs. The application of alternative cooperative approaches and programs has resulted in Part II never having been used.

Part III, which provided for regulating the concentration of nutrients in cleaning agents and water conditioners, was incorporated into the Canadian Environmental Protection Act (CEPA) in 1988 and later into sections 116-119 (Part VII, Division I) of the new Canadian Environmental Protection Act, 1999, which came into force March 31, 2000.

Part IV contains provisions for the general administration of the Act. In addition, Part IV provides for inspection and enforcement, allows the Minister to establish advisory committees, and permits the Minister, either directly or in cooperation with any government, institution, or person, to undertake public information programs.

13.2 Great Lakes

Great Lakes Water Quality Agreement (GLWQA)

The Agreement, first signed in 1972 and renewed in 1978, expresses the commitment of Canada and the United States to restore and maintain the chemical, physical and biological integrity of the Great Lakes Basin Ecosystem and includes a number of objectives and guidelines to achieve these goals. It reaffirms the rights and obligation of Canada and the United States under the Boundary Waters Treaty and has become a major focus of the International Joint Commission activity.

In 1987, a Protocol was signed amending the 1978 Agreement. The amendments aim to strengthen the programs, practices and technology described in the 1978 Agreement and to increase accountability for their implementation. Timetables are set for implementation of specific programs.

The Parties will meet biennially to discuss progress and report periodically to the Commission. New annexes address atmospheric deposition of toxic pollutants, contaminated sediments, groundwater, and nonpoint sources of pollution. Annexes are also added to incorporate the development and implementation of remedial action plans for Areas of Concern and lakewide management plans to control critical pollutants.

The Commission monitors and assesses progress under the Agreement and advises Governments on matters related to the quality of the boundary waters of the Great Lakes system. The Agreement also calls upon the Commission to assist the Governments with joint programs under the Agreement, and provides for two binational boards -- the Great Lakes Water Quality Board and the Great Lakes Science Advisory Board -- to advise the Commission.

Annex 13 "Pollution from Non-Point Sources" of the GLWQA outlines the following purpose and implementation that is directly relevant to defining integrated watershed management:

Purpose

This Annex further delineates programs and measures for the abatement and reduction on non-point sources of pollution from landuse activities. These include efforts to further reduce non-point source inputs of phosphorus, sediments, toxic substances and microbiological contaminants contained in drainage from urban and rural land, including waste disposal sites, in the Great Lakes System.

Implementation

The Parties, in conjunction with State and Provincial Governments, shall:

(a) identify land-based activities contribution to water quality problems described in Remedial Action Plans for Areas of Concern, or in Lakewide Management Plans including, but not limited to, phosphorus and Critical Pollutants; and

(b) develop and implement watershed management plans, consistent with the objectives and schedules for individual Remedial Action Plans or Lakewide Management Plans, on priority hydrologic units to reduce non-point source inputs. Such watershed plans shall include a description of priority areas, intergovernmental agreements, implementation schedules, and programs and other measures to fulfill the purpose of this Annex and the General and Specific Objectives of this Agreement. Such measures shall include provisions for regulation of non-point sources of pollution.

In the August 2006 IJC published "A Special Report to the Governments of Canada and the United States – Advice to Governments on their Review of the Great Lakes Water Quality Agreement". In this report, the IJC noted in its comments under purpose and scope of the Agreement:

During its evolution over the past three decades, the Agreement has taken steps toward recognizing the importance of watershed management in protection and restoring Great Lakes water quality. In many respects, however, this development has been too tentative and the current Agreement has not kept pace with emerging efforts across the basin. This, in turn, has made the Agreement somewhat less relevant to the many activities undertaken by governments, stakeholder groups and local communities. The report goes on to acknowledge that:

Watershed planning occurs at local levels. Annex 13 to the Agreement requires that the Parties develop and implement watershed plans in conjunction with state and provincial governments. Instruments should be devised to enable the Agreement to better facilitate watershed planning.

One of the four recommendations made by the IJC under Purpose and Scope of the Agreement states that:

Recommendation 4

The Commission recommends that the Agreement specify that watersheds be the geographic units to coordinate, integrate and implement programs called for by the Agreement and set out in the Binational Action Plan.

The recent announcement (June 2009) of the Governments of Canada and the United States that they will be updating the GLWQA provides an opportunity to strengthen the watershed management language, as recommended by the IJC, in the Agreement.

13.3 Provincial

Provincial Policy Statement

The Provincial Policy Statement provides for appropriate development while protecting resources of provincial interest, public health and safety, and the quality of the natural environment. The Provincial Policy Statement supports improved land use planning and management, which contributes to a more effective and efficient land use planning system.

The policies of the Provincial Policy Statement may be complemented by provincial plans or by locally-generated policies regarding matters of municipal interest. Provincial plans and municipal official plans provide a framework for comprehensive, integrated and long-term planning that supports and integrates the principles of strong communities, a clean and healthy environment and economic growth, for the long term.

The Provincial Policy Statement is issued under the authority of Section 3 of the *Planning Act* and came into effect on March 1, 2005. It applies to all applications, matters or proceedings commenced on or after March 1, 2005.

In respect of the exercise of any authority that affects a planning matter, Section 3 of the *Planning Act* requires that decisions affecting planning matters "shall be consistent with" policy statements issued under the Act.

Section 1.2.1 states:

A coordinated, integrated and comprehensive approach should be used when dealing with planning matters within municipalities, or which cross lower, single and/or upper-tier municipal boundaries, including:

- a. managing and/or promoting growth and development;
- b. managing natural heritage, water, agricultural, mineral, and cultural heritage and archaeological resources;
- c. infrastructure, public service facilities and waste management systems;
- d. ecosystem, shoreline and watershed related issues;
- e. natural and human-made hazards; and
- f. population, housing and employment projections, based on regional market areas.



Section 2.2 Water, subsection 2.2.1 states that:

Planning authorities shall protect, improve or restore the quality and quantity of water by:

- a. using the watershed as the ecologically meaningful scale for planning;
- b. minimizing potential negative impacts, including cross-jurisdictional and cross-watershed impacts;
- c. identifying surface water features, ground water features, hydrologic functions and natural heritage features and areas which are necessary for the ecological and hydrological integrity of the watershed;
- d. implementing necessary restrictions on development and site alteration to:
 - 1. protect all municipal drinking water supplies and designated vulnerable areas; and

2. protect, improve or restore vulnerable surface and ground water, sensitive surface water features and sensitive ground water features, and their hydrologic functions;

e. maintaining linkages and related functions among surface water features, ground water features, hydrologic functions and natural heritage features and areas;

f. promoting efficient and sustainable use of water resources, including practices for water conservation and sustaining water quality; and

g. ensuring stormwater management practices minimize stormwater volumes and contaminant loads, and maintain or increase the extent of vegetative and pervious surfaces.

Oak Ridges Moraine Conservation Plan

The purpose of the Oak Ridges Moraine Conservation Plan (ORMCP) is to provide land use and resource management planning direction to provincial ministers, ministries, and agencies, municipalities, municipal planning authorities, landowners and other stakeholders on how to protect the Moraine's ecological and hydrological features and functions.

Section 24 speaks to Watershed Plans and states that:

(1) Every upper-tier municipality and single-tier municipality shall, on or before April 22, 2003, begin preparing a watershed plan, in accordance with subsection (3), for every watershed whose streams originate within the municipality's area of jurisdiction.

(2) The objectives and requirements of each watershed plan shall be incorporated into the municipality's official plan.

(3) A watershed plan shall include, as a minimum,

(a) a water budget and conservation plan as set out in section 25;

(b) land and water use and management strategies;

(c) a framework for implementation, which may include more detailed implementation plans for smaller geographic areas, such as subwatershed plans, or for specific subject matter, such as environmental management plans;

(d) an environmental monitoring plan;

(e) provisions requiring the use of environmental management practices and programs, such as programs to prevent pollution, reduce the use of pesticides and manage the use of road salt; and

(f) criteria for evaluating the protection of water quality and quantity, hydrological features and hydrological functions.

(4) Major development is prohibited unless,

(a) the watershed plan for the relevant watershed, prepared in accordance with subsection (3), has been completed;

(b) the major development conforms with the watershed plan; and

(c) a water budget and conservation plan, prepared in accordance with section 25 and demonstrating that the water supply required for the major development is sustainable, has been completed. (5) Subsection (4) applies to every application commenced on or after April 23, 2007.

(6) Subsection (8) applies to every application commenced before the date mentioned in subsection (5), except an application described in subsection (7).

(7) Clause (4) (c) applies to every application that is commenced on or after April 22, 2004 and relates to the part of The Regional Municipality of York that is served by the Yonge Street Aquifer.

(8) An application for major development to which this subsection applies shall not be approved unless,

(a) the relevant municipality has complied with clause (4) (c); or

(b) the applicant,

(i) identifies any hydrologically sensitive features and related hydrological functions on the site and how they will be protected,

(ii) demonstrates that an adequate water supply is available for the development without compromising the ecological integrity of the Plan Area, and

(iii) provides, with respect to the site and such other land as the approval authority considers necessary, a water budget and water conservation plan that,

(A) characterizes groundwater and surface water flow systems by means of modelling,

(B) identifies the availability, quantity and quality of water sources, and

(C) identifies water conservation measures.

The Greenbelt Plan

The Greenbelt Plan identifies where urbanization should not occur in order to provide permanent protection to the agricultural land base and the ecological features and functions occurring on this landscape.

The Greenbelt Plan includes lands within, and builds upon the ecological protections provided by, the Niagara Escarpment Plan (NEP) and the Oak Ridges Moraine Conservation Plan (ORMCP). It also complements and supports other provincial level initiatives such as the Parkway Belt West Plan and the Rouge North Management Plan

Section 3.2 entitled Natural System and subsection 3.2.1 states:

The Protected Countryside contains a Natural System that provides a continuous and permanent land base necessary to support human and ecological health in the Greenbelt and beyond. The Natural System policies protect areas of natural heritage, hydrologic and/or landform features, which are often functionally inter-related and which collectively support biodiversity and overall ecological integrity.

The Natural System within the Protected Countryside functions at three scales:

1. The system builds upon and is connected to other Golden Horseshoe scale natural systems as identified within the NEP and the ORMCP ;

2. The system is connected to and/or supports broader natural systems in southern Ontario such as the Great Lakes Coast, Carolinian Zone and the Kawartha Highlands; and

3. The system is supported by a multitude of natural and hydrologic features and functions found within the Golden Horseshoe but outside of the NEP and the ORMCP. In particular, the numerous watersheds, subwatersheds and groundwater resources, including the network of tributaries that support the major river systems identified in this Plan, are critical to the long-term health and sustainability of water resources and biodiversity and overall ecological integrity. The analysis and management of the Greenbelt's water resources must therefore be integrated with the management of water resources outside the Greenbelt. Municipal official plans and related resource management efforts by conservation authorities and others shall continue to assess and plan for these natural and hydrologic features in a comprehensive and integrated manner, which builds upon and supports the natural systems identified within the Greenbelt.

The Natural System is made up of a Natural Heritage System and a Water Resource System that often coincides given ecological linkages between terrestrial and water based functions.

Subsection 3.2.3 entitled Water Resource System Policies states that:

The following Water Resource System policies apply throughout the Protected Countryside:

1. All planning authorities shall provide for a comprehensive, integrated and long-term approach for the protection, improvement or restoration of the quality and quantity of water. Such an approach will consider all hydrologic features and functions and include a systems approach to the inter-relationships between and/or among recharge/discharge areas, aquifers, headwaters and surface waters (e.g. lakes as well as rivers and streams, including intermittent streams).

2. Watersheds are the most meaningful scale for hydrological planning, and municipalities together with conservation authorities should ensure that watershed plans are completed and used to guide planning and development decisions within the Protected Countryside.

3. Cross-jurisdictional and cross-watershed impacts need to be considered in the development of watershed plans. The development of watershed plans and watershed management approaches in the Protected Countryside should be integrated with watershed planning and management in the NEP and the ORMCP areas and beyond the Greenbelt.

4. Municipalities shall, in accordance with provincial direction related to the protection of source water, protect vulnerable surface and ground water areas, such as wellhead protection areas, from development that may adversely affect the quality and quantity of ground and surface waters.

13.4 Municipal

Within the Provincial Policy Statement, there are standard steps that a municipality or planning board should follow for responsible decision-making on planning applications. Other key principles for responsible decision-making are described below, by type of planning application.

Official Plans

- Municipalities/planning boards should determine the need for a revision to their official plan on an ongoing basis and at least every five years as stated in the *Planning Act*.
- $\cdot\,$ The official plan approval process has specific time lines that should be followed.
- Early consultation with the approval authority (at the beginning of the process) assists in the efficient approval of official plans.

Official Plan Amendments

• Regardless of whether or not an official plan amendment is exempt from approval, the municipality or planning board must consult with the approval authority prior to making a decision on the amendment. This will ensure that any provincial, as well as municipal, interests are identified and addressed in the amendment.

Plans of Subdivision/Condominium

- It is important that clear, understandable and feasible conditions of draft approval for plans of subdivision or condominium are established by the approval authority.
- In providing final approval of plans of subdivision or condominium, the approval authority must be satisfied that established conditions have been met.
- Where the municipality or planning board is the approval authority and it has identified a provincial interest (e.g. presence of a provincially significant wetland), it may consult with the relevant provincial ministry regarding technical matters (e.g. Ministry of Natural Resources).

Application for Consent or Severance

• With the exception of Northern Ontario where the province is the approval authority, provincial ministries do not perform site-specific reviews of consent applications.

Zoning By-laws

• Whether the municipality is considering a comprehensive zoning by-law for the entire municipality or a site-specific rezoning application, it must have regard to the Provincial Policy Statement and the official plan.

While these steps do not explicitly require that watershed plans be carried out, they must adhere to the provincial policy requirements. Figure 23 on page 96 of this report shows the relationship between the Watershed Management process and the Municipal Planning process.



13.5 Other

It should be noted that there are other approvals required by various Acts with respect to water. Section 4.8 of the Provincial Policy Statement states:

In addition to land use approvals under the Planning Act, infrastructure may also require approval under other legislation and regulations, including the Environmental Assessment Act; the Canadian Environmental Assessment Act, 1992; the Environmental Protection Act; the Ontario Energy Board Act, 1998; the Ontario Water Resources Act; the Conservation Authorities Act; the Ontario Heritage Act; and the Safe Drinking Water Act, 2002.

14.0 | Key Environmental & Related Issues/Challenges Facing Ontario

Changes in Ontario's Population Distribution

Canada's most populated province continues to grow with substantial increases in the youth and immigrant populations. Almost one in four Ontarians are born outside of Canada. Home to almost 40% (12,160,282 people) of all Canadians, particularly strong growth occurred in the youth (13-24), newcomer and Aboriginal populations. As of 2006, more than one-quarter (28.3%) of all Ontario residents reported they were born outside of Canada. If current immigration trends continue, between 2001 and 2010 may account for an even higher proportion of immigrants than previous decades. Almost two-thirds (64.6%) of all newcomers came from Asia and the Middle East, Europeans being the next largest group of immigrants (14.6%). Not surprisingly, more than one in four Ontario residents declared a language other than English and French as a mother tongue. Italian and Chinese were the most frequently reported mother tongues other than English and French, accounting for close to 500,000 Ontarians.

Attitudes towards Water

A recent survey conducted by RBC and Unilever Canada (2008) found that there is still a long way to go to raise the profile of water as a top environmental issue in the minds of Canadians. When prompted, Canadians are concerned about the quality and quantity of Canada's freshwater supply, yet when judged against other environmental concerns, water quality/pollution comes in third behind climate change and air pollution. Generally speaking, Canadians are more likely to be concerned with the quality of water than the supply of water. Other key findings include:

- Health care remains the top concern for Canadians followed by stability of the financial markets.
 The longterm supply/quality of Canada' fresh water was third on the list with 86% of Ontarians being very concerned to somewhat concerned.
- Water is the number three environmental issue behind climate change and air pollution.
- Global warming/climate change and air pollution concern come ahead of concern for water, but concern remains high when compared to other resources such as depleting supply of non- renewable resources, effects of humans on animals and their habitat etc.
- Canadians disproportionately believe that water is Canada's most important natural resource (over forestry, agriculture/farmland, oil, fisheries etc.).
- When stacked against other resources in Canada, more are concerned about the declining state of water than any other resource listed (e.g. forests, farmland, fish etc.).
- Confidence that Canada has enough freshwater supply for the long-term has declined (18% of Ontarians are very confident while 56% are somewhat confident about long-term supply of freshwater).



What the Water Experts Say

As part of the IWM initiative, two workshops were held in January and March of 2009 at which known water experts in Ontario were invited to obtain their insights into water management (see Appendices 2 & 3 for Workshops notes). They came from all sectors including: consulting, agencies (provincial and federal), academia, municipal and conservation authorities. Collectively they represented over 600 years of experience in water management in Ontario. Their views of the obstacles facing Ontario now and in the future for water include:

- The move to a more rigid regulatory process that stymies innovative designs and approaches
- The need to consider ecosystem needs in decision-making (e.g., in-stream flow)
- The need to protect funding for science and monitoring
- The need to identify the risks of taking no action (or insufficient action) to protect the environment
- The lack of consideration of economics in planning and decision-making
- Places to Grow which allocates growth without considering implications on the environment and infrastructure
- The need for a framework for community-based local solutions
- The need to better engage municipalities in protecting the environment
- The need to better understand how municipal infrastructure integrates with natural infrastructure

- · Climate change
- The need to evolve from deterministic target-driven regulations to risk-based approaches
- · The lack of a vision for water sharing
- · The myth of water abundance
- Decision-making (on PTTWs, for example) that doesn't reflect the best knowledge available (e.g., from watershed studies)
- Education of legislators and users as to how regulations and policies interrelate
- The need for plain language in regulations
- Lack of common understanding of how groundwater divides should be treated when they don't match up with surface watersheds
- Lack of integration of information on watersheds (e.g., information obtained through the Source Water Protection process)
- · Good science can get diluted

15.0 | How is IWM Used?

Globally

A recent survey completed by the Commission on Sustainable Development found that 16 of 27 developed countries and 19 of 77 developing countries had fully or partially developed Integrated Water Resources Management (terminology used for IWM globally) plans. The concept of basin management (another term used for IWM) is not new; basin level water management has existed in Germany since 1899 and in Spain for over 75 years.

Current major issues being addressed by IWM globally include:

- population growth;
- · demographic changes;
- · economic development; and
- · climate change.

It is the position of the United Nations that policy setting and processes with basin management helps lower risks and leads to more sustainability, promoting economic growth and more equitable development while protecting the environment.

Province of Ontario

Through the consultative work (Conservation Authority survey, Agency survey, IWM Symposium survey, workshop held with the agencies, two expert workshops, numerous presentations to Conservation Ontario Council, MNR senior staff, Working Group on Watershed Management of the Aquatic Resource Management Advisory Committee, and the IWM Symposium) carried out through the IWM Initiative, the following represents the key areas where IWM can and is, in some instances, being used.

- · Land use Changes including Servicing Infrastructure
- · Climate Change
- · Great Lakes
- · Source Protection
- · Watershed-based Fisheries Management Plans
- · Agriculture-based activities and practices
- · Species at Risk Management Plans
- · Biodiversity Management Plans

More information will be provided on this in Phase III of this initiative.



16.0 | Gaps in Current Approach to IWM in Ontario

16.1 Scientific Gaps

The scientific components that have been identified for IWM that has provided consistency to the content of Plans was first put forward in 1995 by the Science and Technology Task Group as part of the Evaluation of the Watershed Planning Initiative. The group identified the following scientific components: hydrology, hydrogeology, water quality, aquatics, terrestrial, stream morphology, mapping and data management, economic, social, and integration between study components. What follows is a description of key improvements that were suggested in 1995 and whether progress has been made or new issues have been identified.

Hydrology – A key need for improvement that was identified regarding the integration of surface water and groundwater interactions. Significant strides have been made in the development of water budget assessments, monitoring methodology and conjunctive modeling. However, this work will need to carry on before we can fully understand the interaction between surface and groundwater.

Hydrogeology (Groundwater) – Today all watershed/subwatershed studies consider the role of groundwater across all disciplines. Significant strides have been made to collect data and build data bases around a groundwater sampling program (Provincial Groundwater Monitoring Network). This work is currently being reviewed and the need for updates will be forthcoming. The quantification and sensitivity of groundwater recharge is still a process that is being worked through.

Water Quality – More progress is needed in terms of how key parameters are identified, protocols for sampling, data management and dissemination. Some plans have been developed to respond to water quality issues but in general more progress is needed in the identified issues.

Aquatics – The issue of scale of assessment for understanding fish habitat has seen improvements, especially with the generation of watershed-based fisheries management plans. This discipline is perhaps one that is most affected by the other disciplines considered in the watershed/subwatershed plan. Aquatics and particularly fish and fish habitat are seen as the result of the physical and biological processes within a watershed/subwatershed. However, improvements are still needed in the science to address biodiversity. This part is our inability to use a set of reliable predictive models. **Terrestrial** – Significant improvements have been made with respect to the incorporation of GIS into terrestrial analyses. Some work has been successful in identifying linkages between watershed/subwatershed linkages to regional habitat systems. Some work has been done with respect to developing a working understanding of the interactions between different types of land use and different types of corridors and habitat blocks. There is still the need to improve the prediction of population potential based on habitat structure and quality.

Stream Morphology – The most significant improvement has been made in the state of the practice. However, data and analyses supporting the development of regional assessments that would improve the capacity of designers to predict channel response to changes in driving mechanisms and ultimate channel form is still a gap.

Mapping and Data Management - Significant improvements have been made in the ability of digital data to be overlaid, by scientific discipline, to develop a picture of overall integration. However, the availability of base mapping in digital form continues to hamper the use of this component across Ontario.

Economic - The issues identified in the 1995 assessment unfortunately continue to be a gap. Some work is underway sporadically in Ontario, There continues to be an absence of economic templates, frameworks and models that could reflect the benefits and sacrifices contained policies and programs. There is a wealth of knowledge around the world on economic models and measures that have been applied in other jurisdictions that can be utilized to work our way through this issue.

Social - Vey little progress has been made in Ontario in terms of improving the application to watershed/subwatershed planning. Improved application of social science to understand public values, needs and desires and knowledge will spin off into increasingly effective participation from all stakeholders.

Integration between Study Components - While improvements have been made in terms of involving related disciplines in field activities and exchange of information between disciplines, this component remains a difficult exercise. There are only a handful of experts in Ontario who are capable of carry out this component. Figure 16 shows the results from the Conservation Authority survey regarding the components that are included in a watershed/subwatershed study. The economic and social components are not likely to be used in most studies. The integration component is utilized in some studies but not in most.

Figure 16



What component studies do you typically include in your watershed work?

16.2 Process Gaps

The process followed in typical watershed/subwatershed studies has evolved over the years and has been heavily influenced by the Adaptive Environmental Management process.

Figure 17 shows the various components of the study process and Conservation Authority respondents were asked to indicate they typically use when carrying out watershed/subwatershed studies. Clearly, scoping out the issues, workplanning, characterizing the watershed/subwatershed and developing a plan are typical components. However, there are also clear gaps in the process having to do with developing targets, monitoring and evaluating implementation and updating plans.

Figure 17

Which study process do you typically include in watershed/subwatershed studies?



16.3 Program Gaps

The research carried out in Phase I identified the broad shifts that were occurring globally in water management as follows:

- from process to outcomes;
- · from water management to watershed management;
- · from regulating to shared responsibility; and,
- from government to governance.

The IWM concept should be evaluated using a set of tools with a view to updating and formally recognizing its role in Ontario that include:

- Management Instruments;
- Enabling Environment; and
- Institutional Framework.

As well, we need to take a look at governance. In this context governance can be defined "an effort to build, manage and maintain inter-organizational networks; in other words, develop an institutional ecosystem". The challenges facing us are to develop coordination and decision-making frameworks that are resilient and allow for adaptation.

The approach to achieving the next level of IWM in Ontario will be more fully discussed in the Phase III report.







Report PHASE III

Updating Integrated Watershed Management in Ontario



18.0 | Introduction

This report is the final Phase of a three-phased process set out for the 2008-2009 Integrated Watershed Management (IWM) Initiative under a collaborative partnership between Conservation Ontario, Ministry of Natural Resources, and Department of Fisheries and Oceans. Specifically, Phase III is intended to:

- · Identify strategic shifts needed to address gaps;
- · Make recommendations for next steps; and
- · Produce a Summary Report.

In order to meet the requirements of the workplan for Phase III the following sequence of chapters is intended to provide a summary of IWM, by providing a description of the IWM process in Section 19. Section 20 describes how IWM is used in Ontario by identifying connections between IWM and various initiatives. Section 21 focuses on which strategic shifts are needed in the areas of scientific assessments, process and governance to move IWM to the forefront in keeping with global trends. Section 22 discusses what opportunities can be afforded through IWM to Ontario and finally Section 23 discusses considerations for next steps. The contents of Phase III comes from and builds on the work completed in Phases I (established the historical status of IWM in Ontario, and current status of IWM in Canada and globally) and Phase II (assessed and defined the current status of IWM in Ontario).





19.0 | IWM as a Tool for Ensuring Watershed Health

What follows is a short discussion about the Integrated Watershed Management process and how it can be used to define watershed health. IWM is being done in Ontario and serves to assess watershed functions and the potential impacts from change and sets out an implementation plan that serves to address long term sustainability. The watershed unit provides context, so that we can understand how cumulative impacts are manifested. However it is clear that additional functionally connected areas (such as those related to groundwater catchments and terrestrial features and functions) should be included in a watershed/subwatershed analysis. Within the realm of IWM certain underlying principles and concepts are fundamental to getting a clear picture of what IWM is all about. Principles that include Adaptive Environmental Management, Precautionary Principle, Sustainability and concepts that include Integration, Risk, Uncertainty and Cumulative Effects define the underpinnings of IWM. The reader is encouraged to refer to Appendix 4 before reading on, where these terms are defined in the context of their use in IWM.

19.1 Integrated Watershed Management Process

The evolution of the process is documented over the years within different publications that were produced by the Ontario Provincial government in concert with other groups such as Conservation Ontario. A brief chronology follows:

- Water Management on a Watershed Basis: Implementing an Ecosystem Approach; Subwatershed Planning; and, Integrating Water Management **Objectives into Municipal Planning Documents** (1992) – Provided early information on preparing, implementing watershed and subwatershed plans.
- An Evaluation of Watershed Management in Ontario (1994) - The focus of this document was to evaluate watershed management (watershed and subwatershed plans) over the previous two years following the release of the 1992 documents. Key to this work was the establishing of the scientific components of watershed and subwatershed plans and a refinement of the watershed/subwatershed process.
- Watershed Management in Ontario: Lessons Learned and Best Practices (2003) - This report describes advance made in watershed management since the early 1990's and illustrates key finding with the use of case studies. Most importantly was the distinction made between watershed management (now referred to in this document as IWM) and watershed planning. This distinction is summarized below.

A technical working definition of Integrated Watershed Management was developed through this initiative and is found in Section 11 (Phase II - Defining IWM in Ontario). As described in the work done in the report entitled Watershed Management in Ontario: Lessons Learned and Best

Practices, four stages were defined for the IWM process and are depicted in Figure 18.

Each of the four stages is intended to be a big picture approach to ensuring watershed health and is defined as follows:

- Planning: Developing watershed/subwatershed or other watershed-based environmental plans.
- Implementation: Implementing the programs, policies or projects that arise from watershed/subwatershed or other watershed-based environmental plans.
- Monitoring and Reporting: Assessing plan goals, objectives and targets are being met and periodically communicating the results to decision makers and the public.
- Reviewing, Evaluating and Updating: Periodically reviewing plans to see if changes are needed and then altering targets, plans or actions as required.

Trigger: The development of watershed/subwatershed plans is usually spurred by one or more triggers. These can include changes to the watershed/subwatershed that can have significant impacts to watershed health e.g. large scale urban development, gravel extractions or large water takings. Triggers can also include updates to Official Plans or broad environmental concerns regarding loss of a species or degraded water quality on rivers.

The process is not only a technical process but also includes extensive inclusion of all stakeholders throughout the process.



Developing Watershed/Subwatershed Plans

Figure 19 shows the standardized watershed planning steps that were developed for Ontario in the document entitled Watershed Management in Ontario: Lessons Learned and Best Practices and is intended to be a watershed specific analysis as part of the bigger IWM approach.

Figure 19



Integrated Watershed Management Process

Figure 20 shows the elements of the watershed/subwatershed elements and the questions answered by each of the elements. It is important that each of these questions be dealt with in the watershed/subwatershed plan so that stakeholders clearly understand the intent and context of the results of the plans.

Figure 20



WATERSHED PLANNING PROCESS

Source: Watershed Management in Ontario: Lessons Learned and Best Practices (May 2003)

It should be understood that the terms 'watershed' and 'subwatershed' are used interchangeably mainly because the process is the same and the major difference is the scale of assessment (i.e. subwatershed plans are done in more detail). Figure 21 illustrates the relative the concept of scale as it relates to watershed planning.





As part of the development of management alternatives, the conceptual impact model (shown in Figure 22) is used in the assessment of cumulative impacts from various stressors

Figure 22

Source: Credit Valley Conservation Monitoring Report, 2003



In Figure 22, issues are linked to the effects they have on the natural environmental components (e.g. water quantity, water quality, stream form etc.). The effects on the natural environmental components are then further quantified using key indicators (e.g. baseflow, thermal regime etc.). The impacts are then identified on key environmental features and functions such as fish reproduction, fish growth etc. as they may be seen in some watersheds as the integrating functions/features that reflect watershed health. The identified impacts (both positive and negative) can be evaluated against the goals, objectives and targets set for the watershed to assess whether they are acceptable.

20.0 | IWM and its Use in Ontario

In order to share the information gained through this work a two-day symposium on Integrated Watershed Management was held in May, 2009 in Mississauga, Ontario. Highlights of the symposium included:

- International speakers showcased global initiatives using Integrated Watershed Management approaches;
- Symposium participants explored key shifts that need to be made in Ontario in order to implement IWM more effectively;
- Discussed how to build the IWM tools such as management instruments and institutional frameworks that are needed for effective Integrated Watershed Management;
- Explored the Science behind Integrated Watershed Management;
- Showcased local initiatives and programs already underway in Ontario that enable sustainable watershed planning.

Appendix 5 contains the program for the IWM Symposium.

IWM is being applied in Ontario and in concert with some existing programs. It also has the potential to be used in upcoming initiatives to provide added robust analysis that integrates additional relevant considerations. The following provide some examples of the use and potential use of IWM.

20.1 Land Use Changes Including Servicing Infrastructure

Information on how the *Planning Act* influences the municipal planning process was presented in Section 13 of the Phase II Report. Figure 23 shows in greater detail how the watershed management process can work with and influence the planning process at each sequential stage, providing greater refinements down to the site scale. Tributary studies are carried out on subcatchment scales and are done at greater detail and correspond to the Plan of Subdivision stage of the municipal planning process. This would include, for example, the assessment of drainage schemes, terrestrial corridors, refinements to the limits of development, and details of the treatment train for stormwater management (i.e. at source, conveyance and end-of-pipe controls).

Figure 23



Figure 24 shows the sequence of the Environmental Assessment Master Planning Process with the Integrated Watershed Management approach embedded throughout the process.

Figure 24



Connections between Land use Changes including Servicing Infrastructure and Integrated Watershed Management

A blending of the Integrated Watershed Management process with the Land use Planning and Environmental Master Planning processes has been successful and has led to:

- · Better understanding of issues;
- Increased knowledge of the environmental resources, their functions and linkages;
- Improved and additional public engagement activities;
- Evaluation of relevant and unique options suited to local watershed/subwatershed conditions;
- Specific evaluation criteria and targets that reflect local conditions with which to assess options/scenarios; and
- Development of land use scenarios and servicing options that fit with local conditions.



20.2 Climate Change

The following summary is taken from International Association for Great Lakes Research (IAGLR) fact sheet: *The Great Lakes at a Crossroad, Preparing for Climate Change.*

In the most recent IPCC (2007) report conclusions indicate that:

- · The climate is warming.
- More than 50% of the increase in globally averaged temperatures since the mid-20th century is very likely due to human sources.
- $\cdot\,$ Average annual world temperatures are expected to rise between 1.1 to 6.4 °C (2 to 11.5 °F) during the 21st century
- Sea levels could rise 18 to 59 cm (7 to 23 inches). Science tells us to expect more frequent warm spells, heat waves, and heavy rainfall in some areas, while more droughts, hurricanes, and extreme high tides are likely in other places.

Specifically, climate change affects the Great Lakes Region by warming temperatures; possibly decreasing lake levels; increasing weather variability and frequency of extreme weather events; changes in diversity, behaviour, and ranges of plants and animals; resulting in impacts on the economy and elevating the value of the Great Lakes as a source of fresh water.

Connections between Climate Change and Integrated Watershed Planning

While there has been significant work done to assess the impacts from climate change from a global and subsequently Great Lakes scale, regional and watershed analyses are only just beginning. Downscaling of the current climate change predictive models to regional and watershed scales are underway in a few watersheds. Additional tools are also needed to make the assessments relevant to local scales in order that appropriate actions are taken. The key connection to watershed planning will involve utilizing the predictive analyses and assessing climate change as an additional stressor to others such as land use change. Utilizing the IWM process will allow for a cumulative assessment of all stressors to a watershed. The impacts realized will be defined at a local scale such that local solutions can be identified through the implementation phase of the watershed/subwatershed plan. Through this process specific meaningful mitigation and adaptation actions can be identified, costed and undertaken to address the impact of climate change.

20.3 Great Lakes

While watershed planning in the Great Lakes Basin has always been cognizant of the impacts of watersheds, it is not truly well integrated with bi-national basin-wide planning, such as the Lakewide Management Plans (LaMPs).

In examining the issue of "biodiversity conservation" for Lake Ontario there are bi-national recommendations demonstrating strong support for watershed planning in the draft Lake Ontario Biodiversity Conservation Strategy.

To address the issue of watershed management and nutrients, from a lake-wide perspective, Conservation Ontario and Environment Canada partnered together to host a workshop entitled *Managing Watersheds for Great Lakes Benefits: Technical Workshop on Nutrients in the Nearshore* (2009). What follows are excerpts from the draft report generated from the Nutrients Technical Workshop referenced above.

With respect to the opinions expressed by the Expert Panel at the workshop, the following have been edited to highlight points related to watersheds and watershed management. The experts provided their opinions on key remedial actions and key science/research/monitoring actions.

Key Remedial Actions

- Remedial actions need to be tailored to the uniqueness of each watershed.
- Nutrient issues need to be addressed within the context of a watershed plan.
- We need to communicate better to stakeholders about the impacts of watersheds on the Great Lakes, as well as the benefits provided by the Great Lakes.
- Remedial actions need to be targeted at the subwatersheds that pose the biggest problem.
- The highest priority must be to improve the quality of water coming from tributaries.
- We need to manage for strong, pulse events where we have large quantities of really poor water quality coming out of tributaries.
- We need to focus on small (< 100 km sq) watersheds that discharge high concentrations of pollutants at low volume directly to the nearshore.

Key Science/Research/Monitoring Actions. We need to:

- Update the Pollution from Land Use Activities Reference Group (PLUARG) studies and identify what the loading targets are for each watershed as it enters the lake.
- Understand which Best Management Practices (BMPs) may be useful in terms of strong pulse events.
- Develop an integrated watershed monitoring model that ties into the nearshore.
- Understand better what is happening in streams (i.e., need more high quality chemistry and flow data.
- Undertake more work on source identification to allow remedial actions to be optimized.
- Gather better nearshore data and backtrack it to sources in the watersheds.
- Make stronger links between watersheds and the nearshore by linking watershed and nearshore models, linking actions in the watershed to the conditions in the nearshore, and by working better together.

Comments from other workshop participants included:

- When addressing nutrients, we need to take a broad ecosystem perspective (e.g., think about how changes in nutrient cycling might affect fish habitat and the food web).
- We need to improve the capacity of Conservation Authorities to collect, synthesize and report on data.
- We should consider holding a Synthesis Workshop that takes the data generated on a tributary-bytributary basis and use it to form a picture of the nearshore zone.
- We shouldn't forget about habitat manipulation such as the creation of wetlands that will actually use and sequester the phosphorus going down a stream.
- We need indices to show that positive change in the nearshore is occurring because of actions taken in the watersheds.

The following summarizes the discussions by participants on what the next steps would be in order to manage the nutrients in the Great Lakes.

Step One: Make a Case for Action

A clear and compelling case needs to be made for action on nutrients in the Great Lakes.

Step Two: Develop a Great Lakes Nutrient Strategy

2a) Identify desired end points:

Both a review of targets is needed as well as the development of indicators for ecosystem health that relate to what is taking place on the bottom of lake in the nearshore. This needs to be backed up by continued research to better understand the complex processes at work in the nearshore, the bioavailability of phosphorus from different sources and other key science questions.

2b) Develop mechanisms for working together:

Addressing nutrients in the Great Lakes requires collaborative and interdisciplinary approaches that involve major stakeholders along with scientists, policy makers and implementers. One proposed mechanism for working together on nutrients in the nearshore is through Integrated Shoreline Management Plans that bridge the gap between watershed plans and the nearshore and that are nested within Lakewide Management Plans.

2c) Target remedial and preventive actions Making progress on nutrients in the nearshore means targeting remedial and preventive actions at the sources and in the areas that contribute most of the nutrients. Actions in watersheds need to be taken within the context of a watershed plan and the provision of long-term funding for implementation.

2d) Monitor, report, review and adapt Effective environmental management is built on a foundation of knowledge about environmental conditions, stresses and changes over time. An integrated monitoring strategy for tributaries is needed. This is a strategy that operates at provincial, basin, regional, and watersheds scales, which addresses both watersheds and the nearshore, which addresses seasonality and pulse events, and which can be used for multiple purposes.

Connections between Great Lakes and Integrated Watershed Planning

It is clear from the work done to date that the connection between watershed planning and the respective Great Lake lies in the interactions that occur in the nearshore. Integrating the work done for watersheds/subwatershed studies and the needs of the nearshore can result in modifications to the assessments and implementation actions in the watershed plan to improve nearshore conditions. It should be noted that with the inclusion of IWM, the resulting management approach and the follow up actions go beyond the issue of nutrient management and can include addressing the issues of erosion controls, flooding, sediment transport etc.

In summary, the Nutrients Technical Workshop identified current threats as being population growth, changing land use practices, invasive species, and climate change. Without action, eutrophication and the growth of nuisance algae will increase, affecting fisheries, recreational resources, waterfronts and drinking water. Workshop recommendations detail an action plan for implementing a Great Lakes Nutrient Strategy that promotes collaboration and integration, is science-based and adaptive, and encourages stewardship actions in the watersheds.

As local, provincial and federal players in protection and restoration of the Great Lakes Basin Ecosystem move forward, integration between local watershed level and Great Lakes basin scale initiatives would be facilitated by:

1) Collaborative development of a funded, watershed-based Action Agenda for the Great Lakes that re-engages watershed communities and supports development of watershed management plans and studies; and,

2) Collaborative development of a concurrent Research/Science Agenda to explore the watershed/nearshore relationship.





20.4 Drinking Water Source Protection

The *Clean Water Act* was passed into law in 2006. This was in response to the Walkerton tragedy when seven people died and more than 2,300 became ill as a result of a series of human and mechanical failures that allowed bacteria to enter into the Municipal water supply. Justice Dennis O'Connor was appointed Commissioner to lead a public inquiry to investigate the tragedy and provide advice on how similar events could be prevented in the future. In his report, Justice O'Connor recommended development of a multi-barrier approach to protect municipal residential drinking water in Ontario. The multi-barrier approach has five parts:

- · Protection of source water
- · Adequate water treatment
- · A secure water distribution system
- · Proper monitoring and warning systems
- · Well-thought out responses to adverse conditions

The *Clean Water Act* addresses protection of untreated water from aquifers, lakes and rivers as the first step in a multi-barrier approach for municipal drinking water systems through the development of local Source Protection Plans (SPP). Because water often crosses jurisdictional and/political boundaries, the *Clean Water Act* sets out a framework for source protection planning on a watershed basis Figure 25 outlines the Drinking Water Source Protection process.

Figure 25

Source: Ministry of Environment



The Drinking Water Source Protection process involves the following steps:

- · Establishing Source Protection Authorities;
- · Establishing Source Protection Committees;
- · Preparing terms of reference;
- Developing an Assessment Report that maps municipal wellheads and intake protection zones and assesses threats to determine whether they pose a low, moderate or significant risk to drinking water systems. Some of the reports/studies that feed into the Assessment report are also critical to IWM and include watershed characterization, water quality risk assessments and water budgets/water quantity risk assessments.
- Developing Source Protection Plans that prevent significant risks to drinking water and ensure that moderate and low risks do not become significant.
- Developing an Implementation and Management Plan for the long-term. There are also overlaps in this final phase that coincides with the recommendation of Watershed Plans including the need for municipal works, stewardship efforts and land management, and the need for monitoring over time so that the principle of adaptive management can be employed.

The following describes the role of the Source Protection Authority (SPA) which in most instances refers to a Conservation Authority. Groups of SPAs are referred to as Source Protection Regions (SPR). It should be noted that these are the same Boards that will be using Watershed Plans to implement important work to protect and enhance the water resources of a watershed. In a few instances, where Conservation Authorities do not exist, other groups have been delegated the responsibilities of an SPA.

1. Prescribed by Act:

- · Data management and storage.
- To report and submit interim and annual progress reports to the public and Province.
- When necessary to propose amendments to source protection plans in prescribed circumstances (for example for new systems or addition of other systems).
- To submit updated source protection plans as prescribed by the Minister.

2. Set out in Source Protection Plan:

- Local implementation of Ontario Drinking Water Stewardship Program.
- Policies assigned to SPA (i.e. education and outreach, monitoring policies).

3. Municipally Delegated or Requested Roles:

- · Inspection and enforcement responsibilities.
- Training, science, support, data management, program integration.

The following Figure 26 shows the existing policy approaches and those that have yet to be approved for implementation.





Source: Ministry of Environment

The following Figure 27 shows the stages in the Source Protection process.

Figure 27



Source Protection Process

Stage 1 Laying the Foundation	Stage 2 Assessment of Threats	Stage 3 Source Protection Planning	Stage 4 Implementation
Establish source protection authorities Appoint chairs of source protection committees Establish source protection commitees Negotiate terms of reference	Assess threats to drinking water and identify the frequency/location Prepare Assessment Report	Prepare source protection plan, including policies to address significant threats to drinkin water	Implement the source protection plan Inspect and Enforce Monitor and Report Review plan

Source: Ministry of Environment

Connections between Source Protection and Integrated Watershed Planning

In summary, there is already significant overlap between what Conservation Authorities do for IWM versus what is done for Source Protection. These overlaps include **management** (the same Conservation Authority Board taking responsibilities for both initiatives), **use of science** (use of similar surface water and groundwater tools and methodologies), and **follow up actions** (land use controls, infrastructure work with municipalities, stewardship, land management practices and monitoring). IWM, however, is focused on managing the water resources and associated environmental features and functions in a holistic manner while source protection is focused on protecting municipal drinking water systems and does require additional implementation actions beyond what is normally done for a Watershed Plan to date. Watershed Plans are not consistently mandated across Ontario whereas Source Protection Plans are, giving more protection to municipal water supplies than to holistic water resources across the province. Given that the needs of the environment are far more sensitive than human needs for water, there is an obvious need for coordinating resources of both programs across Ontario. This is especially true for the monitoring and updating stages of both processes.

20.5 Watershed-based Fisheries Management Plans (WBFiMPs)

The following represent excerpts from the Draft Watershed-based Fisheries Management Plan (WBFiMP) Guideline (July 2009). Watershed-based Fisheries Management is defined as a collaborative effort among government agencies, stakeholder groups and the general public to develop management strategies and prioritized recommendations that will provide direction for the protection and management of fisheries resources on a watershed-basis.The development of a WBFiMP can be summarized into eight steps as described in Figure 28.

Figure 28

Source: Draft Watershed-based Fisheries Management Plan (WBFiMP) Guideline (July 2009) , MNR





Step 1 – <u>Establish the Need</u> - Commonly the need for a plan will be identified by one of the fisheries management agencies; however partners or an organized group of landowners with a keen interest in a watershed may identify the need and promote development of a WBFiMP.

Step 2 – <u>Develop the Management Team</u> - The primary role of the management team is to provide guidance, knowledge and expertise in the development and implementation of the WBFiMP. The specific responsibilities of individual management teams will be identified cooperatively by OMNR, DFO, CAs and any other responsible jurisdictions participating on the management team through development of a Terms of Reference.

Step 3 - Establishing Principles of Operation - An effective management team should be cohesive. 'Principles of Operation' set out the basic operating procedures for the management team. Establishing and adopting these principles early in the planning process promotes the development of trust and cooperation amongst the participants, guides and directs the process, and provides a foundation for the successful completion of the fisheries management plan.

Step 4 – <u>The Public Process</u> - Broad acceptance of a WBFiMP can only be attained through meaningful, open and inclusive public involvement. Although the management team is primarily responsible for the preparation of the WBFiMP, the public, both through their representatives on the management team or an advisory council and through public meetings, should have ultimate stewardship and custody of the plan.

Step 5 - Defining Key Elements of the Plan - The preparation of any WBFiMP involves a number of key elements that form the basis for developing the plan. Some of the following key elements may need to be developed simultaneously or with overlapping timelines as they are interconnected and cannot be considered as 'stand-alone' components.

- Management Philosophy and Legislative Framework
- · Baseline Information
- Identifying Issues Setting Direction Developing Goals, Objectives, Strategies and Actions
- Preparing the Draft Plan

Step 6 - <u>Reviewing Drafts and Attaining Endorsement</u> -After public input has been received on the first draft of the WBFiMP, the draft WBFiMP should be reviewed again by the management team members before sending it to 'targeted' reviewers.

Step 7 – <u>Implementation</u> - The completion of a written fisheries management plan marks an important milestone, but major benefits to the fisheries will be accrued only when the plan is put into operation. Implementing the actions will require considerable management and coordination. To be successful, a committed and enthusiastic implementation committee needs to be established and should include some members that served on the WBFiMP management and community advisory teams, as well as other interested stakeholders.

Step 8 - <u>An Adaptive Management Approach</u> should be used in all WBFiMPs. An environmental monitoring program that provides feedback on the successes (or failures) of management actions is central to the success of this approach. Under adaptive management, actions may be implemented based on incomplete knowledge, provided that the consequences of the action are closely monitored with feedback reporting. This mechanism allows the management action to be modified if predicted effects are not being realized. Although the maximum life cycle for a WBFiMP should be no longer than five years (i.e., before it must be reviewed and revised if necessary), adaptive management allows for changes in management direction if predicted effects are not being realized.

Connections between Watershed Based Fisheries Management Plans and Integrated Watershed Planning

Again, there is significant overlap between what Conservation Authorities do for integrated watershed plans versus what is done for WBFiMPs. These overlaps include management (the Conservation Authority as part of the management team has responsibilities for both initiatives), use of science (use of similar information such as geology, surface water flow regime that includes groundwater, assessment methodologies, see Step 5), and follow up actions (land use controls, infrastructure work with municipalities, stewardship, land management practices and monitoring, see Steps 7 and 8). In many instances fish are used as the integrator of watershed function (outputs) and therefore reflect the health of the watershed. As an example, the Grand River WBFiMP provides insights into the above points.

20.6 Land Management Activities and Practices

Land-based activities on non-vegetated lands such as in the case of agricultural uses can lead to significant erosion if not managed from rain and wind erosion as well as erosion induced by livestock access. The impacts are manifested in the form of upland tableland erosion which then leads to gully erosion which in turn leads to stream bank and lakeshore erosion. Dealing with this issue on a cumulative basis can be daunting, especially in predominantly agricultural-based watersheds where there are multiple land owners. Other land-based activities include those associated with recreation, aggregate extraction and construction in developing areas.

Connections between Land Management Activities and Practices and Integrated Watershed Planning

Integrated Watershed Plans can identify areas of high risk of erosion and can simulate different mitigation options to establish optimal practices to prevent erosion from occurring. Community approaches to better manage recreational vehicle usage in areas prone to erosion as well as propose Environmental Property Plans that work in concert with each other on multiple properties are some of the tools utilized in Implementation Plans resulting from watershed plans.

20.7 Species at Risk Management

The Species at Risk Act (SARA) was proclaimed in June 2003, and is one part of a three part Government of Canada strategy for the protection of wildlife species at risk. This three part strategy also includes commitments under the Accord for the Protection of Species at Risk and activities under the Habitat Stewardship Program for Species at Risk.

The Act aims to prevent wildlife species from becoming extinct, and to secure the necessary actions for their recovery. It applies to all federal lands in Canada; all wildlife species listed as being at risk; and their critical habitat.

More specifically, the Act will:

- establish the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as an independent body of experts responsible for assessing and identifying species at risk;
- require that the best available knowledge be used to define long and short-term objectives in a recovery strategy and action plan;
- create prohibitions to protect listed threatened and endangered species and their critical habitat;
- recognize that compensation may be needed to ensure fairness following the imposition of the critical habitat prohibitions;
- create a public registry to assist in making documents under the Act more accessible to the public; and
- be consistent with Aboriginal and treaty rights and respect the authority of other federal ministers and provincial governments.

SARA is a result of the implementation of the Canadian Biodiversity Strategy, which is in response to the United Nations Convention on Biological Diversity.

Figure 29 outlines the process that is followed.

Figure 29



Step 1. Monitoring starts with an inventory of wildlife species to get an idea of the population status and trend, its ecological function, and a way of tracking information. As a result, the Minister publishes the report on the general status of wildlife species, every five years.

Step 2. The species assessment process is conducted by the COSEWIC. Based on the status report, they use a committee of experts to conduct a species assessment and assign the status of a wildlife species believed to be at some degree of risk nationally.

Step 3. In response to an assessment and status designation, the Minister issues a response statement. This document reflects the jurisdictional commitment to action and acts as a start to the national recovery process.

Step 4. A recovery strategy outlines what is scientifically required for the successful recovery of a species at risk. This includes an identification of its critical habitat and what needs should be addressed.

An action plan then identifies those specific actions needed to help in the species recovery as identified in the recovery strategy. This includes the various projects and activities with associated timelines.

Step 5. Evaluation programs are carried out against the goals and objectives of the recovery strategy and action plan, where they are most effective. As a result, the Minister must produce an annual report on the administration and implementation of the Act.

Monitoring, assessment, response, recovery, and evaluation are ongoing processes that are taken to improve the species status and ecosystem.

Connections between Species at Risk Management and Integrated Watershed Planning

There can be a synergistic relationship between the SARA Plan and Watershed Plans, especially in the area of aquatic species. The complementary components of each process include management (on a local basis, the watershed Plan can inform CAs and municipalities on the presence of species at risk), use of science (assessment methodologies that can simulate changes from climate change, habitat change and unsustainable use), and follow up actions (land use controls, stewardship, land management practices and monitoring). Since both processes rely on the principle of adaptive management, the watershed plan could provide local context in measuring the species status and the ecosystem.

20.8 Biodiversity Management

What follows are excerpts from the *Interim Report on Ontario's Biodiversity, 2008.* Biodiversity is a scientific term referring to the variety of life found in an ecosystem and includes terrestrial, marine and other aquatic systems and the ecological complexes of which they are a part. Biodiversity is essential for the functioning of healthy ecosystems that ultimately supports human well being. Ecosystems provide many benefits referred to as ecological goods and services which include:

- Life-supporting services such as soil formation, photosynthesis, pollination, waste assimilation, and nutrient cycling;
- Products such as breathable air, food, clean water, timber and fibres;
- Regulation of climate, floods, disease, waste, water quality and air quality;
- Recreational opportunities that enhance our quality of life through aesthetic enjoyment and spiritual fulfillment;
- · Sources of medicine.

Ontario's Biodiversity strategy identified five major threats to Ontario's biodiversity: pollution, climate change, habitat change, invasive species, and unsustainable use. It should be noted that ecosystems and species may be subject to more than one threat at any given time and that the cumulative stress may lead to greater impacts than individual stresses alone. Initiatives that support biodiversity conservation with initiatives that range in scale from local community projects to province-wide programs. The report concludes by recognizing the need for collaborative efforts among all stakeholders including municipal, provincial and federal governments, community groups, non-government organizations, Aboriginal communities, academics, individuals and others.
Connections between Biodiversity Management and Integrated Watershed Planning

There is overlap between what Conservation Authorities do for IWM versus what is done for Biodiversity Management, especially in the area of aquatic species. These overlaps include management (the Conservation Authority, as part of their role as local advisors to municipalities on environmental issues, can use the results from IWM to protect and enhance biodiversity), use of science (assessment methodologies that can simulate changes from climate change, habitat change and unsustainable use - which are some of the major threats to Ontario's biodiversity), and follow up actions (land use controls, maintenance and constructions techniques used by municipalities, stewardship, land management practices and monitoring). In many instances the retention/establishment of "green corridors of sufficient length and width" have been linked to the well being (social and health) of local residents.



21.0 | Strategic Shifts to Address Gaps & Update Approach for IWM

21.1 Shifts in IWM Scientific Assessments

Section 16.1 within Section 16 of the Phase II report speaks to the gaps that exist in current applications of IWM in Ontario. Most significantly are the gaps associated with the Mapping and Data Management, Economic, Social, and Integration components. If significant improvements are to be made in these fields, investment in tools, methods and training must occur.

In the case of data management, creation of standardized data collection methodologies for a set of selected parameters, development of data base platforms that support storage, retrieval and easy dissemination of data, and on-going training are essential. A shift towards collaborative efforts across all levels of government and in particular between federal, provincial, conservation authority, municipal, and where applicable, non-government organizations must occur. Some work has already begun but it is sporadic and should be expanded and properly resourced over the long term.

If we agree that ultimately the goal of IWM is to maintain and enhance watershed health which, in turn, links to human well being and economic vitality then one approach can be to use sustainability analysis as a tool for building results-based sense of common purpose in environmental governance in the future. What this means is that sustainability analysis can model how societies and economies function in environmental and quality of life terms, rather than in economic terms alone. This would imply that shifts in economic and social integration into IWM are necessary if sustainability is to be achieved. This shift is a true integration of the three key pillars of sustainability (i.e. environment, social and economic). To achieve this shift, appropriate tools and methodologies to facilitate the incorporation of social and economic factors in appropriate form must be developed. Key to this shift is the collaboration amongst government, academia and organizations with business interests.

Lastly, a shift to making integration of all watershed/subwatershed components a requirement for all IWM assessments is necessary. To achieve this, a set of methodologies needs to be developed for the social and economic components as well as an overall approach to integration. There have been attempts in some plans to apply the integration piece but this work needs to be expanded and built upon as there is much room for improvement.

21.2 Shifts in IWM Process

A shift is needed to place greater emphasis in the process to allow for setting and utilizing scientifically sound targets, monitoring and evaluating implementation and, updating plans. This can be achieved by recognizing at the initial stages that resources (time, funding and expertise) must be set aside for these activities. This will shift the current approach from one that is output-based (i.e. getting the watershed plan done) to one that is outcome-based (i.e. getting the plan implemented and measuring the outputs against its goals, objectives and targets over time).

21.3 Shifts in Governance for Overall Management of Water and Related Environmental Resources

In this context governance can be defined as "an effort to build, manage and maintain inter-organizational networks; in other words, develop an institutional ecosystem". The challenges facing us are to develop coordination and decision-making frameworks that are resilient and allow for adaptation.

In Section 8 of the Phase I Report, it was noted that global shifts for water management include:

- · Sectoral to integrated management;
- Top-down to stakeholder and demand responsive change;
- · Supply fix to demand management;
- Command and control to more cooperative or distributive forms of governance; and
- · Closed expert driven management organizations to more open, transparent and communicative bodies.

In other words global changes include a movement toward integrated management, bottom up stakeholder driven agendas, managing people's attitudes, behaviours and expectations, cooperative and decentralized governance and open and transparent agency communication.

More recently, work completed across Canada by Pollution Probe found that a number of shifts are needed to further the IWM approach and include moving from:

- · process to outcomes;
- water management to watershed management;
- regulating to shared responsibility; and,
- government to governance.

From a national perspective, shifts include a focus on outcomes, recognizing the watershed as a unit of analysis, moving toward recognizing that everyone has a share in responsibility when it comes to the heath of the watershed, and moving towards clarifying how decisions are made and by whom. The following are governance options that various countries have used to address the development and implementation of IWM (referred to as IWRM globally) on a basin/watershed basis and are worthy of further consideration by Ontario:

- · Basin Commissions or Authorities
- · Basin Associations or Councils
- · Basin Corporations or Companies
- Recognition of complementary roles of organizations involved in water management and associated natural resources – Adaptive Co-Management

Adaptive co-management is an approach to environmental and resource management that brings together two aspects – adaptive management and co-management. The former refers to a capability to learn and adapt under certain conditions and in the face of changing circumstances, while the latter refers to the sharing of management power and responsibilities between governments, resource users, and resource-based communities (Charles 2007).

Therefore the key elements of Adaptive Co-Management include:

- · Learning by doing
- · Integration of knowledge systems
- · Collaboration and power sharing
- · Regional and national levels
- · Management flexibility

This approach to governance is especially relevant to Ontario since the concept of Adaptive Environmental Management has taken root; IWM is well established and supports the integration of knowledge, there is a hierarchical approach to management and collaboration does occur on specific projects and programs. These relationships will need to be reinforced and expanded to increase collaboration with emphasis placed on management flexibility. There are four ingredients of adaptive co-management as follows (Charles 2007):

1. the availability of a diverse "toolkit" of possible management measures, and adoption of appropriate "portfolio" of such measures ;

2. the pursuit of robust management ;

3. full utilization of the knowledge base in the resource system; and

4. appropriate institutional reform.

If we look at an integrated vision for managing on a watershed basis, a set of tools are needed for Planning and Decision-making. Such tools can be categorized into (GWP 2003):

- · Management Instruments;
- · Enabling Environment; and
- · Institutional Framework.

Consideration of watershed problems can be due to multiple causes and, as a result, several tools for problem resolution are needed. The following provides a list of tools that can be used under each of the three categories listed above.

The Enabling Environment

- Policies setting goals for water use, protection and conservation.
- Legislative framework the rules to follow to achieve policies and goals.
- Financing and incentive structures allocating financial resources to meet needs

Institutional Roles

- Creating an organizational framework forms and functions.
- Institutional capacity building developing human resources.

Management Instruments

- Water resources assessment understanding resources and needs.
- Plans for IWM combining development options, resource use and human interaction.
- · Demand management using water more efficiently.
- Social change instruments encouraging a wateroriented civil society.
- · Conflict resolution managing disputes, ensuring sharing of water.
- Regulatory instruments allocation and water use limits.
- Economic instruments using value and prices for efficiency and equity.
- Information management and exchange improving knowledge for better water management.

The success of the Flood Damage Reduction Program and the Drinking Water Source Protection programs in Ontario are good examples of how the above three major tools were applied and continue to be applied.



22.0 | What Opportunities Could IWM Provide Ontario?

To provide a response to this question, key attributes have been identified. Examples are provided for further clarification. It is important to note that IWM should not be seen as another layer in addition to that which already exists in Ontario.

1. Supports the creation of comprehensive goals for water resources.

Through IWM, key fundamental goals include building relationships resulting in trust amongst stakeholders, maintaining open dialogue which ultimately leads to meaningful negotiations over implementation.

The following examples are provided from a hierarchical agency perspective typically found in Canada.

Federal

The Department of Fisheries and Oceans has its goal concerning water as follows:

• To develop a system of nested Integrated Management plans for all of its marine waters, and to establish within these a network of marine protected areas.

Environment Canada has as its goal concerning water as follows:

 Clean, safe secure water that protects human health and well being, safeguards ecosystems and biodiversity; and provides social, economic and ecological benefits to Canadians (EC)

Provincial

Ministries of Environment, Natural Resources, and Agriculture Food and Rural Affairs have identified five goals that concentrate on protecting and increasing the many benefits that healthy Great Lakes give us:

- · Resilient ecosystems
- \cdot Human health and well being
- · Green, diverse communities
- · Sustainable natural resources
- · Strong communities

Conservation Authorities

As a general goal Conservation Authorities use IWM to protect and manage natural resources (including their function and linkages) for this and future generations. One additional goal is to build relationships and foster trust with all stakeholders. Individual watersheds sometimes have unique mandates, goals or objectives that reflect local conditions as illustrated in the following examples:

Mississippi Valley Conservation Mission:

Mississippi Valley Conservation will assume a leadership role in the conservation, enhancement and development of the Mississippi Valley by way of watershed planning, integrated resource management programs, and conservation awareness.

Nottawasaga Valley Conservation Authority: To achieve our mission, we have five major objectives to consider, including:

- · Protect, enhance and restore water;
- · Protect, enhance and restore land;
- · Protect life and property from flooding and erosion;
- Provide educational and recreational opportunities for the public;
- Partner with our Watershed Municipalities, provincial/federal agencies, Conservation Ontario, and other interested stakeholders to achieve mutual goals.

Toronto and Region Conservation Authority (Urban Watersheds):

- · Increase natural cover
- Build sustainable communities (new and retrofit)
 manage water balance and promote more sustainable practices overall
- Recognize and develop the regional open space system

2. Establishes process and best management practices in multi participant coordination.

The IWM process relies heavily on engagement. The degree to which engagement takes place will depend on the governance model and local circumstances to provide open dialogue and the process and transparency. Different levels of government will need to be involved in different ways and to varying degrees.

3. Incorporates a variety of data, tools and scientific information.

Information used in IWM is of a scientific nature and includes data and information associated with watershed/subwatershed plan scientific components and includes aquatics, terrestrial, hydrology, stream morphology, water quality, groundwater, economic, social, mapping and data management and integration. These data are to be used in characterizing the watershed's features, functions and linkages, assessing impacts from changes to the watershed and developing an implementation plan that maintains and enhances watershed health and the well being of human beings that live, work and recreate there.

4. Provides models for adaptive management and decision making.

Since we are dealing with the natural environment a systems-based approach is needed which in turn involves a network-based governance model. Governance is the tool that binds organizations and results in achieving shared vision and promotes communication. Decisions should be based on the results of the watershed/subwatershed assessments/plans by those with responsibility and accountability for a particular issue. In the spirit of wise governance, decisions should be made through a transparent and open process in which all stakeholders are engaged.

5. Provides models for implementation.

Decisions can be implemented through a number of avenues, depending on the issue. For example, if a set of recommendations from the watershed plan are made on land use change, then accompanying policies in a municipality's Official Plan or Secondary Plan will have to be written to ensure the recommendations are met. Other examples can be found in Section 20 of this report. Collaboration amongst stakeholders (including agencies) on implementation issues will lead to comprehensive efficient and effective achievement of the plan's goals and objectives on watershed health.

6. Use of performance measurement through monitoring, assessment and reporting.

The IWM process is based on the concept of Adaptive Environmental Management which has been discussed in Section 19. Accomplishments can be measured by carrying out the recommended monitoring and assessment to determine whether targets have been met. This approach can take some time before meaningful results can be obtained. Currently this is a gap in the examples of how the IWM process is being used in Ontario. Another way to measure accomplishments is through reviewing on an ongoing basis what recommendations and implementation actions have been carried out. This approach can yield results on an annual basis.

7. Embraces the principles of continuous learning and adaptation.

The governance model of Adaptive Co-Management has two parts at its very foundation. First is the concept of Adaptive Environmental Management which is based on deliberate learning, uses a systems approach and can assess complex environments and issues, while allowing for adaptation. The co-management concept is based on collaboration and management flexibility.

Using IWM also helps to build social capital. Social capital can be defined as building trust and connections within and between social networks. Building trust is key if all stakeholders are to participate fully to allow for learning and adaptation. There is still work to be done in Ontario to move forward with an Adaptive Co-Management governance model however basic essential ingredients (as outlined above) are present and all that is needed is more focus on collaboration.

There is still work to be done in Ontario to move forward with an Adaptive Co-Management governance model... [however] all that is needed is more focus on collaboration.

23.0 | Considerations for Next Steps

The following considerations are offered following the work completed in Phases I, II and III of this initiative. They provide the next logical steps to move the yardsticks forward in Ontario for managing on a watershed basis to ensure watershed health and human well being.

1. Collaborative Initiatives between Federal Departments, Provincial Ministries, Conservation Authorities and Municipalities:

Create a Watershed Management Working Group

- A quarterly forum for discussion on water issues that could include various levels and organizations like the province's water directors, conservations authorities, municipalities and environmental non-government organizations on the use, needed tools addressing Enabling Factors, Management Instruments and Institutional Arrangements, and opportunities for IWM.
- Review and evaluate various collaborative governance models such as Adaptive Co-Management, Basin Agency etc. applicable to Ontario.
- Monitor the effectiveness of new and existing watershed planning initiatives, policies and practices, including international activities on Basin Planning in Australia and the European Union and provincial approaches from Quebec and Alberta.
- · Reports on progress of working group

2. Steps for further understanding Opportunities for federal/provincial agencies and their partners:

- Use existing forums for interagency discussions on how IWM could be applied, examples include Great Lakes assessments, impacts of climate change at a provincial and local watershed level, data and data management, and connections to other initiatives e.g. Species at Risk Management Plans, Source Water Protection Plans
- Host a Symposium on IWM every two years. See Appendix 6 on the results of the 2009 attendee survey which provides information on the content, duration, format etc. that a future symposium should take.
- Consult and evaluate with stakeholders on existing water policies to fit today's and future needs.
- Hold discussions across departments on the models being used to assess cumulative impact i.e., Ecosystem Based Management, water budgets, Large Ocean Management Areas etc. with a view to updating evaluating approaches on an on-going basis.



3. Local Level Opportunities for Conservation Authorities and Municipalities

- · Hold working forums to:
 - Educate staff and build a full understanding of IWM and opportunities and approaches developed over the last 10 years.
 - Bring consistency to the IWM process amongst Conservation Authorities by reviewing and, if needed, improve standard approaches.
 - Brainstorm on how to address barriers to IWM and utilize opportunities.
 - Work with province and academia to carry out research needed to address gaps in IWM scientific components especially in the areas of target setting, social, economic and integration.
 - Work with municipalities to assess local fit with Official Plans, Secondary Plans etc., develop effluent criteria for sewage treatment plants to meet assimilative capacities of receiving streams etc., develop stormwater retrofits etc.
 - Work with Environmental Non-Government Organizations (ENGOs) on implementation of long term projects and on issues of common concern.
 - Work with interested parties to build a library of success stories where IWM is being used.





Definitions

Aquatic Ecosystem: An aquatic ecosystem refers to a community of organisms (bugs, plants, wildlife, surroundings) that live in water and are dependent on each other for survival.

Aquifer: An underground layer of permeable rock, sediment (usually sand or gravel), or soil where groundwater is stored. Aquifers are connected to other aquifers and surface water bodies and can occur at various depths.

Biodiversity: Refers to the uniqueness and variability of all life with particular emphasis on genes, species, landscapes or ecosystems.

Ecosystem: A dynamic complex of organisms and their associated non-living environment, interacting as an ecological unit composed of primary producers, consumers and decomposers.

Elasticity: Refers to the ability of an ecosystem to accommodate change while maintaining its structure and function.

Ecological resilience refers to the capacity of natural ecosystems, social resilience to the capacity of human communities to cope with change.

The term **ENVIRONMENT** as used in this document refers to the natural components of aquatic ecosystems, the flora and fauna, and the natural ecological processes that take place between individual plants and animals, their surroundings, and between each other. The maintenance of species biodiversity, community structure and functioning and natural ecological processes are important elements (and indicators) of the maintenance of overall environmental integrity.

Ecological Values are defined as the natural ecological processes occurring within water dependent ecosystems and the biodiversity of these systems.

Environmental Water Requirements are descriptions of the water regimes needed to sustain the ecological values of aquatic ecosystems at a low level of risk. These descriptions are developed through the application of scientific methods and techniques or through the application of local knowledge based on many years of observation.

Environmental Water Provisions are that part of environmental water requirements that can be met.

Environmental Water Provisions may refer to:

- unregulated flows in rivers and water in wetlands and aquifers;
- specific volumetric allocations and/or releases from storages;
- water levels maintained in wetlands; and
- water in transit for other users, the pattern of flow of which may be defined to meet an environmental need.

Complexity: A feature of systems that comprise diverse components among which there are many interactions, the resulting implications of which are often unpredictable.

Cumulative Impact: The incremental impact of an action on the environment when the impacts are combined with those from other past, existing and future actions.

Driver: Any natural or anthropogenic factor that causes change within a system, whether through direct or indirect means, regardless of whether it is internal or external to the system.

Erosion: The wearing away, by water, of the banks or bed of a stream or of the materials used in any works.

Green Infrastructure: An interconnected network of green space that conserves natural ecosystem values and functions and provides associated benefits to human populations.

Impact: Any aspect of an action that may cause an effect; for example, land clearing during construction is an impact, while a possible effect is loss and fragmentation of wildlife habitat.

Impact Model: A formal description of a cause-effect relationship that allows the assessing of various components of that relationship through the use of an Impact Statement, a Pathways Diagram, and the validation of linkages and pathways.

Indicator: Anything that is used to measure the condition of something of interest. Indicators are often used as variables in the modeling of changes in complex environmental systems.

Infrastructure: An underlying base or foundation especially for an organization or system. The basic facilities, services, and installations needed for the functioning of a community or society, such as transportation and communications systems, water and power lines, and public institutions including schools, post offices, and prisons.

Integrated Management: An approach to management through which multiple actors collaborate and share risk in defining, analyzing, and resolving social ecological challenges for the common good. This approach moves beyond conventional single-species management to consider the implications of, species interactions, habitat and ecosystem linkages, and cumulative effects.

Mitigation: In the context of climate change, a human intervention to reduce the sources or enhance the sinks of greenhouse gases. Examples include: using fossil fuels more efficiently for industrial processes or electricity generation, switching from oil to natural gas as a heating fuel, improving the insulation of buildings, and expanding forests and other "sinks" to remove greater amounts of carbon dioxide from the atmosphere.

Precautionary Principle: See the report, Integrated Watershed Management in Ontario (Phases I-III), Appendix 4.

Resilience: Refers to the capacity of an ecological or social system to accommodate change, stress and variability without altering its structure and function.

Riparian Zone: The riparian zone is the area between the land and a surface water body. Plants alongside the banks of the water body are called riparian vegetation and are important for the health of the stream and to stop bank erosion.

Robust Management: Management that is designed to ensure an acceptable level of performance despite conditions of elevated scientific uncertainty and limited control over exploitation.

Social Capital: The social norms, networks of reciprocity and exchange, and relationships of trust that enable people to act collectively.

Social Learning: The collaborative or mutual development and sharing of knowledge by multiple stakeholders through learning-by-doing. **Stakeholders**: Individuals or groups (including government and non-government institutions, communities, research institutions, development agencies, etc.) with an interest or claim.

Surface Water: Surface water is the water that runs over or sits on the land. This includes lakes, rivers, streams, creeks and ponds. It is usually fresh water and it is not stored in the ground.

Threshold: The critical boundary (e.g. spatial or temporal) where the attraction of a system to a new equilibrium or configuration supersedes the system's attractions to its current state.

Watershed: The region or area of land that drains into a river, river system, or other body of water. Watersheds are divided by mountains or hill ridges.

Water Dependent Ecosystems: Those parts of the environment, the species composition and natural ecological processes of which are determined by the permanent or temporary presence of flowing or standing water. The instream areas of rivers, riparian vegetation, springs, wetlands, floodplains and estuaries are all water dependent ecosystems.

Water Flow Requirement: Water flow requirement refers to the amount of water that nature (fish, wildlife, streams) needs in a water body so that it can function properly. Water flow requirement needs relate to adequate water flow, water quality, riparian margins and water temperature.

Wetland: Wetlands refer to a body of land saturated by water and include swamps, marshes and bogs. Wetlands are the interface between land and aquatic ecosystems and usually support diverse forms of life and provide significant benefits to the environment.

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