

ESTABLISHING ENVIRONMENTAL FLOW REQUIREMENTS

Synthesis Report



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The Ontario Ministry of the Environment (MOE) regulates water takings in Ontario through the Permit to Take Water (PTTW) process. Low water levels in parts of southern Ontario in recent years, together with heightened public awareness of the sensitivity of the water resource, led to a review by MOE of the permitting process for water takings. A two step review process was initiated in 2002:

Step 1 involved evaluation of the best scientific practices available for assessing the impact of water taking. This first step has been completed and is summarized in the document *Best Practices for Assessing Water Taking Proposals* (Gartner Lee Limited, 2002). A key recommendation of the Best Practices document was that the Ministry test in Ontario methods for defining the instream flow needs of aquatic ecosystems.

This report summarizes the results of **Step 2**, which included verifying existing methods for assessing instream flow needs and establishing new methods where required.

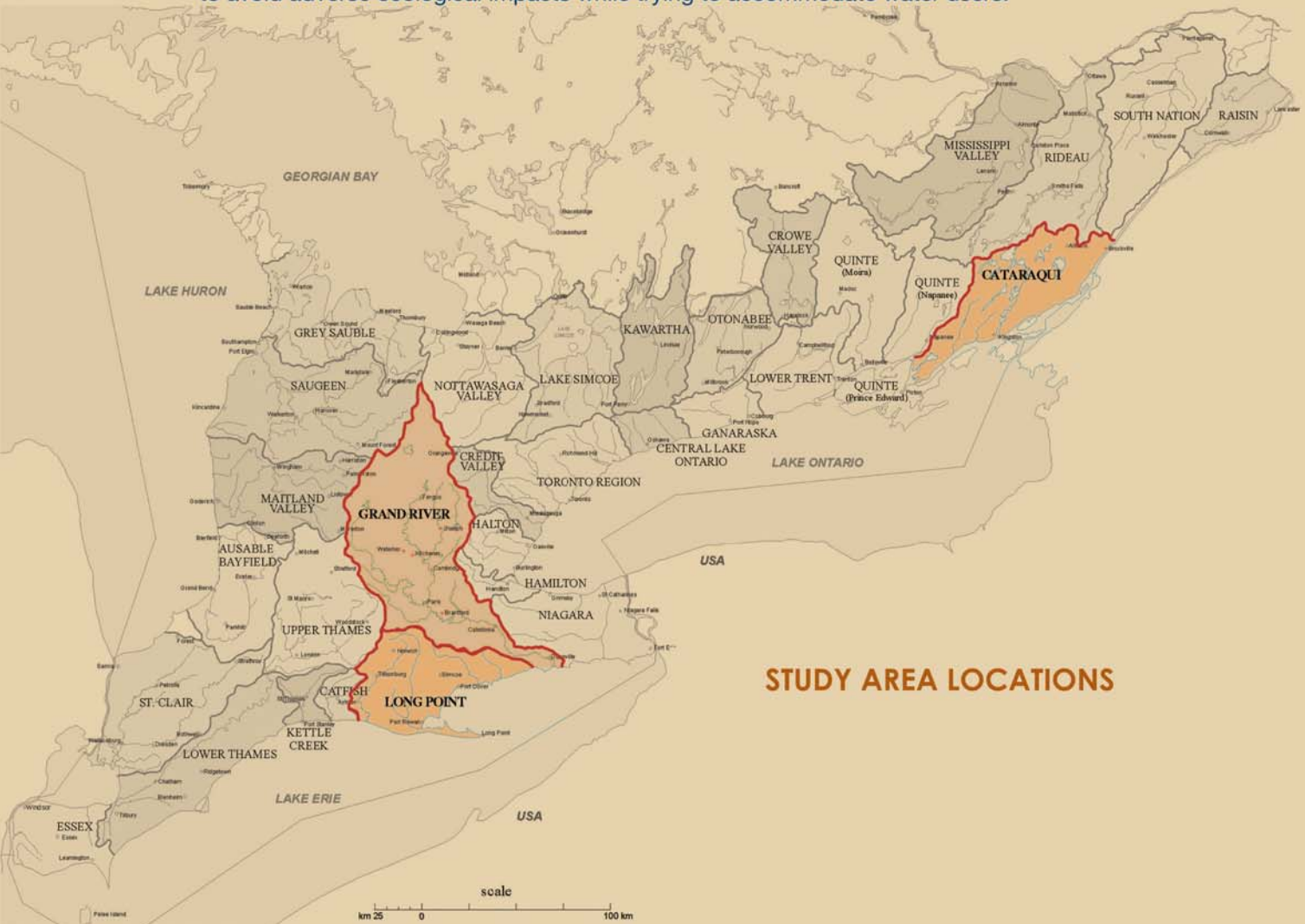
As a result of these projects, the Ministry will be able to continue to improve the permitting process on the basis of sound scientific and public participation principles. As well, while the main goal of the pilot project is to ensure better management of water taking activities, the findings also have implications for other types of water resource related activities, including source water protection planning, headwater stream protection, stormwater management, land-use development, reservoir operations, and stream restoration studies.

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STUDY APPROACH

Three Conservation Authorities (CAs) - Long Point Region Conservation Authority, Cataraqui Region Conservation Authority and Grand River Conservation Authority - were selected to carry out pilot projects. The three CAs were selected because collectively they represent a range of watershed conditions and types of water taking permits across southern Ontario. Studies were organized into two components:

- Testing, comparison and validation of various approaches for setting environmental flow requirements in a variety of watersheds. The goal was to identify easy to use, hydrologic-based approaches for Ontario that give ecologically meaningful threshold flows.
- Developing a process or framework to estimate environmental flow requirements within a given watershed to avoid adverse ecological impacts while trying to accommodate water users.



A Synthesis Report was prepared to assess the results of the three pilot projects in the following key areas:

- effectiveness/value of the approach, methods used and findings;
- data requirements, level of detail, and types of information to be collected/summarized in the field component and in the review and synthesis of available information;
- applicability of the approach and findings to other watersheds; and
- comparison of the methods evaluated in terms of cost, suitability, accuracy and transferability.

The report presents major conclusions and recommendations for future initiatives.

CONCLUSIONS

Each of the studies examined a number of diagnostic tools, field data collection methods, and a range of methods to assess water taking effects and to define instream flow thresholds. All studies concluded that the establishment of instream flows should begin with a thorough understanding of the management objectives for the watershed, which typically include fish and wildlife, water quality, water quantity, channel morphology and sediment regime, aesthetics and groundwater. Due to high demands and low flow conditions during dry summer periods, management of water takings is critical at these times. However, the potential effects of large takings during the spring and the effects of abstractions on critical over-wintering habitat also need to be considered. It is necessary to move beyond consideration of a single, minimum threshold flow in order to address the seasonal requirements of aquatic habitat. Some key findings:

- Setting instream flow requirements calls for a multidisciplinary approach and must consider hydrologic, hydraulic, fluvial geomorphic, water quality and aquatic habitat elements.
- An Adaptive Environmental Management approach for establishing instream flow requirements should be used to provide a framework and decision-making process. This would incorporate a monitoring program to provide feedback on the effectiveness of the selected methodology in meeting the instream flow objectives.
- A number of the methods tested showed promise as diagnostic tools and in transferring approaches to ungauged water systems, including the Tessman approach, Indicators of Hydraulic Alteration (IHA)/Range of Variability Approach (RVA), and the Ontario Flow Assessment Techniques (OFAT). These methods require further testing, development and “fine tuning”.

A Decision Support System approach is recommended for establishing the appropriate level of investigation and instream flow method for other watersheds (including ungauged systems). Prior to initiating the scoping exercise, it is important to first define Watershed Management Objectives/Principles in terms of general instream targets, such as a restored fish community, a stabilized channel cross section, wetland protection. These management objectives are key to determining the sensitivity of the system to water takings. Scoping requires a staged assessment of watershed conditions, watershed vulnerability to stress and size of current/anticipated water taking, as follows:

- Level 1 - Screening: assessing the potential that water takings may exceed ecological thresholds
- Level 2 - Detailed Evaluation: undertaking limited field investigations and possibly simulation modeling to further refine ecological thresholds and confirm water taking effect
- Level 3 - Full Ecological Flow Assessment: a detailed analysis of the full range of ecological flow requirements and a sensitivity analyses to confirm the relationship of key variables to different levels of water taking

Decision Support System Framework

AEM Decision Hierarchy	Recommended Method	Column 1	Column 2	Column 3
		Scale of Effect	Watershed Sensitivity	Magnitude of Water Taking
Level 1: Screening	1. OFAT 2. Tessman	Watershed	Low	Low
Level 2: Detailed Assessment	1. Tessman 2. IHA/RVA	Subwatershed / Tributary	Moderate	Moderate
Level 3: Full Ecological Assessment	1. IHA/RVA 2. Detailed field studies	River Segment / Reach	High	High

The three pilot projects provide a foundation for establishing instream flow needs. However, other areas may need to be studied to complement existing findings, for example urban/urbanizing or flow regulation scenarios characteristic of watersheds undergoing change.

WATER TAKING PERMIT PROCESS

A new permitting process has recently been put into place by the MOE which more rigorously addresses potential impacts of water taking and recognizes that different types of water taking may pose different risks to the environment and other water users. The six principles of the PTTW process are:

- Principle #1 Uses an ecosystem approach that considers both water takers' reasonable needs for water and the natural functions of the ecosystem.
- Principle #2 Water takings are controlled to prevent unacceptable interference with other uses of water and to resolve such problems if they occur.
- Principle #3 Uses adaptive management to better respond to evolving environmental conditions.
- Principle #4 Considers the cumulative impacts of water takings.
- Principle #5 Incorporates risk management principles into the permit application/review process.
- Principle #6 Promotes public and local agency involvement.



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This project has received funding support from the Ontario Ministry of the Environment, however, the views expressed do not necessarily reflect those of the Ministry. Production of this brochure was funded by Fisheries and Oceans Canada



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