

# OAK RIDGES MORAINÉ CONSERVATION PLAN

## Technical Paper Series

### 9 - Watershed Plans

#### 1 Purpose and Overview

This technical paper provides guidance to assist upper-tier and single-tier municipalities in preparing watershed plans as required by the Oak Ridges Moraine Conservation Plan (ORMCP), Section 24. Subsection 24(3)(a) of the ORMCP states that a watershed plan shall include a Water Budget and a Water Conservation Plan as set out in Section 25. Separate guidance is available for preparing water budgets (ORMCP Technical Paper 10) and water conservation plans (ORMCP Technical Paper 11).

It is not the intent of this technical paper to provide comprehensive guidance on all aspects of watershed management. Where appropriate, the reader will be directed to existing guidance and references.

#### 2 Related Considerations

When preparing Watershed Plans, it is suggested that the reader also review the highlighted, associated topic areas as discussed in the ORMCP, as shown in Figure 1 below.

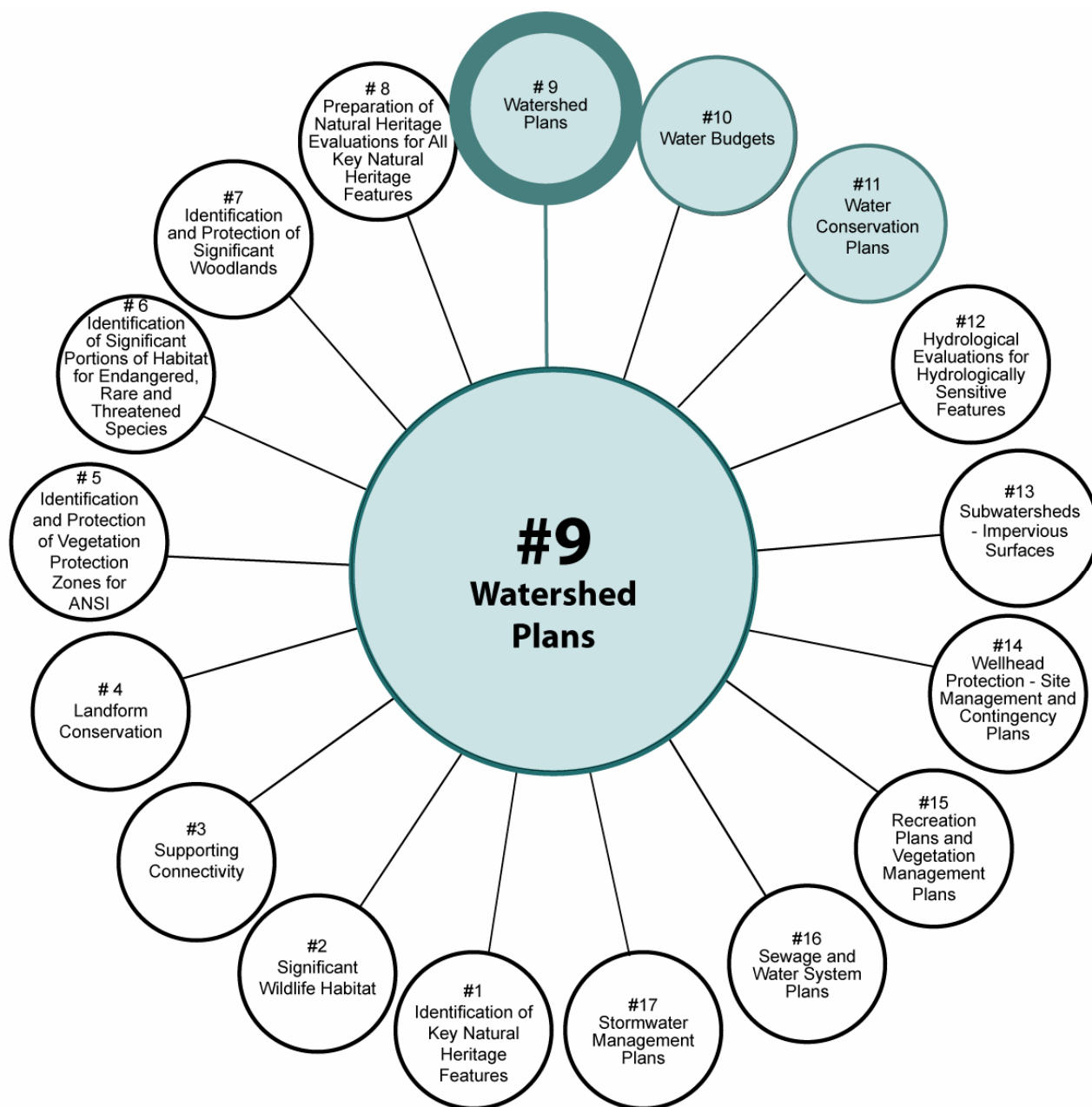
##### ***Clean Water Act, 2006***

The *Clean Water Act, 2006* was passed on October 19, 2006. Associated regulations, Director's Rules and technical modules are currently being developed. Readers of this technical paper should take note that the requirements of the *Clean Water Act, 2006* may have implications to initiatives undertaken to implement the ORMCP. Information concerning the *Clean Water Act, 2006* is available at: [www.ene.gov.on.ca/en/water/](http://www.ene.gov.on.ca/en/water/).

##### **Further Reading**

Please also refer to the additional list of references and resources listed at the end of this technical paper.

Figure 1 ORMCP Topic Areas and Linkages with Technical Paper 9 - Watershed Plans



### 3 Watershed Plan Requirements of the Oak Ridges Moraine Conservation Plan

The ORMCP requirements pertaining to watershed plans are as follows:

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- (1) *Every upper-tier 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.

24(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.

24(5) *Subsection (4) applies to every application commenced on or after April 23, 2007.*

24(6) *Subsection (8) applies to every application commenced before the date mentioned in subsection (5), except an application described in subsection (7).*

24(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.*

This technical paper deals with Section 24 (1-7) of the ORMCP explicitly, but also recognizes the integrating nature of watershed management within the broader framework of an ecosystem approach.

#### **4 Rationale for the Requirements**

This section provides a brief overview of the rationale for using an integrated watershed management approach for implementing the water requirements of the ORMCP.

The Oak Ridges Moraine (ORM) is one of Ontario's most significant landforms. The Moraine has a unique concentration of environmental, geological, and hydrological features that makes its ecosystem vital to south-central Ontario, including: clean and abundant water resources, and healthy and diverse plant and animal habitat.

An ecosystem approach to land use planning requires that boundaries for land use planning be based on biophysical units as the context for examining the relationships

between the natural environment and human activities. The watershed is an ecologically relevant boundary for considering hydrological features and functions and related attributes. Within a watershed, the hydrological cycle with its spatial and temporal expressions on the landscape provides pathways that integrate physical, chemical, and biological processes. It connects hydrological features such as streams, wetlands, kettle lakes, and groundwater to each other and to human activities and human made features<sup>1</sup>.

*Watershed management* is a process of managing human activities within an area defined by watershed boundaries. Watershed management makes sense for a number of reasons (Conservation Ontario, 2003. Watershed Management in Ontario: Lessons Learned and Best Practices):

- because of its unique properties, water integrates and catalyzes other biophysical processes in air, land, and water environments;
- watersheds define distinct biophysical units;
- watersheds are an easily-understood ecosystem unit;
- the health of rivers and streams is both influenced by and a gauge of the health of the lands through which they flow;
- water systems demonstrate the cumulative effects of environmental stresses;
- quality of life is directly linked to water quality in watersheds;
- most management actions can be integrated using watersheds, at some scale, as a common planning unit; and
- there is strong and growing public support for implementation at the local watershed level.

Watershed management generally includes the following components: the identification of issues and scoping, the development of watershed plans, implementation of those plans, monitoring and reporting of progress, and periodic review and evaluation. The intent of watershed management is to reach an end state condition that is consistent with the objectives of the ORMCP, namely: maintaining, improving and restoring all the elements that contribute to the ecological and hydrological functions of the Oak Ridges Moraine Area, including all the quality and quantity of its water and its other resources. To this end, a facilitated public forum could be used to discuss the public's interest and values, to identify a vision statement for each value, and to help identify valued ecosystem or watershed components.

A *watershed study* is the process of compiling the information needed to prepare a watershed plan and involves collecting available information, and filling in data gaps in order to understand the functions, conditions, and issues of the watershed. A *watershed plan* document is a key product of a watershed study.

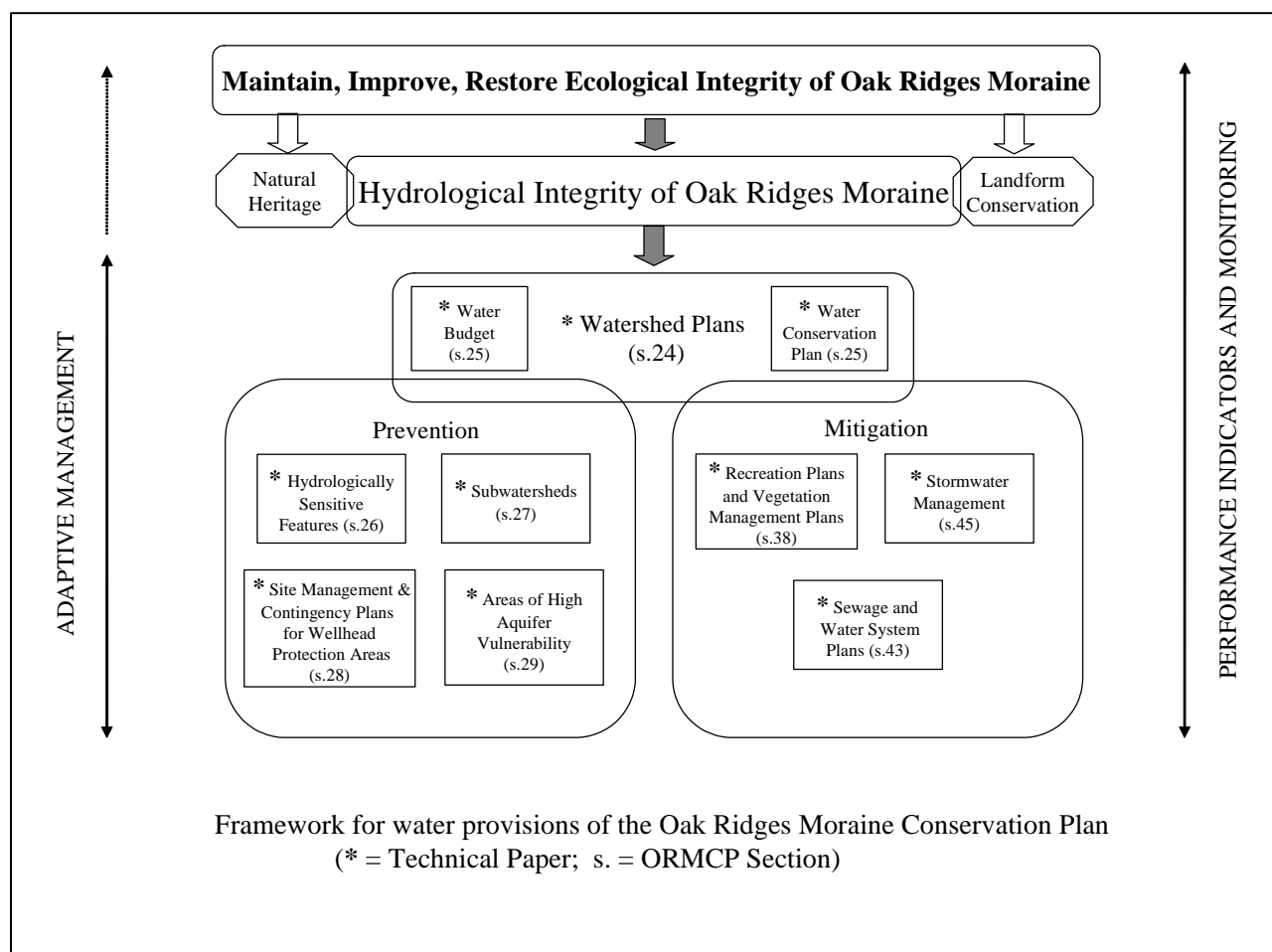
The requirement for upper-tier and single-tier municipalities to prepare watershed plans is a cornerstone of the ORMCP water provisions. It provides a holistic framework for the other feature-focused and issue-based water provisions of the ORMCP (Figure

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<sup>1</sup> It is recognized that the watershed may not be the appropriate scale for examining ecological processes that cross watershed boundaries, such as the movements of terrestrial plants and animals.

2). Specific strategies and activities to maintain, improve, or restore ecological and hydrological integrity should be developed through the ORM watershed plans. By providing a broad understanding of ecosystem function and status, and recommending actions for appropriate land and water management in the watershed, the watershed plan can help incorporate relevant ecosystem considerations into land use planning and decision-making. Watershed plans incorporated into municipal official plans and zoning by-laws, are intended to contribute to maintaining, improving or restoring the hydrological, and hence ecological, integrity across the Oak Ridges Moraine.

**Figure 2 Framework for the Water Provisions of the ORMCP**



Within this framework, the ORMCP incorporates natural heritage systems planning that takes a multi-faceted approach to hydrological integrity. The water provisions involve prevention (e.g. protection of hydrologically sensitive features, subwatershed limits to impervious surfaces, groundwater source protection) and mitigation (e.g. recreation and vegetation management plans, stormwater management, sewage and water system plans).

The preventative provisions, found in Part III of the ORMCP, will be implemented primarily at regional or watershed and subwatershed scales. The mitigative provisions apply primarily to activities at the major development site scale; they are contained in Part IV of the ORMCP. While focused on the site-scale, ideally the mitigative provisions should also be implemented within the larger context of a watershed plan.

With respect to all provisions, opportunities to improve or restore ecological integrity should be explored and, where feasible, acted upon.

Performance indicators and monitoring provide the feedback necessary to practice adaptive management<sup>2</sup>.

## 5 Products of the Watershed Plan Process

The following are some of the expected products of the watershed plan process for the ORMCP:

- A Water Budget that meets the intent of the ORMCP, as per the Technical Papers;
- A Water Conservation Plan that meets the intent of the ORMCP, as per the Technical Papers;
- Criteria for evaluating the protection of water quality and quantity, hydrological features, and hydrological functions;
- Plans to ensure accordance with the subwatershed limits on impervious surfaces identified in the ORMCP;
- Plans to assess accordance with the subwatershed targets for self-sustaining vegetation identified in the ORMCP;
- An environmental monitoring plan that includes indicators that track changes in water quality and quantity, including the protection of hydrological features and functions; and
- A framework for implementation that ensures effective actions and strategies are undertaken, including incorporating recommendations of the watershed plans into both upper-tier and lower-tier municipal official plans, secondary plans, and zoning by-laws.

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<sup>2</sup> Adaptive management is an approach of learning from the outcomes of management actions, accommodating change, and improving management. This approach acknowledges uncertainty and recognizes that natural systems change over time. The approach stresses learning from experience and from feedback obtained from monitoring. Management actions and monitoring programs are carefully designed to generate reliable feedback and provide insight into the reasons underlying outcomes. Management actions and, where appropriate, management goals, objectives, and targets, are then adjusted based on this feedback and improved understanding.



## 6 Implementing the Requirements

Table 1 shows the key elements of success in watershed management experienced by various watershed management projects in Ontario.

**Table 1 Key Elements of Success in Watershed Management**

<b>Aspects</b>	<b>Factors for Success</b>
<b>Watershed /Subwatershed Planning</b>	<ul style="list-style-type: none"> <li>Tailor planning process to particular watershed</li> <li>Develop clear Terms of Reference that define process, roles and responsibilities</li> <li>Collaborate with other municipalities and conservation authorities to: coordinate the watershed plans with adjacent watersheds, utilize shared resources, and consider groundwater and terrestrial connections between watersheds</li> <li>Build understanding and support of Steering Committee</li> <li>Collect baseline data up front</li> <li>Effectively characterize the watershed by involving experts and integrating information from a range of disciplines</li> <li>Use GIS to communicate data, information and recommendations</li> <li>Set clear, understandable goals, objectives and targets</li> <li>Consider a range of alternatives</li> <li>Have expertise and decision support tools for evaluating alternatives</li> </ul>
<b>Implementing Watershed Plans</b>	<ul style="list-style-type: none"> <li>Identify clear, discrete actions and responsibilities</li> <li>Ensure clear accountability of deliverables</li> <li>Ensure "buy in" from key partners from the beginning</li> <li>Gain support of municipal politicians and staff</li> <li>Include actions at different scales (i.e., watershed, subwatershed, site and individual actions)</li> <li>Set "do-able" short term milestones as well as longer-term targets</li> <li>Identify targets that are measurable, so that progress can be evaluated</li> </ul>
<b>Monitoring and Reporting</b>	<ul style="list-style-type: none"> <li>Celebrate success</li> <li>Report on a regular basis</li> <li>Involve the public in developing monitoring plans, monitoring and reporting</li> <li>Link monitoring to watershed goals, objectives and targets</li> <li>Practice adaptive management by revisiting management strategies, as well as goals, objectives, and targets, in light of new information gained</li> </ul>
<b>Periodic Review and Update of Plans</b>	<ul style="list-style-type: none"> <li>Update at 5 or 10 year intervals to reflect management activities that have been implemented, as well as changes in environmental conditions, scientific understanding, or stakeholder priorities</li> </ul>
<b>Partnership Approaches</b>	<ul style="list-style-type: none"> <li>Involve key partners from the beginning of the process in Steering Committee and others (i.e., Technical Committees)</li> <li>Seek strong leadership at the political and staff level from key partners</li> <li>Forge strong links to other programs and processes to maximize the use of information</li> <li>Use consensus-based approaches to develop a shared vision</li> <li>Adopt a philosophy of collaboration in planning and implementation</li> </ul>

<b>Aspects</b>	<b>Factors for Success</b>
<b>Public Involvement</b>	Involve the public in determining the study objectives, goals and selection of the preferred plan Be inclusive, open and unbiased Aim to create "local ambassadors" – public participants in the process who can educate, motivate and serve as watchdogs in their own neighbourhoods Find a strong, enthusiastic and respected citizen to chair the project Steering Committee
<b>Communication</b>	Use effective visual tools such as GIS mapping and photos Develop reports that are engaging, easy to read and appealing Consider the needs of users (e.g., make Implementation Plans stand-alone documents) Celebrate successes
<b>Institutional Aspects</b>	Have strong coordination at the local level Have watershed managers develop watershed/subwatershed plans Set an ambitious schedule and keep to it Find dedicated staff to develop the watershed/subwatershed plan

From: Conservation Ontario, 2003. "Watershed Management in Ontario: Lessons Learned and Best Practices", page 44.

Effective partnership approaches have been central to the success of watershed planning and management in Ontario. This means the involvement of key stakeholders, such as municipalities, provincial ministries and community representatives, in a focused and targeted manner from the earliest stages. Effective partnership approaches lead to successful completion of watershed plans, encourage buy-in for implementation, and create a climate for effective monitoring and reporting (Conservation Ontario, 2003, Watershed Management in Ontario: Lessons Learned and Best Practices).

As part of the watershed planning process, approval authorities may wish to address issues beyond those required by the ORMCP. Without limiting the range of issues that approval authorities may wish to consider in preparing watershed plans, this technical paper provides suggestions for meeting the intent of the ORMCP. Approval authorities may wish to complete watershed plans at different levels of detail in order to fulfill the ORMCP requirements. Issues considered that are not part of the ORMCP requirements would not need to be part of conformity requirements associated with the completion of the watershed plans.

In addressing the requirements, approval authorities may choose to either: (a) develop watershed plans for those watersheds located wholly or partially within the ORMCP area that specifically address the requirements of the ORMCP, or (b) incorporate the requirements of the ORMCP into a larger watershed planning exercise developed for a broader range of management objectives than just conformity with the ORMCP.

Approval authorities may wish to review existing watershed plans prepared by municipalities or conservation authorities to determine the extent to which these plans fulfill the requirements of the ORMCP. Any gaps or further analyses required could be identified at that time.

In consultation with stakeholders, an approval authority may wish to determine priority watersheds within the jurisdiction, in recognition of the fact that it may not be possible to study all watersheds at the same time. For instance, priorities could be set based

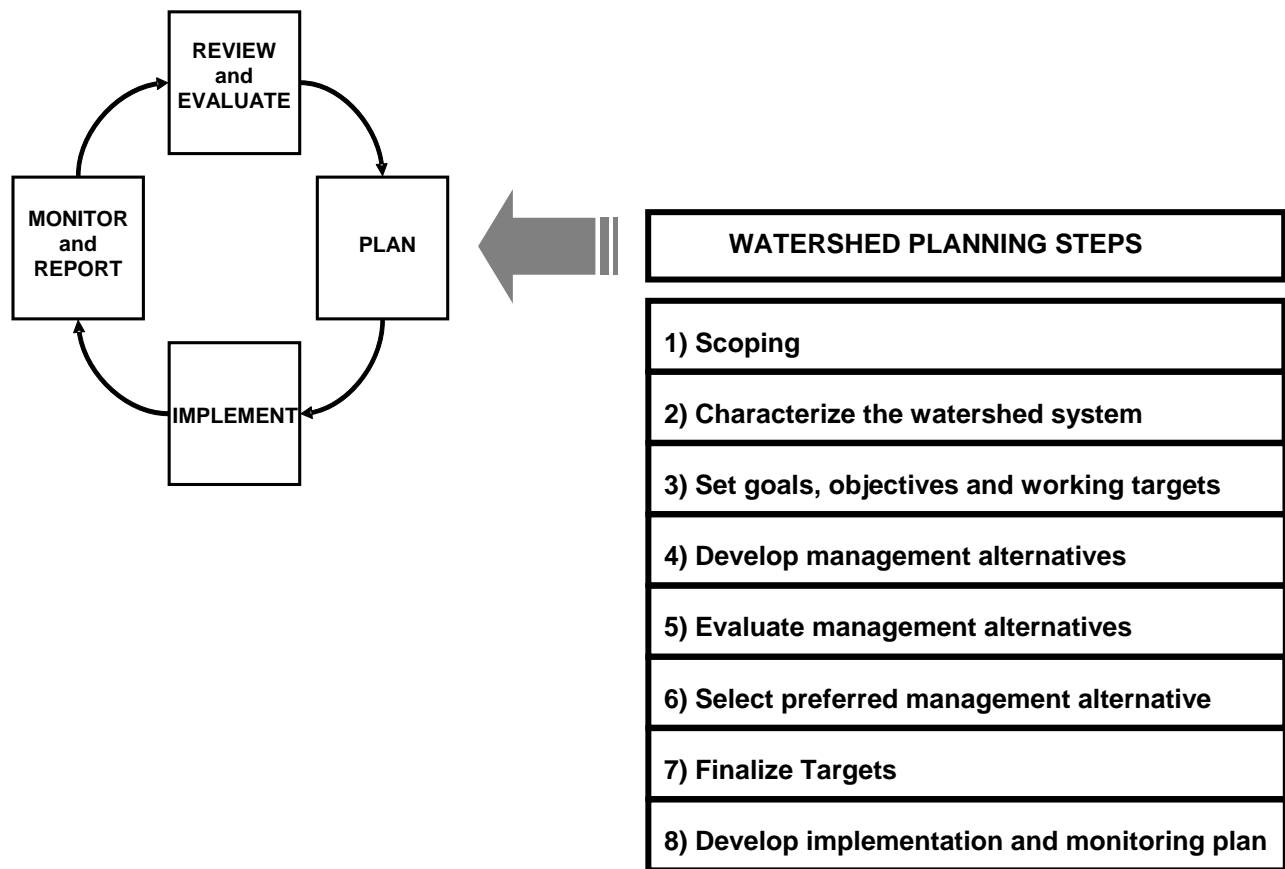


upon an assessment of pressures and stresses within watersheds, or based on the available information on various watersheds.

Figure 3 shows the watershed management process – plan, implement, monitor and report, review and evaluate – and the suggested steps to follow in preparing a watershed plan. It is suggested that municipalities follow the basic process and steps illustrated in Figure 2 when preparing ORM watershed plans.

The remainder of this section describes each of the watershed planning steps, with a focus on fulfilling the watershed plan requirements of the ORMCP.

**Figure 3 Watershed Management Process and Watershed Planning Steps**



Adapted from: "Watershed Management in Ontario: Lessons Learned and Best Practices".  
Conservation Ontario, 2003

## 1 - Scoping

Watershed partners and stakeholders should work cooperatively to ensure that the watershed plans meet the intent of the ORMCP. Approval authorities may choose to prepare a workplan, as a guide to the planning process, to share with all partners.

### Managing Data and Information

Significant amounts of data and information from provincial ministries, federal departments, conservation authorities, municipalities, universities and colleges, and non-governmental organizations are available to support preparation of watershed plans. To assist in preparing watershed plans, and in implementing other components of the ORMCP, these data and information need to be accessible to those that need them.

Through Land Information Ontario (LIO)<sup>3</sup>, the Province has established a data warehouse of available information that will be useful to support watershed planning. These data are accessible to members of the Ontario Geospatial Data Exchange (OGDE)<sup>4</sup>. Additionally, the Province and many partners are documenting their data assets in the Ontario Land Information Directory (OLID)<sup>5</sup> – a freely-available tool to store metadata and allow internet searching.

The preparation and maintenance of watershed information in electronic, digital format is strongly encouraged. Existing data on the ORM, such as the Conservation Authorities Moraine Coalition Hydraulic Database, assembled for the York, Peel, Durham, Toronto/Conservation Authorities Moraine Coalition Groundwater Management Study, should be used in the preparation of the watershed plan.

The suggested scale for use in preparing watershed plans is 1:10,000 or larger. The analysis of geospatial related data should be at a level of detail appropriate to the scale. Where less accurate data are used, this should be clearly documented and the limitations posed by these data explained. All assumptions related to data reliability, interpretability and updating should be similarly documented.

### Defining the Study Area

The Moraine divides the watersheds draining south into western Lake Ontario from those draining north into Georgian Bay, Lake Simcoe, and the Trent River system.

Figure 4 (see p. 24 of this technical paper) shows municipal administrative boundaries in the context of watershed boundaries and the stream network on the Moraine as defined by the Province (digital files of this figure are available from the Province). Approval authorities may wish to use this figure to assist in delineating study areas (i.e. watershed areas) for preparing watershed plans. Note that watershed study teams may use more detailed mapping to define the actual study area boundaries.

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<sup>3</sup> [www.lio.gov.on.ca](http://www.lio.gov.on.ca)

<sup>4</sup> [www.lio.gov.on.ca/en/Exchange.htm](http://www.lio.gov.on.ca/en/Exchange.htm)

<sup>5</sup> [www.lio.gov.on.ca/en/oliddisclaimer.htm](http://www.lio.gov.on.ca/en/oliddisclaimer.htm)

Many watersheds defined for streams originating on the ORM are not located entirely within the ORM. The subwatershed boundaries presented in Figure 4 are suggested as the minimum study area units for preparing a watershed plan. Because aquifers situated and recharged beneath the ORM often discharge off the Moraine, it is strongly recommended that analyses consider entire watersheds. Watershed plans are to be prepared on a watershed basis, but the ORMCP only requires that the recommendations be applied in the ORM portion of the watershed.

### **Working Cooperatively**

Approval authorities should work cooperatively with each other in areas where watershed boundaries overlap two or more jurisdictions. The Watershed Action Guide (see Sources of Additional Information) provides excellent guidance on developing effective and cooperative teams for watershed management.

#### **Conservation Authorities**

Conservation Authorities (CAs) are municipal and provincial partnerships formed on a watershed basis for conservation, restoration, development and management of natural resources, flood prevention and environmental protection. CAs are experienced in water and natural resource management across municipal boundaries, and provide watershed related technical resources and expertise. Nine CAs across the ORM have united as the Conservation Authorities Moraine Coalition to advocate for and protect the ORM. The Coalition was formed in response to the need for a comprehensive policy, planning and management approach geared to sustaining the health of the entire Moraine.

## **2 - Characterize the Watershed System**

The purpose of this step in preparing the watershed plan is to identify, analyze, and evaluate watershed-specific constraints and opportunities in land-use. This will require the watershed study team to assemble existing data and/or collect new data pertaining to various aspects of the watershed system, perform spatial and temporal trend analyses of the data, and evaluate the implications of the analyses. It may be useful to use models to help characterize certain aspects of the watershed system.

Aspects of the watershed system that should be considered include:

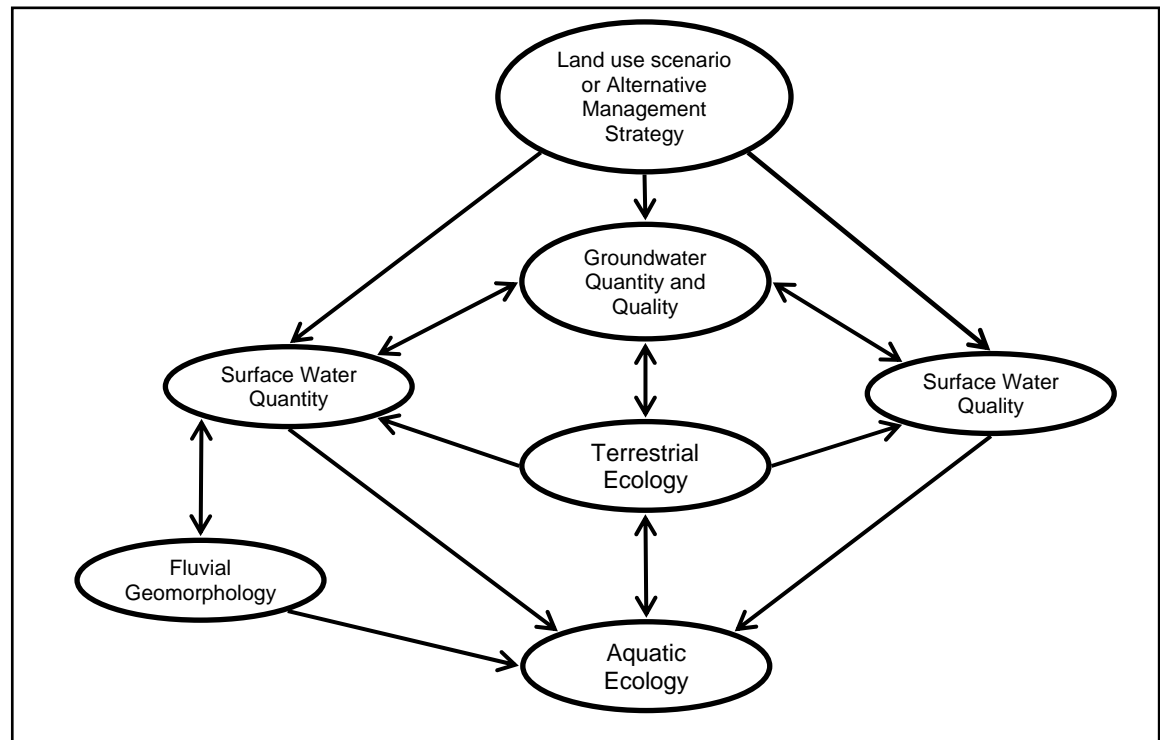
- aquatic ecology;
- terrestrial ecology;
- groundwater quality and quantity;
- surface water quality and quantity;
- hydrology;
- fluvial geomorphology;
- hydrogeology;
- water budget;

- flow regime (hydrograph);
- landform;
- soil types/geologic units;
- extent of wetland and forest natural cover;
- land use;
- impervious cover;
- socio-economic/recreational; and
- water resources issues and conflicts.

Wherever possible and appropriate, a Geographical Information System (GIS) should be used to organize, analyze, and display information.

The functional linkages between the various aspects of the watershed system should also be characterized. Although the watershed may be reduced to its constituent components for scientific study, the linkages between components should also be studied, as well as the system as a whole. Therefore the analysis should recognize the interrelationships between the components, as illustrated conceptually in Figure 5.

**Figure 5 Interrelationships between components of the Watershed System**



Adapted from: Toronto and Region Conservation Authority, Credit Valley Conservation, and Bill Snodgrass

### **3 - Set Goals, Objectives and Working Targets**

Based on the scoping and watershed characterization exercise, the provisions of the ORMCP and the land use planning policies of the approval authority, preliminary goals, objectives and working targets should be identified.

Goals are the qualitative descriptions of desired conditions. They are derived from the ORMCP and the watershed planning process, and provide direction for planning and management within the watershed. However, watershed managers require an operational definition of the goals – objectives of increasing focus, rigour, and achievability are developed to more specifically define the conditions required to meet the goals.

Section 24 of the ORMCP requires that the objectives and requirements of each watershed plan be incorporated into the municipality's official plan. The Section 24 requirement is important because management should begin with a clear image of the end in mind. Table 2 outlines suggested steps involved in formulating management objectives. Resources and references offering additional guidance on developing and evaluating watershed goals and objectives can be found at the end of this technical paper.

**Table 2 Steps for formulating management objectives**

<b>STEP 1</b>
<i>Identify the boundaries of the ecosystem (e.g. a watershed).</i>
<b>STEP 2</b>
<i>(a) Form the initial collaborative team. Determine the individuals, groups and agencies, whose management decisions or actions have the potential to most greatly affect the condition of the ecosystem and who wish to collaborate management.</i>
<i>(b) Collaboration requires negotiation: agree on a process for negotiating agreement among collaborators.</i>
<b>STEP 3</b>
<i>Assess the past and present condition of the ecosystem.</i>
<b>STEP 4</b>
<i>(a) Define causality: assess how human activities have likely changed the condition of the ecosystem.</i>
<i>(b) Determine if the initial collaborative team is sufficient to manage human activities given the apparent values and the type and direction of historical changes in the condition of the ecosystem. Identify and screen new candidates.</i>
<b>STEP 5</b>
<i>Determine the desired condition of the ecosystem. Use a facilitated public forum to further refine the assessment by discussing interests and values, to identify a vision statement for each value, and to help identify valued ecosystem components.</i>
<b>STEP 6</b>
<i>Form a final collaborative team of implementers.</i>
<b>STEP 7</b>
<i>Use all previous information to formulate an initial set of objective statements. Organize them into ecological groupings so dependencies are made obvious.</i>
<b>STEP 8</b>
<i>Organize objectives into the three categories (i.e. maintenance, rehabilitation, and enhancement). Evaluate each objective, and ecologically co-dependent objectives, against the strategic directions, ideals and assessment criteria contained in Table 3. Objectives are complete and the process is finished if these are satisfied and when there is no possibility of misinterpretation – exit the steps.</i>
<b>STEP 9</b>
<i>Refine and tailor objective statements which do not satisfy step 8. Determine data or knowledge needed to refine objectives which do not satisfy the criteria and principles contained in Table 3. Prioritize these needs and decide what must be collected. Collect it.</i>
<b>STEP 10</b>
<i>Return to STEP 8.</i>
<i>From: Gordon, Mark. 1998. "Formulating Objectives for Management on an Ecosystem Scale", page 7.</i>



**Table 3 Summary of the strategic directions which should govern the final number, form and content of management objectives**

### **Underpinning Management Perspective**

An ecosystem approach to management should be used to formulate management objectives, including:

- (1) define the ecosystem boundaries
- (2) establish values first; then ecosystem realities
- (3) ensure that ecological knowledge and understanding exists and is used
  - "System thinking" is used to understand an ecosystem and how it works.
  - Causality is sufficiently understood
  - Perceptual and cognitive biases are recognized
- (4) transdisciplinary integration of knowledge and understanding occurs

### **Ideals**

Management ideals should be:

- (1) effective
- (2) efficient
- (3) fair

Human activities are managed to realize management objectives

### **Strategic Directions of Management**

- (1) maintenance and protection of ecosystem structures and functional processes thereby preventing unwanted ecological changes
- (2) rehabilitation of ecosystem structures and functional processes
- (3) enhancement of ecosystem structures and functional processes

### **Assessment Criteria**

Management objectives should be:

- (1) clearly worded
- (2) achievable
- (3) verifiable
- (4) ecologically complete
- (5) accountable

*Adapted from:* Gordon, Mark. 1998. "Formulating Objectives for Management on an Ecosystem Scale".

Watershed goals and objectives set the stage for the development of specific indicators, measures, and targets. Targets are specific, quantitative benchmarks for a measure which may vary in time and space. The ORMCP specifies that a watershed plan shall include criteria (targets) for evaluating the protection of water quality and quantity, hydrological features, and hydrological functions (ORMCP s. 24(3)(f)). For example, with respect to hydrological features, targets could be developed for stream ecosystems, kettle lake ecosystems, wetland ecosystems, and aquifers. The Water Budget Technical Paper (ORMCP Technical Paper #10) provides additional guidance on establishing watershed targets, with examples related to water quantity in particular. An example related to water quality is shown in Table 4 which outlines optional approaches for setting water quality targets.

**Table 4 Approaches to Setting Targets for the Protection or Restoration of Water Quality**

Set targets based on some combination of the following methods:

- (1) Water quality standards
  - Provincial Water Quality Objectives (e.g. for total phosphorus, dissolved oxygen)
- (2) Defined uses
  - recreation (e.g. frequency of algal blooms)
  - fish habitat (e.g. temperature and dissolved oxygen)
- (3) Comparison to other waters in the ecoregion
  - establish regional reference conditions
- (4) Existing condition
  - maintenance of existing baseline condition
  - proportional change from existing baseline condition
- (5) Historical condition
  - restoration of historical condition
  - proportional change from historical condition

Adapted from: "Lake Wilcox Remediation Strategy". Gartner Lee Limited and Freshwater Research. 1996.

#### **4 - Develop Management Alternatives**

At this step it is necessary to assess whether or not the existing or predicted conditions within the watershed satisfy the targets. The required management options may be classified as maintenance, improvement, or restoration. Models (e.g. water budget models) could be used in a predictive mode to assess the response of the watershed to alternative scenarios (e.g. land use changes, water conservation, restoration of natural areas, climate change). Alternative management options capable of meeting watershed targets are developed.

#### **5 - Evaluate Management Alternatives**

At this step the alternative management options are evaluated using a decision-making framework and established criteria.

The evaluation of alternative options should include:

- an examination of the ability of the option to maintain, improve or restore water quality and quantity;
- an examination of the ability of the option to maintain, improve or restore ecological integrity;
- the cost and feasibility of the alternative; and
- the efficacy of implementation mechanisms (e.g. official plans, zoning by-laws, permits, guides, watershed stewardship, etc.).

#### **6 - Select a Preferred Management Strategy**

The overall preferred strategy should describe more detailed component parts as they apply in the context of the watershed, such as:

- Water Budget;
- Water Conservation Plan;
- Development of Subwatershed Plans;
- Greenlands Strategy;
- Pollution Prevention Plan;
- Stormwater Management Strategy; and
- Restoration Plan.

The preferred management strategy should demonstrate:

- consistency with the ORMCP;
- that the aquatic ecosystem will be maintained and where possible improved;
- that groundwater and surface water quality and quantity will be maintained, and where possible improved;
- a clear plan for establishing a monitoring program;
- a clear plan for implementing water conservation measures; and
- a clear plan for addressing critical data gaps and deficiencies.

## 7 - Finalize Targets

Approval authorities should review working targets and the preferred management strategy with landowners, water users, and key stakeholder groups in the watershed. Targets will be finalized after the review and specific, doable actions identified.

## 8 - Develop Implementation and Monitoring Plan

### Implementation Plan

In completing the watershed plan, municipalities should develop detailed recommendations that describe roles, responsibilities, and schedules for implementing various components of the watershed plan including, for example:

- how planning (e.g. official plans and zoning bylaws) and regulatory tools will be employed to achieve watershed management goals and objectives;
- how water conservation measures and incentives are to be introduced;
- introducing a decision-making model to consider the impact of resource and development decisions on the watershed water budget;
- how remediation and restoration work are to be completed;
- specifying necessary additional data collection;
- identifying research and stewardship activities that are to be undertaken; and
- developing an environmental monitoring plan.

The objectives and requirements of watershed plans should be incorporated into both upper-tier and lower-tier municipal official plans (ORMCP s.24(2)). The upper-tier official plan should provide policy direction to the lower-tier municipalities with respect to incorporating the recommendations of the watershed plan into their official plans, secondary plans, and zoning by-laws. The lower-tier plans and zoning by-laws should provide more detail.

The York Peel Durham Groundwater Study and the Conservation Authorities Moraine Coalition are developing a framework for translating watershed plan recommendations into municipal official plan policies (see “Watershed Planning from Recommendations to Municipal Policies: A Guidance Document, available at: [www.trca.on.ca](http://www.trca.on.ca)).

The watershed plan team should strive to keep the public and watershed stakeholders involved in implementing the watershed plan, for instance by encouraging them to participate in restoration projects. The watershed plan should also encourage both public and private sector stakeholders to take responsibility for monitoring and watershed stewardship, for example by promoting community-based monitoring programs with schools, special interest groups, and neighbourhood associations.

## Monitoring Plan

Figure 6 shows a suggested hierarchy of monitoring related to the water provisions of the ORMCP. The scope of monitoring will vary for each program or project based on the requirements of the ORMCP, environmental targets identified in a plan, and specific conditions of an approval.

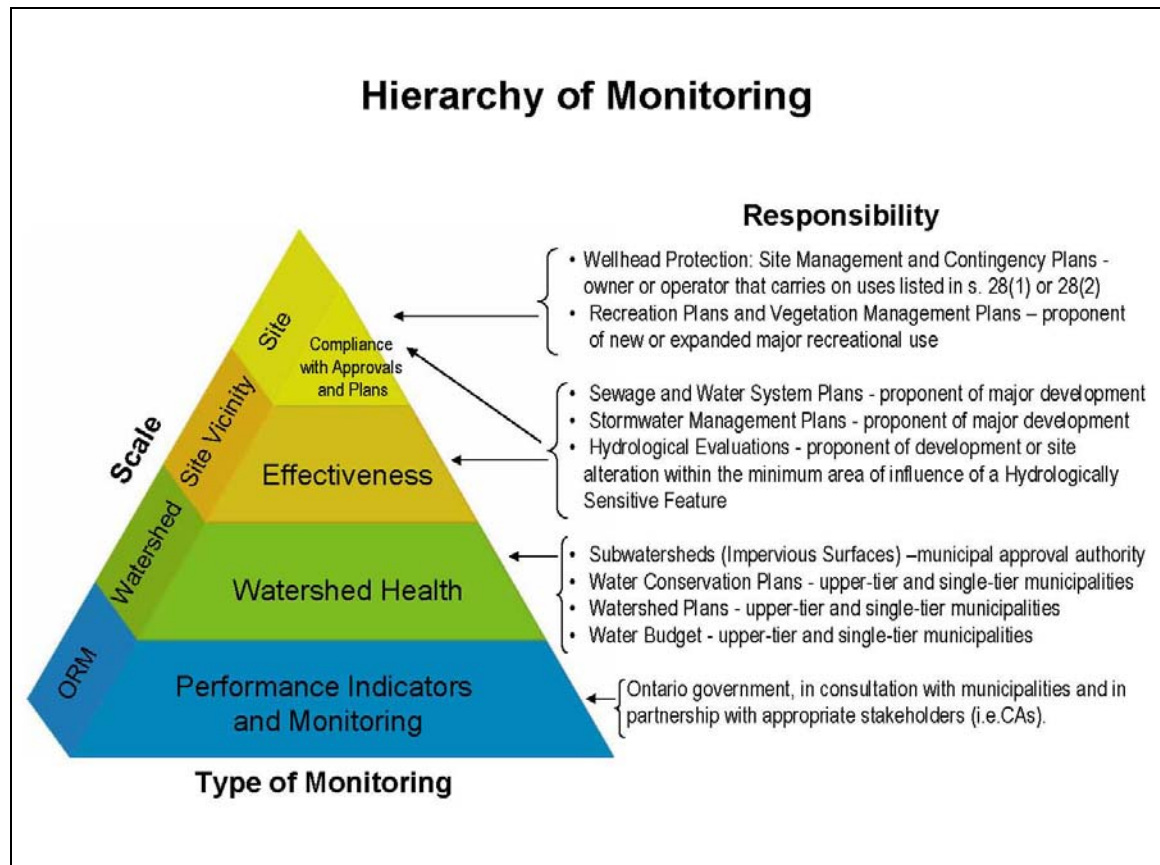
It is suggested that details of the monitoring to be undertaken, such as the frequency at which samples will be collected or observations made, the locations to be monitored, the methods to be used, and the duration of monitoring be designed to suit the specific needs of the particular program or project.

The Ontario government, in consultation with approval authorities, shall over time identify performance indicators for monitoring the effectiveness of the ORMCP (see the Implementation section of the ORMCP). The Province, in partnership with appropriate stakeholders, shall establish a monitoring network to collect, summarize, and evaluate performance indicator data to:

- assess changes in the ecological integrity of the Moraine;
- assess the effectiveness of the policies of the Plan in achieving the Plan's vision and objectives;
- help identify improvements that would address problems encountered in implementing the Plan.

In addition to satisfying the needs of local watershed plans or specific projects, monitoring at the other scales (i.e. at the site, site vicinity, and watershed scales) may provide valuable information that will contribute to the overall monitoring of the ORMCP.

Figure 6 Hierarchy of monitoring related to the water provisions of the ORMCP



The watershed plan should include an outline of proposed monitoring to be undertaken. The ORMCP (s. 24(3)(d)) specifies that a watershed plan prepared by the upper-tier or single-tier municipality shall include an environmental monitoring plan.

The purpose of the environmental monitoring is to evaluate the success of the watershed plan’s land and water use and management strategies at achieving the watershed management goals and objectives. Consistent with an adaptive management approach, feedback from the monitoring should be used to:

- assess progress with respect to meeting the targets established for protecting water quality and quantity, hydrological features, and hydrological functions;
- trigger corrective responses or additional management actions; and
- identify if any revisions to the management goals, objectives, or targets are necessary.

The watershed plan should specify who will take responsibility for ongoing environmental monitoring within the watershed. Approval authorities may wish to consider working together to implement monitoring programs over a number of watersheds. As well, the ORMCP watershed plan monitoring could be



integrated with existing watershed monitoring programs, for example, those maintained by conservation authorities.

## **7 Requirements for Major Development Prior to Completion of a Watershed Plan**

Prior to the completion of a watershed plan, the following provisions from the ORMCP apply to applications for major development:

### **24(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 availability, quantity and quality of water sources, and*
    - (C) identifies water conservation measures.*

Several of these requirements, such as the identification and protection of hydrologically sensitive features and related functions and the demonstration of a sustainable water supply, are the same as those that apply once a watershed plan is in place. Guidance to assist with meeting these requirements can be found in a series of technical papers for the ORMCP.

The Technical Papers regarding Water Budgets and Water Conservation Plans have been prepared to assist with the preparation of water budgets and water conservation plans at a watershed scale. These technical papers should also be consulted when completing this requirement for a major development, and adapted to the appropriate scale for the proposed major development.

## **8 Reviewing and Updating Watershed Plans**

The watershed plan should be viewed as a living document that will evolve in response to management activities that have been implemented, as well as changes in environmental conditions, scientific understanding, or stakeholder priorities. Watershed plans should therefore be updated in time for changes to be incorporated into official plans on a five-year basis, or at the very minimum in time for the ten-year provincial review of the ORMCP.

## 9 References and Resources

The following sources provide additional guidance and information to assist in preparing watershed plans.

### Provincial Guidance and Reports

- Gordon, Mark. 1998. Formulating Objectives for Management on an Ecosystem Scale. Ontario Ministry of the Environment. ISBN 0-7778-7706-6  
[www.ene.gov.on.ca/programs/3672e.pdf](http://www.ene.gov.on.ca/programs/3672e.pdf)
- Ministry of Environment and Energy and Ministry of Natural Resources. 1993. Watershed Management on a Watershed Basis: Implementing an Ecosystem Approach. Publication 3109. [www.ene.gov.on.ca/programs/3109e.pdf](http://www.ene.gov.on.ca/programs/3109e.pdf)
- Ministry of Environment and Energy and Ministry of Natural Resources. 1993. Integrating Water Management Objectives into Municipal Planning Documents. Publication 3110. [www.ene.gov.on.ca/programs/3110e.pdf](http://www.ene.gov.on.ca/programs/3110e.pdf)
- Ministry of Environment and Energy and Ministry of Natural Resources. 1993. Subwatershed Planning. Publication 3111. [www.ene.gov.on.ca/programs/3111e.pdf](http://www.ene.gov.on.ca/programs/3111e.pdf)
- Provincial Watershed Management Committee. 1998. Watershed Action Guide: A Practical Guide for Building Partnerships, Projects and Processes for a Sustainable Watershed, prepared by UMA Environmental Inc. [www.trentu.ca/wsc/pub\\_wateractgd.shtml](http://www.trentu.ca/wsc/pub_wateractgd.shtml)
- Watershed Planning Implementation Project Management Committee. 1997. An Evaluation of Watershed Management in Ontario, released by Ministry of the Environment and Energy and Ministry of Natural Resources. Publication # 3513. ISBN 0-7778-5889-4 [www.ene.gov.on.ca/programs/3513e.pdf](http://www.ene.gov.on.ca/programs/3513e.pdf)
- Watershed Planning Implementation Project Management Committee. 1997. Inventory of Watershed Management Projects in Ontario, released by Ministry of Environment and Energy and Ministry of Natural Resources 1990-1995. Publication # 3546. ISBN 0-7778-6195-X [www.ene.gov.on.ca/programs/35460.pdf](http://www.ene.gov.on.ca/programs/35460.pdf)

### Watershed-Based Pilot Projects

A series of watershed-based pilot projects undertaken by Conservation Ontario in partnership with the Ministry of the Environment and the Ministry of Natural Resources: [www.conservation-ontario.com/projects/watershed\\_pp.html](http://www.conservation-ontario.com/projects/watershed_pp.html)

The Ministry of the Environment, in partnership with the Lake Simcoe Region Conservation Authority (LSRCA) and Nottawasaga Valley Conservation Authority (NVCA) invested in an Assimilative Capacity Study addressing technical and scientific aspects that impact 2 major watersheds within the Nottawasaga River and Lake Simcoe, 35 tributaries and 32 sub-watersheds that cross the 35 municipalities: [www.assimilativecapacity.info/about\\_us\\_bkgnd.htm](http://www.assimilativecapacity.info/about_us_bkgnd.htm)

## **Other Resources**

*Professional Geoscientists Act, 2000:*

[www.e-laws.gov.on.ca/DBLaws/Statutes/English/00p13\\_e.htm](http://www.e-laws.gov.on.ca/DBLaws/Statutes/English/00p13_e.htm)

*Professional Engineers Act, 1990:*

[www.e-laws.gov.on.ca/DBLaws/Statutes/English/90p28\\_e.htm](http://www.e-laws.gov.on.ca/DBLaws/Statutes/English/90p28_e.htm)

Figure 4 Municipal administrative boundaries and watershed boundaries on the Moraine as defined by the Province

