

2 Introduction

2.1 Study Area – The Muskoka River Watershed

The Muskoka River watershed is located in central Ontario's lake country, with the main population centres being Huntsville, Bracebridge and Gravenhurst. Highway 11 bisects the watershed in a north/south direction (Figure 2.1). The watershed originates on the western slopes of Algonquin Provincial Park and extends southwesterly for a distance of some 210 km to Georgian Bay. It is 62 km at its widest point. The watershed encompasses an area of approximately 5100 km² and includes about 78,000 ha of lakes.

From its headwaters in Algonquin Park, the Muskoka River flows through a series of connecting lakes to two outlets in Georgian Bay (Figure 2.2). The watershed is divided into three subwatersheds: the North and South Branches, and the Lower Muskoka subwatershed (Figure 2.3). The North and South Branches comprise approximately the eastern two-thirds of the watershed, originating in the highlands of Algonquin Park. They flow southwesterly until converging in Bracebridge and then flow into Lake Muskoka. The Lower Muskoka subwatershed covers approximately the western one-third of the watershed, and receives the inflow from the North and South Branches as well as Lakes Joseph and Rosseau. This combined flow passes through the Moon and Musquash rivers and discharges into Georgian Bay.

The Muskoka River supports a wide range of aquatic and wildlife ecosystems, and numerous human uses, including water power generation, swimming, canoeing, boating, angling, hunting and trapping, and tourism operations. There are 42 water control structures (dams and/or dam/powerhouse combinations) on the Muskoka River system and three navigation locks. The MNR owns and operates 29 of the control structures, while the waterpower industry, [Ontario Power Generation (OPG), Algonquin Power, Bracebridge Generation, and Orillia Power Generation Corporation] own/operate 11 structures. The District Municipality of Muskoka owns and operates one while the remaining one is privately owned and operated.

Many of the original dams were constructed in the late 1880's to early 1900's to facilitate the transport of logs to sawmills or the diversion of water to power the mills, and to aid in commercial river navigation. Originally constructed of rock

and timber, many of these structures were taken over and rebuilt with concrete during the 1940 to 1970 period by the Ontario Department of Public Works (ODPW). In the early 1970's, the responsibility for the operation and maintenance of the dams was transferred from the ODPW to the MNR. Figures 2.2 and 2.3 shows the location of the various dams and other water control structures (i.e., generating stations) in relation to the watershed features.

Over time, the operational emphasis of some of the dams has evolved from one of commerce and transportation, to recreation, fisheries enhancement and flood control (during period of high flows). As the demand for recreational opportunities increased, so has the demand for shoreline cottage/holiday homes with the concomitant expansion of the tourism industry. The Muskoka River, and its connecting lakes and tributaries, now supports a range of economic, recreational and tourism activities that are enjoyed by residents and visitors year-round.

Hydroelectric power generation has taken place on the Muskoka River since 1894. The 10 generating stations on the river system were constructed from that date through to 1950. In 1940, the Ontario Government and the Hydroelectric Power Commission of Ontario (now Ontario Power Generation - OPG) signed the Hackner-Holden agreement, which formalized the control of lake levels and river flows within the Muskoka River drainage area. The agreement, amended in 1969, continues to form the basis of the operational management plans for many of the Muskoka lakes and their control structures* .

Since assuming responsibility for the majority of the control structures in the mid-1970's, the MNR has strived continually to improve their operation in a manner that recognizes the different, and changing needs and uses of the waterway (e.g., fish and wildlife, navigation, electric power generation, recreation, flood control) while still respecting the terms and conditions of the Hackner-Holden agreement. These adjustments are contained within the operating plans for each MNR dam (MNR, 1997), which are used to guide their operation and integrate them with the operating plans of the waterpower facilities. Dams operated by waterpower producers are all located in riverine sections of the watershed (i.e., none at the

* The 1940 Hackner-Holden Agreement established guidelines for selected water bodies within the Muskoka River watershed and focused on providing adequate flows for power generation while increasing the spring flood response capability (i.e., winter drawdown of lakes). The 1969 Amendment recognized the growing importance of recreational uses and ecological needs within the watershed, and revised the drawdown limits on some of the lakes. It also established fall and winter drawdown limits in most of the lake trout lakes to encourage trout propagation.

outlets of natural lakes) and have their own operational plans and strategies. While each facility has its own operating limits, these facilities are all considered ‘run-of-the-river’ as they have a limited water storage capability and limited ability to influence river flows. Most importantly, the operation of these facilities is coordinated with the operation of the MNR controlled structures to ensure that appropriate flow conditions are maintained.

The Muskoka River Water Management Plan focuses on the flows and levels within the Muskoka River and its managed lakes and tributaries. Forest management or land-based information may be referenced as background, but are not the primary focus of this plan unless they are directly related to water flow and level management.

2.2 Goals and Background

The goal of water management planning is to contribute to the environmental, social and economic well being of the people of Ontario through the sustainable development of waterpower resources and to manage these resources in an ecologically sustainable way for the benefit of present and future generations (MNR, 2002). This will be achieved through the management of water levels and flows as they are affected by the operations of waterpower facilities and associated water control structures.

MNR and the local waterpower companies (OPG, Orillia Power Generation Corporation, Bracebridge Generation and Algonquin Power) commenced the water management planning process for the Muskoka River in spring 2002 by collecting background information (ecological, social and economic), and reviewing the present operational management plans (i.e., water levels and flows) for the water control structures in the watershed. The Background Information Report [Acres & Associated (A&A)*, 2003a] documented the characteristics of the river system and identified the major issues and concerns relating to current operational practices. Subsequently, the Muskoka River Water Management Plan Planning Team identified which issues could be addressed by altered dam operations, as well as those that were outside the scope of the planning process.

* Acres & Associated Environmental Limited (A&A) was retained to undertake Phase 1 (Background Information Collection), with assistance from Acres International Limited (Acres). A&A reverted back to the parent companies in 2003 and Acres International Limited completed the rest of the project.

An Options Report (Acres, 2004) was then developed outlining the process that had been followed in reaching a preferred strategy for operating the various control structures. The following principals guide the preparation, review, approval and implementation of this plan.

2.3 Guiding Principles of Water Management Planning

In 2002, MNR finalized the guidelines for water management planning (MNR, 2002). The following principles guide the preparation, review, approval and implementation of this plan:

- **Maximum Net Benefit to Society:** Water management plans should strive to maximize the net environmental, social and economic benefits derived from the management of water levels and flows by waterpower facilities and other water control structures on a river.
- **Riverine Ecosystem Sustainability:** At a minimum, the water management plan should stop any on going degradation of a riverine ecosystem and seek to improve and, where possible, restore riverine ecosystems.
- **Planning Based on Best Available Information:** The best available information at the time of decision making must be used in water management planning. A key task in the planning process is to collate all existing baseline data and identify data gaps (this task was undertaken in A&A 2003a, Background Information Report).
- **Thorough Assessment of Options:** A thorough assessment of options for management of water flows and levels in a river system must be undertaken in an open and participatory way (this is explained in detail in Acres, 2004a Options Report).
- **Adaptive Management:** Changing the operation of water control facilities may affect complex ecological processes and interaction. These effects can be estimated but the actual degree of impact is not necessarily known. Adaptive management is a long-term process which allows for adjustments to the system on a continual basis to obtain improvements to resource management and limit failures. Monitoring of the system is essential to ensure that the anticipated effects of changes to flows and levels are realized. Information from the monitoring program will be used to determine whether further refinements to the plan are required.

- **Timely Implementation of Study Findings:** If study findings arise after the water management plan has been approved that are likely to improve social, environmental or economic benefits without having adverse impacts, they should be implemented in a timely manner.
- **Aboriginal and Treaty Rights:** Water management planning will be undertaken without prejudice to the rights of Aboriginal people.
- **Public Participation:** Public participation is required to ensure accountability and transparency in the planning process (details of the public consultation program are provided in detail in Appendix D).

Since the initiation of the water management planning process, increased emphasis is being placed on renewable energy options for the Province of Ontario. The Ontario government's strategic directions (Strategy 2.1), as outlined in 'Our Sustainable Future' (MNR, 2005) encourages economic growth for Ontario communities by providing new ventures in renewable energy (water, wind, co-generation, biofuels). MNR will plan and implement this direction through the 'preparation and review of policies to support wind and waterpower generation, including consideration of environmental effects, and implementation of site release policies to stimulate new opportunities. The waterpower industry supports these MNR initiatives.

In summary, the following plan has been developed under a cooperative, consensus-based approach. MNR and the waterpower industry proponents will maintain the cooperative working relationship established during preparation of the plan, and will assist each other when necessary in an ongoing working relationship.

2.4 Terms of Reference for Water Management Plan

Separate Terms of Reference were issued for each of the following phases of the water management plan:

- Phase 1 – Background Information Collection
- Phase 2 – Options Development, Plan Report and Implementation.

Phase 1

Phase 1 was carried out by A&A with support from local social (French Planning Services, Bracebridge) and natural environment (Tanith Enterprise, Huntsville) subconsultants and Acres International Limited (Acres) (hydrologic model setup and calibration). This phase included the following tasks:

- collection of all available background information on the Muskoka River watershed related to flows and water level operations
- determination of gaps in information and the need for further data compilation
- formation and coordination of a Public Advisory Committee (PAC)
- implementation of a public consultation program, consisting of open houses, presentations to stakeholder groups, establishment of an internet web site, and preparation of public consultation materials (i.e., project newspaper, questionnaire, mailouts, etc)
- maintenance of a public consultation record
- establishing a hydrologic model for the Muskoka watershed and undertaking a 'base case' model run of existing conditions
- preparation of a preliminary list of issues/conflicts to be addressed by the final plan (e.g., managing levels for one lake versus another, dam operations versus fisheries impacts)
- preparation of a Background Information Report summarizing the existing environmental features and sensitivities, dam operations and key issues/concerns, and an Executive Summary
- undertake a number of reviews/investigations to fill data gaps.

Phase 2

Acres was retained to finalize the water management plan. The following tasks were identified to complete the water management planning process:

- Evaluation of issues/conflicts identified in Phase 1, to determine those that could be addressed within the current operating framework, those requiring further studies, and those which were outside the water management planning process.

- Undertake additional investigations to fill priority data gaps.
- Develop general and specific goals and objectives for the water management planning process for the Muskoka River watershed using existing information, supplemented with data for additional studies.
- Refine hydrologic model, and undertake a series of runs (adjusting water levels and flows) to provide options for control structure operations.
- Develop evaluation criteria to compare and assess the merit of the proposed operating strategy with the current operating plans.
- Undertake public and First Nation consultation to present the preliminary preferred strategy.
- Prepare an Options Report summarizing the process undertaken to develop a new strategy for operating the water control structures on the Muskoka River system.
- Preparation of a Draft Plan (this document) summarizing the water management planning process and provide the proposed operating plans for each control structure. Monitoring plans are included to ensure the effectiveness of and compliance with the proposed strategy.
- Preparation of Final Plan, incorporating public and First Nation comments on the Draft Plan.

2.5 Issues, Resource Values and Interests Identified through Scoping

Through a series of Planning Team, PAC and Steering Committee meetings and discussions (Appendix A) a number of key values of the Muskoka River watershed were given primary consideration in the development of goals and objectives for the Water Management Planning process.

The more important values identified include the following:

- Many of the larger lakes and associated river reaches within the watershed are extensively developed for recreational use, with well established, long-term, high value infrastructure (cottages, boathouses, resorts, camps, etc).

- Recreational boating occurs to varying degrees on almost all watershed lakes, with commercial navigation (tour/sight-seeing boats) an important commercial activity on the larger lakes.
- Ecological conditions within the watershed are generally good, although the potential for improvement in specific areas was identified.
- The existing operational plan (as documented in the Muskoka River Dam Operation Manual, MNR, 1997) provided specific amounts of base flow below individual dams throughout the watershed. While these flow targets were often met in lower portions of the watershed, the provision of base flow in upper watershed river reaches and the specific contributions from individual lakes/reaches were less well defined.
- The dams have increasingly less ability to control water levels and river flows as inputs (i.e., rainfall) increase to the system. During high input periods, such as the spring freshet and other large seasonal storm events, limited control is exerted, and dams are intentionally opened to allow this flow to pass unhindered through the system.
- The waterpower sites within the watershed are all located on riverine portions of the watershed, and are essentially run-of-river operations (i.e., less than 48 hours of water storage as per draft Terra Choice Eco-Logo certification criteria). The release of water by the management and operation of the MNR controlled dams at the outlet of upstream lakes provides the flow required for the operation of these facilities.
- Existing structures have specific limits in terms of flow passage and water retention capability. Only water level and flow changes that could be accommodated within the operational constraints of the present structures should be considered.

2.6 Planning Objectives

A number of basic planning objectives were utilized in developing the water management plan for the Muskoka River system, as follows:

- Existing operational plans and the strategies employed therein to address river system issues and concerns will be the starting point for plan review and option development.

- Realistic goals and objectives will be established which seek to balance the water resource needs and uses of various interest groups.
- Existing, presently available information on river system characteristics and conditions will be utilized to the maximum extent in decision-making.
- It is recognized that this is the first cycle in an ongoing planning process related to water management, and that not all issues and concerns will be addressed in this cycle. Adaptive management will be utilized as a guiding principle to obtain incremental improvements over time.
- Monitoring and data collection programs arising from this plan will be utilized to verify that changes implemented during this round of planning are appropriate and effective in meeting the stated objectives.

General ecological, social and economic objectives, as well as specific objectives for individual river reaches and lakes within the river system were developed to assist with plan preparation, and are provided in future sections of this report (Sections 9 and 10).

2.7 Report Organization

This final water management plan is organized in 17 sections and 7 appendixes that presents background information and the preferred operating strategy for the Muskoka River system (in terms of flows and water levels). Section 1 identifies the plan partners and provides approval of the plan by their respective organizations. This section presents the rationale for water management planning and the goals and objectives for the Muskoka River system. Section 3 describes the physical and biological environment of the lakes and river segments within the system, while Section 4 describes the social and economic environment. Section 5 describes the water control structures within the river system and their current operating strategies, while issues, resource values and interest related to present water management activities are provided in Section 6. Initial data gaps and deficiencies are provided in Section 7, while baseline data collected during the preparation of this plan is summarized in Section 8. Section 9 describes the options development process, while Section 10 describes the evaluation criteria used to assess alternate operational strategies. Section 11 compares the preferred operating strategy with the existing operating plans, while Section 12 presents the detailed operating plans for each structure. Section 13 presents the compliance monitoring plan for the waterpower facilities, while Section 14 outlines the data

gaps, and science and information needs that will be assessed during the present iteration of the plan (to 2016). Section 16 presents the plan implementation strategy, while Section 17 outlines the details of the plan amendment, review and renewal process. Lists of tables and figures are provided within the report Table of Contents. Various abbreviations and/or acronyms are used throughout the report. A Glossary of Abbreviations is also provided at the front of the report in association with the Table of Contents.

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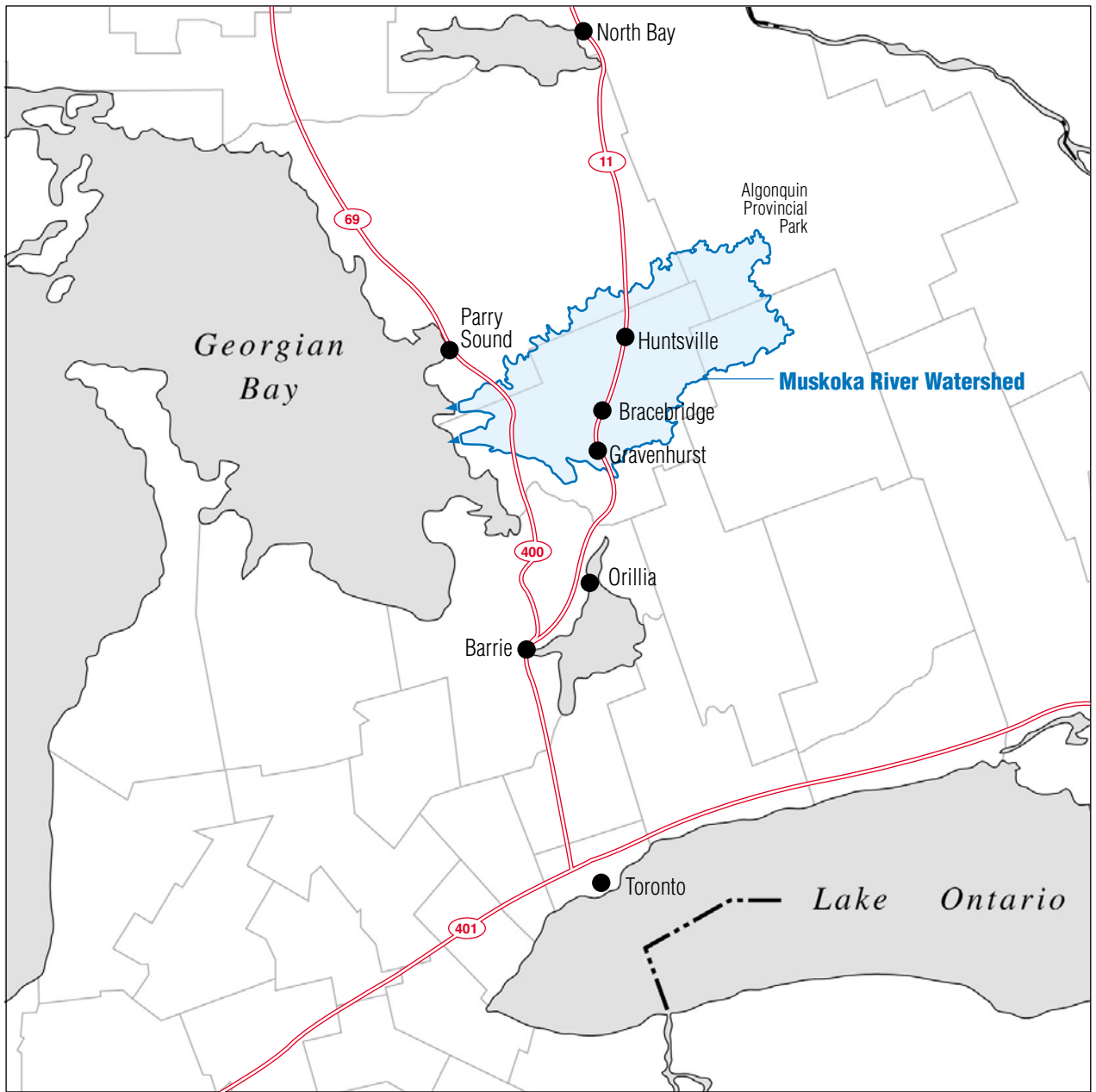


Figure 2.1
Muskoka River Water Management Plan
Location Map

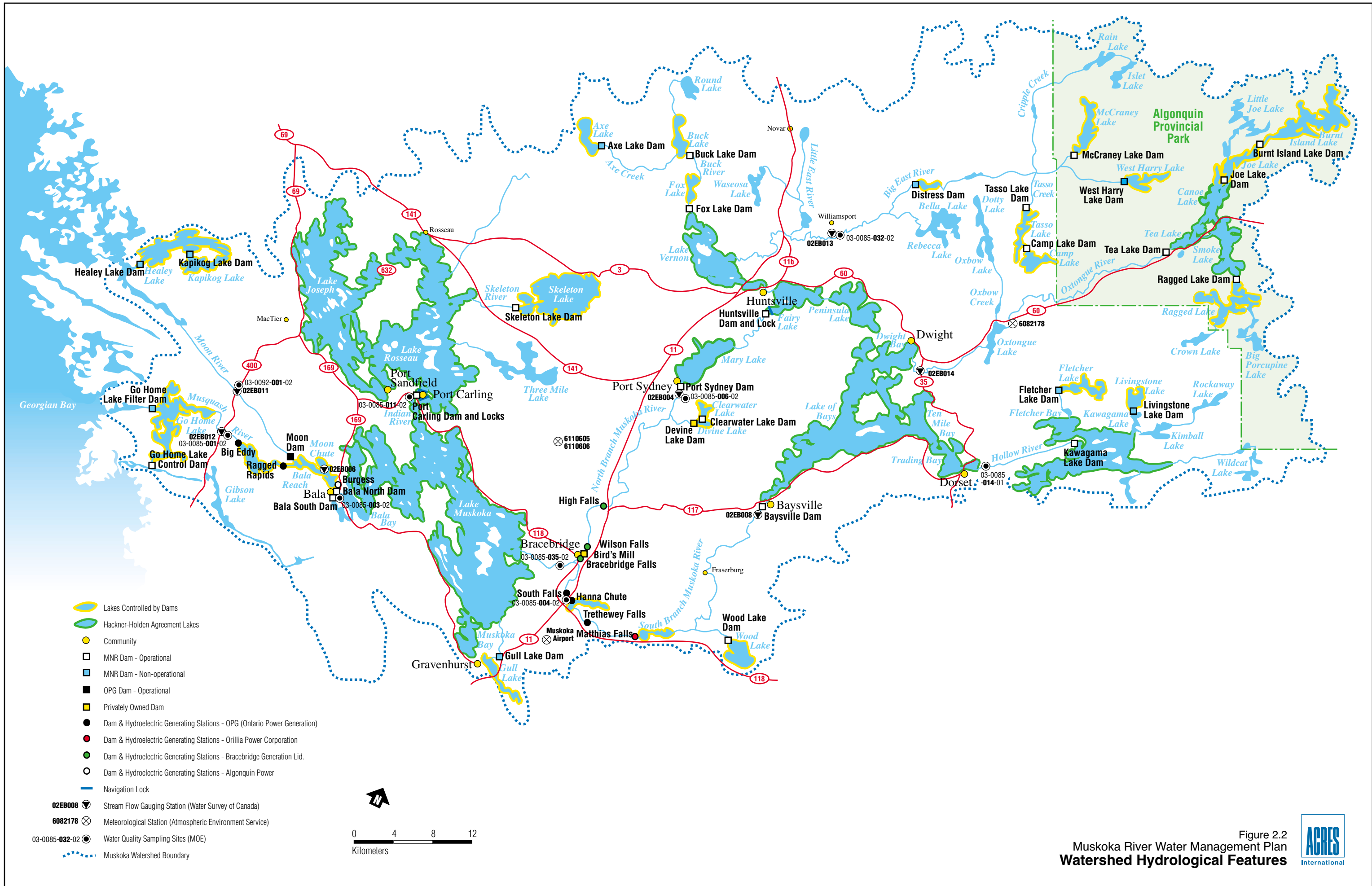
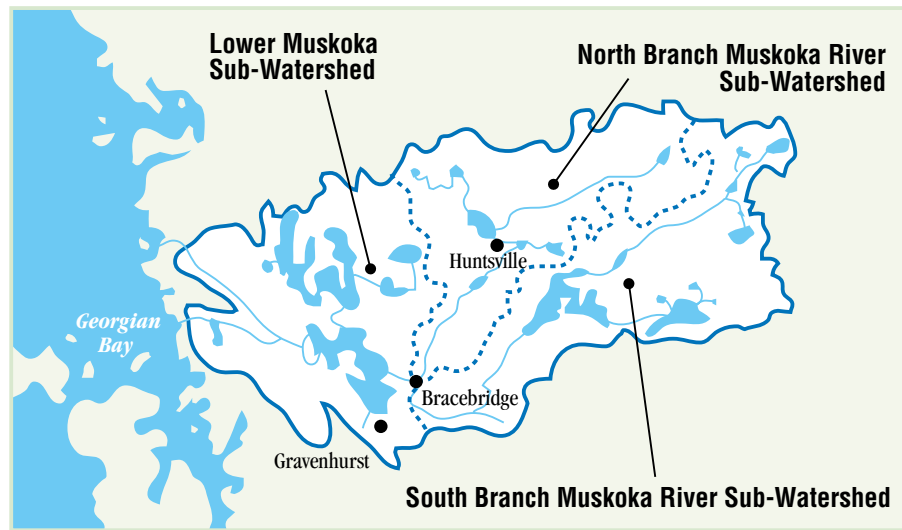


Figure 2.2
Muskoka River Water Management Plan
Watershed Hydrological Features





The watershed is composed of three sub-watersheds as shown above. River profiles for the 3 sub-watersheds are shown in the adjacent figures.

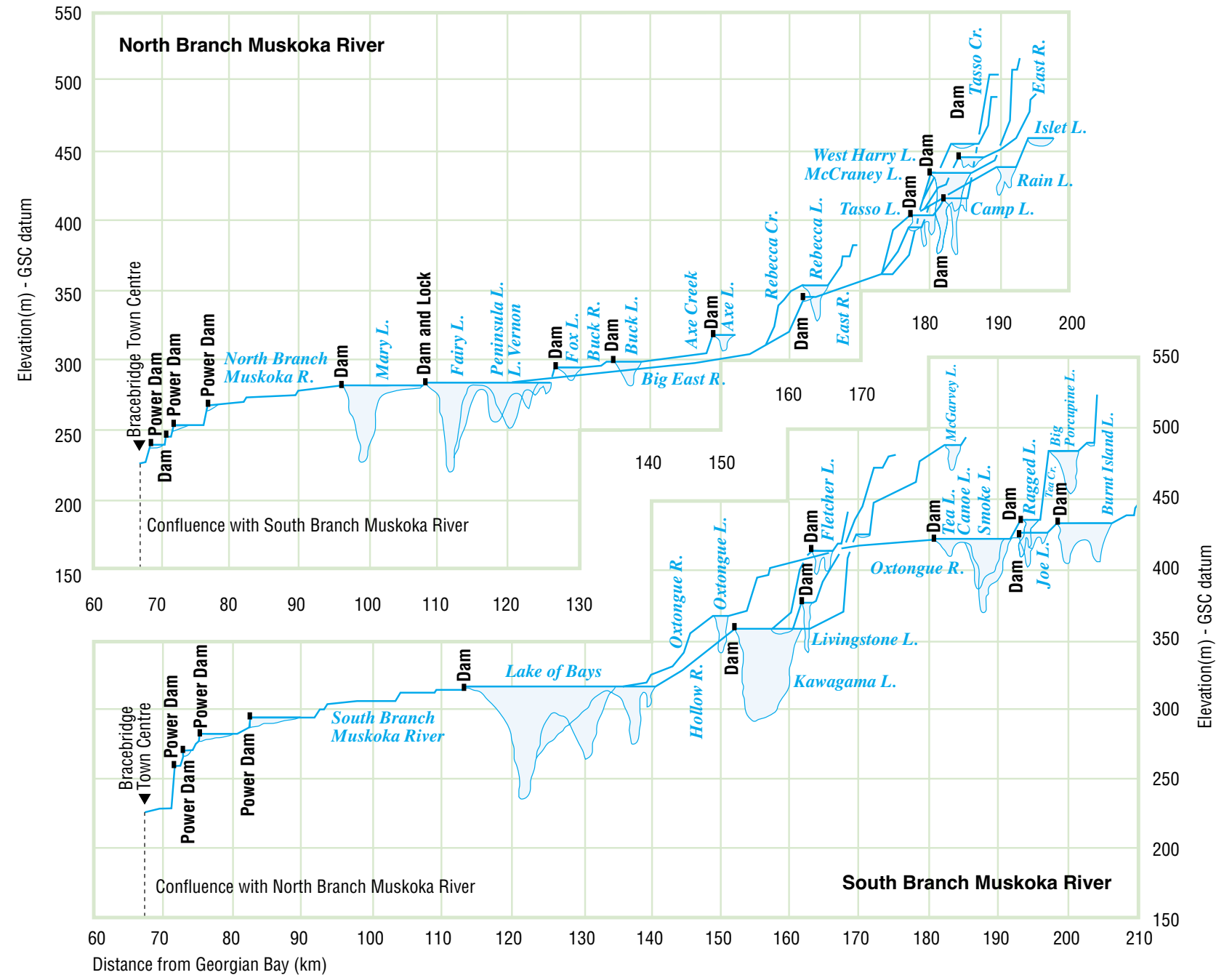
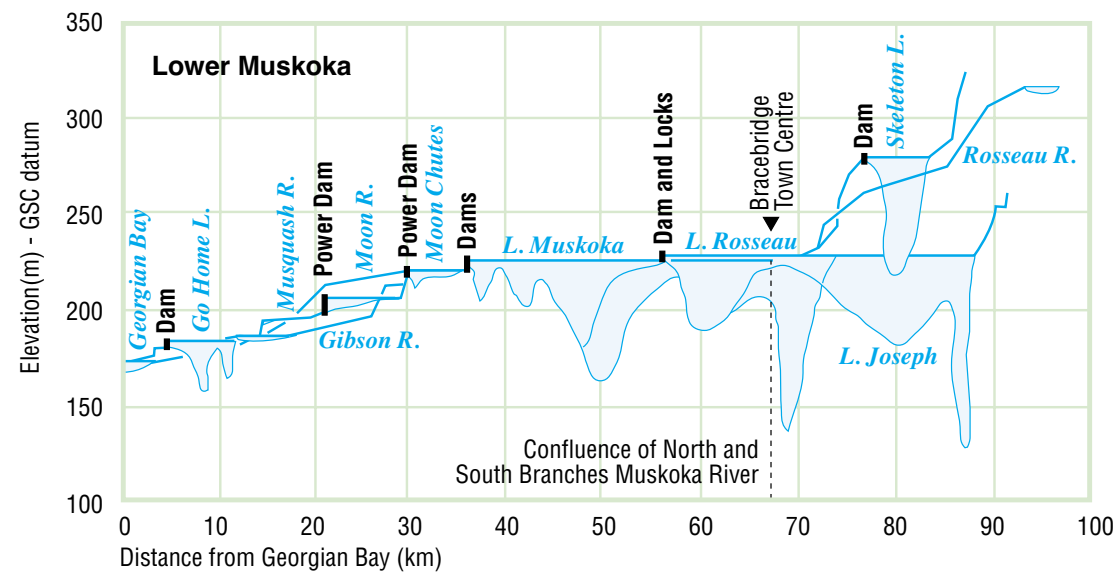


Figure 2.3
 Muskoka River Water Management Plan
Water Surface Profiles

