

Lake Management in Ontario

Gordon Miller

Ontario is a large jurisdiction in North America that spans terrain of vastly different bedrock and surficial geology and includes hundreds of thousands of inland lakes. These lakes are generally of excellent water quality and have a high recreational value to Ontario citizens and the many visitors they draw each year. Managing these lakes has always been a challenge due to the magnitude of the task but sincere and largely successful efforts have been made over the last 60 years and continue. This article will attempt to summarize and characterize those efforts.

Ontario also has watershed responsibility on the Canadian side of four of the five Great Lakes, but management of the Great Lakes involves quite a different and more complex ecology and policy structure. Management decisions are influenced by authorities in two federal governments, two provinces, and eight states. As a result, Ontario's role in Great Lakes management will not be discussed here.

Lake Management Policies in Ontario

Lake management policy started with the Ontario Water Resources Act (OWRA) in the 1950s, which created the first clear prohibition of water pollution and established policy authority to regulate water takings. As our understanding of watersheds and aquatic ecosystems developed, a more comprehensive approach to environmental management was needed. That came with the passing of the Environmental Protection Act (EPA) in 1972. Originally the intention was to replace the OWRA with the EPA but powerful wording in the pollution prohibition that had been

included in the OWRA during optimistic post-war years could not be duplicated in the more wary legislature of the 1970s so both statutes remain in effect to this day.

Those two pieces of legislation still form the foundation of the policies and programs that are in place relating to the management of lakes in Ontario. Periods of austerity have resulted in contractions and setbacks over the years but the long-term trend has been toward increased sophistication. Much of the enhancement of the policy regime over the years usually has been focused on a particular environmental problem or a challenged geographic area.

Examples of the former include the Nutrient Management Act that regulates the management of agricultural manure and other residues, the ban on residential and municipal use of cosmetic pesticides, and the Toxics Reduction Act, which focuses on reducing the industrial use of toxic substances. All of these policies seek to limit or remove the opportunity for polluting substances to find their way into watercourses.

Water quality challenges in various geographic areas of the province have arisen over the years as recreational and more recently residential development encroaches on the watersheds of inland lakes. There have been various responses in land use planning and environmental policy but state-of-the-art in Ontario is represented by the comprehensive and sophisticated approach to protecting and remediating Lake Simcoe. Decades of monitoring and attempts at watershed management have evolved into the Lake Simcoe Protection Act and the Lake Simcoe Protection Plan.

In addition to these policy approaches, The Clean Water Act requires communities to protect the quantity and quality of their drinking water sources through science-based source water protection plans. For communities drawing drinking water from lakes this results in certain restrictions and prohibitions in land use in the proximity of the intake.

Overview of Assessment Activities

Monitoring and assessment of the water quality of the vast number of lakes in Ontario has always posed an almost insurmountable challenge. Wide-scale monitoring has been going on for more than 50 years, but despite these efforts knowledge of the state of the lakes overall is limited. Although much of the populated south has been well studied, data in the lakes of the Canadian Shield are spotty and only in recent years has there been an attempt to develop baseline water quality and environmental information in what is termed the Far North ahead of industrial development. The Far North includes the great stretches of peat lands in the lowlands draining to Hudson and James Bay.

The solution to this conundrum of an unmanageable number of lakes has been to form a variety of partnerships and work on two geographic scales. At the broad scale, the Ministry of the Environment and Climate Change (MOECC) through its Dorset Environmental Science Centre (DESC) coordinates many monitoring partnerships involving the federal government, other provincial ministries, conservation authorities, municipalities, academic institutions, cottage and

environmental organizations, industry, First Nations, and volunteers. The best known is the Lake Partners Program, which has run for many decades and currently samples nearly 550 recreational lakes across Ontario.

In another broad-scale monitoring program, the DESC analyzes water samples collected from over 800 lakes as part of a fisheries management initiative of the Ministry of Natural Resources and Forestry (MNR). The sampled lakes range from being within 100 km of Lake Erie in the south to the same distance from Hudson Bay in the north resulting in the most representative data set to characterize Ontario lakes overall. Frequency graphs of these data for total phosphorus, dissolved organic carbon, calcium, and chloride are publicly available.

Another well-known broad-scale monitoring program is the *Guide to Eating Ontario Fish*, which has been published annually since 1977 by the MNR and MOECC. Although marketed as a public health service, the data from fish tissue samples collected in hundreds of lakes provide a long-term monitoring of metals and organic contaminants that bioaccumulate through the food chain.

To supplement the information provided by broad-scale monitoring, more geographically focused and frequent monitoring and more advanced scientific analysis is conducted in a number of areas of the province. At the center of these efforts is the DESC, which has for 40 years, intensely monitored lakes in central Ontario, including some fully calibrated watersheds where detailed geochemical modelling was undertaken. DESC is perhaps best known for its trailblazing acid precipitation research during the 1980s, but it continues to be a leading scientific center for lake research and limnology.

The aforementioned Lake Simcoe Protection Plan is another excellent example of focused lake management. Lake Simcoe has been the center of concern for many years because of eutrophication primarily from agriculture and loss of its lake trout fishery due to water quality, over-exploitation, and invasive species. But the recent encroachment into the watershed of urban sprawl from the south has given rise to the political will and available

funding to implement a serious effort at rehabilitation, which includes a Lake Simcoe Phosphorus Strategy with a target to reduce phosphorus levels by 40 percent.

In the far west of Ontario there is a multi-agency and civilian collaboration regarding the water quality of the Rainy River/Lake of the Woods basin. The coordinated monitoring and research is published in *State of the Basin Reports*. The pooling of expertise and resources allows for much more comprehensive analysis of watershed issues, including the ongoing effects of climate change.

Another collaboration facilitating lake monitoring and research is the Muskoka Watershed Council in south-central Ontario. The partnership pools the resources of the District Municipality of Muskoka and the DESC and produces a Muskoka Watershed Report Card that reports broadly on environmental conditions in the watersheds of a large area of the granitic Canadian Shield. A limnological problem of particular concern in this area is the decline in calcium concentrations to critical levels due to acid deposition, timber harvesting, and timber regrowth.

The Experimental Lakes Area in northwestern Ontario is well known for its pioneering research in the role of phosphorus in eutrophication, acid rain and lake acidification, and the deposition and movement of mercury in watersheds among other accomplishments. For many decades it was operated by the federal government of Canada, but in 2012 the government of the day defunded and attempted to close the facility. The Province of Ontario intervened with funding along with private donors and the facility was placed in the control of the International Institute for Sustainable Development. It is one of few locations that allow for whole-lake experimentation to be carried out in controlled conditions.

Funding of Watershed and Lake Management

Because of the collaborative and decentralized approach that has developed in watershed and lake management in Ontario it is difficult to provide information on expenditures made to support this activity. The MOECC spends approximately \$8.5 M per year on lake management. This includes activities such

as the monitoring of water quality, biota, and land use activities to assess aquatic ecosystems, as well as management initiatives, and volunteer partner programs to assess water quality. However, there is no spending estimate for the significant contributions other ministries and other agencies and volunteers as the costs of their participation is distributed throughout various parts of their operations.

There are no formal provincial level programs for shoreland protection, aquatic weed control, sediment control, and watershed best management practices but those activities are often undertaken locally by watershed management organizations known as Conservation Authorities (CAs), of which there are 36 in Ontario. The CAs are chartered by provincial legislation but most of their funding comes from the municipalities in the watersheds they manage. Periodically, provincial or federal grant money is made available for local lake or watershed initiatives subject to application and review.

Website Citations to Program Information and Data

The numerous studies and information sources referred to in this article are summarized in further detail along with links to reports and websites in the MOECC report entitled *Water Quality in Ontario 2014 Report* (<https://www.ontario.ca/page/water-quality-ontario-2014-report>).

Gord Miller is an ecologist and environmental policy analyst with many years of experience. He has worked in the manufacturing industry and consulting business as well as in academia as a professor.



Most of his career, however, has been spent in the public sector, starting as a scientist with the Ministry of the Environment and concluding his career by serving three five-year terms as Ontario's Environmental Commissioner. In that role he was an independent Officer of the Legislative Assembly overseeing and critically evaluating government decisionmaking on the environment, climate change, and energy conservation. Gord retired from that role in May of 2015. 🌱