# *Mississippi River*
# *Water Management Plan*
## ***Final Report***

Mississippi Valley Conservation

ONTARIO POWER GENERATION

CANADIAN HYDRO DEVELOPERS, INC.

ENERDU POWER SYSTEMS, LTD.

*Mississippi River Power Corporation*

Ontario
Ministry of Natural Resources
Ministère des Richesses naturelles

June 15, 2006

**Amended February 2018**

*Cette publication hautement specialisée, Mississippi River Water Management Plan n'est disponible qu'en Anglais en vertu du Règlement 411/97 qui en exempte l'application de la Loi sur les services en français. Pour obtenir de l'aide en français, veuillez communiquer avec Robert Paquette au ministère des Richesses naturelles au (613) 258-8207 ou robert.paquette@ontario.ca*

*This specialized publication, Lac des Mille Lacs Issues and Management Strategies Document is available in English only according to Regulation 411/97 which exempts it from translation under the French Language Services Act. To obtain information in French, please contact Robert Paquette at the ministry of Natural resources at (613)258-8207 or robert.paquette@ontario.ca*

Ontario Ministry of Natural Resources, Kemptville District

# Executive Summary

*The Mississippi River system is composed of a complex network of rivers, streams, rapids and lakes and numerous water control structures including 23 which are owned by: Mississippi Valley Conservation, Ontario Power Generation, Canadian Hydro Developers, Enerdu Power Systems Ltd. and the Ministry of Natural Resources. Twelve of these structures have a significant impact on water levels and flows, and are subject to this planning process. Six of these structures are owned and operated by the Mississippi Valley Conservation (MVC), while the Crotch Lake Dam is owned and operated by the Ontario Power Generation (OPG). The other five operate as hydro-electric energy generating systems (High Falls, Appleton, Enerdu, Almonte and Galetta). As well, there are a number of smaller privately owned structures that are not subject to this process.*

*In 2001, Ontario deregulated the power industry and restructured the electricity market. As a result, Ministry of Natural Resources made amendments to the Lakes and Rivers Improvement Act that would require the production of Water Management Plans, and thereby begin the process of ensuring that water resources were not abused to meet potential peak hydro demands. These plans document operating ranges, management strategies and provisions for self-monitoring for compliance.*

*The objectives for the Mississippi River Water Management Plan include:*

- *reviewing and documenting current operation and management regimes from an ecological and water management perspective;*
- *setting water management objectives for the system to balance environmental, social and economic values and considerations;*
- *enhancing public understanding of water management; and*
- *defining the individual operating plans for each water control structure.*

*Over the past three years, federal and provincial agencies have met with the waterpower producers and Mississippi Valley Conservation and discussed the various options to manage water flows and levels on the system. As well, several community representatives were involved with the Public Advisory Committee and they provided advice to the Planning Team in the development of options as well as provided an essential link to the community. Several Public Open Houses were held, and numerous submissions and surveys have been completed and considered in this process.*

*The result of these consultations has been the preparation of the Mississippi River Water Management Plan. The preferred option for this plan is to operate the hydro-generating facilities and water control structures in accordance with the current operating practices, as described in Sections 7 and 8, with the exception of the Shabomeka Lake Dam. While water levels will still be managed within the current operating range of Shabomeka Lake, adjustments have been made in the fall and winter water levels to improve the success of lake trout spawning. This preferred option is considered to satisfy the planning objectives to the greatest extent possible, given the range of competing interests and uncertainty associated with weather conditions.*

# *Sommaire*

Le réseau fluvial du Mississippi se compose d'un réseau complexe de rivières, de ruisseaux, de rapides, et de lacs et il est équipé nombreux ouvrages de régulation de l'eau dont 23 sont la propriété de : Mississippi Valley Conservation, Ontario Power Generation, Canadian Hydro Developers, Enerdu Power Systems Ltd. et du ministère des Richesses naturelles. Douze d'entre eux ont d'importantes incidences sur les niveaux et les débits de l'eau et sont assujettis à ce processus de planification. La Mississippi Valley Conservation (MVC) est propriétaire exploitant de six de ces structures, alors que l'Ontario Power Generation (OPG) est propriétaire exploitant du barrage du lac Crotch. Les cinq autres structures (High Falls, Appleton, Enerdu, Almonte et Galetta) sont des systèmes générateurs d'énergie hydroélectrique. Plusieurs propriétaires privés possèdent également des structures plus petites qui ne sont pas assujetties à ce processus.

En 2001, l'Ontario a déréglementé l'industrie énergétique et restructuré le marché de l'électricité, à la suite de quoi, le ministère des Richesses naturelles a apporté des modifications à la *Loi sur l'aménagement des lacs et des rivières*. Ces modifications demandaient la production de Plans de gestion de l'eau et de ce fait, entamaient le processus qui permet de veiller à ce qu'on n'abuse pas des ressources hydriques pour satisfaire aux demandes de pointe potentielles. Ces plans documentent la plage maximale de fonctionnement acceptable, les stratégies de gestion et les dispositions pour l'autosurveillance de la conformité.

Les objectifs du plan de gestion de l'eau du fleuve Mississippi comprennent :

- l'étude et la documentation des exploitations et régimes opérationnels existants du point de vue de l'écologie et de la gestion de l'eau;
- l'élaboration d'objectifs de la gestion de l'eau qui respectent l'équilibre entre le système et l'environnement ;
- les valeurs et considérations sociales et économiques;
- l'amélioration de la compréhension de la gestion de l'eau par le public;
- la définition de plans opérationnels propres à chacune des structures de régulation de l'eau.

Au cours des trois dernières années, les organismes fédéraux et provinciaux ont rencontré les producteurs d'hydroélectricité et les représentants de la Mississippi Valley Conservation pour débattre des diverses options de gestion des débits et niveaux de l'eau du réseau fluvial. Plusieurs représentants de la collectivité ont participé au comité de consultation publique et prodigué à l'équipe de planification leurs conseils sur l'élaboration des options. Ils ont également créé un lien essentiel avec la collectivité. Plusieurs journées portes ouvertes ont été organisées pour le public et de nombreux sondages et soumissions ont été remplis et étudiés au cours de ce processus.

Ces consultations ont abouti à la préparation du Plan de gestion de l'eau du fleuve Mississippi. L'option privilégiée pour ce plan consiste à exploiter les installations hydroélectriques et les structures de régulation de l'eau conformément aux pratiques actuelles d'exploitation, décrites aux chapitres 7 et 8, exception faite du barrage du lac Shabomeka. Bien que les niveaux de l'eau y seront encore gérés dans les limites de la plage actuelle de fonctionnement acceptable du lac Shabomeka, des rajustements ont été apportés aux niveaux de l'eau en automne et en hiver afin d'améliorer les chances de succès du frai du touladi. On juge que cette option privilégiée est celle qui satisfait le mieux aux objectifs étant donné la diversité des intérêts opposés et l'incertitude associée aux conditions météorologiques.

# Table of Contents

# List of Figures

# List of Maps

# List of Appendices

## Approval Page

# Mississippi River Water Management Plan

Mississippi River Waterpower Producers and the Ontario Ministry of Natural Resources,
Bancroft, Kemptville and Peterborough Districts, Southern Region

In submitting this plan, (I/we) declare that this water management plan for waterpower has been prepared in accordance with Water Management Planning Guidelines for Waterpower, as approved by the Minister of Natural Resources on May 14, 2002.

Dave Keevill
Canadian Hydro Developers Inc.
I have authority to bind the corporation.

Dec 12/2006
Date

Mike Dupuis
Enerdu Power Systems Ltd.
I have authority to bind the corporation.

DEC 22/2006
Date

Scott Newton
Mississippi River Power Corporation
I have authority to bind the corporation.

Jan 9/2007
Date

Peter Murray
North East Plant Group Manager
Ontario Power Generation Inc.
I have authority to bind the corporation.

Jan 16/07
Date

Paul Lehman
Mississippi Valley Conservation Authority (MVC)
I have authority to bind the corporation.

Nov 30/2006
Date

I certify that this water management plan has been prepared in accordance with Water Management Planning Guidelines for Waterpower, as approved by the Minister of Natural Resources on May 14, 2002, and that direction from other sources, relevant policies and other obligations have been considered. I recommend this plan be approved for implementation.

Martin D. Blake
Acting District Manager, Kemptville District
Ontario Ministry of Natural Resources

Jan 23/07
Date

Approved by:

Ray Bonenberg, Regional Director, Southern Region

Feb 9/2006

In 1994, MNR finalized its Statement of Environment Values (SEV) under the Environmental Bills of Rights. The SEV is a document that describes how the purposes of the EBR are to be considered whenever decisions are made in the ministry that might significantly affect the environment. During the development of this water management plan, the ministry has considered its SEV.

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Ontario

February 16, 2018

**Subject: Ministry of Natural Resources and Forestry Approval of Administrative Amendment to Align the Mississippi River Water Management Plan with Current Provincial Policy**

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This letter is to advise that the Mississippi River Water Management Plan has been amended under Section 23.1 (6) of the *Lakes and Rivers Improvement Act.* An administrative amendment was undertaken by the Ministry of Natural Resources and Forestry, and was approved on February 16, 2018. The amendment was undertaken to align the Mississippi River Water Management Plan with direction in the approved 2016 Maintaining Water Management Plans Technical Bulletin.

Changes as a result of this amendment are reflected in the updated (February 2018) version of the Mississippi River Water Management Plan. A summary of this amendment can be found in the History of Amendments on the following page and in more detail in Appendix 9.

Regards,

Sharon Rew
Regional Director
Southern Region
Ministry of Natural Resources and Forestry

# HISTORY OF AMENDMENTS

## FEBRUARY 2018 AMENDMENT

On February 16th, 2018, the Ministry of Natural Resources and Forestry (MNRF) approved an amendment to the Mississippi River Water Management Plan to align the plan with the approved 2016 Maintaining Water Management Plans Technical Bulletin (refer to Appendix 9 for a complete summary of amendment text changes).

The administrative amendment resulted in changes to the following sections of the plan:

| | |
|---|---|
| Expiry Date | The expiry date has been **removed**. |
| Amendments | Section 10 has been **replaced.** |
| Standing Advisory Committee | Section 11.1 has been **added.** |
| Compliance | Section 9.2.4 has been **revised,** Section 9.2.5 has been **replaced** and Section 9.2.5.1 has been **added**. |
| Effectiveness Monitoring | Section 9.1 has been **revised**. |
| Implementation Reporting | Section 9.3 has been **added**. |

# DISCLAIMER

This water management plan (WMP) sets out legally enforceable provisions for the management of flows and levels on this river within the values and conditions identified in the WMP.

In instances where, due to emergency energy shortages, the Independent Electricity System Operator (IESO) requests that owners of the waterpower facilities and associated water control structures seek relief from certain provisions of this WMP, the Ministry of Natural Resources and Forestry (MNRF) will consider those requests expeditiously and, after consultation with the IESO, may allow short-term relief from certain provisions.

The mandatory provisions of this WMP will be waived, as appropriate, when the dam owners (which may include other dam owners, such as MNRF) are requested to do so by a police service or other emergency measures organization.

In instances of unscheduled facility imperatives (e.g. emergency maintenance etc.), MNRF will consider requests from the owner for temporary relief from the plan expeditiously with consideration to the relative priorities of both MNRF and the owner.

This plan does not authorize any other activity, work or undertaking in water or for the use of water, or imply that existing dams(s) meet with safe design, operation, maintenance, inspection, monitoring and emergency preparedness to provide for the protection of persons and property under the *Lakes and Rivers Improvement Act*. Approval of this WMP does not relieve the dam owners from their responsibility to comply with any other applicable legislation. For the purposes of this plan, an operational plan means a plan for the management of flows and levels.

Approval of this plan does not grant a dam owner the right to flood Crown land or the land of any other person without first obtaining the Crown's or that person's consent, nor does it authorize any infringement of the rights of the Crown or of any other person.

# *Section 1 – Introduction and History*

The Mississippi River Water Management Plan is prepared under the auspices of the *Lakes and Rivers Improvement Act*. The proponents of this plan include all current owners and managers of the hydro-electric and other water control structures along the river system, i.e., Mississippi Valley Conservation, Ontario Power Generation Inc., Canadian Hydro Developers Inc., Enerdu Power Systems Ltd., and Mississippi River Power Corporation. Ontario Ministry of Natural Resources is also an active participant in this process, as an advisor to the Planning Team.

The management of water levels and flows in the upper Mississippi River system has been examined a number of times over the past two decades. This planning process will build on that work and on Mississippi Valley Conservation Authority's (MVC's) experience with management of the river system. A key part of the process will be to incorporate the experience and involvement of all owners of hydro facilities and control structures along the river system.

## 1.1 The Challenge of Managing Water Levels and Flows

All of the dams in the western portion of the watershed were originally built to maintain enough water in the system to allow timbers to be floated downstream three or four times a year. The purposes of these structures have become much broader with changing conditions in the watershed. With the advent of more and more permanent and seasonal residents living and recreating along the river system, the dams now must serve the purposes of flood protection, low flow augmentation, ice management, recreational access, and erosion control. The dams must also be operated to maintain specific flow and level requirements of fish and wildlife which depend on the lakes, rivers and shorelines, particularly during fish spawning periods. Once all these needs are satisfied, hydro producers also benefit by producing electricity from the flowing water in the system.

Over the past number of years, the watershed has been experiencing more severe weather events, whether due to global climate change or to the natural long-term fluctuations in climate and weather. These unpredictable severe rainfalls and droughts make the job of managing water levels that much more difficult. The watershed historically receives approximately 870 mm of precipitation annually, and it loses about 530 mm to evaporation and transpiration, leaving only 340 mm to re-supply the ground water, fill the upper lakes, and keep a minimum flow in the river at the High Falls Generating Station of 5 cubic meters per second (cms) throughout the year.

Historically, maintaining an average flow of 5 cms at High Falls GS came from a "gentleman's agreement" to provide a minimum flow downstream of Crotch Lake throughout the summertime. This "agreement" has expanded over the years to now be a year round value. The value came through years of operation which determined that this was the amount of water that could be maintained, by utilizing all of the storage in Crotch Lake, over a 4 month period with an average amount of rainfall over that same period. Coincidentally, this flow also approximately equaled 1/3 the total plant flow capacity of the High Falls G.S., thereby allowing one of the three units to operate at full capacity. While all of the uses (including hydro generation) of the river would benefit from flows higher than 5 cms, there is a finite supply of water in the system on an annual basis which precludes this from occurring. When significant rainfall occurs, higher flows may be maintained to improve downstream conditions as long as flooding is not an issue. The local drainage area between Crotch Lake and High Falls also contributes to that flow and may (when Crotch Lake is being filled in the fall and spring or being operated to prevent downstream flooding) provide some or all of the 5 cms requirement. During times that Crotch Lake is being utilized to minimize downstream flooding, flows well in excess of that 5 cms may be generated by this local drainage area as was witnessed in the flooding of 1998. During drought conditions, flows may be less than 5 cms, once the storage has been used in Crotch Lake.

The history of development and management of the dams of the Mississippi River system has evolved to today's management regime – one that tries hard to balance the sometimes conflicting needs of all the uses and maintains the ecological integrity of the river system.

The operation of the water control systems is constrained by the amount of precipitation (rain/snow) replenishing the system and therefore is subjected to the natural, seasonal variation of the water cycle. The major challenge for the operators is to manage the minimal amount of available water to ensure proper flows or augment flows across the entire system in an equitable and sustainable fashion.

## 1.2 History of Development

Development of this area began in the early 1800s, primarily for the lumber industry. The area was heavily timbered with millions of board feet of pine, spruce and other species of trees being cut and transported by river to the sawmills on the Ottawa River. The lower Mississippi River, around what is now Almonte and Carleton Place, saw numerous textile and grist mills built in the early 1820s. Shortly thereafter, sawmills came into prevalence as the timber trade exploded in the Ottawa Valley.

In order to get the product to market a number of log dams were built along the system in the early 1860s. The original dams at Mazinaw, Crotch, Big Gull and Kashwakamak Lakes were all built during this period, solely for lumbering purposes. The original dam in Carleton Place was a water powered mill built in 1860 and operated periodically for power production as well as log driving. Other dams sprung up from various mill operations and then for hydro production. By the 1880s, the timber industry was in steady decline and by the turn of the century had virtually stopped and the dams used to transport the logs fell into disrepair.

The Mississippi River Improvement Company Limited (MRIC) was formed in 1909. Its purpose was to hold title to the dams at Crotch, Big Gull and Kashwakamak Lakes and operate them to maintain storage capacity in the associated lakes. Within the next ten years, MRIC had assumed the maintenance and operation of Mazinaw and the abandoned lumberman's dams at Shabomeka and Mississagagon Lakes.

The Carleton Place Dam was purchased by the Hydro Electric Power Commission of Ontario (later to become Ontario Hydro) in 1919 and at the same time the Commission purchased shares in MRIC. In 1938, the Commission assumed the management of MRIC and became the majority shareholder in MRIC. Over the first half of the twentieth century, MRIC rebuilt most of the dams they owned.

The Department of Lands and Forests (now the Ministry of Natural Resources) constructed a number of structures between the late 1950s and 1970, primarily to control water for recreational or fisheries purposes. Six dams were built within the Mississippi River watershed, but since they are on tributaries not included within the scope of this plan, they will not be considered further in the plan.

The most significant development of the upper lakes appears to have also taken place from the early 1950s to the end of the 1970s as Crown land around the lakes was sold to private individuals. This led to changes in the operating regimes of most of the dams, especially during the summer months as tourism and recreational interests became more prevalent. More recently, the upper lakes have seen a conversion of many dwellings from seasonal to year round use. Crotch Lake remains the only significant lake on the main channel of Mississippi River that is predominantly undeveloped as the surrounding lands are largely owned by the Crown or Ontario Hydro.

By 1970, Ontario Hydro and the Carleton Place Hydro Commission rebuilt the Carleton Place structure and approached the newly formed Mississippi Valley Conservation Authority (MVC) to assume ownership and operation of the dam. Ownership was transferred to MVC in the fall of 1973. Between 1974 and 1978, MVC, with funding from MNRF, rebuilt four other structures, Bennett Lake on the Fall River, Widow and Lanark on the Clyde River, and Farm Lake on the Mississippi River.

In 1981, MVC completed an inventory of water control structures within the Mississippi River watershed. A total of 43 structures were identified, the majority of those were either derelict or privately owned. There were four organizations which controlled the majority of the significant dams on the Mississippi River: Mississippi River Improvement Company (MRIC), Mississippi Valley Conservation (MVC), Ministry of Natural Resources and Forestry (MNRF), and Ontario Hydro (now Ontario Power Generation Inc.(OPGI)).

In 1983, Ontario Hydro sold the Galetta Generating Station to Mr. Laurier Dupuis and Mr. Mike Dupuis. They refurbished the structure and began producing power again at the site in 1984.

In 1983, MVC released its "Interim Watershed Plan" which assessed the current resource management issues within the watershed and proposed a variety of programs to address the operation and maintenance of watershed dams. This was the forerunner of the current water management planning process, whereby field work was undertaken to document operating objectives and constraints and structural and hydraulic data of the watershed's dams. A key objective of the program was to improve coordination amongst the three primary dam operators.

Through the 1980s, MVC continued to take on greater responsibility for managing the watershed's dams when MNRF contracted MVC to operate all MNRF owned dams and when Ontario Hydro contracted MVC to provide field operations and monitor water levels at the MRIC's Crotch Lake Dam and the Ontario Hydro's High Falls Generating Station.

Substantial rehabilitation of the Shabomeka Lake Dam was completed by MRIC in 1989. The cost of this work raised concerns with the MRIC shareholders as to the ongoing costs versus the benefits of operating and maintaining control dams at Shabomeka Lake, Mazinaw Lake, Kashwakamak Lake, Big Gull Lake, Mississagagon Lake and Crotch Lake. In 1991, the MRIC decided that continued operation and maintenance of the control dams were beyond its financial capabilities and negotiated agreements to shift responsibilities to MVC (for Shabomeka, Mazinaw, Kashwakamak, Big Gull, and Mississagagon) and to Ontario Hydro (for Crotch Lake Dam). After these transfers, MRIC was formally dissolved.

MVC constructed automated lake level gauges on Shabomeka, Mazinaw, Kashwakamak, Big Gull and Crotch Lakes in 1991 to collect detailed water level information and initiated a dam rehabilitation program with the reconstruction of Mazinaw Lake Dam in 1992.

In 1995, the Upper Mississippi Watershed Alliance (Alliance) was created, to address water level concerns across the watershed, and specifically from Crotch Lake to Dalhousie Lake. The Alliance consisted of residents from Shabomeka, Mazinaw, Kashwakamak, Big Gull, Crotch and Dalhousie Lakes as well as from the Snow Road and Ardoch communities. A working group was established with representatives from MVC, MNRF, Ontario Hydro and the Alliance to discuss the various issues and identify opportunities to resolve them. Several meetings were held from 1995 to 1997 which resulted in clarification of several issues raised. While there were no recommendations made by the working group to revise current operating policies a variety of fishery related issues were resolved.

Two new power generating stations were developed in the early 1990s along the lower Mississippi River. The Appleton Generating Station was rebuilt by Merol Power in 1993 and the Maple Leaf Mills Generating Station in Almonte was reconstructed in 1995 by Canadian Hydroelectric Components. Merol Power was subsequently sold to Canadian Hydro Developers in spring of 1998.

This history of changing ownership has led to the current situation, where the ownership of dams and other water control structures is in the hands of:

- Mississippi Valley Conservation
- Ontario Power Generation Inc.
- Canadian Hydro Developers Inc.
- Enerdu Power Systems Ltd.
- Mississippi River Power Corporation

With the passage of the *Energy Competition Act* in 1998 the Ministry of Natural Resources began the process of ensuring water resources are managed to meet the needs of all interests along the water systems. In December 2000 the Lakes and Rivers Improvement Act was amended to allow the Minister of Natural Resources to order the preparation of management plans for the operation of waterpower facilities and associated water control structures. In May 2002 Ontario's electricity market was opened for competition and the "Waterpower: Water Management Planning Guidelines for Waterpower" were approved to guide the process under which this plan has been prepared.

# Section 2 – Goals, Objectives and Scope

## 2.1 Goals, Objectives and Principles

The goal of the Mississippi River Water Management Plan (MRWMP) is "to develop a water level and flow management plan for the Mississippi River that builds on the current operating regime for the system and integrates environmental and socio-economic values and considerations."

The specific goals and objectives for the Mississippi River Management Plan were developed through discussions with the Planning Team, and the Public Advisory Committee (PAC) (see Appendix 1 for members of the committees) and confirmed through the public consultation process. Figure 2.1 provides the goals objectives and guiding principles for the development and implementation of the Mississippi River Water Management Plan.

## 2.2 Terms of Reference and Scope

The complete Terms of Reference which were approved in July 2003 are found in Appendix 2.

The plan was prepared according to the "Water Management Planning Guidelines for Waterpower" (Ontario Ministry of Natural Resources, May 2002) and other applicable direction, such as the Aquatic Ecosystem Guidelines, and results in a comprehensive water management plan (WMP) being prepared for the Mississippi River system.

In general, the scope of the MRWMP includes:

- Baseline conditions (environmental, social and economic) present at the time of planning;
- A focus on the current management of water levels and flows;
- Operating regimes required at the waterpower facilities and associated water control structures;
- The relative scale of effects of waterpower operations and their related issues; and
- Other water resources users and the public interest in water.

The study area has been defined as the Mississippi River and interconnecting lakes. Not all water control structures within the watershed are included in the scope of the study. Those with little or no influence on flows and levels on the Mississippi River have been excluded.

The hydro facilities and water control structures that are subject to this plan include:

1. Shabomeka Lake Dam
2. Mazinaw Lake Dam
3. Kashwakamak Lake Dam
4. Big Gull Lake Dam
5. Mississagagon Lake Dam
6. Crotch Lake Dam
7. High Falls Generating Station
8. Carleton Place Dam
9. Appleton Generating Station
10. Mississippi River Power Corp. G.S.
11. Enerdu Power Systems Ltd. G.S.
12. Galetta Generating Station

**Figure 2.1 – Goals and Objectives of Water Management Planning**

## GOALS

***MNRF Water Management Plans***

*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.*

***Mississippi River Water Management Plan***

*To develop a water level and flow management plan for the Mississippi River that builds on the current operating regime for the system and integrates environmental and socio-economic values and considerations.*

## Objectives

### MNRF Water Management Plans

1. ***Review and Document*** *current operation and management of existing hydro-electric generating facilities, dams and water control structures from an ecosystem and water management perspective.*
2. ***Set Water Management Objectives*** *which will attempt to balance environmental, social and economic values and considerations.*
3. ***Enhance Public Understanding*** *of water management and provide meaningful opportunities for broad public, First Nations, stakeholder and interest group involvement in the development of the comprehensive water management plan.*
4. ***Define Individual Operating Plans*** *for each hydro facility/dam and water control structure for the normal range of operating conditions.*

### Mississippi River Water Management Plan

1. ***Maintain or Improve Aquatic Ecosystem Health throughout the System***
   - Improve lake trout spawning success on Shabomeka and Mazinaw Lakes.
   - Maintain spring spawning opportunities for pike, walleye and bass by having steady flows or rising levels.
   - Minimize water level fluctuations as they affect aquatic and riparian wildlife.
   - Where possible, emulate the natural flow regime.
   - Improve aquatic ecosystem health by maintaining flow through the system.
   - Ensure abundance of wild rice is not reduced due to fluctuating water levels.
2. ***Address Public Safety and Minimize Property Damage***
   - Minimize flooding throughout the system.
   - Minimize ice damage throughout the system.
3. ***Maintain Water Levels throughout the System for Navigation, Recreation, Cultural and Social Opportunities***
   - Maintain stable water levels for navigation, including boat access only properties, throughout the recreational season and the entire system.
   - Maintain water levels suitable for access to Twin Islands and Fawn Lakes.
   - Maintain and improve recreation, and access to Wild Rice beds and Pictographs.
4. ***Recognize Power Generation Values from the System***
   - Maintain or enhance power generation on a seasonal and daily basis.
5. ***Develop Public Awareness on Current Conditions***
   - Explain constraints, objectives and natural processes that are considered in the operation of the Mississippi River system.
   - Foster an understanding of how the system operates.

### Guiding Principles

***Maximum net benefit to society*** *– maximize net environmental, social and economic benefits derived from operation of water power facilities and associated water level control structures in terms of water flow and levels.*

***Riverine ecosystem sustainability***

*Planning based on best available information and* ***establishment of baseline conditions***

***Evaluation of the need for changes*** *to the existing water management operations for water level and flow management to address objectives and issues.*

***Planning will be without prejudice to the rights of Aboriginal People*** *and treaty rights*

***Public & stakeholder participation*** *– communications and integration are paramount to this planning exercise*

***Adaptive management*** *– effectiveness monitoring to assist future planning.*

Issues that were raised in public consultation, which are determined to be outside of the scope of this plan by the Planning Team will be forwarded to the appropriate organizations and documented in the WMP. New and/or proposed significant structural modifications to waterpower facilities or water control structures are beyond the scope of this WMP, as they require prior Environmental Assessment Act approvals.

Tributaries of the Mississippi River system are not included in the study area. Flows from these tributaries can only contribute significantly to conditions along the Mississippi River when significant runoff resulting from rainfall and or snowmelt occurs. This is a direct result of the lack of storage along the tributaries to mitigate the incoming flows. As there are no storage reservoirs of any consequence on any of the tributaries, streamflows from these tributaries cannot be manipulated to provide low flow augmentation or flood control at any other time of the year.

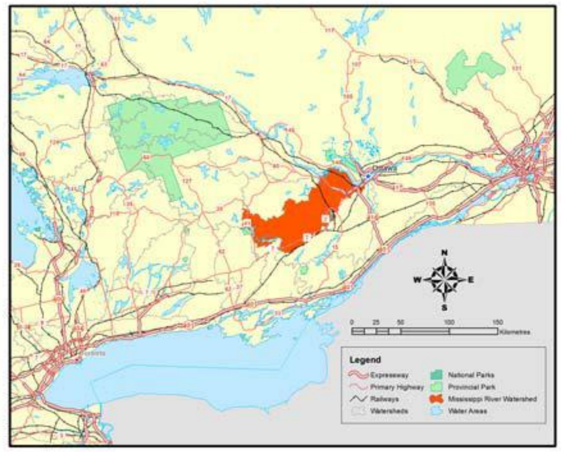
Environmental, social and economic issues that are not related to the manipulation of water flows and levels will not be addressed through this water management planning process. The WMP, for example, will not address issues related to over-fishing, water quality, source water protection, ground water quality or quantity, wetlands, floodplain regulations or urbanization. These issues would be considered during the completion of a watershed plan, of which the MRWMP would be a building block within that plan.

In the case of extreme events such as drought and flood conditions, the operating plans for each water control structure along the system provide protocols and procedures to be followed. In the case of drought situations, for instance, a “**low water response team**” is convened to determine actions for the associated situation.

# Section 3 – General Description

## 3.1 Watershed Overview

The Mississippi River watershed is located in southeastern Ontario (see Map 3.1) and is composed of a complex network of rivers, streams, rapids, and over 250 lakes. The Mississippi River has a drainage area of 3,740 sq km from its headwaters in Kilpecker Creek, in the Township of Addington Highlands, to its outlet at the Ottawa River in the City of Ottawa (see Map 3.2 – Mississippi River Watershed).




**Map 3.1 – Watershed Location**

The river is 212 km in length, and begins at an elevation of 325 m (1,066 ft) in the west and drops 252 m (827 feet) gradually towards the east to an elevation of 73 m (240 ft) at the outlet to Ottawa River. Figure 3.1 indicates the profile of the Mississippi River.

There are 23 water control structures within the Mississippi River watershed that are either owned or operated by the plan proponents. According to the Terms of Reference (Appendix 2), there are 7 water control structures and 5 hydro-electric generating stations in the Mississippi River that are subject to this planning exercise (Figure 3.2). The other eleven water control structures and several smaller, privately owned structures in the Mississippi River watershed are not subject to this planning exercise due to their limited capacity to influence flows or water levels at the hydro generating stations. Figure 3.3 provides an overview of the characteristics of the structures.

**Figure 3.2 – Waterpower Generating Stations and Water Control Structures on the Mississippi River**

| Waterpower Generating Stations | Water Control Structures |
|---|---|
| High Falls G.S. | Shabomeka Lake Dam |
| Appleton G.S. | Mazinaw Lake Dam |
| Enerdu G.S. | Kashwakamak Lake Dam |
| Almonte G.S. | Mississagagon Lake Dam |
| Galetta G.S. | Big Gull Lake Dam |
| | Crotch Lake Dam |
| | Carleton Place Dam |

The watershed traverses four upper tier (counties and cities) and eight lower tier municipalities (towns and townships):

| | |
|---|---|
| Lennox County | Township of Addington Highlands |
| Frontenac County | Township of North Frontenac |
| | Township of Central Frontenac |
| Lanark County | Townships of Tay Valley |
| | Township of Lanark Highlands |
| | Township of Drummond/North Elmsley |
| | Township of Beckwith |
| | Town of Carleton Place |
| | Town of Mississippi Mills |
| City of Ottawa | |

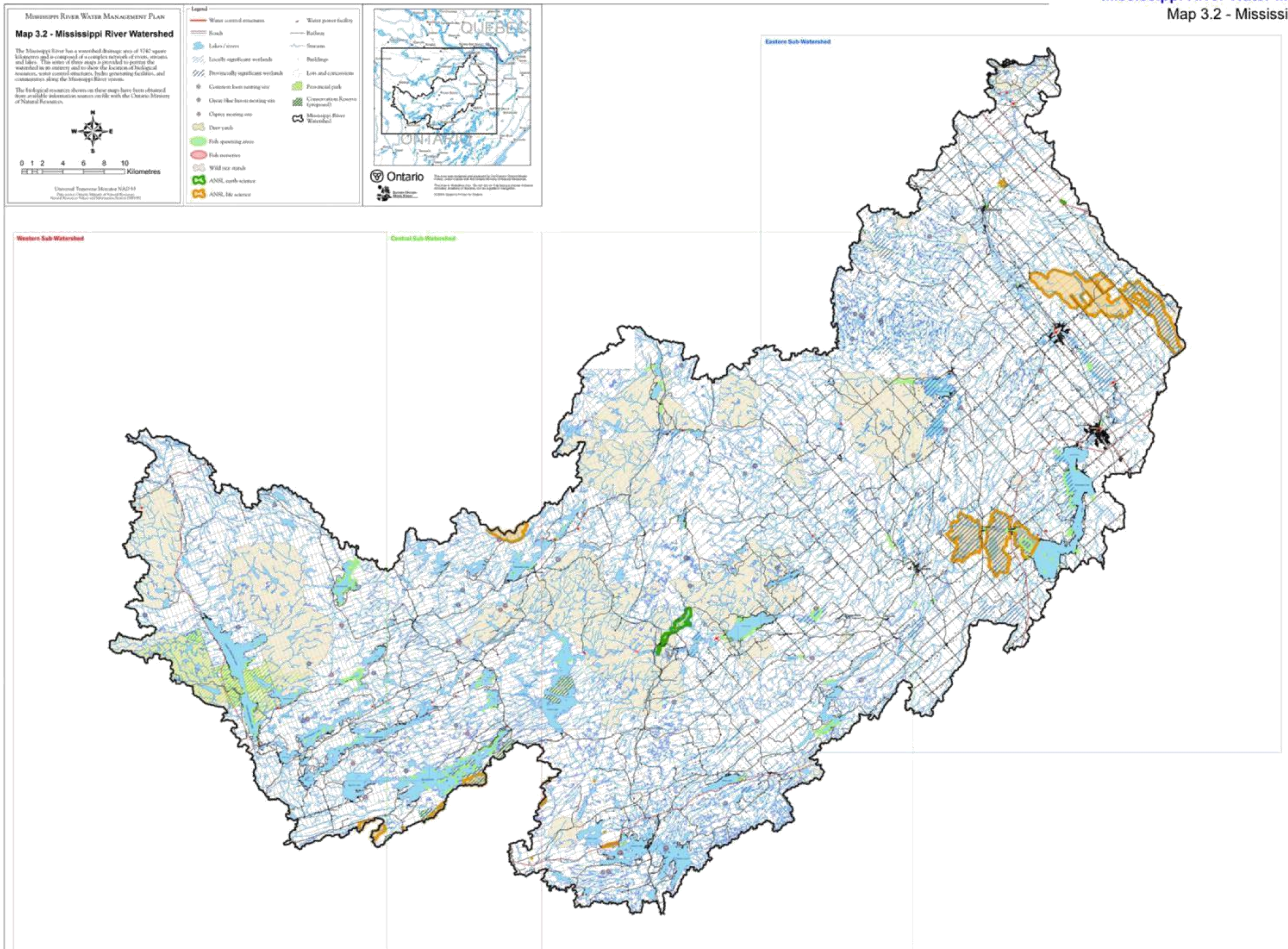
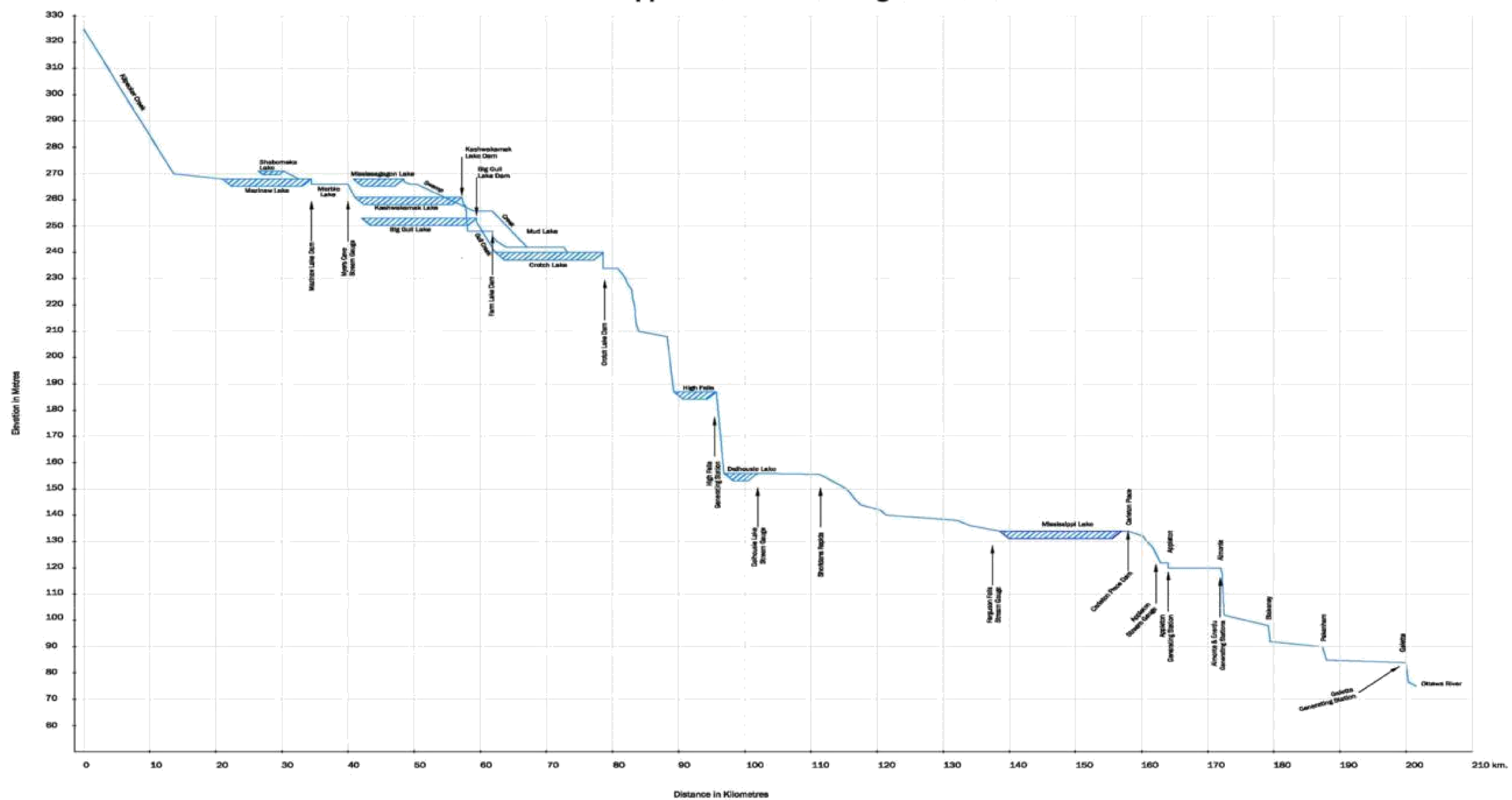

Mississippi River Water Management Plan
Map 3.2 - Mississippi River Watershed
Legend
QUEBEC
ONTARIO
Ontario
Kilometres
Western Sub-Watershed
Central Sub-Watershed
Eastern Sub-Watershed

Figure 3.1 - Mississippi River Profile

# Mississippi River Water Management Plan




Mississippi Valley Conservation

## Mississippi River Profile

**Figure 3.3 – Description of Existing Waterpower Stations and Water Control Facilities**

| Control Structure | Installed Hydro Generating Power (megawatts) | Combined Hydraulic Capacity (cms) (Station Only) | Drainage Area (sq km) | Total Storage Volume (ha m) [1] | Usable Storage Volume (ha m) | Elevation of deck of dam or (Weir) (m. a.s.l.) | # of Sluices (stoplog bays)-Width of sluice # of Stoplogs |
|---|---|---|---|---|---|---|---|
| Shabomeka | - | 12.0 | 41 | 536 | 402 | 271. 67 (271.45)[2] | 1 – 2.44 m. 8 stoplogs |
| Mazinaw | - | 48.0 | 339 | 3423 | 1793 | 269.00 (268.20) [3] | 2 – 3.95 m 7 stoplogs/sluice |
| Kashwakamak | - | 65.0 | 417 | 3822 | 1911 | 262.26 (261.06) , (261.67) [3] | 2 – 3.43 m. 10 stoplogs/sluice |
| Mississagagon | - | 3.0 | 22 | 491 | 382 | 268.45 (268.42) | 1 – 1.33 m. 6 stoplogs |
| Big Gull | - | 25.0 | 135 | 3048 | 1524 | 254.76 (253.66) , (254.47) [3] | 1–2.90 m./1–2.29 m 7 and 5 stoplogs |
| Crotch | - | 68.0 | 1030 | 7617 | 5859 | 241.67 (240.00) | 1 - 4.20 m. 16 stoplogs |
| High Falls G.S. | 2.9 | 275.2 (14.3) | 1233 | 132 | 132 | 188.42 (187.61) | 4 - 4.67 m. 1-20, 3-12 |
| Carleton Place | - | 260.0 | 2876 | 3787 | 1273 | 135.63 (133.92) | 5 - 4.25 m 3 bays w 10, 2 w 9 logs |
| Appleton G.S. | 1.3 | (35.0) | 2932 | n.a. | n.a. | (123.00) | 4 - 6.71 m 8 stoplogs |
| Enerdu G.S. | 0.35 | (14.0) | 3012 | n.a. | n.a. | 117.2 | - |
| Mississippi River G.S. | 2.4 | (34.0) | 3012 | n.a. | n.a. | 114.44 | - |
| Galetta G.S. | 1.6 | (30.0) | 3684 | n.a. | n.a. | (82.61) | 2 – 6 m., 1 - 5m. 7 stoplogs / sluice |

1. Total storage based on height of stoplogs times surface area of the lake. Big Gull and Carleton Place are influenced by the channel above the dam and are based on number of logs which impact water levels on the lake
2. Elevation of top of embankment
3. Elevation of emergency spill way.
4. Usable storage refers to the actual operating range currently in place (maximum of summer target range to minimum fall level), not maximum spring level to sill elevation of structure.
5. n.a – means not applicable.

The Mississippi River watershed is divided into three sub-watersheds (see Map 3.2): the western and central sub-watersheds lie on the Canadian Shield, and the eastern sub-watershed lies off the Shield to the west of the Ottawa River. The western sub-watershed is speckled with deep, glacial lakes, whereas the eastern sub-watershed is dominated by riverine systems, which is a reflection of its topography and surficial geology. The central sub-watershed is a combination of both the western and eastern sub-watersheds, and may be considered a transitional zone between ecological land types and communities.

### *3.1.1 Western Sub-watershed*

There are 10 dams owned or operated by the plan proponents located in the western sub-watershed (see Map 3.3). Four of these dams (Farm Lake Dam, Malcolm Lake Dam, Mosque Lake Dam and Pine Lake Dam) are not within the scope of the Terms of Reference for the Mississippi River Water Management Plan (MRWMP). The following 6 dams are all water control facilities that influence the levels and flows of downstream hydro facilities and are subject to this planning process:

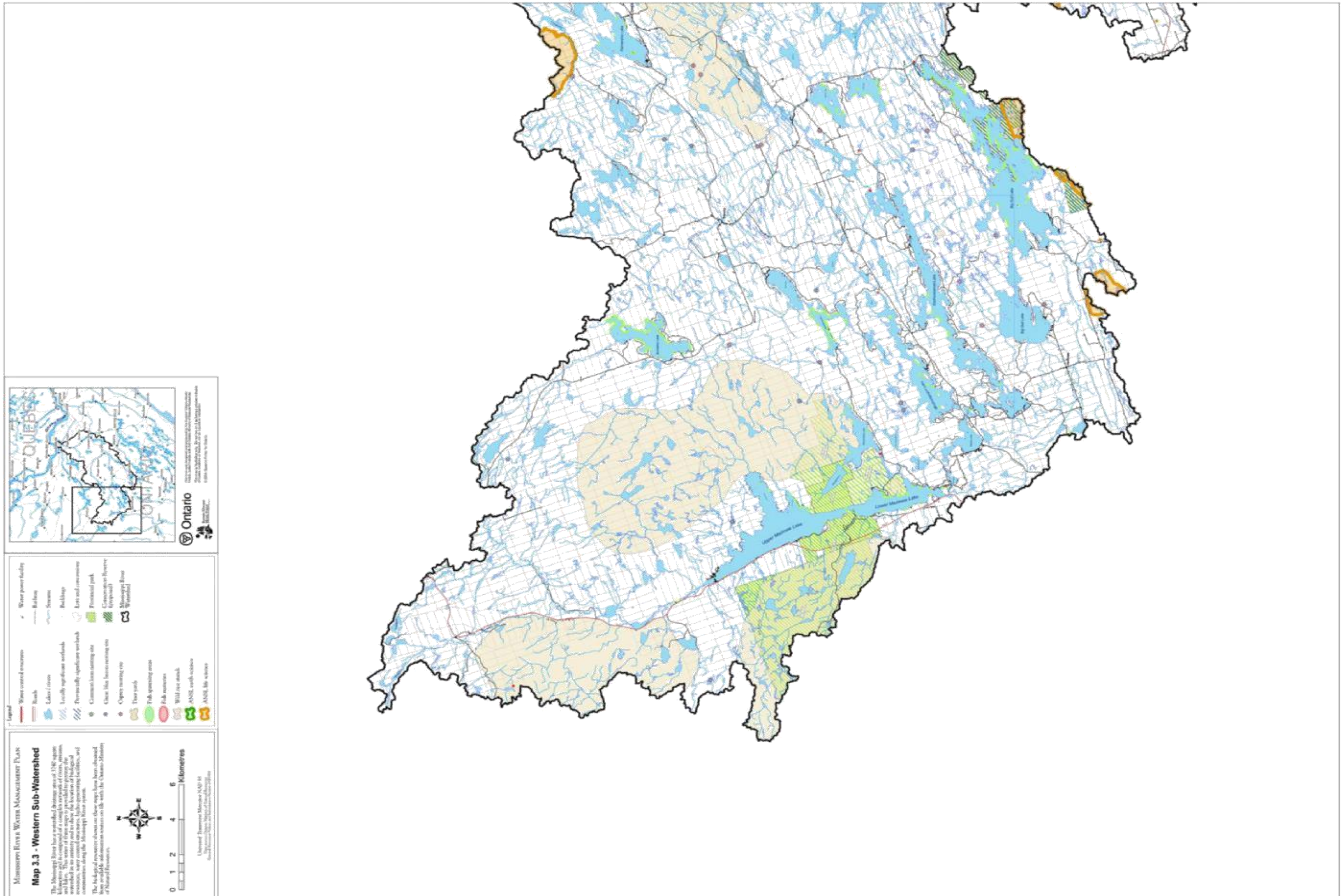
- Shabomeka Lake Dam
- Mazinaw Lake Dam
- Mississagagon Lake Dam
- Kashwakamak Lake Dam
- Big Gull Lake Dam
- Crotch Lake Dam

The western sub-watershed’s north-western boundary starts at Kilpecker Creek, the headwater of the system and extends to the dam at the outlet of Crotch Lake. It includes the vast majority of the lakes in the watershed and virtually all available reservoir storage for stream flow regulation. This portion of the watershed is generally underlain by Precambrian bedrock with thin soils, which has largely shaped the area’s history and development.

The headwaters of the Mississippi River originate in Denbigh Township in Rolufs Lake and Crooked Lake on Kilpecker Creek. Mazinaw Lake is the first significant lake on the Mississippi River system. Bon Echo Creek and Semi-circle Creek are the two significant streams which enter the lower Mazinaw Lake. Bon Echo Creek is an unregulated stream, which flows from Bon Echo Lake through the Bon Echo Provincial Park. Semi-circle Creek contains the first major water control structure on the system, at the outlet of Shabomeka Lake.

The second major water control structure is located at the outlet of Mazinaw Lake. From Mazinaw Lake, the river flows through the smaller lakes of Little Marble, Marble and Georgia Lakes into Kashwakamak Lake. The inlet to Kashwakamak Lake is known as Whitefish Rapids, an important walleye spawning site rehabilitated by the MNRF.

The third major control structure in this sub-watershed is located at the outlet of Kashwakamak Lake. From here, the river flows through a smaller lake known as Farm Lake, which is maintained by an overflow weir. The Mississippi River then flows through the Village of Ardoch. A unique concern with regards to dam operations and water levels exists here. While flooding and erosion are a concern, the wild rice growing in this area is of great significance to the native Algonquin First Nations who harvest the rice each fall.



One of the most significant tributaries of the Mississippi River is Buckshot Creek. Draining an area of 309 sq. km, this tributary enters the Mississippi River from the north, just below the Village of Ardoch and between Farm Lake and Crotch Lake. There are no human-made control structures on the main channel of the creek; however, numerous beaver dams exist along its length. The Mississagagon Lake Dam, which controls Mississagagon Lake, is on Swamp Creek which is a tributary of Buckshot Creek.

Side Dam Rapids are situated at the inlet of the Mississippi River into Crotch Lake. Another significant body of water, Big Gull (Clarendon) Lake also flows into Crotch Lake near Colonel’s Island via Gull Creek. This lake is a headwater lake, having a very limited drainage basin not much larger than the size of the lake itself.

The most significant reservoir on the Mississippi River system with regards to flood mitigation and low flow augmentation is Crotch (Cross) Lake. The dam at the outlet of Crotch Lake marks the eastern boundary of this sub-watershed.

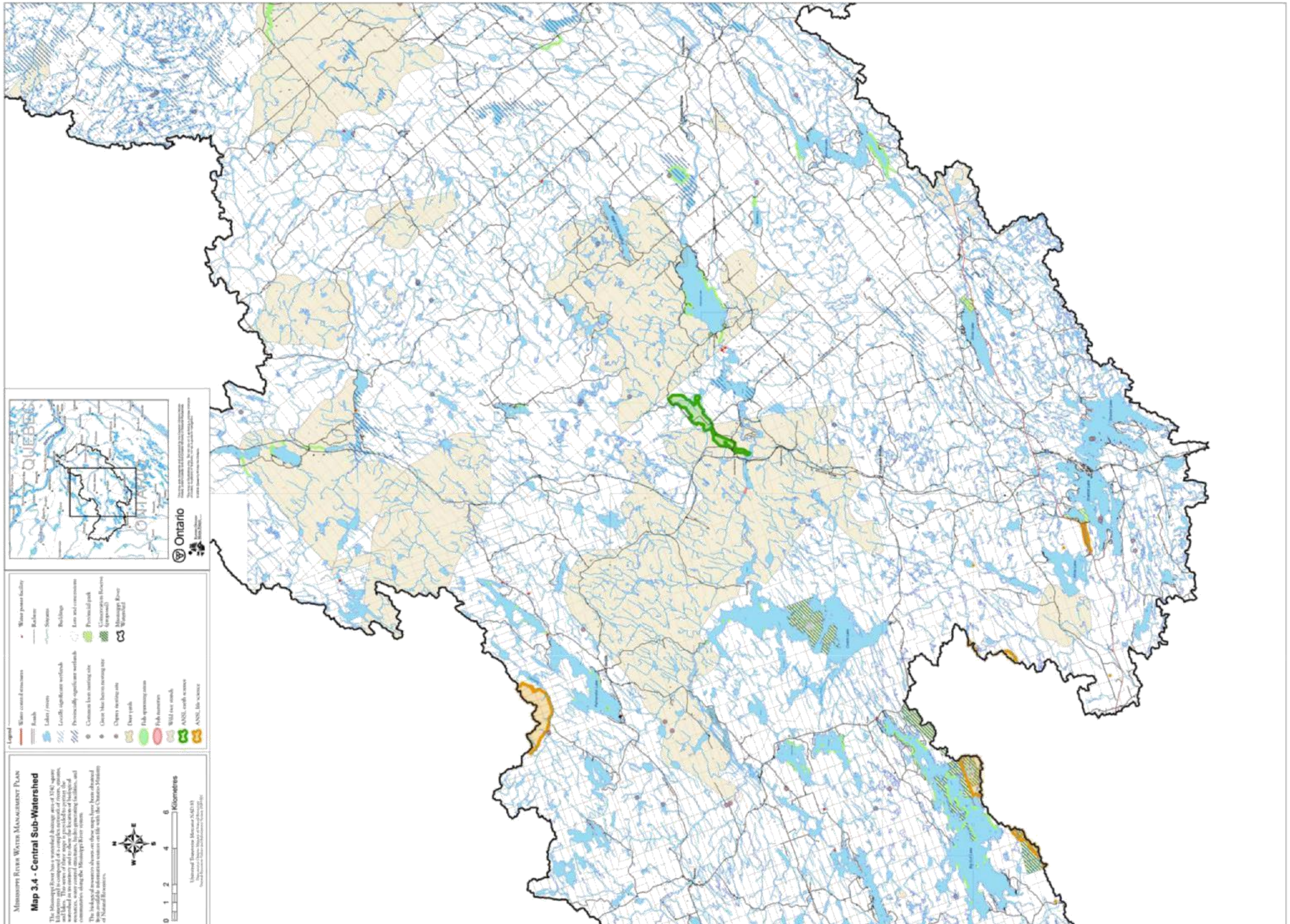
Many reaches within this sub-watershed have concerns regarding the effects of drawdown, operation levels and timing on local fish populations (especially on lake trout, walleye and bass), impacts of water level fluctuations on shoreline vegetation and wildlife, erosion, ice damage and unsafe winter conditions because of variable ice conditions, and access issues to property and boat launch sites. Many sites along the reach have had walleye spawning shoal rehabilitation. Shabomeka Lake is the only lake regulated for fall drawdown prior to lake trout spawning in September.

### *3.1.2 Central Sub-watershed*

The central portion of the watershed extends from the outlet of Crotch Lake through rolling terrain and marginal farmland to the Inlet of Mississippi Lake. The river itself is not heavily developed in this section of the watershed. There are 7 dams owned or operated by the plan proponents in the central sub-watershed. Six of these (Summit, Palmerston, Canonto, Widow and Bennett Lake Dams and the Lanark Dam) are not within the scope of the MRWMP (see Map 3.4). The High Falls Generating Station is the only water control facility that influences the levels and flows of downstream hydro facilities and is subject to this planning process.

The remnants of a log chute constructed during the 1860s can be found at the outlet of Kings Lake. The river then flows through a series of rapids to Millers Lake. The most significant set of rapids is at Ragged Chutes where a drop in elevation of over 20 meters exists. Two major tributaries empty into the Mississippi River just below Miller Lake, being Antoine Creek and Cranberry Creek. Both tributaries drain areas dominated by beaver swamps and are completely uncontrolled. Butternut Falls, at the outlet of Antoine Creek in the Village of Snow Road has a history of flooding.

From Miller Lake, the river flows through the Hamlet of Snow Road into Stump Bay, which is the forebay of High Falls, the first hydro-electric generating station on the river. The outflow from High Falls flows into Dalhousie Lake at Gedde’s Rapids: Dalhousie being the second last significant lake on the Mississippi River system. There is a natural rock outcrop at the head of Sheridan’s Rapids which controls levels on Dalhousie Lake, especially during the summer months. From Sheridan's Rapids, the river winds eastward through the Playfairville Rapids to the confluence of the two most significant tributaries on the Mississippi River system: being the Clyde and Fall Rivers.


Mississippi River Water Management Plan
Map 3.4 - Central Sub-Watershed
Legend
Lakes / rivers
Kilometres
0 1 2 4 6
Ontario

The Clyde River, having numerous tributaries of its own is the most significant tributary of the Mississippi River in terms of size, with a total drainage area of 614 sq. km. The headwaters of the river are in the Canadian Shield and are characterised by numerous small lakes, many of which are spring fed. There is virtually no storage available on the controlled lakes within this drainage area. The most significant settlement on this river is the Village of Lanark, which historically has annual flooding and low flow problems.

The Fall River has three significant lakes, Sharbot and Silver which are uncontrolled and Bennett, which has a dam at the outlet. The Fall River also has one significant tributary: Bolton Creek. The Fall River drains an area of 495 sq km and is predominantly rolling hills and glacial deposits. Within its boundaries are the Village of Sharbot Lake and the Hamlet of Fallbrook. Many pasture farms can be found throughout this sub-watershed.

From here, the Mississippi River flows easterly through the Hamlet of Ferguson Falls and the Village of Innisville into Mississippi Lake, which is the last lake on the Mississippi River proper. Lakeshore development in this area is quite dense, with a recent trend toward converting from seasonal to permanent dwellings.

### *3.1.3 Eastern Sub-watershed*

There are 6 dams owned or operated by the plan proponents in the eastern sub-watershed and only one of these dams (Clayton Lake Dam on the Indian River) is not within the scope of the MRWMP (see Map 3.5). All five remaining dams are on the Mississippi River and four of the five are waterpower generating stations. Two of these stations (Enerdu and the Mississippi River Power Corporation) are located within 125 m of each other in the Town of Mississippi Mills.

- Carleton Place Dam
- Appleton Generating Station
- Mississippi River Power Corporation Generating Station
- Enerdu Power Systems Ltd. Generating Station
- Galetta Generating Station

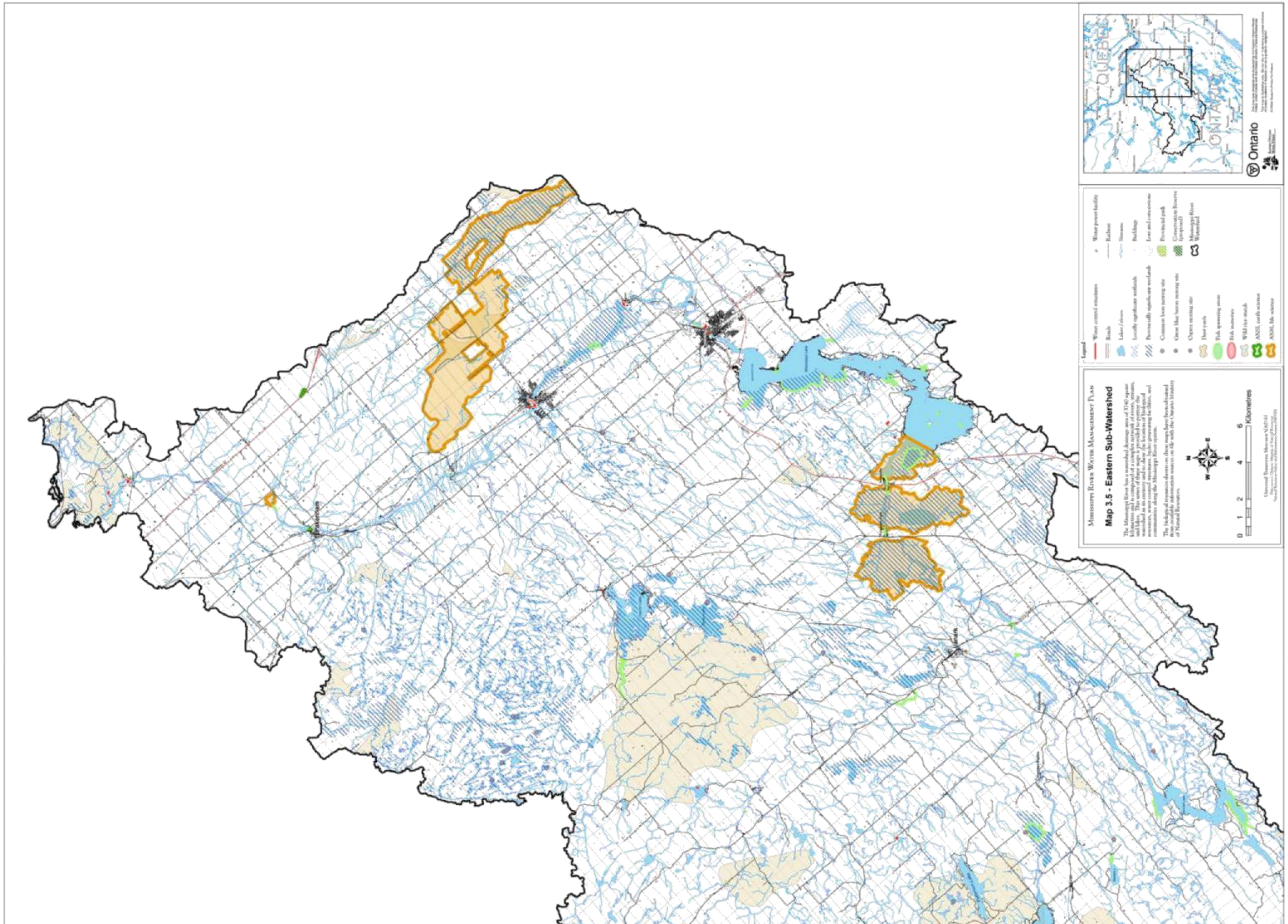
The eastern sub-watershed contains most of the population. Several communities, including Carleton Place, Almonte, Pakenham, Galetta, and a portion of the City of Ottawa, are situated along the main channel. As well, Mississippi Lake itself has over 1700 homes and cottages built along its shoreline. The terrain is much flatter here, with farmland dominating the rural areas outside of the communities.

The most significant tributary flowing into Mississippi Lake is McIntyre Creek. It empties near the inlet of the Mississippi River at a location which is a migratory bird sanctuary.

The Carleton Place Dam is located on the Mississippi River, downstream of Mississippi Lake within the Town of Carleton Place. Not intended for hydro-electric production, it maintains recreational levels on Mississippi Lake and provides minimal flood control benefits for Mississippi Lake and downstream municipalities.

From Carleton Place the river flows through the community of Appleton. The Appleton Generation Station was built here in 1993 at the site of the abandoned and derelict structure formally belonging to the textile mill.

Map 3.5 - Eastern Sub-watershed



The river continues north through the Town of Mississippi Mills (Almonte), where two generating stations are located. The first station, the Enerdu Generating Station was originally constructed in 1842, while the Mississippi River Power (formerly Almonte PUC) Generating Station, was originally constructed in 1890.

Several smaller tributaries and the Indian River flow into the Mississippi River between Almonte and the next downstream community, Pakenham. Below Pakenham, the last two significant uncontrolled tributaries enter the Mississippi River: Indian Creek and Cody Creek.

The Mississippi River then flows through the Village of Galetta, which is the last community on the system and to the Galetta Power Generating Station, which is the last control structure. It then empties into the Ottawa River at Chats Lake, just above the Chats Falls Generating Station.

## 3.2 Physical Resources

***Geologic Features*** - The geologic features within the watershed are quite complex, with the area being divided by underlying Precambrian bedrock to the west and Palaeozoic bedrock formations to the east. The Mississippi River generally follows the contact of these two formations which extend from the Village of Galetta to a point in the vicinity of Bells Corners in Bathurst Township. The surficial geology is largely a result of glaciation, from which till was deposited in the characteristic forms of moraines, drumlins and till plains, creating the lacustrine systems in the west, and other features found on the river system including eskers and spillways of clay and sand plains dominated by riverine systems in the east. These landforms have a more sorted and uniform composition as a result of their origin from glacial and post-glacial waters.

The Precambrian complex consists of crystalline limestone, quartzite and gneiss which were intruded, deformed and metamorphosed by bodies of granite, syenite and other igneous rocks. The Palaeozoic rocks consist of sandstone, limestone, dolomites and shale that were deposited approximately 500 million years ago.

***Soils*** - The soils within the watershed are closely related to the bedrock and surficial geology. The nature and properties of the soils are related to the characteristics of the parent materials from which they developed. The irregular terrain of the western sub-watershed has very shallow soils with frequent outcroppings. Internal drainage of these soils is good due to the coarse texture of the deposit. The soils in the eastern sub-watershed, which are underlain by the flat Palaeozoic rock formation, are more basic, finer textured and generally deeper. The types of soils in this area are numerous and inconsistent in nature as a result of the variable parent materials and active geologic processes which operated. Internal drainage within these soils is also variable, ranging from very poor to good.

The Mississippi River watershed can be described as consisting of broad geographic areas reflecting the underlying geologic features, topography and settlement patterns.

## 3.3 Biological Resources

To address general conservation concerns associated with the operation of waterpower control structures in a comprehensive way, this water management plan (WMP) was developed in accordance with the following legislation and policy documents:

- MNRF's Beyond 2000 and Statement of Environmental Values (SEV);
- Strategic Plan for Ontario Fisheries – SPOF II;
- Provincial Lakes and Rivers Improvement Act (LRIA);
- Federal Fisheries Act;
- Fisheries and Oceans Canada's Policy for the Management of Fish Habitat;
- Provincial Endangered Species Act (ESA);
- List of Designated Species at Risk in Ontario which are regulated under various legislation including the ESA and the Provincial Fish and Wildlife Conservation Act;
- Federal Species at Risk Act;
- Federal Migratory Bird Act; and
- Others that must be considered during the management planning stage.

The Mississippi River system contains both cold and warmwater fish species. Historically, lake trout lakes dominated the watershed, but now only a few lakes in the western sub-watershed continue to be managed as coldwater fisheries. The central and eastern sub-watershed lakes are managed as warmwater, walleye and bass dominated fisheries, and the river reaches' water levels and flow are managed to protect fish spawning. The watershed has many natural heritage features including several locally and provincially significant wetlands, rare species and species at risk, other significant natural features such as wild rice, a migratory bird sanctuary and Areas of Scientific and Natural Interest (ANSIs), and Parks, Conservation Reserves and Crown land.

The Mississippi River system has diversified aquatic habitats (spawning grounds, nursery, rearing, and food supply and migration areas) upon which fish depend directly or indirectly to carry out their life processes. Many of the important fish spawning areas are located below sections of rapids and dams and along shorelines of lakes and the river proper. In the western sub-watershed, most lakes support populations of walleye, although lakes such as Mazinaw contain lake trout and support both warm and coldwater populations. The central and eastern sub-watersheds contain primarily warmwater fish species such as northern pike, walleye, large and smallmouth bass, bluegill, pumpkinseed, rock bass, yellow perch and American eel.

In general, water levels and flows are important to fish species during the spawning and incubation periods of the eggs which can last from ice break-up to early summer for most species. Walleye spawn in spring, generally from mid-April to mid-May, on rocky areas in white-water below dams or rapids in the river. Walleye in lakes will spawn on cobble or gravel on shoals. Bass will spawn in late May to early June. Lake trout spawning occurs mainly in the fall from mid-October to early November, depending on temperature, on rocky shoals found in lakes. Lake trout spawning success is also susceptible to water levels. If fall drawdowns occur after spawning, some shoals may be uncovered or unprotected exposing the eggs to the drying and freezing conditions of the winter air. The MNRF is responsible for the protection and management of fisheries including fisheries allocation, fish and fish habitat information management and fish habitat rehabilitation. DFO is responsible for the management and protection of fish habitat. Wherever possible, MNRF and DFO take a coordinated approach to aquatic resource management.

The Mississippi River system is home to a wide diversity of mammal, reptile and amphibian, insect and bird species. In many cases the life-cycles of these species are directly related to the river and the corresponding land-water interface. One example of this important linkage would be the numerous wetland areas found along the river and the shores of some lakes. Loons, ducks and other waterfowl use these wetlands for nesting and staging areas. Furbearing mammals such as beaver, muskrat and raccoon derive food and shelter from wetlands. Reptiles depend on wetlands for much or all of their life-cycle and osprey and herons benefit from the shallow water feeding opportunities they provide. Certain wetland habitats on Kashwakamak Lake provide suitable habitat for a rare, species at risk turtle species known as Blanding's turtle.

The Mississippi River system is also home to several rare species and species designated as species at risk. These rare species are considered to be of concern because so few populations exist in Ontario. The river supports a total of 6 known rare species including 4 dragonfly species and 2 fish species. There are 4 species at risk including 1 fish species, 2 bird species, and 1 turtle that are dependent upon the river system and are afforded protection against wilful persecution, harm and destruction of their critical habitat.

As well, the Mississippi River is the site of many natural heritage features. Natural heritage refers to ecological features that perform various beneficial functions on the landscape. These natural heritage features include; wetlands that form the interface between aquatic and terrestrial ecosystems; fish habitat; species at risk habitat; and Areas of Natural and Scientific Interest (ANSI) which provide recognition and protection to significant natural features.

One such natural heritage feature in the Mississippi River system is wild rice. Wild rice is an edible wild grain that is a staple for aboriginal communities and is still harvested today. An integral part of shallow lake and river ecosystems, this tall aquatic grass provides food for waterfowl and habitat for snails and water insects, which are also eaten by waterfowl. Wild rice beds also provide habitat for furbearers and other wildlife. Water levels are important to maintaining wild rice stands as high water levels can drown these plants and low water levels can dry them up.

The information contained in this plan represents the best available information on the biological resources and is not necessarily a comprehensive list of species found in the Mississippi River system.

# *Section 4 Public Consultation and General Comments*

## 4.1 The Consultation Process

The planning process included consultation with the public from its outset in early 2003. An "Invitation to Participate" (paid advertisement) was placed in local and regional newspapers in February 2003 to announce the beginning of the planning process. In addition to identifying individuals interested in serving on the project's Public Advisory Committee, this consultation resulted in a mailing list for the project.

A 12 member Public Advisory Committee (PAC) (Appendix 1) was established in April, 2003 to bring forward the broad spectrum of interests associated with water level and flow management on the Mississippi system. The PAC's principle duties were to assist the plan proponents in carrying out public consultation and to provide advice and comment on the content of the Mississippi River Water Management Plan (MRWMP).

During the "Scoping Stage" of planning, two open houses were held in July 2003, one in the western portion of the watershed in Cloyne and the second in the central part of the watershed at the Mississippi Valley Conservation (MVC) office in Lanark. The open houses displayed general information on water management planning as well as the description of the planning process and time lines for this project. Background information about the current water management system and the fish and wildlife values of the system were also displayed.

Questionnaires were provided to the participants at the open houses. The majority of the input received at the open houses focused on the lakes in the western portion of the system and their interaction and influence on the downstream sections of the system. In addition to the open house input, additional written contributions were received from municipalities, lake associations and the general public during the consultation period.

A Scoping Report, summarizing the characteristics of dam operations, physical and biological resources within the planning area and outlining the MRWMP planning issues and objectives was released in May, 2004 for a 30 day review period at the conclusion of the "Scoping Stage" of planning. The comments received were added to the public record and brought forward for consideration in the planning process. The entire Comments and Responses document can be found in Appendix 8.

The MRWMP undertook "Options Development" by examining the issues raised in the planning process. The document entitled "Comments and Responses" was publicly released in September, 2004 and provides background information for specific issues raised by the public, identifies those issues for which options will be developed and what action will be undertaken by the MRWMP project to address an issue. The document also identifies those issues which are out of the scope of the MRWMP exercise and commits to forwarding the specific issue to the appropriate public agency.

Open houses for the "Options Development" stage were advertised concurrent with the release of the Comments and Responses document and held during October, 2004 in Northbrook and Lanark. The "Options Development" open houses focused on describing the management alternatives considered in the planning process. Input received at the open houses was directed to the planning team for further consideration in the further refinement of options for the MRWMP.

The “Options Development” phase of the planning process concluded with the release of the Options Development Report (June, 2005) on July 5, 2005 for a 30 day public review.

The “Draft” Mississippi River Water Management Plan open houses took place August 19th and 20th, 2005 in Cloyne and Lanark respectively.

During the above phases of the planning process, the public received notice of upcoming open houses through paid advertisements in local and regional newspapers, news releases and posters in watershed municipal offices, libraries and local businesses. Direct mailings to the project mailing list, municipalities, cottage associations and interest groups were undertaken each time a report was released and in advance of information centres. Participants at the open houses had the opportunity to identify matters of interest and concerns by meeting with dam and hydro facility owners, PAC representatives and Ministry of Natural Resources and Forestry (MNRF) staff.

The internet was also used as a communication tool in the preparation of the MRWMP. Background information, reports, notices of open houses, meeting minutes and other information related to the MRWMP is located on the project website at http://www.mississippiwaterpowerplan.com. Also, an information notice was posted on the Environmental Bill of Rights Registry and was updated throughout the planning process.

Copies of documents produced in the MRWMP exercise were available for public review at local government offices (municipal, MNRF, MVC) and public libraries within the planning area and were provided in electronic format, upon request, from the Mississippi Valley Conservation.

Aboriginal groups with an interest in the Mississippi River system were consulted at the Invitation to Participate, Scoping, Options Development and Draft Plan stages of the planning process and their views and concerns documented. There was also Aboriginal involvement through membership on the MRWMP Steering Committee and Planning Team. Consultation with the Sharbot Mishigama Anishinabe Algonquin First Nation, Ardoch Algonquin First Nation and the Ardoch Algonquin First Nation and Allies provided valuable information for the planning process with respect to the identification of resource considerations including wild rice, spawning beds and wildlife habitats on the lakes and rivers which are part of the Mississippi system. Information has been shared with the Algonquins of Pikwakanagan with respect to the MRWMP. The dialogue provided by the MRWMP exercise facilitated a better understanding of resource interests common to both the Aboriginal peoples and water management proponents as they were considered and addressed in the process.

The results of Public and Aboriginal consultations are found in this Plan. General concerns about watershed-wide issues are described in Section 4.2, and specific comments that apply to an individual reach, water control structure or generating station can be found in Section 7 in each individual reach description. Appendix 3 and 4 contain the Public Consultation and Aboriginal Consultation Reports, respectively.

## 4.2 General Comments and Responses

Through the work of the Planning Team, the Public Advisory Committee, and through the public consultation process, comments, concerns and issues were identified. Those that are general in scope and those outside the scope of the plan are dealt with here in Section 4, those specific to a particular lake or reach of the river are dealt with in Section 7. The following provides a general summary of the comments that were received and the complete Public Consultation Report is available in Appendix 3. The complete Comments and Responses Report, which provides more detail on individual comments received during the planning process, is included as Appendix 8.

### 4.2.1 Fluctuating Water Levels, General Operations, Flooding and Priorities

The most common comments received during the consultation process related to the fluctuation in water levels during and between years, and the operating regimes in place to control those levels. The concerns can be generalized as:

> **High water levels** are a serious concern when they happen, as they can lead to flooding of property, property damage, and shoreline erosion. High water levels and flooding are going to happen as a result of natural conditions (spring runoff, heavy rains), and the dams in the system are managed as a first priority to hold water and to control the release of water to downstream areas, and reduce flooding as much as possible. In the Mississippi system, the western watershed experiences a minimal amount of flooding, but the downstream lakes and river in the central and eastern watershed do have a certain amount of flooding, notably around Dalhousie Lake and Mississippi Lake. Flooding in these areas is particularly worrisome, as the shores of the lakes are very heavily developed with seasonal and permanent residences and commercial operations. Severe weather is occurring more frequently, and the floods of 1998 and 2002 attest to an unusual amount of rainfall in the watershed.
>
> **Low water levels** can be the result of drought conditions, experienced across the watershed in recent years. In addition, low fall and winter levels on many of the lakes results from the drawdown of water in the fall, which is done to ensure there is capacity in the upper lakes to hold spring rain and snowmelt and reducing annual flooding in downstream areas. Concerns over low water levels have been expressed by many residents across the watershed, typically around summer and early fall levels. Complaints relate to loss of access to shoreline properties, loss of recreational shorelines, docks being left high and dry, reducing water taking for personal and municipal use, and reducing power generation. Examples are on Crotch Lake, where the drawdown is quite large (to protect against spring flooding downstream on Dalhousie and Mississippi Lakes), and on Mazinaw, where the entire eastern side of the lake is only accessible by water.
>
> **Changing water levels** at the wrong time or by too much may also have the effect of creating problems with surface ice. A concern over drawdowns in winter has been expressed by a number of respondents, as this may lead to unstable ice conditions during winter and increased risk of ice damage to docks and other shoreline property in the spring.

A number of concerns over water levels were identified throughout the plan area, and these are described in the issues section for each river reach (Section 7). However, the most severe were identified in the Crotch Lake and Dalhousie Lake areas. Operation of the Crotch Lake dam and High Falls Generating Station provides a special challenge to water managers on the system because there is such a large drainage area upstream of the Crotch Lake Dam and there is only so much that can be done to keep levels stable in one area (or time of year) without having a negative impact on the other. The current operation (base case) has evolved in response to identified concerns over many years, and in most cases will be difficult to improve upon. Nonetheless, the options process does try to find improvements, and this can be followed in the options discussions of the reach-by-reach description in Section 7 of the plan. In the case of Crotch Lake, the Planning team tried several different options to see if improvement could be made.

The public identified a number of specific questions related to fluctuating water levels and general operating regimes. These included:

- If hydro-electric generation sites were non-existent within the watershed, would the water be managed differently?
- What are the overall priorities for managing water levels?
- If hydro-electric generation in the Mississippi River watershed is produced by “run of the river”, how does hydro-electric generation influence water management policy within the watershed?
- Is it possible to maintain higher summer levels during a drought?
- Is winter drawdown necessary?
- Is it possible to manage the watershed adaptively to include predictive climate data and reduce unnecessary drawdown?
- Which structures within the system operate with a variable flow system?
- Could a study be created, whereby an upper watershed lake is exempt from the winter drawdown for a number of years to comparatively study the ecological impact?
- Has a literature review been conducted to research the impact of the winter drawdown, and, if not, could one be conducted?

*Response to Public Comments on Fluctuating Water Levels* – If hydro stations were closed, but dams still existed in these locations, there would be only minor changes to the overall operation of the system because of one less competing interest for water.

The overall goal is to maximize the net benefits of the water for the people, fish and wildlife living in, on, near or using the system. Water management within the Mississippi River has evolved to the point where the priorities are as follows (note the priorities vary on importance depending on the time of year, location and circumstances):

- Flood control;
- Low flow augmentation;
- Ecological integrity;
- Recreation / tourism; and
- Hydro-generation.

The hydro-generation stations on the Mississippi River are “run of the river”. They can operate and produce power in variable water flows and have limited impact on the overall operation of the system. Occasionally, when there is sufficient water, the system can be operated to maximize generation, but on average the hydro-generating stations are only able to operate at about 50% efficiency. The system is never operated to maximize hydro-electric generation to the detriment of the other priorities. As with any of the other competing interests on the system, the overall goal is to maximize the benefits of the water in the system for the people, fish and wildlife living on, or using the system.

Fluctuations in water levels over the year are the cause of many frustrations, but the system is managed to mitigate these as much as possible. For example, the summer levels in the system are maintained to balance all the various objectives, and keep a minimum flow level throughout the system. During droughts only so much water is available in the system and the onset of rainfall is the only way to relieve low water levels. The lakes need to be drawn down in the fall and maintained that way over the winter to make sure that there will be enough storage capacity for spring snowmelt and rains. Without the ability to store some of the spring water flows, the lower parts of the watershed would experience additional flooding. A reduction in the magnitude of drawdown on any of those lakes would have an impact on their ability to reduce downstream flooding.

Managers also use as many tools as they can to understand and predict the behaviour of the water in the system. One thing that still is not overly accurate is predictive or forecasted climate data, and so “pre-emptive” decisions to adjust water levels based on how much or when the rain is coming really can’t be made except through averaging conditions over a number of years.

The suggestion to exempt an upper watershed lake from the normal winter drawdown would be difficult to do. Drawdowns on lakes are required to meet the objectives for the system, and taking one of the lakes out of the equation could create some serious implications for the rest of the system. However, a literature review with regard to impacts of winter drawdowns will be undertaken (see Section 8, Data Gaps).

### 4.2.2 Fluctuating Water Levels, Fish, Wildlife and Vegetation

The importance of appropriate water levels to fish, wildlife, and vegetation is a concern to the managing agencies and to the public. A wide variety of concerns had been expressed about fluctuating water levels and their effects on fish, wildlife, vegetation and general conservation.

The Ministry of Natural Resources (MNRF) manages fisheries based upon self-sustaining, naturally reproducing populations within the lake. Therefore, lake trout lakes are managed as coldwater systems with warmwater components if they share their waters with cool to warmwater species, such as walleye, northern pike, bass, perch and sunfish. Water level regulations, therefore, must take into consideration the fall drawdown, spring freshet and summer drawdown timing in regards to successful spawning of lake trout, walleye, bass and other fish species.

**Lake Trout** – The timing of the fall drawdown can negatively impact the spawning success of lake trout. Lake trout spawn in the fall, when water temperature is between 8 and 11 degrees Celsius (generally from mid-October to early November) in depths of 0.3 m to 12 m of aquatic shoreline habitat. Lake trout need cold, well-oxygenated waters, with clean (silt/sediment free) boulder or rocky/rubble shoals to deposit their eggs during spawning. The eggs sink and settle between the rocks, where they are protected during the incubation stage of development. If early fall levels are high, lake trout will spawn within these ‘false shoreline’ zones, and when these levels are dropped after the spawn, the eggs may be exposed to the drying and freezing affects of cold air temperatures or crushed by ice forming on or scouring the lake bed. Lowering lake levels prior to spawning allows lake trout to spawn in areas which will have enough water depth to protect their eggs during the winter.

**Walleye** – Excessive fluctuations in water levels, particularly a drop in water levels in the spring after the spawn has begun, can have a negative impact on walleye spawning success by limiting the availability of habitat or stranding eggs. In many instances, MNRF has established seasonal flow and/or water level requirements to minimize these impacts.

High water levels which flood the riparian zone can increase the influx of nutrients or contaminants which may change the plankton productivity, which is an important food source for walleye fry. Low water levels can force young walleye to feed further from shore where the water is colder and may provide less food and expose the fry to danger from predators. If suitable habitat is not to be found, walleye have been documented to migrate downstream to more hospitable areas.

**Other Fish Species** – Some areas of bass and pike habitats become enhanced with high water levels because new areas of shoreline vegetation become flooded creating new habitat. Unfortunately, low water flow and levels can reduce habitat availability and water quality can negatively impacting these species which tend to spawn close to shore in the benthic zones like many other fish species in this watershed. High levels of water may also impact water quality by increasing the influx of nutrients, mercury and other contaminants into the water.

**Loons** – Small lakes, generally those between 5 and 50 ha, can accommodate only one pair of loons. Larger lakes may have more than one pair of breeding loons, with each pair occupying a bay or section of the lake. Loons build their nests close to the water, with the best sites being completely surrounded by water, such as on an island, on submerged logs, or on sedge mats. Loss of habitat results from lakeshore development, pollution, acid rain and fluctuating lake levels which may swamp or destroy nests, or obstruct water access causing loons to abandon nesting sites or become exposed to predators.

**Vegetation** – Emergent vegetation and wild rice plants drown in high water or dry up in low water, which may destroy the seed bed. Wild rice beds are an important natural and cultural heritage plant and are afforded some protection for harvesting.

**Beavers** – Regulating water levels within the areas of beaver lodges may negatively impact the animal's survival if water levels become too low and diminish suitable beaver habitat in the area. Beavers will abandon their dens once access to water and food sources is diminished, which exposes the animal to predators and other dangers. Beavers are natural regulators of water and once the beaver is gone, habitat conditions will change.

**Other Wildlife** – Turtles, amphibians and insects, such as dragonflies, rely upon the aquatic environment to complete their development, for winter hibernation or for food. Low water levels can expose hibernating animals to winter-freeze or destroy their breeding and feeding habitats. High water levels can increase habitat availability, but increase the influx of nutrients, mercury and other contaminants which impact the water quality and the food chain directly, which reduces local biodiversity.

During the consultation processes, the public identified a number of general concerns and questions related to this issue, as well as numerous specific cases. The general concerns are expressed below, and the specific cases are to be found in the description of issues in Section 7 of this plan.

- Are bass and walleye spawning habitat in the riverine areas of the watershed, such as Snow Road, Innisville and Appleton, considered in any operating plans?

- What mechanisms will be developed to measure the impact of any potential changes of lake levels on fish and wildlife?
- Are American eels or the River Redhorse sucker adversely affected by the current operation of the hydro-stations in the lower reaches of the Mississippi River?

***Response to Public Comments*** – All operating plans take into consideration concerns related to fish and fish habitat, particularly spawning grounds, as well as other species that rely on the riverine ecosystems. For example, bass spawning habitat in the Mississippi River at Snow Road has been incorporated into the operations of both Crotch Lake Dam and the High Falls G.S. The bass spawning requirements of Appleton Dam are dealt with through the normal operation of the dam, which maintains stable water levels through the village for the month of June.

Changing lake levels and their potential effects on fish and wildlife will be measured and reported on through the effectiveness monitoring program for this water management plan (see Section 9).

The American eel population in the Mississippi River presents a complex situation. While the hydro-electric facilities and dams on the Mississippi River, the Ottawa River, and the St. Lawrence River are one of the factors that have affected American eel migrations and populations, altering the operation of these facilities will not resolve the problem. If new methods are developed to ensure safe American eel migration, it may be possible to alter the design of the dams in the future.

On the Mississippi River system, the River Redhorse Sucker is known to exist between Appleton and the Ottawa River. There is no evidence that the River Redhorse Sucker is adversely affected by the operation of hydro-facilities. Ongoing data collection is of interest to the MNRF and the hydro-producers.

Drawdowns on the lakes are required to meet the objectives for the system. A literature review with regard to impacts of winter drawdowns will be undertaken (see Figure 8.3, Information Needs).

### 4.2.3 General Lake Ecology Concerns

**Diminishing Lake Trout Populations** – Lake trout were historically abundant in coldwater lakes within the Mississippi watershed. The species has been extirpated from many lakes and currently, natural populations exist in only a handful of lakes. Some natural populations continue to decline. Slow growth, late maturity, low reproductive potential and slow recruitment rate contribute to the difficulty in rehabilitating natural populations. Lake trout are also very sensitive to change in their habitat and environment, making them an indicator of overall ecosystem health. Recently, distinct genetic strains of lake trout have been identified in the Haliburton and Mazinaw areas, increasing the conservation concern for local populations. Several factors have contributed to the extirpation and decline of lake trout populations. Habitat alteration, including development, increased water temperatures, increased nutrient loading, fluctuating water levels that expose spawning shoals, introduction of exotic, invasive and non-indigenous species, as well as exploitation by angling, have contributed to the decline of lake trout. Despite regulation and policy changes imposing restrictions to fishing regulations, shoreline development, forestry activities, and water management planning, the status of local lake trout populations continues to be of concern.

**Diminishing Walleye Populations** – Walleye, like many fish species, are impacted by a variety of factors which may decrease the suitability of their habitat conditions and negatively impact their reproductive and recruitment success. Walleye are adapted to low to moderate light conditions; therefore, as water clarity improves, from invasive species such as zebra mussels, the suitability of the habitat decreases. As well, the amount of nutrients in a lake will determine productivity and, therefore, the amount of available food. Other factors which may impact walleye include shoreline development and land use that impacts water and habitat quality and quantity, fluctuating water levels, acid rain, nutrient loading, contaminants and invasive species such as black crappie, bluegill and northern pike which either compete with or prey upon walleye.

**Water Levels and Property Damage** - Residents complain about ice and flood damage to property and obstructed access (boat and navigation) due to low summer levels and drought conditions, which may worsen with the changing climate. A number of lake residents lose access to water with the fall drawdown, and depending on ownership of 'drowned lands' they may have to cross a neighbour's property to get to the lake when water levels have been drawn down. Water levels come up in spring before the ice is out, damaging docks, and the stabilization of water levels during winter months is important to provide safe shore ice access for winter sports.

### 4.2.4 Economic Value of the Watershed

Many of the specific concerns brought forward in the public consultations dealt with the economic effect of managing water levels, for example the effects of low water levels on tourism. Questions also arose over the importance of power generation along the river and its priority when compared to other uses and users of the system:

- What is the economic value of the watershed and what is the comparative value of hydro-production vs. recreation? What is the hierarchy of priority?

  ***Response*** – Hydro-production and recreation are not mutually exclusive. While determining the exact values of hydro-production and recreation are difficult, hydro-production has minimal impact on recreational opportunities. The system is currently operated for the benefit of both. When options are considered in this plan, costs and benefits will be taken into account. Also, the plan includes a section on the socio-economics of the river system (Section 5).

## 4.3 Matters Outside the Scope of the Water Management Plan

Several comments were received on matters that were outside the scope of water management planning, or of this particular plan, and are summarized below:

***Water Quality*** – Several respondents were concerned whether or not the water management plan takes into account water quality in the rivers and lakes, drinking water use, and the effects of such matters as increased development, cattle in the streams, and sewage discharge into the waterbodies.

***Response*** – The water management plan can have some, albeit minor, influence on water quality. If water is continuously flowing through the system, there will be an element of flushing out of contaminants and pollutants. This flushing and the impact of managing the dams is a fairly minor influence, particularly in summer when levels are naturally low. Sources of contamination are critical to the overall health of the river system but do not fall within the terms of reference of a water management plan.

***Geographic Extent of the MRWMP*** – Why are the tributaries not included in the study area? They have a significant influence on water levels in the river and on dam operations.

***Response*** – The study area has been defined as the Mississippi River and interconnecting lakes. Not all water control structures within the watershed are included in the scope of the study, specifically those on tributaries which have little or no storage capabilities and therefore minimal influence on reducing high or augmenting low flows and levels on the Mississippi River.

***Invasive Species*** – Questions were asked about the impacts of species introduced to the river such as zebra mussels and Eurasian water-milfoil.

***Response*** – The spread of such species is a real concern to the agencies involved in the plan, but is outside the terms of reference for the water management plan.

***Construction of Additional Water Control Structures*** – Questions were asked about the construction of new water control structures to improve water levels within specific river reaches and lakes such as Dalhousie Lake and Marble Lake.

***Response*** – The construction of new water control structures requires the preparation of a detailed Environmental Assessment and is outside of the terms of reference for the water management plan.

# Section 5 Socio-Economic Summary

## 5.1 Hydro-electric Generation

Development of the Mississippi River began in the 1800s to transport large timbers from Mazinaw Lake downstream to Sawmills along the river and Quebec (see Section 1.2 History for more detail). Dams were built at strategic points along the river to hold water back, and slides were built to carry logs past falls and rapids (MVC Background Study 1987). Other dams such as Mazinaw, Crotch, Big Gull and Kashwakamak Lake were originally built solely for lumber transport purposes.

The lower river system around towns such as Carleton Place, Almonte, Pakenham and Appleton thrived with textile and grist mills as the river supplied the power. The original dam in Carleton Place was a water powered mill. Other dams were constructed for various mill operations and then for hydro generation (Water Management Strategy, Background Report, MVC, 2003).

There are twelve water control structures along the Mississippi River which are considered within the scope of this plan. Five of these structures are power generating facilities being High Falls G.S., Appleton G.S., Enerdu G.S., Almonte G.S. and Galetta G.S.

The total installed capacity from these 5 Hydro-electric plants is 8 megawatts, and this would supply the average needs for 7200 homes. However, the average annual production based on current water flows is roughly half of the installed capacity. Total hydro power produced does vary from year to year depending on the amount and timing of precipitation (rain/snow) in the watershed.

## 5.2 Municipal and Private Water

There are a number of water-taking permits issued for the Mississippi River. Of these, only four result in a direct extraction of approximately 14,000 cubic metres of water per day (m3/d), which is equivalent to 0.16 cubic metres per second (cms). The most notable of these is for the municipal water supply at Carleton Place, which has a maximum taking of water at 12,000 cubic metres of water per day (m3/d).

There are two municipal sewage treatment facilities, which discharge effluent into the Mississippi River; Mississippi Mills (Almonte), with a population of 4600; and Carleton Place, with a population of 9300.

The mean seven-day drought estimate, with a 20 year return period, at Appleton is approximately 4 cms. At present, there have been no reports of significant surface water shortages that have affected either municipal supply or effluent requirements. Other water takings within the watershed are either from off-line surface or groundwater sources, which are not directly influenced by streamflow conditions in the Mississippi River (Renfrew County-Mississippi-Rideau Groundwater Study – 2003).

## 5.3 Harvesting Wild Rice

One aboriginal community, the Ardoch Algonquin First Nations, lives along the river in the village of Ardoch. Each fall, the community harvests the wild rice that grows in that area. Maintenance of these wild rice beds is important to sustain the traditional activities of this community.

## 5.4 Tourism and Recreation

Many of the communities along the Mississippi River boast of good, year-round recreational activities including white water (spring) and flat water canoeing, boating on the larger lakes, and lake trout, pickerel, bass and pike fishing on over 200 lakes and streams, as well as snowmobiling and skiing opportunities in the winter.

Mazinaw Lake, one of the deepest lakes (145 m or 476 ft) in Ontario, is the location of the Bon Echo Provincial Park and Mazinaw Rock. The rock is a 1.5-kilometre sheer rock face, rising 100 metres above the lake and features over 260 native pictographs – the largest visible collection in Canada. The park annually attracts more than 175,000 visitors (Bon Echo Provincial Park website, 2005).

*Mazinaw Rock*

Community beaches include Bon Echo Provincial Park, Carleton Place, Almonte, Pakenham and several other smaller beaches along the river.

Camping and Crown land recreational opportunities are more prevalent in the western section of the river above Dalhousie Lake. The Eastern section is limited to a few commercial campgrounds and a number of lakes and Crown land (Background Information for Water Management Strategy, MVC, 1987).

Several other shore-based businesses exist such as resorts, camps, fishing expeditions, marinas and canoe/boat rentals, which may be affected by fluctuating river flows and levels. The Selected Demographic, Social and Economic Statistics (Statistics Canada, 2001) were reviewed for the Mississippi River extent, and a total of 2235 businesses were identified.

## 5.5 Permanent and Seasonal Residents

The number of seasonal residents in the Mississippi River Watershed is significant, given that there are over 250 lakes found throughout the watershed, with 75% of these in the western portion of the watershed. From the 1950s to 1970s much of the Crown land around the upper watershed lakes (Shabomeka, Mazinaw, Kashwakamak, Mississagagon, and Big Gull lakes) was sold to private individuals. More recently, these areas have seen a transition from seasonal to permanent dwelling.

The Carleton Place area is the most densely populated region along the Mississippi River system. Carleton Place has a population of 9300 and Mississippi Lake alone has approximately 1700 residences located along its shores (Carleton Place Dam Operational Assessment, MVC, 1999). As well, a substantial number of these residences have or are in the process of being converted to year round residences. Figure 5.1 provides a table of the lake characteristics and associated number of residents and resorts/marinas.

**Figure 5.1 – Mississippi River's Water Control Structures**

| Control Structure | Drainage Area (sq km) | Maximum Depth (m) | Surface Area (ha) | No. of Residential Properties* | No. of Marinas/ Resorts |
|---|---|---|---|---|---|
| Shabomeka | 41 | 32 | 268 | 99 | - |
| Mazinaw | 339 | 145 | 1630 | 314 | >4 |
| Kashwakamak | 417 | 22 | 1274 | 377 | >5 |
| Mississagagon | 22 | 24 | 545 | 127 | 3 or > |
| Big Gull | 135 | 26 | 2540 | 323 | 5 or > |
| Crotch | 1030 | 31 | 1953 | 7 | 3 |
| High Falls G.S. | 1233 | N/A. | 264 | N/A | N/A |
| C.P. Dam | 2876 | N/A. | 3030 | N/A. | N/A. |
| Appleton G.S. | 2932 | N/A. | N/A. | N/A | N/A |
| Enerdu G.S. | 3012 | N/A. | N/A | N/A | N/A |
| Almonte G.S. | 3012 | N/A. | N/A | N/A | N/A |
| Galetta G.S. | 3684 | N/A. | N/A | N/A | N/A |
| | | | | | |
| **Other Notable Areas** | | | | | |
| Dalhousie Lake | 1309 | 13 | 521 | 195 | N/A |
| Mississippi Lake | 2876 | 9.2 | 3030 | 1700 | 3 |

* Number of dwellings based on MVC structural surveys undertaken between 1985 and 1992.

N/A Not applicable

# Section 6 – Water Management Options

## 6.1 The Approach Used to Analyze Options

An important part of this planning process was the identification and consideration of different operating regimes that might resolve identified issues and concerns. In order to decide where optional operating approaches could be beneficial, the Planning Team completed an analysis of the comments and issues that had been identified by the public. Some of the comments and issues were outside the scope of this water management planning exercise, and Section 4 identifies these and offers a response as to how they might be dealt with. Other issues could be resolved by a response from the Planning team, and were not considered further. Those issues that remained were considered in the options development stage and are related to the following four facilities on the system:

- Shabomeka Lake Dam,
- Mazinaw Lake Dam,
- Kashwakamak Lake Dam, and
- Crotch Lake Dam.

For these four facilities, options were developed and analyzed in an attempt to address the issues that had been identified. Details of these options are found in the reach by reach description in Section 7.0.

Figure 6.1 summarizes the process that was followed.

## 6.2 Constraints Considered

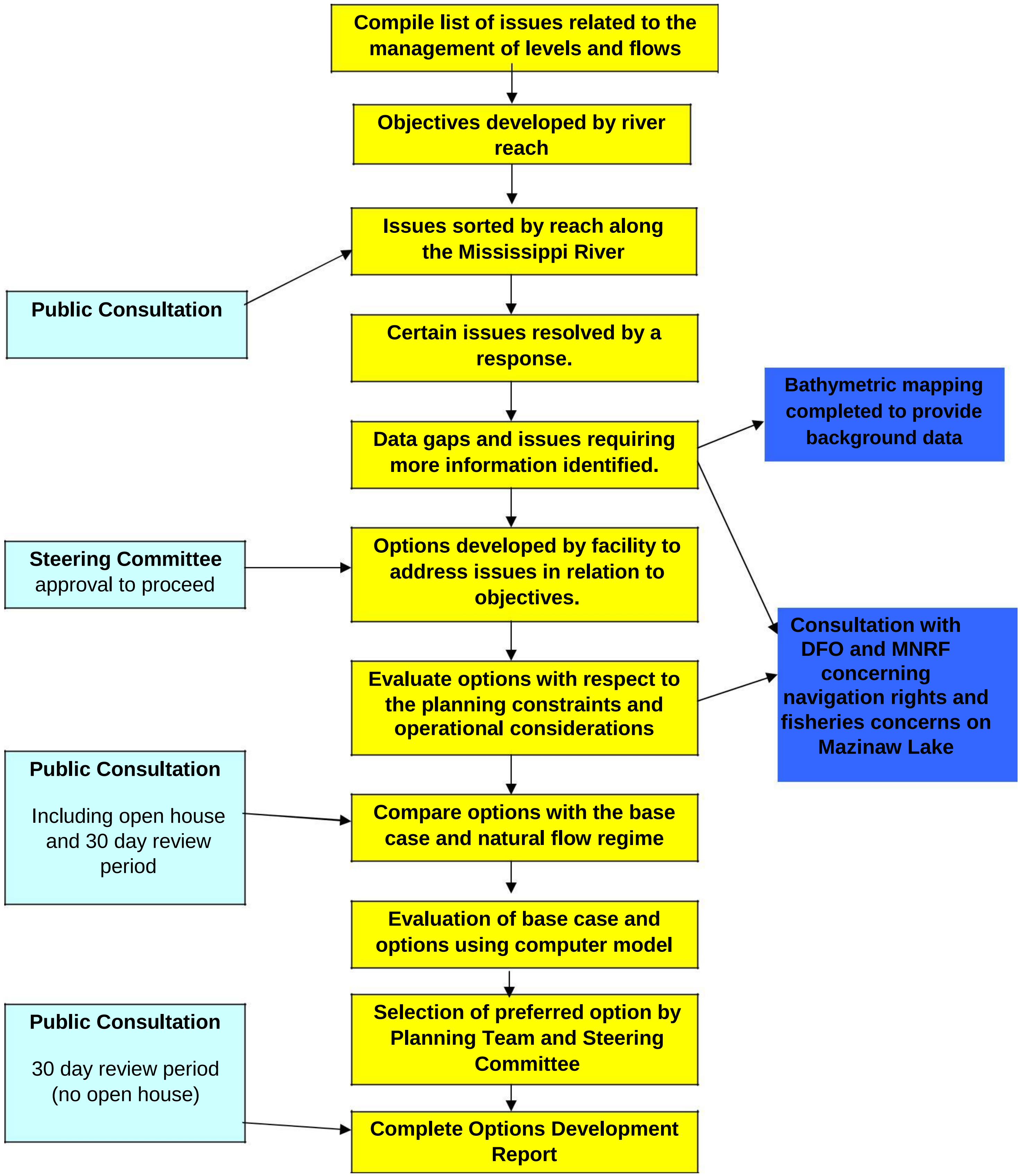
There were three overriding constraints that had to be taken into account as the options were being considered. These constraints included:

***Weather and Climate*** – The weather and climatic conditions (precipitation, runoff, and evaporation) provide an over-arching constraint and challenge to the operation of the facilities along the river. Operations are constrained by the variability and uncertainty of the local weather conditions, and by the reliability of weather forecasts.

***Planning Constraints*** – These are physical constraints due to the topography of the watershed and the configuration and size of a dam or channel leading up to a dam, which restricts the ability of the structure to influence flows and levels. Modifications to these constraints are considered to be outside the scope of this plan.

***Operational Considerations –*** These represent environmental, socio-economic or safety considerations, which have been identified over time and which guide operating procedures under various watershed conditions. While these may be modified, changes should be supported through a cost/benefit analysis which weighs the various options and outcomes. Certain factors affecting these considerations (e.g., land use) may be beyond the scope of the water management planning process, however, their implications must be considered in examining the various options.

**Figure 6.1 – MRWMP Option Development Flowchart**



## 6.3 Developing the Options

The Planning Team considered the operation of each of the facilities in relationship to the plan's objectives and constraints. The team developed optional regimes for each of the four dams – options that might resolve the identified issues. The first option that was considered was the existing operating regime, or the "Base Case," and this is described in the following section.

## 6.4 The Base Case and Natural Flow Regime

The Aquatic Ecosystem Guidelines recommend that where opportunities exist, water control structures be managed and operated to reflect the natural flow regime of the river system under consideration. The Planning Team recognizes that changes in the watershed's hydrology due to factors such as changes in land use are beyond the ability of the Water Management Plan to address. However, the natural flow regime can be considered a benchmark against which management options and operating strategies can be evaluated to determine if a potential gain in ecological conditions can be realized.

The Base Case for the Mississippi River Water Management Plan represents the current operating regime for the twelve water control structures subject to planning, a regime that has developed over time in response to the needs and concerns of various uses and users. In order to describe the Base Case and evaluate management options, it was important to ensure that operating decisions at each individual structure and their influence could be accurately described, particularly for those structures with sufficient capacity to regulate streamflows. This was accomplished through the use of a computer model, which simulated the natural inflows to each structure, routing those inflows through the storage reservoirs based on actual dam settings and subsequently routing the outflows to the next downstream structure. This was accomplished for the eleven year period 1993 – 2003. Records prior to 1993 were insufficient to provide a longer period of record.

The Natural Flow Regime was modeled by removing the influence of the individual dams. This was accomplished (through the simulation of the computer model) by removing all stoplogs from the water control structures and simulating the resulting streamflow conditions at the downstream structures over the same eleven year period. This approach provides an accurate comparison of the influence that the Base Case exerts on the river system.

In general, the base case resembles the natural flow regime. By managing water storage in the system, the base case reduces peak flows in the spring and augments flows throughout the remainder of the year. A description of the base case for each structure in the system can be found in the reach-by-reach descriptions in Section 7.

## 6.5 Evaluating the Options

Additional options were developed and analyzed for the four dams. The Planning Team completed an initial "qualitative" assessment of the options, and where this initial assessment phase was considered inconclusive the options were evaluated through the use of the simulation model. The effects of the options were simulated over a period of eleven years as was done for the base case, to assess their impact on streamflows and water levels along the river system.

Alternative options were then selected if they provided a net benefit to the system and did not conflict with a planning objective.

Figure 6.2 and Appendix 6 summarize the options considered. A more detailed description of the options and the process for option selection is contained in the report, “Mississippi River Water Management Plan, Option Development Report” (June 6, 2005) which is attached to this plan as Appendix 5. Each option for the four dams is described in Section 7 of this plan, along with an evaluation of how the option deals with the issues, objectives, and constraints.

## 6.6 The Preferred Option

Issues and concerns were examined in light of the benefits and costs of a variety of options. With the exception of the Shabomeka Lake Dam, it is felt that the current operating regime (or the base case) of the hydro-electric generating facilities and water control structures offers the best solution.

Therefore, the preferred option for purposes of the Mississippi River Water Management Plan will be to operate the hydro generating facilities and water control structures in accordance with the Base Case as described in Section 7, with the exception of the Shabomeka Lake Dam. The Base Case is considered to satisfy the planning objectives to the greatest extent possible, given the range of competing interests and uncertainty associated with weather conditions.

With respect to Shabomeka Lake, the preferred option is: to continue with the mid-September drawdown while raising winter water levels in Shabomeka Lake by approximately 0.30m (one log) more than current practice. This will aid in ensuring that water is covering the spawning habitat throughout the spawning and incubation period for lake trout (October – April).

**Figure 6.2 – Summary of Options**

| Options | Description | Objective | Model | Decision | Rationale |
|---|---|---|---|---|---|
| **Option 1 – Base Case** | | | | | |
| 1 A | Status Quo | | Yes | | |
| **Option 2 – Shabomeka** | | | | | |
| 2 A (1) | Remove one less log | Fisheries | Yes | preferred | effectiveness monitoring required |
| 2 A (2) | remove two less logs | Fisheries | Yes | X | monitor effectiveness of 1 log; data gap |
| 2 B | delay log removal | Navigation/ recreation | No | X | conflict w/lake trout objective |
| **Option 3 – Mazinaw** | | | | | |
| 3 A | revise drawdown date | Fisheries/ ecosystem | No | X | conflict w/DFO authorization |
| **Option 4 – Kashwakamak** | | | | | |
| 4 A | eliminate 2nd drawdown | Ecosystem | No | X | science gap-benthic hibernating vertebrates |
| **Option 5 – Crotch Lake** | | | | | |
| 5 A | reduce summer drawdown to 238.5 m | Navigation | Yes | X | conflicts outweigh benefits |
| 5 B | reduce winter, replace water w/ upper lakes | Navigation / recreation | No | X | conflicts outweigh benefits |
| 5 C | eliminate winter; w/l 239.5 m; some logs | Fisheries / ecosystem | Yes | X | conflicts outweigh benefits |
| 5 D | eliminate second drawdown; no logs | Ecosystem / hydro | Yes | X | conflicts outweigh benefits |
| 5 E | 5cms avg. flow; 1cms fill; 3cms min summer | Ecosystem / hydro | Yes | X | model run which resembles base case |
| 5 F | 5cms avg. flow; 1cms fill; 5cms min summer | Ecosystem / hydro | Yes | X | conflicts outweigh benefits |
| 5 G | >5cms avg. flow; 1cms fill; 7cms min summer | Ecosystem / hydro | Yes | X | conflicts outweigh benefits |
| 5 H | >5cms avg. flow; 2cms fill; 5cms min summer | Ecosystem / hydro | Yes | X | conflicts outweigh benefits |
| 5 I | >5cms avg. flow; 2cms fill; 7cms min summer | Ecosystem / hydro | Yes | X | conflicts outweigh benefits |
| F J | maximize hydro generation - 14 cms | power generation | Yes | X | not viable, no other objectives can be met |
| 5 K | maintain at or above weir height | Fisheries | No | X | conflicts outweigh benefits |

Note: X – The Base Case is preferred over proposed option(s).
Model – yes if the option was modeled

# Section 7 – Reach Description, Issues and Options and Operating Plans

## 7.1 General Operating Principles

All of the dams in the western portion of the watershed were originally built to maintain enough water in the system to allow timbers to be floated downstream three or four times a year. The purposes of these structures have become diversified with the changing conditions in the watershed. As well as flood protection, low flow augmentation, ice management, erosion control and recreation necessary as a result of extensive development along the watercourse over the last fifty years, they also must be operated to maintain specific flow and level requirements for lake trout, walleye, bass, pike and as much as possible, all other fish species. Stable levels are required for wildlife such as loons, frogs, muskrat and beaver and sufficient flow maintained to allow hydro producers to continue operating their plants and turn a profit.

The management of the system has become increasingly difficult as weather patterns alter when and how much water is available at any given time, storms and droughts have tended to be more severe and new restrictions are placed on how dams can be operated. This watershed historically receives approximately 870 mm of precipitation annually and it loses approximately 530 mm of that to evaporation annually, thereby leaving only 340 mm to re-supply groundwater aquifers, fill the upper lakes and maintain a minimal flow of 5 cubic meters per second (cms) throughout the year.

There are six major lakes in the watershed which act as storage reservoirs in the spring to alleviate flooding downstream of Crotch Lake. These lakes - Shabomeka, Mazinaw, Kashwakamak, Big Gull, Crotch and Mississagagon - all have water control structures at their outlets. There are two other notable lakes on the main branch of the Mississippi River, being Dalhousie and Mississippi Lakes. Neither of these lakes have a dam at their outlet although Mississippi Lake is influenced by the Carleton Place Dam under low flow conditions. Both of these lakes are heavily developed.

Every fall, the dams are operated to drawdown the lakes to provide storage for the spring runoff. As snowmelt and spring rains occur, the lakes are gradually filled to reach the summer target levels for recreation and tourism. It requires approximately 140 mm of runoff from rainfall and snowmelt to fill the lakes. Conditions must be monitored to ensure that the targets can be reached while ensuring adequate storage remains for late spring rainfalls and sufficient flows and levels are maintained for spawning fish. In doing so, there is a reduction in flooding to areas downstream as the uncontrolled flows from Antoine and Cranberry Creeks, the Fall and Clyde River systems move through the central and eastern portion of the watershed. Once the runoff is over, all of these dams, except for the Crotch Lake Dam, are operated to maintain relatively stable elevations on the lakes for recreation throughout the summer months. Crotch Lake Dam is unique as it is the only true reservoir lake on the system.

From late June through early October, Crotch Lake is drawn down to ensure flows in the lower portion of the river. Under normal conditions, approximately 60% of the flow in the river comes from Crotch Lake. During the droughts of 2001 and 2002, 100% of the flow in the river below Crotch Lake came from Crotch Lake as all other tributaries had virtually dried up. The upper lakes were operated to bring levels down to the bottom of their respective target range to maintain flow in the river in the western portion of the watershed. Crotch Lake normally fluctuates from 2.5 to 3.5 m (depending on amount of precipitation) over the course of the summer.

Throughout the fall, as the other lakes are being drawn down, Crotch Lake is filled again while still maintaining at least a minimum average flow of 5 cms downstream of the dam. From January through March the lake is again drawn down to perform the same low flow augmentation function over the remainder of the winter months and to maximize storage in the lake for spring.

Section 7 provides a range of information on individual lakes or dams, for each of the reaches of the Mississippi River system. The information includes:

- a brief physical description of the reach;
- a summary of natural resources;
- a comment on land uses in the reach or on the individual lake;
- a description of the dam;
- a summary of public comments that were received during the planning process, and responses to them;
- planning considerations and operational constraints for each dam;
- an analysis of optional operating or management approaches, where options were considered, and conclusions from the options analysis process (see Appendix 5 for additional information); and
- the current and/or preferred operating plan (base case) for the dam.

## *Reach 1 – Shabomeka Lake*

Shabomeka Lake (a.k.a. Buck Lake) is located in the Township of North Frontenac (formerly Barrie Township), on Semicircle Creek and is considered a headwater lake on the Mississippi River (see Map 7.1). Shabomeka Lake flows into Semicircle Lake which then flows into Mazinaw Lake. The Shabomeka Dam is the first major water control structure on the system and is located on the southwest shores of Shabomeka Lake. Figure 7.1 provides the physical characteristics of Shabomeka Lake and Dam.

| **Figure 7.1 – Physical Characteristics Shabomeka Lake and Dam** | |
|---|---|
| Elevation (mean metres ASL) | 271 |
| Embankment Elevation (m) | 271.45 |
| Surface Area (ha) | 270 |
| Drainage Area (sq. km) | 41 |
| Maximum Depth (m) | 32 |
| Mean Depth (m) | 12 |
| Volume ($m^3$) | $3.3 \times 10^7$ |
| Perimeter (km) | 13.7 |
| Total Storage Volume (ha. m) | 536 |
| Hydraulic Capacity (cms) | 12.0 |

*Source – MVC and MNRF*

***Natural Resources*** – Lake trout have been documented spawning at several locations throughout Shabomeka Lake. Based on field observation the potential spawning shoals are susceptible to the fall drawdown, and concerns have been raised regarding the survival of lake trout eggs over winter.

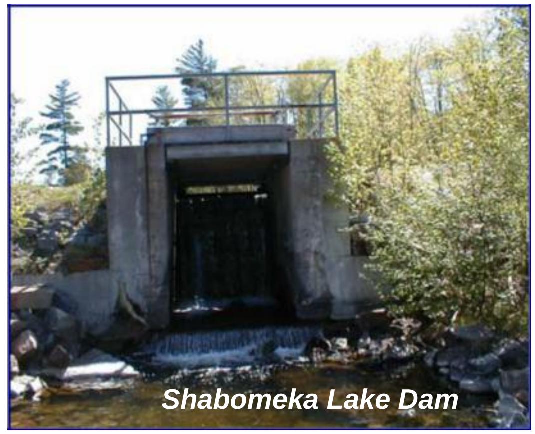
Spawning habitat rehabilitation was completed on two shoals on the south shore of the lake in 1988, to address the concerns regarding the timing of drawdown, and lake trout were observed utilizing one of the two rehabilitated sites in 1990. Currently, the lake trout population in Shabomeka Lake is maintained through artificial stocking. Spawning sites of other species have not been assessed. Figure 7.2 provides a list of documented fish species in Shabomeka Lake. There are no known species at risk in this reach.

| |
|---|
| Lake whitefish |
| Lake herring |
| Lake trout |
| Northern redbelly dace |
| Pearl dace |
| White sucker |
| Rock bass |
| Largemouth bass |
| Smallmouth bass |
| Pumpkinseed |
| Yellow perch |
| Burbot |

*Source - MNRF*

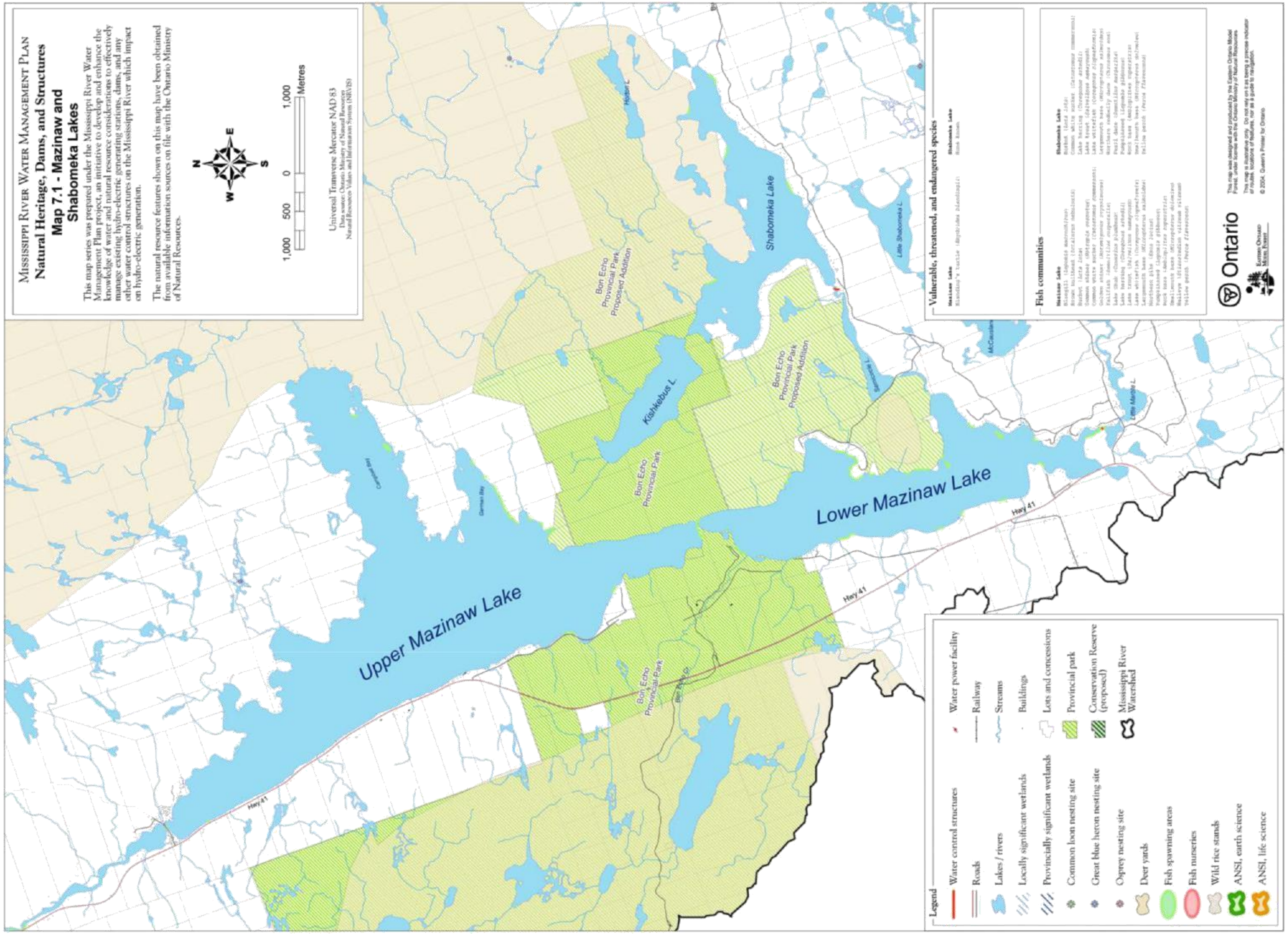
***Land Use –*** There are approximately 99 residential buildings on Shabomeka Lake, with about 1/4 of them having boat-only access. The Bon Echo Provincial Park and the proposed park addition are located along the northern and western shores of the lake.

***Description of Shabomeka Lake Dam*** – The Shabomeka Dam is used for water control purposes and is located at the outlet on the southwest shore of Shabomeka Lake. The dam consists of a single concrete sluice containing eight 0.25 m x 0.25 m x 2.44 m stoplogs. An earth embankment on either side of the sluice forms the remainder of the dam. The dam is owned and operated by Mississippi Valley Conservation (MVC) and the removal and replacement of stoplogs is done by a local contractor.


***Shabomeka Lake Dam***

***Public Comment Summary –*** During the consultation phase, a total of five questionnaires, one email, and one letter were received with comments or concerns regarding Shabomeka Lake's fall water levels and their impact on lake trout spawning. Comments did not suggest any issues related to water levels in the spring, summer or winter. A suggestion was made that more water should be left in the lake in the fall in order to protect spawning shoals that are left high and dry after the mid-September drawdown. Several comments concurred with the need to protect these shoals, but others made the point that increasing fall water levels might cause more ice damage the following spring. The timing of the fall drawdown was also a noted issue for those who had trouble getting access to their properties after mid-September.

> <u>Response to comments</u> – Shabomeka Lake's operating guidelines were changed in 1981 to a mid-September drawdown to accommodate the lake trout spawning in mid-October. Despite observations of excellent lake trout spawning habitat in several areas of the lake, a self-sustaining population has not become re-established; currently the lake trout population is sustained entirely through the provincial stocking program. Also, when the drawdown timing was changed, the cottage association was in agreement.
>
> The Planning Team believes that the best lake trout spawning habitat is exposed after the September drawdown, and that lake trout are simply not finding adequate substrate for spawning. We are proposing to continue with the mid-September drawdown, but removing one less log from the dam in order to ensure that there is water covering the spawning habitat throughout the spawning and incubation period (October – April).
>
> The Planning Team has proposed continuing with the mid-September drawdown and raising the winter water levels in Shabomeka Lake by approximately 0.30 m or one log from the current strategy. This proposed action will be examined in the option development phase.


Mississippi River Water Management Plan
Natural Heritage, Dams, and Structures
Map 7.1 - Mazinaw and Shabomeka Lakes
This map series was prepared under the Mississippi River Water Management Plan project, an initiative to develop and enhance the knowledge of water and natural resource considerations to effectively manage existing hydro-electric generating stations, dams, and any other water control structures on the Mississippi River which impact on hydro-electric generation.
The natural resource features shown on this map have been obtained from available information sources on file with the Ontario Ministry of Natural Resources.
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Metres
Universal Transverse Mercator NAD 83
Upper Mazinaw Lake
Lower Mazinaw Lake
Shabomeka Lake
Kishkebus L.
Little Shabomeka L.
Bon Echo Provincial Park
Bon Echo Provincial Park Proposed Addition
Hwy 41
Vulnerable, threatened, and endangered species
Fish communities
Ontario
Legend
Water control structures
Roads
Lakes / rivers
Locally significant wetlands
Provincially significant wetlands
Common loon nesting site
Great blue heron nesting site
Osprey nesting site
Deer yards
Fish spawning areas
Fish nurseries
Wild rice stands
ANSI, earth science
ANSI, life science
Water power facility
Railway
Streams
Buildings
Lots and concessions
Provincial park
Conservation Reserve (proposed)
Mississippi River Watershed

***Analysis of Management Options*** – In response to the public comments, two additional management options (2a and 2b) were considered for Shabomeka Lake Dam (see Appendix 5, Options Report, for more details):

**Option 2a:** Maintain the lake at a higher minimum level prior to freeze up by removing one less stoplog, which increases water levels by approximately 0.30 m.

Strategy for development of the option – To maintain stable water levels for lake trout spawn and after ice-out for loons and nesting birds.

How option addresses comments – The option of establishing a higher winter water level on Shabomeka Lake may also be beneficial for riparian wildlife, since winter levels will be established slightly earlier in the season.

Benefits:

- An increase in suitable spawning habitat for lake trout may improve survival rates of hatch by preventing eggs from freezing in ice.
- An increase in the available spawning habitat around the lake.
- Some benefits to boat access only properties by having more water in the lake in the fall.
- Increased flexibility in dam operations to minimize movement of ice in winter.
- Additional depth may provide better access for beaver and muskrat lodges.

Conflict or concerns:

- Although ice damage has always been a concern on this lake there could remain a concern with a few wooden docks that could have ice built up around the base.

A variation of this option, maintaining a higher minimum level (two logs or more) was suggested by the planning team and discussed; however, due to potential damages to the shoreline, adjacent structures and different ice loading on the dam, this variation was not considered further.

Conclusion: Option 2a for Shabomeka Lake of continuing with the mid-September drawdown and raising the winter water levels in Shabomeka Lake by approximately 0.30 m (one log) from the current strategy will aid in ensuring that water is covering the spawning habitat throughout the spawning and incubation period (October – April).

**Option 2b**: Delay removal of stoplogs from the dam until after Thanksgiving weekend.

Strategy for development of the option – Delay removal of the stoplogs to extend the access period for properties with boat-only access to Thanksgiving weekend.

How option addresses issue – A delay in removal of stoplogs extends the recreational season, use of the lake, and access to boat only access properties.

Benefits:

- This option would provide a longer recreational season and use of the lake, through easier access to boat only access properties.

Conflict or concerns:

- There is a direct conflict with returning the lake to a naturally reproducing lake trout lake. Spawning success through this option would be unlikely.

Conclusion: Extending the recreation season directly conflicts with the objective of enhancing ecosystem health.

Conclusion of Option Analysis: The current management strategies will be changed by maintaining a higher minimum level prior to freeze up by removing one less stoplog (increase water level by approximately 0.30 m). No changes to the timing of the drawdown will be made.

**OPERATING PLAN – SHABOMEKA LAKE**

***Planning Considerations and Operational Constraints*** – Figure 7.3 summarizes the known planning and operational matters to be considered in the management strategies. Flooding of the access road occurs at 271.25 m, shoreline erosion occurs at 271.00 m and flooding of main dwellings occurs above 272.00 m. Overtopping the dam occurs at 271.45 m and has been a concern in the past. Ice damage can be a concern especially in years where there is little to no snow to ensure filling of the lake in the spring. The minimum lake level of 269.60 to 269.80 m (increased from the current levels of 269.35 to 269.65 m) during the fall and winter should be considered to improve lake trout spawning success.

The fall drawdown begins mid-September with 7 of the 8 stoplogs in the dam being removed by early October. The early drawdown is undertaken in an attempt to have lake levels stable prior to lake trout spawning.

**Figure 7.3 – Shabomeka Lake Dam Planning Considerations and Operational Constraints**

| | Spring (Mar 1 – May 31) | Summer (May 23 – Oct 15) | Fall (Sept 15 – Dec 1) | Winter (Nov 15 – Mar 15) |
|---|---|---|---|---|
| **Flooding** | Maximum 271.20m; Twp road floods at 271.25 m; dam overtops at 271.45 m; and dwelling flooding starts at 272.00 m. | Dam overtops at 271.45 m; Maximum Target 271.10 m; and Dock / Nuisance flooding at 271.20 m. | No concern on lake due to drawdown. Drawdown assists in reduction of spring flood magnitudes downstream. | No operational constraint due to drawdown. |
| **Fisheries Lake Trout** | No operational constraint | No operational constraint | Drawdown - Sept 15 – Oct 15. Minimum lake level for spawning estimated at between 269.60 m and 269.90 m. | Stable levels at or above 269.60 m. |
| **Walleye** | N/A | N/A | N/A | N/A |
| **Bass** | N/A | N/A | N/A | N/A |
| **Other** | N/A | N/A | N/A | N/A |
| **Wildlife** | Stable water levels after ice-out for loons/nesting birds if possible. | No operational constraint | Criteria met through operation for lake trout. | Criteria met through operation for lake trout. |
| **Recreation Tourism** | Stable levels at 270.96 (+/- 0.10) m from long weekend in May through September. | Stable levels at 270.96 (+/- 0.10) m | No operational constraint | Stable ice conditions for ice fishing / snowmobiling. |
| **Navigation** | No operational constraint | No operational constraint | Access to boat only access properties not been raised as a concern. | N/A |
| **Erosion** | Maintain levels below 271.10 m. | Maintain levels below 271.10 m | No operational constraint | No operational constraint |
| **Ice** | Minimize ice movement to reduce shoreline damage. | N/A | N/A | Minimize ice movement to reduce shoreline damage. |
| **Low Flow Augmentation** | N/A | Limited storage volume so little impact on main river system. | Drawdown begins mid September so augmentation implicit. | Drawdown used to assist in refilling Crotch Lake. |
| **Power Generation** | N/A | N/A | N/A | N/A |

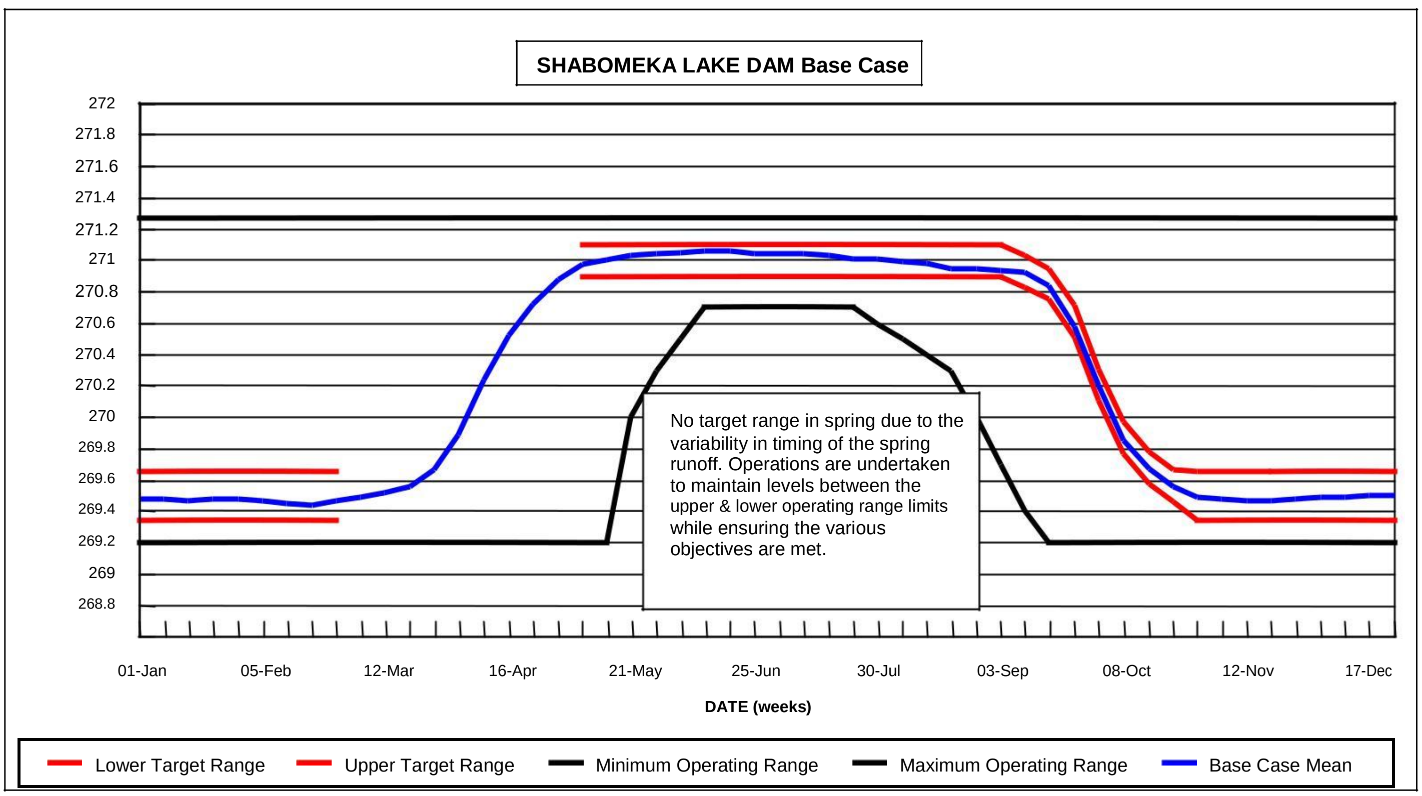
***Management Strategies*** – The Operating Range for the Shabomeka Dam is 269.18 – 271.28 m a.s.l. (above sea level). The following best practices provide direction on how the dam will be managed within this operating range:

1. Spring
   a. The dam is operated early in the spring to capture runoff to ensure summer levels are met.
   b. Stable water levels are targeted after ice-out for loons/nesting birds (if possible).
   c. The dam is operated to ensure a minimum water level of 271.00 m is reached at the start of summer while trying to ensure that 271.15 m is not exceeded.

2. Summer
   a. Lake levels are targeted between 270.90 m a.s.l. and 271.10 m. throughout the summer months, with virtually no outflow from the lake during this period under normal conditions.

3. Fall/Winter
   a. The fall drawdown begins on or about September 15, with 7 of the 8 stoplogs in the dam being removed by early October. Implementing preferred option 2a will raise the winter water levels in Shabomeka Lake by approximately 0.30 m (one log) from the current strategy in order to cover lake trout spawning habitat throughout the spawning and incubation period (October – April). Stable minimum winter water levels are currently targeted between 269.35 m and 269.65 m (269.60 m to 69.80 m proposed) by early November.

**Figure 7.4 – Shabomeka Lake Dam Operating Guidelines**



## Reach 2 – Semicircle Lake and Creek

Semi-circle Lake is located in the Township of North Frontenac, and this reach is about 1.5 km in length and has no water management structures (see Map 7.1 on page 39). Water flows in from Shabomeka Lake, through Semicircle Lake and Creek into Lower Mazinaw Lake. This area is influenced by water flows through the Shabomeka Lake Dam.

***Natural Resources*** – This reach has both cold and warmwater fish species (see Figure 7.5). There are no known species at risk in this reach.

| Figure 7.5 – Fish Species Semicircle Lake and Creek |
|---|
| Lake trout |
| Northern Pike |
| White sucker |
| Largemouth bass |
| Smallmouth bass |
| Pumpkinseed |
| Yellow perch |

*Source - MNRF*

***Natural Heritage Features*** – Bon Echo Provincial Park proposed addition is located along the north shore of Semicircle Lake and Creek.

***Land Use*** – The lands surrounding this are predominantly Crown owned and there is no shoreline development.

### Reach 3 – Mazinaw Lake

Mazinaw Lake is the first major lake on the Mississippi River and is one of the largest headwater lakes in the watershed. Mazinaw Lake is located in the Townships of Abinger and North Frontenac and is on the main channel of the Mississippi River (see Map 7.1, page 39).

**Figure 7.6 – Physical Characteristics Mazinaw Lake and Dam**

| | |
|---|---|
| Elevation (mean metres ASL) | 267.8 |
| Surface Area (ha) | 1590 |
| Drainage Area (sq. km) | 339 |
| Maximum Depth (m) | 145 |
| Mean Depth (m) | 42 |
| Volume (m3) | 685 x 10$^{o}$ |
| Perimeter (km) | 51.4 |
| Emergency Spillway Elevation (m) | 268.20 |
| Total Storage Volume (ha. m) | 3423 |
| Hydraulic Capacity (cms) | 48 |

*Source – MVC and MNRF*

The lake has two distinct basins—upper and lower, which are separated by a narrow channel at the base of Mazinaw Rock. Upper Mazinaw Lake receives inflow from Roluf and Crooked Lakes through Kilpecker Creek in Denbigh Township at the north end of the lake. Lower Mazinaw Lake receives inflow from Semicircle Creek and Bon Echo Creeks, and flows out through the Mazinaw Lake Dam at the south end of the lake. Figure 7.6 provides a summary of the physical characteristics of Mazinaw Lake and Dam.

***Natural Resources*** – There are three identified lake trout spawning shoals in Mazinaw Lake; the primary shoal is located on the south shore of Campbell Bay. This shoal is susceptible to the fall drawdown, and concerns have been raised regarding the survival of lake trout eggs over winter.

A habitat rehabilitation project to address drawdown concerns was completed in recent years. The other known lake trout spawning sites are located at the Narrows, and on the east shore of the south basin. Deep water spawning activity is suspected in Mazinaw Lake, although no sites have been confirmed.

| Figure 7.7 – Fish Species Mazinaw Lake | |
|---|---|
| Lake whitefish | Rock bass |
| Lake herring | Largemouth bass |
| Lake trout | Smallmouth bass |
| Northern Pike | Bluegill |
| Lake chub | Pumpkinseed |
| White sucker | Walleye |
| Brown bullhead | Yellow perch |
| Burbot | Common shiner |
| Golden shiner | Fallfish |

*Source – MNRF*

Walleye spawn throughout the south basin, as well as at inflows in Campbell Bay, German Bay, and at the extreme north end of the lake. Water levels flowing out of Mazinaw Lake must be maintained throughout spawning season, April to May, to ensure protection of eggs and hatched fry in the river downstream of the dam. Spawning sites of other species have not been assessed. Figure 7.7 provides a list of fish species in Mazinaw Lake.

***Species at Risk*** – Certain shoreline wetland habitats on the lake provide suitable habitat for a species at risk turtle, known as Blanding's turtle (*Emydoidea blandingii*). The Blanding's turtle is a Species at Risk (SAR) with a federal and provincial threatened SAR designation and is, therefore, afforded protection for itself and its critical habitat by the Fish and Wildlife Conservation Act, National and Provincial Parks Acts, the Natural Heritage component of the Provincial Policy Statement under Ontario's Planning Act provides for the protection of significant portions of the habitat of threatened species, and SARA. These turtles are protected from collection or disturbance in all National Parks where it occurs. Because of delayed sexual maturity, Blanding's turtle is affected by a variety of disturbances that affect both adult and juvenile turtles.

***Land Use*** – There are approximately 314 residential buildings and at least 4 marina/resorts located on Mazinaw Lake, and all of the residential buildings on the east shore are accessible only by boat. Water access only properties become inaccessible by boat once the fall drawdown has occurred The Bon Echo Provincial Park, Bon Echo Park proposed addition, and the Mazinaw Lake Enhanced Management Area are located along the western and eastern shore of the lake.

***Description of Mazinaw Lake Dam*** – The Mazinaw Lake Dam is used for water control purposes and is located at the south end of Mazinaw Lake, which flows into Marble Lake. The Mazinaw Lake Dam is a concrete structure consisting of two sluices each containing seven 0.25 m x 0.30 m x 3.95 m stoplogs. An emergency bypass channel, which is at an elevation of 268.20 m acts as the access to the dam. The dam is owned and operated by MVC and the removal and replacement of stoplogs is done by a local contractor.

***Mazinaw Lake Dam***

***Public Comment Summary*** – A total of five questionnaires and two emails were returned with comments from people and a local conservation organization regarding Mazinaw Lake. Three questionnaires were returned without comments, all indicating they had no concerns with water levels at all. Most of the respondents indicated that summer and winter levels were adequate, with some opposed to changes to the current water level regime on Mazinaw Lake. However, a few indicated that spring levels were too high and fall levels were too low. The fall levels dealt with the fisheries (walleye and lake trout) and navigational concerns and the spring levels dealt with flooding of docks and yards.

> *Response to Public Comment* – Walleye and Lake Trout spawn at different times of the year. Walleye typically spawn in early April. In a lake environment, walleye require water levels to stay at or above the elevation in which they began to spawn. In a river environment, they require relatively constant flows for a six-week period. The operating plan for Mazinaw Lake allows the lake to fill on its own from rain and snowmelt in the spring. Once inflows into the

lake begin to subside, stoplogs are replaced to mimic the natural reduction of inflow so that stable levels are achieved on the lake. Another significant walleye spawning area also exists immediately downstream of the dam. The dam is operated to reduce the flows as early as possible in the spring so that a constant flow can be maintained for a longer period of time.

Lake trout typically spawn in mid-October to early November. The drawdown on Mazinaw Lake occurs throughout November and December with normal winter levels typically achieved in January. The current operating regime (in place and documented for more than 50 years) exposes known spawning shoals after the end of the spawning period and results in some egg mortality.

In the early 1990s, there was a proposal to begin the drawdown prior to the onset of lake trout spawning thereby ensuring that spawning would take place in areas that would not subsequently be dewatered. However, the proposed change to the operating regime required approval by Canadian Coast Guard under the provisions of the Navigable Waters Protection Act because the lower water levels would interfere with navigation on the lake. Although fish habitat management staff from the Department of Fisheries and Oceans supported the proposed change, there was some evidence that the lake continues to support a self-sustaining population of lake trout despite the late fall drawdown. Since it could not be demonstrated that the proposed change to the operating regime was critical to the sustainability of the lake trout, the Coast Guard denied approval of the proposed change to the operating regime.

Following the reconstruction of the dam in 1992, the operating plan for the structure was formally ratified between the Department of Fisheries and Oceans and the Coast Guard and a decision was made that no change to the timing of the drawdown would take place. **The historical records (since the 1950's) indicate that while stoplogs may have been removed from the dam in September or October to compensate for fall rains and to maintain stable lake levels, the drawdown of the lake itself has never occurred prior to November**. No option is being considered to lower water levels, which would impact navigation or boat access only properties, in the summer on this lake. In maintaining the November-December drawdown, hunters will continue to have easier access during the fall hunt.

Subsequently, MNRF has determined that Mazinaw Lake continues to support a self-sustaining population of lake trout within the current regime of water levels. Although the late fall drawdown undoubtedly affects lake trout, which spawn on the known shallow-water shoals, these recent findings support the theory of deep-spawning lake trout in Mazinaw Lake. Natural reproduction seems to be sustaining the lake trout population in Mazinaw Lake and, as a result, there is no need to revisit the option of an earlier drawdown to accommodate lake trout.

Under the current operating guidelines the priorities for this lake are flood control, healthy fisheries, continued recreation and tourism, maintained access to property and boat navigation, and low flow augmentation.

***Analysis of Management Options*** – In response to the public comments one additional management option (3a) was considered for Mazinaw Lake Dam (see Appendix 5, Options Report, for more details):

**Option 3a:** Revise drawdown date to mid to late September.

Strategy for development of the option – Stabilize lake level at minimum levels so lake trout eggs do not freeze on the active shoals.

Benefits:

- This option would offer a greater chance for spawning success and survival for shallow water spawners.
- This option would stabilize the lake at minimum levels prior to lake trout spawning so the active shoal in Campbell's Bay doesn't get used and eggs freeze.

Conflict or concerns:

- Canadian Coast Guard has expressed concern that unless new evidence is shown that current procedures are having a negative effect on survival of lake trout their decision is unlikely to change. New evidence shows spawning survival of various ages does exist in the lake.
- Navigational concerns through the narrows and for boat access only properties arise.
- Impact on drawdown rates and timing of Kashwakamak Lake must be considered and potential impact on wild rice crops in Ardoch.

Conclusion of Option Analysis: Given the current constraints and evidence of naturally reproducing Lake Trout, the current operation is the preferred option.

**OPERATING PLAN – MAZINAW LAKE**

***Summary of Planning Considerations and Operational Constraints*** – Figure 7.7 identifies the planning and operational matters to be considered in the management strategies. Flooding of low properties and docks occurs at 268.00 m and flooding of main dwellings on the lake begins at 268.55 m. Downstream flooding, specifically on Little Marble and Marble Lake, is a common occurrence if the dam has to be operated under high flow conditions. A stable water level of 267.80 m (+/- 0.10 m) from May long weekend to mid-November is required for navigation through the narrows (less than 2 m depth at the normal summer optimum level of 267.80 m) and access to pictographs. Future considerations should be given to the timing of drawdown to enhance reproductive success of lake trout.

***Management Strategies*** – The maximum Operating Range is 266.50 – 268.20 m a.s.l. The following best practices provide direction on how the dam will be managed within this operating range:

1. Spring
    a. This dam is not normally operated in the spring until levels have stabilized from runoff.
    b. Stoplogs are replaced to either maintain or bring lake levels up to the summer targets while maintaining adequate flow for walleye spawn below the dam.

2. Summer
    a. Lake levels are targeted between 267.60 m and 267.90 m throughout the summer months (and until mid November) with a minimal flow being passed through the dam to keep water in the downstream channel.

3. Fall/Winter
    a. The fall drawdown does not occur until after the deer hunting season, which is in mid-November. This ensures adequate water in the lake to allow navigation through the narrows, between the upper and lower lakes, as well as access to the east-shore residences.
    b. Lake levels are targeted at its minimum level by mid-January at 266.70 m.
    c. Eight (8) of the total fourteen (14) stoplogs in the dam are removed between mid-November and mid-December.

**Figure 7.8 – Mazinaw Lake Dam Operating Guidelines**

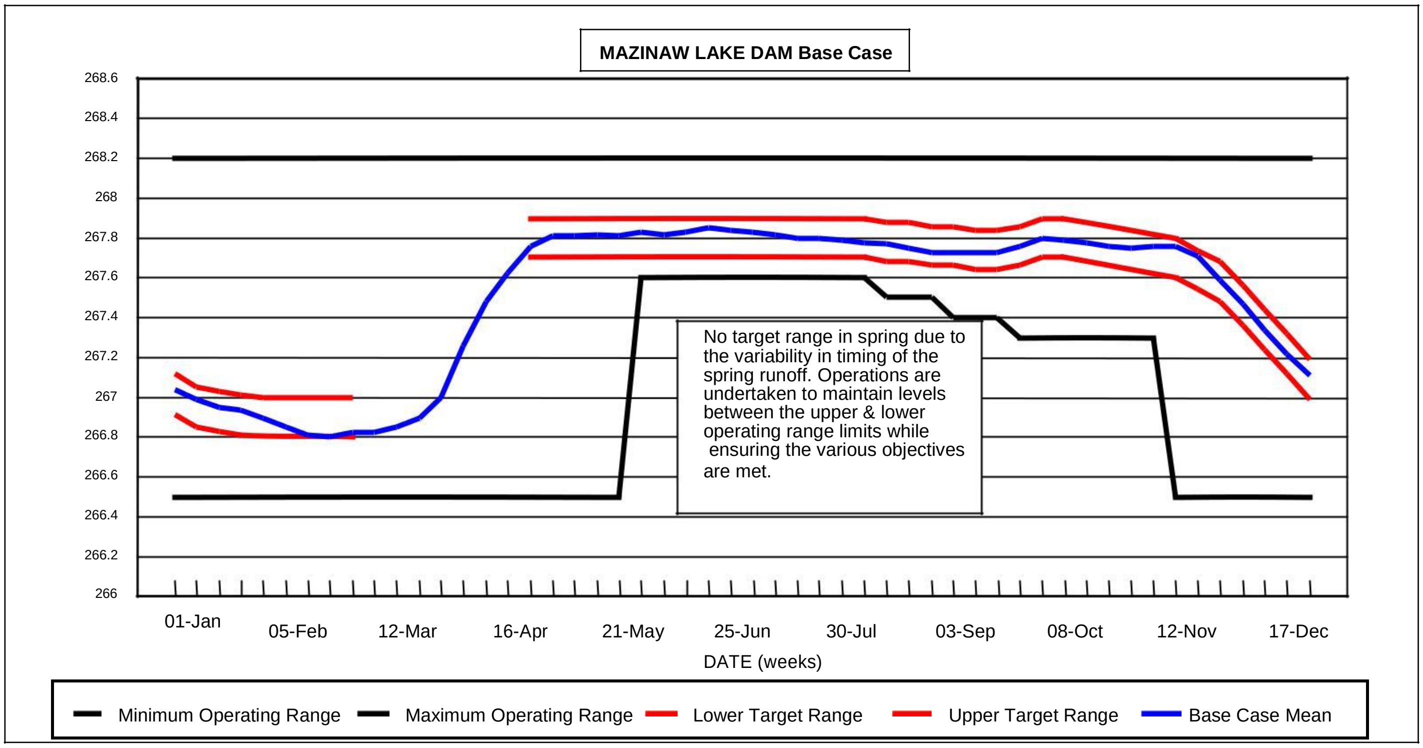



**Figure 7.9 – Mazinaw Dam Planning Considerations and Operational Constraints**

| | Spring (Mar 1 – May 31) | Summer (May 23 – Oct 15) | Fall (Sept 15 – Dec 1) | Winter (Nov 15 – Mar 15) |
|---|---|---|---|---|
| **Flooding** | Maximum 268.00 m; emergency bypass floods at 268.20 m; dam overtops at 269.00 m; and dwelling flooding begins at 268.55 m<br><br>Little Marble/Marble – flooding occurs if more than one log or significant outflows occur out of Mazinaw Lake, due to channel restrictions. | Maximum 268.00m; and dock/nuisance flooding at 268.00 m. | Maximum 268.00m; and dock/nuisance flooding at 268.00 m. | No concern on lake due to drawdown. Drawdown assists in reduction of spring flood magnitudes downstream. |
| **Fisheries Lake Trout** | No operational constraint | No operational constraint | Drawdown mid-November after spawn has taken place, potential cause of reduction in spawn survival. | Stable levels at or above 266.8 m not reached until January after ice is on lake. |

**Figure 7.9 – Mazinaw Dam Planning Considerations and Operational Constraints**

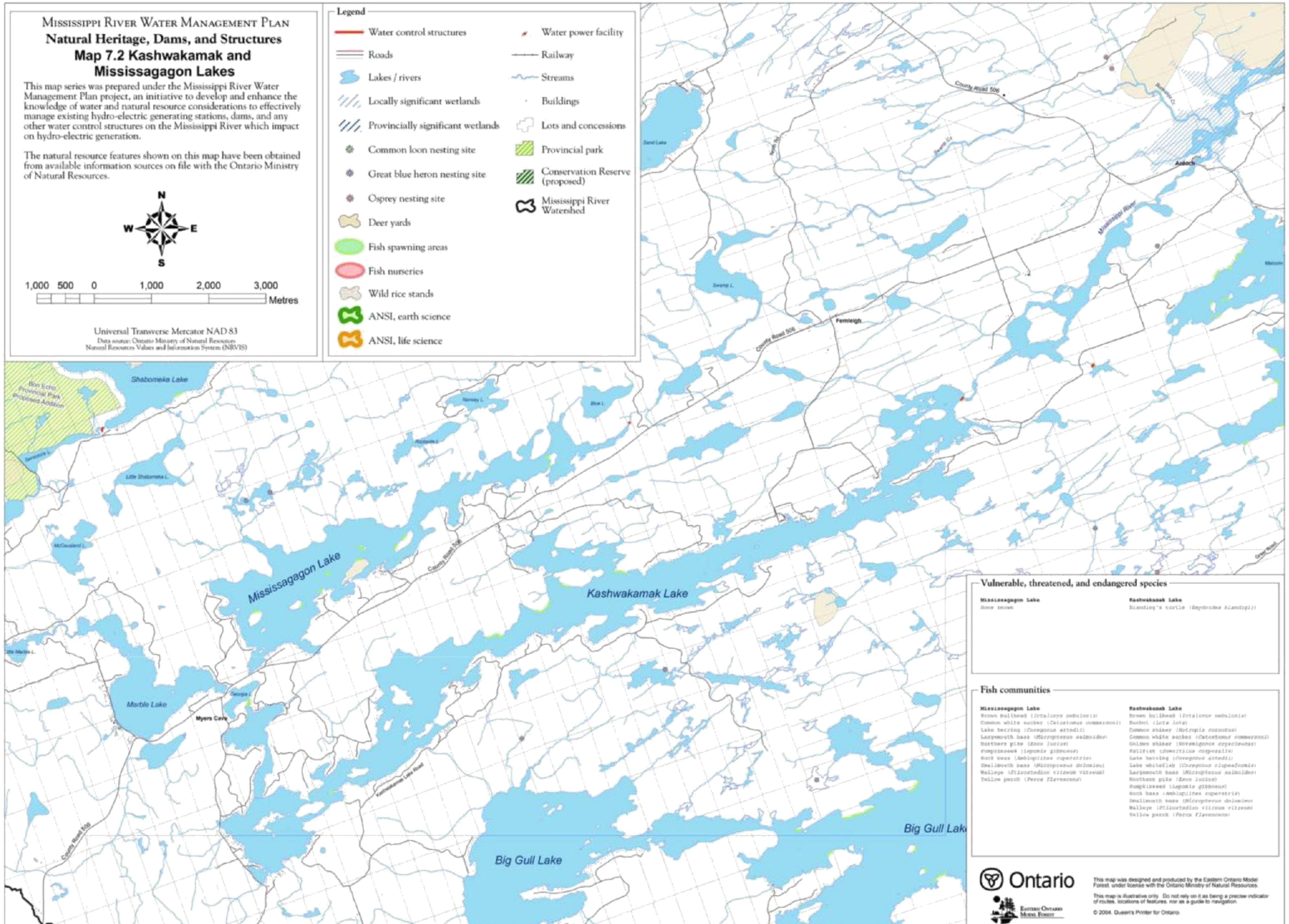
| | Spring (Mar 1 – May 31) | Summer (May 23 – Oct 15) | Fall (Sept 15 – Dec 1) | Winter (Nov 15 – Mar 15) |
|---|---|---|---|---|
| **Walleye** | No concern, covered by natural filling of lake in spring. Critical to slow flow and maintain flow before or early in spawn period. | No operational constraint | No operational constraint | No operational constraint |
| **Bass** | No operational constraint | No operational constraint | No operational constraint | No operational constraint |
| **Wildlife** | Stable water levels after ice-out for loons/nesting birds if possible. | No operational constraint | Burrowing or hibernating amphibians, reptiles, wildlife (muskrat, beaver) and other animals are at risk since lake doesn't reach minimum levels until after ice on. | Burrowing or hibernating amphibians, reptiles, wildlife (muskrat, beaver) and other animals are at risk since lake doesn't reach minimum levels until after ice on. |
| **Recreation / Tourism** | Stable levels at 267.80 (+/- 0.10) m from long weekend in May through September. | Stable levels at 267.80 (+/- 0.10) m allow access to pictographs, beach at Bon Echo. | Stable levels at 267.80 (+/- 0.10) m. | Stable ice conditions for ice fishing/ snowmobiling/ cottage access. |
| **Erosion** | No operational constraint | No operational constraint | No operational constraint | No operational constraint |
| **Navigation** | No operational constraint | No operational constraint | Access to boat only access properties and through narrows must be maintained until after hunting season. Drawdown restricted to historical operations as per DFO order. | No operational constraint |
| **Ice** | Minimize ice movement to reduce shoreline damage. | Not applicable | Not applicable | Minimize ice movement to reduce shoreline damage. |
| **Low Flow Aug** | Not applicable | Maintain minimal flow for downstream considerations (undefined). | Use all of target range to 267.60 m if required. | Drawdown used to assist in refilling Crotch Lake. |
| **Power Generation** | Not applicable | Not applicable | Not applicable | Not applicable |

## *Reach 4 – Marble and Georgia Lake (Mazinaw Lake Dam to Kashwakamak Lake)*

The reach between Mazinaw Lake Dam and Kashwakamak Lake is located in the Township of North Frontenac, and it includes 7.5 km of river and lake systems. The Mississippi River flows from the Mazinaw Lake Dam into Little Marble Lake past Marble Rapids into Marble Lake to Georgia Lake's outlet through Whitefish Rapids into Kashwakamak Lake. There are no water control structures in this reach (see Map 7.2)

***Natural Resources*** – A significant walleye spawning bed is located at Whitefish Rapids at the inflow of Kashwakamak Lake. Figure 7.10 provides a list of documented fish species. There are no known species at risk or significant natural heritage features, however, Northern Map Turtles are listed as Special Concern.

| Marble Lake | |
|---|---|
| Lake whitefish | Brown bullhead |
| Lake herring | Rock bass |
| Northern Pike | Largemouth bass |
| Golden Shiner | Smallmouth bass |
| Fallfish | Pumpkinseed |
| Common shiner | Walleye |
| White sucker | Yellow perch |
| | *Source – MNRF* |


Mississippi River Water Management Plan
Natural Heritage, Dams, and Structures
Map 7.2 Kashwakamak and Mississagagon Lakes
This map series was prepared under the Mississippi River Water Management Plan project, an initiative to develop and enhance the knowledge of water and natural resource considerations to effectively manage existing hydro-electric generating stations, dams, and any other water control structures on the Mississippi River which impact on hydro-electric generation.
The natural resource features shown on this map have been obtained from available information sources on file with the Ontario Ministry of Natural Resources.
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Metres
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Legend
Water control structures
Roads
Lakes / rivers
Locally significant wetlands
Provincially significant wetlands
Common loon nesting site
Great blue heron nesting site
Osprey nesting site
Deer yards
Fish spawning areas
Fish nurseries
Wild rice stands
ANSI, earth science
ANSI, life science
Water power facility
Railway
Streams
Buildings
Lots and concessions
Provincial park
Conservation Reserve (proposed)
Mississippi River Watershed
Shabomeka Lake
Mississagagon Lake
Kashwakamak Lake
Marble Lake
Myers Cave
Big Gull Lake
Fernleigh
County Road 506
Mississippi River
Vulnerable, threatened, and endangered species
Fish communities
Ontario

***Public Comment Summary*** – One individual from Marble Lake responded to the survey and expressed a concern about the effect of the operation of Mazinaw Lake Dam on Marble Lake and suggested that the installation of a weir at the outlet of Marble Lake would improve summer water levels.

> *Response to Public Comment* – The removal and replacement of stoplogs at Mazinaw Lake dam does have an impact on water levels in the downstream lakes. In the spring, the dam is operated to ensure that Mazinaw Lake will reach its normal summer levels by the May long-weekend and to reduce any downstream flooding by using the storage available in Mazinaw. The objective is to keep a relatively stable outflow from the lake from early April through to mid-May to protect the walleye spawning shoal below the dam and to ensure the lake has enough capacity to effectively handle late spring runoff. The dam is only operational during the summer months to respond to rain events and to keep Mazinaw Lake and downstream levels as stable as possible. It should be noted also that the dam at Mazinaw is operated under a legal agreement with the Canadian Coast Guard, and winter levels will not stabilize on Marble Lake until after the ice is in because of the legal constraint on the drawdown.
>
> The response to the question about a weir on Marble Lake is not a simple one. The process to construct a dam would require an individual to make an application to several applicable agencies and is outside of the scope of this plan.

## *Reach 5 – Kashwakamak Lake*

Located on the main channel of the Mississippi River, Kashwakamak Lake (a.k.a. Long Lake) is dominated by numerous inlets and shallow bays and is located in the Townships of North Frontenac. The Mississippi River enters the west end of the lake from the outlet of Georgia Lake at Whitefish Rapids and exits at the Kashwakamak Lake Dam at the east end of the lake (see Map 7.2 on page 50) to flow down the Mississippi River through Farm and Mud Lake to Crotch Lake. Figure 7.11 provides a summary of the physical characteristics of Kashwakamak Lake and Dam.

**Figure 7.11 – Physical Characteristics Kashwakamak Lake and Dam**

| | |
|---|---|
| Elevation (mean metres ASL) | 261 |
| Emergency Spillway Elevation (m) | 261.67 |
| Surface Area (ha) | 1191 |
| Drainage Area (sq. km) | 417 |
| Maximum Depth (m) | 22 |
| Mean Depth (m) | 8 |
| Volume (m3) | $9.7 \times 10^7$ |
| Perimeter (km) | 66 |
| Elevation of Deck of Dam (m) | 262.26 |
| Weir Elevation (m) | 261.06 |
| Total Storage Volume (ha. m) | 3822 |
| Hydraulic Capacity (cms) | 65 |

*Source – MVC and MNRF*

***Natural Resources*** – The weedy inlets and bays of Kashwakamak Lake are ideal habitat for cool water and warmwater fish species that dominate this lake. The lake is managed as a warmwater fishery. There is an abundant walleye population that is known to spawn at a prime spawning shoal near the main inlet at Whitefish Rapids, and at several locations along the north shore of the lake. Water levels must be maintained high enough in early spring to ensure coverage at Whitefish Rapids' shoals for walleye spawning, as well as for shallow bay habitats for bass spawning in June.

Bass reproduction has been assessed in the lake with nesting activities having been documented throughout the lake. Higher nest densities tend to occur in shallow bays on the north and east ends of the lake. Northern pike reproductive activities have been recorded at two shallow sites in the extreme eastern end of the lake.

| Figure 7.12 – Fish Species Kashwakamak Lake | |
|---|---|
| Lake whitefish | Rock bass |
| Lake herring | Largemouth bass |
| Northern Pike | Smallmouth bass |
| Golden Shiner | Pumpkinseed |
| Fallfish | Walleye |
| White sucker | Yellow perch |
| Brown bullhead | Burbot |
| Common shiner | |

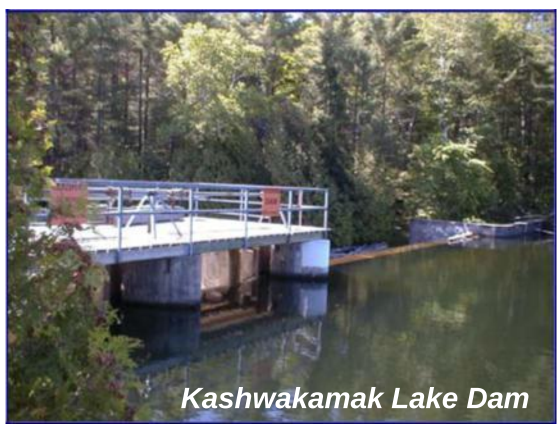
*Source – MNRF*

Kashwakamak Lake once supported lake trout; however, this species has been extirpated from the lake likely due to a number of reasons such as water levels, logging, development, angling and poor spawning success. Kashwakamak Lake still supports other coldwater species such as lake herring and burbot. Figure 7.12 provides a list of documented fish species in Kashwakamak Lake.

***Species at Risk*** – Certain shoreline wetland habitats on the lake provide suitable habitat for a species at risk turtle, known as Blanding's turtle (*Emydoidea blandingii*). The Blanding’s turtle is a Species at Risk (SAR) with a federal and provincial threatened SAR designation and is, therefore, afforded protection for itself and its critical habitat by the Fish and Wildlife Conservation Act, National and Provincial Parks Acts, the Natural Heritage component of the Provincial Policy Statement under Ontario's Planning Act provides for the protection of significant portions of the habitat of threatened species, and SARA. These turtles are protected from collection or disturbance in all National Parks where it occurs. Because of delayed sexual maturity, Blanding’s turtle is affected by a variety of disturbances that affect both adult and juvenile turtles.

***Land Use*** – Kashwakamak Lake has approximately 377 residential structures on the lake and at least 5 resorts/marinas. Other than property on islands, there are no boat-access only dwellings on this lake.

***Description of Kashwakamak Lake Dam*** – The Kashwakamak Lake Dam is used as a water control structure and is located at the outlet at the east end of Kashwakamak Lake. The Kashwakamak Lake Dam is a concrete structure consisting of two sluices each containing ten 0.30 m x 0.30 m x 3.43 m stoplogs and an overflow weir with an elevation of 261.06 m, which regulates levels throughout most of the summer. MVC owns and operates this structure. The Kashwakamak Lake Dam has a drainage area of 417 sq km and the total storage volume is 3,822 ha m.



*Kashwakamak Lake Dam*

***Public Comment Summary*** – Five questionnaires were submitted indicating water levels were satisfactory year round. As well, a letter was submitted by the Kashwakamak Lake Cottage Association and signed by members of the Board of Directors for the Association indicating that the 200 member association “is satisfied with the water levels currently being maintained in the lake by MVC through its operation of the dams.”

One questionnaire was returned from a person with property on Kashwakamak Lake that identified a broad range of concerns including the impacts of high water levels on the wild rice in the Ardoch area, shoreline erosion on Farm Lake, and property damage, especially to docks. As well, low summer and fall water levels were having an impact on property access and to fish, amphibian and reptile habitat.

*Response to Public Comment* – The operating plan for the Kashwakamak dam considers all competing human needs of the lake. The plan includes a target range of no more than 20 cm of lake levels fluctuations over the summer. Records indicate that the levels on Kashwakamak Lake, even during the 2003 drought, remained within the 20 cm target range. The timing and magnitude of the fall drawdown was established to minimize impacts on fish and wildlife and boat access and navigation; however, enough water needs to be drawn down to maintain storage capacity during the influx of water into the system in spring. Erosion and damage to docks would potentially occur under natural conditions. Under the normal operating conditions of Kashwakamak Lake dam, no more than two stoplogs are removed at any one time during the fall and winter drawdown to minimize downstream erosion and flooding. Also, under normal conditions for this lake, once the logs are all in place, usually by mid-May to mid-June, the dam is non-operational for the duration of summer and only the overflow weir controls the water levels.

In the fall, Kashwakamak Lake drawdown begins after the Thanksgiving weekend. From mid-November to late December the lake levels remain relatively constant until the drawdown on Mazinaw Lake is complete, and levels continue to drop reaching the minimum level around early to mid-January. The continued drawdown after the ice is on the lake may result in the death or injury to some hibernating amphibians and reptiles. The legal constraint regarding navigation on Mazinaw Lake does not allow an earlier drawdown on Mazinaw Lake.

***Analysis of Management Options*** – In response to the public comments, one additional management option was considered for Kashwakamak Lake Dam (see Appendix 5, Options Report, for more details):

**Option 4a:** Eliminate the drawdown at the Kashwakamak Lake Dam after the Mazinaw Lake drawdown is complete to maintain water level at lake elevation.

Strategy for development of the option – Maintain stable winter water levels at lake elevation prior to Mazinaw Lake drawdown.

How option addresses comment – Aquatic hibernating amphibians and reptiles do best when stable water levels exist in late fall and during ice cover. They over-winter in water, burying themselves in the bottom mud of streams and lakes. These hibernating creatures have limited ability to move to avoid dewatering after the onset of hibernation.

On Kashwakamak Lake, most of the drawdown has been completed prior to the lake freezing over, which allows some protection for these animals. Kashwakamak Lake remains relatively constant until the drawdown on Mazinaw Lake is complete and continues to drop reaching its minimum level around early to mid-February. The continued drawdown after the ice is on the lake may result in some hibernating amphibians and reptiles in the dewatered areas not surviving. The legal constraint on Mazinaw Lake does not allow an earlier drawdown on Mazinaw Lake so the only option is to eliminate the second drawdown on Kashwakamak Lake.

Benefits:

- There is potential for a reduction in mortality rates of benthic hibernating vertebrate (frogs, turtles etc).

Conflict or concerns:

- A reduction in available storage for spring runoff (will vary each year)
- Increased shoreline damage from ice due to ice forming at higher elevations
- May adversely impact hydro generation.

Conclusion of Option Analysis: There is no scientific methodology available at this time to quantify the current mortality rate of benthic vertebrates or the potential/actual reduction if this option were selected and, therefore, the current operation is the best option.

**OPERATING PLAN – KASHWAKAMAK LAKE DAM**

***Planning Considerations and Operational Constraints*** – Figure 7.11 summarizes the known planning and operational matters to be considered in the management strategies for the Kashwakamak Dam. Flooding of main dwellings occurs above 261.60 m and nuisance flooding occurs at 261.30 m. Access to the developed bays by boat is hampered at 261.00 m, 10 cm below optimum levels. The water level must be high enough in early spring to ensure coverage at Whitefish Rapids for walleye and lake levels must be maintained throughout June for bass spawning. Stable and minimal outflows are required from early June through end of September to ensure growth and harvest of wild rice crop.

As well, this lake is heavily used by snowmobilers and skiers and the fluctuating ice levels and its instability is of great concern for safe shore ice access during the winter sport season.

***Management Strategies*** – The maximum Operating Range for Kashwakamak Dam is 259.35 – 261.33 m a.s.l. The following best practices provide additional direction on how the dam will be managed within this operating range:

1. Spring
    a. As the spring freshet occurs, the dam is operated to slowly bring lake levels up to summer requirements while trying to minimize shoreline damage from ice movement.
    b. The summer water levels are targeted prior to the start of the walleye spawn, if possible, due to the existence of a prime spawning shoal at the head of the lake at Whitefish Rapids.

2. Summer
    a. Lake levels are targeted between 261.00 m and 261.20 m throughout the summer months, with a minimal flow being passed through the dam to keep water in the downstream channel.

3. Fall/Winter
    a. The fall drawdown begins after Thanksgiving weekend with 14 of the 20 stoplogs removed during the drawdown.
    b. Minimum winter lake level of 259.60 m a.s.l. is targeted for the end of February.

**Figure 7.13 – Kashwakamak Lake Dam Operating Guidelines**

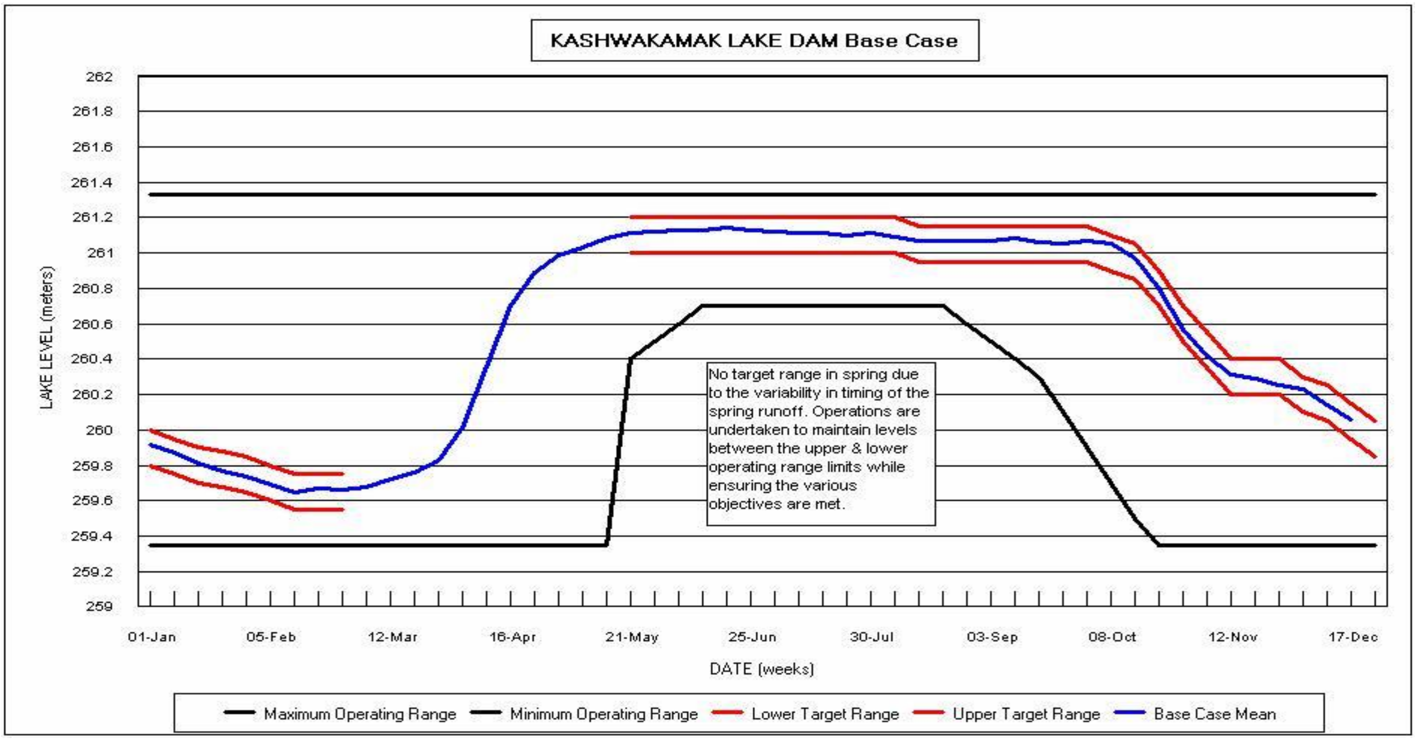



**Figure 7.14 – Kashwakamak Dam Planning Considerations and Operational Constraints**

| | Spring (Mar 1 – May 31) | Summer (May 23 – Oct 15) | Fall (Sept 15 – Dec 1) | Winter (Nov 15 – Mar 15) |
|---|---|---|---|---|
| **Flooding** | Maximum 261.35 m; emergency spillway overtops at 261.67m; and dwelling flooding at 261.60 m. | Maximum Target 261.10 m; and nuisance/dock flooding starts at 261.30 m. | No concern on lake due to drawdown. Drawdown assists in reduction of spring flood magnitudes downstream. | No concern due to drawdown. |
| **Fisheries** **Lake Trout** | Not applicable | Not applicable | Not applicable | Not applicable |
| **Walleye** | Spawning at Whitefish Rapids requires lake at 260.50 m (estimated not corroborated by survey or site evaluation) or above. | No operational constraint | No operational constraint | No operational constraint |
| **Bass** | Ensure adequate water to cover shoals, accomplished by being at / near target of 261.10 m by long weekend of May. | Spawning in June – stable levels at or near target of 261.10 m. | No operational constraint | No operational constraint |
| **Pike** | No operational constraint | No operational constraint | No operational constraint | No operational constraint |
| **Wildlife** | Stable water levels after ice-out for loons/nesting birds if possible. | No operational constraint | Lake at or below 260.20 prior to freeze up / start of Mazinaw drawdown to ensure survival of burying amphibians/wildlife. | Minimum levels of 259.60 m |

**Figure 7.14 – Kashwakamak Dam Planning Considerations and Operational Constraints**

| | Spring (Mar 1 – May 31) | Summer (May 23 – Oct 15) | Fall (Sept 15 – Dec 1) | Winter (Nov 15 – Mar 15) |
|---|---|---|---|---|
| **Wild Rice** | No operational constraint | Minimal outflows after 1st of June to facilitate growth of wild rice downstream in village of Ardoch. | Consistent and minimal outflows maintained through growth and harvest of wild rice (end of September). | No operational constraint |
| **Recreation / Tourism** | Stable levels at 261.10 (+/- 0.10) m from long weekend in May through September. | Stable levels at 261.10 (+/- 0.10) m | No operational constraint | Stable ice conditions for ice fishing / snowmobiling. |
| **Erosion** | Maintain levels below 261.20 m. | Maintain levels below 261.20 m. | No operational constraint | No operational constraint |
| **Navigation** | Access to the lake as early as possible after ice-out. | Levels below 261.00 m make numerous bays hazardous to access (historical complaints). | Levels below 261.00 m make numerous bays hazardous to access. | No operational constraint |
| **Ice** | Minimize ice movement to reduce shoreline damage. | Not applicable | Not applicable | Ensure stable levels for safety of ice fisherman, snowmobilers |
| **Low Flow Aug** | Not applicable | During droughts, minimal flow maintained using all of target range flow will vary depending on severity/timing of drought. | During droughts, minimal flow maintained using all of target range flow will vary depending on severity/timing of drought. | Drawdown used to assist in refilling Crotch Lake. |
| **Power Generation** | Not applicable | Not applicable | Not applicable | Not applicable |

## *Reach 6 – Farm Lake and Mud Lake (Kashwakamak Lake to Crotch Lake)*

***The reach between Kashwakamak Lake Dam and Crotch Lake includes a section of river 16.8 km in length and several small lakes including Farm and Mud Lakes. Mud Lake is a shallow, well vegetated lake and is fed by Buckshot Creek as well as the Mississippi River. Several rapids occur along this stretch of river from Mud Lake to the inlet of Crotch Lake including Birch and Sidedam Rapids, and Whitefish Rapids at the inflow of Crotch Lake (see Map 7.2 and 7.3 on pages 50 and 57).***

***This reach also has two tributaries: Buckshot Creek flows from the north and Malcolm Lake Creek flows from the south draining Malcolm Lake and Green (Ardoch) Lake. Farm Lake Dam is a non operable weir located at the east end of the lake and is not within the scope of this management plan. Malcolm Lake also has a water control structure, which is operated as an overflow weir and is outside the scope of this plan.***

| |
|---|
| |
| |
| ***Smallmouth bass*** |
| ***Walleye*** |

***Source – MNRF***

***Natural Heritage Features*** – Within this reach there exists the Mud Lake Provincially Significant Wetland (PSW), and Wild Rice stands at Mud Lake. High water levels have the potential to flood the wild rice beds and may destroy the annual crop and next year's seed beds. Therefore, stable and minimal outflows are required from early June through end of September to ensure growth and harvest of wild rice crop.

***Summary of Comments Received*** – One comment submitted in a report prepared by the Public Advisory Committee (PAC) members wanted to know if minimum levels on Malcolm Lake could be established and maintained to allow access to Green (Ardoch) Lake from the Village of Ardoch.

> *Response to Public Comment* – Malcolm Lake has a structure that is operated as an overflow weir that cannot manipulate water levels and flows and is, therefore, outside the scope of this process. However, this structure has an operating plan which is followed. Under normal conditions, the dam is not operated and water levels on Malcolm and Green Lakes are directly maintained by natural inputs of rainfall and snow melt. Green Lake is not accessible from the Village of Ardoch, as it does not flow directly into the Mississippi River.

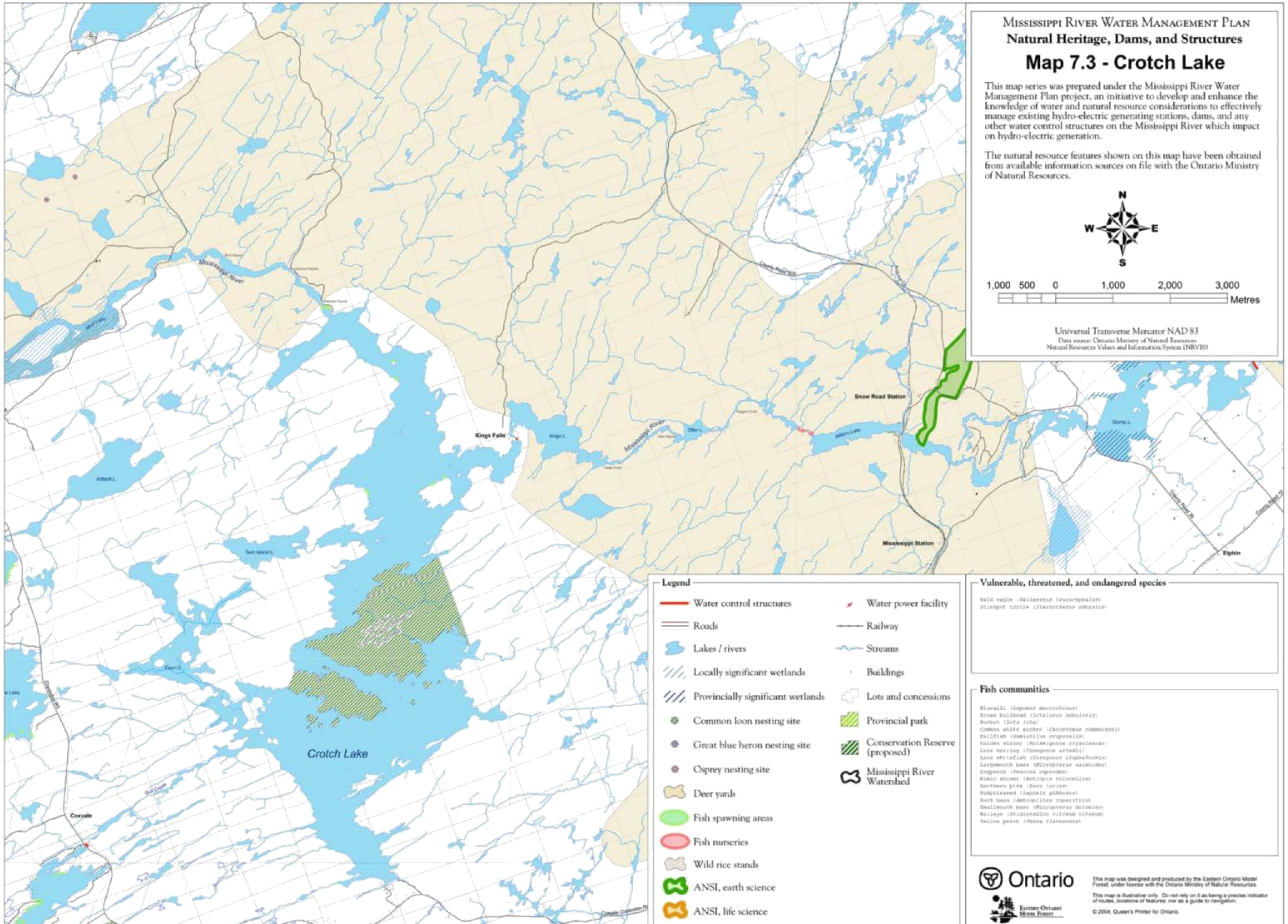
## *Reach 7 – Mississagagon Lake*

Mississagagon Lake is a head water lake and is located on Swamp Creek, a small tributary of Buckshot Creek that connects with the Mississippi River at Mud Lake. Mississagagon Lake is located in the Township of North Frontenac, and has the least impact on the overall system of the lakes in this area due to its very small drainage area and relatively small storage volume. Figure 7.16 describes the physical characteristics of Mississagagon Lake and Dam.

**Figure 7.16 – Physical Characteristics Mississagagon Lake and Dam**

| | |
|---|---|
| Elevation (mean metres ASL) | 268.2 |
| Emergency Spillway Elevation | n.a. |
| Surface Area (ha) | 524 |
| Drainage Area (sq. km) | 22 |
| Maximum Depth (m) | 24 |
| Mean Depth (m) | 9 |
| Volume (m3) | $4.8 \times 10^7$ |
| Perimeter (km) | 35.4 |
| Elevation of Deck of Dam (m) | 268.45 |
| Weir Elevation (m) | 268.42 |
| Total Storage Volume (ha. m) | 491 |
| Hydraulic Capacity (cms) | 3 |

*Source – MVC and MNRF*


Mississippi River Water Management Plan
Natural Heritage, Dams, and Structures
Map 7.3 - Crotch Lake
This map series was prepared under the Mississippi River Water Management Plan project, an initiative to develop and enhance the knowledge of water and natural resource considerations to effectively manage existing hydro-electric generating stations, dams, and any other water control structures on the Mississippi River which impact on hydro-electric generation.
The natural resource features shown on this map have been obtained from available information sources on file with the Ontario Ministry of Natural Resources.
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Metres
Universal Transverse Mercator NAD 83
Data source: Ontario Ministry of Natural Resources
Natural Resources Values and Information System (NRVIS)
Mississippi River
Kings Falls
Snow Road Station
Mississippi Station
Elphin
Coxvale
Crotch Lake
Legend
Water control structures
Roads
Lakes / rivers
Locally significant wetlands
Provincially significant wetlands
Common loon nesting site
Great blue heron nesting site
Osprey nesting site
Deer yards
Fish spawning areas
Fish nurseries
Wild rice stands
ANSI, earth science
ANSI, life science
Water power facility
Railway
Streams
Buildings
Lots and concessions
Provincial park
Conservation Reserve (proposed)
Mississippi River Watershed
Vulnerable, threatened, and endangered species
Bald eagle
Stinkpot turtle
Fish communities
Bluegill
Brown bullhead
Burbot
Common white sucker
Fallfish
Golden shiner
Lake herring
Lake whitefish
Largemouth bass
Logperch
Mimic shiner
Northern pike
Pumpkinseed
Rock bass
Smallmouth bass
Walleye
Yellow perch
Ontario
Eastern Ontario Model Forest
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***Natural Resources*** – Mississagagon Lake is managed as a warmwater fishery. The lake herring, a coldwater species, is also a component of this lake, which is indicative of coldwater conditions and reminiscent of the historical lake trout populations.

Walleye spawning has been historically documented throughout the lake. Walleye spawn in small numbers at a small number of sites located on the north shore and near small islands in the western portion of the lake, and spawning assessments for walleye in 1987 and 2003 showed that spawning success was low. The lake still struggles to support a self-sustaining population, and has received rehabilitative stocking of walleye for many years. In order to protect the naturally reproducing walleye population and encourage recruitment success, lake levels can not drop once spawning has begun in May. Spawning sites of other species have not been assessed. Figure 7.17 provides a list of fish species in Mississagagon Lake. There are no known species at risk or significant natural heritage features.

**Figure 7.17 – Fish Species Mississagagon Lake**

| | |
|---|---|
| Lake herring | Largemouth bass |
| Northern Pike | Smallmouth bass |
| White sucker | Pumpkinseed |
| Brown bullhead | Walleye |
| Rock bass | Yellow perch |

*Source – MNRF*

***Land Uses*** – Mississagagon Lake has approximately 127 residential buildings on the lake and at least 3 resorts/marinas. Other than property on islands, there are no boat-access only dwellings on this lake.

***Description of Mississagagon Lake Dam*** – Mississagagon Lake Dam is a water control structure that is located at the outlet of Mississagagon Lake (see map 7.2 on page 50). The dam is a concrete capped rock filled timber crib weir, with a single sluice in the centre of the dam containing six 0.15 m x 0.15 m x 1.33 m stoplogs. Due to their size, the stoplogs are bolted together in two sets, one of 4 and one of 2. The dam is owned and operated by MVC. The Mississagagon Lake Dam has a total drainage area of 22 sq km and a total storage volume of 490 ha m.


*Mississagagon Lake Dam*

***Public Comment Summary*** – Two questionnaires were returned. Respondents indicated that summer, winter and spring levels were too low on Mississagagon Lake, but that fall levels were satisfactory. Specifically, the concern was about the impact of low water levels on wildlife in the marshy area around Sucker Creek.

> *Response to Public Comment* – Obviously the marshy areas around Sucker Creek that are dewatered as a result of the drawdown will cause a change in wildlife habitat. However, typically the fall drawdown begins Thanksgiving weekend and is complete before the lake freezes over. Winter denning furbearers, especially muskrat and beaver, and hibernating amphibians and reptiles need stable water levels in late fall and during ice cover. The furbearers build an entrance to their den below the low water level to ensure an entrance free from winter ice. Water levels dropped too low after these species have entered their winter habitats can essentially freeze them out. Species like beaver and muskrat can adapt to moderate changes in water levels in late fall and winter.

Amphibians and reptiles over-winter in water, burying themselves in the bottom mud of streams and lakes. Amphibians require will oxygenated water to survive in the winter and dropping water levels after they have entered winter habitat can cause ice to freeze to their depth or crowd the habitat such that oxygen is severely depleted.

The current operating guidelines require the fall drawdown to be completed prior to the lake freezing over, such that winter water levels are achieved prior to these wildlife species entering their winter habitats. This winter water level is maintained into early spring to minimize impacts. Periodically wet falls such as 2003 can cause problems for the animals but this would not be the norm. No further analysis of management options was required.

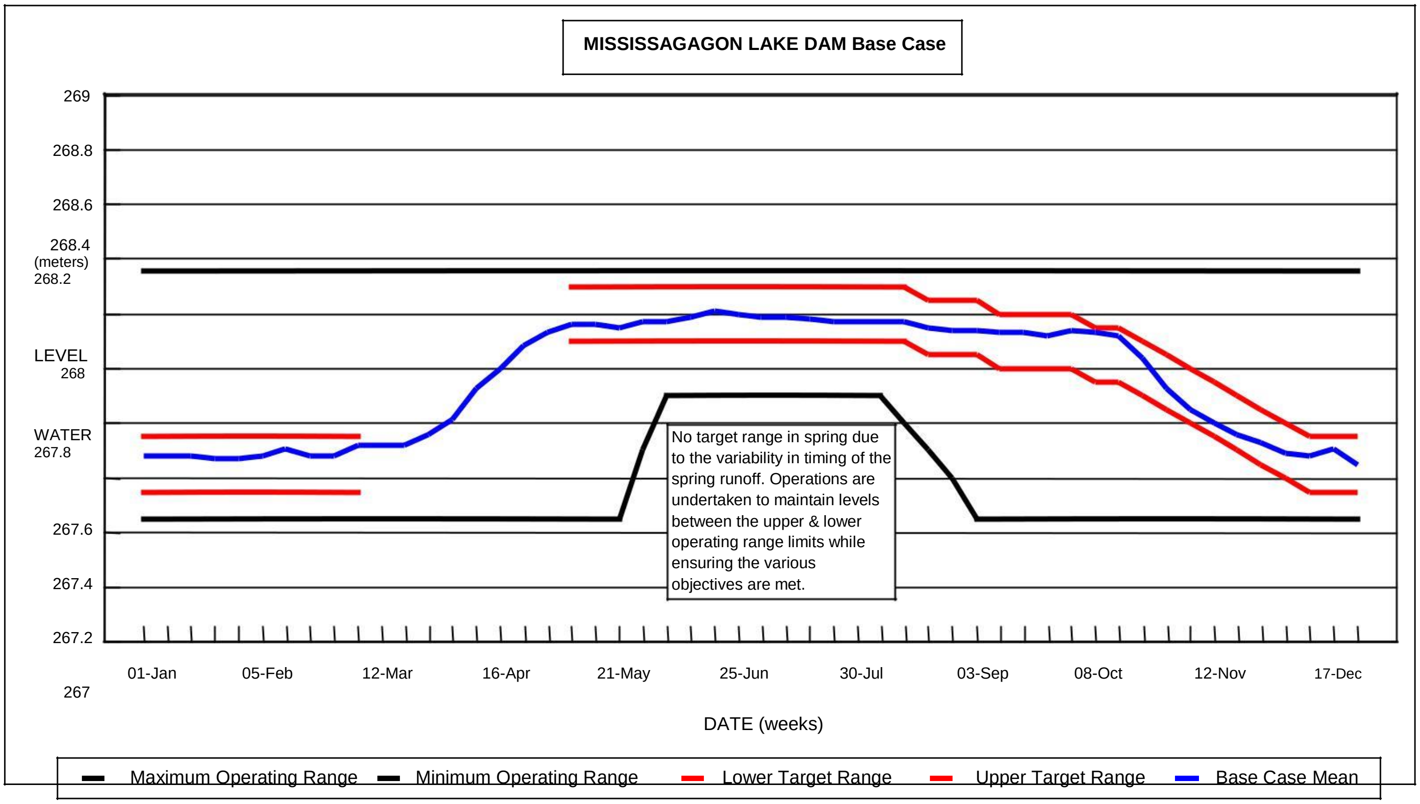
**OPERATING PLAN – MISSISSAGAGON LAKE**

***Planning Considerations and Operational Constraints*** – Flooding of property and docks has occurred on occasion in the past, although flooding of dwellings has not been a problem. Nuisance flooding occurs at 268.35 m and the flooding of main dwellings begins at 268.50 m. Water levels can not drop for six weeks once walleye spawning has begun.

***Management Strategies*** – The maximum Operating Range for the Mississagagon Lake Dam is 267.45 – 268.36 m a.s.l. The following best practices provide additional direction on how the dam will be managed within this operating range:

1. Spring
    a. The stoplogs are replaced early in the spring to ensure summer target levels can be reached.
    b. Water levels can not drop for six weeks once walleye spawning has begun.
2. Summer
    a. Lake levels are targeted between 268.10 m and 268.30 m throughout the summer months, with virtually no flow being passed through the dam.
3. Fall / Winter
    a. The fall drawdown on this lake begins after the Thanksgiving weekend, with all the stoplogs removed from the dam.
    b. The drawdown is usually complete in two weeks with the lake normally reaching its minimum level of 267.60 m by early November.

**Figure 7.18 – Mississagagon Lake Dam Operating Guidelines**




## *Reach 8 – Swamp Creek (Mississagagon Lake Outlet to Mud Lake Inlet)*

This reach between Mississagagon Lake outlet and Mud Lake inlet includes Swamp Creek and Swamp Lake and a portion of Buckshot Creek. This 7.5 km reach is located in the Township of North Frontenac.

***Natural Resources*** – The lakes within this reach are managed as warmwater fisheries, with cool and warmwater species including walleye, northern pike, and large and smallmouth bass. Figure 7.19 provides a list of fish species in Swamp Creek. There are no known species at risk or significant natural heritage features.

| |
|---|
| Northern Pike |
| Largemouth bass |
| Smallmouth bass |
| Walleye |

*Source – MNRF*

## *Reach 9 – Big Gull Lake*

Big Gull Lake (a.k.a. Clarendon Lake) is a headwater lake, which flows into Crotch Lake through Gull Creek and is located in the Townships of North Frontenac (see Map 7.4). Figure 7.20 provides the physical characteristics of Big Gull Lake and Dam.

**Figure 7.20 – Physical Characteristics Big Gull Lake and Dam**

| | |
|---|---|
| Elevation (mean metres ASL) | 253.4 |
| Emergency Spillway Elevation (m) | 254.47 |
| Surface Area (ha) | 2360 |
| Drainage Area (sq. km) | 135 |
| Maximum Depth (m) | 26 |
| Mean Depth (m) | 4 |
| Volume (m3) | $9.2 \times 10^7$ |
| Perimeter (km) | 89 |
| Total Storage Volume (ha. M) | 3048 |
| Elevation of Deck of Dam (m) | 254.76 |
| Weir Elevation | 253.66 |
| Hydraulic Capacity (cms) | 25 |

*Source – MVC and MNRF*

***Natural Resources*** – Walleye are known to spawn throughout Big Gull Lake, especially in the north-eastern reaches of the lake near the outlet of Gull Creek. The lake has limited preferred walleye spawning substrate (i.e., rocky/cobble shoals). Numerous enhancement projects have been undertaken in recent years by the local cottage associations to supplement the existing walleye spawning habitat. Lake levels are, therefore, maintained at levels above 253.10 m to cover and protect the shoals prior to walleye spawning in May.

Although Big Gull Lake formerly supported lake trout, this species has since been extirpated from the lake although the lake still supports coldwater species including lake herring, lake whitefish and burbot. Spawning sites of other species have not been assessed. Figure 7.21 provides a list of fish species in Big Gull Lake. There are no known Species at Risk.

| Figure 7.21 – Fish Species Big Gull Lake | |
|---|---|
| Lake whitefish | Largemouth bass |
| Lake herring | Smallmouth bass |
| Northern Pike | Bluegill |
| Golden Shiner | Pumpkinseed |
| White sucker | Walleye |
| Brown bullhead | Yellow perch |
| Rock bass | Burbot |

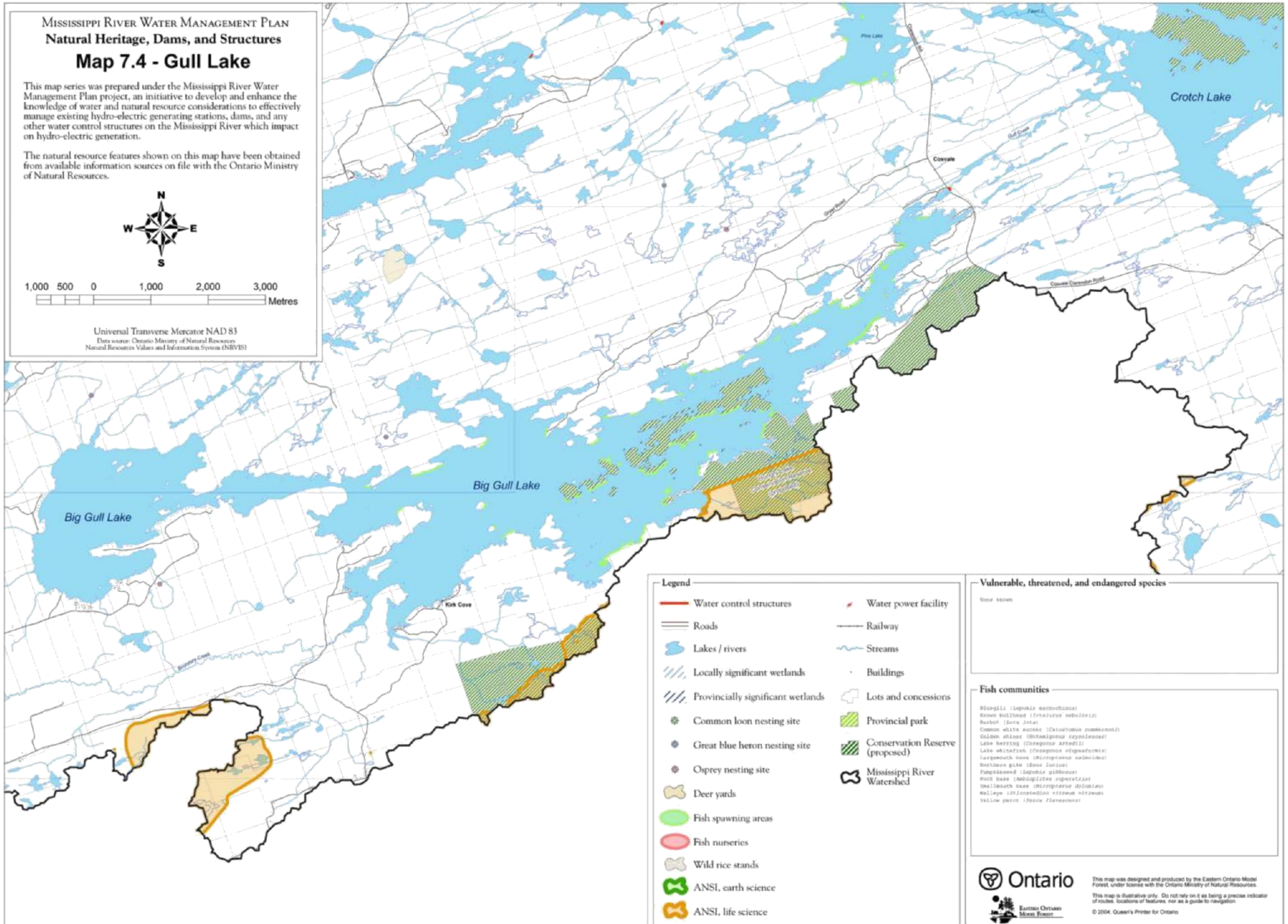
*Source – MNRF*

***Land Use*** – There are approximately 323 residential structures on the lake and at least 5 resorts and other than property on islands, there are no boat access only dwellings on this lake. The Hungry Lake Conservation Reserve is located on the southern shore and includes several large islands.

***Description of Big Gull Lake Dam*** – Big Gull Lake Dam is a water control structure that is located at the outlet of Big Gull Lake. The Big Gull Lake Dam is a concrete structure consisting of two sluices and an overflow weir, and is owned and operated by MVC. The sluices have different configurations with the north sluice containing seven 0.25 m x 0.30 m x 2.90 m stoplogs and the south sluice containing five, 0.25 m x 0.30 m x 2.29 m stoplogs. Although the dam has an overflow weir, water levels rarely get to its top height of 253.66 m.

*Big Gull Lake Dam*

Big Gull Lake dam has a drainage area of 135 sq km, a total storage volume of 3,048 ha m, and a usable storage capacity of 2,286 ha m.


Mississippi River Water Management Plan
Natural Heritage, Dams, and Structures
Map 7.4 - Gull Lake
This map series was prepared under the Mississippi River Water Management Plan project, an initiative to develop and enhance the knowledge of water and natural resource considerations to effectively manage existing hydro-electric generating stations, dams, and any other water control structures on the Mississippi River which impact on hydro-electric generation.
The natural resource features shown on this map have been obtained from available information sources on file with the Ontario Ministry of Natural Resources.
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1,000 500 0 1,000 2,000 3,000
Metres
Universal Transverse Mercator NAD 83
Crotch Lake
Big Gull Lake
Big Gull Lake
Legend
Water control structures
Roads
Lakes / rivers
Locally significant wetlands
Provincially significant wetlands
Common loon nesting site
Great blue heron nesting site
Osprey nesting site
Deer yards
Fish spawning areas
Fish nurseries
Wild rice stands
ANSI, earth science
ANSI, life science
Water power facility
Railway
Streams
Buildings
Lots and concessions
Provincial park
Conservation Reserve (proposed)
Mississippi River Watershed
Vulnerable, threatened, and endangered species
Fish communities
Ontario
Eastern Ontario Model Forest
This map was designed and produced by the Eastern Ontario Model Forest, under license with the Ontario Ministry of Natural Resources.
This map is illustrative only. Do not rely on it as being a precise indicator of routes, locations of features, nor as a guide to navigation.
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***Public Comment Summary*** – One questionnaire was received from a property owner on Big Gull Lake who had concerns regarding low water levels and their impact on boating/navigation and walleye spawning. One questionnaire without comments was also received indicating summer levels were too low and winter levels were okay. As well, three additional emails were received following the scoping report indicating that residents preferred the current conditions of the lake.

> Response to Public Comments – Big Gull Lake is a large headwater lake with very few tributaries to supply water in the spring, so low summer levels are often a concern. However, experience has shown that the current operation regime is the most effective in minimizing downstream flooding. Occasionally, dry springs have resulted in lower water levels in early spring and, in the case of the drought of 2001, low water levels throughout the summer. Exposure of walleye shoals during the spring spawning and incubation period is only an issue during unusually dry springs when optimum summer water levels can not be achieved.

## OPERATING PLAN – BIG GULL LAKE DAM

***Planning Considerations and Operational Constraints*** – Figure 7.22 summarizes the known planning and operational matters to be considered in the management strategies. Flooding of shoreline and docks has occurred on occasion; however, there has been greater concern with reaching summer target levels than with flooding. Walleye spawning shoals have been built on the lake, and the lake level must be above 253.10 m prior to the start of the spawn. Nuisance flooding of shoreline and docks has occurred at 253.55 m. The numerous shallow shoals that exist along the shoreline make navigation hazardous at levels below the water level of 253.10 m.

Low spring freshet volumes may necessitate raising water levels earlier than normal potentially resulting in ice damage. As such, this lake is generally the first to be operated in the spring. As a headwater lake, it is extremely important to capture all spring runoff early to ensure reaching the summer target level.

**Figure 7.22 – Big Gull Lake Dam**
**Planning Considerations and Operational Constraints**

| | |
|---|---|
| **Flooding** | Flooding of main dwellings occurs above 253.90 m; and nuisance flooding of shoreline structures occurs at 253.55 m. |
| **Navigation** | Numerous shallow shoals exist making navigation hazardous at levels 30 cm below target of 253.40 m. |
| **Walleye Spawning** | Levels above spawning shoals (estimated at 253.15 m) prior to spawn beginning. Spawning shoal identified at outlet of Gull Creek. |
| **Ice Damage** | Limited inflows results in early operations potentially resulting in ice damage. |

***Management Strategies*** – The maximum Operating Range for Big Gull Lake Dam is 252.40 – 253.60 m a.s.l. The following best practices provide direction on how the dam will be managed within this operating range:

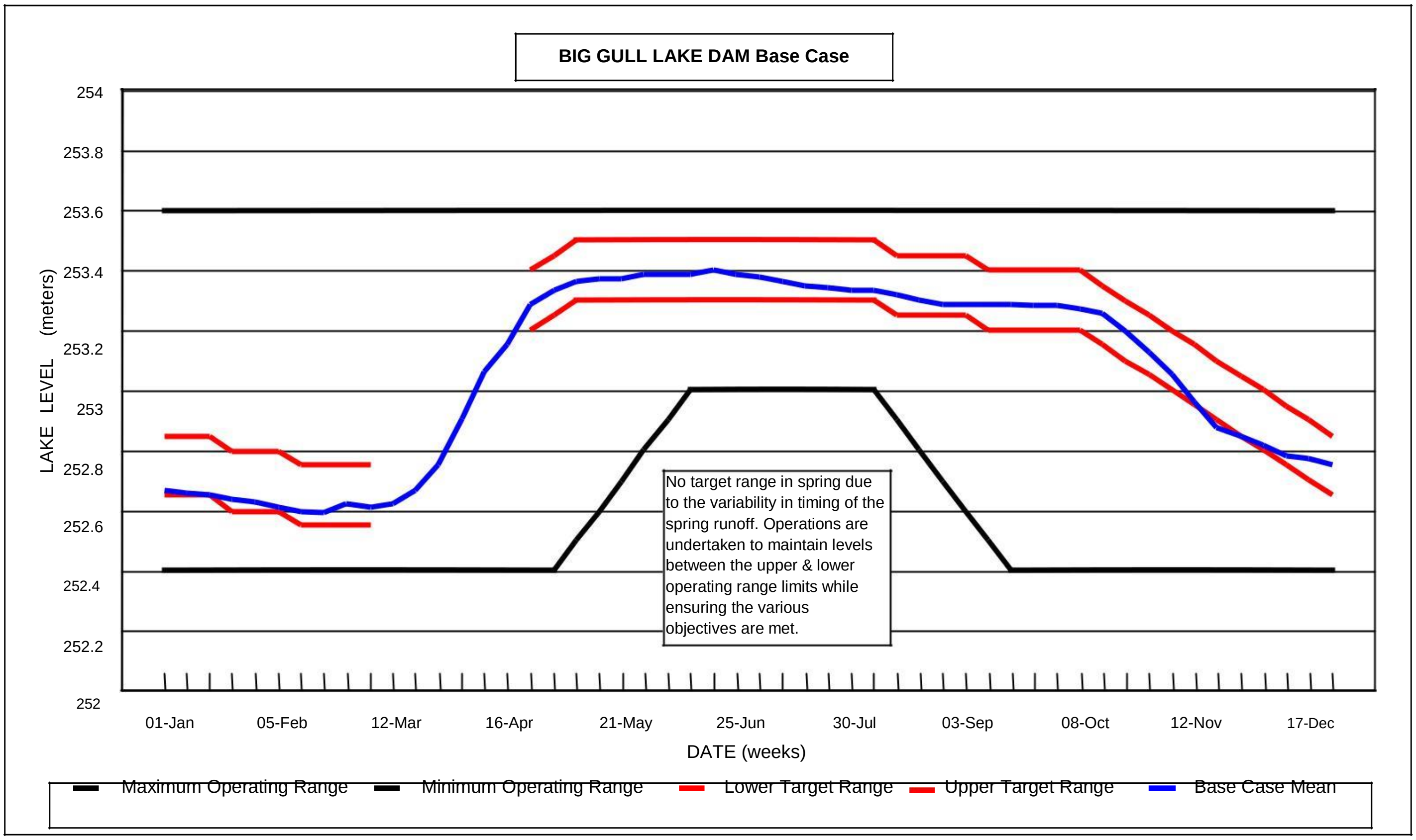
1. Spring
    a. As this is a headwater lake with minimal concerns of flooding residential buildings, it is extremely important to capture all spring runoff early to ensure reaching the summer target level of 253.40 m.

b. Lake levels are targeted to an elevation of 253.10 m prior to the start of walleye spawning.

2. Summer
   a. Lake levels are targeted between 253.30 m and 253.50 m throughout the summer months with virtually no flow being passed through the dam at elevations below 253.40 m.

3. Fall/Winter
   a. The fall drawdown begins after Thanksgiving weekend with 8 of the 12 stoplogs (4 from each sluice) removed during this process.
   b. Lake levels are targeted to drop to around 252.60 m by December.

**Figure 7.23 – Big Gull Lake Dam Operating Guidelines**



## *Reach 10 – Gull Creek (Big Gull Lake Dam to Crotch Lake Inlet)*

The Gull Creek reach is about 3.5 km in length and is located between the Big Gull Lake Dam and the inlet to Crotch Lake, in the Township of North Frontenac. See Map 7.4 on page 61.

***Natural Resources*** – Walleye spawning shoals have been identified in Big Gull Creek and at the outlet of the creek into Crotch Lake. Due to the limited supply of water for this reach in the spring, Big Gull Lake dam is operated to ensure the spawning shoals on the lake are adequately covered. As well, if sufficient water exists, that flows are maintained for the walleye spawning in the downstream creek. There are no species at risk or significant natural heritage features in this reach.

## *Reach 11 – Crotch Lake*

Crotch Lake (a.k.a. Cross Lake) is the most significant lake on the Mississippi River with respect to flood control and the provision of water for low flow augmentation. It is the only true reservoir lake in the watershed, and is located in the Township of North Frontenac. There are two major inflows into the lake which include the Mississippi River to the north and Gull Creek in the south-west. Fawn Lake and Twin Islands Lake are also connected to the west side of Crotch Lake through rocky and narrow inlets. Crotch Lake has several bays and islands (see Map 7.3 on page 57). Figure 7.24 provides a summary of the physical characteristics of Crotch Lake and Dam.

**Figure 7.24 – Physical Characteristics Crotch Lake and Dam**

| | |
|---|---|
| Elevation (mean metres ASL) | 240 * |
| Emergency Spillway Elevation | n.a. |
| Surface Area (ha) | 2160 * |
| Drainage Area (sq. km) | 1030 |
| Maximum Depth (m) | 31 * |
| Mean Depth (m) | 11 * |
| Volume (m3) | $1.2 \times 10^{8}$ * |
| Perimeter (km) | 87.5 * |
| Total Storage Volume (ha. m) | 7617 |
| Hydraulic Capacity (cms) | 68 |
| Elevation of Deck of Dam | 241.67 |
| Weir Elevation | 240.00 |

* These factors are highly variable due to the water management regime on Crotch Lake

*Source – MVC and MNRF*

***Natural Resources*** – Walleye spawning is documented in high numbers at several locations in Crotch Lake. The primary spawning shoal and staging area is located at Sidedam Rapids, and spawning bed construction by the MNRF was implemented at the mouth of Gull Creek and Whitefish Rapids (Mud Lake Reach). A seasonal fish sanctuary is in force from March 1st until the first Monday in June to protect fish spawning in these areas. Another important spawning site for walleye is documented at King Falls, both above and below the Crotch Lake Dam. Walleye spawning has also been documented around islands in the north basin, as well as at two inlets to Fawn Lake and on Gull Creek, upstream from Crotch Lake.

Crotch Lake's Fall Walleye Index Netting (FWIN) survey (1997) indicates that walleye recruitment fell below those reported for Big Gull (1998) and Kashwakamak (1999). Although recruitment may be lower than that in surrounding lakes, a subsequent FWIN survey in 2005 suggests walleye populations are stable in Crotch Lake. The lake may have lower fish productivity and recruitment rates than surrounding lakes as a result of various, interlaced factors such as angling pressure,

| | |
|---|---|
| Lake whitefish | Largemouth bass |
| Lake herring | Smallmouth bass |
| Northern Pike | Bluegill |
| Golden Shiner | Pumpkinseed |
| Fallfish | Walleye |
| Mimic shiner | Yellow perch |
| White sucker | Logperch |
| Brown bullhead | Burbot |
| Rock bass | |

*Source - MNRF*

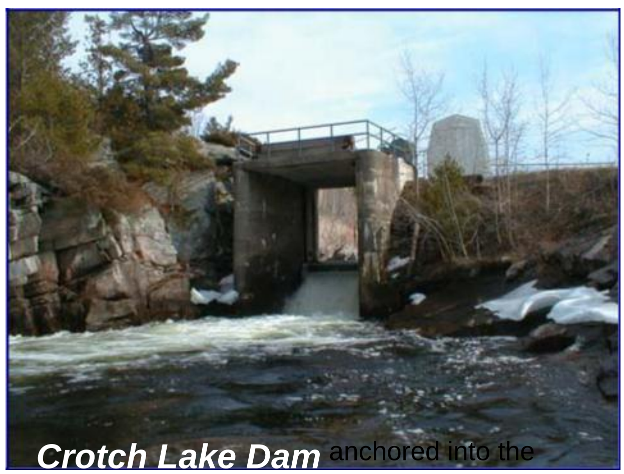
quality and quantity of spawning habitat, water quality, invasive species, competition for food and predation, potential effect of the drawdowns, acid rain, climate change and pollution.

Crotch Lake formerly supported lake trout, which have been extirpated from the lake although the lake still supports coldwater fish including lake whitefish, lake herring and burbot. Spawning sites of other species have not been assessed. Figure 7.25 provides a list of fish species in Crotch Lake.

***Species at Risk*** – Crotch Lake has been the site of nesting bald eagles (*Haliaeetus leucocephalus*), which have a provincial species at risk designation of “endangered” by the Committee on the Status of Species at Risk in Ontario (COSSARO). This means that the species is at risk of extinction or extirpation in Ontario. The bald eagle is regulated in Ontario and is, therefore, protected, including its critical habitat (feeding, nesting and breeding sites), under the Ontario Endangered Species Act from wilful persecution or harm. The Stinkpot Turtle is listed as Threatened on the Species at Risk Ontario list. It is named for its musky, skunk-like smell noted when it is disturbed or handled. It frequents shallow, weedy, slow-moving water of ponds, lakes and streams where it typically walks along the bottom rather than swimming. Populations that were likely historically widespread in southern Ontario have declined as development has altered shorelines. The current distribution and population size is difficult to determine as Stinkpots rarely leave the water, even to bask, and so they are likely overlooked. Stinkpot turtles and their habitat are afforded protection by the Fish and Wildlife conservation Act, National and Provincial Parks Act, the Provincial Policy Statement, and the Species at Risk Act.

***Land Use*** - Crotch Lake has three resorts on the lake and a few residential buildings, and is primarily surrounded by Crown or OPG owned land. Semi-annual (late summer and winter) drawdown management operations and low summer levels impact boat access, marina operations and navigation at the two public access sites, and can make the public access unusable for recreational activities, as well as access to Fawn and Twin Island Lakes. The Crotch Lake Conservation Reserve, Crotch Lake Enhanced Management Area is also located in the central portion of the Crotch Lake.

***Description of Crotch Lake Dam*** – The Crotch Lake Dam is a water control structure and is located at the outlet, on the east side of Crotch Lake, which flows into the Mississippi River and into a series of small lakes immediately down stream: Kings, Otter and Miller. The dam consists of two main components: a single concrete sluice containing sixteen 0.30 m x 0.30 m x 4.20 m stoplogs and a 110 m long rock filled gabion weir designed to be overtopped at elevations above 240.00 m (the design specifications limit the overtopping to 0.50 m).



***Crotch Lake Dam***

The bottom 3 stoplogs are bolted together and anchored into the dam so they can not be removed.

The dam is owned and operated by Ontario Power Generation (OPG) with the removal and replacement of stoplogs done by MVC. The Crotch Lake Dam has a total drainage area of 1030 sq km and a total storage volume of 7617 ha m. It is the only true reservoir lake in the watershed. The lake fluctuates by up to 3 m twice a year to augment downstream flows and provide storage for spring runoff thus reducing downstream flooding.

***Public Comment Summary*** – A total of twelve questionnaires and two emails were received from Crotch Lake property owners with concerns regarding the low and/or fluctuating water levels on Crotch Lake and the magnitude of the semi-annual drawdowns on the lake's fish habitat and population. A number of respondents noted that the low summer and fall levels also created difficulties for navigation and access to properties and that the new boat launch is inaccessible when the lake is fully drawn down. One comment wondered whether the lake was managed primarily as a recreational destination, or as a water reservoir.

*Response to Public Comments* – The location of Crotch Lake in the Mississippi River system is critical to the management of the entire system. Given its location in the watershed, any changes to the operation at the Crotch Lake dam could have a significant effect upon water levels upstream and downstream. The drainage area for the Crotch Lake Dam is 1,030 sq km while the total drainage area of the Mississippi River watershed is approximately 3,700 sq km. Therefore, roughly 70% of the total watershed area lies below Crotch Lake. However, this downstream area is uncontrolled (i.e., no reservoir storage) and, therefore, limits the ability of this area to contribute to flows on the lower section of the Mississippi River, as well as placing greater importance on flows from Crotch Lake and other lakes upstream. Despite the overall demand of the system, the Crotch Lake Dam is operated to accommodate the mix of local needs and desires as well as manage for both recreational use and water control.

The overall drawdown does clearly have an effect on users and on the fish and wildlife of the lake. However, the dam has been operated under more or less the same regime for about 50 years, and operations have evolved to reflect recent uses as well as better information. For example, in the early 1990s Ontario Hydro, Dalhousie Lake Working Group, representatives from Crotch Lake, MNRF and MVC revised the operating plan for Crotch Lake to ensure that the walleye fisheries on Crotch Lake and at the inlet to Dalhousie Lake were both addressed, as much as possible, during spring operations.

As Crotch Lake begins to fill in early April, MNRF advises MVC when the walleye spawn has begun on Crotch Lake and at Dalhousie Lake. Crotch Lake is then filled to accomplish its many roles in the system with the understanding that as long as the lake does not fall below the level required by spawning walleye, the eggs on the lake should survive. Recent surveys by MNRF have found a healthy fishery in Crotch Lake despite the magnitude of the semi-annual drawdown (winter and late summer).

The effect of water levels on access and navigation are important considerations for the operating plan of the dam. In response to expressed concerns, access to Twin Island and Fawn Lakes for recreational purposes has been identified as a sub-objective in this plan.

Based on historical data, the implications of different operating regimes will be assessed as part of this Water Management Plan. The reduction of the overall size of the drawdown, adjusting the timing of drawdowns, and consideration of one rather than two drawdowns annually will be addressed as a part of the options development process. In addition, the feasibility of ensuring navigable passage into Twin Island and Fawn Lakes will be assessed.

***Analysis of Water Management Options*** – Ten (10) different options were developed to address the comments related to Crotch Lake. The number of options considered reflected the degree of concern that was expressed about the water levels in this lake, and the importance of this dam to the rest of the river system. The strategy for the development of options was to investigate a change in the levels and flows to benefit the objectives for Crotch Lake and compare those benefits against the conflicts/concerns to the rest of the watershed. See Appendix 5, Options Report, for more details.

<u>How options address comments</u> – The operating regimes for Crotch Lake and upstream lakes have been integrated to allocate the available water in the most equitable way among a wide range of uses and interests. Due to this integration, changes in individual operating regimes may have significant implications to existing uses and expectations. A variety of different operating regimes were evaluated including changes to the magnitude and timing of drawdowns and use of a single drawdown. The resulting options were assessed both qualitatively and quantitatively through the use of simulation modeling. The options were also assessed against improving navigable passage to Twin Island and Fawn Lakes and the potential impacts on downstream water levels and flows.

**<u>Option 5a</u>:** Reduce summer drawdown to a level of 238.5 m to improve recreational opportunities by restricting the release of water from Crotch Lake once this level is achieved. Historical data indicates that this level is achieved around the middle of August. The implications of this option would reduce outflow from Crotch Lake to matching the inflow into the lake, which in dry summer periods can be near zero cms. This condition could last from mid August through to October when the drawdown from the upper lakes begins.

<u>Benefits:</u>

- Allows access to Twin Island and Fawn Lakes throughout the summer period
- Higher water levels would provide more surface area for recreational opportunities and fish habitat on the lake typically from mid August through mid October.

<u>Conflict or concerns:</u>

- Option 5a fails to maintain low flow augmentation. Lower flows on the lakes and rivers downstream would result in impacts on ecological integrity and recreational opportunities.
- Navigation would be affected on Mississippi Lake (1700 residences & 4 marinas), Dalhousie Lake (195 residences & 1 resort), 6 downstream communities and all riverine sections below Crotch Lake.
- Significant loss in power production (could result in complete loss of power production in dry summer periods).
- Impact on municipal requirements for waste assimilation

<u>Conclusion Option 5a</u>**:** Current operations (base case) provide the best opportunity to maintain ecosystem health and navigation on the lake as well as downstream.

**<u>Option 5b</u>:** Reduce summer drawdown to a level of 238.5 m and utilize water from the upper lakes to maintain existing downstream flow conditions. This option would require drawdowns on the upper lakes to start in early August to offset the water normally removed from Crotch Lake. Restrictions on the current operating guidelines for Mazinaw Lake and the potential detrimental impact on the growing and harvesting period of the wild rice at Ardoch eliminate the use of Kashwakamak and Mazinaw Lakes to supplement this flow. As well, no specific rationale has been identified to support changing the current extent of drawdown on the lake.

Benefits:

- Allows access to Twin Island and Fawn Lakes throughout the summer period.
- Higher water levels would provide more surface area for recreational opportunities and fish habitat on the lake typically from mid August through mid October.

Conflict or concerns:

- This option is in direct conflict with drawdown dates for navigation on Mazinaw Lake that are set in the legal agreement with the federal government.
- Navigational opportunities would be affected on Mazinaw (320 residences, 4 resorts & a provincial park), Shabomeka (100 residences), Kashwakamak (380 residences & 5 resorts), Big Gull (320 residences & 5 resorts) and Mississagagon (130 residences & 3 resorts).
- Wild rice growth cycle would be altered as a result of water level changes.

Conclusion Option 5b: Current operations (base case) provide the best opportunity to maintain ecosystem health and navigation on the lake as well as downstream.

**Option 5c:** Eliminate the winter drawdown by leaving all the logs in and attempt to maintain a level of 239.5 m.

Benefits:

- Provides increased fish habitat in Crotch Lake.
- Emulates more closely components of a natural system.
- Allows access to Twin Island and Fawn Lake throughout the summer period.
- Higher water levels would provide more surface area for recreational opportunities.
- Water levels will be established before beaver, muskrat, turtles, amphibians and aquatic invertebrates enter winter hibernation on Crotch Lake.
- Provides more stable ice conditions on Crotch Lake.
- The risk of winter kill of fish would be reduced.

Conflict or concerns:

- Reduces flood storage used to mitigate flooding at the prime flood damage centers of Dalhousie and Mississippi Lake and the 6 communities downstream.
- Downstream water levels will not be stabilized before beaver, muskrat, turtles, amphibians and aquatic invertebrates enter winter hibernation.
- This option fails to maintain ecological integrity (water quality, flushing rates etc.) of lower river system, recreational opportunities on Mississippi Lake and Dalhousie Lake as well as the river.
- There could be significant economic impacts associated with Mississippi and Dalhousie Lakes (1700 cottages/homes, 4 marinas, numerous B&B's and 6 communities located downstream).
- There would be significant loss in power production.
- Ice damage would occur to areas downstream of Crotch Lake due to either increased flows when ice is forming or dropping water levels after the ice has formed.

Conclusion 5c: Current operations (base case) provide the best opportunity to maintain ecosystem health and navigation on the lake as well as downstream.

**Option 5d:** Eliminate the winter drawdown by not refilling Crotch Lake in the fall (all removable logs left out of dam after October). The expectation of this option was to improve the ecological health of Crotch Lake. However, the option might result in negative impacts on the ecological integrity of the lower river system.

This option has been undertaken at least twice in the past 50 years (reasons why were not adequately documented). Increased problems with frazil ice and ice jams occurred in the lower section of the river during the winter of one of these years. Ice fluctuations will still occur on Crotch Lake with this option.

Benefits:

- Total change in water levels on Crotch Lake will be reduced throughout the fall and winter; however, water levels will continue to fluctuate by up to 2 m during this period due to inflow conditions.
- Increases power generation from October to January.
- Increased flood control capabilities through the winter months.

Conflict or concerns:

- This option may result in negative impacts on the ecological integrity of the lower river system. However, the complexity and level of study required to resolve these conflicts is beyond the scope of this plan.
- This option may provide additional flood protection through the winter. However, opportunities to augment flows in the winter will be lost. Minimum flow requirements to maintain ecosystem integrity and to provide adequate waste assimilation capacity at Carleton Place and Almonte are unknown at this time. Further investigation on minimum flow requirements should be completed prior to further consideration of this option.
- No net gain to the ecosystem on Crotch Lake can be determined.
- Downstream water levels will not be established before beaver, muskrat, turtles, amphibians and aquatic invertebrates enter winter hibernation.
- This option may cause ice damage to areas downstream of Crotch Lake due to either increased flows when ice is forming or dropping water levels after the ice has formed.
- The option would result in significant loss in power production - would reduce the efficiency of High Falls G.S. and Enerdu G.S. by necessitating spilling water from October to January.

Conclusion Option 5d: Current operations (base case) provide opportunities to augment flows as required to maintain minimum flow requirements. This option does not achieve any significant benefit on Crotch Lake, either in stabilizing winter water levels or improving ecological habitat. Further analysis is not considered warranted.

**Option 5e:** Maintain an average flow of 5 cms at High Falls by utilizing Crotch Lake to maintain a minimum outflow of 1 cms when storing water in the lake & and a minimum outflow of 3 cms when utilizing the lake for low flow augmentation.

This option best reflects the current operating procedures for Crotch Lake. Crotch Lake has historically been utilized to provide low flow augmentation during the summer, fall and winter months, and flood storage during the spring for High Falls and the river downstream. Crotch Lake provides 60 to 100 per cent of the downstream flow during the summer and winter months when the stored water in the lake is utilized for low flow augmentation. The volume of water in this lake can provide an average flow of 5 cms (with a minimum of 3 cms) from June through September and January through March under **normal** conditions. During high precipitation periods flows may be higher than 5 cms and / or the dam may be operated to store the water depending on conditions throughout the watershed. In the fall, when the drawdown of the upper lakes is underway, Crotch Lake is not being used to augment downstream flows, as water is being stored in Crotch Lake to use later. At this time, flows are being maintained by the water from the upper lakes and / or from the local drainage area between Crotch Lake and High Falls.

For short periods of time, outflows from Crotch Lake may be reduced to near zero as stoplogs are replaced in the dam (typically when flooding downstream is an issue and flows downstream of the dam are high from local runoff). This condition is temporary and occurs when there are limited impacts on recreation, navigation and fisheries and will recover quickly due to the volume of water coming from the upper lakes. In general, use of Crotch Lake to maintain a flow of 5 cms into High Falls is most critical in the June to October and January to March periods when other sources of water are normally not available.

Benefits:

- Resembles existing operation **with maximum benefit** for flood control, low flow augmentation, fisheries & wildlife, recreational opportunities and power generation benefits outlined in base case.
- Resembles natural flow regime.

Conflict or concerns:

- Maintaining a minimum of 1cms for an extended period of time could result in dry river conditions downstream.
- Dry years may require that levels be reduced to ensure that Crotch Lake fills in case it is a dry spring.
- Less water for hydro generation.
- Closely resembles the base case but in the base case there are occasions where the flow is below 1 cms to get the lake filled.
- Sub-objective of maintaining higher levels to improve access and fish habitat for Twin Island and Fawn Lakes can not be achieved under normal conditions.

Conclusion Option 5e: This most closely represents the current operating regime providing the most benefit to the overall system with the least impact on any specific priority of reach.

**Options 5f, 5g, 5h, and 5i:** Several increased minimum flow rates were modeled under these options to provide average flow rates higher than the current 5 cms :

Option 5f - minimum outflow of 1 cms [filling] & minimum outflow of 5 cms (average of 7 cms) [low flow augmentation],
Option 5g - minimum of 1 & minimum of 7 cms (average of 9 cms), Option 5h – minimum of 2 & minimum of 5 cms, and Option 5i – minimum of 2 & minimum of 7 cms.

When the water is available from rainfall over the summer period, higher outflows from Crotch Lake are maintained until such time as Crotch Lake levels return to normal. Continuing to maintain increased outflows after that occurs could potentially cause the system to run out of water and adversely affect all downstream levels and flows.

Benefits:

- Greater flow out of Crotch Lake into High Falls G.S. increases power production here and at all downstream generating stations for as long as flows can be maintained.

- Higher flows downstream provide better recreational, navigational opportunities on the lakes and river by having higher levels.
- Increased flows increase flushing rates on lakes and deeper water provides cooler water with more oxygen and less plant growth thereby improving fish habitat and water quality in general.

Conflict or concerns:

- Without rainfall during the summer months (which we cannot be assured will be received), the system would run out of water sometime between mid August and mid September depending on the outflow maintained, resulting in serious impacts on all users/ uses of the river.
- Impact on Twin Island and Fawn lake access would occur earlier in the year and likely be more significant especially during late summer drought conditions.

Conclusion Options 5f, 5,g, 5h, and 5i: The current operation (base case) best maintains the integrity of all planning objectives.

**Option 5j:** Maximize hydro generation. Existing voluntary constraints on water flows are eliminated to operate Crotch Lake strictly for power generation. The intent is to increase the outflow from Crotch Lake and the diurnal operation used by High Falls to fluctuate the flows from Crotch Lake in order to meet power generation demands.

Benefits:

- Power generation will increase on the river system.

Conflict or concerns:

- The river system would run out of water by September/October.
- Increased fluctuating water levels downstream of Crotch Lake, the lake would drop below 236.5 around August.
- Flooding levels on Dalhousie Lake and High Falls.
- The amount of time it takes for water to travel from Crotch Lake to High Falls restricts the ability to meet peak demand.
- Impacts fisheries, navigation, recreation, flood mitigation, and ecological integrity.

Conclusion Option 5j: Option 5j was not considered a viable option because operating the system solely for the benefit of power generation would be detrimental to all other objectives for the system. There is a finite supply of water in the system, which would not be available throughout the year with this option. The current operations provide the best balance for power generation, environmental and social objectives.

**Option 5 k:** Maintain the spill point at Crotch Lake Dam at or above the weir height of 240.00 m.

Benefits:

- This option would increase fish habitat.
- Higher water levels would provide more surface area for recreational opportunities.
- This option allows access to Twin Island and Fawn Lake throughout the summer period.

Conflict or concerns:

- The option fails to maintain ecological integrity of the downstream river system.
- There would be a significant increase in flood potential to downstream areas.
- There would be a significant loss in power production.

- There could be significant economic impacts associated with Mississippi and Dalhousie Lakes.
- This option is not possible given the configuration of the existing structure.

Conclusion Option 5k:

- The current operation (base case) better protects critical fish spawning habitat while at the same time ensuring downstream ecological integrity.

Conclusion of Analysis of All Options for Crotch Lake Dam: After examining all the above options, the conclusion is that the current operating regime offers the best solution with the least conflicts.

**OPERATING PLAN – CROTCH LAKE DAM**

***Planning Considerations and Operational Constraints*** – Figure 7.26 summarizes the planning and operational matters to be considered in the management strategies. While flooding of buildings and shoreline structures is not a primary concern, low flow in the summer is a problem and requires flow augmentation to maintain flow minimums below the dam. As well the stability of the dam must be considered at water levels above 240.50 m.

**Figure 7.26 – Crotch Lake Dam Planning Considerations and Operational Constraints**

| | Spring (Mar 1 – May 31) | Summer (May 23 – Oct 15) | Fall (Sept 15 – Dec 1) | Winter (Nov 15 – Mar 15) |
|---|---|---|---|---|
| **Flooding** | Minimum levels at/near 237.00 m for maximum flood storage. Uncontrolled flows at 240.00 m – top of weir. Structural stability concerns at 240.50 m | Uncontrolled flows at 240.00 m – top of weir. Structural stability concerns at 240.50 m | Uncontrolled flows at 240.00 m – top of weir. Structural stability concerns at 240.50 m. | Uncontrolled flows at 240.00 m – top of weir. Structural stability concerns at 240.50 m. Max level 239.50 m to allow for spring freshet |
| **Fisheries**<br>**Lake Trout** | Not applicable | Not applicable | Not applicable | Not applicable |
| **Walleye** | Lake level should not drop below level at which spawning begins. Flows should be maintained for 5 weeks for downstream river spawners at same time. Lake level high enough to provide access to Gull Creek shoals | No operational constraint | No operational constraint | No operational constraint |
| **Bass** | No operational constraint | Flows maintained to ensure spawn survival throughout June at Snow Road | No operational constraint | No operational constraint |
| **Pike** | Filling of lake in March as per normal operations addresses pike spawning concerns | No operational constraint | No operational constraint | No operational constraint |
| **Wildlife** | No operational constraint | No operational constraint | No operational constraint | Burying amphibians, reptiles etc and wildlife muskrats, beaver etc at risk since lake doesn't reach minimum levels until after ice on. |
| **Recreation**<br>**Tourism** | No operational constraint | When flows exceed 15 cms at High Falls G.S. water levels on Crotch Lake will be maintained. | No operational constraint | No operational constraint |
| **Erosion** | Rock shoreline – no concern | Rock shoreline – no concern | Rock shoreline – no concern | Rock shoreline – no concern |

**Figure 7.26 – Crotch Lake Dam Planning Considerations and Operational Constraints**

| | Spring (Mar 1 – May 31) | Summer (May 23 – Oct 15) | Fall (Sept 15 – Dec 1) | Winter (Nov 15 – Mar 15) |
|---|---|---|---|---|
| **Navigation** | No operational constraint | No operational constraint | Access to Fawn Lake / boat launch | Not applicable |
| **Ice** | No concern for shoreline damages. Drawdown inherent risk to snowmobilers | Not applicable | Not applicable | Filling and drawdown inherent risk to snowmobilers due to ice movement |
| **Low Flow Aug** | Maintain minimum flow of 5 cms at High Falls G. S. No concern until after runoff over as dam operated for flooding and fisheries issues | Avg. flows between 5 and 15 cms maintained throughout summer dependant on availability of water from rainfall. Lake at or near 240.00 by July to ensure adequate water supply to meet 5 cms requirement at High Falls G.S. | Maintain at least minimum avg. flow of between 5 and 15 cms at High Falls G.S. as drawdown from upper lakes occurs until lake reaches 239.50 m | Maintain minimum flow of 5 cms at High Falls G.S. |
| **Power Generation** | If water available in Crotch Lake is due to rainfall / snowmelt runoff, maintain flows of 15 cms as long as not at the expense of flooding, fisheries or low flow augmentation. | If water available in Crotch Lake is due to rainfall, maintain flows of 15 cms as long as not at the expense of flooding, fisheries or low flow augmentation. | If water available in Crotch Lake is due to rainfall maintain flows of 15 cms as long as not at the expense of flooding, fisheries or low flow augmentation. | If water available in Crotch Lake is due to rainfall / snowmelt runoff, maintain flows of 15 cms as long as not at the expense of flooding, fisheries or low flow augmentation. |

In order to accommodate walleye spawning above the dam lake water levels must not drop below an elevation at the start of spawning level until at least mid May, and this is also a consideration for spawning areas located at Sidedam Rapids and Gull Creek. Outflows must be as stable and consistent as possible to ensure survival of walleye downstream of the dam as far as the Dalhousie Lake inflow. Outflows maintained from mid-May through to late June must ensure adequate coverage of bass spawning habitat in the Snow Road area.

The lake must be at or near 240.0 m by July 1 to ensure a low flow augmentation of 5 cms can be maintained downstream through mid September with an average amount of rainfall occurring over this time frame. When levels exceed the operating range due to substantial rainfall/runoff, higher flows may be maintained to maximize hydro production at High Falls G.S. and other downstream benefits until levels on the lake return to the operating range.

***Management Strategies*** – The Compliance Range for Crotch Lake is 236.80 – 240.20 m a.s.l. The following best practices provide direction on how the dam will be managed within this operating range:

1. Spring
    a. Prior to the spring freshet, the lake level is drawn down to a target of 237.00 m. with up to 12 logs removed from the sluice.
    b. As runoff begins in the spring, stoplogs are replaced to increase lake levels.
    c. Lake levels are targeted to remain above the elevation at which walleye spawn in the lake and be maintained for a period of six weeks during the spawning season.

2. Summer
    a. The lake is targeted at an elevation between 239.50 m and 240.00 m and operated to maintain these levels until late June.

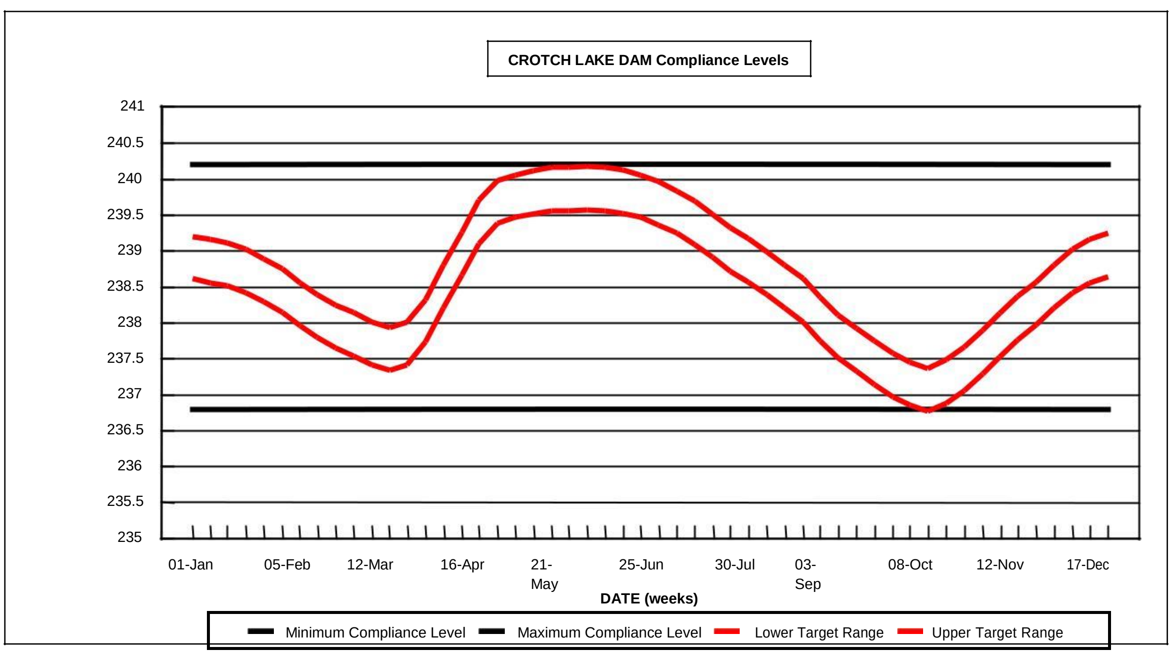
b. Usually beginning around the first of July, one stoplog is removed from the dam about every 10 days to maintain an average downstream flow of 5 cms throughout the remainder of the summer.
c. The lake declines steadily and by mid to late September is again near an elevation of 237.00 m.

3. Fall/Winter
    a. After Thanksgiving weekend, the logs are replaced in the dam to capture the water from drawdowns being done on the upper lakes, while maintaining at least a minimum downstream flow of 5 cms if possible. Summer droughts may force flows to be less than 5 cms to ensure filling the lake for later usage.
    b. By mid-January, the lake level is targeted between an elevation of 239.00 m and 239.50 m. Stoplogs are again removed to maintain at least the minimum average downstream flow of 5 cms.

***Compliance Monitoring***- Crotch Lake dam is owned by OPG and is primarily used to provide flood control and low flow augmentation. It is also operated in conjunction with the High Falls G.S. to meet compliance requirements at High Falls. The lower compliance level for Crotch Lake dam has been increased from the original lower operating limit of 236.00 m to 236.80 m, to reflect current operating practice. Water levels below 236.80 m would only be achieved if the low water indicators were reached.

The upper compliance level of 240.20 m does not create flooding on Crotch Lake but would result in the High Water Indicator at High Falls G.S. The normal operation of this dam is to have the lake at 240.00 m (the crest of the weir) at the start of the summer to ensure adequate resources to maintain minimum flows for low flow augmentation. The 20 cm range between the upper target level and the compliance level provides limited storage to accommodate rainfall events to minimize the impact on downstream flows while not jeopardizing the low flow objective of the structure. See Figure 7.27.

**Figure 7.27 – Compliance Levels for Crotch Lake Dam**



## *Reach 12 – Crotch Lake to Stump Lake (Kings Lake, Otter Lake and Millers Lake)*

The reach between Crotch Lake Dam and Stump Lake inlet is a 10.5 km stretch of lakes and river, and is located in the Township of North Frontenac. The Mississippi River flows out of Crotch Lake and through Kings Lake, Otter Lake and Millers Lake. A series of chutes and rapids are found along this stretch including Kings Chute, Otter Rapids and Ragged Chute. See Map 7.3 on page 57.

***Natural Resources*** – Both cool water and warmwater fish use this reach as spawning and staging areas. There are no species at risk or significant natural heritage features. Figure 7.28 provides a list of fish species found in this reach.

| Figure 7.28 – Fish Species Kings, Otter and Millers Lake |
|---|
| Northern Pike |
| Largemouth bass |
| Smallmouth bass |
| Walleye |

*Source - MNRF*

## *Reach 13 – High Falls G.S. and Stump Lake*

The High Falls Generating Station (G.S.) is located on the Mississippi River downstream of Snow Road Village (see Map 7.5). The forebay for the dam is known locally as Stump Lake. The High Falls G.S. is a "run-of the river" facility, which is a generating station with minimal forebay storage that passes some or all of the inflow through one or more turbines on a consistent basis, with the remainder, if any, going over an existing falls or spillway. High Falls G.S. is the outlet of Stump Lake and passes water downstream into Dalhousie Lake. Figure 7.29 identifies the physical characteristics of High Falls G.S. and Stump Lake.

**Figure 7.29 – Physical Characteristics High Falls G.S. and Stump Lake**

| | |
|---|---|
| Elevation of Stump Lake (m ASL) | 187.56 (summer) |
| Surface Area of Stump Lake (ha) | 127.17 |
| Drainage Area (sq. km) | 1233 sq. km |
| Hydraulic Capacity (cms) | 14.3 through plant and 82 through the stoplogs |
| Total Storage (ha. m) | 132 |
| Useable Storage (ha. m) | 132 |
| Weir Elevation (m) | 187.61 |
| Emergency Spillway Elevation (m) | 187.61 |

*Source – MVC and MNRF*

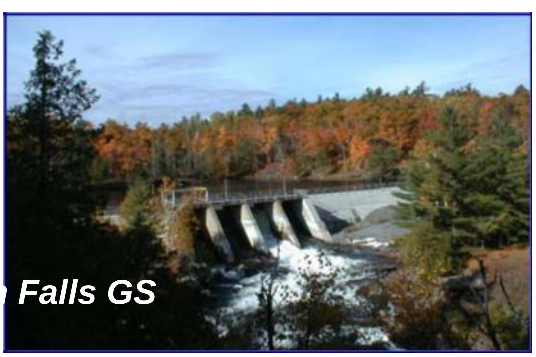
***Natural Resources*** – There is a significant walleye spawning shoal located at Gedde's Rapids at the inlet to Dalhousie Lake, which is immediately downstream of High Falls G.S.. White sucker have been seen spawning here as well. Constant flows through the plant and control structure must be considered once spawning has begun. Figure 7.30 provides a list of documented fish species in Stump Lake. There are no known species at risk in this reach.

| Figure 7.30 – Fish Species Stump Lake | |
|---|---|
| Northern Pike | Pumpkinseed |
| Rock bass | Walleye |
| Smallmouth bass | Yellow perch |
| Bluegill | |

*Source - MNRF*

***Natural Heritage Features*** – Stump Lake Provincially Significant Wetland is found within this reach.

***Description of High Falls G.S.*** – The High Falls Generating Station consists of two major components, the generating station and a concrete control structure having four sluices and an overflow weir. The generating station has the total capacity to discharge 14.3 cms. There are a total of 56 stoplogs in this dam, with 20 in the first sluice and 12 in each of the other three sluices. The stoplogs are each 0.30 m x 0.30 m x 4.67 m. The elevation of the weir is 187.61 m. OPG



endeavors to maintain water levels within the operating range of 187.00 m and 187.56 m while producing power from the available streamflow. The plant has a maximum plant output of 2.3 megawatts.

Since High Falls G.S. is a run of the river facility, any flows which exceed 14.3 cms must be passed through the four stoplog sluices or over the concrete weir. Throughout most of the year, water flows are targeted to an average of 5 cms received from Crotch Lake and the local drainage area upstream of High Falls G.S. This amounts to approximately 1/3 of the plants overall efficiency. During the spring, the plant can normally run at peak efficiency due to higher flows. Flows through this dam affect all aspects of the river from the dam to Mississippi Lake. The generating station has a total drainage area of 1233 sq km and a total storage volume in Stump Bay of approximately 130 ha m.

**OPERATING PLAN – HIGH FALLS G.S.**

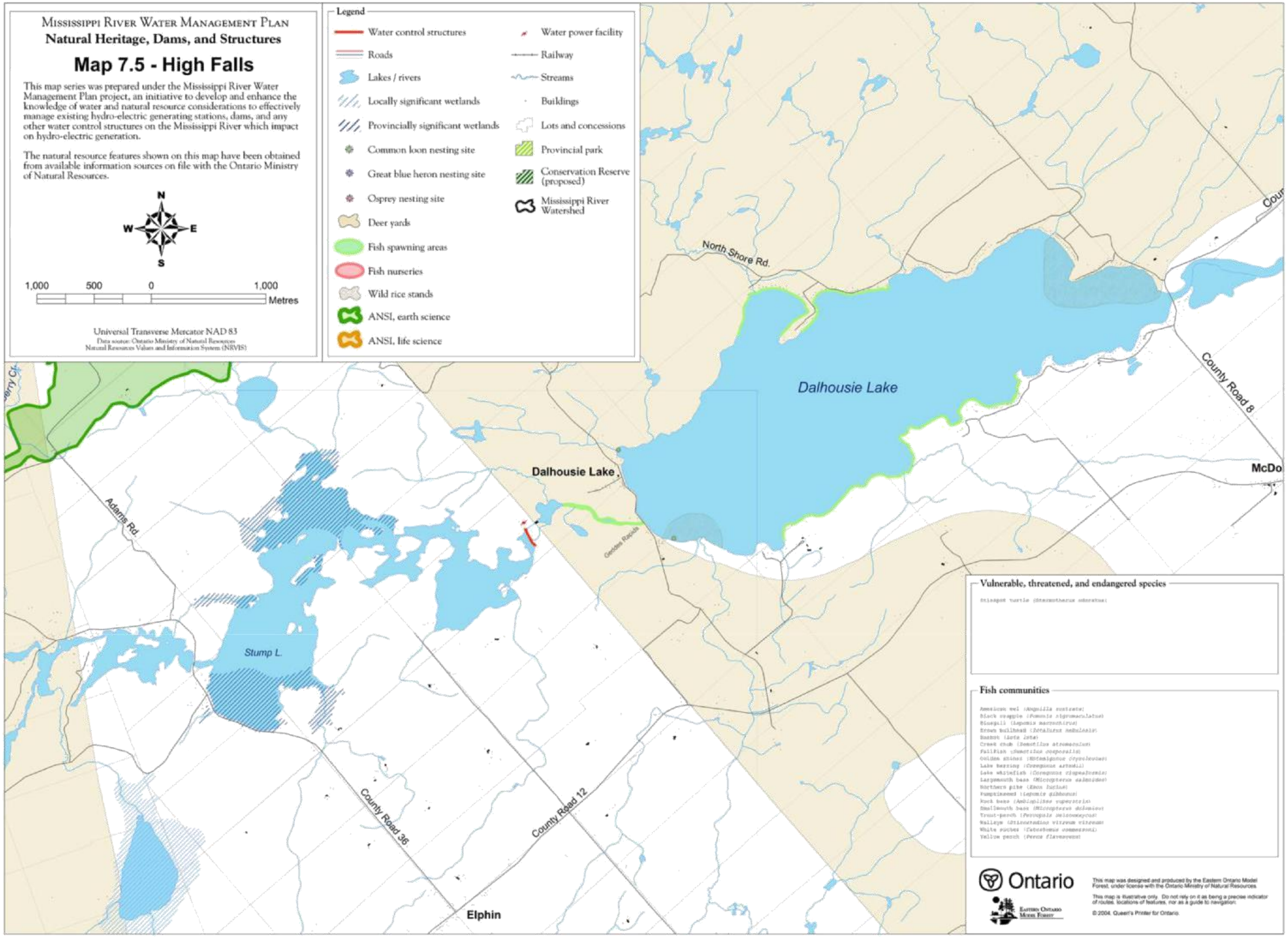
***Planning Considerations and Operational Constraints*** – Figure 7.31 summarizes the known planning and operational matters to be considered in the management strategies. Flooding in the Snow Road area has occasionally been a problem and levels must be maintained below 187.65 m when possible. As well, downstream flooding on Dalhousie Lake and Mississippi Lake is an annual problem. However, due to the lack of available storage volume in the station's headpond, there is no ability to mitigate flooding downstream and it must be operated to pass streamflows as they occur. There are two significant tributaries, the Antoine and Cranberry Creeks, which enter the Mississippi River just upstream of the station. Both of these creeks are uncontrolled and can have significant impact on water levels and flows at this structure throughout the year.

**Figure 7.31 – High Falls Generating Station**
**Planning Considerations and Operational Constraints**

| | |
|---|---|
| **Flooding- Upstream** | Upstream flooding in Snow Road Village occurs at 187.70 m. |
| **Flooding - Downstream** | Limited channel capacity at Sheridan's Rapids due to channel configuration at Dalhousie Lake. |
| **Bass Spawning** | Maintain levels above 187.00 m above the dam to ensure adequate coverage of spawning shoals throughout June. |
| **Walleye Spawning** | Maintain consistent and stable flows throughout the spawning period of early April to late May. |

***Management Strategies*** – The Compliance Range for High Falls G.S. is 186.9 – 187.65 m a.s.l. with a mandatory minimum flow requirement of 1 cms. The following best practices provide additional direction on how the dam will be managed within this operating range:

1. Annual
    a. Constant flows through the plant and control structure must be maintained, if possible, during walleye spawning season as there is a significant walleye spawning shoal located at Gedde's Rapids at the inlet to Dalhousie Lake, immediately downstream of the dam.
    b. Water levels must be targeted below 187.65 m to reduce flooding in the Snow Road area.


Mississippi River Water Management Plan
Natural Heritage, Dams, and Structures
Map 7.5 - High Falls
This map series was prepared under the Mississippi River Water Management Plan project, an initiative to develop and enhance the knowledge of water and natural resource considerations to effectively manage existing hydro-electric generating stations, dams, and any other water control structures on the Mississippi River which impact on hydro-electric generation.
The natural resource features shown on this map have been obtained from available information sources on file with the Ontario Ministry of Natural Resources.
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Universal Transverse Mercator NAD 83
Data source: Ontario Ministry of Natural Resources
Natural Resources Values and Information System (NRVIS)
Legend
Water control structures
Roads
Lakes / rivers
Locally significant wetlands
Provincially significant wetlands
Common loon nesting site
Great blue heron nesting site
Osprey nesting site
Deer yards
Fish spawning areas
Fish nurseries
Wild rice stands
ANSI, earth science
ANSI, life science
Water power facility
Railway
Streams
Buildings
Lots and concessions
Provincial park
Conservation Reserve (proposed)
Mississippi River Watershed
North Shore Rd.
Dalhousie Lake
Dalhousie Lake
County Road 8
McDo
Adams Rd.
Stump L.
County Road 36
County Road 12
Elphin
Vulnerable, threatened, and endangered species
Stinkpot turtle (Sternotherus odoratus)
Fish communities
American eel (Anguilla rostrata)
Black crappie (Pomoxis nigromaculatus)
Bluegill (Lepomis macrochirus)
Brown bullhead (Ictalurus nebulosus)
Burbot (Lota lota)
Creek chub (Semotilus atromaculatus)
Fallfish (Semotilus corporalis)
Golden shiner (Notemigonus crysoleucas)
Lake herring (Coregonus artedii)
Lake whitefish (Coregonus clupeaformis)
Largemouth bass (Micropterus salmoides)
Northern pike (Esox lucius)
Pumpkinseed (Lepomis gibbosus)
Rock bass (Ambloplites rupestris)
Smallmouth bass (Micropterus dolomieu)
Trout-perch (Percopsis omiscomaycus)
Walleye (Stizostedion vitreum vitreum)
White sucker (Catostomus commersoni)
Yellow perch (Perca flavescens)
Ontario
This map was designed and produced by the Eastern Ontario Model Forest, under license with the Ontario Ministry of Natural Resources.
This map is illustrative only. Do not rely on it as being a precise indicator of routes, locations of features, nor as a guide to navigation.
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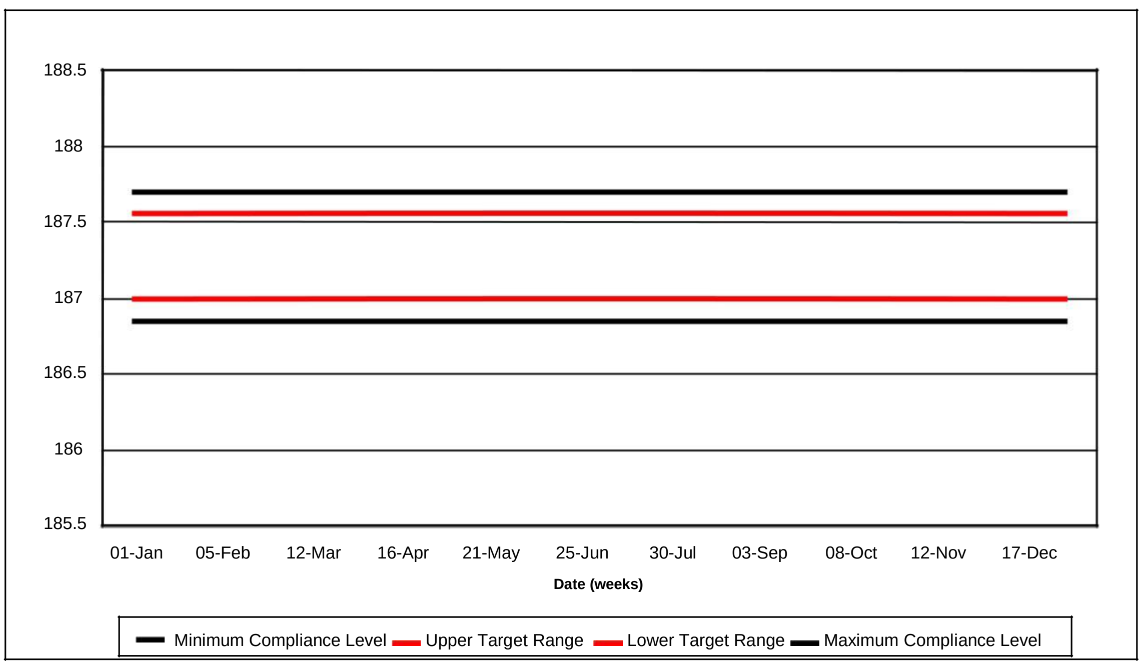
Eastern Ontario Model Forest

c. Replacement of the stoplogs, once stream flows begin to recede, should mimic the reduction in inflows (i.e., water levels should remain relatively constant above the dam so that inflow equals outflow).
d. A minimum target of 5 cms water flow through the structure to augment low flows downstream of the dam, whenever possible.

***Compliance Monitoring –*** Proposed compliance ranges for the High Falls G.S. have been established on the basis of average daily water level records. Due to the limited storage capacity at run-of-the-river structures, sudden fluctuations resulting from equipment failure or weather conditions can impact short term water level readings. Average daily readings are considered a more appropriate compliance measure.

Historically, OPG has attempted to maintain at least an average flow of 5 cms (maximum efficiency is 14.3 cms) through the High Falls generating station and this continues to be objective. This plant is operated to pass outflows from Crotch Lake and upstream tributaries to achieve this objective. Short term reductions in discharge may periodically occur due to interruptions in the electrical distribution system. As confirmed through simulation, such short term reductions in discharge will not adversely affect downstream water level conditions. For compliance purposes the minimum flow requirement has been set as 1 cms in recognition of historic conditions. Historic mean daily flows have generally been maintained within this range. While actual upstream flooding limits have been noted as a data gap, public input has identified flooding concerns above levels of 187.70 m. See Figure 7.32.

**Figure 7.32 – Compliance Levels for High Falls G.S.**



## *Reach 14 – Gedde's Rapids and Dalhousie Lake*

Gedde's Rapids is located in the stretch of the Mississippi River that lies about 1 km downstream of the High Falls Generating Station (see Map 7.5 on page 75). Gedde's Rapids provide an important spawning area for walleye, which can be impacted by the operating regime of the High Falls Generating Station.

Dalhousie Lake is a relatively shallow lake approximately 5 km in length and 1 km wide, and is located in the Township of Lanark Highlands. Dalhousie Lake is the first significant flood damage area on the main channel of the Mississippi River. Figure 7.33 provides the physical characteristics of Dalhousie Lake.

**Figure 7.33 – Physical Characteristics Dalhousie Lake**

| | |
|---|---|
| Elevation (m ASL) | 156.4 |
| Surface Area (ha) | 603.5 |
| Maximum Depth (m) | 16.8 |
| Mean Depth (m) | 5.2 |
| Volume (m3) | $3.15 \times 10^7$ |
| Perimeter (km) | 13.5 |

*Source – MVC and MNRF*

The lake is managed as a warmwater bass and walleye fishery, with a mix of coldwater indicating species such as lake herring, lake whitefish and burbot, as well as the rarely seen American eel, and some invasive warmwater species including bluegill and black crappie.

***Natural Resources*** – Gedde's Rapids are an important spawning habitat for walleye, and water levels must be managed to maintain appropriate levels during this period. Figure 7.34 provides a list of expected fish species at Gedde's Rapids.

| |
|---|
| |
| |
| |
| |
| *Pumpkinseed* |
| *Walleye* |

*Note - This community was not sampled.*

Dalhousie Lake is managed by the MNRF as a warmwater fishery with cool and warmwater species that include walleye, northern pike, and large- and smallmouth bass, with an interesting inclusion of American eel. Lake herring, a coldwater species, is also a component of this reach (Dalhousie Lake) which is indicative of coldwater conditions and reminiscent of the historical lake trout populations among these sub-watersheds. Dalhousie Lake is home to large and diverse colonies of molluscs. Studies in the mid-1990s discovered at least 7 species of freshwater clams. The lake also provides a high quality sport fishery for warmwater species and has been the focus of numerous fisheries management activities over the years. Figure 7.35 provides a list of fish species in Dalhousie Lake.

**Figure 7.35 – Fish Species Dalhousie Lake**

| | |
|---|---|
| American eel | Brown bullhead |
| Lake whitefish | Trout-perch |
| Lake herring | Rock bass |
| Northern Pike | Largemouth bass |
| Golden Shiner | Smallmouth bass |
| Creek chub | Bluegill |
| Fallfish | Pumpkinseed |
| White sucker | Walleye |
| Shorthead redhorse | Yellow perch |
| Black crappie | Burbot |

*Source - MNRF*

The inlet of the Mississippi River (downstream of Gedde's Rapids) is used as a staging area by walleye prior to spawning, and serves as a nursery and feeding area for walleye post-spawning. Walleye are also known to spawn in the Mississippi River at the Dalhousie Lake outlet. Water levels and flows can affect both these spawning areas. Also, two shoals on the lake, the Promontory and Gull Rocks, are known to support walleye feeding.

Northern pike spawn on the northeast shore of the lake near the lake outlet. It is also suspected that pike may spawn in the vegetated shores of the Mississippi River downstream of Dalhousie Lake.

Most smallmouth bass spawning on Dalhousie Lake occurs along the southern and south-eastern shores in the gravel-cobble substrate. The spawning of other species has not been evaluated.

There are no known species at risk.

***Natural Heritage Features*** – Wild rice stands are located along the south-western and north-eastern shoreline of the lake.

***Land Use*** – Dalhousie Lake has approximately 195 residential buildings, primarily in the form of cottages, found on the eastern and western ends of the lake. The 1 in 100 year flood elevation for Dalhousie Lake is 158.00 m.

***Public Comment Summary*** – A total of four surveys, four emails and two letters were received from individuals having property or issues on Dalhousie Lake. Most respondents expressed concerns about the water level fluctuations and incidences of flooding and low summer water levels.

> <u>*Response to Public Comments*</u> – Dalhousie Lake has experienced two major floods within the last 6 years, the spring of 1998 and the summer of 2002. Both were a direct result of the amount of runoff entering the system, although all dams were operated to mitigate flooding to the extent that was possible. In 1998, as the rivers were peaking from the snowmelt, a very significant storm occurred across the northern portion of the watershed. At the time of the peak on Dalhousie Lake, it is estimated that between 80 and 100 cms were entering Dalhousie Lake from the Mississippi River. At that time, less than 10 cms was coming out of Crotch Lake as it and all of the upper lakes were being operated to store as much of the runoff as possible.
>
> Dalhousie Lake does not have a water control structure at the outlet of the lake and is, therefore, unregulated. Water levels on the lake naturally fluctuate based on the inflows and elevation of the riverbed at Sheridan's Rapids. On average, the lake naturally fluctuates 1.0 to 1.9 m annually. Water levels in the summer are typically low and fluctuate with inflow, making it difficult for navigation in some parts of the lake. This condition can also be aggravated through increased sedimentation.
>
> The dams upstream of Dalhousie Lake provide benefits by minimizing the impacts of flooding. However, these dams were not designed to hold any more logs and, therefore, any more water than at present. Through the modeling exercise, changes to inflow rates to Dalhousie Lake will be assessed to determine the impact on water levels.

***Planning Considerations and Operational Constraints (for Upstream Structures)*** – Flooding on Dalhousie Lake begins when water levels reach 157.20 m. Water levels throughout the summer are generally maintained by outflows from Crotch Lake at approximately 5 cms, resulting in a water level on Dalhousie Lake of between 156.00 and 156.10 m. This can normally be sustained throughout the summer; however, high evaporation rates can result in lower streamflows and water levels. Low summer levels prohibit access to docks in Purdon Bay and both public and private launch structures, and makes boat navigation difficult from the lake and the river outlet. There is also limited channel capacity at Sheridan's Rapids to pass a high flow of water.

## *Reach 15 – Dalhousie Lake Outlet to Mississippi Lake Inlet*

This reach is located between the Dalhousie Lake outlet and the inflow of Mississippi Lake and includes a number of rapids and falls including: Sheridan's Rapids, Four Stepstone Rapids, Playfairville Rapids, Ferguson Falls and Innisville Rapids (See Map 7.6). There are no water control structures within this reach. Water management issues concerning these reaches include maintaining water levels on significant spawning habitats downstream and within the rapids of the river as well as low flow augmentation during the summer months.

***Dalhousie Lake to Sheridan's Rapids*** – This section of the Mississippi River is quite shallow, with a length of 8 km, and many of the adjacent lands are treed swamps. It contains numerous areas for northern pike, yellow perch and bullhead spawning. The floodplain surrounding this reach provides important waterfowl, bullfrog and turtle habitat. Walleye spawning sites below the rapids are at risk from impacts of low water levels during spawning season. Figure 7.36 provides a list of the documented fish species in this portion of the reach. There are no known species at risk and the McCullouch's Mud Lake Provincially Significant Wetland is located in this reach.

| Figure 7.36 – Fish Species Dalhousie Lake to Sheridan's Rapids | |
|---|---|
| American eel | Rock bass |
| Northern Pike | Largemouth bass |
| White sucker | Smallmouth bass |
| Channel catfish | Pumpkinseed |
| Yellow bullhead | Walleye |
| Brown bullhead | Yellow perch |

*Source - MNRF*

***Sheridan's Rapids to Four Stepstone Rapids*** – This section of the river is about 1.5 km in length and is extremely shallow and is only accessible by canoe or kayak. Walleye spawn below the rapids while smallmouth bass spawn in gravel along the riverbank. Figure 7.37 provides a list of expected fish species. A community survey was not completed. There are no species at risk or significant natural Heritage Features in this reach.

| Figure 7.37 – Fish Species Sheridan's Rapids to Four Stepstone Rapids | |
|---|---|
| Northern Pike | Smallmouth bass |
| White sucker | Pumpkinseed |
| Brown bullhead | Walleye |

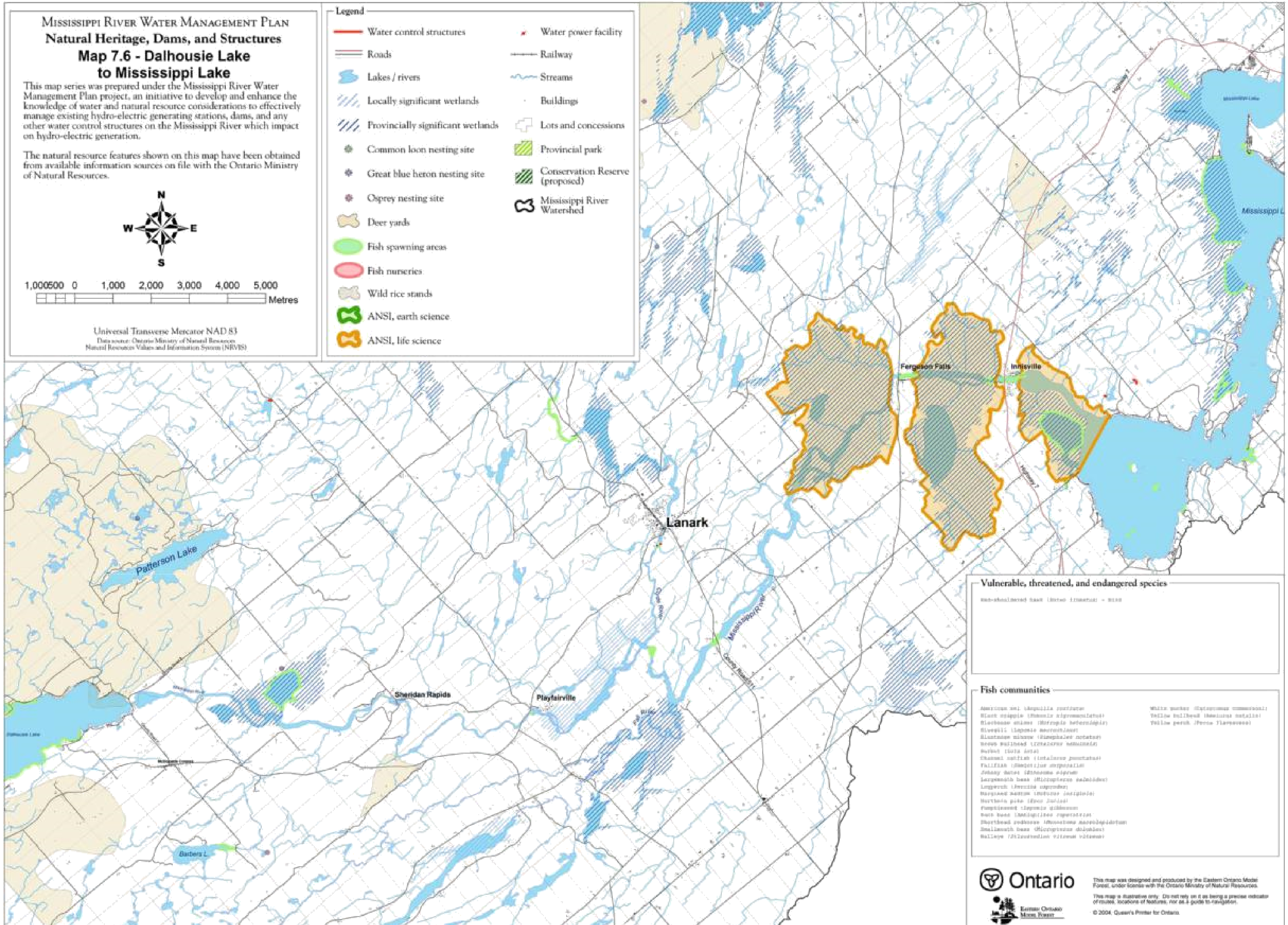
*Note – Community not sampled.*

***Four Stepstone Rapids to Playfairville Rapids*** – This stretch of river is very similar to the reach immediately upstream, and is 3 km in length. Walleye spawning habitat is located below the rapids. Figure 7.38 provides a list of the expected fish species. There are no known species at risk or significant natural heritage features in this reach.

| Figure 7.38 – Fish Species Four Stepstone Rapids to Playfairville Rapids | |
|---|---|
| Northern Pike | Smallmouth bass |
| White sucker | Pumpkinseed |
| Brown bullhead | Walleye |

*Note – Community not sampled* *Source –MNRF*

***Playfairville Rapids to Fergusons Falls*** – The upstream portion of the stretch is again very shallow and accessible only by canoe or kayak, and is 11 km in length. As the river descends from the Canadian Shield through this reach it deepens and widens. This section of the river provides excellent bullfrog habitat. Walleye spawn below the rapids and wild rice stands cover large areas. Figure 7.39 provides a list of documented fish species.


Mississippi River Water Management Plan
Natural Heritage, Dams, and Structures
Map 7.6 - Dalhousie Lake to Mississippi Lake
This map series was prepared under the Mississippi River Water Management Plan project, an initiative to develop and enhance the knowledge of water and natural resource considerations to effectively manage existing hydro-electric generating stations, dams, and any other water control structures on the Mississippi River which impact on hydro-electric generation.
The natural resource features shown on this map have been obtained from available information sources on file with the Ontario Ministry of Natural Resources.
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Universal Transverse Mercator NAD 83
Data source: Ontario Ministry of Natural Resources
Natural Resources Values and Information System (NRVIS)
Legend
Water control structures
Roads
Lakes / rivers
Locally significant wetlands
Provincially significant wetlands
Common loon nesting site
Great blue heron nesting site
Osprey nesting site
Deer yards
Fish spawning areas
Fish nurseries
Wild rice stands
ANSI, earth science
ANSI, life science
Water power facility
Railway
Streams
Buildings
Lots and concessions
Provincial park
Conservation Reserve (proposed)
Mississippi River Watershed
Mississippi Lake
Mississippi L
Highway 7
Ferguson Falls
Innisville
Lanark
Patterson Lake
Clyde River
Mississippi River
Sheridan Rapids
Playfairville
Fall River
Dalhousie Lake
Barbers L.
Vulnerable, threatened, and endangered species
Fish communities
Ontario
Eastern Ontario Model Forest
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The Margined Madtom (*Noturus insignis*) is a fish that is found in this reach and it was formally listed as “threatened” by COSEWIC. However, in 2002 it was down-listed to “data deficient” because of its unknown origin. The Rusty Snaketail (*Ophiogomphus rupinsulensis*) is a dragonfly that is also found in this reach and is currently on the COSEWIC 2005 candidate list as a high priority species for further research. However, neither of these species are considered to be species at risk. There are two natural heritage features found in this reach: Playfairville Locally Significant Wetland, and the Upper and Lower Mud Lake Provincially Significant Wetland Complex.

| **Figure 7.39 – Fish Species<br>Playfairville Rapids to Fergusons Falls** | |
|---|---|
| American eel | Rock bass |
| Northern Pike | Largemouth bass |
| White sucker | Smallmouth bass |
| Channel catfish | Pumpkinseed |
| Yellow bullhead | Walleye |
| Brown bullhead | Yellow perch |
| Margined madtom | |

*Source – MNRF*

**Fergusons Falls to Innisville Rapids** – This 3.0 km section of the river is shallow and the Innisville Rapids are an important walleye spawning ground. Spawning shoals have been built in this section of the river to enhance the survival rate of the spawn. Figure 7.40 provides a list of documented fish species.

| | |
|---|---|
| American eel | Rock bass |
| Northern Pike | Largemouth bass |
| White sucker | Smallmouth bass |
| Channel catfish | Pumpkinseed |
| Yellow bullhead | Walleye |
| Brown bullhead | Yellow perch |

*Source - MNRF*

Fluctuating river levels may impact walleye spawning sites near significant habitat located along the rapids. If river flow or water levels are reduced because of water facility management, walleye may abandon habitat in search of suitable habitat downstream, or a new year-class may be lost to the system, reducing local biodiversity.

The Halloween Pennant (*Celithemis eopnina*) is a “rare” dragonfly that is found in this reach and it is currently tracked by OMNRF; however, it is not a species at risk. There are two natural heritage areas located in this reach: the Innisville Wetland, which is a Provincially Significant Area of Natural and Scientific Interest (ANSI), and the Steward/Haley Lake Provincially Significant Wetland Complex.

## *Reach 16 – Mississippi Lake and Carleton Place Dam*

Mississippi Lake, one of the largest inland lakes in south-eastern Ontario, is the last major lake on the river system and is found in the Townships Drummond, Beckwith and Ramsay. Mississippi Lake has two basins separated by a long narrow channel at Squaw Point: 1) the south basin which is the deeper portion of the lake, and 2) the north basin which is between 2.0 and 3.0 m deep. Figure 7.41 identifies the physical characteristics of Mississippi Lake and Carleton Place Dam (see Map 7.7).

**Figure 7.41 – Physical Characteristics Mississippi Lake and Carleton Place Dam**

| | |
|---|---|
| Elevation (m ASL) | 134.4 |
| Emergency Spillway Elevation (m) | |
| Surface Area (ha) | 2349.0 |
| Drainage Area (sq. km) | 2876 |
| Maximum Depth (m) | 52.7 |
| Mean Depth (m) | 9.2 |
| Volume (m3) | $6.36 \times 10^7$ |
| Perimeter (km) | 55.9 |
| Total Storage Volume (ha. M) | 3787 |
| Weir Elevation | 133.92 |
| Hydraulic Capacity (cms) | 260 |

*Source – MVC and MNRF*

***Natural Resources*** – Mississippi Lake is managed as a walleye and bass fishery. It has a mix of cold, cool and warmwater fish species, such as the rarely seen American eel and invasive black crappie and bluegill. It also supports a large number of fishing tournaments each year including several professional bass competitions.

**Figure 7.42 – Fish Species Mississippi Lake**

| | |
|---|---|
| American eel | Rock bass |
| Northern Pike | Largemouth bass |
| Fallfish | Smallmouth bass |
| Bluntnose minnow | Bluegill |
| Blacknose shiner | Pumpkinseed |
| White sucker | Walleye |
| Yellow bullhead | Yellow perch |
| Brown bullhead | Logperch |
| Black crappie | Johnny Darter |
| Burbot | |

*Source – MNRF*

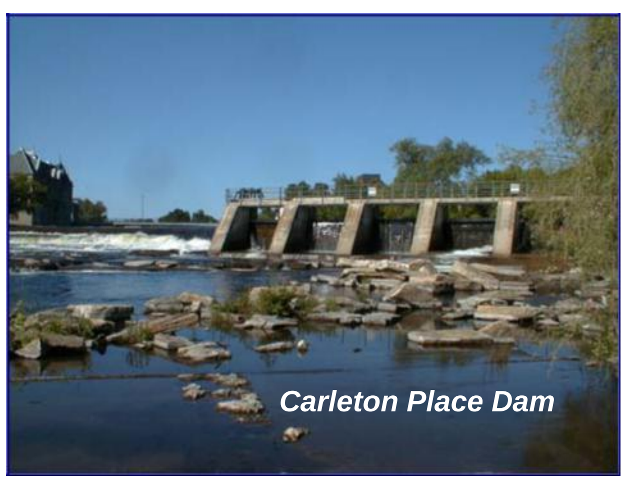
Walleye from Mississippi Lake participate in an impressive spawning run in the Mississippi River near Innisville at the south-western end of the lake. Northern pike and largemouth bass are known to spawn in Mississippi Lake's vegetated bays. These shallow areas also provide critical nursery habitat and serve as feeding areas. Smallmouth bass spawn along rocky portions of the shoreline including Brown's Point, Rocky Point and the Cooke's shoreline. Figure 7.42 provides a list of fish species in Mississippi Lake.

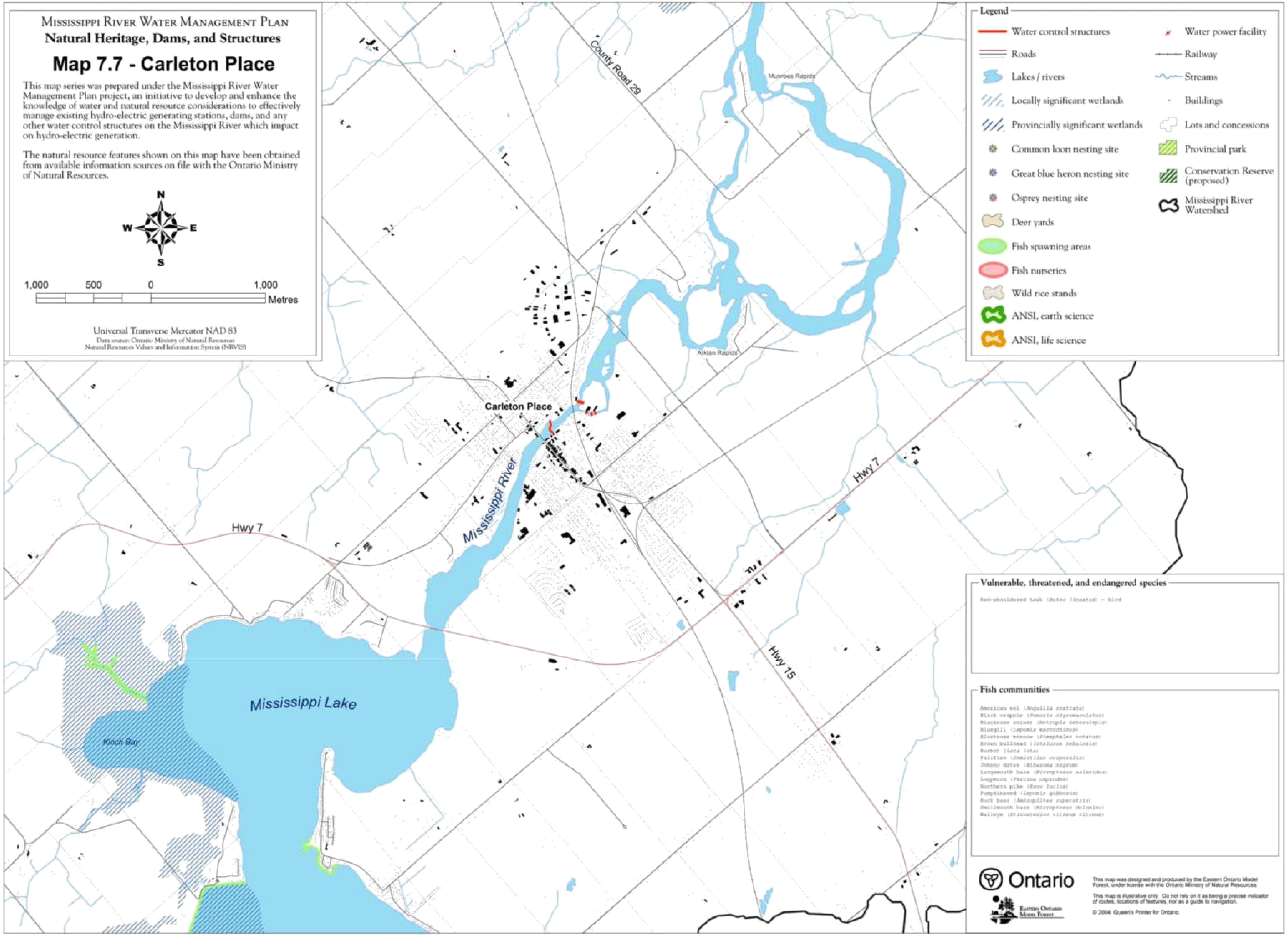
***Significant Species and Species at Risk*** – Mississippi Lake has two known significant wildlife species: the Moustached clubtail and the Red-shouldered hawk. The Moustached clubtail (*Gomphus adelphus*) is a rare dragonfly that is tracked by the OMNRF, but is not considered to be a species at risk. The Red-shouldered hawk (*Buteo lineatus*) is a bird with a provincial and federal species at risk designation of "Special Concern". Mississippi Lake has important shoreline habitat for the Red-shouldered hawk, including nesting and feeding areas designated as 'critical habitat'. This bird is protected under the Fish and Wildlife Conservation Act.

***Natural Heritage Features*** – Wild rice stands, McEwen Bay Provincially Significant Wetland, McEwen Bay Migratory Bird Sanctuary (an important staging area for wildlife), and Mississippi Lake Provincially Significant Wetland are found on the lake. O-Kee Lee Locally Significant Wetland is located on the river in Carleton Place.

The Innisville wetland is a provincially significant wetland found at the southwest end of the lake. This portion of the lake is also home to a federal migratory bird sanctuary and a provincial Area of Natural and Scientific Interest (ANSI). Other wetland areas are situated along the west shore of the lake and in Kinch Bay. Wild rice grows in many of these wetlands and shallow bays.

***Land Use*** - There are approximately 1700 residential structures along the shores of the lake, and there is a water intake pipe located between the lake and the dam. A structural survey of Mississippi Lake completed by MVC in 1985 estimated that there were 68 residential buildings, which would be subjected to flooding above the first floor elevation in the event the 1 in 100 year flood elevation of 135.60 m occurred. A municipal water intake pipe is located between the lake and the dam.


*Carleton Place Dam*


Mississippi River Water Management Plan
Natural Heritage, Dams, and Structures
Map 7.7 - Carleton Place
This map series was prepared under the Mississippi River Water Management Plan project, an initiative to develop and enhance the knowledge of water and natural resource considerations to effectively manage existing hydro-electric generating stations, dams, and any other water control structures on the Mississippi River which impact on hydro-electric generation.
The natural resource features shown on this map have been obtained from available information sources on file with the Ontario Ministry of Natural Resources.
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Universal Transverse Mercator NAD 83
Data source: Ontario Ministry of Natural Resources
Natural Resources Values and Information System (NRVIS)
Legend
Water control structures
Roads
Lakes / rivers
Locally significant wetlands
Provincially significant wetlands
Common loon nesting site
Great blue heron nesting site
Osprey nesting site
Deer yards
Fish spawning areas
Fish nurseries
Wild rice stands
ANSI, earth science
ANSI, life science
Water power facility
Railway
Streams
Buildings
Lots and concessions
Provincial park
Conservation Reserve (proposed)
Mississippi River Watershed
County Road 29
Munroes Rapids
Appleton Rapids
Carleton Place
Mississippi River
Hwy 7
Hwy 7
Hwy 15
Mississippi Lake
Kinch Bay
Vulnerable, threatened, and endangered species
Red-shouldered hawk (Buteo lineatus) - bird
Fish communities
American eel (Anguilla rostrata)
Black crappie (Pomoxis nigromaculatus)
Blacknose shiner (Notropis heterolepis)
Bluegill (Lepomis macrochirus)
Bluntnose minnow (Pimephales notatus)
Brown bullhead (Ictalurus nebulosus)
Burbot (Lota lota)
Fallfish (Semotilus corporalis)
Johnny darter (Etheostoma nigrum)
Largemouth bass (Micropterus salmoides)
Logperch (Percina caprodes)
Northern pike (Esox lucius)
Pumpkinseed (Lepomis gibbosus)
Rock bass (Ambloplites rupestris)
Smallmouth bass (Micropterus dolomieu)
Walleye (Stizostedion vitreum vitreum)
Ontario

***Description of Carleton Place Dam*** - The Carleton Plan Dam is a water control structure and is located within the Town of Carleton Place, just downstream of Mississippi Lake (see Map 7.7 ). The dam is a concrete structure (owned by MVC) with five sluices containing a total of 48 stoplogs and a 75 m overflow weir, which regulates the water levels upstream of the dam for most of the year. There are a total of ten stoplogs in each of the first three sluices and nine stoplogs in the last two sluices, with all stoplogs being 0.25 m x 0.25 m x 4.25 m. The weir elevation is 133.92 m and the normal operating range for the dam is 133.93 m to 134.50 m. The weir was designed for the use of flashboards, but they have never been placed on this structure. The dam has a total drainage area of 2876 sq km and a total storage capacity of 3787 ha m.

***Public Comment Summary*** *-* Two questionnaires and one email were received. Respondents questioned whether Mississippi Lake is used as a reservoir and whether flooding incidences have increased. There was also concern expressed over operation of the dam for maintaining water levels in Mississippi Lake, particularly to maintain stable ice in the winter.

> *Response to Public Comments* – Water levels on Mississippi Lake fluctuate based on the amount of rainfall received over the summer, and flows downstream of Carleton Place dam are determined by the amount of water flowing over the weir. Under normal summer conditions all of the logs are left in the dam. Currently, Mississippi Lake is not used to augment flows downstream of the Carleton Place dam. The dam has minimal effect on flood reduction upstream or downstream. In high flows, it's the physical characteristics of the channel between Mississippi Lake and Carleton Place dam that controls water levels on the lake.
>
> There is no evidence to suggest that flooding has increased in frequency. However, there have been two incidents in the past six years. This lake experienced flooding above the 1/100-year flood level in 1998 and set a record in June 2002 when levels reached those normally expected in April. Both were a direct result of the amount of rain and the runoff entering the system. Dams across the watershed were operated, to the extent possible, to mitigate flooding.
>
> The Carleton Place Dam is normally operated to reduce, as much as possible, shoreline damage and flooding on Mississippi Lake resulting from an increase in inflows from rainfall or snowmelt, stable levels for recreation, the protection of water intakes, and to maintain stable ice levels.
>
> A hydrologic simulation analysis was completed in response to the question of whether water levels on Mississippi Lake could be maintained lower to reduce potential flood levels. The simulation examined the impact of removing all stoplogs throughout the year from the Carleton Place Dam. In essence, this scenario simulated a natural condition which would provide the greatest opportunity for flood relief on Mississippi Lake and concluded that the resulting flood levels would be reduced by at most 1 cm. This operating policy would result in excessive water level fluctuations throughout the year on Mississippi Lake without provisions for flood relief. These conclusions were presented to the Mississippi Lakes Association and the suggested changes in operating policy were subsequently rejected by MVC.

## OPERATING PLAN – CARLETON PLACE DAM

***Planning Considerations and Operational Constraints*** – Figure 7.43 summarizes the known planning and operational matters to be considered in the management strategies. While the water levels of Mississippi Lake can be influenced to some degree by the operation of the Carleton Place Dam, the narrowing of the river channel from the outlet of the lake to the dam and the shallowness of the river through the town (specifically above the main street bridge) limits the ability of this structure to reduce flood levels on Mississippi Lake and in the community of Carleton Place. At streamflows below 20 cms, water levels at the dam and on the lake are virtually the same and typically range from 133.95 m to 134.35 m. Once flows exceed 20 cms, water levels between the dam and Mississippi Lake become influenced by channel constrictions upstream of the dam. Normal flows in late August and September are between 5 and 10 cms. Once flows exceed 150 cms (average spring flow conditions), the Carleton Place Dam has little influence on water levels on Mississippi Lake.

**Figure 7.43 – Carleton Place Dam**
**Planning Considerations and Operational Constraints**

| | |
|---|---|
| **Upstream Channel Capacity (between lake and dam)** | Carleton Place Dam has limited ability to reduce flood levels beyond the 1:2 year return periods. |
| **Carleton Place Water Intake Pipe** | Elevation to be defined. |
| **Flooding** | Flooding within Carleton Place occurs at 134.65 m. |
| | Flooding on Mississippi Lake occurs at 135.00 m with property damage at 135.20 m. |

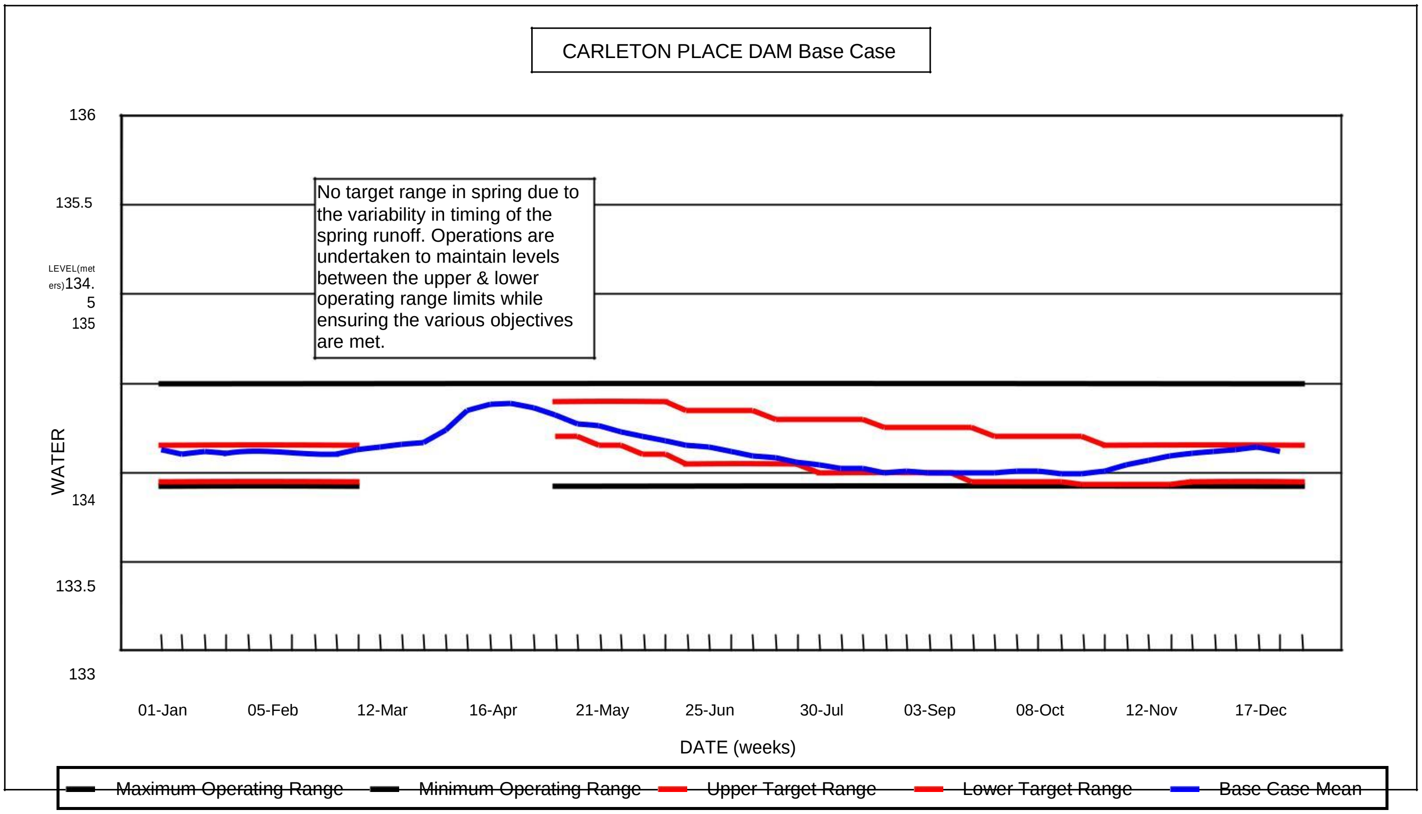
***Management Strategies*** – The operating range for the Carleton Place Dam is 133.93 – 134.50 m a.s.l. The following best practices provide additional direction on how the dam will be managed within this operating range:

1. Spring
    a. As water levels increase in the spring, additional stoplogs are removed to keep ice on the river and the lake as stable as possible.
    b. Once 25 logs are removed from the dam, its influence on upstream flood levels is effectively negated and operations are undertaken to keep levels in the river below 134.50 m.
    c. As streamflows and water levels recede, stoplogs are replaced with the objective of having the lake at an elevation of 134.35 m for the long weekend in May.

2. Summer
    a. The summer target range is between 134.00 m. and 134.35 m.
    b. The dam is not operated over the summer unless significant precipitation increases water levels on the lake above 134.35 m.

3. Fall/Winter
    a. Between 10 and 20 stoplogs are removed from the dam (depending on streamflows) and fall/winter water level is targeted between 133.95 m and 134.20 m.

**Figure 7.44 – Carleton Place Dam Operating Guidelines**




## *Reach 17 – Carleton Place Dam to Appleton G.S.*

The section of river from the Carleton Place dam to the Appleton Generating Station is relatively shallow and contains a series of small rapids: Arklan, Munroes and Appleton Rapids. Development has taken place along most of this section of the river. This reach is about 5 km in length and is generally wider and deeper than the river upstream of Mississippi Lake (see map 7.8).

***Natural Resources*** – This reach includes documented cool and warmwater fish species. Walleye are also suspected to spawn below the Carleton Place structure while the riverbanks provide ample smallmouth bass spawning substrate. Spawning locales of other species is not known. Figure 7.45 provides a list of expected fish species. A community survey was not completed. There are no known species at risk or significant natural heritage features. Wetland habitat follows the western and eastern shoreline, south of the Appleton G.S..

| **Figure 7.45 – Fish Species Carleton Place to Appleton** | |
|---|---|
| Northern Pike | Smallmouth bass |
| White sucker | Pumpkinseed |
| Brown bullhead | Walleye |

*Note – Community not sampled*

***Description of Appleton G.S.*** – The Appleton Generating Station is owned by Canadian Hydro Developers Inc. (CHDI) and is located in the Village of Appleton.

This Appleton Generating Station is a “run-of-the-river” structure with no forebay or storage capabilities, which

impacts only the section of the river approximately 0.5 km upstream of the dam. The generating station can pass a maximum flow of 35 cms through the plant and any excess must be spilled through the stoplogs or over the weir. Flashboards are installed in the summer on the weir to increase head in the river to maximize hydro production and are removed in late fall.

The generating station was built in 1995 by Merol Power and was purchased by Canadian Hydro Developers in 1998. This is a fully automated, 24-hour a day hydro facility that can be controlled either at the site or from a remote location.

The Appleton G.S. consists of a powerhouse, a concrete control structure containing four sluices and one mechanical gate, which are used to pass flows which exceed the capacity of the plant and an overflow weir. The four sluices each have eight 0.30 m x 0.30 m x 6.71 m stoplogs. The mechanical gate is 2.13 m x 6.71 m. The weir is 30.5 m long with an elevation of 123.00 m and the capacity to hold flashboards on the crest of the weir. There are three generating units located in the powerhouse, each capable of producing 450 kW, when in operation. The turbines are designed to adjust to inflows and maintain stable levels in the forebay as long as capacity is not exceeded. The Appleton G.S. has a maximum plant output of 1.3 megawatts. The station has a total drainage area of 2932 sq km and has no storage capacity. The operation of the Generating Station only impacts a 0.5 km section of river upstream of the dam.

**OPERATING PLAN – APPLETON G.S.**

***Planning Considerations and Operational Constraints*** – Flood levels within the Village of Appleton are reached when levels exceed 124.00 m. Additional concerns about this reach include impacts on summer water levels for boat launching and access, and frazil ice in the winter, which is ice formed below the surface of fast flowing super cooled water and normally is created downstream of rapids.

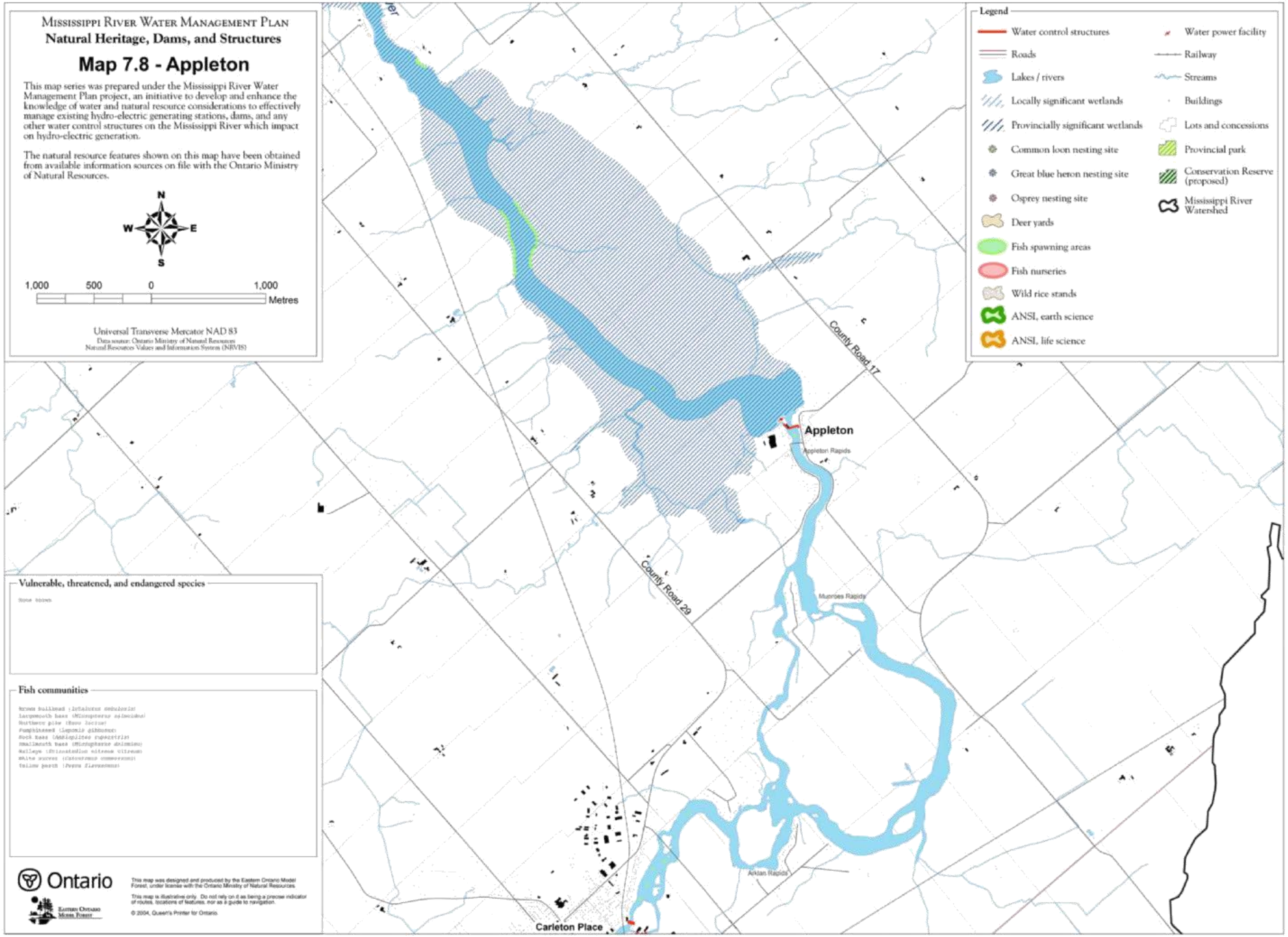
***Management Strategies*** – The Compliance Range for the Appleton G.S. is 122.50 m – 123.80 m a.s.l., with a working target of 123.3 m a.s.l. (the target level will allow for a sudden increase of flow due to intense rainfall or plant shutdown of the generating station). The following best practices provide additional direction on how the dam will be managed within this operating range:

1. The Appleton Generating Station is a “run of the river” operation and can pass a maximum flow of 35 cms through the plant and any excess must be spilled through the stoplogs or over the weir.

2. Installation of flashboards to a maximum of 0.3 m will be placed on the weir as soon as lower water permits and it is safe to do so. This will bring the level of the weir to 123.3 m, the target level for optimum power generation.

3. When flows increase due to spring runoff to levels near flood conditions, water levels will be kept at or below 123.8 m by the use of the mechanical gate and or stoplogs.

4. Debris removal from the river is performed at the intake for the generating station with either rakes or an excavator designed for this purpose. Most of the natural debris is diverted through a spillway beside the power station.


Mississippi River Water Management Plan
Natural Heritage, Dams, and Structures
Map 7.8 - Appleton
This map series was prepared under the Mississippi River Water Management Plan project, an initiative to develop and enhance the knowledge of water and natural resource considerations to effectively manage existing hydro-electric generating stations, dams, and any other water control structures on the Mississippi River which impact on hydro-electric generation.
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Universal Transverse Mercator NAD 83
Data source: Ontario Ministry of Natural Resources
Natural Resources Values and Information System (NRVIS)
Vulnerable, threatened, and endangered species
None known
Fish communities
Brown bullhead (Ictalurus nebulosus)
Largemouth bass (Micropterus salmoides)
Northern pike (Esox lucius)
Pumpkinseed (Lepomis gibbosus)
Rock bass (Ambloplites rupestris)
Smallmouth bass (Micropterus dolomieu)
Walleye (Stizostedion vitreum vitreum)
White sucker (Catostomus commersoni)
Yellow perch (Perca flavescens)
Ontario
Eastern Ontario Model Forest
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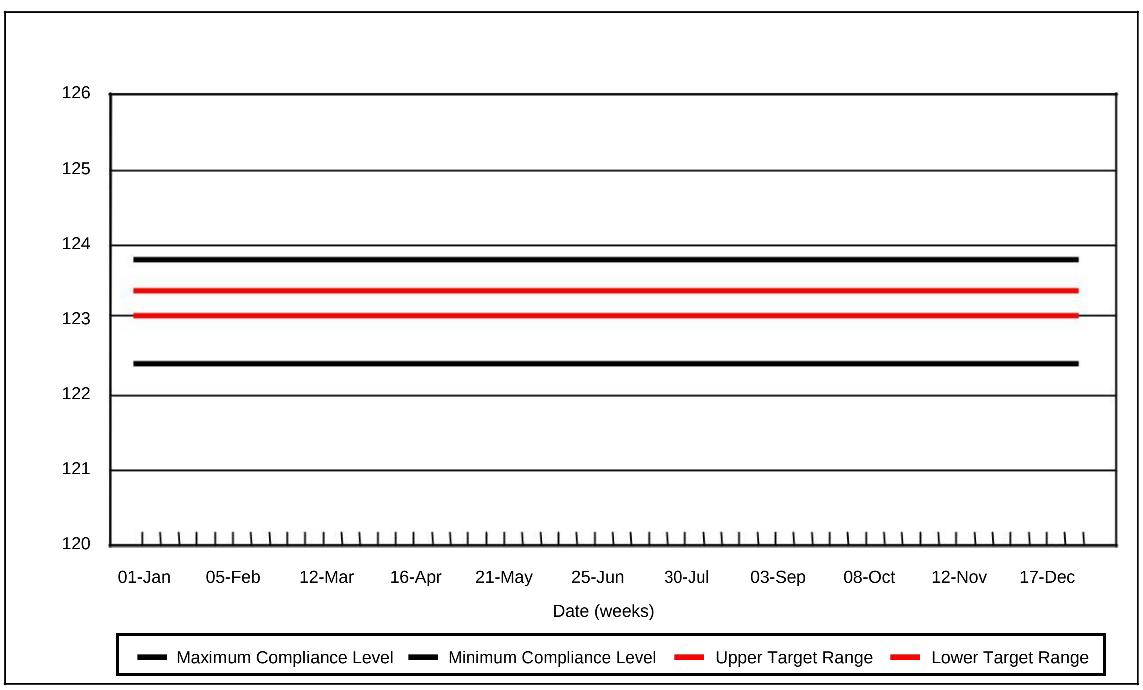
Legend
Water control structures
Water power facility
Roads
Railway
Lakes / rivers
Streams
Locally significant wetlands
Buildings
Provincially significant wetlands
Lots and concessions
Common loon nesting site
Provincial park
Great blue heron nesting site
Conservation Reserve (proposed)
Osprey nesting site
Mississippi River Watershed
Deer yards
Fish spawning areas
Fish nurseries
Wild rice stands
ANSI, earth science
ANSI, life science
County Road 17
Appleton
Appleton Rapids
County Road 29
Munroes Rapids
Arklan Rapids
Carleton Place

***Maintenance*** - From time to time maintenance is required on the power plant. This involves lowering the river upstream of the dam and dewatering the forebay immediately in front of the trash racks of the power station. In order to achieve this, the mechanical gates are opened and/or stoplogs will be pulled to bring the water levels below the height of the permanent cofferdam. The cofferdam is located at the entrance to the forebay to direct flows toward the stoplog bay, and is normally out-of-sight below water level. Water levels will be lower during this time until inspection is completed. Normally, inspection occurs for short periods of time (no greater than 2 weeks) in low flow conditions between July 1 and October 1 and during this period the total river flow is passed through the stoplog sluiceways of the structure.

MNRF will consider requests from the owner for temporary relief from the minimum compliance level at the Appleton facility in order to enable the owner to carry out the operational inspection as outlined above. Supporting information and advice from the Mississippi Valley Conservation will serve to expedite these requests. Under normal circumstances, requests will be approved. The owner will submit a request to MNRF a minimum of five working days prior to the date that the inspection is to be undertaken. MNRF will review and respond to this request expeditiously. The owner will advise MNRF when the water levels have returned above the minimum compliance level.

***Compliance Monitoring*** - Water levels have not been recorded at this facility in the past and therefore compliance levels have been established on the basis of upstream flooding constraints and maintaining minimum head pond elevations for aesthetics, fisheries and recreation. Compliance levels conform to *Lakes and Rivers Improvement Ac*t for approval for dam reconstruction in 1993. With approval from MNRF and in consultation with MVC, the minimum compliance level may be exceeded for operational inspections and maintenance as outlined above. See Figure 7.46.

**Figure 7.46 – Compliance Levels for Appleton G.S.**



## *Reach 18 – Appleton to Almonte (Enerdu and Mississippi River G.S.)*

The stretch of river from the Appleton Generating Station to Almonte is about 9 km in length and includes the Enerdu and Mississippi River Generating Stations located in the Town of Mississippi Mills (Almonte). The river is moderately deep in this reach and a provincially significant wetland complex is located along a portion of the riverbank.

***Natural Resources*** – This reach includes documented cool and warmwater fish species. Walleye and white sucker spawn below the Appleton Generating Station while the vegetated banks provide spawning for northern pike, bullheads and perch. This portion of the river is also home to many turtles and bullfrogs. Figure 7.47 provides a list of documented fish species. There are no known species at risk.

| Figure 7.47 – Fish Species Appleton to Almonte | |
|---|---|
| Northern Pike | Smallmouth bass |
| White sucker | Pumpkinseed |
| Brown bullhead | Walleye |
| Rock bass | Yellow perch |
| Largemouth bass | |

*Source - MNRF*

***Natural Heritage Features*** – This reach includes the Appleton Provincially Significant Wetland, and the Appleton Swamp Provincially Significant Candidate ANSI.

***Land Use*** – Agriculture dominates most of the shoreline through this section of the river, until the Town of Mississippi Mills. Boat access at boat launches is difficult due to low water levels and low storage capability at the stations.

***Description of Enerdu Generating Station*** – The Enerdu Generating Station is located on the Mississippi River in the Town of Mississippi Mills (see Map 7.9). The Enerdu Generating Station is a "run-of-the-river" operation that consists of a powerhouse with an overflow weir. The total length of the dam is approximately 61 m and the elevation of the weir is 117.2m a.s.l. Flashboards (0.40 m on weir and 0.50 m across river) are added in the summer to increase the head at the dam. The Enerdu Generating Station has a maximum plant output of 0.35 megawatts.


***Enerdu***

The dam can pass approximately 14 cms through the generating station with excess water being spilled over the weir. The station has a total drainage area of 3012 sq. km. and maintains levels except under extremely low flows from the dam to the tailrace of the Appleton Dam, which is a distance of about 9 km. The dam has limited storage capabilities due to the rock outcrop approximately 0.5 km upstream of the dam.

This facility was originally built in 1842 as the Wylie Flour Mill and was used to grind grain into flour. From 1993-97 two turbine intakes, two pit-type Kaplan turbines, two draft tubes, two Santasalo 5:1 gearboxes, two 250 hp, 600 V and 1200 rpm induction generators along with a tailrace and metering equipment were installed by the Dupuis family. The original dam was repaired and is still in use.

## OPERATING PLAN – ENERDU G.S.

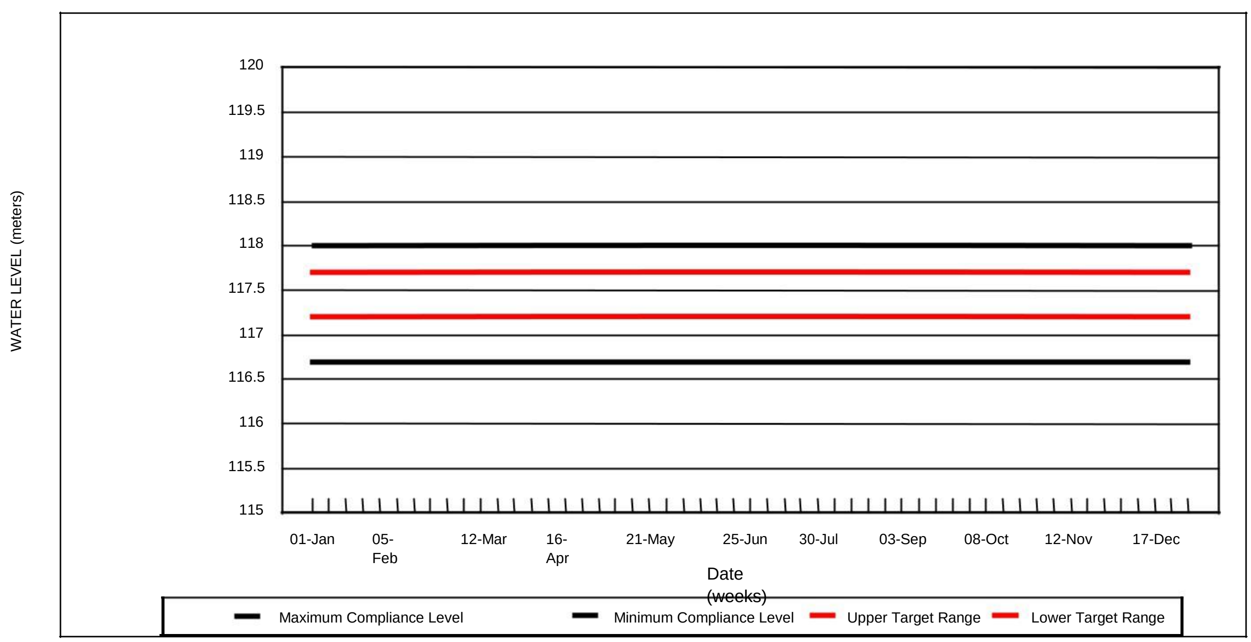
***Planning Considerations and Operational Constraints*** – Operational constraints on this reach include frazil ice in the winter, which is ice formed below the surface of fast flowing super cooled water and normally is created downstream of rapids.

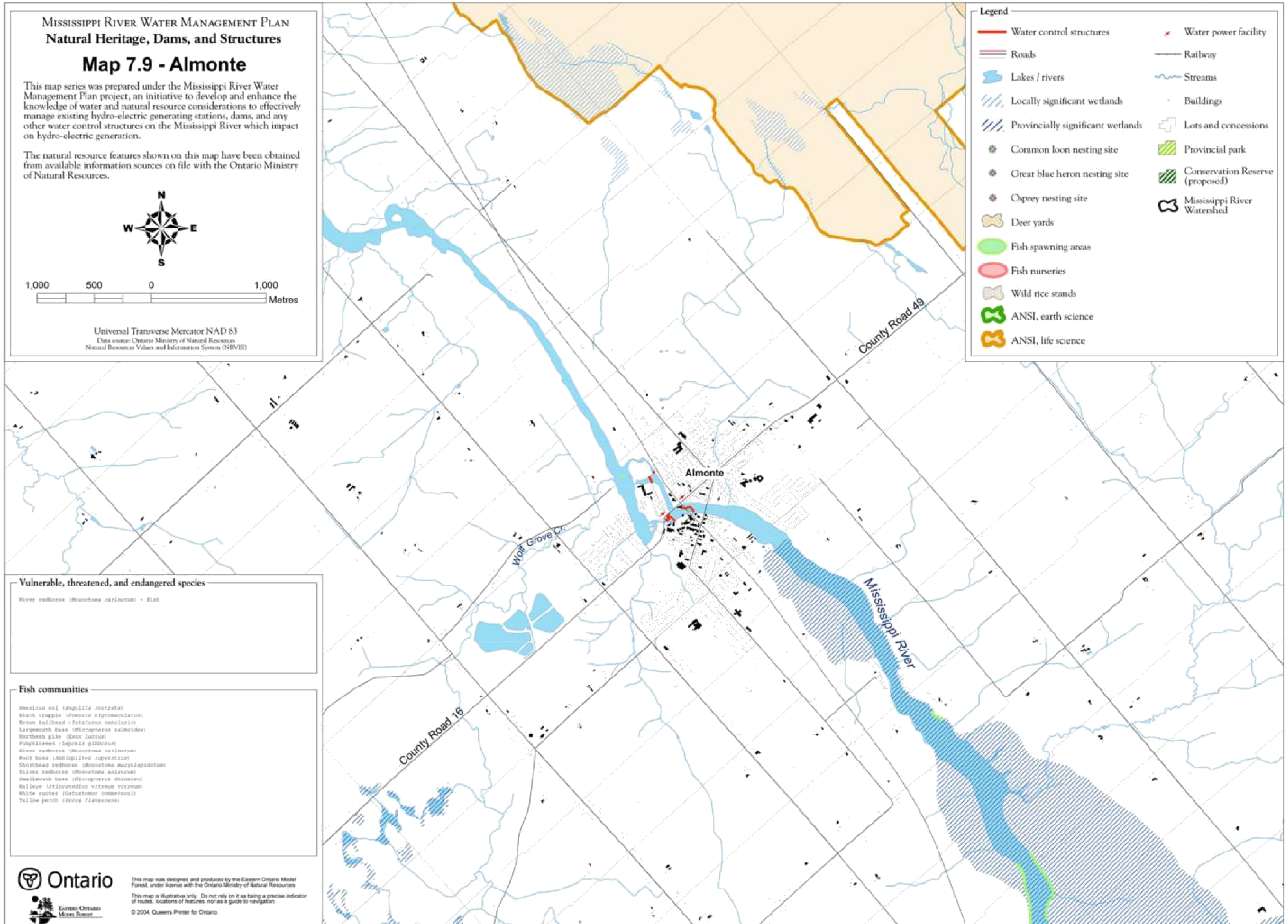
***Management Strategies*** – The compliance range for the Enerdu GS is 116.7 to 118 .0 m. The following best practices provide direction on how the dam will be managed:

1. The Enerdu Generating Station is a "run-of-the-river" operation and can pass approximately 14 cms through the generating station with excess water being spilled over the weir.
2. The best management practices or target range for this structure is 117.20 m to 117.70 m. Flashboards are added to the top of the weir (117.60 m) and across the river (117.70 m) to increase the head at the dam providing normal summer levels being maintained between 117.60 m and 117.70 m. The stepped elevation of the flashboards allows flows to be directed to the intake channel of the dam when levels are between 117.60 and 117.70 m.
3. With this flashboard configuration, flows exceeding 40 cms (25 cms if the plant is not operational) will cause levels in the community to exceed 118.0 m. The flashboards are to be removed if levels reach this elevation.

***Compliance Monitoring*** - Due to the limited storage capacity at run-of-the-river structures sudden fluctuations resulting from equipment failure or weather conditions can impact short term water level readings. Average daily readings are considered an appropriate compliance measure. Although this structure has no stoplog control section as part of its superstructure, the flashboards can impact flood levels through the community of Almonte under moderate flow conditions. Therefore, an upper compliance level of 118.0 m exists for this structure. If the elevation of 118.0 m is exceeded when the flashboards are not in place and the discharge facilities have been operated when operable to provide the maximum discharge possible, the structure will not be considered to be out of compliance (see Figure 7.48).

**Figure 7.48 – Compliance Levels for Enerdu Generating Station**




Mississippi River Water Management Plan
Natural Heritage, Dams, and Structures
Map 7.9 - Almonte
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Universal Transverse Mercator NAD 83
Data source: Ontario Ministry of Natural Resources
Natural Resources Values and Information System (NRVIS)
Vulnerable, threatened, and endangered species
River redhorse (Moxostoma carinatum) - Fish
Fish communities
American eel (Anguilla rostrata)
Black crappie (Pomoxis nigromaculatus)
Brown bullhead (Ictalurus nebulosus)
Largemouth bass (Micropterus salmoides)
Northern pike (Esox lucius)
Pumpkinseed (Lepomis gibbosus)
River redhorse (Moxostoma carinatum)
Rock bass (Ambloplites rupestris)
Shorthead redhorse (Moxostoma macrolepidotum)
Silver redhorse (Moxostoma anisurum)
Smallmouth bass (Micropterus dolomieu)
Walleye (Stizostedion vitreum vitreum)
White sucker (Catostomus commersoni)
Yellow perch (Perca flavescens)
Ontario
Eastern Ontario Model Forest
This map was designed and produced by the Eastern Ontario Model Forest, under license with the Ontario Ministry of Natural Resources.
This map is illustrative only. Do not rely on it as being a precise indicator of routes, locations of features, nor as a guide to navigation.
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Legend
Water control structures
Roads
Lakes / rivers
Locally significant wetlands
Provincially significant wetlands
Common loon nesting site
Great blue heron nesting site
Osprey nesting site
Deer yards
Fish spawning areas
Fish nurseries
Wild rice stands
ANSI, earth science
ANSI, life science
Water power facility
Railway
Streams
Buildings
Lots and concessions
Provincial park
Conservation Reserve (proposed)
Mississippi River Watershed
Almonte
County Road 49
County Road 16
Wolf Grove Cr.
Mississippi River

***Description of Mississippi River G.S.*** – The Mississippi River Power Generating Station is owned by Mississippi River Power Corporation (MRPC) and is located 150 m downstream of the Enerdu Generating Station in the Town of Almonte (see Map 7.9).


The Mississippi River Power G.S. is a "run-of-the-river" operation and has a maximum plant output of 2.4 megawatts. The station consists of a power house with a debris bypass stoplog sluice and an overflow weir. The hydro station can pass approximately 34 cms, with excess flows going over the falls beside the generating facility or down the chancery channel and over Willards Falls.

The dam was first built in 1890 by the Metcalfe brothers and operated for ten years by the Almonte Electric Light Company. In 1901, the Town of Almonte purchased the plant from the AELC and in 1908 the Almonte Electric Light Commission was formed. The dam, however, deteriorated and after several years was rebuilt in 1925 in its present location, just downstream of the original site. Total plant capacity at that time was 840 kilowatts. In 1987, major renovations were initiated; however, due to a number of problems completing the work the plant did not reopen until 1991.

The Mississippi River Power G.S. has a total drainage area of 3012 sq. km. and only influences levels in the bay between Enerdu and this structure.

**OPERATING PLAN – MISSISSIPPI RIVER POWER G.S.**

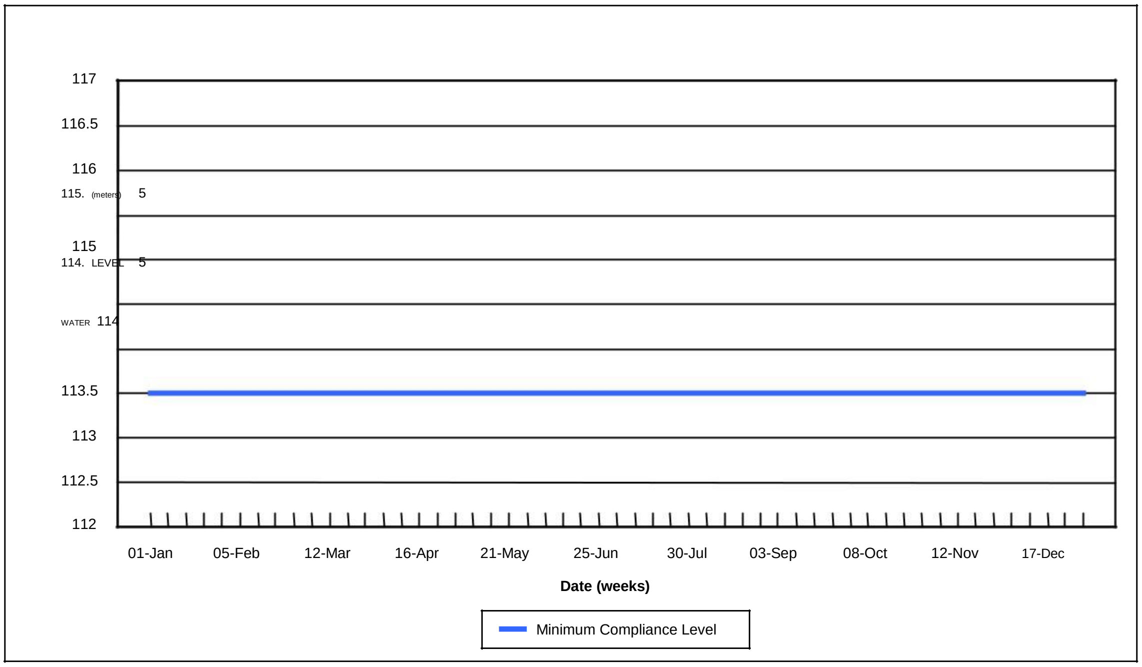
***Planning Considerations and Operational Constraints*** – Operational Constraints on this reach include frazil ice in the winter, which is ice formed below the surface of fast flowing super cooled water and normally is created downstream of rapids.

***Management Strategies*** – There is no upper compliance level provided for Mississippi G.S. The lower compliance level for the Mississippi River Power GS is 113.5 m. The following best practices provide direction on how the dam will be managed:

1. The Mississippi River G.S. is a "run-of-the-river" operation and can pass approximately 34 cms through the generating station, with excess flows going over the falls beside the generating facility or down the chancery channel and over Willards Falls.

***Compliance Monitoring*** - Due to the limited storage capacity at run-of-the-river structures sudden fluctuations resulting from equipment failure or weather conditions can impact short term water level readings. Daily readings are considered sufficient for compliance reporting. The lower compliance level was established based on the upstream channel elevations. No upper compliance level has been established due to inability of the generating facility to influence water levels above normal operating limits. See Figure 7.49. An ongoing objective in operating this plant is to maintain scenic flows over the weir.

**Figure 7.49 – Compliance Levels – Mississippi River Power G.S.**




## *Reach 19 - Almonte to Pakenham*

This stretch of the river from Almonte to Galetta is about 15 km in length and is moderately deep and begins immediately below the Almonte waterfalls. There are no water control structures in this reach. A series of rapids break up the river with the most notable being Blakeney, Pakenham and Galetta, and a treed wetland.

***Natural Resources*** – Important habitat for a rare dragonfly and a fish designated as a species at risk (River redhorse) is located in this stretch of river. Figure 7.50 provides a list of documented fish species.

| *Figure 7.50 -- Fish Species Almonte to Pakenham* | |
|---|---|
| | |
| | |
| | |
| | |
| | |
| | |
| | |

*Source - MNRF*

***Significant Species and Species at Risk*** – The Rapids Clubtail (*Gomphus quadricolor*) is a rare dragonfly, but not a species at risk. It is, however, currently on the COSEWIC 2005 candidate list and is of high importance. Dragonfly species' habitat may be enhanced with high levels of water, but when flow and levels are reduced habitat quality and food sources may be diminished.

The River redhorse (*Moxostoma carinatum*) is a fish with a provincial and federal species at risk designation of Special Concern. This fish spawns in rivers in May and June over gravel, cobble, boulder or bedrock substrate in fast flowing, shallow areas.

***Natural Heritage Features*** – Pakenham Bridge Outcrop Provincially Significant Earth Science ANSI is found within this reach.

***Land Use*** – The land use along the river is primarily agricultural. The Town of Mississippi Mills (formerly Almonte and Pakenham) is located in this reach.

## *Reach 20 – Pakenham to Galetta*

This reach includes 11 km of the Mississippi River from Pakenham to the Galetta Generating Station in the City of Ottawa. Downstream of Pakenham, the river becomes quite deep with very little slope.

***Natural Resources*** – The rare River redhorse fish is found throughout much of this river section, but most notably below the rapids at Blakeney. Walleye, smallmouth bass, northern pike and several other warmwater species are also thought to spawn throughout this section of the river, mainly around the rapids. Figure 7.51 provides a list of documented fish species.

| | |
|---|---|
| American eel | Black crappie |
| Northern Pike | Rock bass |
| White sucker | Largemouth bass |
| Greater redhorse | Smallmouth bass |
| River redhorse | Pumpkinseed |
| Shorthead redhorse | Walleye |
| Silver redhorse | Yellow perch |

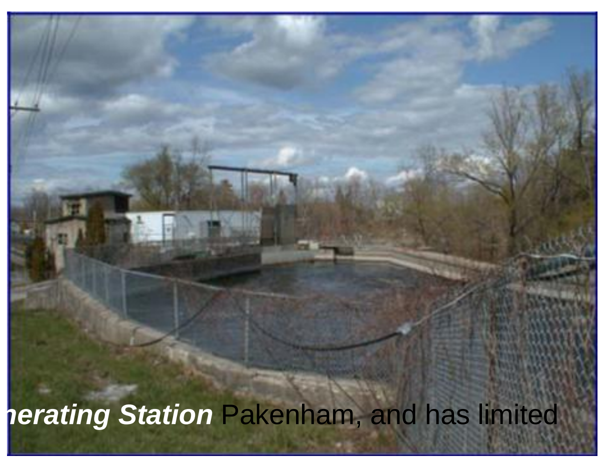
*Source - MNRF*

***Significant Species and Species at Risk*** – Greater redhorse (*Moxostoma valenciennesi*) is a rare species, but not a species at risk. The River redhorse (*Moxostoma carinatum*) is a fish with a provincial and federal species at risk designation of “Special Concern” and is protected by legislation.

***Natural Heritage Features*** – Lower Mississippi Provincially Significant Wetland, Cody Creek Black Maple Forest Provincially Significant ANSI, and Galetta Black Maple Forest Provincially Significant Candidate ANSI are found within this reach.

***Land Use*** – The land use along the river is primarily agriculture. The Town of Mississippi Mills (Pakenham) and the Village of Galetta are located in this reach.

**Description of Galetta Generating Station** – The Galetta G.S. is located in the Village of Galetta at the bottom end of this reach and is owned by Canadian Hydro Developers, Inc. (see Map 7.10).



***erating Station***

This station is a “run-of-the-river” operation, and the dam can pass approximately 30 cms through the generating station, with excess flows passed through the control section or over the weir. The Generating Station uses only the water that the river delivers. Flashboards are installed once low flows exist to provide additional head in the river to maximize power production.

The Galetta Generating Station has a total drainage area of 3684 sq km and influences water levels from Galetta through to the falls in Pakenham, and has limited storage capabilities.
During high flows, the bridge immediately downstream of this plant creates a backwater affect on the

tailrace. This can result in a quick and substantial increase in water levels in the tailrace area of the plant.

The station consists of a power house with 3 stoplog sluices; two sluices are 6 m wide while the third is 5 m wide and each sluice contains seven (7) 0.30 m x 0.30 m x 5.95 or 4.95 m stoplogs, respectively. The dam has an emergency spillway in the intake channel leading to the powerhouse, which contains 6 stoplogs, as well as a weir (at elevation 82.61 m) approximately 35 m in length. The elevation of the crest is approximately 1.40 m below the flood elevation in Galetta. There are 4 generators located in the powerhouse, 2 of which have been in the station since it began operation. It has a maximum plant output of 1.6 megawatts.

The Generating Station was built in the early 1900's and has had several owners. Canadian Hydro Developers purchased the plant in 1998 and upgraded it to double its original capacity from 800 kW to 1.6 megawatts. The power is now fully automated 24 hours a day and can be operated either from the site or a remote location.

**OPERATING PLAN – GALETTA G.S.**

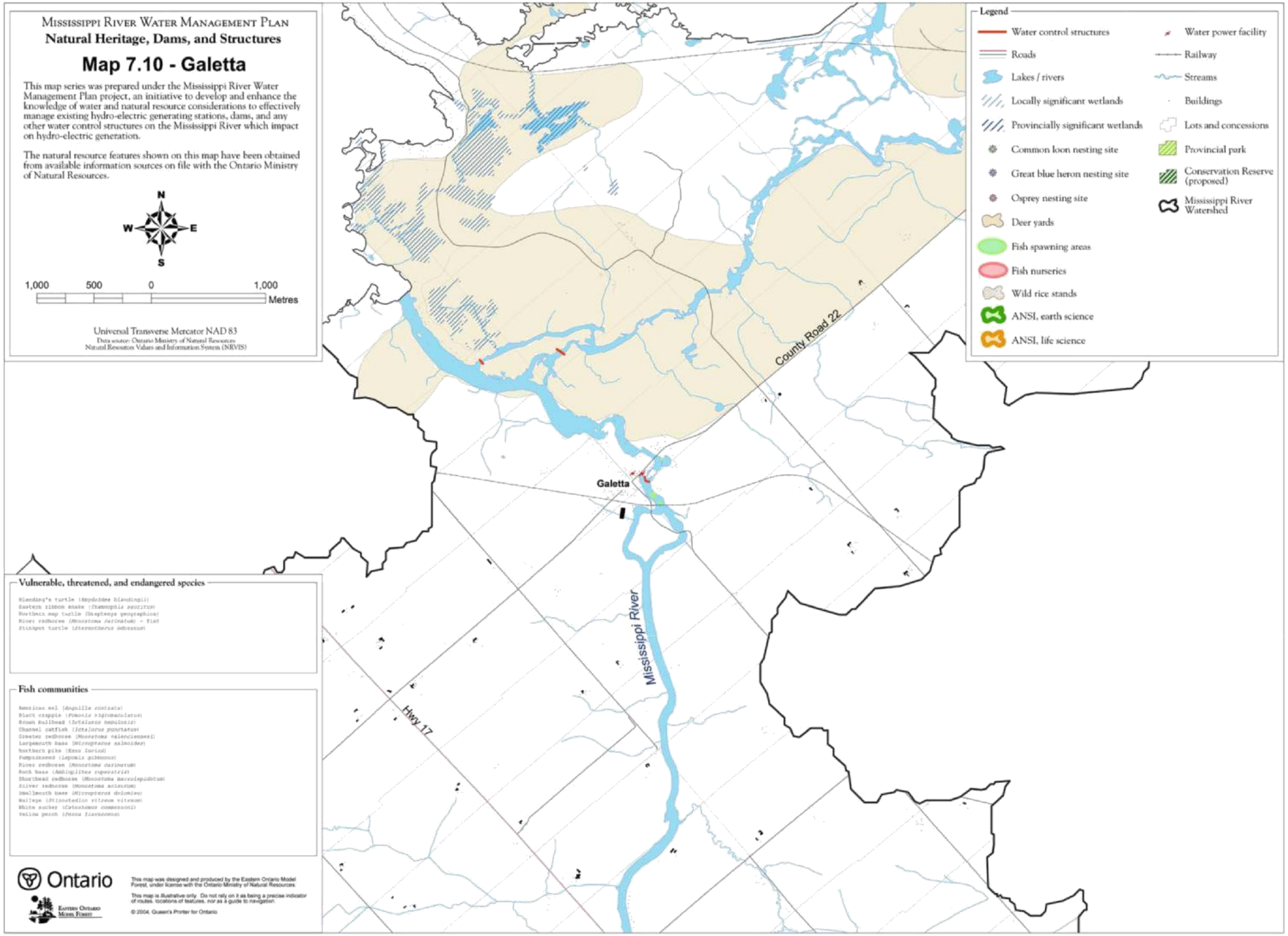
***Planning Considerations and Operational Constraints*** – The station has very limited storage capacity and influences water levels from Galetta through to the falls in Pakenham. During high flows the bridge immediately downstream of this plant creates a backwater effect which can result in a quick and substantial increase in water levels in the tailrace area of the plant.

***Management Strategies*** – The compliance range for the Galetta G.S. is 82.51 – 83.80 m a.s.l. with a target range (current operating range) of 83.00 to 83.30 m a.s.l. The following best practices provide additional direction on how the dam will be managed within this operating range.

1. This station is a "run-of-the-river" operation and the plant can pass approximately 30 cms through the generating station, with excess flows through the control section (stoplog sluices) or over the overflow weir (elevation of 82.61 m).

2. Flashboards (elevation of 83.00 m) are installed when lower water permits. This provides additional head in the river to maximize power production. These are designed to fail when conditions above flood levels occur and will break away from the weir.

3. When flows increase due to spring run off to levels near flood conditions, water levels will be kept at or below 83.8 m by the use of stoplog removal.


Mississippi River Water Management Plan
Natural Heritage, Dams, and Structures
Map 7.10 - Galetta
This map series was prepared under the Mississippi River Water Management Plan project, an initiative to develop and enhance the knowledge of water and natural resource considerations to effectively manage existing hydro-electric generating stations, dams, and any other water control structures on the Mississippi River which impact on hydro-electric generation.
The natural resource features shown on this map have been obtained from available information sources on file with the Ontario Ministry of Natural Resources.
N
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1,000
Metres
Universal Transverse Mercator NAD 83
Legend
Water control structures
Roads
Lakes / rivers
Locally significant wetlands
Provincially significant wetlands
Common loon nesting site
Great blue heron nesting site
Osprey nesting site
Deer yards
Fish spawning areas
Fish nurseries
Wild rice stands
ANSI, earth science
ANSI, life science
Water power facility
Railway
Streams
Buildings
Lots and concessions
Provincial park
Conservation Reserve (proposed)
Mississippi River Watershed
County Road 22
Galetta
Mississippi River
Hwy 17
Vulnerable, threatened, and endangered species
Fish communities
Ontario
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***Compliance Monitoring*** - Daily readings are considered sufficient for compliance reporting. See Figure 7.52.

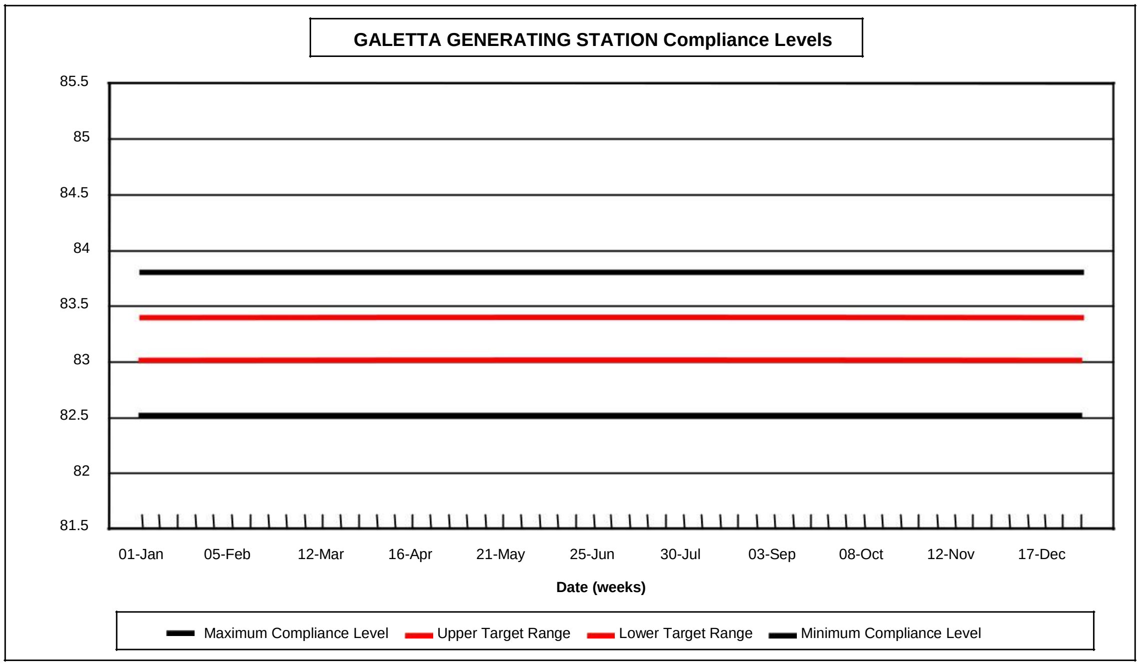



**Figure 7.52 – Compliance Levels for Galetta G.S.**

## *Reach 21 - Galetta to Ottawa River*

The final stretch of the Mississippi River extends 3.5 km in length from the Galetta outfall to the Ottawa River and is located in the City of Ottawa ( formerly Township of West Carleton).

***Natural Resources*** – This reach includes documented cool and warmwater fish species that include the rarely seen American eel and several redhorse suckers including the River redhorse, a designated species at risk. Figure 7.53 provides a list of the documented fish species.

| | |
|---|---|
| American eel | Black crappie |
| Northern Pike | Rock bass |
| White sucker | Largemouth bass |
| Channel catfish | Smallmouth bass |
| Brown bullhead | Pumpkinseed |
| River redhorse | Walleye |
| Shorthead redhorse | Yellow perch |
| Silver redhorse | |

*Source – MNRF*

***Species at Risk*** – River redhorse (*Moxostoma carinatum*) is a fish with a provincial and federal species at risk designation of 'Special Concern'. Fluctuating lake levels may impact the spawning success of the River redhorse fish, a designated species at risk. These fish spawn in rivers in May and June over gravel, cobble, boulder or bedrock substrate in fast flowing, shallow streams. Other species at risk found in this reach include: Eastern ribbon snake (*Thamnophis sauritius)*, Stinkpot turtle (*Sternotherus odoratus*), Blanding's turtle (*Emyboidea blandingii)* and Northern map turtle (*Graptemys geographica).*

***Natural Heritage Features*** – Mississippi Snye Wetland Provincially Significant Candidate ANSI and the Morris Island Provincially Significant Wetland Complex are found within this reach.

***Land Use*** – The land use along the river is mix of agriculture, residential and conservation lands. The Village of Galetta is located in the top end of this reach.

# Section 8 - Information Management

## 8.1 Baseline Data Collection

The following provides a description of the baseline data and studies which were completed as part of the planning process to assist in decision making:

**Fisheries Data** – A comprehensive search of all fisheries data and information relevant to the Mississippi River was completed and documented in the report Water Management Strategy, Mississippi River Fisheries Data – H. Von Rosen, 2002.

**Hydrology and Hydraulic Assessments –** Evaluating the performance of dam operating strategies with respect to multiple objectives requires knowledge of the stream flows occurring at each dam site under consideration and the capacity of each reservoir to manipulate stream flows. Actual stream flow records at each dam site are seldom available and it is therefore necessary to estimate stream flows through a variety of indirect methods.

For the purpose of the MRWMP, the planning team considered the Base Case to represent the existing operating regimes for the water control structures and reservoirs along the Mississippi River. Due to the presence of several reservoirs on the Mississippi River it was important to insure that the stream flow estimates reflected actual conditions as closely as possible.

Water level, dam settings and stream flow records were obtained from MVC, OPG and Environment Canada at the following locations as shown on Figure 8.1.

**Figure 8.1 – Historic Records**

| Gauge Location | Source | Parameter |
|---|---|---|
| Shabomeka Lake Dam | MVC | Water level/operating records |
| Mazinaw Lake Dam | MVC | Water level/operating records |
| Mississippi River below Marble Lake (02KF016) | Env. Canada | Stream flow |
| Kashwakamak Lake Dam | MVC | Water level/operating records |
| Big Gull Lake Dam | MVC | Water level/operating records |
| Mississagagon Lake Dam | MVC | Water level/operating records |
| Buckshot Creek @ Plevna | Env. Canada | Stream flow |
| Crotch Lake Dam | MVC | Water level/operating records |
| High Falls G.S. | OPG | Stream flow |
| Dalhousie Lake | MVC | Water level |
| Clyde River @ Gordons Rapids (02KF013) | Env. Canada | Stream flow |
| Clyde River @ Lanark (02KF010) | Env. Canada | Stream flow |
| Mississippi River @ Ferguson Falls (02KF001) | Env. Canada | Stream flow |
| Mississippi Lake | MVC | Water level/operating records |
| Mississippi River @ Appleton (02KF006) | Env. Canada | Stream flow |
| Indian River near Blakeney (02KF012) | Env. Canada | Stream flow |
| Carp River near Kinburn (02KF011) | Env. Canada | Stream flow |

The data was reviewed to identify data gaps or anomalies. Data gaps were filled through interpolation or through correlation with other gauge records. Anomalies were reviewed and corrected from alternative data sources. Based on the available data, it was determined that a data record of sufficient quality could be generated for the period of 1993 – 2003 inclusive, at each reservoir site.

**Stream flow –** Water level and flow conditions over this period were derived at dam and reservoir locations through a mass balance in accordance with the following relationship:

$$t^*(I_1 + I_0)/2 = t^*(O_0 + O_1)/2 + S_1 - S_0 + Evap$$

Where: I is reservoir inflow
O is structure outflow
S is lake storage
Evap is lake evaporation
t is the time step

Outflow from the control structures was computed from available rating curves based on dam settings and reservoir elevations while lake storage values were estimated from the surface area of the lake. Lake evaporation was accounted for by applying monthly evaporation rates across the lake surface. Evaporation rates were obtained from a water budget analysis conducted as part of the Renfrew County-Mississippi-Rideau Groundwater Study.

By utilizing the above relationship at progressive 12 hr. time steps, an inflow hydrograph for each reservoir was derived over the eleven-year period. Inflow hydrographs were subsequently routed through each reservoir using the Storage Indication Method to attenuate inflows and determine reservoir elevations and outflows at each time step.

Dam outflows were routed to the next downstream structure using the Muskingum routing method. Routing parameters were established through trial and error to obtain the best agreement between observed and predicted stream flows. Stream flows were compared to observed records at selected stream gauge sites to verify results. Where necessary structure rating curves were adjusted to provide better agreement with observed conditions.

**Local Drainage Contributions** – Where records were available (Figure 8.2), stream flow contributions from local drainage areas between these sites were determined by subtracting the total flow from the routed upstream inflow. These local stream flows contributions were prorated on an aerial basis to further separate local tributaries where considered necessary. Through this approach, a continuous stream flow record (1993 – 2003) for each sub-basin in the watershed, above Appleton, was generated. These stream flows represent natural (unregulated) conditions. Appleton is the furthest downstream stream gauge on the Mississippi River. For locations downstream of Appleton, the following approach was used to generate the required stream flow records.

**Figure 8.2 – Sub-Basin Description**

| Sub-basin ID | Name | Records Available | Local Drainage Area (km$^2$) |
|---|---|---|---|
| 1 | Shabomeka Lake | Yes | 40.3 |
| 2 | Mazinaw Lake | Yes | 298.6 |
| 3 | Kashwakamak Lake | Yes | 42.6 |
| 4 | Buckshot Creek | No | 172.7 |
| 5 | Mississagagon Lake | Yes | 22.0 |
| 6 | Big Gull Lake | Yes | 141.4 |
| 7 | Crotch Lake | Yes | 298.1 |
| 8 | High Falls | Yes | 203.2 |
| 9 | Mississippi River @ Dalhousie Lake | Yes | 78.9 |
| 10 | Clyde River @ Gordons Rapids | Yes | 287.8 |
| 11 | Clyde River @ Lanark | Yes | 326.2 |
| 12 | Fall River | No | 427.3 |
| 13 | Mississippi River @ Ferguson Falls | Yes | 215.9 |
| 14 | Mississippi Lake | Yes | 209.4 |
| 15 | Mississippi River @ Appleton | Yes | 63.1 |
| 16 | Mississippi River @ Almonte | No | 208.0 |
| 17 | Indian River @ Blakeney | Yes | 210.2 |
| 18 | Mississippi River @ Galetta | No | 1201.1 |

**Correlation to Adjacent Stream Gauge –** The Waterpower Project Science Transfer Report – 1.0 Simulating and Characterizing Natural Flow Regimes presents an approach which transposes the response characteristics of an adjacent unregulated watershed by manipulating its flow duration curve through an adjustment based on drainage area or mean annual runoff. This methodology allows a time series of stream flows to be generated for an ungauged drainage basin from which a variety of statistical measures or flow metrics can be determined to characterize the flow regime.

For sites located downstream of Appleton, a dimensionless regional flow duration curve (FDC) was developed by averaging the FDC's for the Indian River near Blakeney and the Carp River near Kinburn stream gauges. FDC's for individual drainage areas were subsequently derived by adjusting the regional FDC by the corresponding drainage area. A continuous stream flow record was generated by using a weighted average of the Indian River and Carp River stream flows as source sites in conjunction with the regional FDC. These flows were then added to the routed upstream inflows to determine the total stream flow at the associated dam site.

**Hydraulic Assessments** – Various hydraulic analyses were undertaken to verify water level conditions at selected locations within the study area. Hydraulic modeling was accomplished using the HEC-II backwater model which has the ability to compute water surface profiles in natural channels by incorporating actual channel configurations and accounting for energy losses due to channel roughness and obstructions. Several hydraulic models were utilized throughout the planning process.

1. Flood Plain Mapping Study of the Mississippi Valley – 1983 was used to provide a hydraulic model of the Mississippi River channel from Galetta to Carleton Place.

2. A hydraulic model of the Mississippi River (MVC – 1999) between the Carleton Place Dam and Mississippi Lake was utilized to model the backwater effects of the river channel downstream of Mississippi Lake.
3. A hydraulic model of the Ardoch Road Bridge upstream of the Big Gull Lake Dam was developed from field surveys (MVC – 2004) to model the backwater effects of the bridge/channel on Big Gull Lake water levels.
4. A rating curve for the Shabomeka Lake Dam embankment was developed from field surveys (MVC – 2003).
5. Dalhousie Lake Rating Curve – Acres International Ltd, 1992

**Modeling of Options** – Where it was necessary to simulate the effect of the options under consideration, the Base Case model, described above, was altered by adjusting dam settings at each time step to adhere to the outflow and/or water level regime defined by the option. The resulting dam outflows were subsequently routed to the critical downstream reaches and added to the local tributary inflows. The water level and flow regime was subsequently compared to the Base Case to assess the effect of implementing the option.

**Bathymetric Mapping** – Bathymetric mapping was completed for three lakes in the upper Mississippi River Watershed (Mazinaw, Shabomeka, and Crotch). Modern digital depth sounders, combined with GPS technology and computer mapping software, were used to create more accurate bathymetric maps. These electronic maps were utilized provide information not available with the old style paper maps. Manipulation of these maps provided watershed and fisheries managers with more accurate information on the effects of changes in water levels within the individual lakes, as well as on the watershed as a whole.

**Elevations for Enerdu / Appleton** – A field survey was conducted to provide further information with respect to the geodetic elevations of the Enerdu and Mississippi River Power Corp. generating facilities. MVC and Canadian Hydro Developers also undertook field surveys on the Appleton and Galetta Generating Stations.

## 8.2 Information Needs

The following information needs have been identified as information that may support future planning and decision making (Figure 8.3).

Proponents and MNRF will make best efforts to address these data gaps over the span of this WMP as resources, expertise and opportunities become available.

Records from the preparation of this water management plan for the Mississippi system will also be maintained by MNRF and MVC as a reference for subsequent planning exercises.

**Figure 8.3 – Information Needs**

| Item # | Information Need | Description | Responsibility | Information Manager |
|---|---|---|---|---|
| #1 | Eels | Keep informed of broader research being done. | MNRF | MNRF |
| #2 | Instream Flow Requirements | Specific minimum flows through each of the control structures required to maintain ecological integrity. The specific minimum flows need to be established through current research on in-stream flow requirements. Implementation of this research will be addressed in future amendments to this plan. | MNRF/DFO | |
| #3 | Status of Amphibian, Reptile, Mammal & Invertebrate Populations | Keep informed of research being undertaken on the impact of lower winter water levels on the abundance of amphibians, reptiles, mammals and invertebrate populations. | MNRF | MNRF |
| #4 | Lake Trout Spawning | High Priority for Effectiveness Monitoring. Little baseline information exists on the impacts of water levels on the long term sustainability of the naturally reproducing lake trout. The status of the population needs to be assessed on an on-going basis to measure the population response to the new operating regime. | MNRF | MNRF/MVC |
| #5 | Waste Assimilation | Confirm waste assimilation requirements on the lower river system during low flow periods. | MOE | MOE/MVC |
| #6 | Hydro-meterological Network | Enhance hydro-meterological monitoring across the Mississippi watershed. | MNRF | MNRF/MVC |
| #7 | Walleye Assessment | Crotch Lake: walleye spawning assessment, including upstream, in the lake and downstream; effect of 2 major drawdowns in all 3 locations and effect of low flow downstream. | MNRF | MNRF |
| #8 | Socio-economic Data | Additional information on the socio-economic conditions for the river system, particularly data on the economic value of tourism and recreation. | MNRF / MVC | MVC |
| #9 | Literature Review | Impact of drawdown on fish and fish habitat. | MNRF | MNRF |
| **Areas to be Updated** | | | | |
| #10 | Bathymetric Mapping | Bathymetric mapping of the following lakes: Kashwakamak, Gull, Mississagagon, Dalhousie and Mississippi. | MNRF | MNRF |
| #11 | Species at Risk | Monitoring the species at risk and keep informed of broader research being completed (i.e. Blanding's turtle). | MNRF | MNRF |
| #12 | Water Taking Permits | Confirm the number and volume of water taking permits issued on the river system. | MOE | MOE / MVC |
| #13 | Other Spawning | Spawning sites of other species should be assessed. | MNRF | MNRF |
| #14 | Mazinaw Lake Rehabilitation | Mazinaw Lake assessment of spawning bed rehabilitation project. | MNRF / MVC | MNRF |
| #15 | Wild Rice Research | Conduct literature search and compilation of how changes in flows would impact the rice. May also include further consultation with First Nations. | MNRF | MNRF / MVC |
| #16 | Dam Safety Assessment | Proposed changes to the Shabomeka Lake Dam operating regime requires a structural review of loading conditions on Shabomeka Lake Dam. | MVC | MVC |

# Section 9 – Monitoring

## 9.1 Effectiveness Monitoring

Effectiveness monitoring is a required component of water management planning. It is necessary to determine whether the water management plan has met it's objectives and how effective the plan has been in protecting aquatic ecosystem health. Water management planning is an adaptive management process where scientific information gathered through effectiveness monitoring during the first term of the plan is used to make improved resource management decisions, reduce the amount of uncertainty and make adjustments for the next planning cycle.

The water management planning team developed an effectiveness monitoring plan to address both the broader and site specific or species specific objectives of the plan. The monitoring plan is linked directly to the plan objectives and includes methods, responsibilities, required data and timelines for reporting.

Reporting on the results of data the Effectiveness Monitoring Plan will occur through submission of the Implementation Report as outlined in Section 9.3.

### 9.1.1 System Wide Effectiveness Monitoring Plan

The Mississippi River is a large complex ecosystem, which is continuously subjected to many stressors and influences. These include social as well as environmental factors, which occur across broad geographic areas and time frames. Five planning objectives were identified for the Mississippi River Water Management Plan (Figure 2.1). Within these broad objectives, sub-objectives were further identified to assist in monitoring the effectiveness of the plan in achieving those objectives.

The data collected to determine the effectiveness of this plan in meeting the objectives will be primarily achieved through continued monitoring of the existing hydro-meteorological gauge network (water levels, flows, and precipitation data) and dam operating records. This data will be used to determine whether the Mississippi River Water Management Plan can further influence either flows or water levels in supporting the plan objectives, while recognizing that external factors such as climate variability and other social or environmental factors may exert influences, which are beyond the ability of the water control structures to address.

### 9.1.2 Shabomeka Lake Effectiveness Monitoring Plan

A monitoring program is required on Shabomeka Lake to assess whether operational changes to the water management plan are effective in meeting the ecological objectives of the Mississippi Water Management Plan. The purpose of the effectiveness monitoring plan is to provide information to either confirm that the plan is achieving objectives or to propose modifications to the target levels and flows in the next planning cycle in order to meet such objectives. The monitoring plan will identify how the objectives are to be evaluated, the data required, responsibility for implementation of the plan, how and when the monitoring will occur and how and when the results will be reported (Figure 9.1).

As a result of concerns regarding water level fluctuations and the potential impact to natural lake trout reproduction, an effectiveness monitoring plan was developed and will be carried out through the term of the MRWMP. Monitoring will occur at the population level to try to determine whether a change in water levels is having an impact on lake trout reproduction and recruitment. The effectiveness monitoring plan supports an adaptive management approach to water management

**Table 9.1 – Effectiveness Monitoring Plan Outline**

| Objectives | Sub-Objectives | Effectiveness Monitoring Strategy | Data Required | Responsibility | Reporting Requirements |
|---|---|---|---|---|---|
| **Maintain or improve aquatic ecosystem health throughout the system.** | Improve lake trout spawning success on Shabomeka and Mazinaw. | 1. Assess lake trout population for natural recruitment.<br>2. Assess spawning activity.<br>3. Continue to monitor water levels throughout the winter to ensure that they are approximately 0.30 metres higher than normal.<br>4. Complete a survey of structures on the lake. | a. SLIN assessment prior to implementing the change in water levels.<br>b. SLIN assessment data following change.<br>c. Annual spawning observations.<br>d. Water levels and operating records.<br>e. Assess the number of shoreline structures affected by the increased water levels. | a. MNRF with proponent support<br>b. MNRF with proponent support<br>c. MNRF with proponent support<br>d. MVC<br>e. MVC | Reports due by beginning of next planning cycle |
| | Maintain spring spawning opportunities for pike, walleye and bass by having steady flows or rising levels.<br><br>Minimize water level fluctuations as they affect aquatic and riparian wildlife.<br><br>Where possible emulate the natural flow regime.<br><br>Improve aquatic ecosystem health by maintaining flow through the system. | 1. Continue to monitor flows, water levels, precipitation and dam operations during critical spawning periods. | a. Water levels, flows, precipitation and operating records. | a. MVC | An annual summary will be provided by MVC. |

**Table 9.1 – Effectiveness Monitoring Plan Outline**

| Objectives | Sub-Objectives | Effectiveness Monitoring Strategy | Data Required | Responsibility | Reporting Requirements |
|---|---|---|---|---|---|
| | Ensure abundance of wild rice is not reduced due to fluctuating water levels. | 1. Continue to monitor flows, water levels, precipitation and dam operations during critical spawning period.<br>2. Maintain communications with First Nations as needed. | a. Water levels, flows, precipitation and operating records.<br>b. Maintain communications with First Nations. | a. MVC<br>b. MNRF / MVC | |
| **Address public safety and address property damage** | Minimize flooding and ice damage throughout the system. | 1. Assess impact on flood conditions.<br>2. Assess impact on shoreline structures and conditions. | a. Monitor lake levels and structure outflows.<br>b. Conduct shoreline survey. | a. MVC<br>b. MVC | Reports due by beginning of next planning cycle. |
| **Maintain water levels throughout the system for navigation, recreation, cultural and social opportunities** | Maintain stable water levels for navigation, including boat access only properties, throughout the recreational season and the entire system.<br><br>Maintain and improve recreation and access to wild rice beds and Pictographs. | 1. Continue to monitor flows, water levels, precipitation and dam operations during critical spawning periods.<br>2. Maintain communications with First Nations. | a. Water levels, flows, precipitation and operating records. | a. MNRF / MVC | |

**Table 9.1 – Effectiveness Monitoring Plan Outline**

| Objectives | Sub-Objectives | Effectiveness Monitoring Strategy | Data Required | Responsibility | Reporting Requirements |
|---|---|---|---|---|---|
| **Recognize Power Generation Values from the system** | Maintain or enhance power generation on the system. | 1. Continue to monitor flows, water levels, precipitation and dam operations during critical spawning periods. | a. Water levels, flows, precipitation and operating records. | a. Proponents | |
| **Develop Public Awareness on Current Conditions** | Explain constraints, objectives and natural processes that are considered in the operation of the Mississippi River system.<br><br>Foster an understanding of how the system operates. | 1. A comparison will be made of the issues raised by the public during the next planning cycle against those from the current planning process. | a. Issues raised during the next planning cycle. | a. Proponents | Included in the next planning cycle. |

planning. If impacts to the population are noted, either negative or beneficial impacts, further study may be required to identify what specific management action is responsible for the change and additional changes to water levels may be requested.

An increase of approximately 0.30 m to fall water levels is proposed on Shabomeka Lake in order to meet the objective of improving lake trout spawning success. The possibility of detecting a significant change in the success of lake trout reproduction and recruitment with this minor increase in water levels may be difficult and may require a long period of time before a significant result is detected. In addition, confounding factors may contribute to limiting lake trout spawning success. Further study would be required in order to positively correlate a change in spawning success to a 0.3 m change in water levels.

The proposed changes to the current operating regime may under certain conditions affect some shoreline structures. In order to assess this potential impact, a shoreline survey will be conducted prior to the next planning cycle.

***Proposed Monitoring Studies*** – Previous spawning shoal assessment data (1980, 1985, 1990, 1995) and lake trout population assessment data (1959, 1987 and 1999) is available for Shabomeka Lake. In order to make a valuable comparison (before the water level change and afterwards), similar methods as those used previously should be followed. Methods for spawning shoal assessment include direct shoal observations each night throughout the spawning season (late October depending on water temperatures). The number of fish using each shoal are counted and locations of shoals mapped. Spawning shoal assessment could be conducted annually or bi-annually following the change in water levels. Methods for lake trout population assessment follow the standard provincial Spring Littoral Index Netting (SLIN) protocol. The most recent SLIN conducted on Shabomeka Lake was 1999. The SLIN protocol suggests assessments are completed every 5 years in order to monitor changes in population over time. A SLIN assessment should be completed in the spring of 2006, prior to the change in water level regime and once again in 2011, to continue with the 5-year cycle. Due to the “catchability” of different sizes and ages of fish (small young fish are generally not captured), a SLIN would need to be conducted five years following the change in water levels in order to assess age structure and recruitment within the population.

A shoreline survey will consist of a field reconnaissance to observe shoreline conditions as well as interviews with shoreline residents.

***Required Data*** – Data required includes the number of shoals available/used before the change and the number of shoals available/used after leaving more water in the lake. SLIN data includes length, weight and age of fish captured, and an assessment of whether fish captured are of the stocked or natural strain. Age structure analysis would allow determination of whether or not any natural reproduction and recruitment are occurring.

***Data Collection Methods*** – Standard OMNR inventory protocols including shoal assessment and standardized SLIN.

***Responsibilities and Timelines for Reporting*** – OMNR Bancroft District would be responsible for the data collection and analysis with support from the proponent.

OMNR Bancroft would be responsible for reporting study findings in a timely manner. Spawning shoal assessment would be completed annually or bi-annually in the fall and a report available to the

MRWMP team January 1 of the following year. A SLIN would be completed in the spring of 2006 and approximately 5 years after the water level change. A report outlining the findings of the surveys would be completed by OMNR and sent to the MRWMP by January 1 the following year. An overall assessment of the effectiveness of the change in water levels would be available for the start of the next planning cycle.

MVC will assume responsibility for completing the shoreline survey prior to the next planning cycle or as conditions warrant.

## 9.2 Compliance Monitoring

### 9.2.1 Compliance Monitoring and Reporting

Prior to the Water Management Planning Process, all dams on the Mississippi River system utilized a defined, well documented, operating range or in the case of the generating stations from Appleton downstream, specific physical landmarks to define maximum or minimum elevations above the structure. All dams are operated using best management practices - levels were maintained within these operating guidelines as much as possible to fulfill the various objectives of the individual structures In addition to the operating range, a narrower target range existed which operators strived to maintain throughout the year. The operating range limits quite often were relatively close to the upper or lower section of the target range at various times of the year to try to ensure maximum benefits to the entire watershed. As such, these minimum and maximum limits historically have only been exceeded due to intense weather events. This has not necessarily put the river and / or lakes in what would be considered a flood stage but allowed owners/operators the necessary flexibility to operate the river system to mitigate potential damages and competing objectives.

Due to the restructuring of Ontario's electricity market and subsequent amendments to the *Lakes and Rivers Improvement Act*, dam owners on rivers with waterpower facilities were required to develop Water Management Plans and operate their facilities in accordance with the provisions of these plans. The requirement to produce these plans is intended to prevent hydro operators from exploiting water resources for the benefit of meeting an electricity demand at the expense of the environment or some other objective. The proponents will be responsible for on-going self-monitoring through a Compliance Monitoring Program specified within the MRWMP.

The planning team for the MRWMP has established these new minimum and maximum boundaries for structures within the area of interest that require them. It was unanimously determined that all structures owned by MVC would not be held to compliance requirements because they are never operated in a manner that would specifically enhance hydro generation. MVC will continue to operate their structures using the best management practices utilized prior to this process.

The compliance levels established for the hydro facilities do not give the operators the right to operate beyond these levels <u>under normal operating conditions</u>. All facilities will continue to operate using the best management practices utilized prior to this planning process with no significant change in the current management regime of any structure. In some cases, operating ranges have been modified to better reflect current practices or established to reflect new information regarding a structure. In the cases of the hydro facilities from Appleton downstream, the compliance level and operating ranges are identical because an established operating range did not previously exist for these structures. These facilities will still be operated using historical target ranges based on previously established limits.

Figure 9.2 outlines the required information to be recorded at each facility subject to compliance monitoring and the operating range for compliance.

**Figure 9.2 – Revised Compliance Ranges for Compliance Monitoring**

| Control Structure and Responsibility for Monitoring | Data | Rationale | Minimum flow | Compliance Range for Compliance Issues (m a.s.l.) |
|---|---|---|---|---|
| **Crotch** (OPGI) | Weekly staff gauge reading | Current practice | ** | 236.80 - 240.20 |
| **High Falls G.S.** (OPGI) | Daily average reading | Run of the river facility; Minimal storage capabilities | 5 cms – best practice 1cms - mandatory | 186.85 - 187.70 |
| **Appleton G.S.** (CHD) | Daily staff gauge reading | Run of the river facility; Minimal storage capabilities | ** | 122.50 – 123.80 |
| **Enerdu G.S.** (EPS) | Daily average reading | Run of the river facility; Minimal storage capabilities | ** | >116.7 <118.0 *** |
| **Almonte G.S.** (MRPC) | Daily staff gauge reading | Run of the river facility; Minimal storage capabilities | ** | >113.5 |
| **Galetta G.S.** (CHD) | Daily staff gauge reading | Run of the river facility; Minimal storage capabilities | ** | 82.51 - 83.80 |

* Daily average reading - The average of 24 measurements (level and/or flow), taken at the beginning of every hour, calculated at 00:00 hours e.s.t.

**Minimum Outflows – Except as explicitly noted, minimum outflow requirements will be achieved through best management practices and structure leakage which is inherent to all water control structures. When required to achieve the mandatory flow requirement of 1 cms at the High Falls G.S., Crotch Lake will be used to augment downstream flows.

***Upper compliance level in place when flashboards are in use by Enerdu G.S.

The proponents must operate their facilities in accordance with the provisions of this approved plan as required by Section 23.1 of the *Lakes and Rivers Improvement Act* (LRIA. The proponents are also responsible for on-going self-monitoring through a Compliance Monitoring Program as further specified herein.

### 9.2.2 Summary of Compliance Monitoring

**Mississippi Valley Conservation Water Control Structures** – The water control structures owned and operated by MVC are not hydro-generating facilities and are operated to achieve multiple objectives as described in the Base Case Description. Due to the multi-use nature of these structures, the operational requirements are not considered to be subject to the compliance and enforcement provisions of the plan. MVC will continue to operate these structures to achieve the operating target ranges identified in the Plan. MVC will continue to monitor and record daily water levels in accordance with current practice.

**Power Company Operated Structures** – Information on compliance monitoring for the 6 structures identified in Figure 10.2 is provided in Section 7 under the associated reaches.

### 9.2.3 High and Low Water Indicators

The Water Management Planning Guidelines recognize that weather conditions and their impacts on water supplies are a source of ongoing uncertainty to the management of waterpower facilities and other control structures. The guidelines, therefore, identify high and low water indicators that are defined as follows. Operators will not be considered to be out of compliance with their WMP when they operate outside the mandatory operating range as a result of a high or low water condition as defined below;

High water indicators are identified by the guidelines as:

- Water level in the head pond/ reservoir is at or above the maximum water level stipulated in the approved WMP;
- Head pond / reservoir level is increasing; and
- Discharge facilities have been operated to discharge the maximum discharge possible (while minimizing upstream and downstream flood damages).

Low water indicators are identified by the guidelines as:

- Facilities with minimum downstream flow and minimum reservoir/head pond water level requirements are in a low water condition when all of the following conditions are met:
- Outflow from the facility is at or below the minimum flow required in the WMP;
- Water level in the head pond/ reservoir is at or below the minimum water level stipulated in the approved WMP; and
- Head pond / reservoir level is decreasing.

The MRWMP planning team has established High Flow conditions for the following facilities which represent the maximum discharge possible while minimizing downstream flood damages. Therefore as outlined above at discharge flows above the High Flow condition, the High Water Indicator will be met and the operators will not be considered to be out of compliance with the water level requirements of the plan. These are:

**High Falls G.S**. – outflows above 40 cms. – This indicates when flooding on Dalhousie Lake is about to or is occurring. This dam and those upstream are operated to mitigate flooding upstream and downstream as much as possible at this flow rate.

**Appleton G.S. and all structures downstream** – flood event flows at the Appleton stream gauge exceeding 143 cms. This is the 2 year return period and represents the flow at which flooding will begin on Mississippi Lake, and along the river at flood damage centres at Appleton, Almonte, Pakenham and Galetta. All dams are operated to mitigate flooding upstream and downstream as much as possible at this point. The lower section of the Mississippi River (downstream of Almonte) usually reaches flows of 143 cms well before the Appleton stream gauge due to the significant tributaries that enter the system downstream of the gauge. Until such time as an automated stream gauge exists on the river near Galetta, the determination of out of plan flows at Galetta will be the combined flows from Appleton and the Indian River gauges and it will be the responsibility of MVC to notify MNRF and power producers when this occurs.

**Enerdu Generating Station** – due to its unique feature of only having flashboards (as opposed to stoplogs) as a means of impacting flows and levels upstream of this structure, a separate high water indicator is in place for this structure when the flashboards are in place in the river and / or on the weir. Flood levels (elevations above 118.00 m) within the Almonte Ward of Mississippi Mills are impacted by the flashboards once flows exceed 40 cms. Therefore, the high water indicator for this structure, **when the flashboards are in place**, is 118.00 m (recorded at the Bridge Street bridge or some other suitable location).

**Frazil Ice** - frazil ice formations can have a significant impact on the ability of dam operators to pass water through their structures. Two structures on this river system have historically had frazil ice problems which have severely reduced their ability to pass flows, the Appleton and Mississippi River Power Generating Stations. Frazil ice can also impact the flows being recorded at the Appleton stream gauge. Real time recorded flows may be much higher than they actually are due to the restrictions from the frazil ice in the river occurring downstream of the gauge. During periods of frazil ice, MVC will be responsible for providing estimated actual flows for the downstream hydro station operators. In situations where frazil ice causes a high water indicator to be met the operator will not be deemed to be out of compliance with the plan. Operators must still continue to do everything possible to maintain flows and levels and must report and document the initial occurrence of exceeding the value and when the dam is fully functional again.

### 9.2.4 Data Management for Compliance Monitoring

Owners will maintain records of all level and/or flow information that are required by the plan for a retention period of fifteen years (this change is to accommodate no plan term [i.e., 10 years and the additional 5 years required to retain records]). It is recognized that water level measurements may be unavailable from time to time due to equipment failure or environmental conditions.

- OPGI will maintain data for OPGI facilities at its Evergreen Energy Control Centre and make it available to MNRF upon request for audit activities.
- MVC will maintain data for its facilities at the MVC Office and make it available to MNRF upon request for audit activities.
- CHD will maintain data for its facilities at the Canadian Hydro Developers Head Office and make it available to MNRF upon request for audit activities.
- MRPC will maintain data for its facility at the Mississippi River Power Office and make it available to MNRF upon request for audit activities.
- Enerdu will maintain data for its facility at Enerdu and make it available to MNRF upon request for audit activities.

#### *9.2.5 Self-Monitoring, Data Reporting and Incident Notification*

All facilities are required to self-monitor mandatory water flow and level limits, and report on any incidents where a deviation from the operating requirements of the WMP (mandatory flows and levels), or other mandatory conditions of the Mississippi River WMP. All incidents must be reported to the MNRF.

An initial notification to the MNRF is required within 24 hours of the occurrence of the incident or when the proponent(s) first becomes aware of the incident.

The report should include:

- The date, time and nature of the deviation;
- The extent of the deviation;
- Possible causes of the deviation;

- Known or anticipated impacts associated with the deviation; and
- Steps taken or to be taken, including the timeframe, to correct the deviation.

The facility owner/operator is then required to provide a written report to the MNRF within 30 days, outlining the details of the incident, any additional information not provided in the incident notification and subsequent remediation. The report must be signed and dated.

MNRF will have 90 days to respond and will take into account the nature, severity and the reasons for the non-compliance. Facility operators will be provided with a fair and reasonable opportunity to explain what happened and their actions before any enforcement action is taken.

#### *9.2.5.1 Annual Compliance Reports*

Each individual plan proponent will prepare and submit an Annual Compliance Report. The report will contain a summary and description of all incidents and any remedial action(s) proposed or undertaken. In the event there were no recorded incidents of noncompliance, the report will state as such.

### 9.2.7 Out of Compliance Enforcement

i. Companies that do not operate their waterpower facilities in accordance with their approved WMP will be held accountable.
ii. MNRF will determine the response to non-compliance in accordance with legislation and policy.
iii. In instances of non-compliance, MNRF will conduct an investigation. Investigations will take into account a number of factors including the severity of impact, weather, the intent of the offender, failure of equipment and unforeseen events.
iv. Procedures will be developed to help determine the most appropriate enforcement action (including warnings, orders and laying charges under s. 28 of the LRIA) based upon the history of the offender and the impacts of the offence.

### 9.2.8 Annual Reporting / Compliance Monitoring

The proponents will prepare an Annual Compliance Report to be submitted to MNRF by January 30$^{th}$ of each year outlining: summary of operations and summary of incidents.

## 9.3 Implementation Reporting

Plan proponents for the Mississippi River WMP shall submit an Implementation Report to the MNRF every five years. This report shall be a collective submission from all plan proponents.

The Implementation Report will provide status updates, transparency of dam operations and inform adaptive management considerations. The Implementation Report is not intended to initiate a fundamental review of the WMP.

The Implementation Report will include:

- Summary of all amendment requests received, including the rationale for completed amendments and how proposed amendments that did not proceed were addressed;
- Status of the Standing Advisory Committee, where applicable;
- Report on the results of the effectiveness monitoring program (EMP), if applicable, including a summary of monitoring conducted and findings, a determination of whether operations are

- having a negative or unintended impact, and an assessment of whether revisions to the facility operations, or the EMP, are required; and
- Status and results of any data or information collection outlined in the WMP's data collection program, if applicable, and a determination of whether revisions to the program are required.

The MNRF will review the report for completeness but will not formally approve the report. If the report is not complete, the MNRF will request that additional information be provided. The MNRF may also audit records used by the proponent(s) to prepare the Implementation Report and may request any additional information to verify the information presented.

Upon confirmation from the MNRF that the Implementation Report is complete, plan proponents will make the report publicly available.

In accordance with the Technical Bulletin, the first Implementation Report to cover the initial term of the Mississippi River WMP should be submitted to MNRF no later than December 31, 2019, as outlined in the OWA schedule. Also, in accordance with the Technical Bulletin, Implementation Reports must be submitted every five year thereafter.

# Section 10 – Provision for Plan Amendments

**10.1 Plan Amendments**

In order for the Mississippi River WMP to remain current and to address future issues, the plan may be amended by following the amendment process set out in this section. Any change to the Mississippi River WMP requires an amendment to be submitted to the plan proponents and approved by MNRF. From time to time, new data, information, or issues may arise. MNRF retains the authority to amend a plan at any time, or issue an Order for the plan proponent(s) to amend the WMP.

**10.2 The Amendment Process**

Any party (Plan Proponent, MNRF, or 3rd Party) with an interest in the WMP may request an amendment to the WMP by bringing forward issues to the attention of the plan proponent(s).

An amendment request must be accompanied by sufficient information to allow the proponent(s) to determine whether the proposed amendment should proceed, and whether the amendment should be treated as minor or major. Proponent(s) must apply due diligence when considering proposed amendments.

The plan proponent(s) are responsible for:

- Receiving amendment requests;
- Assessing amendment requests based on criteria outlined in this section;
- Proposing amendments to MNRF; and
- Preparing amendment proposals for MNRF review

The multiple proponents for this WMP will work together when assessing an amendment request and prepare an amendment proposal (where necessary).

MNRF will review proposed amendments to ensure that plan proponents screen and process amendments consistent with the 2016 Maintaining Water Management Plans Technical Bulletin.

*10.2.1 Types of Amendments*

Changes to the Mississippi River WMP may include simple text corrections to significant modifications to an operating regime. In order to provide flexibility for a range of potential amendment requests, two categories of amendments (minor and major) exist. The categories are mainly differentiated by the expected level of public interest in the proposed change to the WMP.

Amendments may be subject to public and First Nations and Métis community engagement or consultation, dependent on the category of amendment (described below), as detailed in Section 3.5 of the Maintaining Water Management Plan Technical Bulletin, 2016.

*10.2.1.1 Minor Amendments*

Minor amendments are changes that do not affect the operating regime, plan objectives, are not expected to generate a high level of public interest, and are not expected to adversely affect Aboriginal and treaty rights. Minor amendments will not be subject to public and First Nations and Métis community engagement or consultation beyond discussions with a SAC (if applicable). Minor amendments may include:

- Changes in the presentation of information, factual or text corrections; and/or
- 

- Changing a WMP to include a new dam and its associated Operating Plan (Section 2.1 of the Maintaining Water Management Plan Technical Bulletin, 2016)

*10.2.1.2 Major Amendments*

Major amendments are more significant in scale such as: changes to the operating regime or plan objectives, changes that could be expected to generate a high level of public interest or changes that might adversely affect Aboriginal and treaty rights. A major amendment will be subject to public, First Nations, and Métis community engagement or consultation. For major amendments where equivalent consultation and engagement has previously occurred through another process (e.g. previous notification that a change will be required, or amendments required after public consultation in other planning processes), MNRF may exercise discretion to process the proposed change as a minor amendment on a case by case basis.

*10.1.2 Amendment Request*

Individuals submitting an amendment request shall clearly articulate concerns and potential solutions. Amendment requestors shall participate in good faith opportunities undertaken to obtain Indigenous Communities, public and stakeholder input on proposed major amendments and should consider their ability to contribute towards those engagement opportunities.

An amendment request should provide sufficient information to allow plan proponent(s) to determine whether an amendment request should be investigated further. It is the responsibility of the individual(s) requesting the amendment to demonstrate that the request is credible, worthy of consideration and within the scope of the Mississippi River WMP and the LRIA.

The amendment request must contain the following information:

- A description of the changes being requested;
- The rationale for the changes being requested;
- Results of any pre-consultation completed with potentially affected parties; and
- Where changes in operations are proposed, a description of how the proposed operation changes may impact other dams subject to the WMP.

Upon receipt of an amendment request from a third party, the plan proponent(s) will acknowledge receipt of the request in writing to the third party and notify the MNRF that a request has been received. Where the MNRF receives an amendment request from a third party, the request will be forwarded to the plan proponent(s).

Where plan proponent(s) are considering submitting an amendment request to the MNRF, prior consultation with the MNRF, the SAC (if applicable) and other plan proponents may occur.

Plan proponents will maintain records for all amendment requests.

*10.13 Review of Amendment Request and Categorization of Amendment*

The proponent(s) is responsible for screening amendment requests to determine if the request should proceed through the amendment process, and for categorizing the amendment as minor or major. This determination will ensure the appropriate degree of public consultation for the plan amendment.

The assessment will consider the following criteria:

a) Is the amendment consistent with this Technical Bulletin?
b) Is the amendment consistent with the Mississippi River WMP objectives, or does the amendment propose a change to the WMP objectives?
c) Is there an alternative method to deal with the request rather than amending the WMP?

d) Is the request within the scope of the Mississippi River WMP?
e) Is the request related to any ongoing data or effectiveness monitoring commitments?
f) Is the request supported by other potentially affected parties?
g) Is the amendment required to comply with other regulatory requirements?
h) Has the amendment request been considered previously?
i) Does the amendment have the potential to negatively affect dam safety/public safety?
j) Does the amendment have potential impacts on socio-economic or environmental considerations?

Where an amendment request does not contain sufficient information to complete an assessment or make a recommendation to MNRF, the plan proponent will return the proposed amendment to the third party with a request for additional information.

When a plan proponent(s) has completed the screening of the amendment request, written notification will be provided to MNRF. The notification will include: a summary of the amendment request and supporting rationale, results of the assessment, a recommendation of whether the request should be further considered, and if so, the appropriate category for the amendment.

*10.1.4 Review of Assessment Results*

The MNRF will review the plan proponent's screening results and will:

- Agree with the recommendation;
- Request additional information; or
- Disagree with the recommendation.

Where the plan proponent(s) recommends against proceeding with the amendment request, and the MNRF is in agreement, the plan proponent(s) will notify the requestor of the decision with supporting rationale.

Where the MNRF agrees that the amendment request should proceed, the plan proponent(s) will develop and submit the final amendment proposal for MNRF consideration. The plan proponent(s) will undertake any necessary planning, consultation, information gathering or other investigative activities associated with the amendment. Where the amendment is requested by a third party, the third party may be expected to support engagement activities.

Where the MNRF disagrees with the recommendation, the MNRF will discuss the proposed amendment with the plan proponent(s). The MNRF may subsequently direct the plan proponent(s) to proceed with consideration of the plan amendment.

**10.3 Ordering an Amendment**

When a decision is made to proceed through the plan amendment process, the MNRF may formalize the decision through the issuance of an Order to prepare an amendment or approve the amendment under the authority of LRIA Section 23.1(6). Plan proponent(s) may also request that the MNRF issue an Order to amend the plan.

The MNRF retains the authority to require a plan proponent to undertake a WMP amendment where the plan proponent is unwilling to consider reasonable requests or where there are significant concerns regarding a facility's operation.

When MNRF intends to order a plan proponent to amend a plan, the proponent(s) will be provided a notice of intent to issue an Order to amend the plan prior to the issuance of the Order. Upon receipt of a notice of intent to issue an Order to amend a plan, the proponent(s) has 15 days to submit a request for an inquiry to the MNRF. Requests for an inquiry under the LRIA are referred by the MNRF to the Office of the Mining and Lands

Commissioner (OMLC). Additional detail regarding appeals to the OMLC are referenced in MNRF's LRIA Administrative Guide and Section 11 of the LRIA.

**10.4 Amendment Preparation**

Where the MNRF has determined that a proposed amendment request should proceed, the plan proponent(s) shall prepare the final amendment proposal, including completing consultation activities or information gathering in support of the proposed amendment. Where the amendment is requested by a third party, the third party requester should discuss opportunities for collaboration in preparing the amendment.

For minor amendments, the plan proponent(s) must engage the MNRF, other plan proponent(s) and the SAC (if applicable). Public and First Nations and Métis community engagement and consultation requirements for major amendments are described in the subsections 10.1.4.1 and 10.1.4.2.

*10.4.1 Consultation and Engagement Requirements for Major Amendments*

Plan proponent(s) and in certain circumstances third party amendment requestors, shall undertake public and First Nations and Métis community engagement and consultation when developing a major amendment. Specific requirements shall be discussed with the MNRF in advance. The scope of consultation and engagement may vary depending on:

- Scope and scale of the proposed major amendment;
- Level of public, stakeholder and First Nation and Métis community interest in dam operations;
- Level of potential impact on Aboriginal and treaty rights;
- Potential impacts on other regulatory approvals; and
- Potential impacts within the scope of the LRIA and the WMP.

Consultation and engagement approaches may include:

- Direct written notice;
- Open houses;
- Information sessions;
- Public notice; and/or
- Community meetings or workshops/focus groups.

Sufficient opportunity for reasonable engagement shall be provided and information regarding the amendment shall be communicated in concise plain language.

*10.4.2 Consultation and Engagement Requirements Where EA Applies*

In some instances, proposed changes to existing operations of the WMP will be subject to the Environmental Assessment (EA) Act, such as MNRF's Resource Stewardship and Facility Development Class EA, or the OWA Class EA.

In such cases, the EA Act requirements shall be completed in advance of submitting an amendment request. The plan proponent(s) is not required, but may elect, to incorporate WMP amendment considerations during the EA Act process.

Where proposed changes are subject to an EA, the proponent may not be required to complete any additional public and First Nations and Métis community engagement and consultation in support of the proposed WMP amendment where sufficient engagement activities have been completed as part of the EA process.

MNRF determination of whether consultation and engagement completed during the EA is sufficient for purposes of a WMP amendment shall be made as part of the Ministry's assessment of the WMP amendment screening results. Additional consultation and engagement shall not be required, unless the MNRF concludes that the EA consultation was insufficient. In this case, the MNRF will determine the scope and scale of additional consultation and engagement necessary for the purposes of the WMP amendment.

### 10.5 Amendment Submission

Following completion of any applicable consultation requirements, the plan proponent(s) will provide the MNRF, other plan proponent(s) where appropriate, and any third party requesters, a copy of the final amendment proposal including:

a) Amendment request and supporting rationale;
b) Proposed changes (replacement text) as they would appear within the approved plan;
c) Map of the area affected by the amendment (if applicable);
d) Record of consultation identifying the type of form of feedback sought, issues identified and steps taken by the proponent to modify the proposed amendment in response to comments (if applicable); and
e) Any other supporting information deemed applicable to the proposed amendment.

### 10.6 Amendment Review

All amendments to the Mississippi River WMP must be approved by the MNRF.

The MNRF will complete a review of the amendment submission. For proposed minor amendments, the MNRF will complete a review within 30 days of receipt of a complete submission. For proposed major amendments, MNRF will complete a review within 60 days of receipt of a complete submission.

During and/or following the review of the proponent’s amendment submission, the MNRF may, with supporting rationale, request additional information required to complete the MNRF’s review.

#### *10.6.1 Requests for Additional Information*

Where additional information is required, the MNRF will identify in writing the additional information requested and the rationale for the request. In such circumstances, the MNRF review timeline will be put on hold until the MNRF receives the requested information.

Upon receiving a request for additional information from the MNRF, the proponent may:

- Agree to provide the additional information by the specified time;
- Request a change to the specified time for submitting the information;
- Request a review by the Regional Director of the required information; or
- Refuse to provide the additional information.

Further details regarding the above scenarios can be found in Section 3.7.1 of the Technical Bulletin (2016).

### 10.7 Issuance of Decision

In issuing a decision on the proposed amendment, the MNRF shall either:

- Approve the amendment;
- Approve the amendment subject to changes considered advisable to further the purposes of the Act; or
- Refuse the amendment.
-

MNRF will provide the plan proponent(s) and any third party requester, as appropriate, written confirmation of its decision and supporting rationale.

If the amendment is approved, the WMP will be revised and a record of the amendment will be appended to the approved WMP.

Where the MNRF intends to refuse an amendment, a Letter of Intent to Refuse approval of the amendment will be issued to the proponent identifying the supporting rationale and any additional measures the proponent(s) can take to address any outstanding concerns. The Letter of Intent to Refuse approval of amendment will notify the proponent that unless the MNRF receives a request within 15 days from the proponent for an inquiry, the amendment will be refused.

Requests for an inquiry under the LRIA are referred by the Ministry of the Office of Mining and Lands Commissioner (OMLC). Additional information on appeals to the OMLC is detailed in MNRF's LRIA Administrative Guide.

# Section 11 – Standing Advisory Committee

## 11.1 Standing Advisory Committee

A SAC is no longer a mandatory requirement for complex WMPs. SACs are recommended as a best management practice to provide plan proponent(s) with a mechanism for engaging First Nation and Métis communities and the public. Any proposal to discontinue an established SAC should be informed by advice from the MNRF, advice from the SAC and consideration of the level of public, stakeholder and First Nation and Métis community interest in dam operations. Where a plan proponent(s) makes this recommendation, an amendment to the WMP with appropriate rationale will be required to remove the provision for a SAC from this WMP.

Plan proponent(s) are responsible for administering the SAC (if applicable), and SACs will work directly with the plan proponent(s). Proponents are required to report on the status of the SAC (if applicable) every five years as a component of ongoing Implementation Reports as outlined in Section 9.3.

The role of the SAC (if applicable) is to serve as an advisory group, as defined through a terms of reference. The terms of reference will outline the membership, scope, duration and roles and responsibilities of the SAC and its relationship with the plan proponents. MNRF will define what role it will have, if any, in a SAC.

A SAC (if applicable) should include representatives with a broad range of interests on the river such as First Nation and Métis communities, riparian land owners, municipalities and interested groups.

# Glossary

**Area of Natural and Scientific Interest** – Areas with special resource management provisions designed to protect significant earth and life science values; usually has a management plan that guides activities permitted and restricted in this area.

**Bathymetry** – Detailed topography or contour profile of the bottom of lake or river.

**Base Case** – This term refers to the current annual operating regime (plan) of a dam or hydro-electric facility. The base case reflects the operation of the facility based on previous experience, constraints, and benefits.

**Baseflow** - is that portion of stream flow originating in indirect runoff, that is, runoff that has reached the stream or river by first passing through the underlying aquifer, rather than by flowing directly overland as surface flow. Baseflow effectively drains the neighbouring shallow ground water reservoirs, eventually leading to their depletion in the absence of substantial recharge. This is almost always cool or cold water and does not vary much in quantity or temperature at a particular location throughout the year. Base flow is characteristically a very slow process, with strong runoff diffusion and very little variability. The presence of base flow throughout the year is an indication of a humid climate and a shallow ground water table with fast recharge potential.

**Bedrock Outcrops** – Areas where the underlying bedrock underground layers of rock foundation are exposed above the soil layer.

**Cubic meters per second** – A unit expressing rate of discharge, typically used in measuring streamflow. One cubic metre per second is equal to the discharge in a stream of a cross section one metre wide and one metre deep, flowing with an average velocity of one metre per second.

**Drawdown** – The difference between maximum and minimum water levels in a reservoir. Also refers to the act of lowering reservoir levels.

**Drawdown Zone** – Reservoir regions alternately exposed and submerged due to water level fluctuations.

**Drought** – Reduced natural inflows that do not permit maintaining minimum flow and/or level requirements. Prior permission is required from MNR to reduce the reservoir level below the legal minimum.

**Ecosystem** – An ecological community together with its environment, functioning as a unit.

**Flashboards** – One or more boards projecting above the top of a dam (usually a weir) to increase the depth of the water. They are normally designed to fail under high flow conditions so that they do not increase flood levels.

**Flood** – An overflow of water onto lands that are used or usable by man and not normally covered by water. Floods have two essential characteristics: The inundation of land is temporary; and the land is adjacent to and inundated by overflow from a river, stream, lake, or ocean.

**Flood Frequency Curve** – A graph of annual flood peaks usually ranked in descending order and their frequency of exceedence. The graph may be interpreted as the probability of a certain discharge occurring in a given year. The annual flood frequency curve describes a sample of peak annual events only and is often misinterpreted as representing all floods.

**Flood plain** – A strip of relatively flat and normally dry land alongside a stream, river, or lake that is usually covered by water during a flood.

**Flow Regime** – A range of flows associated with a river or stream that outlines the flow levels or conditions in a watercourse.

**Forebay** – A reservoir immediately upstream of a generation facilities intake.

**Frazil Ice** – Frazil ice is generated in open (no formation of cover ice) sections of a river that are turbulent and swift flowing (or "white water"). These sections of open water become super cooled and "runs" of frazil ice crystals occur. These "runs" are periods in which the frazil ice crystals are generated; they are relatively brief (i.e. seconds or minutes) but repetitive. Frazil is most commonly produced on clear, cold nights with strong winds while the river is near minimum flow; this effect will be enhanced if the proceeding day was cold, cloudy and windy.

**Freshet** – The accumulated runoff from total precipitation and snowmelt usually occurring around April but may vary on a year to year basis depending upon climatic conditions.

**Head** – The difference in elevation between the water at the reservoir (forebay) and the discharge (tailrace)

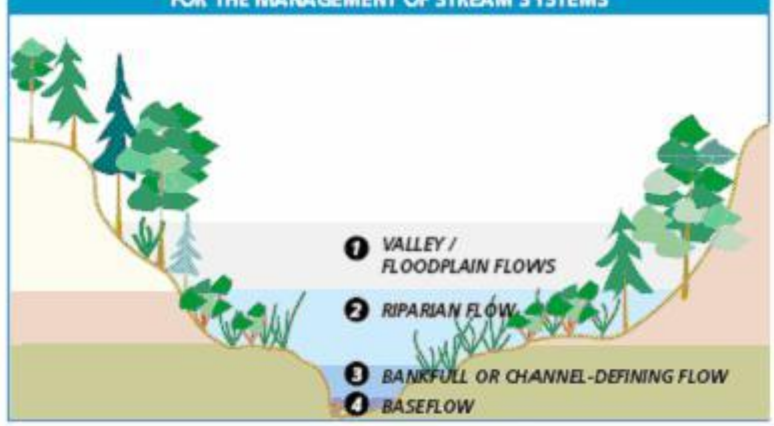
**Headpond** –The reservoir or area upstream of the dam where water is impounded or stored.

**Headwater** – The section of a river or stream with the highest elevation above sea level. This is the area in a watershed that most streams begin and flow down to areas of lower elevation.

**Hectare meters** – ha m or 10, 000 $m^3$.

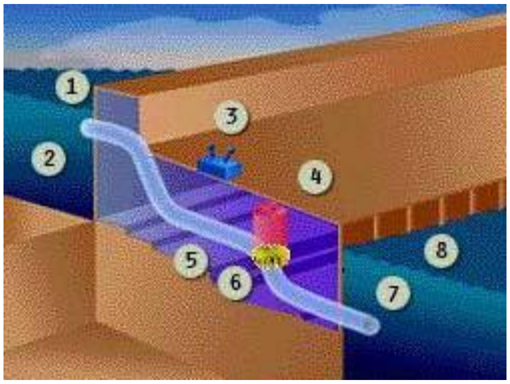
**High Flow***:* High flows represent flood events. Flood events provide flushing flows. Flood events also provide exposure to floodplains, a vital part of nutrient cycling and habitat maintenance. This is true for small to medium size floods with a return period of less than 1 to 5 years, larger floods can result in structural damage of bank erosion and total bed movement, from which habitats and biota take longer to recover from. There are three major types of high flows: Valley /Floodplain Flows, Riparian Flows, Bankfull Flows. High flow variables include: -Bankfull $Q_1$ - $Q_{1.5}$ . The maximum flow attained from 1-1.5 years -Riparian or floodplain $Q_2$- $Q_{20}$: The maximum flow attained from 2-20 years -Valley $Q_{25}$- $Q_1$: The maximum flow attained from 25-100 years

FIGURE 4-2: A CROSS-SECTIONAL VIEW OF FOUR FLOW STAGES FOR THE MANAGEMENT OF STREAM SYSTEMS




**Hydro:** The term “Hydro” is derived From the Greek Word “Hydros” Meaning Water. Hydroelectricity, therefore, means “electricity from water”. “Hydro” has become a generic term in Canada meaning “electricity”. This originates from the days when all of our electricity was produced by hydroelectric generators.

**Hydroelectric Facility**:




***1. Forebay***
***2. Intake***
***3. Transformer***
***4. Generator***
***5. Penstock***
***6. Turbine***
***7. Draft tube***
***8. Tailrace***

**Hydraulic Capacity** – The total volume of water which can be passed through all sluiceways of a structure but not including any weir or emergency spillway. It is based on all stoplogs (which can be removed) out of the dam and the head being the difference between the normal summer optimum level and the sill (or top elevation of any irremovable logs ) of the dam and the clear opening width of each sluice.

**Hydraulic Characteristics** – Physical characteristics of a dam or watershed area affecting a dam which can not be changed.

**Hydrologic Model** – A model of the properties, distribution, and effects of water on the earth's surface, sometimes in the soil and the underlying rocks, and in the atmosphere.

**Inflow** – The total amount of water coming into a body of water, normally comes from precipitation, tributaries and melting snow and ice.

**Inflow Design Flood (IDF) Level** – The water level at a dam which is used to assess the safety of a dam with respect to flood passage and stability. The IDF for low hazard dams is often the same as the RF.

**Instantaneous Flow** – Water, which at any instant, is flowing into the channel system from surface flow, subsurface flow, base flow, and rainfall that has directly fallen onto the channel. Minimum instantaneous flow is the minimum flow attained in an instant in time. Maximum instantaneous flow is the maximum flow attained in an instant in time.

**Kilowatt-hour (kWh)** – Power demand of 1,000 watts for one hour. Power company utility rates are typically expressed in cents per kilowatt-hour.

**Littoral Zone** – The area of the shore of a lake where light is able to penetrate to the bottom; often more than 60 percent of the flora and fauna in the lake or other body of water exists in the littoral zone.

**Local Drainage Area** – The drainage area of a watershed located between two water control structures not including any of the local or total drainage area of the upstream structure.

**Maximum Operating Level** – The maximum water level to which the reservoir or storage lake is operated under normal operating conditions at a given time of the year.

**Minimum Operating Level** – The minimum water level to which the reservoir or storage lake is operated under normal operating conditions at a given time of the year.

**Nuisance Flooding** – Associated with flooding of docks, shoreline and possibly outbuildings but not effecting the access, egress or main dwelling on a lot.

**Ogee-Crested Weir** – The word ogee describes the shape of the curve, in profile or section, on the crest of the dam. The shape is a reverse curve, similar to the letter "S", but elongated. The shape is intended to match the natural shape of flowing water. The downstream faces of overflow dams are often made in this shape.

**One Hundred (100) Year Flood** – Historical records allow experts to estimate the size of future floods. Estimates such as the “100 year flood” are often used. A 100 year flood is an estimate of the largest flood that will happen at a certain place once in every 100 years on average. In other words, there is 1 chance in 100 that a flood this large will happen in any given year. Of course, it is entirely possible that the 100 year flood might not happen for several centuries or perhaps, it could happen several times in a 100 year period.

**Ontario Low Water Response** (formerly Water Response 2000) – Is intended to ensure provincial preparedness, to assist in co-ordination and to support local response in the event of a drought. This plan is based on existing legislation and regulations and builds on existing relationships between the province and local government bodies.

**Operating Range** – The upper and lower limits of water levels on the dam operation curve that any given time through the year should only be exceeded under extreme (flood/drought) conditions).

**Out of Scope** – The Scope of the MRWMP includes environmental, social and economic considerations, which are currently influenced by the timing and/or magnitude of dam operations within the Study Area. Considerations which are not currently influenced by the timing and/or magnitude of dam operations, or which are outside of the Study Area, are considered outside the scope of the MRWMP.

**Penstock** – A pipe conducting water from the forebay to the scroll case of the turbine.

**Provincially Significant Wetlands** – Wetlands that have special characteristics of natural or cultural importance; PSWs are evaluated wetlands that are assessed and scored in terms of their characteristics (i.e. Have valued hydrological function such as flood attenuation capacity; Contain vulnerable, threatened or endangered flora or fauna); development in and around PSW s is restricted and limited.

**Reach** – Any length of river under study, with definable features; reaches on the Mississippi River are defined or separated by waterpower facilities, water control structures or obvious natural features that cause a change in the characteristics of the river.

**Riparian Properties** – Properties or land parcels along a riverbank or on lakefront.

**Runoff** – (1) That part of the precipitation, snow melt, or irrigation water that appears in uncontrolled surface streams, rivers, drains or sewers. Runoff may be classified according to speed of appearance after rainfall or melting snow as direct runoff or base runoff, and according to source as surface runoff, storm interflow, or ground-water runoff. (2) The total discharge described in (1), above, during a specified period of time. (3) Also defined as the depth to which a drainage area would be covered if all of the runoff for a given period of time were uniformly distributed over it.

**Run of the River** – A generating facility is called a run of the river operation when it has minimal forebay storage, passes all or most of the inflow of water from upstream through one or more turbines on a consistent basis, with the remainder of the water spilling over existing falls or the dam's spillway.

**Sluice Gate** – A gate which can be placed into an opening in a dam to shut off or regulate the flow of water. The gate may be permanently attached to a hoist and can be controlled either hydraulically or electrically at the location or remotely. A sluice may also be filled with stoplogs.

**Spillway** – A structure over or through which excess or flood flows are discharged. If the flow is controlled by gates or stoplogs, it is a controlled spillway, if the elevation of the spillway crest is the only control it is an uncontrolled spillway (weir).

**Spillway Capacity** – The maximum amount of water that can be passed through or over the spillway.

**Spring Freshet** – Wet conditions in a watershed associated with spring rains, melting snow cover, often high water table levels, and sometimes surface water flooding.

**Stop Logs** – A series of logs (usually made of BC fir but can be steel, composite plastic or concrete) that acts as a gate which can be placed into an spillway opening at a dam to regulate the flow of water. The stoplogs are manually manipulated using a manual or hydraulic winching system operating one log at a time.

**Tailrace** – A channel carrying water away from a hydraulic generating station.

**Tailwater** – The water from a generating station after it has passed through the turbine.

**Target Range** – The optimum band of operation or target water level for any given time through the year. This is a “Best Management Practice” and is not enforceable or subjected to compliance issues.

**Total Drainage Area** – The total area of land which drains to a point on a watercourse.

**Total Storage** – Is based on the height of the stoplogs multiplied by the surface area of the lake.

**Water Taking Permits** – Under Section 34 of the Ontario Water Resources Act, the MOE regulates the withdrawal and use of large quantities of surface and ground water (i.e. 50,000 L per day or greater requires a water taking permit); the ecosystem approach and impacts to supply of water in the watershed is to be taken into consideration when the MOE reviews and approves permits. Permit applications are posted on the Environmental Bill of Rights Registry. For more information see www.eco.on.ca.

**Waterpower** – Generating electricity by conversion of the energy of running water.

**Watershed** – A line of separation between waters flowing to different rivers, or basins; area of and drained by a single river and its tributaries or creeks.

**Weir** – A non operable dam in a stream to raise the water level or divert the flow.

**Winter Drawdown** – The level at which a reservoir is reduced to in order to allow for increased water volumes associated with spring freshet.

# References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Flood Plain Mapping Study of the Mississippi Valley: Cumming Cockburn & Ass.1983

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Waterpower Project Science Transfer Report – 1.0 Simulating and Characterizing Natural Flow Regimes: Watershed Science Centre, 2003

**Additional Waterpower Program Documents consulted:**

Aquatic Ecosystem Guidelines for Water Management Planning, Ontario Ministry of Natural Resources, v1.3 September, 2002 Draft

Compliance and Enforcement Guidelines - Appendix J of the Water Management Planning Guidelines for Waterpower, Ministry of Natural Resources, June 30, 2005.

Decision-making in Water Management Planning for Waterpower, Waterpower Project, Ontario Ministry of Natural Resources, Draft July 14, 2003

Metcalfe, R.A., Smakhtin, V.Y., Krezek, C., 2003. Simulating and Characterising Natural Flow Regimes. Waterpower Project Science Transfer Report 1.0, Ontario Ministry of Natural Resources. Including: Mississippi River Flow Metrics Data Sheets for: Almonte/Almonte Upper Falls, Appleton, Crotch Lake, Galetta, High Falls. Waterpower Project Science Transfer Report Site Specific Data, 2004.

Selected Demographic, Social and Economic Statistics, Mississippi River Extent. Prepared for the Ministry of Natural Resources, Statistics Canada Central Region, June 2004

Socio-Economic Best Practices in Water Management Planning for Waterpower, Waterpower Project, Ontario Ministry of Natural Resources, Draft January 29, 2003.

**Ministry of Natural Resources file information including: wetland evaluations, lake files, species at risk, fisheries, protected areas, etc.**

Bathymetric Mapping Studies

District Lake files (both from Bancroft and Kemptville) (e.g. Crotch Lake FWIN, Shabomeka Lake SLIN 1999, spawning assessments, etc)

District wetland evaluation files

MNR's Natural Resource Values Information System (NRVIS)

Natural Heritage Information Center database for info on species at risk and natural heritage features

Personal communications with Area Biologists, Christie Curley, Steve Bobrowicz, Erin McDonald, Steve Lawrence and Vince Ewing.

# *Mississippi River Water Management Plan*

## *Appendices*

Mississippi Valley Conservation

ONTARIO POWER GENERATION

CANADIAN HYDRO DEVELOPERS, INC.

ENERDU POWER SYSTEMS, LTD.

*Mississippi River Power Corporation*

Ontario
Ministry of Natural Resources
Ministère des Richesses naturelles

*June, 2006*

# Table of Contents

## Appendix 1 – Committee Membership

| Steering Committee | Company/Agency | Phone |
|---|---|---|
| David Servos - co-chair (Barrie Askew) | Ontario Power Generation (Evergreen Energy) | 705 472-5568 |
| Art Currie - co-chair | Ministry of Natural Resources, Kemptville | 613 258-8201 |
| Mike Stockton | Canadian Hydro Developers, Inc. | 613 795-7655 |
| Scott Newton | Mississippi River Power Corp. | 613 256-2403 |
| Mike Dupuis | Canadian Hydro | 613 256-1983 |
| Paul Lehman | Mississippi Valley Conservation | 613 259-2421 |
| Spencer Martin (Jim Niefer) | Department of Fisheries & Oceans | 613 925-2865 x135 |
| Bob Walroth | Ministry of Natural Resources, Bancroft | 613 332-3940 x202 |
| Doreen Davis | Sharbot Mishigama Anishinabe Algonquin First Nation | 613 279-1970 |

| | | |
|---|---|---|
| **Planning Team** | | |
| Mike Stockton - co-chair | Canadian Hydro Developers, Inc. | 613 795-7655 |
| Paul Lehman co-chair | Mississippi Valley Conservation | 613 259-2421 |
| Gord Mountenay | Mississippi Valley Conservation | 613 259-2421 |
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| Mike Dupuis (Nicole Beaudette) | Enerdu Power Systems Ltd. | 613 256-1983 |
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| Anda Rungis | Ministry of Natural Resources, Kemptville | 613 258-8414 |
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| Jim McCready | 1 Anne St., Carleton Place ON K7C 3V8 | 613 257-5853 |
| Kristy Giles | Mississippi River Water Management Plan | 613 220-9401 |
| | | |

| Public Advisory Committee | | |
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| Carl Winterburn | RR#1 McDonalds Corners, ON K0G 1M0 | 613 278-2488 |
| Don Cuddy | 2395 Harlowe Rd., RR#1. Arden ON K0H 1B0 | 613 336-1702 |
| Ed Carew | Box 1085 Carleton Place, ON K7C 4K8 | 613 257-4715 |
| Ed Giffin | 3430 Lakeview Rd., Inverary, ON K0H 1X0 | 613 353-7776 |
| Fred Watts | RR#1 Cloyne, ON K0H 1K0 | 613 336-2071 |
| Jay Ambrose | 242 Mississippi Dr. RR#1, Arnprior ON K7S 3G7 | 613 623-8917 |
| Jim McCready | 1 Anne St., Carleton Place ON K7C 3V8 | 613 257-5853 |
| Mike O'Malley | 521 River Road, Almonte ON K0A 1A0 | 613 257-7667 |
| Russell Gray | 2412 Harlowe Rd., RR#1, Arden, ON KOH 1B0 | 613 336-2566 |
| Jim Christini | Box 132, MacDonald's Corners, ON K0G1M0 | 613-278-2114 |
| | | |
| **Project Support** | | |
| Doug Unsworth | Ministry of Natural Resources, Peterborough | 705-755-3229 |
| Paul King-Fisher | Ministry of Natural Resources, Peterborough | 705-755-1520 |

# Mississippi River Management Plan for Water Power (MRMPWP) Terms of Reference

## Introduction
The Mississippi River watershed is shown on Figure 1. It has a drainage area of 3750 square kilometres and is composed of a complex network of rivers, stream and lakes. The river is 212 kilometres in length, within its headwaters in Denbigh Township and Kilpecker Creek and it's outlet in the City of Ottawa and the Village of Fitzroy Harbour at the Ottawa River.

Historically and today, the residents and communities of the Mississippi system rely on the river for its natural resources. The waters of the Mississippi system provide a diversity of aquatic habitats (fish, waterfowl, furbearers, wetlands, wild rice, etc.) and provide a variety of opportunities for recreational, cultural and commercial purposes, including hydro production. Management of the water levels and flow through control structures also provides benefits to society including flood control and low flow augmentation.

The management of water levels and flows in the upper Mississippi River system has been examined a number of times over the past two decades. This planning exercise will build on the Mississippi Valley Conservation's experience with management of the river system and will incorporate operations at hydro owned facilities and control structures.

## Goal of MRMPWP
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**.**
The goal of the MRMPWP is to develop a water level and flow management plan (MP) for the Mississippi River that builds on the current operating regime for the system and integrates environmental and socio-economic values and considerations.

## Objectives
1. Review and document operation and management of existing hydro-electric facilities, dams and water control structures on the Mississippi River from an ecosystem and water management perspective;
2. Set water management objectives for the Mississippi River as a system which balance environmental, social and economic values and considerations;
3. Enhance public understanding of water management on the Mississippi system and provide meaningful opportunities for broad public, First Nations, stakeholder and interest group involvement in the development of the comprehensive water management plan;
4. Define individual operating plans for each hydro facility/dam and water control structure on the Mississippi River for the normal range of operating conditions.

## Principles
- Maximum net benefit to society - maximize net environmental, social and economic benefits derived from operation of water power facilities and associated water level control structures in terms of water flows and levels;
- Riverine ecosystem sustainability;

- Planning based on best available information and establishment of baseline conditions;
- Evaluate the need for changes to the existing water management operations for water level and flow management to address objectives and issues;
- Planning will be without prejudice to the rights of Aboriginal people and treaty rights;
- Public & stakeholder participation - Internal and external communications and integration are paramount to this planning exercise;
- Adaptive management - effectiveness monitoring to assist future planning.

Environmental, social and economic issues that are not related to the manipulation of water flows and levels will not be addressed through water management planning. For example the water management plan will not address issues related to over-fishing, water quality or urbanization.

The water management plan will reference other water management related programs. For example, drought and flood conditions will be defined in the MP by specific thresholds in which case other applicable protocols and procedures will be followed for these extreme events.

Once approved, hydro facility and water control owners will be required to comply with the flows and levels set out in the MRMPWP, as well as applicable statutory and regulatory requirements.

**Scope**

The plan shall be prepared according to the Water Management Planning Guidelines for Waterpower (May 2002) and other applicable direction, such as the Aquatic Ecosystem Guidelines, and will result in a comprehensive water management plan (WMP) being prepared for the Mississippi River system.

In general, the scope of the MRMPWP will include:

- Baseline conditions (environmental, social and economic) present at the time of planning;
- A focus on the management of water levels and flows;
- Operating regimes required at the waterpower facilities and associated water control structures;
- The relative scale of effects of waterpower operations and their related issues, and
- Other water resources users and the public interest in water.

The study area has been defined as the Mississippi River and interconnecting lakes. Not all water control structures within the watershed are included in the scope of the study, specifically those with little or no influence on flows and levels on the Mississippi River. The hydro facilities and water control structures subject to planning include:

- Mazinaw Lake Dam
- Shabomeka Lake Dam
- Kashwakamak Lake Dam
- Mississagagon Lake Dam
- Big Gull Lake Dam
- Crotch Lake Dam
- High Falls Dam/Generating Station
- Carleton Place Dam
- Appleton Dam/Generating Station
- Mississippi River Power Corp. Dam/Generating Station
- Enerdu Power Systems Ltd. Dam/Generating Station
- Galetta Dam/Generating Station

Appendix A contains a description of the hydro facilities subject to planning and an overview of the mandates of the agencies involved in this project.

Issues outside of the scope of this plan will be forwarded to the appropriate organizations as matters outside this planning process.

New and/or proposed significant modifications to waterpower facilities or water control structures are beyond the scope of the MP as they require prior Environmental Assessment Act approvals prior to the approval of the MP.

**Planning Responsibilities**

The hydro producers, who use the public resource, share responsibility with the other proponents as co-leads in the preparation of the MRMPWP. Proponency and responsibility on the Mississippi system is shared with the Mississippi Valley Conservation (MVC) as the owner of water control structures that affect the management of water levels and flows on the river system. The plan proponents will be responsible for: authoring the management plan; participating and directing the planning process; and, preparing certain technical reports and any modeling of the system required to produce the plan. The plan proponents will negotiate the sharing of role and responsibilities and project costs. Consultants may be retained by the plan proponents, however consultants will not replace representation and participation by dam and facility owners in this initiative.

The Ministry of Natural Resources and Forestry (MNRF) will provide technical support and resource management information and advice throughout the planning process. A principal role of the MNRF will be to ensure the spirit and intent of the planning guidelines are met and to facilitate and participate in consultations with First Nations and Aboriginal Communities to ensure transparency and fairness. MNRF will also perform plan review and approval functions and along with other regulatory agencies will ensure compliance with and enforcement of orders and plan provisions that fall with relevant legislation.

Decisions shall be made by consensus. Consensus is defined as a decision that participants can accept, without having to agree to all the details of the operating regime. Where consensus cannot be reached, issues shall be referred first to an MNRF administered issue resolution process and then to a formal alternate dispute resolution (ADR) mechanism. Costs for the ADR process will be borne by the proponents and the parties involved.

**Planning Process & Schedule**

Figure 2 outlines the planning schedule and key steps in the planning process for the MRMPWP and is based the Water Management Planning Guidelines for Waterpower (May, 2002). The planning schedule has an end date of December 31, 2004.

MNRF will formalize the requirement to prepare a water management plan with each of the plan proponents through the issuance of an order under the LRIA. This order will set out key milestones in the planning process and dates by which the milestones are to be achieved.

The Mississippi River Management Plan for Water Power will be prepared in accordance with the generic table of contents described in Figure 3.

Three committees to carry out specific tasks in proceeding through a planning process and preparing the MP have been established for the MRMPWP. The following identifies the individuals who are assigned to each of the three committees and generally highlights the roles and responsibilities of each committee:

**Steering Committee**

The Steering Committee has overall responsibility for ensuring that the MRMPWP initiative meets the stated goal, objectives and principles and employs an open and transparent planning process to result in a broadly acceptable plan. In the long term, the steering committee will oversee the plan's implementation and renewal.

<u>Plan Proponents:</u>

David Servos, Ontario Power Generation, Evergreen Energy (Co-Chair)
Mike Stockton, Canadian Hydro Developers Inc.
Mike Dupuis, Enerdu Power Systems Inc.
Scott Newton, Mississippi River Power Corp.
Paul Lehman, Mississippi Valley Conservation

<u>Additional Steering Committee Members:</u>

Art Currie, Ministry of Natural Resources (Co-Chair)
Bob Walroth, Ministry of Natural Resources
Chief Doreen Davis, Sharbot Mishigama Anishnabe Algonquin First Nation Spencer
Martin (alternate-Jim Niefer), Department of Fisheries and Oceans (DFO)

The primary responsibilities of the Steering Committee are:

- Prepare & Approve Terms of Reference
- Form Planning Team
- Public Notice and Invitation to Participate
- Appoint & train Public Advisory Committee (PAC)
- Develop Public & First Nations/Aboriginal Communities consultation plans
- Endorse list of initial issues & values and consult with public
- Approve identified plan objectives
- Approve data collection program
- Consult on scoping report & prepare consultation record
- Approve range of options
- Consultation on options report & prepare consultation record
- Select Preferred Option
- Consult on Draft Plan & prepare consultation record
- Submit Final Plan to MNRF for review and approval
- Establish standing advisory committee
- Approve effectiveness monitoring program procedure, schedule and reporting

**Planning Team**

The Steering Committee has appointed a Planning Team (PT) as a working body, responsible for implementation of the planning process and plan production. The Planning Team consists of:

| | |
|---|---|
| <u>Plan Proponents:</u> | Barrie Askew, Ontario Power Generation, Evergreen Energy |
| | Mike Stockton, Canadian Hydro Developers Inc. |
| | Mike Dupuis, Enerdu Power Systems Inc. |
| | Scott Newton, Mississippi River Power Corporation |
| | Gord Mountenay, Mississippi Valley Conservation |
| <u>MNRF</u>: | Anda Rungis, Planner |
| | Bob Walroth, Area Supervisor |
| | Christie Curley, Biologist |
| | Steve Bobrowicz, Biologist |
| | Norm Dallard, Engineering Technologist |
| <u>DFO:</u> | Jim Niefer |
| <u>First Nations:</u> | Chief Doreen Davis |
| <u>PAC Representative:</u> | Jim McCready |

Key Responsibilities:
- Scope WMP, in consultation w/Steering Committee & PAC
- Develop & assist in delivering PAC training, public consultations, etc.
- Identify priority issues, values & interests & describe river system
- Identify objectives (and measures to achieve objectives)
- Review and summarize baseline information for plan preparation
- Identify information gaps in terms of objectives & develop data collection program
- Develop scoping report (goal, objectives, strategies, issues)
- Develop range of options
- Socio-economic evaluation
- Report on options development & evaluation
- Develop draft plan
- Develop final plan

Paul Lehman and Mike Stockton, on behalf of the proponents, will co-chair the planning team. All proponents will be responsible for authoring the plan. All regulatory agencies will provide direction during the planning process to ensure statutory/regulatory obligations are fulfilled.

The Public Advisory Committee selected representative, Jim McCready, will be invited to participate on the planning team and will be provided a per diem in accordance with the current government rate.

In addition to the above planning team, Kristy Giles and Paul King-Fisher (MNRF Waterpower Program Staff) provide support to the MRMPWP. It may be necessary to involve other individuals as the process develops. Consultants may be retained, however consultants will not replace plan proponent participation in this exercise.

The planning team members will recognize the government of Ontario's policy preference to sustain renewable sources of energy and consider the potential where possible, for development of new sources of renewable energy including water power.

**Public Advisory Committee (PAC)**

The Steering Committee will appoint a Public Advisory Committee (PAC) to ensure the views and interests of the public, stakeholders and water resource users are brought forward, understood and considered in the development of the MP. The principle duties of this group are to facilitate public consultation at various steps in the planning process through the identification of values, issues and opportunities and to provide advice on the content of the plan. The PAC will be guided by the terms of reference established by the Steering Committee and attached in Appendix B.

Key Responsibilities:
- Identify training needs and receive training
- Prepare schedule of PAC meetings to parallel MP schedule
- Jointly hosting, with the proponents, public consultation opportunities
- Identification and consultation on issues & resource values
- Identification of plan objectives (and measures to achieve objectives)
- Consultation on scoping report
- Development of range of options
- Report on options development and evaluation
- Consultation on options report
- Consultation of draft plan

Expressions of interest will be solicited from the general public through a newspaper advertisement. All candidates will be requested to submit a letter expressing the reasons for their interest in this exercise. The Planning Team will review all expressions of interest and recommend 8 to 12 names to the Steering Committee.

**Approval of Terms of Reference by Steering Committee**
**Date: July 16, 2003**

ORIGINAL SIGNED

______________________________
**David Servos**, Ontario Power Generation (Evergreen Energy)

ORIGINAL SIGNED

______________________________
**Mike Stockton,** Canadian Hydro Developers, Inc.

ORIGINAL SIGNED

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**Scott Newton,** Mississippi River Power Corp.

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Mike Dupuis, Enerdu Power Systems Ltd.

ORIGINAL SIGNED

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**Paul Lehman**, Mississippi Valley Conservation

ORIGINAL SIGNED

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**Art Currie**, Ministry of Natural Resources

ORIGINAL SIGNED

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**Bob Walroth**, Ministry of Natural Resources

ORIGINAL SIGNED

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**Spencer Martin**, Department of Fisheries and Oceans

ORIGINAL SIGNED

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**Chief Doreen Davis**, Sharbot Mishigama
Anishinabe Algonquin First Nation

The planning process included consultation with the public from its outset in early 2003. An "Invitation to Participate" (paid advertisement) was placed in local and regional newspapers in February 2003 to announce the beginning of the planning process. In addition to identifying individuals interested in serving on the project's Public Advisory Committee, this consultation resulted in a mailing list for the project.

A 12 member Public Advisory Committee (PAC) was established in April, 2003 to bring forward the broad spectrum of interests associated with water level and flow management on the Mississippi system. The PAC's principle duties were to assist the plan proponents in carrying out public consultation and to provide advice and comment on the content of the Mississippi River Water Management Plan (MRWMP).

During the "Scoping Stage" of planning two open houses were held in July 2003, one in the western portion of the watershed in Cloyne and the second in the central part of the watershed at the Mississippi Valley Conservation (MVC) office in Lanark. The open houses displayed general information on water management planning as well as the description of the planning process and time lines for this project. Background information about the current water management system and the fish and wildlife values of the system were also displayed.

Questionnaires were provided to the participants at the open houses. The majority of the input received at the open houses focused on the lakes in the western portion of the system and their interaction and influence on the downstream sections of the system. In addition to the open house input, additional written contributions were received from municipalities, lake associations and the general public during the consultation period.

A Scoping Report, summarizing the characteristics of dam operations, physical and biological resources within the planning area and outlining the MRWMP planning issues and objectives was released in May, 2004 for a 30 day review period at the conclusion of the "Scoping Stage" of planning. The comments received were added to the public record and brought forward for consideration in the planning process.

The MRWMP began "Options Development" by examining the issues raised in the planning process. The document entitled "Comments and Responses" was first publicly released in September, 2004 and provides background information for specific issues, identifies those issues for which options will be developed and what action will be undertaken by the MRWMP project to address an issue. The document also identifies those issues which are out of the scope of the MRWMP exercise and commits to forwarding the specific issue to the appropriate public agency.

Open houses for the "Options Development" stage were advertised concurrent with the release of the Comments and Responses document and held during October, 2004 in Northbrook and Lanark. The "Options Development" open houses focussed on describing the management alternatives considered in the planning process. Input received at the open houses was directed to the planning team for further consideration in the further refinement of options for the MRWMP.

The "Options Development" phase of the planning process concluded with the release of the Options Development Report (June, 2005) on July 5, 2005 for a 30 day public review.

The "Draft" Mississippi River Water Management Plan information centres took place on August 19 and 20, 2005 in Cloyne and the Village of Lanark, respectively.

During the above phases of the planning process, the public received notice of upcoming open houses through paid advertisements in local and regional newspapers, news releases and posters in watershed municipal offices, libraries and local businesses. Direct mailings to the project mailing list, municipalities, cottage associations and interest groups were undertaken each time a report was released and in advance of information centres. Participants at the open houses had the opportunity to identify matters of interest and concerns by meeting with dam and hydro facility owners, PAC representatives and Ministry of Natural Resources and Forestry (MNRF) staff.

The internet was also used as a communication tool in the preparation of the MRWMP. Background information, reports, notices of open houses, meeting minutes and other information related to the MRWMP is located on the project website at http://www.mississippiwaterpowerplan.com. Also, an information notice was posted on the Environmental Bill of Rights Registry and was updated throughout the planning process.

Copies of reports produced in the MRWMP exercise were available for public review at local government offices (municipal, MNRF, MVC) and public libraries within the planning area and were provided in electronic format, upon request, from the Mississippi Valley Conservation.

The results of the Public Consultation are found in this Plan. General concerns about watershed wide issues are described in Section 4.2, and specific comments that apply to an individual reach, water control structure or generating station can be found in Section 7 in each individual reach description. The final version of the Comments and Responses Report, a document prepared to formally respond to questions and issues raised in the water management planning process for the Mississippi River, is found in Appendix 8.

The following summarizes the actions taken through consultation with the public and government agencies in the Mississippi River Water Management Plan planning process and the resulting responses.

| **PHASE 1 - Organizing for Planning** | | |
|---|---|---|
| **DATE** | **ACTION** | **RESPONSE** |
| mid February, 2003 | **Invitation to Participate Newspaper Advertisement in a total of 10 (local, regional and french language) newspapers to establish mailing list and seek interested candidates for Public Advisory Committee. Project contacts identified.** | Individuals interested in serving on PAC submitted applications for consideration. |
| | Initial mailing list assembled including interest group, government & non-government agencies, lake association representatives, etc. | Mailing list updated as new information is provided. |
| | | |
| 14-Mar-03 | Fax sent to watershed municipalities with Invitation to Participate advertisement identifying that the project is seeking interested candidates from municipalities and other sectors for the PAC. | |
| | **Public Advisory Committee applications reviewed & 12 member Public Advisory Committee selected.** | 1st PAC meeting held on May 14, 2003 |
| Summer/03 | **Invitation to Participate revised to incude statement about PAC establishment. This notice was distributed by PAC members to their local constituents (lake associations, etc.) as required.** | |
| | | |
| **PHASE 2 - Scoping** | | |
| **DATE** | **ACTION** | **RESPONSE** |
| 23-Jul-03 | **Environmental Registry Posting - Invitation to Participate - to identify the commencement of planning and opportunities for public consultation throughout planning process.** | |
| June/July 2003 | **Mail out to Interested Individuals - to advise of upcoming information centre.** | |
| July, 2003 | **Newspaper Advertisements to advise of upcoming information centre.** | |
| 25-Jul-03 | **First Information Centre held in Cloyne to invite public participation and view background information.** | Individuals responded by completing questionnaires & submitting written input. All input is summarized in Comments & Responses document. |

| | | |
|---|---|---|
| 26-Jul-03 | **First Information Centre held in Lanark to invite public participation and view background information.** | Individuals responded by completing questionnaires & submitting written input. All input is summarized in Comments & Responses document. |
| 30-Jul-03 | **Letter acknowledging input provided at Information Centre would be considered in planning process was sent to all individuals who provided comments/name & address by MNRF.** | |
| Fall, 2003 | **MRWMP Project Website Established - terms of reference, background information, meeting minutes and other project information posted.** | |
| **PHASE 2 - SCOPING continued…** | | |
| **DATE** | **ACTION** | **RESPONSE** |
| 5-May-04 | **MRWMP Project Website Updated to include dowloadable version of Scoping Report, electronic comment form for providing input regarding Scoping Report, project team minutes posted on website for information purposes.** | |
| 6-May-04 | **Environmental Registry Posting Updated - to indicate availability of Scoping Report for 30 day public review.** | |
| 6-May-04 | **Mail out to project list to ensure interested individuals and agencies are notified that Scoping Report has been released for 30 day public review.** | Input provided during Scoping Report review phase is included in Comments & Responses document. |
| | | |
| **PHASE 3 - Options Development** | | |
| **DATE** | **ACTION** | **RESPONSE** |
| 13-Sep-04 | **Environmental Registry Posting Updated - to provide notification of upcoming Options Development Information Centres.** | |
| September, 2004 | **Mailing to interested individuals & agencies on project mailing list to advice of dates/locations for upcoming Options Development Information Centre.** | |
| September, 2004 | **MRWMP Project Website updated to provide details for upcoming Options Development Information Centre and availability of Response to Issues document as well as updated meeting minutes, etc.** | |
| September, 2004 | **Notice posted in local municipal offices, libraries and businesses in Northbrook and Lanark area to advertise upcoming Options Development Information Centre. Response to Issues document available in local libraries and municipal offices.** | |

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| 2-Oct-04 | **2nd Information Centre for Development of Options held in Northbrook.** | 5 people attended the open house. Comments provided were recorded by Mississippi River Water Management Plan team members and included in Comments and Responses document. |
| 6-Oct-04 | **2nd Information Centre for Development of Options held in Lanark.** | 25 people attended open house. Comments provided were recorded by Mississippi River WMP team members and included in Comments & Responses document. |
| 5-Jul-05 | **EBR notice updated to identify that Options Development Report is available for 30 day public review.** | |
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| | | |
| **PHASE 3 - Options Development continued...** | | |
| **DATE** | **ACTION** | **RESPONSE** |
| 5-Jul-05 | **Options Development Report available in local municipal offices and libraries for public review.** | 2 individuals provided comments concerning Options Development. |
| 5-Jul-05 | **MRWMP Project Website updated to include downloadable copy of Options Development Report. Public comments can be submitted via electronic comment form.** | 1 comment received via electronic comment form. Planning team to provide response. |
| 20-Jul-05 | Comment received via electronic comment form requesting notice to snowmobile clubs regarding unsafe ice conditions. | Correspondence sent October 17, 2005 clarifying MVC role in providing notice. |
| | | |
| **PHASE 4 - Draft Plan Review** | | |
| **DATE** | **ACTION** | **RESPONSE** |
| August, 2005 | **Newspaper Advertisements - in local and regional newspapers to provide advance notice of 3rd Information Centre for Draft Plan Review** | |
| August, 2005 | **Notice mailed to project mailing list to advise of Information Centre for Draft Plan Review and availability of draft Mississippi River Water Management Plan.** | |
| 15-Aug-05 | **EBR notice & MRWMP project website updated to advise of upcoming 3rd Information Centre for Draft Plan Review & announce that the draft Mississippi River Water Management Plan is available for public review until September 20, 2005.** | |

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| 15-Aug-05 | **Draft Mississippi River Water Management Plan available in local municipal offices and libraries for public review.** | |
| 19-Aug-05 | **3rd Information Centre for Draft Plan Review - held in Cloyne.** | An estimated 14 people attended the open house. |
| 20-Aug-05 | **3rd Information Centre for Draft Plan Review - held in Lanark.** | An estimated 12-15 people attended the open house. |
| | | |
| **Summary of Input Received during Draft Plan Review** | | |
| **DATE** | **COMMENT** | **RESPONSE** |
| 16-Aug-05 | Individual indicated support for Mazinaw Lake regime as proposed. Expressed concern with boat traffic at Narrows. | Planning Team considered input. Letter of response sent Dec.2/05. Address updated in mailing list |
| 19-Aug-05 | Individual indicated support for current water management. | Comments presented to Planning Team. Added to mailing list |
| 19-Aug-05 | 3 individuals requested they be added to mailing list | Inidivudal names and addresses added to mailing list |
| 20-Aug-05 | Individual suggested Mazinaw rule-curve still counter-productive. Identified constraints in system if a new structure was to be considered at Dalhousie Lake or Sheridans Rapids. | Plan Team considered input. |
| | | |
| | | |
| **Summary of Input Received during Draft Plan Review continued…** | | |
| **DATE** | **COMMENT** | **RESPONSE** |
| 20-Aug-05 | Individual suggested edits to draft plan pertaining to natural resources. Indicated support for Shabomeka Lake operating range proposal and recommended monitoring. Questioned a number of natural resource matters related to upper lakes in Mississippi system. | Planning Team considered input. Edits made to MRWMP. MNRF letter sent Dec 23, 2005 |
| 20-Aug-05 | Individual suggested more automated streamflow and precipitation stations in the upper Mississippi basin as well as reinstallation of the Ragged Chute streamflow station would be useful. Requested to be added to mailing list. | Planning Team considered input. No changes necessary to MRWMP. Added to mailing and email list. |
| 20-Aug-05 | Individual indicated interest in participating on future MRWMP Standing Advisory Committee. | General information was provided at open house as to formation of Standing Advisory Committee. Individual added to mailing list |

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| 25-Aug-05 | Individual indicated concurence with draft plan preferred option. Also expresses concern with water level conditions causing ice to drop in January resulting in shoreline damage and safety issues. | Correspondence sent November 16, 2005 in response to questions raised about ice safety. |
| 22-Aug-05 | Individual requested additional information concerning Shabomeka Lake options considered in MRWMP. | Planning Team considered input. MNRF letter sent Dec. 2, 2005 |
| 30-Aug-05 | MOE will provide information related to waste assimilation requirements and water taking permits, as required, during implementation phase of MRWMP. | Input presented to planning team. |
| 1-Sep-05 | Ministry of Culture requested further details about extent of land disturbance anticipated. Interest relates to potential for impacting heritage resources. | Follow up phone call was made by Mississippi Valley Conservation staff to discuss draft plan recommendations and planning process. |
| 2-Sep-05 | Cottage association representative of property owners on Big Gull Lake indicated they can live with current drawdown and operations as long as general levels are maintained. Also indicated interest in continuing to maintain spawning bed habitat improvements with the assistance of MNRF. | Comment acknowledged by Planning Team. |
| 15-Sep-05 | Town of Carleton Place indicates support for the draft plan and preferred option. | Comment acknowledged by Planning Team. |
| 16-Sep-05 | Individual satisfied with management of Kashwakamak Lake levels.  Noted that ecology of lake is changing as witnessed by fewer aquatic fish and turtles and therefore ecology of lake is an important part of the management plan. | Correspondence sent Nov 16, 2005 in response to questions raised. |
| 19-Sep-05 | The Department of Fisheries and Oceans indicates "no comment" with respect to finalization of draft plan. | Comments presented to Planning Team. |
| | | |
| **Summary of Input Received during Draft Plan Review continued…** | | |
| **DATE** | **COMMENT** | **RESPONSE** |
| 19-Sep-05 | MRWMP Public Advisory Committee provided letter of support with specific suggestions for improving final document. | Planning Team worked with PAC to address specific comments in final Mississippi River Water Management Plan. PAC endorsement of final MRWMP received January 4, 2006. |

| | | |
|---|---|---|
| 20-Sep-05 | Individual comments indicate that water levels experienced on Crotch Lake are not as stated in the part of the draft plan. Concerned with increased water levels after walleye and bass begin spawning destroying the spawn and management of the lake during the winter season resulting in downstream flooding. Suggests that a different management approach is required from what is proposed for Crotch Lake. | Correspondence sent Dec 14/05 providing background information about Crotch Lake in response to concerns . No specific changes proposed to final water management plan as a result of input. |
| 20-Sep-05 | Environmental group indicates the draft plan is in general, a good "point in time" statement re. a number of water management issues. Climate change challenges not addressed. Comments regarding: establishing priorities where all needs cannot be met; minimum flows for tourism and aesthetics; pollution issues; Recommends state of the basin reporting every 3 years. | Comments considered by Planning Team. MVC staff discussed climate change challenges with individual providing the input. |
| 11-Oct-05 | Review conducted by the Ministry of Natural Resources staff in Southern Region identfied "required" changes to the draft plan as well as offered editorial and content suggestions to improve the readability of the draft plan. | Planning team carefully considered all comments identified in the MNRF review. All required changes were incorporated in the final plan as well as most of the recommended editorial suggestions. |

# Mississippi River Water Management Plan

*An integrated approach to maximize all uses of the river including Waterpower, Flood Control & Low Flow Augmentation, Fish and Wildlife, and Tourism and Recreation*

## *Option Development Report*

## June 6, 2005

Mississippi Valley Conservation

ONTARIO POWER GENERATION

***Enerdu, Inc.***

CANADIAN HYDRO DEVELOPERS, INC.

***Mississippi River Power Corporation***

Ministry of Natural Resources
Ministère des Richesses naturelles
Ontario

## Mississippi River Water Management Plan
## Option Development Report

### Table of Contents

## Introduction

The Option Development phase considered possible changes in operations in response to comments received during public consultation while considering all objectives and constraints of the system. Included in this report is the background for areas considering alternate options, the option development process followed to assess the options, the results of the assessment and the final preferred option.

For the option development process the Planning Team provided direction and developed the range and number of options to be explored with input from the Public Advisory Committee (PAC). The Steering Committee decided on the range and number of options to be considered. Two open houses occurred in October 2004 to present the options being considered to the public.

The following provides a description of the base case, alternatives evaluated and the preliminary preferred option. The preliminary preferred option is the result of the evaluation and analysis of fourteen options.

The study area has been defined as the Mississippi River and interconnecting lakes. The background provided below incorporates the reaches and facilities within the study area for which options were considered.

The final plan will be prepared according to the Water Management Planning Guidelines for Waterpower (May 2002) and other applicable direction and will result in a comprehensive water management plan (WMP) being prepared for the Mississippi River system.

## Section 1 Background

### 1.1 Shabomeka Lake

#### Physical Description

Located on Semi Circle Creek, Shabomeka Lake (a.k.a. Buck Lake) is a headwater lake, which flows into Mazinaw Lake.

The lake has:
- A drainage area of 41 sq. km
- A maximum depth of 32 m
- An average depth of 12.4 m
- A total storage volume of 536 ha. m.
- Approximately 99 residential buildings on this lake, with about 1/4 of them having boat access only

Flooding of the access road, shoreline flooding, and overtopping the dam have been a concern in the past. Ice damage can be a concern especially in years where there is little to no snow to ensure filling of the lake in the spring.

#### Dam Operations

The dam consists of a single concrete sluice containing eight 0.25 m x 0.25 m x 2.44 m stoplogs. An earth embankment on either side of the sluice forms the remainder of the dam. The elevation of the deck of the dam is 271.67 m. The dam is owned and operated by MVC with the actual removal and replacement of stoplogs done by a local contractor.

The dam is operated early in the spring to capture runoff to ensure meeting summer levels. Lake levels are maintained between 270.90 m (above sea level - a.s.l.) and 271.10 m throughout the summer months, with virtually no outflow from the lake during this period under normal conditions. The fall drawdown begins mid September with 7 of the 8 stoplogs in the dam being removed by early October. The early drawdown is undertaken in an attempt to have lake levels stable prior to the lake trout spawning. The lake normally reaches its minimum level of 269.50 m by early November.

**Biological Resources**

Lake trout have been documented spawning at several locations throughout Shabomeka Lake. The shoals, however, are susceptible to the fall drawdowns, and concerns have been raised regarding the survival of lake trout eggs here over winter. A spawning habitat rehabilitation project at this site to address this concern was completed on two shoals on the south shore of the lake in 1988, and lake trout were observed utilizing one of the two rehabilitated sites in 1990. Currently the lake trout population in Shabomeka Lake is maintained through stocking. Spawning sites of other species have not been assessed.

The following table provides a summary of the management objectives and constraints which guide operations over the course of the year. The relative importance given to these objectives will vary throughout the year in response to the potential risks imposed by emerging weather and watershed conditions.

**Figure 1a Temporal and Spatial Table for Operational Considerations and Constraints**

| Shabomeka Lake Dam | Spring (Mar 1 – May 31) | Summer (May 23 – Oct 15) | Fall (Sept 15 – Dec 1) | Winter (Nov 15 – Mar 15) |
|---|---|---|---|---|
| | | | | |
| **Flooding** | Maximum 271.20m, Twp road floods at 271.25 m, dam overtops at 271.45 m, dwelling flooding starts at 272.00 m. | Dam overtops at 271.45 m.<br>Maximum Target 271.10 m<br>Dock / Nuisance flooding at 271.20 m | No concern on lake due to draw down. Draw down assists in reduction of spring flood magnitudes downstream | No concern due to draw down |
| **Fisheries – Lake Trout** | No concern | No concern | Draw down -Sept 15 – Oct 15<br>Minimum Lake level for spawning estimated at 269.85 m | Stable levels at or above 269.85 m |
| **Walleye** | N/A | N/A | N/A | N/A |
| **Bass** | N/A | N/A | N/A | N/A |
| **Other** | N/A | N/A | N/A | N/A |
| **Wildlife** | Stable water levels after ice out for loons/nesting birds if possible | No concern | Criteria met through operation for lake trout | Criteria met through operation for lake trout |
| **Recreation / Tourism** | Stable levels at 270.96 (+/- 0.10) m from long weekend in May through September | Stable levels at 270.96 (+/- 0.10) m | No concern | Stable ice conditions for ice fishing / snowmobiling |
| **Erosion** | Maintain levels below 271.10 m | Maintain levels below 271.10 m | No concern | No concern |
| **Navigation** | No concern | No concern | Access to boat only access properties not been raised as a concern | N/A |
| **Ice** | Minimize ice movement to reduce shoreline damage | N/A | N/A | Minimize ice movement to reduce shoreline damage |
| **Low Flow Aug** | N/A | Limited storage volume so little impact on main river system | Draw down begins mid September so augmentation implicit | Drawdown used to assist in refilling Crotch Lake |
| **Power** | N/A | N/A | N/A | N/A |

| | | | | |
|---|---|---|---|---|
| **Generation** | | | | |

## 1.2 Mazinaw Lake

### Physical description

Located on the main channel of the Mississippi River, this is the first major lake on the river system and is also considered a headwater lake although it is not operated as such due to the significant drainage area above the dam.

The lake has:
- A total drainage area of 339 sq. km
- A maximum depth of 145 m
- An average depth of 41.2 m
- A total storage volume of 3423 ha. m
- Two distinct basins – upper and lower which are separated by a narrow channel at the base of Mazinaw rock
- Approximately 314 residential buildings, at least 4 marinas, and one provincial park (all of the residential buildings on the east shore are boat access only)

Flooding of low properties and docks and overtopping of the dams emergency bypass channel has occurred. Downstream flooding, specifically on Little Marble and Marble Lake are a common occurrence if the dam has to be operated under high flow conditions.

### Dam Operations

The dam is a concrete structure consisting of two sluices each containing seven 0.25 m x 0.30 m x 3.95 m stoplogs. There is also an emergency bypass channel, which is at an elevation of 268.20 m and acts as the access to the dam. The dam is owned and operated by MVC with the actual removal and replacement of stoplogs done by a local contractor.

This dam is not normally operated in the spring until levels have stabilized from runoff. Stoplogs are then replaced to either maintain or bring lake levels up to summer requirements while maintaining adequate flow for walleye spawn below the dam. Lake levels are maintained between 267.90 m and 267.60 m throughout the summer months with a minimal flow being passed through the dam to keep water in the downstream channel. Although this is a lake trout lake, the fall drawdown on this lake does not occur until after the deer hunting season, which is usually the 2$^{nd}$ week of November. This ensures adequate water in the lake to allow navigation through the narrows between the upper and lower lakes as well as access to the east shore residences. The lake normally reaches it minimum levels in mid January at 266.70 m. Eight of the total fourteen stoplogs in the dam are removed between mid-November and mid-December.

### Biological Resources

There are three identified lake trout spawning shoals in Mazinaw Lake; the primary shoal is located on the south shore of Campbell Bay. This shoal is susceptible to the fall drawdowns, and concerns have been raised regarding the survival of lake trout eggs here over winter. A habitat rehabilitation project at this site to address this concern was completed in recent years; however; its success has yet not been assessed. The other known lake trout spawning sites are located at the Narrows, and on the east shore of the south basin. Deep water spawning activity is suspected in Mazinaw Lake, however, no sites have been confirmed.

Walleye spawn throughout the south basin, as well as at inflows in Campbell Bay, German Bay, and at the extreme north end of the lake.

Spawning sites of other species have not been assessed.

The following table provides a summary of the management objectives and constraints, which guide operations over the course of the year. The relative importance given to these objectives will vary throughout the year in response to the potential risks imposed by emerging weather and watershed conditions.

**Figure 1b Temporal and Spatial Table for Operational Considerations and Constraints**

| Mazinaw Lake Dam | Spring (Mar 1 – May 31) | Summer (May 23 – Oct 15) | Fall (Sept 15 – Dec 1) | Winter (Nov 15 – Mar 15) |
|---|---|---|---|---|
| | | | | |
| **Flooding** | Maximum 268.00m, emergency bypass floods at 268.20 m, dam overtops at 269.00 m, dwelling flooding begins at 268.55 m. | Maximum 268.00m,.Dock / Nuisance flooding at 268.00 m | Maximum 268.00m,.Dock / Nuisance flooding at 268.00 m | No concern on lake due to draw down. Draw Down assists in reduction of spring flood magnitudes downstream |
| **Fisheries – Lake Trout** | No concern | No concern | Draw down - mid November after spawn has taken place, potential cause of reduction in spawn survival | Stable levels at or above 266.8 m not reached until January after ice is on lake |
| **Walleye - on lake<br><br>- downstream of dam** | No concern, covered by natural filling of lake in spring<br>Critical to slow flow and maintain flow before or early in spawn period | No concern | No concern | No concern |
| **Bass** | Not applicable | Not applicable | Not applicable | Not applicable |
| **Wildlife** | Stable water levels after ice out for loons/nesting birds if possible | No concern | Burying amphibians, reptiles etc and wildlife muskrats, beaver etc at risk since lake doesn't reach minimum levels until after ice on. | Burying amphibians, reptiles etc and wildlife muskrats, beaver etc at risk since lake doesn't reach minimum levels until after ice on. |
| **Recreation / Tourism** | Stable levels at 267.80 (+/- 0.10) m from long weekend in May through September | Stable levels at 267.80 (+/- 0.10) m<br>Allow access to pictographs, beach at Bon Echo | Stable levels at 267.80 (+/- 0.10) m | Stable ice conditions for ice fishing / snowmobiling / cottage access |
| **Erosion** | No concern | No concern | No concern | No concern |
| **Navigation** | No concern | No concern | Access to boat only access properties and through narrows must be maintained until after hunting season | No concern |
| **Ice** | Minimize ice movement to reduce shoreline damage | Not applicable | Not applicable | Minimize ice movement to reduce shoreline damage |
| **Low Flow Aug** | Not applicable | Maintain minimal flow (undefined) | Use all of target range to 267.60 m if required | Drawdown used to assist in refilling Crotch Lake |
| **Power Generation** | Not applicable | Not applicable | Not applicable | Not applicable |

## 1.3 Kashwakamak Lake

**Physical Description**

Located on the main channel of the Mississippi River, Kashwakamak Lake (a.k.a. Long Lake) is dominated by numerous inlets and shallow bays.

The lake has:

- A total drainage area of 417 sq. km
- A maximum depth of 22 m
- An average depth of 8.4 m
- A total storage volume of 3822 ha. m
- Approximately 377 residential structures on the lake and at least 5 resorts
- Other than property on islands, there are no boat access only dwellings on this lake

Flooding of property and docks has occurred on occasion in the past although flooding of dwellings has not been a problem.

**Dam Operations**

The dam is a concrete structure consisting of two sluices each containing ten 0.30 m x 0.30 m x 3.43 m stoplogs and an overflow weir with an elevation of 261.06 m which regulates levels throughout most of the summer. MVC owns and operates this structure.

As runoff starts to occur in the spring, the dam is operated to slowly bring lake levels up to summer requirements while trying to minimize shoreline damage from ice movement. It is important to have the lake level near summer target levels prior to the start of the walleye spawn if possible because of the prime spawning shoal at the head of the lake at Whitefish Rapids. Lake levels are maintained between 261.00 m and 261.20 m throughout the summer months with a minimal flow being passed through the dam to keep water in the downstream channel. The fall drawdown begins after Thanksgiving weekend with 14 of the 20 stoplogs removed during the drawdown. Lake levels normally drop to around 260.20 m by the end of October and remain relatively constant as the drawdown of Mazinaw Lake commences. The lake reaches its minimum winter elevation of 259.65 m by the end of February.

**Biological Resources**

Kashwakamak Lake has an abundant walleye population that is known to spawn near the main inlet at Whitefish Rapids and at several locations along the north shore of the lake.

Bass reproduction has been assessed in the lake; bass nesting activities have been documented throughout Kashwakamak Lake, though higher nest densities occur in shallow bays on the north and east ends of the lake.

Northern pike reproductive activities have been recorded at two shallow sites in the extreme eastern end of the lake.

Kashwakamak Lake formerly supported lake trout, however that species has been extirpated from the lake.

Certain shoreline wetland habitats on the lake provide suitable habitat for a turtle species at risk, known as Blanding's turtle.

The following table provides a summary of the management objectives and constraints, which guide operations over the course of the year. The relative importance given to these objectives will vary throughout the year in response to the potential risks imposed by emerging weather and watershed conditions.

**Figure 1c Temporal and Spatial Table for Operational Considerations and Constraints**

| Kashwakamak | Spring | Summer | Fall | | Winter |
|---|---|---|---|---|---|

| Lake Dam | (Mar 1 – May 31) | (May 23 – Oct 15) | (Sept 15 – Dec 1) | (Nov 15 – Mar 15) |
|---|---|---|---|---|
| | | | | |
| **Flooding** | Maximum 261.35m, Emergency spillway overtops at 261.67, dwelling flooding at 261.60.m | Maximum Target 261.10 m, nuisance / dock flooding starts at 261.30 m | No concern on lake due to draw down. Draw Down assists in reduction of spring flood magnitudes downstream | No concern due to draw down |
| **Fisheries – Lake Trout** | Not applicable | Not applicable | Not applicable | Not applicable |
| **Walleye** | Spawning at Whitefish Rapids requires lake at 260.50 m (estimated not corroborated by survey or site evaluation) or above | No concern | No concern | No concern |
| **Bass** | Ensure adequate water to cover shoals, accomplished by being at / near target of 261.10 m by long weekend of May | Spawning in June – stable levels at or near target of 261.10 m | No concern | No concern |
| **Other – Pike** | No concern | No concern | No concern | No concern |
| **Wildlife** | Stable water levels after ice out for loons/nesting birds if possible | No concern | Lake at or below 260.20 prior to freeze up / start of Mazinaw draw down to ensure survival of burying amphibians/wildlife | Minimum levels of 259.60 m |
| **Wild Rice** | No concern | Minimal outflows after 1st of June to facilitate growth of wild rice downstream in village of Ardoch | Consistent and minimal outflows maintained through growth and harvest of wild rice (end of September) | No concerns |
| **Recreation / Tourism** | Stable levels at 261.10 (+/- 0.10) m from long weekend in May through September | Stable levels at 261.10 (+/- 0.10) m | No concern | Stable ice conditions for ice fishing / snowmobiling |
| **Erosion** | Maintain levels below 261.20 m | Maintain levels below 261.20 m | No concern | No concern |
| **Navigation** | Access to the lake as early as possible after ice out | Levels below 261.00 m make numerous bays hazardous to access (historical complaints ) | Levels below 261.00 m make numerous bays hazardous to access | No concern |
| **Ice** | Minimize ice movement to reduce shoreline damage | Not applicable | Not applicable | Ensure stable levels for safety of ice fisherman, snowmobilers |
| **Low Flow Aug** | Not applicable | During droughts, minimal flow maintained using all of target range, flow | During droughts, minimal flow maintained using all of target range, flow will | Drawdown used to assist in refilling Crotch Lake |

| | | | | |
|---|---|---|---|---|
| | | will vary depending on severity/timing of drought | vary depending on severity/timing of drought | |
| **Power Generation** | Not applicable | Not applicable | Not applicable | Not applicable |

### 1.4 Crotch Lake

**Physical Description**

The most significant lake on the Mississippi River with respect to flood control and low flow augmentation, Crotch Lake (a.k.a. Cross Lake) is the only true reservoir lake in the watershed.

The lake has:
- A total drainage area of 1030 sq. km
- A maximum depth of 31 m
- An average depth of 8.4 m
- A total storage volume of 7617 ha. m
- Three resorts on the lake and a few residential buildings
- Primarily surrounded by Crown or OPG owned land

**Dam Operations**

The dam consists of two main components, a single concrete sluice containing sixteen 0.30 m x 0.30 m x 4.20 m stoplogs and a 110 m rock filled gabion basket weir designed to be overtopped at elevations above 240.00 m (the design specifications limit the overtopping to 0.50m). Bottom 3 stoplogs are bolted together and anchored into the dam so they can not be removed. The dam is owned and operated by OPG with the actual removal and replacement of stoplogs done by MVC.

The lake fluctuates by up to 3 m twice a year to augment downstream flows and provide storage for spring runoff to reduce downstream flooding. In the spring, the lake level is down to an elevation of approximately 237.00m with up to 12 logs out of the sluice. As runoff begins in the spring, stoplogs are replaced, to increase lake levels. It is extremely important to determine when walleye begin spawning on the lake as water levels cannot drop below the elevation at which they began to spawn for a period of six weeks. The lake is filled to an elevation between 239.50 m and 240.00 m and operated to maintain these levels until late June. Usually beginning around the first of July, one stoplog is removed from the dam about every 10 days to maintain at least an average downstream flow of 5 cms throughout the remainder of the summer. The lake declines steadily and by mid to late September is again near an elevation of 237.00 m. After Thanksgiving weekend, the logs are replaced in the dam to capture the water from the drawdown being done on the five upper lakes while maintaining a minimum flow at High Falls G.S. of 5 cms. By mid January the lake is normally back to an elevation between 239.00 m and 239.50 m and stoplogs are again removed to maintain at least the minimum downstream flow of 5 cms.

It is important to understand that when Crotch Lake is being filled, downstream flows are maintained through tributary flows below Crotch Lake and/or from the drawdowns being undertaken on the upper lakes. Flows are maintained based on the availability of water in the system. When the drawdown on Crotch Lake is being undertaken and the storage is being utilized, this is when Crotch Lake maintains the average flow of 5cms to the downstream system. Flows higher than 5cms during these periods are a result of additional runoff from precipitation events.

**Biological Resources**

Walleye are documented as spawning in high numbers at several locations in Crotch Lake. The primary spawning shoal and staging area is located at Sidedam Rapids; a seasonal fish sanctuary is in force from 01 March until the first Monday in June to protect fish spawning in this area. Another important spawning site for walleye is documented at King Falls, both above and below the dam. Walleye spawning has also been documented around islands in the north basin, as well as at two inlets to Fawn Lake and on Gull Creek, upstream from Crotch Lake.

Crotch Lake formerly supported lake trout, however that species has been extirpated from the lake.

Spawning sites of other species have not been assessed.

Crotch Lake area is the site of nesting bald eagles. This bird species at risk is listed as endangered by the Committee on the Status of Species at Risk in Ontario (COSSARO). This means the species is at risk if extinction or extirpation in Ontario.

The following table provides a summary of the management objectives and constraints, which guide operations over the course of the year. The relative importance given to these objectives will vary throughout the year in response to the potential risks imposed by emerging weather and watershed conditions.

**Figure 1d Temporal and Spatial Table for Operational Considerations and Constraints**

| Crotch Lake Dam | Spring (Mar 1 – May 31) | Summer (May 23 – Oct 15) | Fall (Sept 15 – Dec 1) | Winter (Nov 15 – Mar 15) |
|---|---|---|---|---|
| | | | | |
| **Flooding** | Minimum levels at/near 237.00 m for maximum flood storage. Uncontrolled flows at 240.00 m – top of weir. Structural stability concerns at 240.50 m | Uncontrolled flows at 240.00 m – top of weir. Structural stability concerns at 240.50 m | Uncontrolled flows at 240.00 m – top of weir. Structural stability concerns at 240.50 m. | Uncontrolled flows at 240.00 m – top of weir. Structural stability concerns at 240.50 m. Max level 239.50 m to allow for spring freshet |
| **Fisheries – Lake Trout** | Not applicable | Not applicable | Not applicable | Not applicable |
| **Walleye** | Lake level should not drop below level at which spawning begins. Flows should be maintained for 5 weeks for downstream river spawners at same time. Lake level high enough to provide access to Gull Creek shoals | No concern | No concern | No concern |
| **Bass** | No concern | Flows maintained to ensure spawn survival throughout June at Snow Road | No concern | No concern |
| **Other – Pike** | Filling of lake in March as per normal operations addresses pike spawning concerns | No concern | No concern | No concern |
| **Wildlife** | No concern | No concern | No concern | Burying amphibians, reptiles etc and wildlife muskrats, beaver etc at risk since lake doesn't reach minimum levels until after ice on. |

| | | | | |
|---|---|---|---|---|
| **Recreation / Tourism** | No concern | When flows exceed 15 cms at High Falls G.S. water levels on Crotch Lake will be maintained. | No concern | No concern |
| **Erosion** | Rock shoreline – no concern | Rock shoreline – no concern | Rock shoreline – no concern | Rock shoreline – no concern |
| **Navigation** | No concern | No concern | Access to Fawn Lake / boat launch | Not applicable |
| **Ice** | No concern for shoreline damages. Drawdown inherent risk to snowmobilers | Not applicable | Not applicable | Filling and drawdown inherent risk to snowmobilers due to ice movement |
| **Low Flow Aug** | Maintain minimum flow of 5 cms at High Falls G. S. No concern until after runoff over as dam operated for flooding and fisheries issues | Avg. flows between 5 and 15 cms maintained throughout summer dependant on availability of water from rainfall. Lake at or near 240.00 by July to ensure adequate water supply to meet 5 cms requirement at High Falls G.S. | Maintain at least minimum avg. flow of between 5 and 15 cms at High Falls G.S. as drawdown from upper lakes occurs until lake reaches 239.50 m | Maintain minimum flow of 5 cms at High Falls G.S. |
| **Power Generation** | If water available in Crotch Lake due to rainfall / snowmelt runoff, maintain flows of 15 cms as long as not at the expense of flooding, fisheries or low flow augmentation. | If water available in Crotch Lake due to rainfall, maintain flows of 15 cms as long as not at the expense of flooding, fisheries or low flow augmentation. | If water available in Crotch Lake due to rainfall maintain flows of 15 cms as long as not at the expense of flooding, fisheries or low flow augmentation. | If water available in Crotch Lake due to rainfall / snowmelt runoff, maintain flows of 15 cms as long as not at the expense of flooding, fisheries or low flow augmentation. |

# SECTION 2  Option Development Process

## 2.1 Summary of Option Development Approach

The Option Development Process considered all issues identified during this process. All issues are documented in the Comments and Responses Document (Appendix A). All issues which were within the scope of water management planning and did not result in a direct conflict with the constraints or objectives and required further analysis through option development are outlined in Appendix B. Additional options were brought forward by members of the Planning Team in response to concerns and opportunities identified at the planning table.

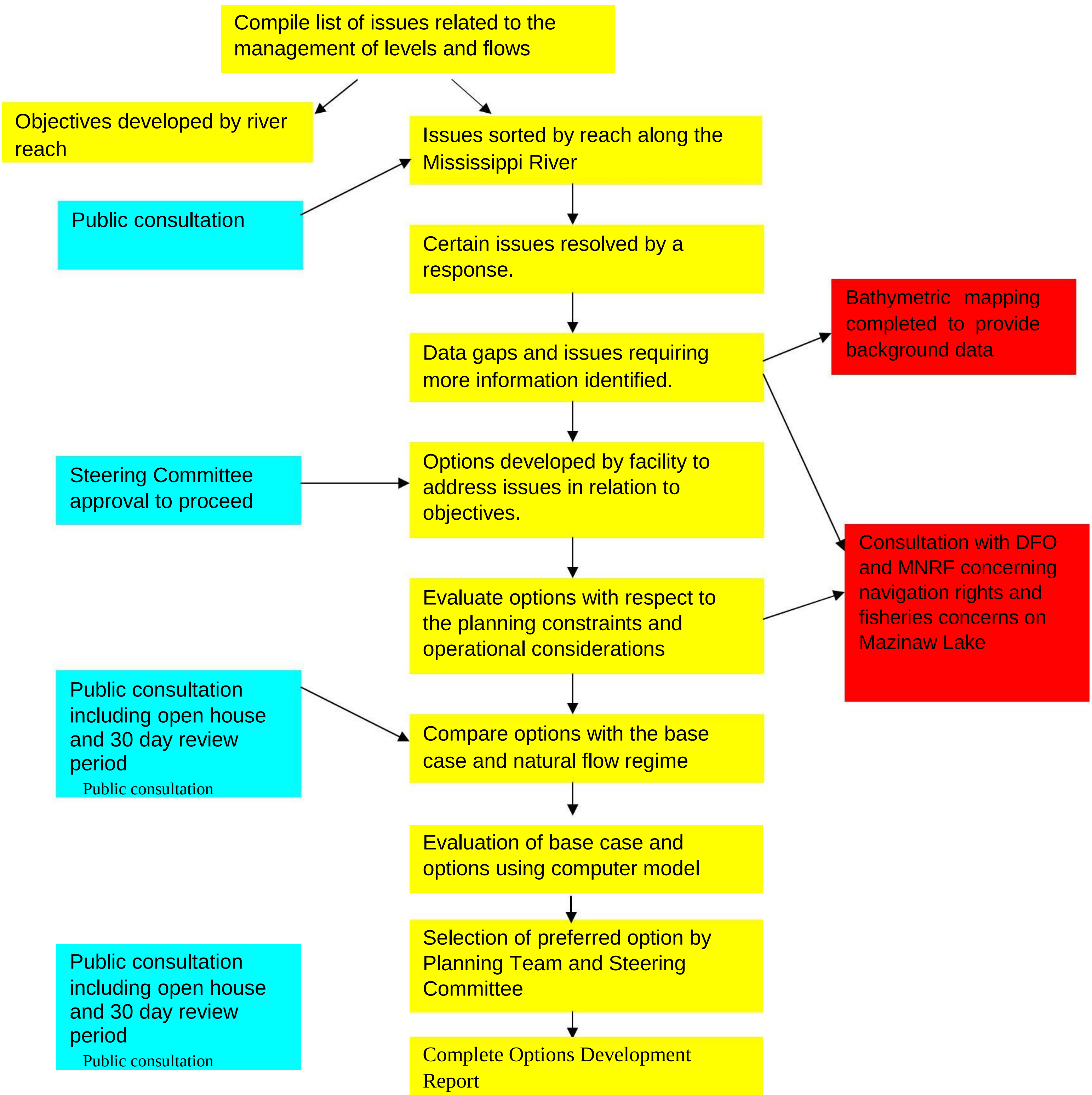
The options were initially subjected to a qualitative assessment of their ability to satisfy the management objectives and constraints outlined in the Spatial and Temporal Charts, and were subsequently compared to the Base Case and Natural Flow Regime. Where the initial assessment phase was considered inconclusive, the options were further evaluated through the use of a simulation model. The effects of the options were simulated over a period of eleven years to assess their impact on streamflows and water levels along the river system.

Alternative options were then selected if they provided a net benefit to the system and did not conflict with a planning objective.

The public provided comments on the issues raised, responses to the issues and the options to be considered in the plan (Appendix A).

All Planning Team decisions were made by consensus.

**Figure 2 MRWMP Option Development Flowchart**



### 2.2 Plan Objectives

1. **Maintain or improve aquatic ecosystem health throughout the system.**
   - Improve lake trout spawning success on Shabomeka and Mazinaw. Maintain spring spawning opportunities by having steady flows or rising levels for pike, walleye and bass.
   - Minimize water level fluctuations as they affect aquatic/riparian wildlife.
   - Where possible emulate the natural flow regime.
   - Improve aquatic ecosystem health by maintaining flow through the system.
   - Ensure abundance of wild rice is not reduced due to fluctuating water levels.

2. **Address public safety and minimize property damage due to flooding and ice.**
   - Minimize flooding throughout the system.
   - Minimize ice damage throughout the system.

3. **Maintain water levels for navigation (including boat access only properties), recreation, cultural and social opportunities throughout the system.**
   - Maintain stable water levels for navigation throughout the recreation season throughout the system.
   - Maintain water levels suitable for access to Twin Island and Fawn Lakes.
   - Maintain and improve recreation throughout the system.

4. **Maintain economic, recreation, cultural and social opportunities throughout the system.**
   - Maintain access to Wild rice and Pictographs

5. **Recognize power generation values from the system.**
   - Maintain or enhance power generation on a seasonal and daily basis.

6. **To develop public awareness on the overall constraints, objectives and natural processes that are considered in the operation of the Mississippi River system.**
   - Constraints and objectives
   - Foster an understanding of how the system operates
   - Current conditions

## SECTION 3 Base Case Description

### 3.1 Summary of Option 1 – Current Operation (Base Case Description)

The following outlines the current operation of the Mississippi River system, which represents Option 1 – Base Case for the purpose of this plan. Option 1 - Base Case represents no change to the current operation. All other options developed represent a change in operation.

### 3.2 Hydrology and Hydraulic Assessment

Evaluating the performance of dam operating strategies with respect to multiple objectives requires knowledge of the streamflows occurring at each dam site under consideration and the capacity of each reservoir to manipulate streamflows. Actual streamflow records at each dam site are seldom available and it is therefore necessary to estimate streamflows through a variety of indirect methods.

For the purpose of the MRWMP, the planning team considered the Base Case to represent the existing operating regimes for the water control structures and reservoirs along the Mississippi River. Due to the presence of several reservoirs on the Mississippi River it was important to insure that the streamflow estimates reflected actual conditions as accurately as possible.

Water level, dam settings and streamflow records were obtained from MVC, OPG and Environment Canada at the following locations. The data was reviewed to identify data gaps or anomalies. Data gaps were filled through interpolation or through correlation with other gauge records. Anomalies were reviewed and corrected from alternative data sources. Based on the available data, it was determined that a data record of sufficient quality could be generated for the period of 1993 – 2003 inclusive, at each reservoir site.

**Figure 3 Historic Records**

| Gauge Location | Source | Parameter |
|---|---|---|
| Shabomeka Lake Dam | MVC | Water level |
| Mazinaw Lake Dam | MVC | Water level |
| Mississippi River below Marble Lake | Env. Canada | Streamflow |
| Kashwakamak Lake Dam | MVC | Water level |
| Big Gull Lake Dam | MVC | Water level |
| Mississagagon Lake Dam | MVC | Water level |
| Buckshot Creek @ Plevna | Env. Canada | Streamflow |
| Crotch Lake Dam | MVC | Water level |
| High Falls GS | OPG | Streamflow |
| Dalhousie Lake | MVC | Water level |
| Clyde River @ Gordon Rapids | Env. Canada | Streamflow |
| Clyde River @ Lanark | Env. Canada | Streamflow |
| Mississippi River @ Ferguson Falls | Env. Canada | Streamflow |
| Mississippi Lake | MVC | Water level |
| Mississippi River @ Appleton | Env. Canada | Streamflow |
| Indian River near Blakeney | Env. Canada | Streamflow |
| Carp River near Kinburn | Env. Canada | Streamflow |

### Streamflow

Water level and flow conditions over this period were derived at dam and reservoir locations through a mass balance in accordance with the following relationship:

$$t*(I_{1} + I_{0})/2 = t*(O_{0} + O_{1})/2 + S_{1} – S_{0} + Evap$$

Where: I is reservoir inflow
O is structure outflow
S is lake storage
Evap is lake evaporation
t is the time step

Outflow from the control structures was computed from available rating curves based on dam setting and reservoir elevation while lake storage values were based on the surface area of the lake. Lake evaporation was accounted for by applying monthly evaporation rates to the lake surfaces. Evaporation rates were obtained from a water budget analysis conducted as part of the Renfrew County-Mississippi-Rideau Groundwater Study.

By utilizing the above relationship at progressive time intervals, an inflow hydrograph for each reservoir was derived over the eleven year period. Inflow hydrographs were subsequently routed through each reservoir using the Storage Indication Method to attenuate inflows and determine reservoir elevations and outflows at each time step.

Dam outflows were routed to the next downstream structure using the Muskingum routing method. Routing parameters were established through trial and error to obtain the best agreement between observed and predicted streamflows. Streamflows were compared to observed records at selected stream gauge sites to verify results. Where necessary structure rating curves were adjusted to provide better agreement with observed conditions.

**Figure 4 Sub-basin Description**

| Sub-basin ID | Name | Records Available | Local Drainage Area ($km^2$) |
|---|---|---|---|
| 1 | Shabomeka Lake | Yes | 40.3 |
| 2 | Mazinaw Lake | Yes | 298.6 |
| 3 | Kashwakamak Lake | Yes | 42.6 |
| 4 | Buckshot Creek | No | 172.7 |
| 5 | Mississagagon Lake | Yes | 22.0 |
| 6 | Big Gull Lake | Yes | 141.4 |
| 7 | Crotch Lake | Yes | 298.1 |
| 8 | High Falls | Yes | 203.2 |
| 9 | Dalhousie Lake | Yes | 78.9 |
| 10 | Clyde River @ Gordon Rapids | Yes | 287.8 |
| 11 | Clyde River @ Lanark | Yes | 326.2 |
| 12 | Fall River | No | 427.3 |
| 13 | Mississippi River @ Ferguson Falls | Yes | 215.9 |
| 14 | Mississippi Lake | Yes | 209.4 |
| 15 | Appleton | Yes | 63.1 |
| 16 | Almonte | No | 208.0 |
| 17 | Indian River @ Blakeney | Yes | 210.2 |
| 18 | Mississippi River @ Galetta | No | 1201.1 |

### Local Drainage Contributions

Where the above records were available, streamflow contributions from local drainage areas between these sites were determined by subtracting the total flow from the routed upstream inflow. Through this approach, a continuous streamflow record (1993 – 2003) for each sub-basin in the watershed, above Appleton, was generated. These streamflows represent natural (unregulated) conditions. Appleton is the furthest downstream stream gauge on the Mississippi River. For locations downstream of Appleton, the following approach was used to generate the required streamflow records.

### Correlation to Adjacent Stream Gauge

The Waterpower Project Science Transfer Report – 1.0 Simulating and Characterizing Natural Flow Regimes presents an approach which transposes the response characteristics of an adjacent unregulated watershed by manipulating its flow duration curve through an adjustment based on drainage area or mean annual runoff. This methodology allows a time series of streamflows to be generated for an ungauged drainage basin from which a variety of statistical measures or flow metrics can be determined to characterize the flow regime. These flow metrics include estimates of flood and drought conditions which should be based on at least 30 years of streamflow records.

For sites located downstream of Appleton, a dimensionless regional flow duration curve (FDC) was developed by averaging the FDC's for the Indian River near Blakeney and the Carp River near Kinburn stream gauges. FDC's for individual drainage areas were subsequently derived by adjusting the regional FDC by the corresponding drainage area. A continuous streamflow record was generated by using a weighted average of the Indian River and Carp River streamflows as source sites with the regional FDC. These flows were then added to the routed upstream inflows to determine the total streamflow at the dam site.

The Base Case is graphically described for each structure by mean water level and discharge hydrographs based on 11 years of record (1993 – 2003 inclusive). This period was used, to assess and compare the selected options relative to the Base Case, as it was the longest period of time for which daily water level and discharge values at each water control structure upstream of Carleton Place were available. This record period also includes a range of extreme events including both flood and drought conditions which allowed the performance of the selected options to be assessed under these conditions. It should be noted that the water level and discharge hydrographs represent daily mean values for the period of 1993-2003 and may not be representative of longer-term historic conditions. For example, the current operating targets included on the water level hydrographs were derived from a longer record of weekly water level observations.

The Mississippi River watershed receives an average annual precipitation of 873 mm. Evapotranspiration losses amount to approximately 532 mm, thereby leaving 341 mm of net available water to supply surface and groundwater systems.

There are six major lakes in the watershed which act as storage reservoirs in the spring to alleviate flooding downstream of Crotch Lake. These lakes, which include Shabomeka, Mazinaw, Kashwakamak, Big Gull, Crotch and Mississagagon, have water control structures at their outlets. There are two other notable lakes on the main branch of the Mississippi River, being Dalhousie and Mississippi Lakes. Dalhousie Lake does not have a dam at its outlet and therefore is uncontrolled. Water levels on Mississippi Lake are maintained under low flow conditions by the Carleton Place Dam. Under moderate to high flow conditions, channel constrictions upstream of the Carleton Place Dam affect water levels on Mississippi Lake and are therefore not indicative of water levels at the Carleton Place Dam.

Starting in the early fall and finishing late winter, all of the dams in the western watershed are operated to draw down the lakes to provide storage for the spring runoff. As snowmelt and spring rains occur, the lakes are gradually filled to reach the summer target levels for recreation and tourism. It requires approximately 140 mm of runoff from rainfall and snowmelt to fill the lakes. Conditions must be monitored to ensure that the targets can be reached while ensuring adequate storage remains for late spring rainfalls and that sufficient flows and levels are maintained for fish spawning. In doing so, there is a reduction in flooding along downstream areas as the uncontrolled flows from Antoine Creek, Cranberry Creek, Fall River and Clyde River move through the central and eastern portion of the watershed. Once the spring runoff has subsided, all of these dams, except for the Crotch Lake Dam, are operated to maintain relatively stable elevations on the lakes for recreation throughout the summer months. Crotch Lake Dam is unique as it is the only true reservoir lake on the system. As snowmelt and spring rains occur, the lakes are gradually filled to reach the summer target levels for recreation and tourism.

The Base Case mean values shown in Figures 5 through 12 reflect the total historical record for each site. The Base Case mean values shown in Figures 18 through 24 reflect the 11 years (1993 - 2003) of data utilized to model the options.

**Figure 5**

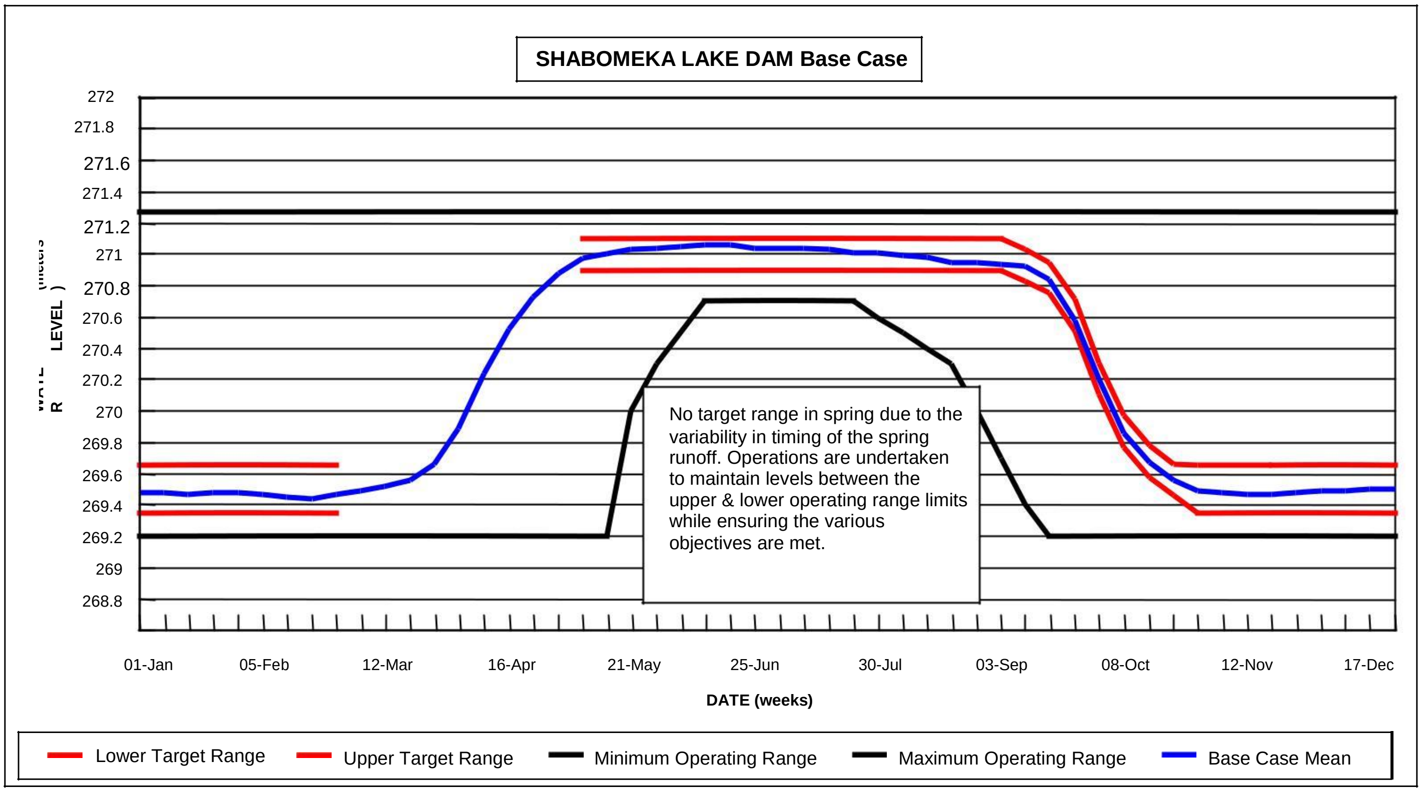
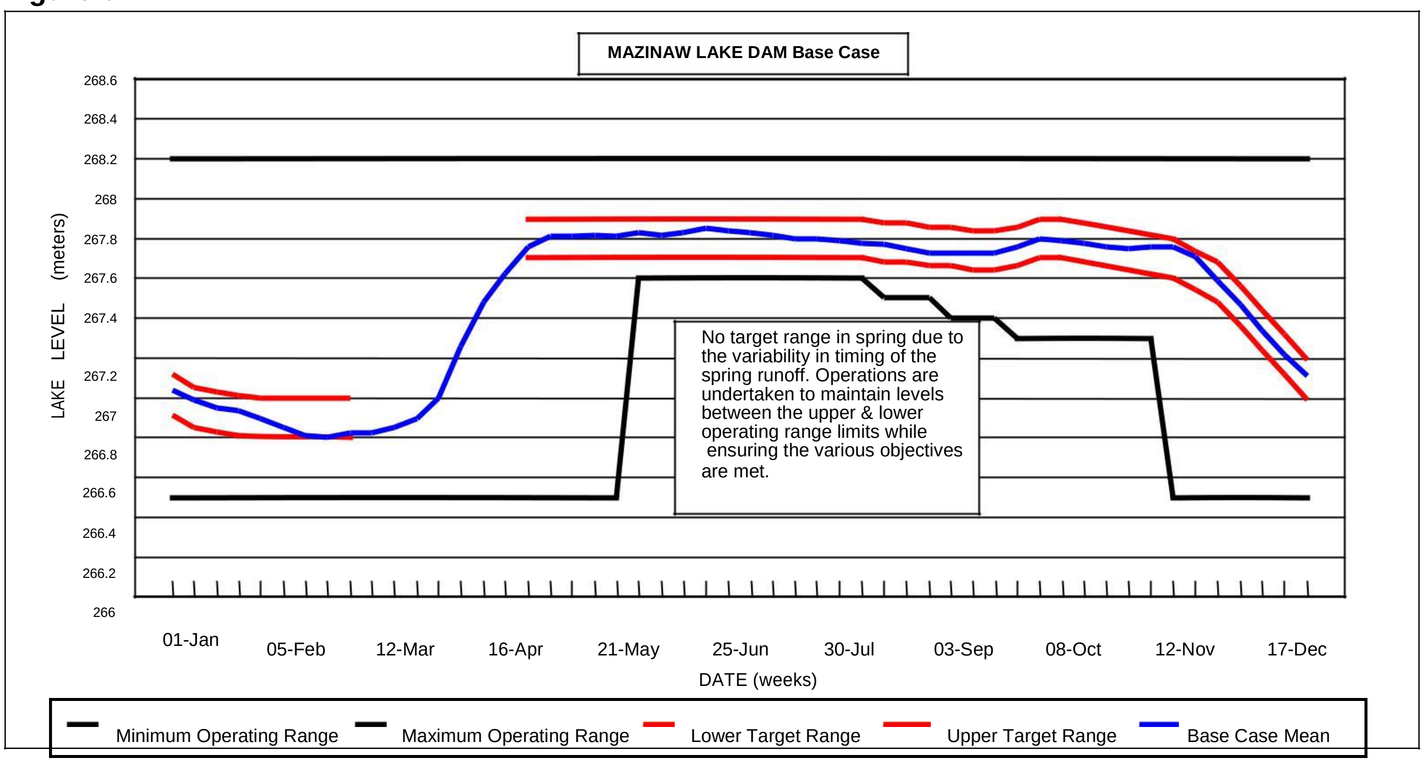
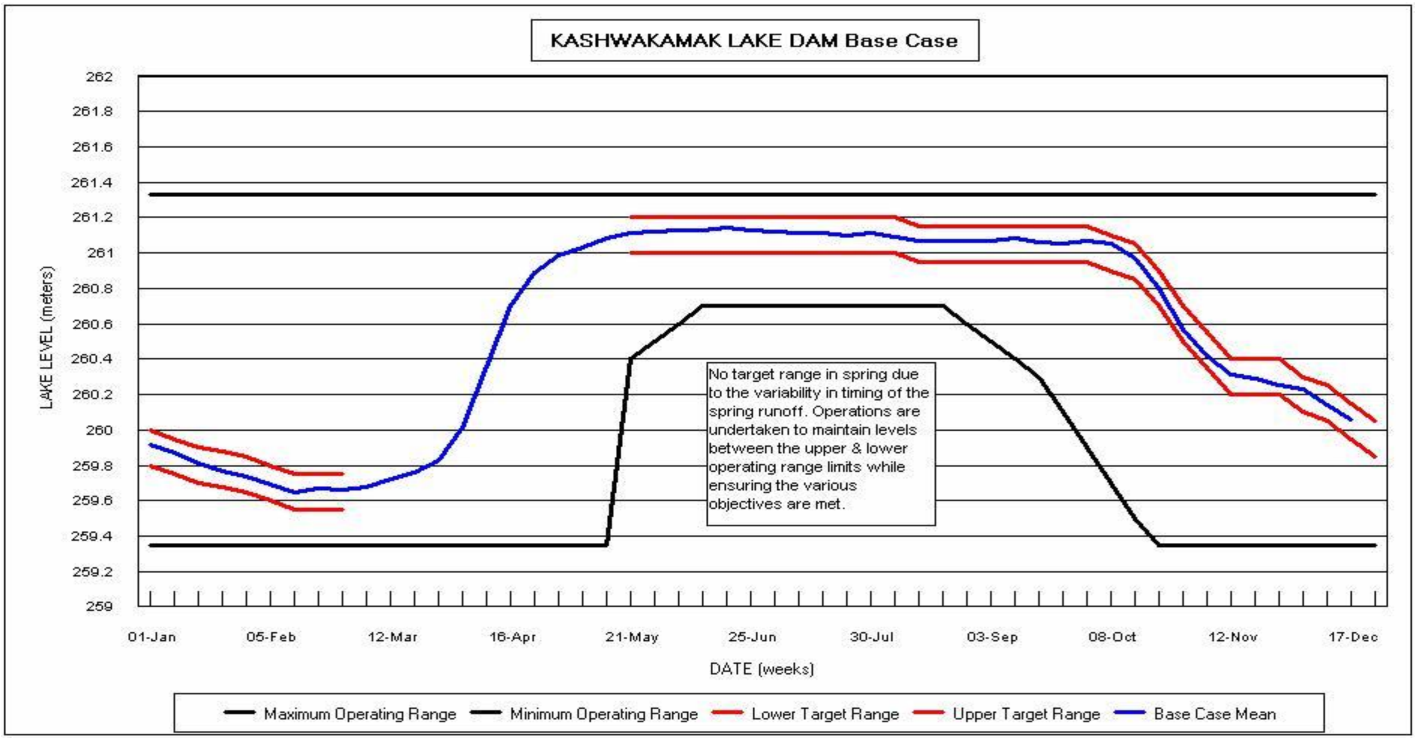


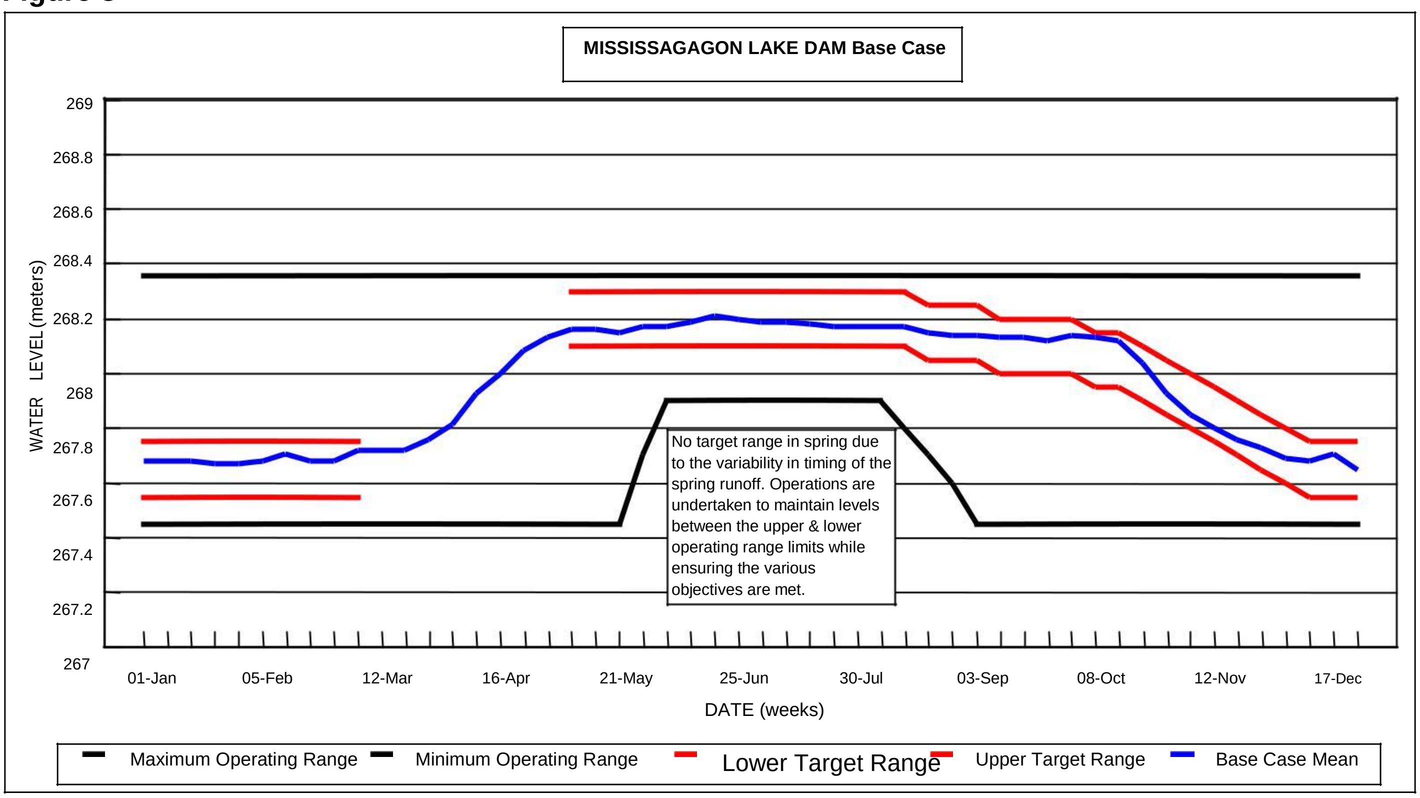

**Figure 6**



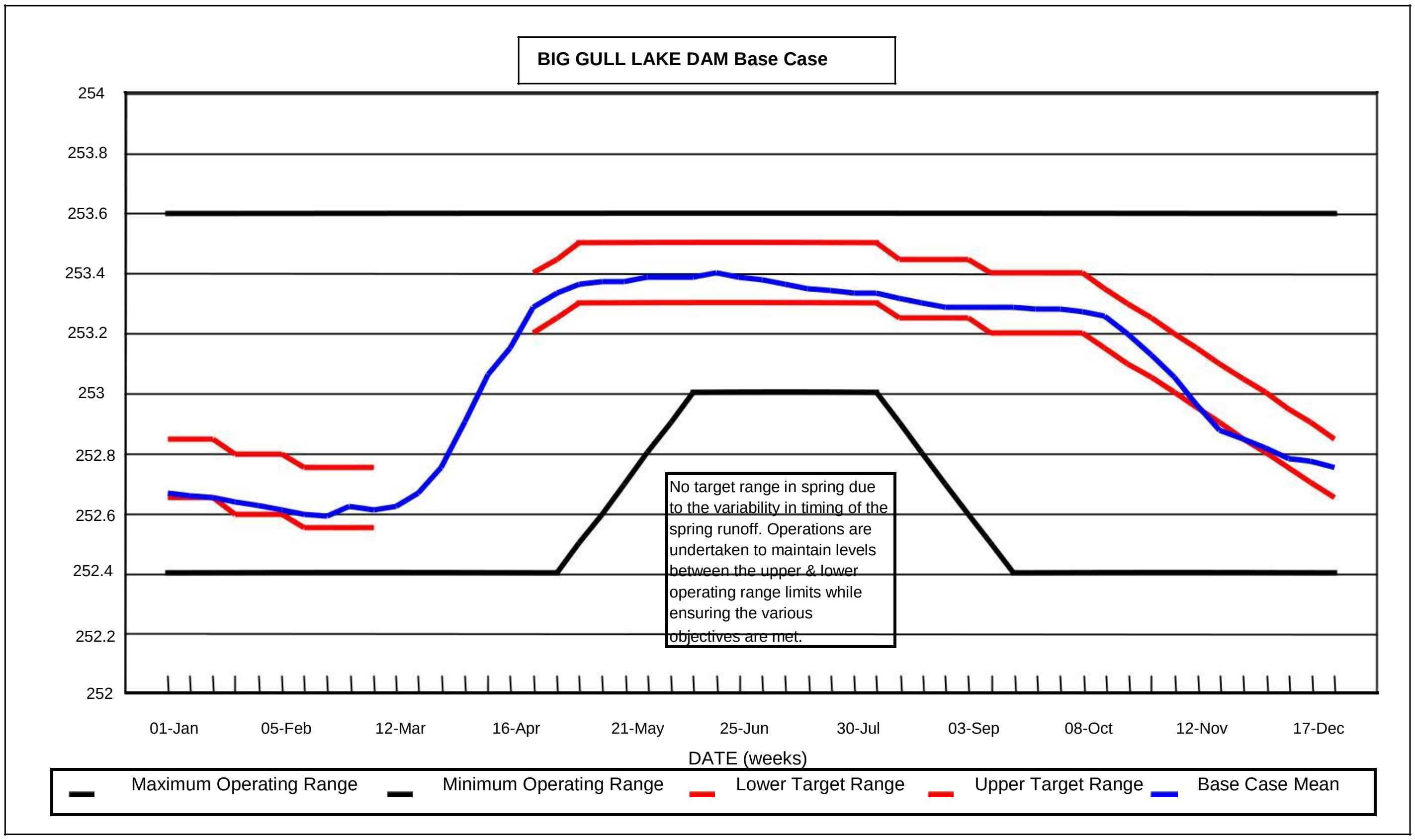
## Figure 7




## Figure 8




## Figure 9




From late June through early October, Crotch Lake is drawn down to maintain flows in the lower portion of the river. Crotch Lake normally fluctuates 2.5 to 3.5 m (depending on amount of precipitation) over the course of the summer. Throughout the fall, as the other lakes are being drawn down, Crotch Lake is filled again while still maintaining at least a minimum flow downstream of the dam. From January through March the lake is again drawn down to perform the same low flow augmentation function over the remainder of the winter months and to maximize storage in the lake to store the spring runoff.

Crotch Lake is the primary reservoir on the Mississippi River and is used to provide both flood control and low flow augmentation. Due to the lake's limited storage capacity, these two objectives are mutually exclusive at various times of the year. For example, once Crotch Lake has been filled following the spring freshet, no storage is available to provide flood control until lake levels begin to recede. Typically, the risk of flooding is greatest during the spring, while the need to augment low flows is normally the greatest during the summer months to support recreation, maintain water quality, hydro generation and ecological integrity of the lower river. The Crotch Lake operating regime reflects this trend, however, flooding or drought conditions can occur at any time of the year.

In general, when Crotch Lake is being utilized for flood control to minimize downstream flooding, the dam is operated to limit outflows to the extent possible. This may result in all outflows from Crotch Lake being restricted to minimize downstream flooding. This condition is not considered to be detrimental to downstream ecological functions due to leakage through the structure and streamflow contributions from tributaries immediately downstream of Crotch Lake. Under high flow conditions, streamflow contributions from the sub-watershed area between Crotch Lake and High Falls will be sufficient to maintain a streamflow of 5 cms or greater at the High Falls G.S.

When Crotch Lake is being drawn down during the summer for low flow augmentation purposes, 60 to 100 percent of the downstream flow may be supplied from storage in Crotch Lake. Depending on the contributions from local tributaries downstream of Crotch Lake, the average 5 cms flow requirement at the High Falls G.S., may be achieved through a combination of local drainage and/or Crotch Lake outflow. In the event that the local tributaries contribute streamflows of 15 cms or greater, outflows from Crotch Lake may be restricted to store additional water in Crotch Lake to be utilized later in maintaining downstream flows between 5 cms and 15 cms.

During the fall, when Crotch Lake is again being filled, outflows will typically be in the order of 5 cms, but may range from 0 cms to 15 cms depending on weather conditions as outlined above.

Note: The following chart depicts mean water levels to be higher in the last 11 years than the historic mean water levels over the last 40 years (approximately 0.5 m higher levels in the fall and winter months). Caution should be exercised in interpreting these results as the 11 years of data used to assess the various options may not be representative of the longer term historic conditions.

**Figure 10**

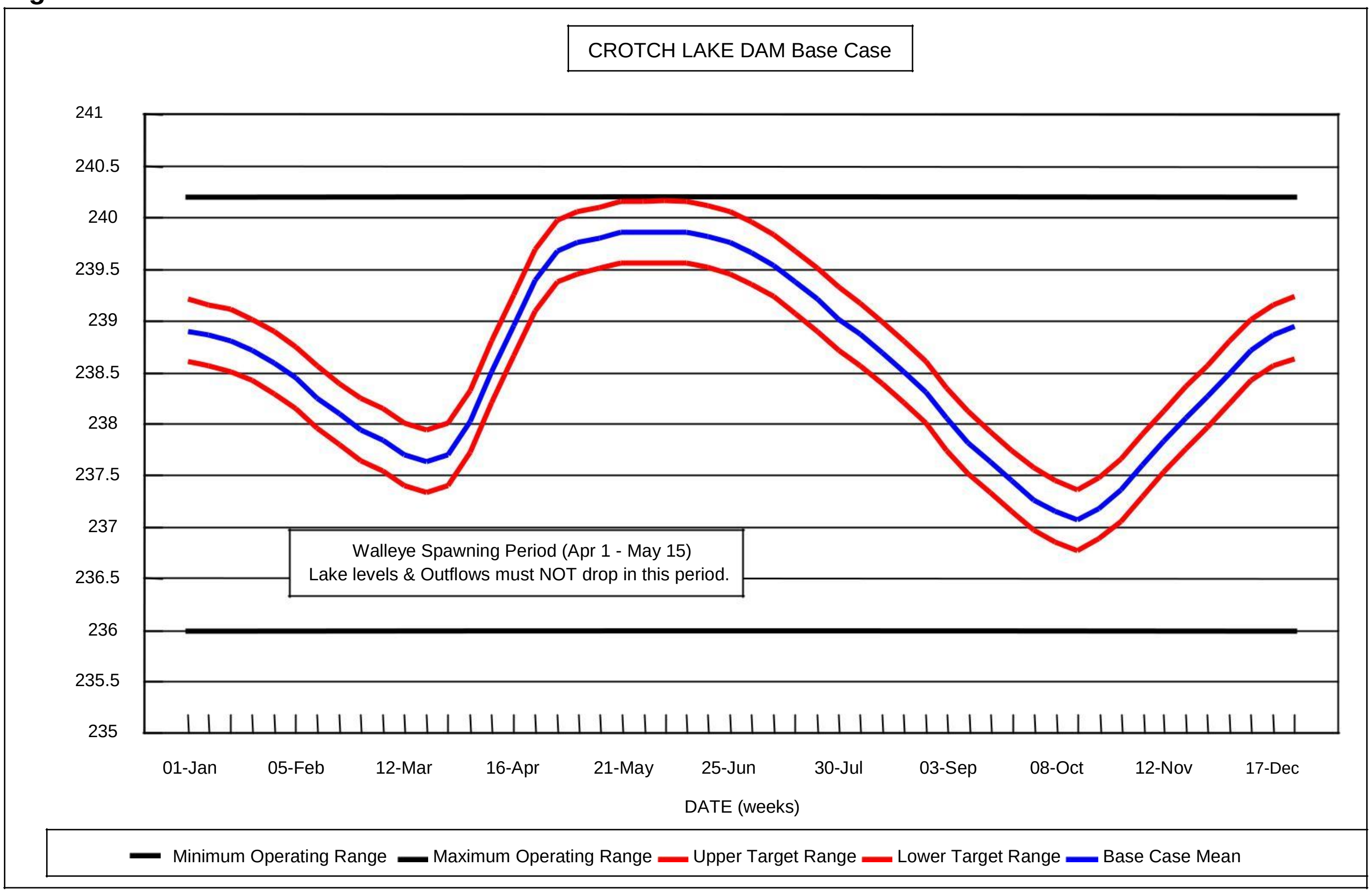


**Figure 11 a**

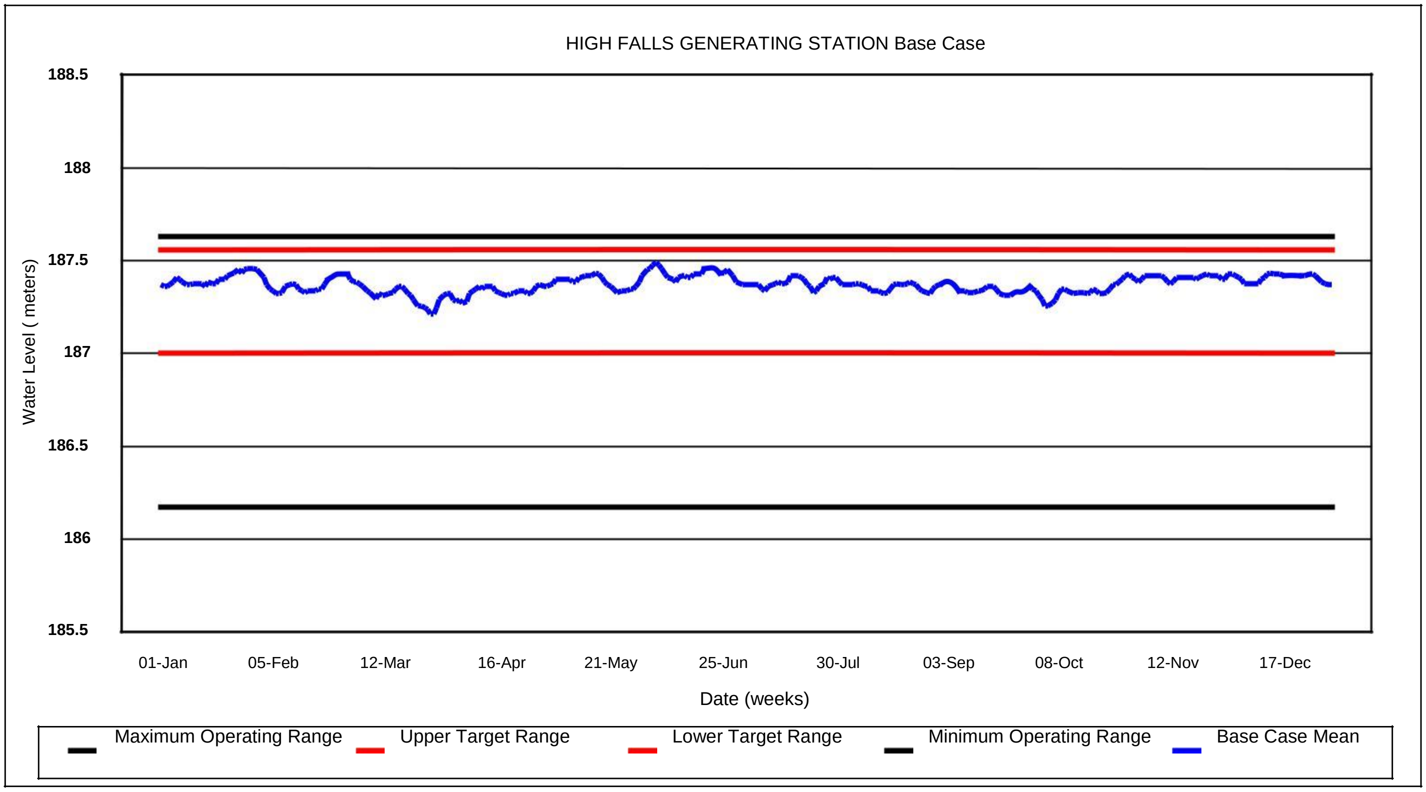
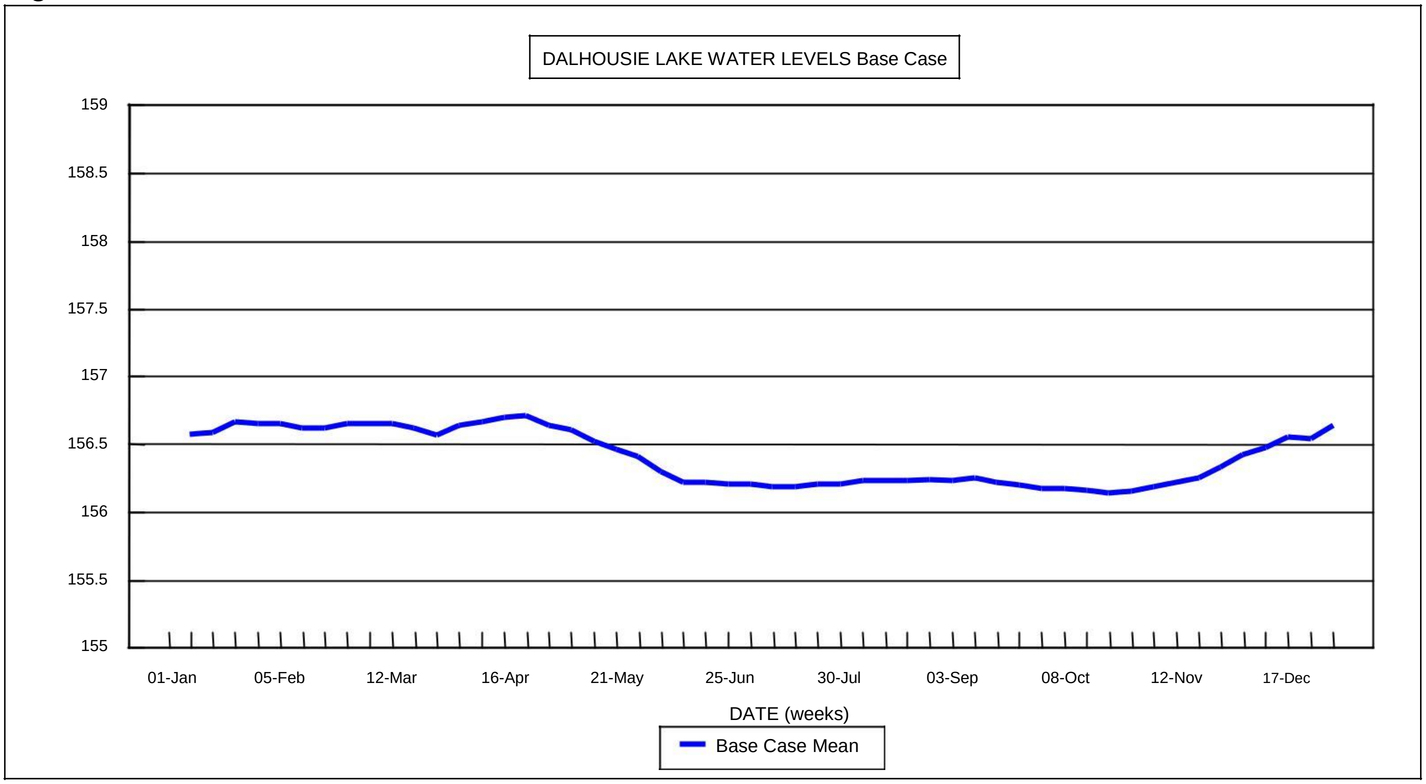

HIGH FALLS GENERATING STATION Base Case
188.5
188
187.5
187
186.5
186
185.5
Water Level ( meters)
01-Jan
05-Feb
12-Mar
16-Apr
21-May
25-Jun
30-Jul
03-Sep
08-Oct
12-Nov
17-Dec
Date (weeks)
Maximum Operating Range
Upper Target Range
Lower Target Range
Minimum Operating Range
Base Case Mean

**Figure 11 b**



DALHOUSIE LAKE WATER LEVELS Base Case
159
158.5
158
157.5
157
156.5
156
155.5
155
01-Jan
05-Feb
12-Mar
16-Apr
21-May
25-Jun
30-Jul
03-Sep
08-Oct
12-Nov
17-Dec
DATE (weeks)
Base Case Mean

**Figure 12 a**

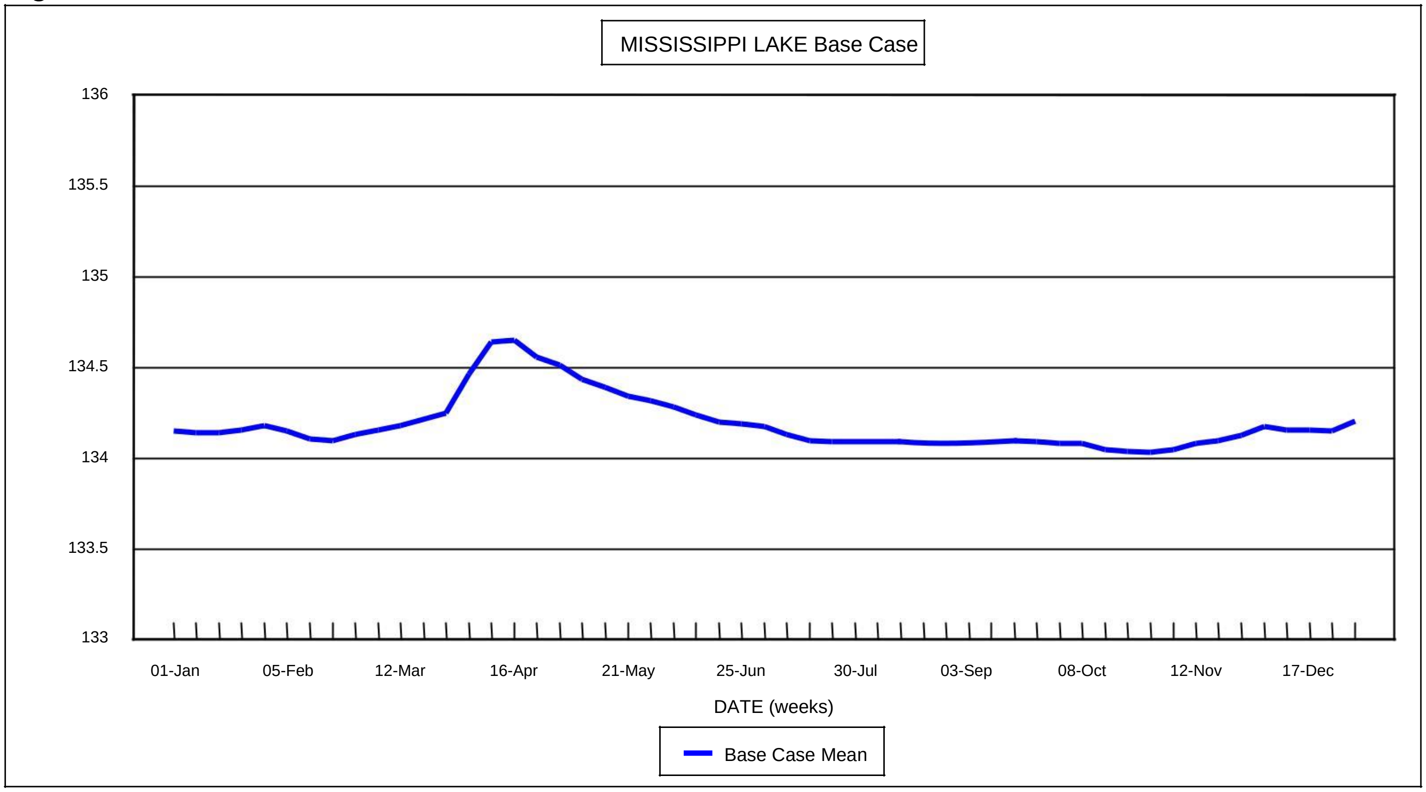

MISSISSIPPI LAKE Base Case
136
135.5
135
134.5
134
133.5
133
01-Jan
05-Feb
12-Mar
16-Apr
21-May
25-Jun
30-Jul
03-Sep
08-Oct
12-Nov
17-Dec
DATE (weeks)
Base Case Mean

**Figure 12 b**

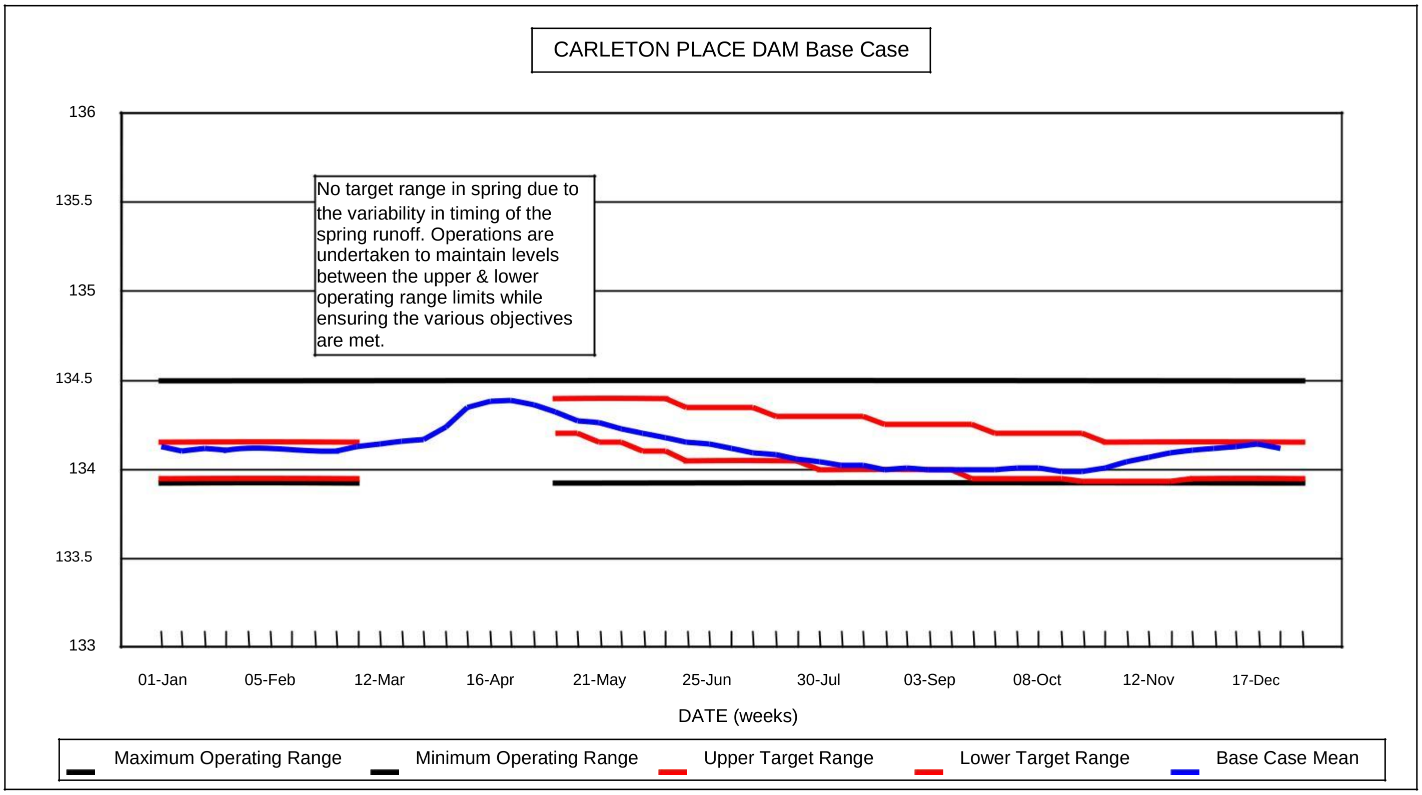

CARLETON PLACE DAM Base Case
136
135.5
135
134.5
134
133.5
133
No target range in spring due to the variability in timing of the spring runoff. Operations are undertaken to maintain levels between the upper & lower operating range limits while ensuring the various objectives are met.
01-Jan
05-Feb
12-Mar
16-Apr
21-May
25-Jun
30-Jul
03-Sep
08-Oct
12-Nov
17-Dec
DATE (weeks)
Maximum Operating Range
Minimum Operating Range
Upper Target Range
Lower Target Range
Base Case Mean

**Figure 13**

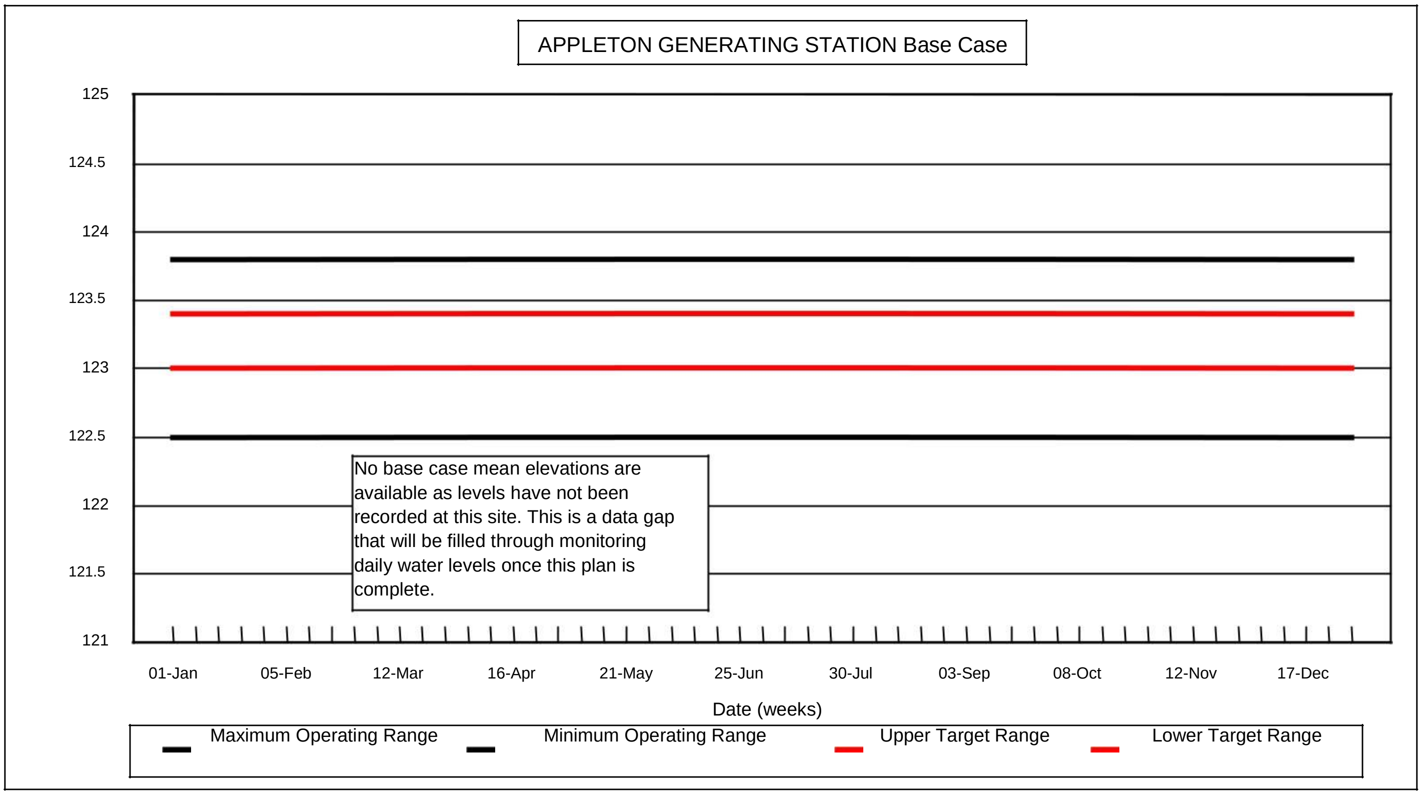

APPLETON GENERATING STATION Base Case
125
124.5
124
123.5
123
122.5
122
121.5
121
No base case mean elevations are available as levels have not been recorded at this site. This is a data gap that will be filled through monitoring daily water levels once this plan is complete.
01-Jan
05-Feb
12-Mar
16-Apr
21-May
25-Jun
30-Jul
03-Sep
08-Oct
12-Nov
17-Dec
Date (weeks)
Maximum Operating Range
Minimum Operating Range
Upper Target Range
Lower Target Range

**Figure 14**

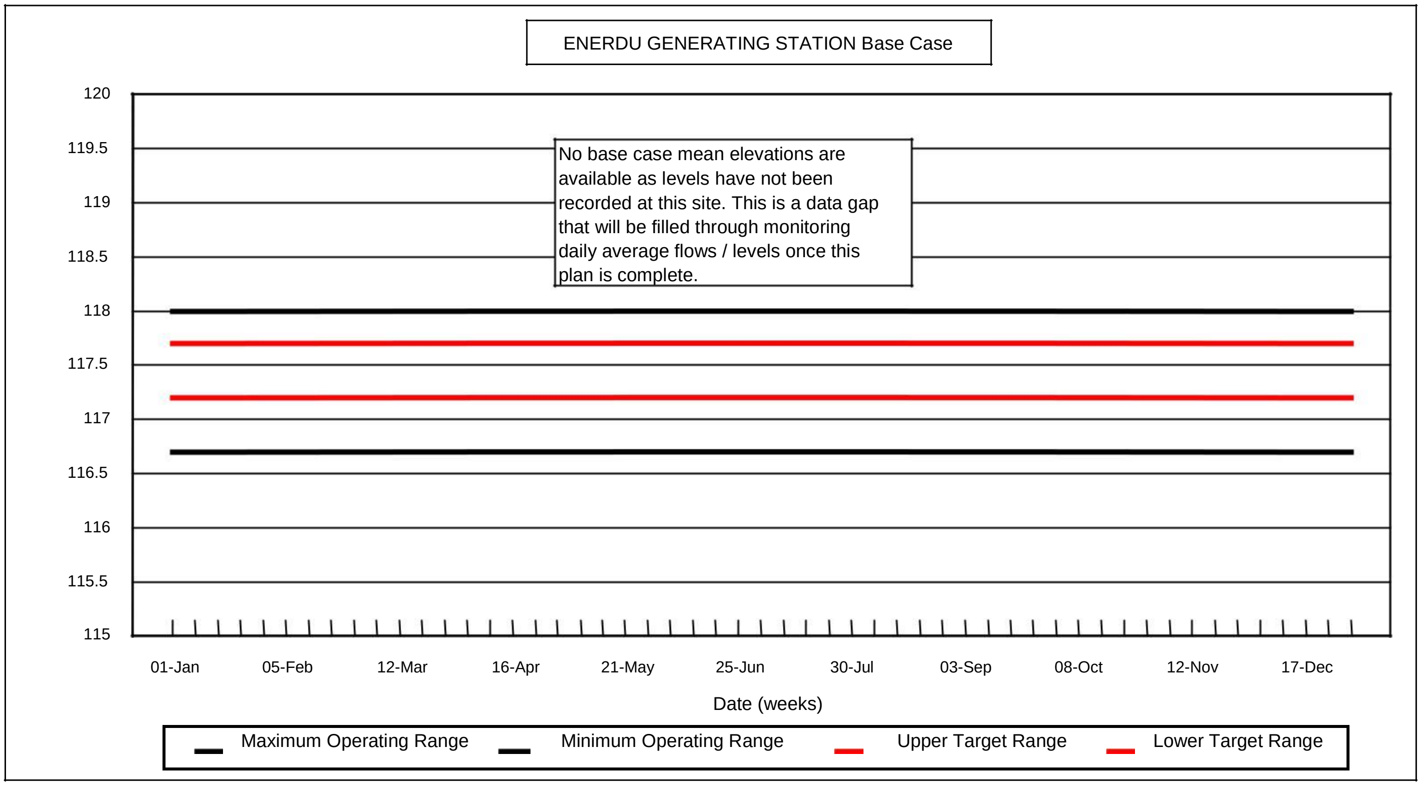

ENERDU GENERATING STATION Base Case
No base case mean elevations are available as levels have not been recorded at this site. This is a data gap that will be filled through monitoring daily average flows / levels once this plan is complete.
120
119.5
119
118.5
118
117.5
117
116.5
116
115.5
115
01-Jan
05-Feb
12-Mar
16-Apr
21-May
25-Jun
30-Jul
03-Sep
08-Oct
12-Nov
17-Dec
Date (weeks)
Maximum Operating Range
Minimum Operating Range
Upper Target Range
Lower Target Range

**Figure 15**

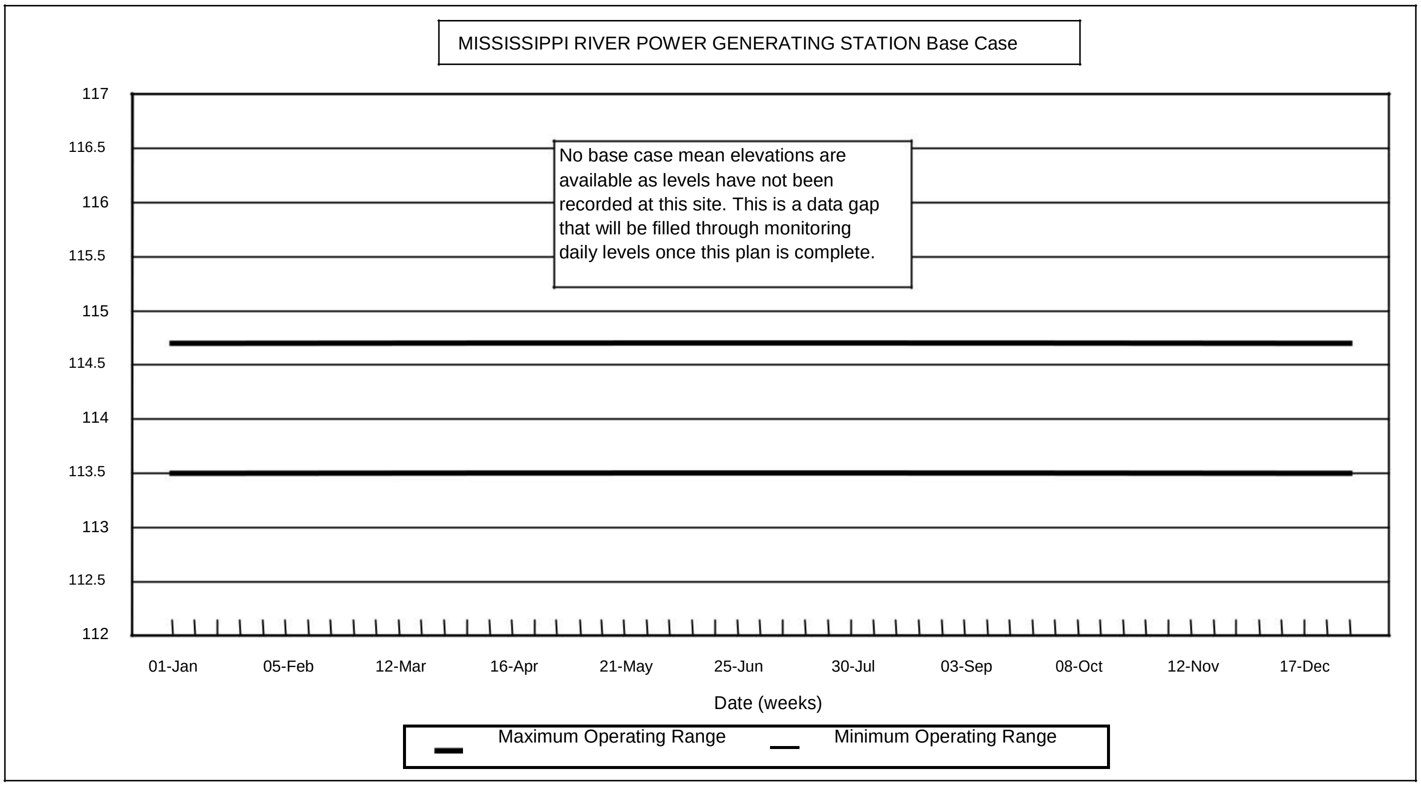
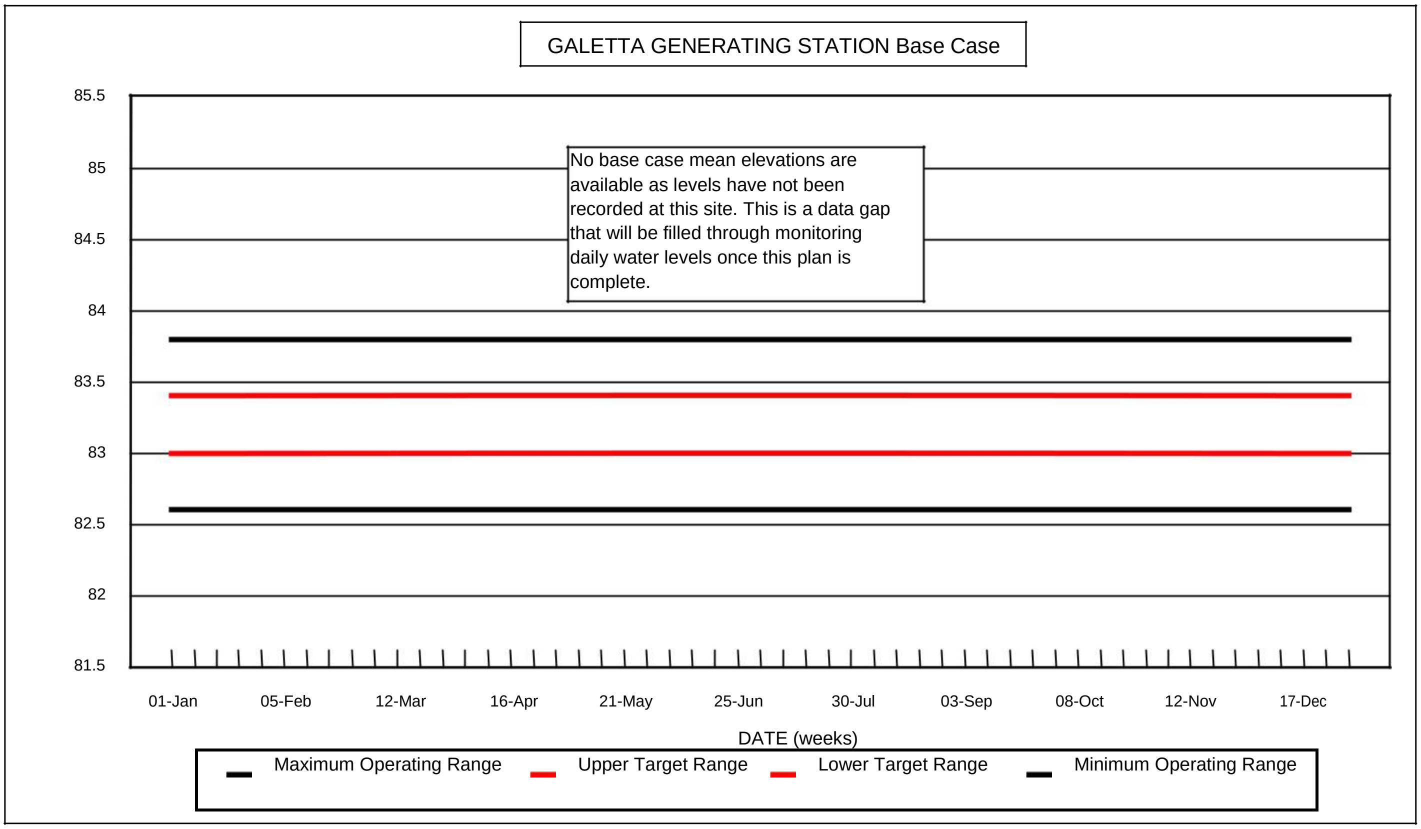

MISSISSIPPI RIVER POWER GENERATING STATION Base Case
No base case mean elevations are available as levels have not been recorded at this site. This is a data gap that will be filled through monitoring daily levels once this plan is complete.
117
116.5
116
115.5
115
114.5
114
113.5
113
112.5
112
01-Jan
05-Feb
12-Mar
16-Apr
21-May
25-Jun
30-Jul
03-Sep
08-Oct
12-Nov
17-Dec
Date (weeks)
Maximum Operating Range
Minimum Operating Range

**Figure 16**



GALETTA GENERATING STATION Base Case
No base case mean elevations are available as levels have not been recorded at this site. This is a data gap that will be filled through monitoring daily water levels once this plan is complete.
85.5
85
84.5
84
83.5
83
82.5
82
81.5
01-Jan
05-Feb
12-Mar
16-Apr
21-May
25-Jun
30-Jul
03-Sep
08-Oct
12-Nov
17-Dec
DATE (weeks)
Maximum Operating Range
Upper Target Range
Lower Target Range
Minimum Operating Range

# SECTION 4 Option Development Summary

The Planning Team considered alternative operating regimes for the dams and reservoirs subject to the planning process, to address issues related to water levels and flows which had been identified. The best available information was used to develop and subsequently evaluate each option.

The Planning Team outlined the range of options being considered and subsequently evaluated each alternative operating regime against both the Base Case and the Natural Flow Regime. Based on this assessment a preferred option was selected.

## 4.1 Natural Flow Regime

The Aquatic Ecosystem Guidelines recommend that where opportunities exist, water control structures be managed and operated to reflect the natural flow regime of the river system under consideration. The Planning Team recognizes that changes in the watershed's hydrology due to factors such as changes in land use are beyond the ability of the Water Management Plan to address. However, the natural flow regime can be considered a benchmark against which management options and operating strategies can be evaluated to determine if a potential gain in ecological conditions can be realized.

The Base Case for the Mississippi River Water Management Plan represents the current operating regime for the twelve water control structures subject to planning. In order to describe the Base Case and evaluate management options, it was important to insure that operating decisions at each individual structure and their influence could be accurately described, particularly for those structures with sufficient capacity to regulate streamflows. As described in Section 3 - Hydrology and Hydraulic Assessment this was accomplished by simulating the natural inflows to each structure, routing those inflows through the storage reservoirs based on actual dam settings and subsequently routing the outflows to the next downstream structure. This was accomplished for the eleven year period 1993 – 2003. Records prior to 1993 were insufficient to provide a longer period of record.

The Natural Flow Regime was produced by removing the influence of the individual dams. This was accomplished by removing all stoplogs from the water control structures and simulating the resulting streamflow conditions at the downstream structures over the same eleven year period. This approach provides an accurate comparison of the influence, which the Base Case exerts on the river system.

In general, the base case resembles the natural flow regime. As a result of storage being utilized in the system, the base case reduces peak flows in the spring and augments flows throughout the remainder of the year.

The table below summarizes the options considered.

**Figure 17 – Summary of Options**

| option | description | objective | model | Decision | Rationale |
|---|---|---|---|---|---|
| | | | | | |
| **Option 1 – Base Case** | Status Quo | | yes | | |
| | | | | | |
| **Option 2 - Shabomeka** | a (1) - remove one less log | fisheries | yes | preferred | effectiveness monitoring required |
| | a (2) - remove two less logs | fisheries | yes | X | monitor effectiveness of 1 log; data gap |
| | b - delay log removal | navigation/ recreation | no | X | conflict w/lake trout objective |
| | | | | | |
| **Option 3 - Mazinaw** | a - revise drawdown date | fisheries/ ecosystem | no | base case | conflict w/DFO authorization |
| | | | | | |
| **Option 4 - Kashwakamak** | a - eliminate 2nd drawdown | ecosystem | no | base case | science gap-benthic hibernating vertebrates |
| | | | | | |
| **Option 5 - Crotch Lake** | a - reduce summer drawdown to 238.5 m | navigation | yes | X | conflicts outweigh benefits |
| | b - reduce winter, replace water w/ upper lakes | Navigation / recreation | no | X | conflicts outweigh benefits |
| | c - eliminate winter; w/l 239.5 m; some logs | Fisheries / ecosystem | yes | X | conflicts outweigh benefits |
| | d - eliminate second drawdown; no logs | Ecosystem / hydro | yes | X | conflicts outweigh benefits |
| | e - 5cms avg flow; 1cms fill; 3cms min summer | Ecosystem / hydro | yes | base case | model run which resembles base case |
| | f - 5cms avg.flow; 1cms fill; 5cms min summer | Ecosystem / hydro | yes | X | conflicts outweigh benefits |
| | g - >5cms avg.flow; 1cms fill; 7cms min summer | Ecosystem / hydro | yes | X | conflicts outweigh benefits |
| | h - >5cms avg.flow; 2cms fill; 5cms min summer | Ecosystem / hydro | yes | X | conflicts outweigh benefits |
| | i - >5cms avg.flow; 2cms fill; 7cms min summer | Ecosystem / hydro | yes | X | conflicts outweigh benefits |
| | j - maximize hydro generation - 14 cms | power generation | yes | X | not viable, no other objectives can be met |
| | k – maintain at or above weir height | Fisheries | no | X | conflicts outweigh benefits |

X - Base Case preferred over proposed option

### 4.2 Shabomeka Lake

**Option 2a**

**Lake maintained at a higher minimum level prior to freeze up by removing one less stoplog (increase water level by 0.3 m.) to improve lake trout spawning habitat.**

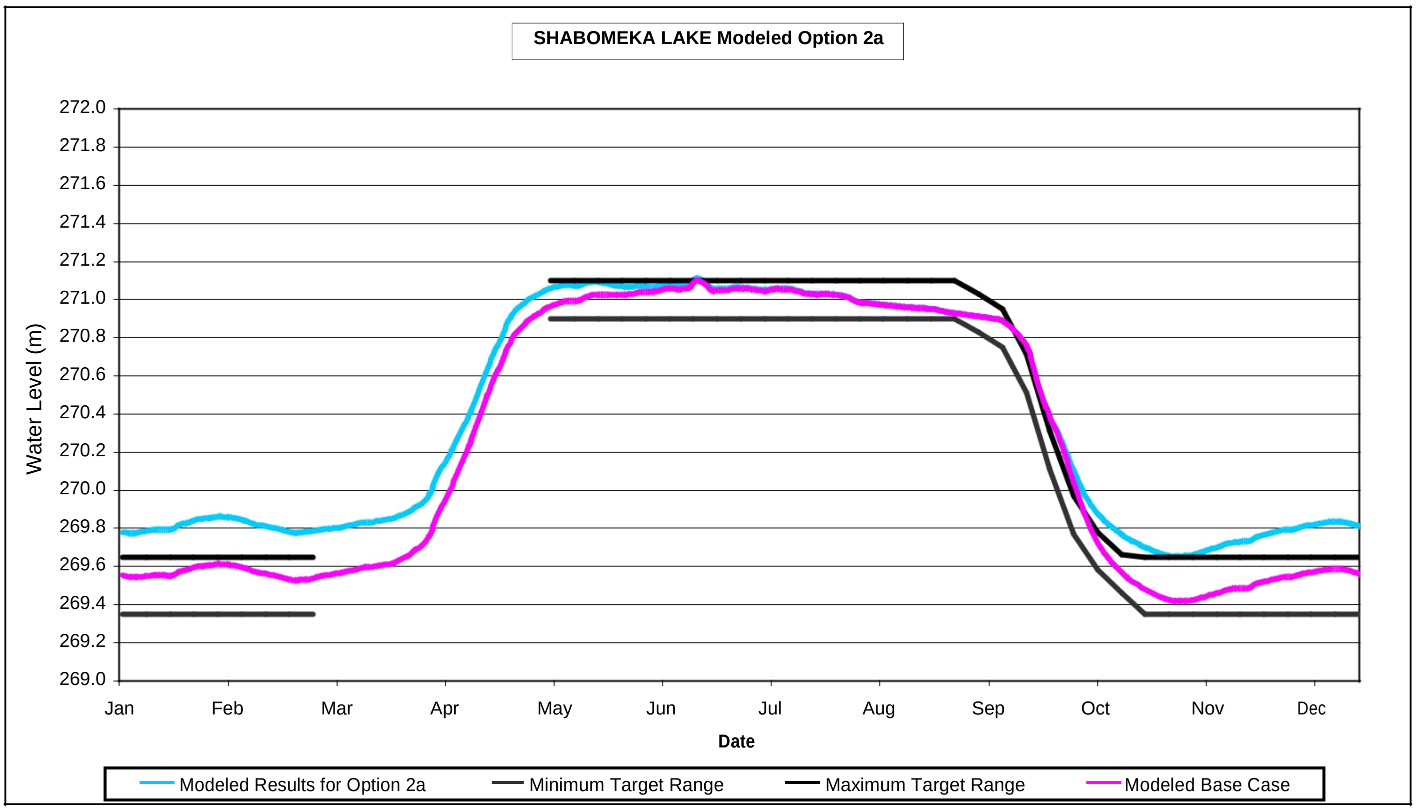
Strategy for development of the option:
To maintain stable water levels for Trout spawn and after ice out for loons and nesting birds

How option addresses comments:
The option of establishing a higher winter water level on Shabomeka Lake may also be beneficial for riparian wildlife, since winter levels will be established slightly earlier in the season.

An additional option of maintaining an even higher minimum level (two logs or more) cannot be considered until the performance of Option 2a is determined through effectiveness monitoring.

Option Evaluation:
Subjective analysis completed - see Option Development Analysis Chart for Shabomeka Lake in Appendix B.

**Figure 18**




Benefits:
- An increase in suitable spawning habitat for the lake trout may improve survival rates of hatch by preventing eggs from freezing in ice.
- An increase in the available spawning habitat around the lake
- Some benefits to boat access only properties by having more water in the lake in the fall.
- Increased flexibility in dam operations to minimize movement of ice in winter.
- Additional depth may provide better access for beaver and muskrat lodges.

Conflict or concerns:

- Although ice damage has always been a concern on this lake there could remain a concern with a few wooden docks that could have ice built up around the base.

The option of establishing a higher winter water level on Shabomeka Lake may also be beneficial for riparian wildlife, since winter levels will be established slightly earlier in the season.

A variation of this option, maintaining a higher minimum level (two logs or more) was considered, however potential damages to the shoreline, adjacent structures and different ice loading on the dam, this variation was not considered further.

*Option 2a for Shabomeka Lake of continuing with the mid-September drawdown and raising the winter water levels in Shabomeka Lake 0.30m (one log) from the current strategy, will aid in ensuring that water is covering the spawning habitat throughout the spawning and incubation period (October – April).*

**Option 2b**

**To delay removal of stoplogs from dam until after Thanksgiving weekend**

Strategy for development of the option:
To extend access period to boat only access properties to Thanksgiving weekend

How option addresses issue:
A delay in removal of stop logs extends the recreational season, use of the lake and access to boat only access properties.

Option Evaluation:
Subjective analysis completed - see Option Development Analysis Chart for Shabomeka Lake in Appendix B.

Benefits:

- A longer recreational season and use of the lake, through easier access to boat only access properties

Conflict or concerns:

- A direct conflict with returning lake to a naturally reproducing lake trout lake. Spawning success through this option would be unlikely.

*Extending the recreation season directly conflicts with the objective of enhancing ecosystem health.*

## 4.3 Mazinaw Lake

**Option 3a**

**Revise drawdown date to mid to late September.**

Strategy for development of the option:
Stabilize lake at minimum levels so the lake trout eggs do not freeze on the active shoals.

How option will address comment:
In the early 1990's there was a proposal to begin the drawdown prior to the onset of lake trout spawning, thereby ensuring that spawning would take place in areas that would not subsequently be dewatered. However, because the lower water levels would interfere with navigation on the lake, the proposed change to the operating regime required approval by the Canadian Coast Guard under the provisions of the Navigable Waters Protection Act. Although fish habitat management staff from the Department of Fisheries and Oceans supported the proposed

change, there was some evidence that the lake continued to support a self-sustaining population of lake trout, despite the late fall drawdown. Since it could not be demonstrated that the proposed change to the operating regime was critical to the sustainability of the lake trout, the Coast Guard denied approval of the proposed change to the operating regime.

Subsequently, MNRF has determined that Mazinaw Lake continues to support a self-sustaining population of lake trout. The provincial stocking program on Mazinaw was discontinued in 1996, as part of the Management Strategy for Lakes with Naturally Reproducing Populations of Brook Trout and Lake Trout (MNR 1995). MNRF completed a lake trout population assessment in the spring of 2004. The results of the netting project included native lake trout of various ages, indicating that natural recruitment is occurring under the current operating regime. Although the late fall drawdown undoubtedly affects lake trout, which spawn on the known, shallow-water shoals, these findings support the theory of deep-spawning lake trout in Mazinaw Lake. Natural reproduction seems to be sustaining the lake trout population in Mazinaw Lake, and as a result, there is no need to revisit the option of an earlier drawdown to accommodate lake trout.

Option Evaluation:
Subjective analysis completed - see Option Development Analysis Chart for Mazinaw Lake in Appendix B.

Benefits:
- Greater chance for spawning success and survival for shallow water spawners.
- Stabilize lake at minimum levels prior to lake trout spawning so active shoal in Campbell's Bay doesn't get used and eggs freeze.

Conflict or concerns:
- Existing authorization requiring operating guidelines of previous dam is still in effect. Canadian Coast Guard has expressed concern that unless new evidence is shown that current procedures are having an effect on survival of lake trout their decision is unlikely to change. New evidence shows spawning survival of various ages does exist in the lake.
- Navigational concerns through the narrows and for boat access only properties arise.
- Impact on drawdown rates and timing of Kashwakamak Lake must be considered and potential impact on Wild Rice crops in Ardoch.

*Given the current constraints and evidence of naturally reproducing Lake Trout current operation is the preferred option.*

## 4.4 Kashwakamak Lake

**Option 4a**
**Drawdown eliminated after Mazinaw Lake drawdown is complete to maintain level at lake elevation.**

Strategy for development of the option:
Maintain stable water levels at lake elevation achieved prior to Mazinaw Lake drawdown.

How option addresses comment:
Aquatic hibernating amphibians and reptiles do best when stable water levels exist in late fall and during ice cover. They over-winter in water, burying themselves in the bottom mud of streams and lakes. These hibernating creatures have limited ability to move to avoid dewatering after the onset of hibernation.

On Kashwakamak Lake, most of the drawdown has been completed prior to the lake freezing over, which allows some protection for these animals. Kashwakamak remains relatively constant until the drawdown on Mazinaw Lake is complete and continues to drop, reaching its minimum level around early- to mid-January. The continued drawdown after the ice is on the lake may result in some hibernating amphibians and reptiles in the dewatered areas not surviving. The legal constraint on Mazinaw Lake does not allow an earlier drawdown on Mazinaw Lake so the only option is to eliminate the second drawdown on Kashwakamak.

Maintaining higher fall water levels on Kashwakamak Lake for ecosystem benefits <u>may</u> also benefit navigational access to property.

<u>Option Evaluation:</u>
Subjective analysis completed - see Option Development Analysis Chart for Kashwakamak Lake in Appendix B.

<u>Benefits:</u>
- The potential for a reduction in mortality rates of benthic hibernating vertebrate (frogs, turtles etc).

<u>Conflict or concerns:</u>
- A reduction in available storage for spring runoff (will vary each year)
- Increased shoreline damage from ice due to ice forming at higher elevations
- May adversely impact hydro generation.

*Option 4a - There is no scientific methodology available at this time to quantify the current mortality rate or the potential / actual reduction if this option were selected and therefore the current operation is the best option.*

## 4.5 Crotch Lake

Many options were developed to address the comments related to Crotch Lake. The strategy for development of an option was to investigate altering the levels and flows to benefit the objectives for Crotch Lake and compare those benefits against the conflicts/concerns to the rest of the watershed.

<u>How options address comments:</u>
The operating regimes for Crotch Lake and upstream lakes have been integrated to provide the greatest potential to equitably allocate the available water among a wide range of uses and interests. Due to this integration, changes in individual operating regimes may have significant implications to existing uses and expectations.

A variety of different operating regimes were evaluated including changes to the magnitude and timing of drawdowns and use of a single drawdown. The resulting options were assessed both qualitatively and quantitatively through the use of simulation modeling.

The performance of the modified operating regimes was assessed against the intended benefits of improving navigable passage to Twin Island and Fawn Lakes and the potential impacts on downstream water levels and flows.

**<u>Option 5a</u>**
**Reduce summer drawdown to a level of 238.5m to improve recreational opportunities by restricting the release of water from Crotch Lake once this level is achieved.**

<u>Comment:</u> Historical data indicates that this level is achieved around the middle of August. The implications of this option would reduce outflow from Crotch Lake to matching the inflow into the lake, which in dry summer periods can be near zero cms. This condition could last from mid August through to October when the draw down from the upper lakes begins. Concerns related to biological processes on the lake have not been supported with current scientific documentation.

<u>Option Evaluation:</u>
Subjective analysis completed - see Option Development Analysis Chart for Crotch Lake in Appendix B.

Benefits:

- Allows access to Twin Island and Fawn Lakes throughout the summer period
- Higher water levels would provide more surface area for recreational opportunities and fish habitat on the lake typically from mid August through mid October.

Conflict or concerns:

- Fails to maintain low flow augmentation resulting in impacts on ecological integrity and recreational opportunities on lakes and the river downstream especially during low flow periods.
- Navigational opportunities impacted on Mississippi (1700 residences & 4 marinas), Dalhousie (195 residences & 1 resort), 6 downstream communities and all riverine sections below Crotch Lake.
- Significant loss in power production (could result in complete loss of power production in dry summer periods).
- Impact on municipal requirements for waste assimilation

*Current operations (base case) provide the best opportunity to maintain ecosystem health and navigation on the lake as well as downstream.*

**Figure 19a**

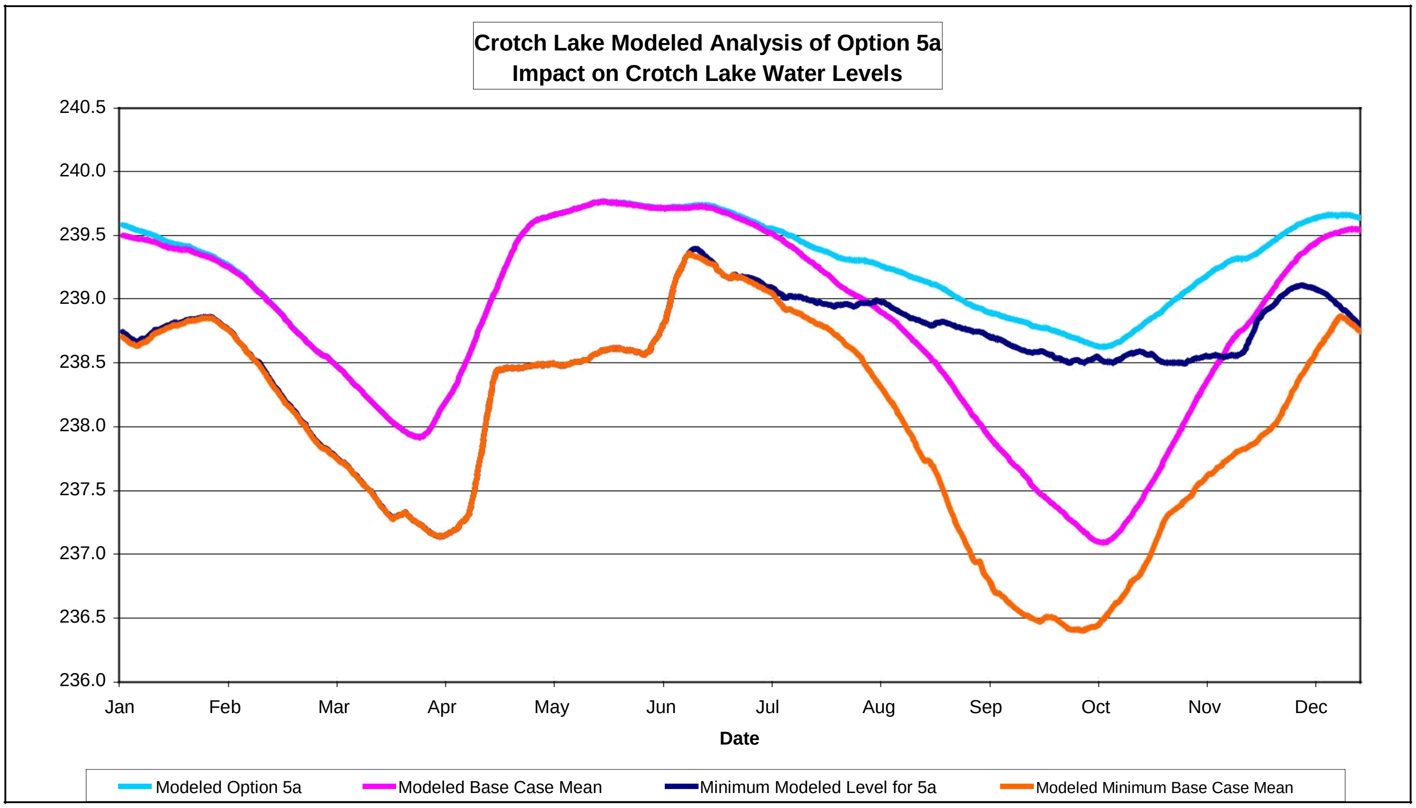
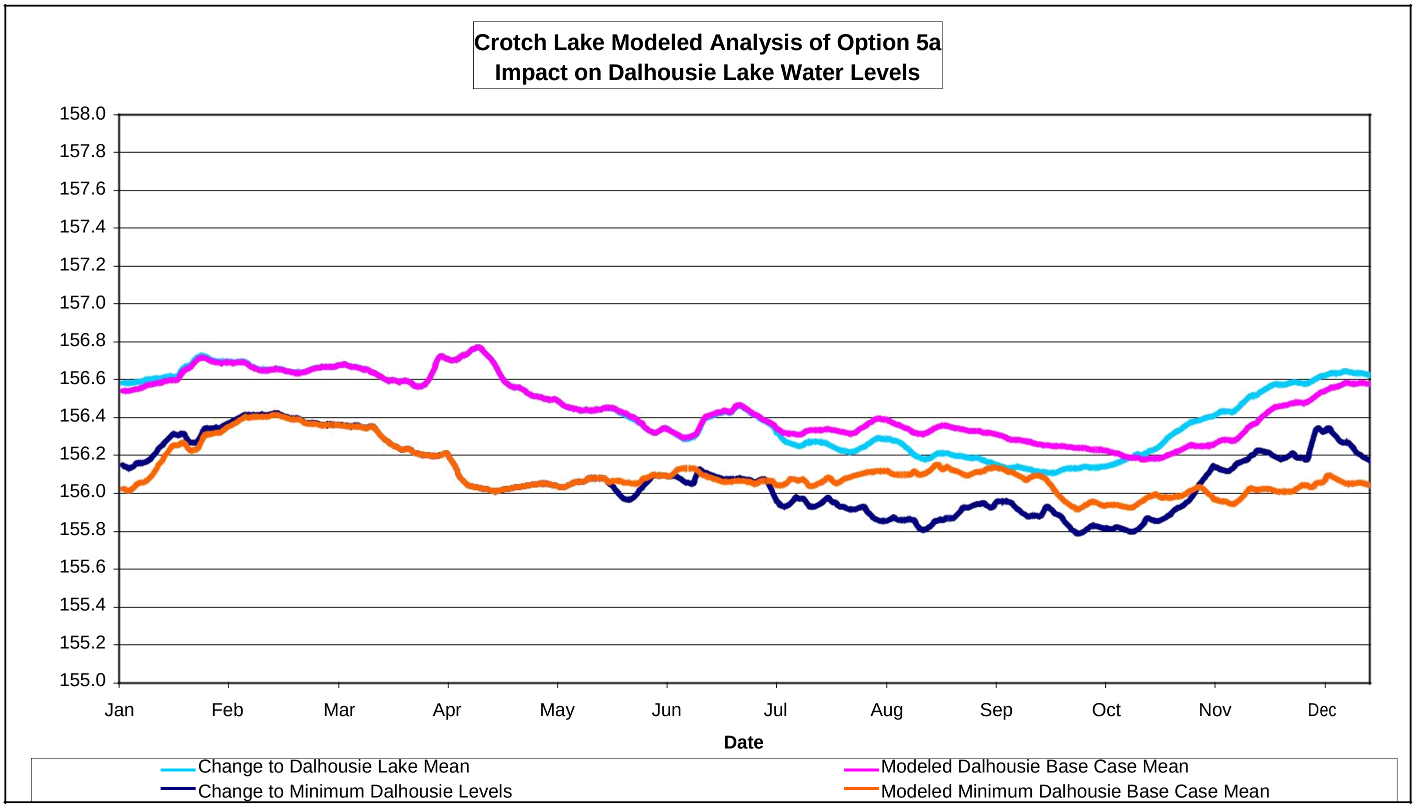


**Figure 19b**




**Option 5b**

**Reduce summer drawdown to a level of 238.5m and utilize water from the upper lakes to maintain existing downstream flow conditions.**

Comment: Historical data indicates that this level is achieved around the middle of August. The implications of this option would result in the need to begin draw downs on the upper lakes in early August to offset the water normally removed from Crotch Lake. Restrictions on the current operating guidelines for Mazinaw Lake and the potential detrimental impact on the growing and harvesting period of the wild rice at Ardoch eliminate the use of Kashwakamak and Mazinaw Lakes to supplement this flow. As well, no specific rationale has been identified to support changing the current extent of draw down on the lake.

Option Evaluation:
Subjective analysis completed - see Option Development Analysis Chart for Crotch Lake in Appendix B.

Benefits:
- Allows access to Twin Island and Fawn Lakes throughout the summer period
- Higher water levels would provide more surface area for recreational opportunities and fish habitat on the lake typically from mid August through mid October.

Conflict or concerns:
- Conflict with drawdown dates for navigation on Mazinaw Lake
- Navigational opportunities impacted on Mazinaw (450 residences, 5 resorts & a provincial park), Shabomeka (100 residences), Kashwakamak (400 residences & 5 resorts), Big Gull (450 residences & 6 resorts) and Mississagagon (200 residences & 3 resorts)
- Wild Rice growth cycle altered due to water level change

*Current operations (base case) provide the best opportunity to maintain ecosystem health and navigation on the lake as well as downstream.*

**Option 5c**

**Eliminate the winter drawdown by leaving all the logs in and attempt to maintain a level of 239.5 m.**

Option Evaluation:

Subjective analysis completed - see Option Development Analysis Chart for Crotch Lake in Appendix B.

**Figure 20a**

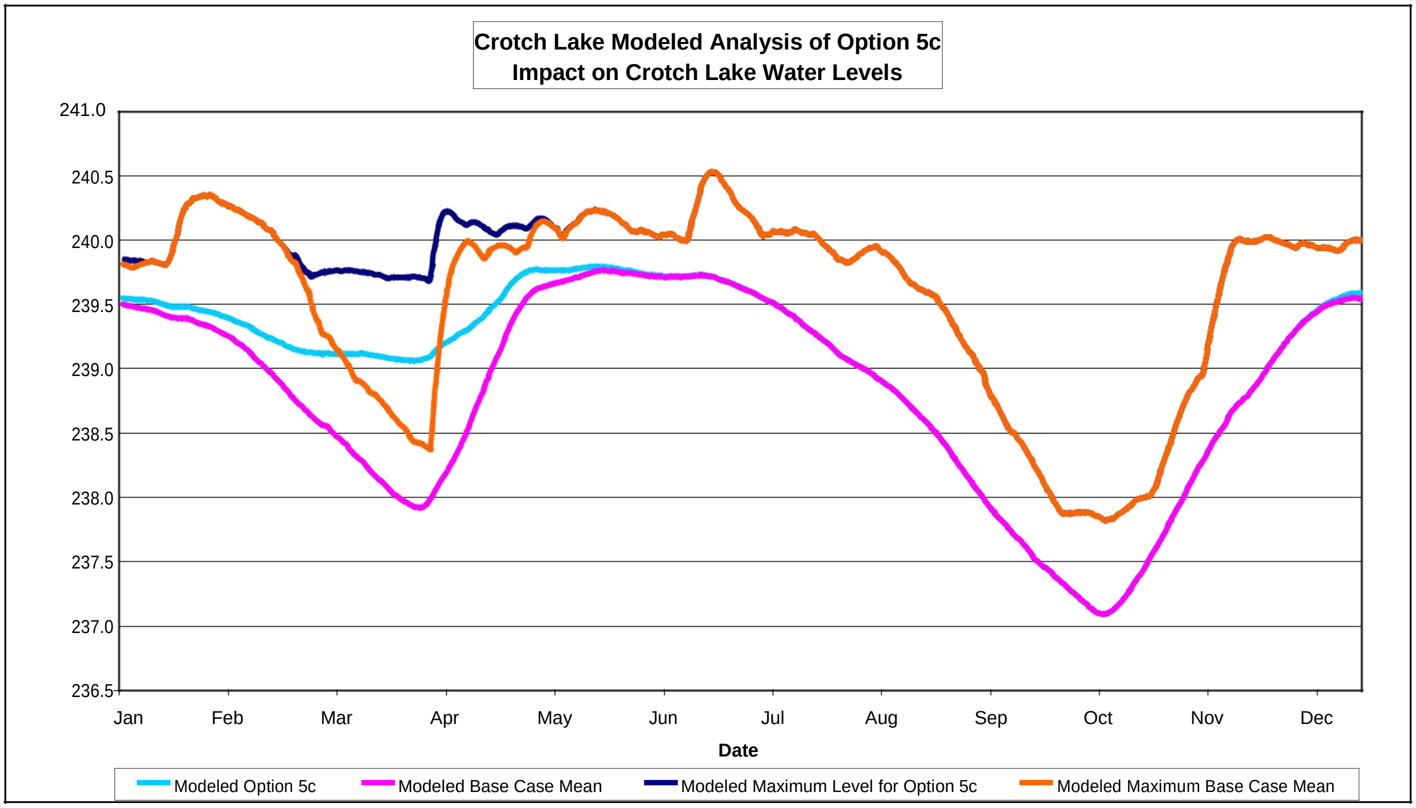
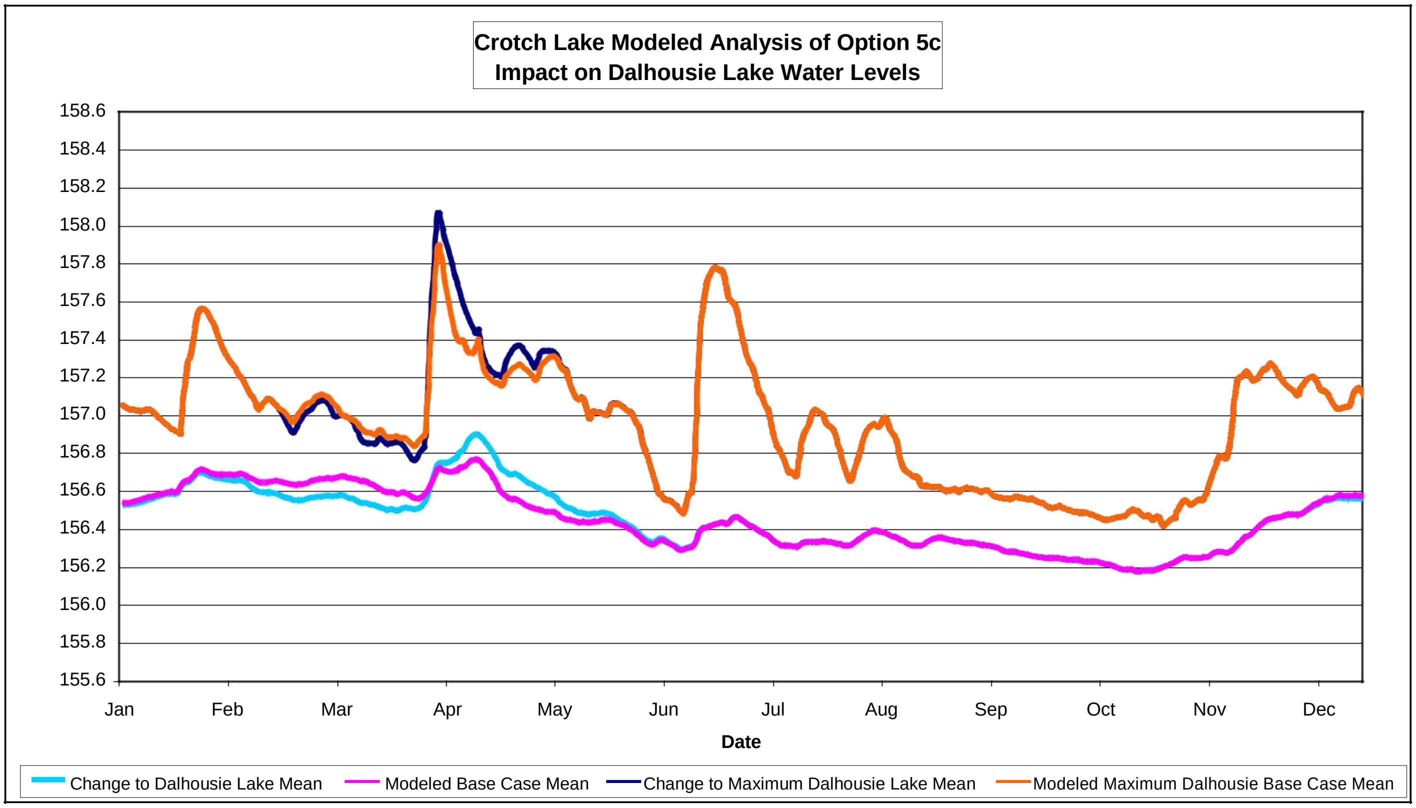


**Figure 20b**




Benefits:

- Increased fish habitat
- Emulates components of a natural system
- This allows access to Twin Island and Fawn Lake throughout the summer period
- Higher water levels would provide more surface area for recreational opportunities
- Water levels will be established prior to beaver, muskrat, turtles and aquatic invertebrates enter winter hibernation on Crotch Lake
- Stable ice conditions on Crotch Lake
- Risk of winter kill of fish reduced

Conflict or concerns:

- Reduces flood storage to mitigate flooding at the prime flood damage centers of Dalhousie and Mississippi Lake and the 6 communities downstream
- Downstream water levels will not be established prior to beaver, muskrat, turtles and aquatic vertebrates entering winter hibernation
- This option fails to maintain ecological integrity (water quality, flushing rates etc.) of lower river system, recreational opportunities on Mississippi Lake and Dalhousie Lake as well as the river
- Significant economic constraints associated with the two lakes (1700 cottages/homes, 4 marinas, numerous B&B's and 6 communities located downstream
- Significant loss in power production
- Ice damage to areas downstream of Crotch Lake due to either increased flows when ice is forming or dropping water levels after the ice has formed

*Current operations (base case) provide the best opportunity to maintain ecosystem health and navigation on the lake as well as downstream.*

**Option 5d**

**Eliminate the winter draw down by not refilling Crotch Lake in the fall (all removable logs left out of dam after October).**

Comments: The expectation of this option was to improve the ecological health of Crotch Lake. This option may result in negative impacts on the ecological integrity of the lower river system however, the complexity and level of study required to resolve these conflicts is beyond the scope of this plan.

This option may provide additional flood protection through the winter however, this would exclude the use of Crotch Lake to augment low flows during this period. The implications on waste assimilation requirements for downstream communities, of not having low flow augmentation during this period are unknown.

This option has been undertaken at least twice in the past 50 years (reasons why were not adequately documented). Increased problems with frazil ice and ice jams occurred in the lower section of the river during the winter of one of these years. Ice fluctuations will still occur on Crotch Lake with this option.

Option Evaluation:
Subjective analysis completed - see Option Development Analysis Chart for Crotch Lake in Appendix B.

Benefits:

- Total change in water levels on Crotch Lake will be reduced throughout the fall and winter however, water levels will continue to fluctuate by up to 2m during this period due to inflow conditions.
- Increases power generation from October to January
- Increased flood control capabilities through the winter months

Conflict or concerns:

- Opportunities to augment flows in the winter will be lost. Minimum flow requirements to maintain ecosystem integrity and to provide adequate waste assimilation capacity at Carleton Place and Almonte are unknown at this time. Further investigation on minimum flow requirements should be completed prior to further consideration of this option.
- No net gain to the ecosystem on Crotch Lake can be determined
- Downstream water levels will not be established prior to beaver, muskrat, turtles and aquatic vertebrates entering winter hibernation
- Potential ice damage to areas downstream of Crotch Lake due to either increased flows when ice is forming or dropping water levels after the ice has formed
- Significant loss in power production - would reduce the efficiency of High Falls G.S. and Enerdu G.S. by necessitating spilling water from October to January

*Current operations (base case) provide opportunities to augment flows as required to maintain minimum flow requirements. This option does not achieve any significant benefit on Crotch Lake in stabilizing winter water levels or improving ecological habitat and therefore further analysis is not considered warranted.*

**Figure 21a**

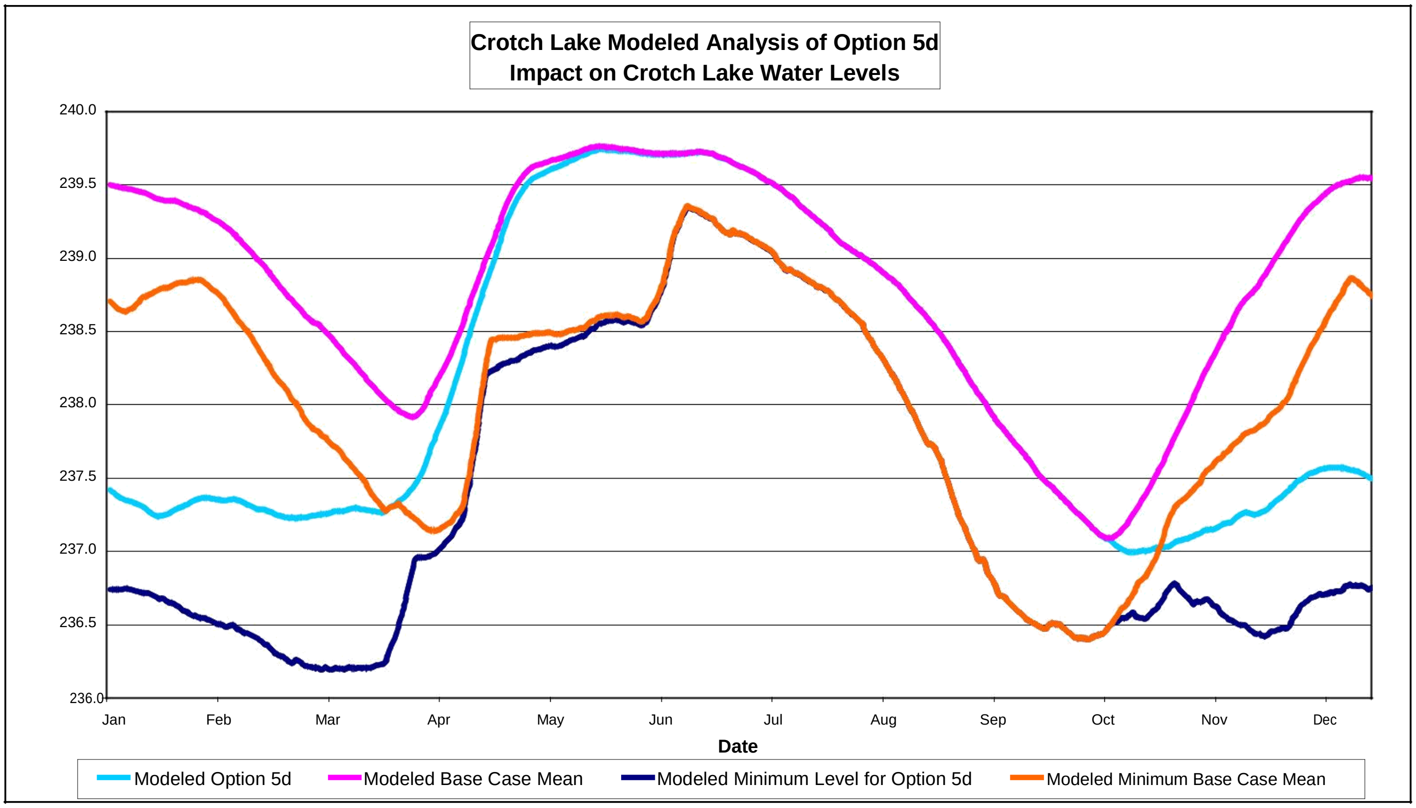
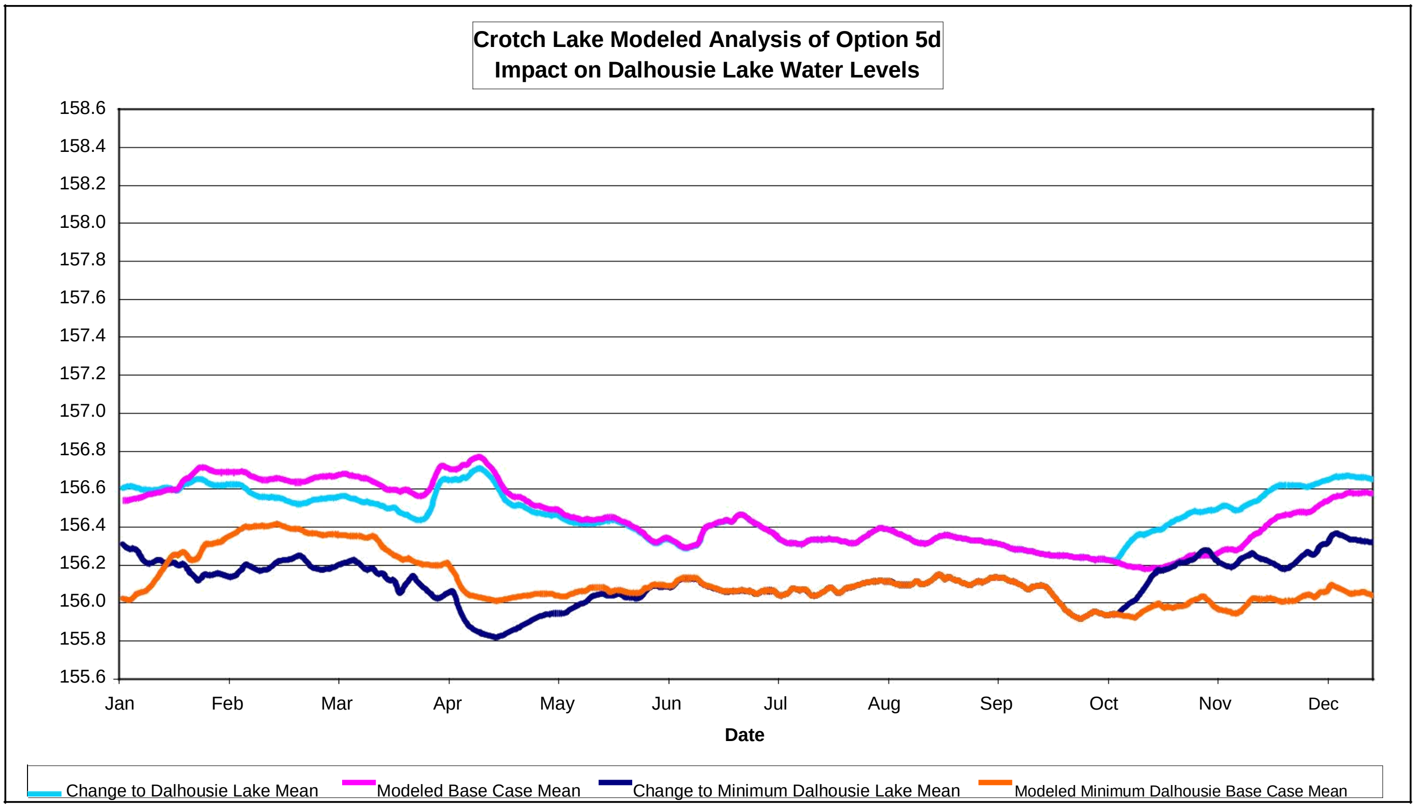

Crotch Lake Modeled Analysis of Option 5d
Impact on Crotch Lake Water Levels
240.0
239.5
239.0
238.5
238.0
237.5
237.0
236.5
236.0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Date
Modeled Option 5d
Modeled Base Case Mean
Modeled Minimum Level for Option 5d
Modeled Minimum Base Case Mean

**Figure 21b**




**Option 5 e**

**An average of 5cms annually; 1cms (minimum when filling the lake) & 3 cms (minimum summer flow)**

Comment: This option best reflects the current operating procedures for Crotch Lake. Crotch Lake has historically been identified as the source to maintain a minimum flow of 5 cms to High Falls and the river downstream. As has been previously mentioned Crotch Lake provides 60 to 100 per cent of the downstream flow during the summer months depending on streamflows from contributing areas downstream of Crotch Lake. In the fall, when the draw down of the upper lakes is underway, Crotch Lake is not being used to augment downstream flows as water is being stored in Crotch Lake to utilize later and flows are being maintained by the water from the upper lakes. Depending on the previous summer, if below average precipitation occurred, flows out of Crotch Lake may be lower than 5 cms in order to allow the lake to be filled to ensure adequate water supply later in the year. Inflows to High Falls will be maintained at or near an average of 5 cms by utilizing both Crotch Lake and the feeder creeks between Crotch Lake and High Falls.

For short periods of time, outflows from Crotch Lake may be reduced to near zero as stoplogs are replaced in the dam. This condition is temporary and occurs when there are limited impacts on recreation, navigation and fisheries and will recover quickly due to the volume of water coming from the upper lakes. In general, use of Crotch Lake to maintain a flow of 5 cms into High Falls is most critical in the June to October and January to March periods when other sources of water are normally not available.

Option Evaluation:

**Figure 22a**

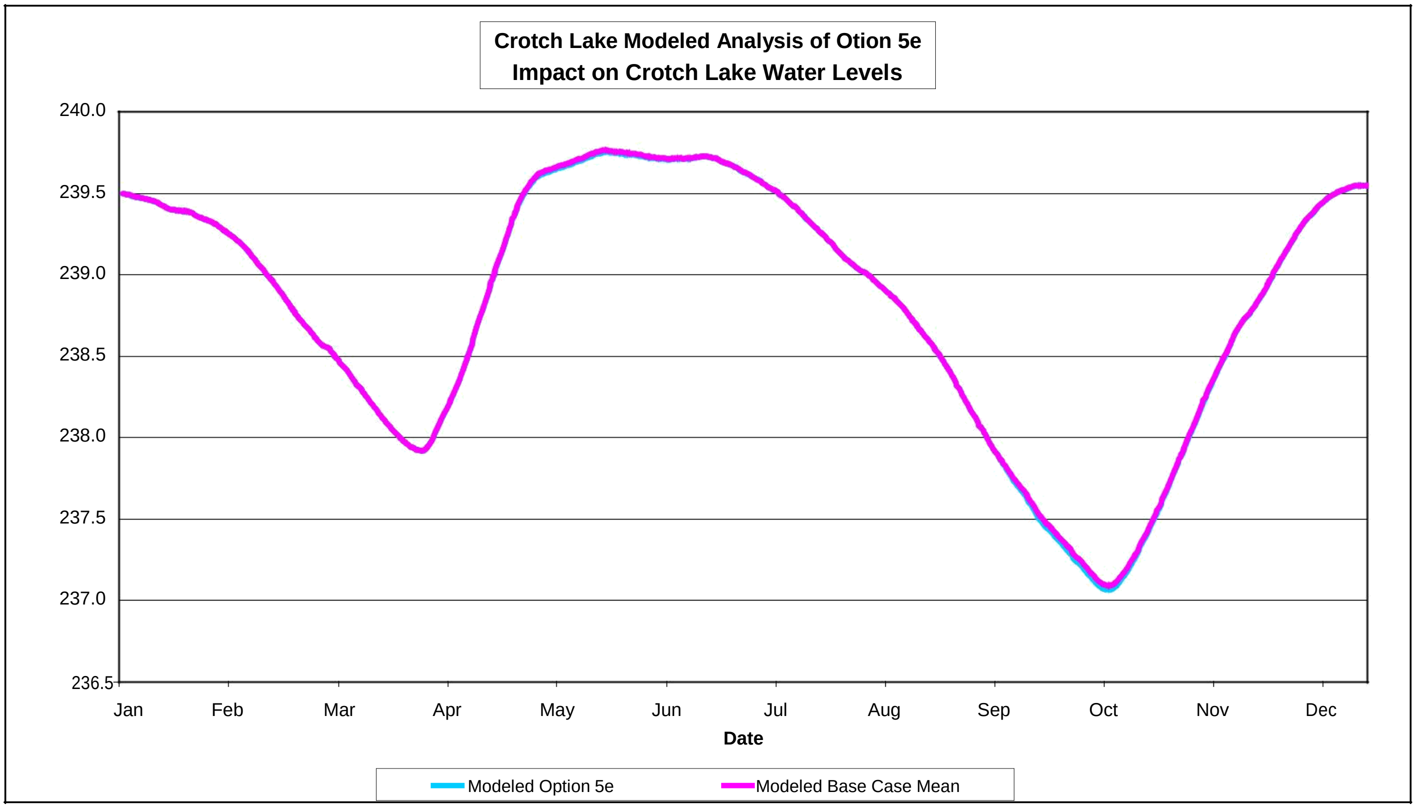
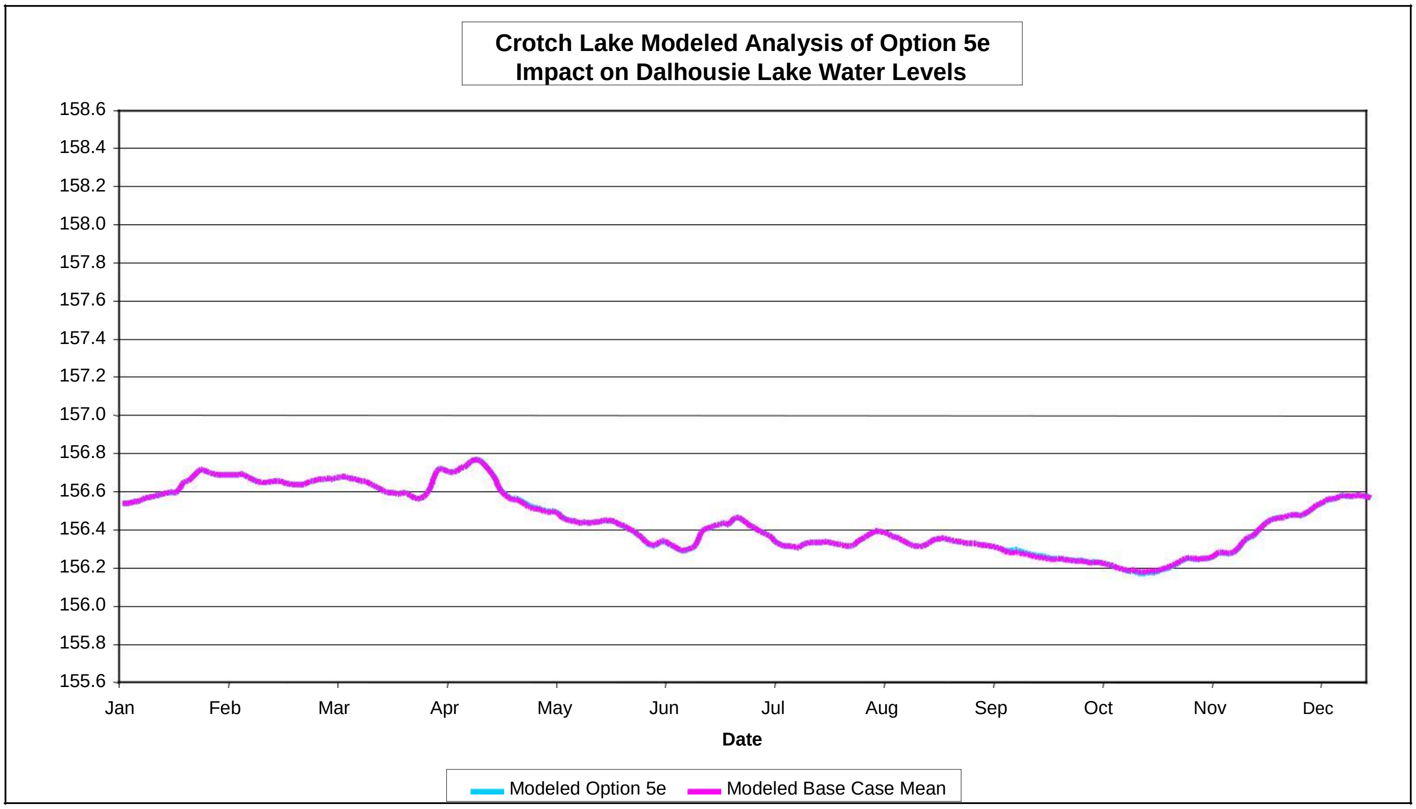


**Figure 2b**




<u>Benefits:</u>
- Resembles existing operation
- Resembles natural flow regime

<u>Conflict or concerns:</u>
- Maintaining a minimum of 1cms for an extended period of time could result in dry river conditions downstream.
- Dry years may require that levels be reduced to ensure that Crotch Lake fills in case it is a dry spring.
- Less water for hydro generation
- Closely resembles the base case but in the base case there are occasions where the flow is below 1 cms to get the lake filled.

**<u>Option 5 f, g, h, i</u>**
**Increase the minimum flow rate: an average flow higher than 5cms annually; 1&5 cms, 1&7cms, 2&5cms, 2&7cms.**

<u>Comment:</u> When the water is available from rainfall over the summer period, higher outflows from Crotch Lake are maintained until such time as Crotch Lake levels return to normal. Continuing to maintain increased outflows after that occurs could potentially cause the system to run out of water and adversely affect all levels and flows and all uses/users of the water should that occur.

No graphical representation is provided for options 5g,h and i, as these are incrementally detrimental to the impacts on the system shown in option 5f. Subjective analysis was not completed as these options were considered through modeled analysis.

Option Evaluation:

**Figure 23a**

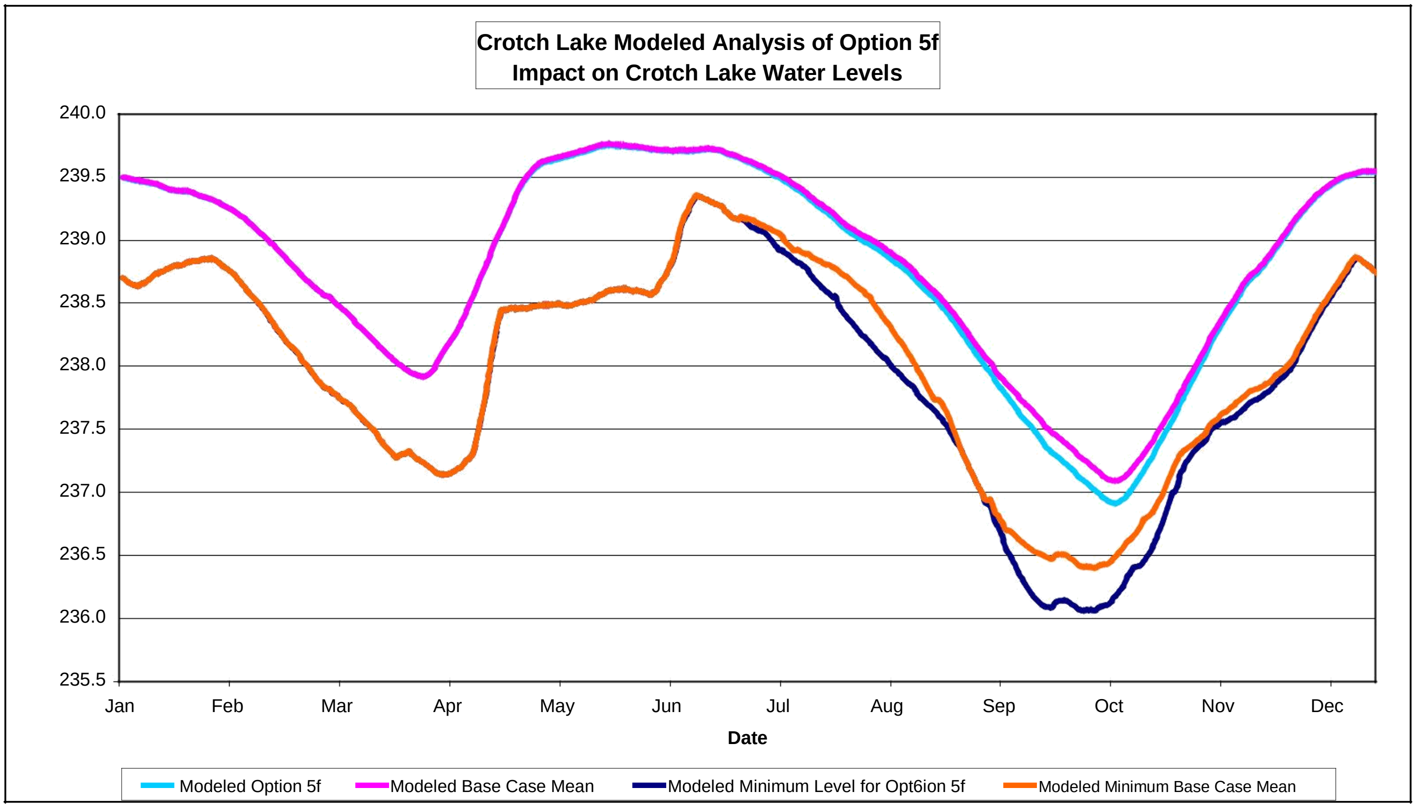
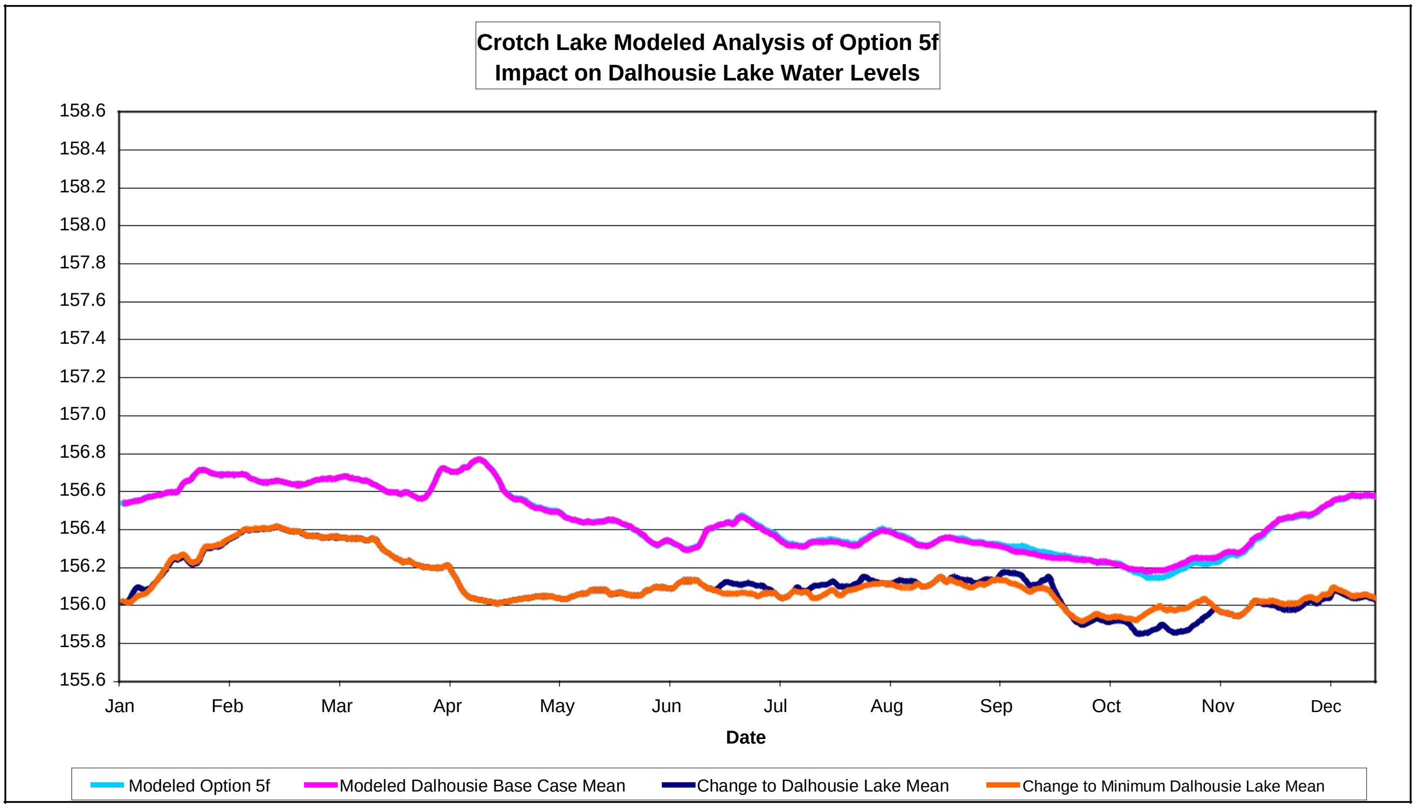


**Figure 23b**




Benefits:

- Greater flow out of Crotch Lake into High Falls GS increases power production here and at all downstream generating stations for as long as flows can be maintained.
- Higher flows downstream provide better recreational, navigational opportunities on the lakes and river by having higher levels.
- Increased flows increase flushing rates on lakes and deeper water provides cooler water with more oxygen and less plant growth thereby improving fish habitat and water quality in general.

Conflict or concerns:

- Without rainfall during the summer months (which we can not be assured will be received), the system would run out of water sometime between mid August and mid September depending on the outflow maintained, resulting in serious impacts on all users/ uses of the river.

*The current operation (base case) best maintains the integrity of all planning objectives*.

**Option 5j**
**Maximize hydro generation**

Voluntary constraints are eliminated to operate Crotch Lake for generation requirements.

Strategy for option development:
Outflow will be increased from Crotch Lake and a diurnal operation used for High Falls. To fluctuate flows from Crotch Lake to meet power generation demands.

Option Evaluation:
Subjective analysis completed - see Option Development Analysis Chart for Crotch Lake in Appendix B.

**Figure 24a**

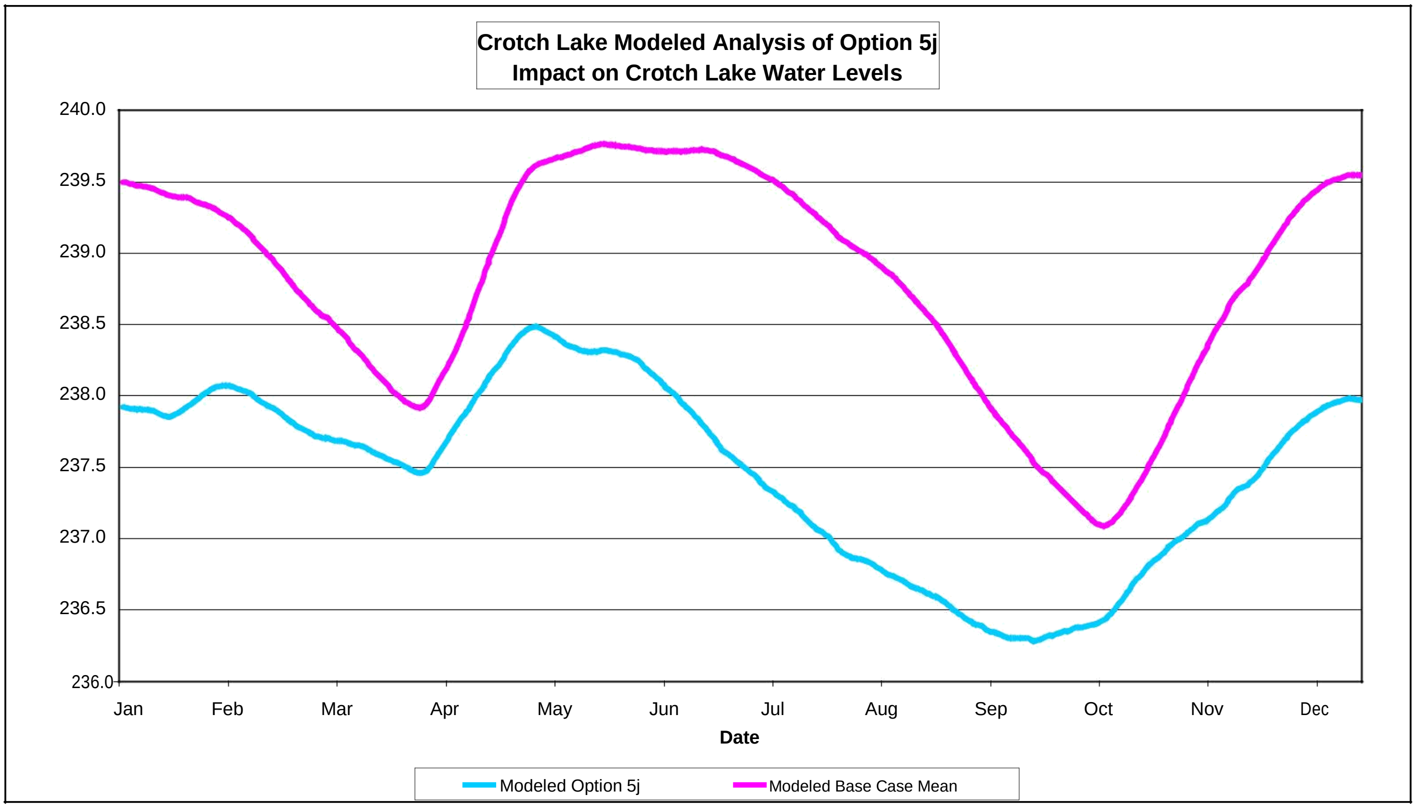
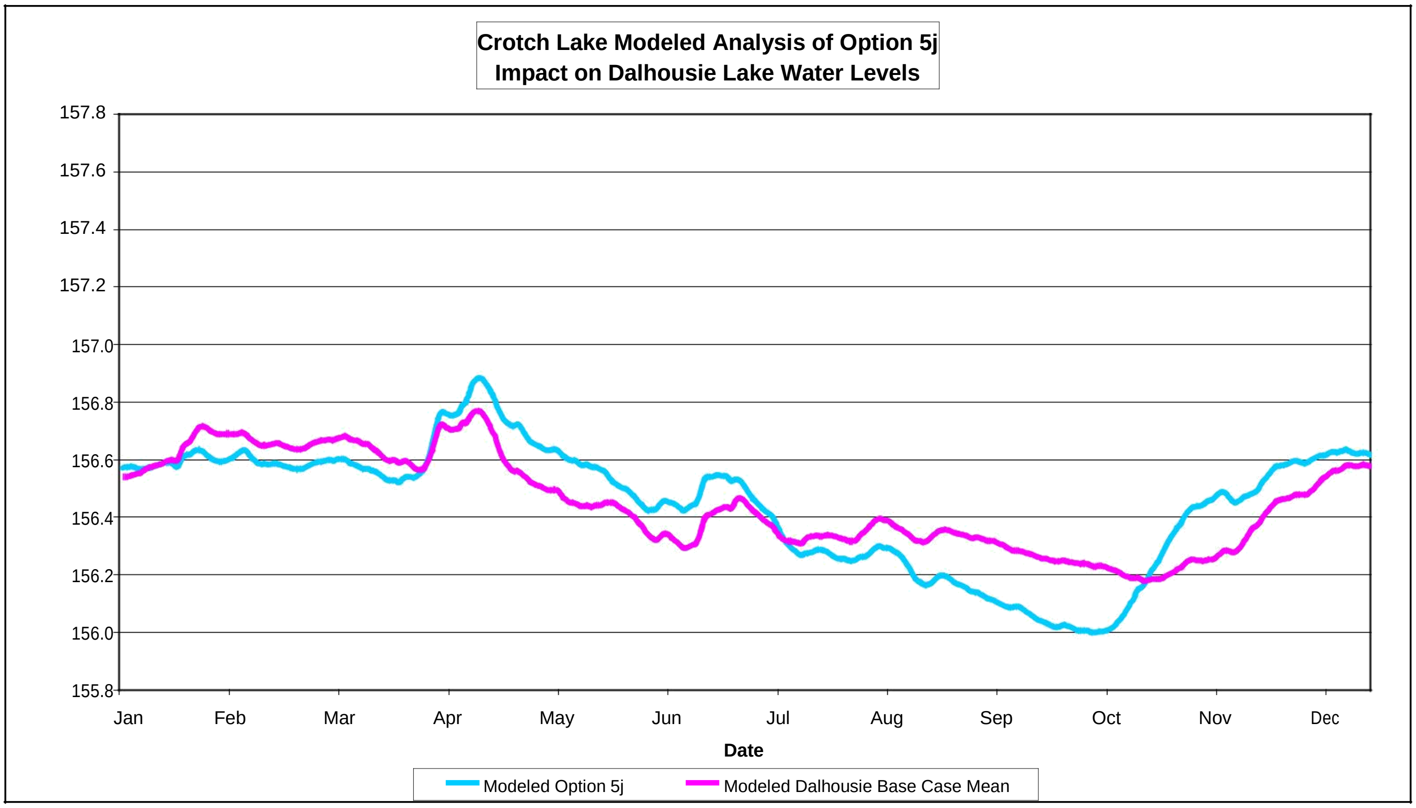

Crotch Lake Modeled Analysis of Option 5j
Impact on Crotch Lake Water Levels
240.0
239.5
239.0
238.5
238.0
237.5
237.0
236.5
236.0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Date
Modeled Option 5j
Modeled Base Case Mean

**Figure 24b**




<u>Benefits:</u>

- Power generation will increase on the river system.

<u>Conflict or concerns:</u>

- System would run out of water by September/October
- Increased fluctuating water levels downstream of Crotch Lake, the lake would drop below 235.5 around August
- Flooding levels on Dalhousie Lake and High Falls
- The amount of time it takes for water to travel from Crotch Lake to High Falls restricts the ability to meet peak demand.
- Impacts fisheries
- Impacts navigation
- Impacts recreation
- Impacts flood mitigation
- Impacts ecological integrity

*The option of 5j was not considered a viable option because operating the system solely for the benefit of power generation would be detrimental to all other objectives for the system. There is a finite supply of water in the system, which would not be available throughout the year with this option. The current operations provide the best balance for power generation, environmental and social objectives.*

**Option 5 k**
**Maintain spill point at or above weir height of 240.00m.**

Option Evaluation: Option Evaluation:
Subjective analysis completed - see Option Development Analysis Chart for Crotch Lake in Appendix B, no further analysis was required.

Benefits:
- Increase fish habitat
- Higher water levels will provide more surface area for recreational opportunities.
- Allows access to Twin Island and Fawn Lake throughout the summer period.

Conflict or concerns:
- Fails to maintain ecological integrity of the downstream river system.
- Significant impact on flood potential to downstream areas.
- Significant loss in power production.
- Significant economic constraints associated with Mississippi and Dalhousie Lakes.
- Not physically possible due to current configuration of existing structure.

*Current operation protects critical fish spawning habitat while at the same time ensuring downstream ecological integrity.*

## SECTION 5 Preferred Option

### 5.1 Summary of Preferred Option

The preferred option for purposes of the Mississippi River Water Management Plan will be to operate the hydro generating facilities and water control structures in accordance with the Base Case as described in Section 3 with the exception of the Shabomeka Lake Dam.

The Base Case represents the current operating regime and as such would not result in changes from that which presently exists. The Base Case is considered to satisfy the planning objectives to the greatest extent possible, given the range of competing interests and uncertainty associated with weather conditions. Due to the absence of historical data associated with the hydro generating facilities downstream of Carleton Place, the Base Case for these facilities has been defined on the basis of field surveys and operator experience.

With respect to Shabomeka Lake, the preferred option includes Option 2a, which would continue with the mid-September drawdown while raising winter water levels in Shabomeka Lake by 0.30m (one log) from the current strategy. This will aid in ensuring that water is covering the spawning habitat throughout the spawning and incubation period (October – April).

## SECTION 6 Compliance Monitoring and Reporting

Prior to the Water Management Planning Process, all dams on the Mississippi River system utilized a defined, well documented, operating range or in the case of the generating stations from Appleton downstream, specific physical landmarks to define maximum or minimum elevations above the structure. All dams were operated using best management practices - levels were maintained within these operating guidelines as much as possible to fulfill the various objectives of the individual structures In addition to the operating range, a narrower target range existed which operators strived to maintain throughout the year. The operating range limits quite often were relatively close to the upper or lower section of the target range at various times of the year to try to ensure maximum benefits to the entire watershed. As such, these minimum and maximum limits historically have only been exceeded due to specific intense weather events. This has not necessarily put the river and / or lakes in what would be considered a flood stage but allowed owners/operators the necessary flexibility to operate the river system to mitigate potential damages and competing objectives.

Due to the restructuring of Ontario's electricity market and subsequent amendments to the Lakes and Rivers Improvement Act, dam owners on rivers with waterpower facilities were required to develop Water Management Plans and operate their facilities in accordance with the provisions of these plans. The requirement to produce these plans is intended to prevent hydro operators from exploiting water resources for the benefit of meeting an electricity demand at the expense of the environment or some other objective. The proponents will be responsible for on-going self-monitoring through a Compliance Monitoring Program specified within the WMP.

The planning team for the MRWMP has established these new minimum and maximum boundaries for structures within the area of interest that require them. It was unanimously agreed that all structures owned by MVC would not be held to compliance requirements because they are never operated in a manner that would specifically enhance hydro generation. MVC will continue to operate their structures using the best management practices utilized prior to this process.

The compliance levels established for the hydro facilities do not give the operators the right to operate beyond these levels **under normal operating conditions**. All facilities will continue to operate using the best management practices utilized prior to this planning process with no significant change in the current management regime of any structure. In some cases, operating ranges have been modified to better reflect current practices or established to reflect new information regarding a structure. In the cases of the hydro facilities from Appleton downstream, the compliance level and operating ranges are identical where required because an established operating range did not previously exist for these structures. These facilities will still be operated using historical target ranges based on previously established limits.

As each Water Management Plan is completed and approved, the proponents must operate their facilities in accordance with the provisions of the approved plan as required by legislative amendments to the *Lakes and Rivers Improvement Act* (LRIA) or with the existing authority to issue a second order requiring compliance under Section 23(1.1). The proponents will be responsible for on-going self-monitoring through a Compliance Monitoring Program specified within the WMP.

The following chart outlines the required information to be recorded at each facility

**Figure 25 - Revised Operating Ranges for Compliance Monitoring**

| Control Structure | Data | Rationale | Minimum flow for Compliance Issues | Operating Range for Compliance Issues (m a.s.l.) | Responsibility |
|---|---|---|---|---|---|
| **Shabomeka** | Weekly staff gauge reading | Current practice | ** | See summary below | MVC |
| **Mazinaw** | Weekly staff gauge reading | Current practice | ** | See summary below | MVC |
| **Kashwakamak** | Weekly staff gauge reading | Current practice | ** | See summary below | MVC |
| **Mississagagon** | Weekly staff gauge reading | Current practice | ** | See summary below | MVC |
| **Big Gull** | Weekly staff gauge | Current practice | ** | See summary | MVC |

| | | | | | |
|---|---|---|---|---|---|
| | reading | | | below | |
| **Crotch** | Weekly staff gauge reading | Current practice | Best practice | 236.80 - 240.20 | OPGI |
| **High Falls G.S.** | Daily average reading | Run of the river facility; Minimal storage capabilities | 1cms * Best practice | 186.85 - 187.70 | OPGI |
| **C.P. Dam** | Weekly staff gauge reading | Current practice | ** | See summary below | MVC |
| **Appleton G.S.** | Daily staff gauge reading | Run of the river facility; Minimal storage capabilities | ** | 122.50 – 123.80 | CHD |
| **Enerdu G.S.** | Daily average reading | Run of the river facility; Minimal storage capabilities | ** | >116.7 | EI |
| **Almonte G.S.** | Daily staff gauge reading | Run of the river facility; Minimal storage capabilities | ** | >113.5 | MRPC |
| **Galetta G.S.** | Daily staff gauge reading | Run of the river facility; Minimal storage capabilities | ** | 82.61 - 83.80 | CHD |

* Daily average reading -
**Minimum Outflows – Except as explicitly noted, minimum outflow requirements will be achieved through best management practices and structure leakage which is inherent to all water control structures. When required to achieve the mandatory flow requirement of 1cms at the High Falls GS, Crotch Lake will be used to augment downstream flows.

## 6.1 Summary of Compliance Monitoring

### Mississippi Valley Conservation Water Control Structures

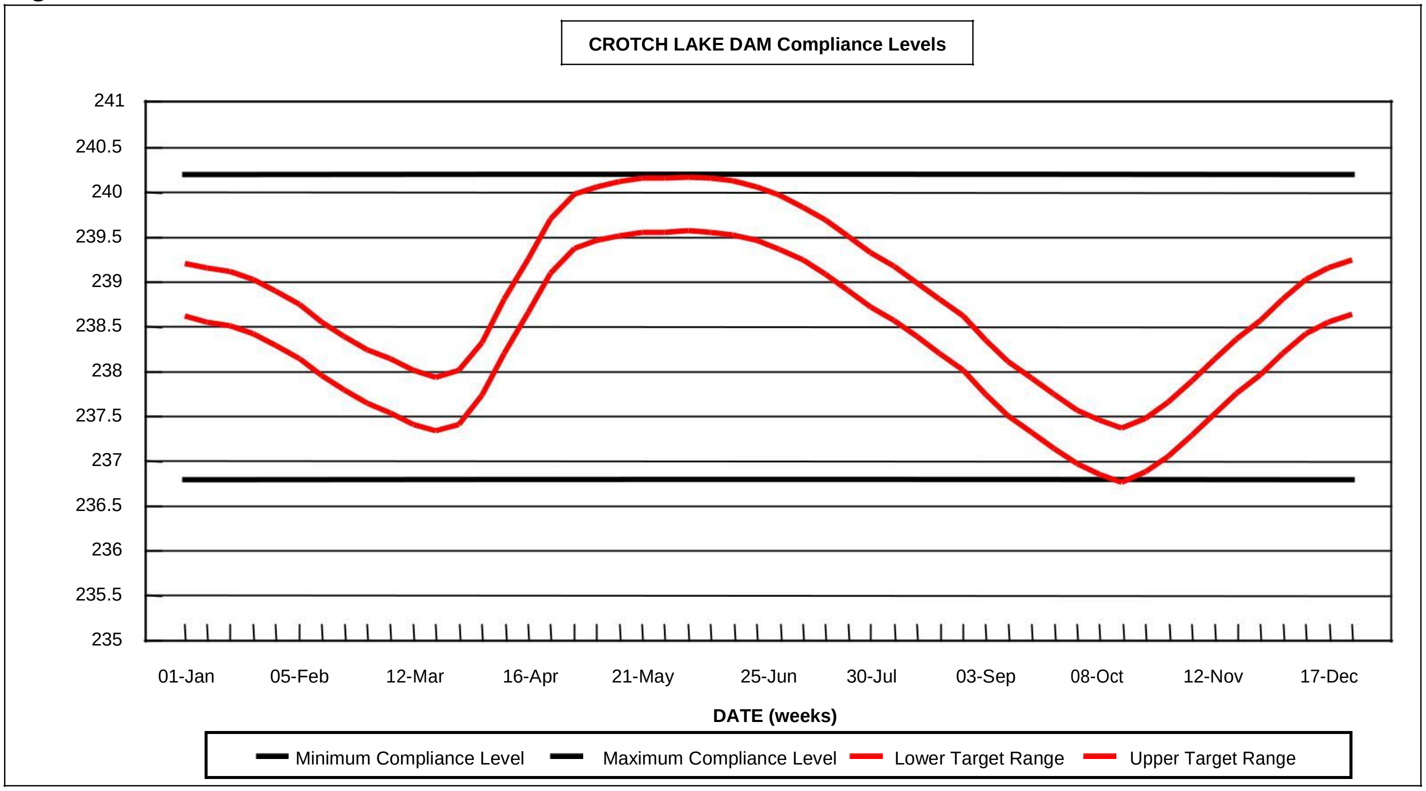
The water control structures owned and operated by MVC are not hydro-generating facilities and are operated to achieve multiple objectives as described in Section 3 – Base Case Description. Due to the multi-use nature of these structures, the operational requirements are not considered to be subject to the Compliance and Enforcement Guidelines. MVC will continue to operate these structures to achieve the operating target ranges identified in the Plan. For the purposes of this plan, MVC will comply with the monitoring and reporting requirements as described in Figure 24. MVC will continue to monitor and record daily water levels in accordance with current practice.

### Crotch Lake Dam

Crotch Lake dam is owned by OPG and is primarily used to provide flood control and low flow augmentation. It is also operated in conjunction with the High Falls G.S. to meet compliance requirements at High Falls. The lower compliance level for Crotch Lake dam has been increased from the original lower operating limit of 236.00 m to 236.80 m, to reflect current operating practice. Water levels below 236.80 m would only be achieved if the low water indicators were reached.

The upper compliance level of 240.20 m does not create flooding on Crotch Lake but would result in the High Water Indicator at High Falls G.S. The normal operation of this dam is to have the lake at 240.00 m (the crest of the weir) at the start of the summer to ensure adequate resources to maintain minimum flows for low flow augmentation. The 20 cm range between the upper target level and the compliance level provides limited storage to accommodate rainfall events to minimize the impact on downstream flows while not jeopardizing the low flow objective of the structure.

**Figure 26**

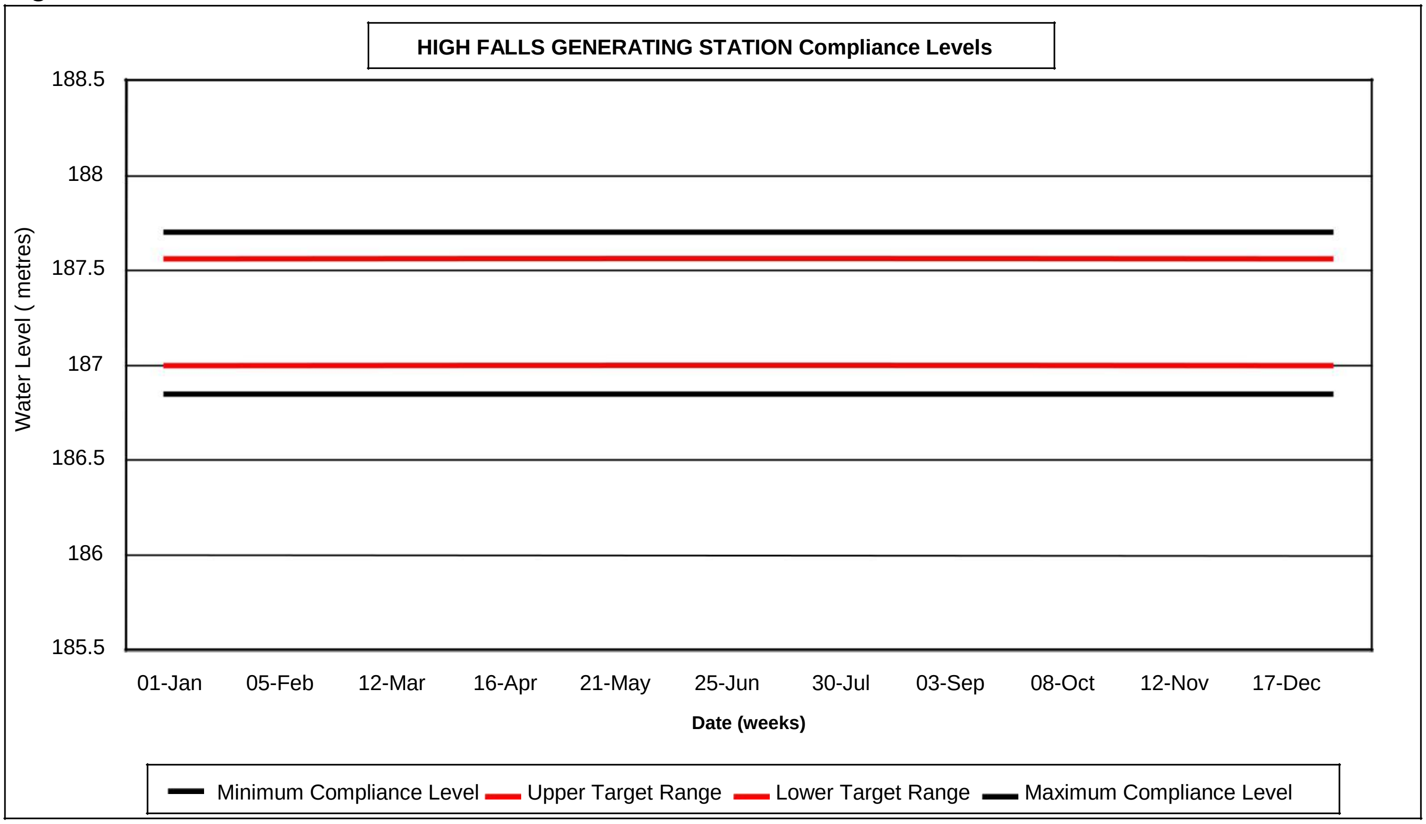



### High Falls Generating Station

Proposed compliance ranges have been established on the basis of mean daily water level records. Due to the limited storage capacity at run-of-the -river structures sudden fluctuations resulting from equipment failure or weather conditions can impact short term water level readings. Mean daily readings are considered a more appropriate compliance measure.

Historically, OPG has attempted to maintain an average flow of 5 cms through the High Falls generating station and this continues to be objective. This plant is operated to pass outflows from Crotch Lake and upstream tributaries to achieve this objective. Short term reductions in discharge may periodically occur due to interruptions in the electrical distribution system. As confirmed through simulation, such short term reductions in discharge will not adversely affect downstream water level conditions. For compliance purposes the minimum flow requirement has been set as 1 cms in recognition of historic conditions. Historic mean daily water levels have generally been maintained within this range. While actual upstream flooding limits have been noted as a data gap, public input has identified flooding concerns above levels of 187.70 m.

**Figure 27**

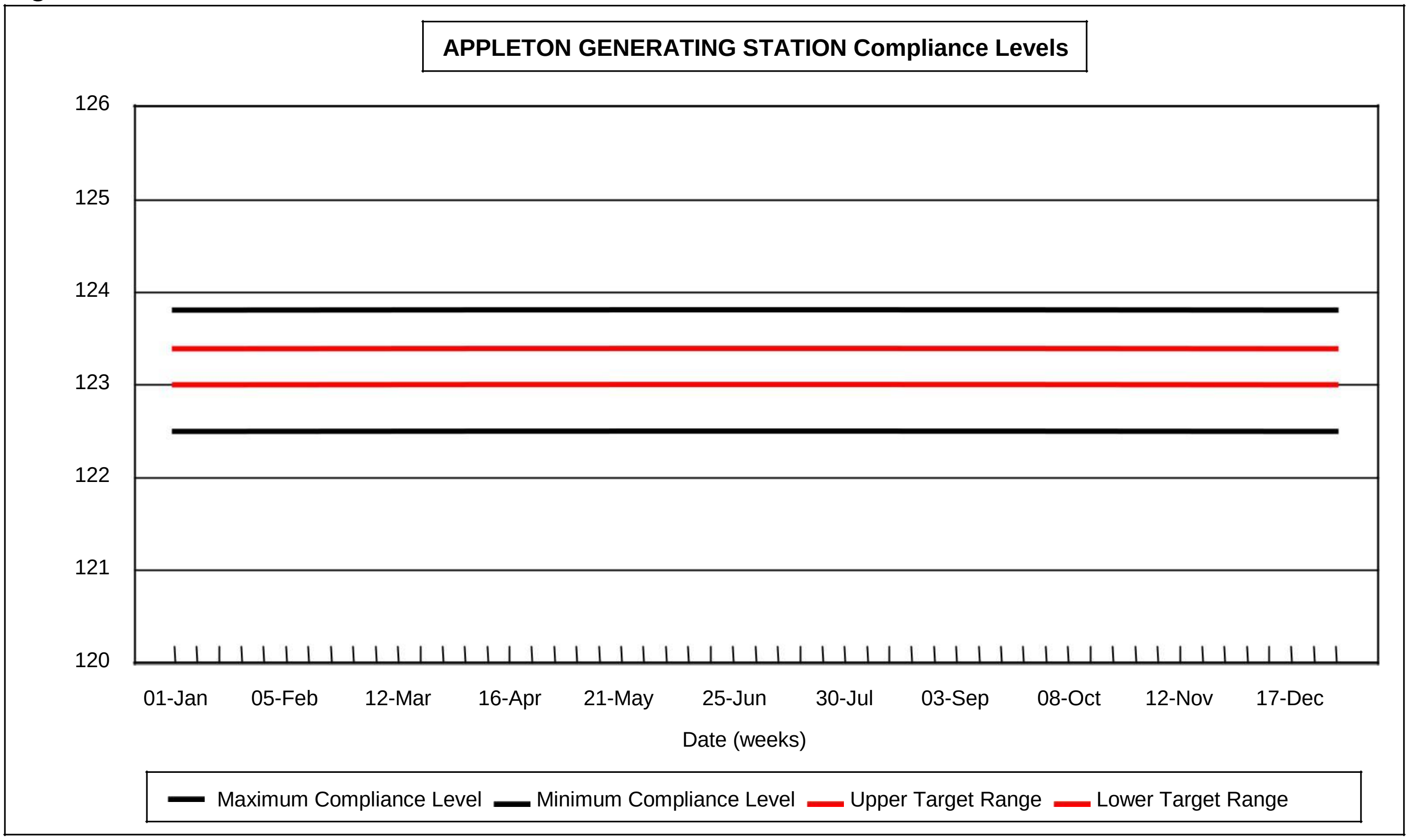



## Appleton Generating Station

Water levels have not been recorded at this facility in the past and therefore compliance levels have been established on the basis of upstream flooding constraints and maintaining minimum head pond elevations for aesthetics, fisheries and recreation.

Compliance levels conform to L&RIA approval for dam reconstruction in 1993.

**Figure 28**

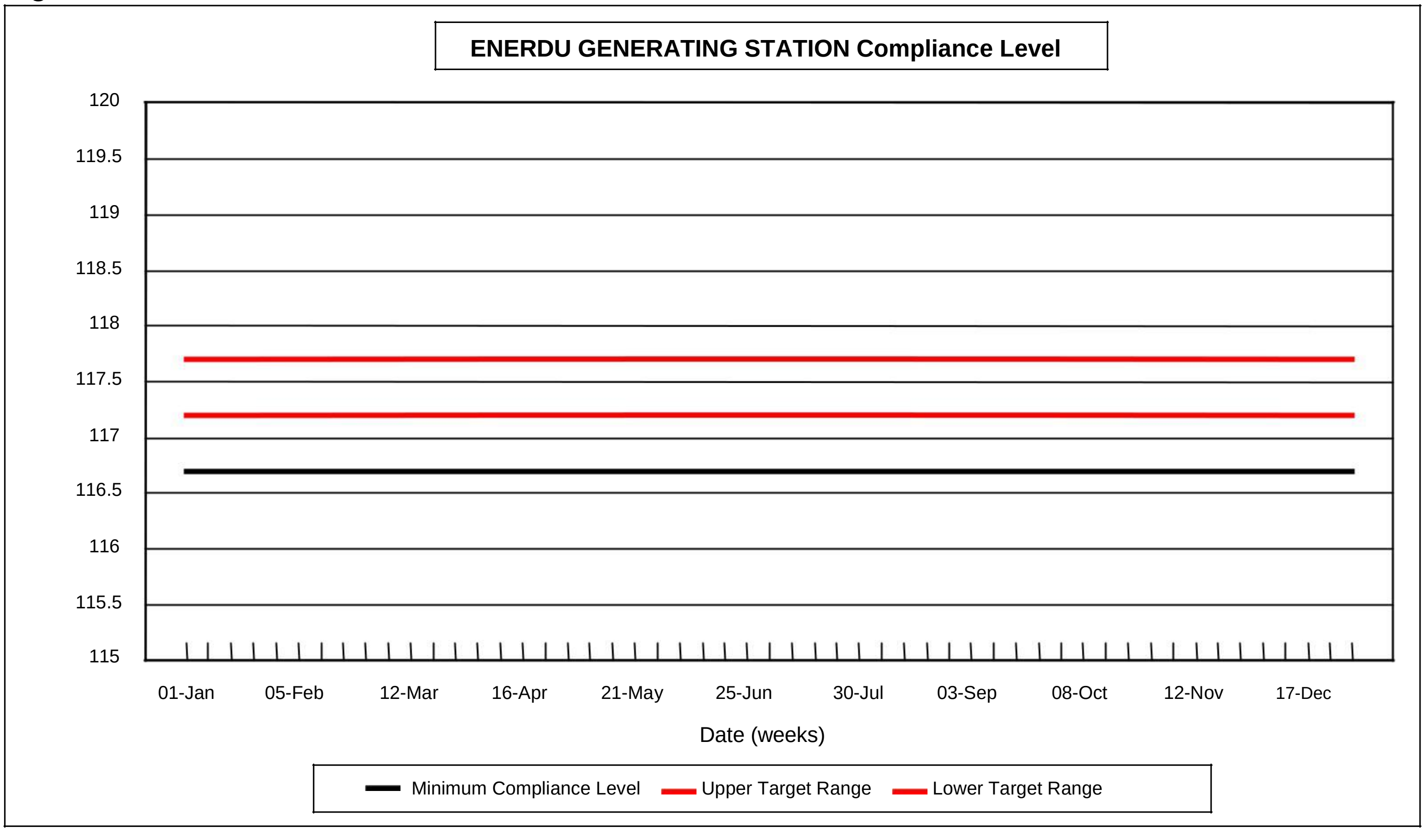



### Enerdu Generating Station

Due to the limited storage capacity at run-of-the-river structures sudden fluctuations resulting from equipment failure or weather conditions can impact short term water level readings. Mean daily readings are considered an appropriate compliance measure.

This structure has no stoplog control section as part of its superstructure therefore only has the ability to influence low flows. No upper compliance level is associated with this structure.

**Figure 29**



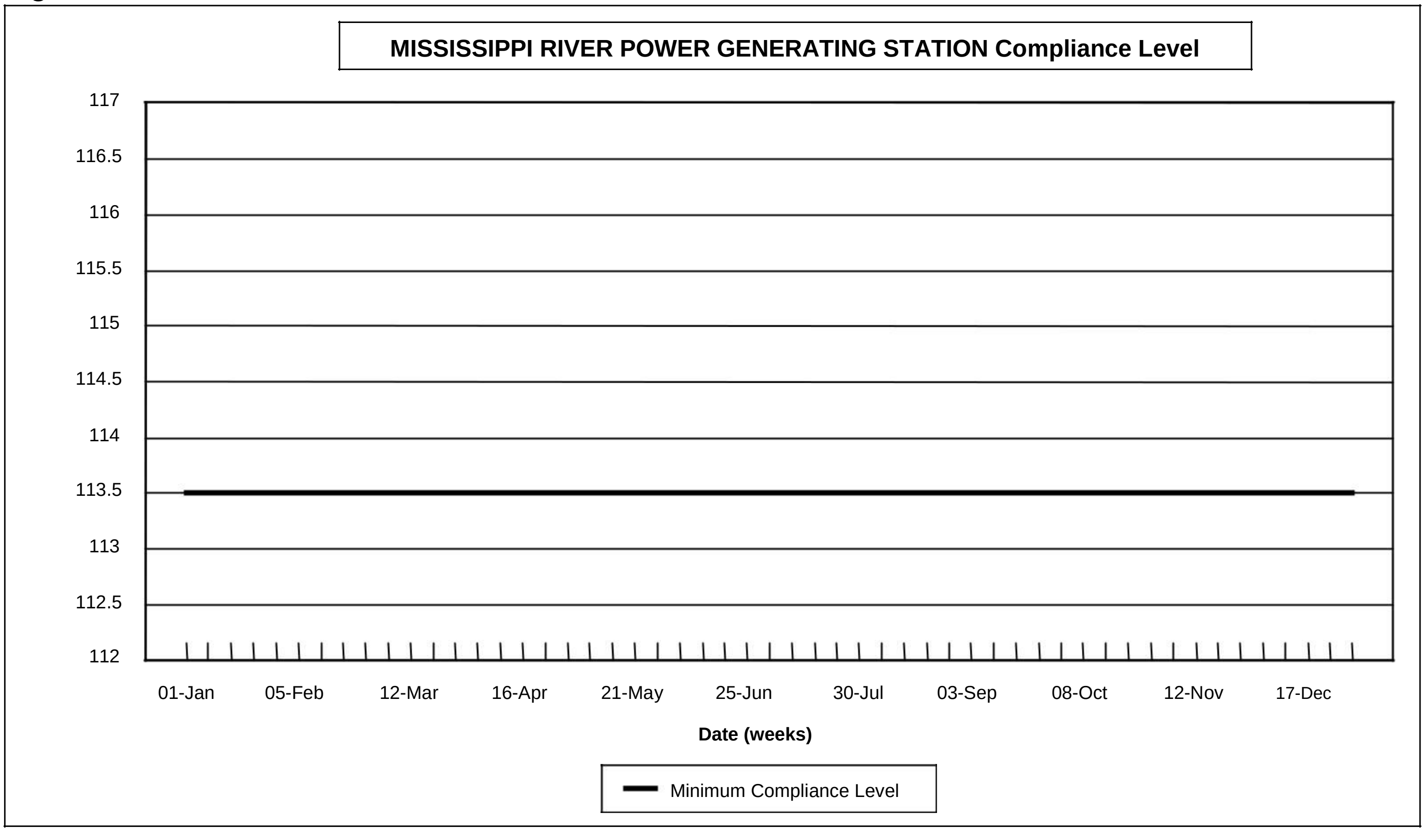

### Mississippi River Power Generating Station

Due to the limited storage capacity at run-of-the-river structures sudden fluctuations resulting from equipment failure or weather conditions can impact short term water level readings. Daily readings are considered sufficient for compliance reporting.

The lower compliance level was established based on the upstream channel elevations.
No upper compliance level has been established due to inability of the generating facility to influence water levels above normal operating limits.

An ongoing objective in operating this plant is to maintain scenic flows over the weir.

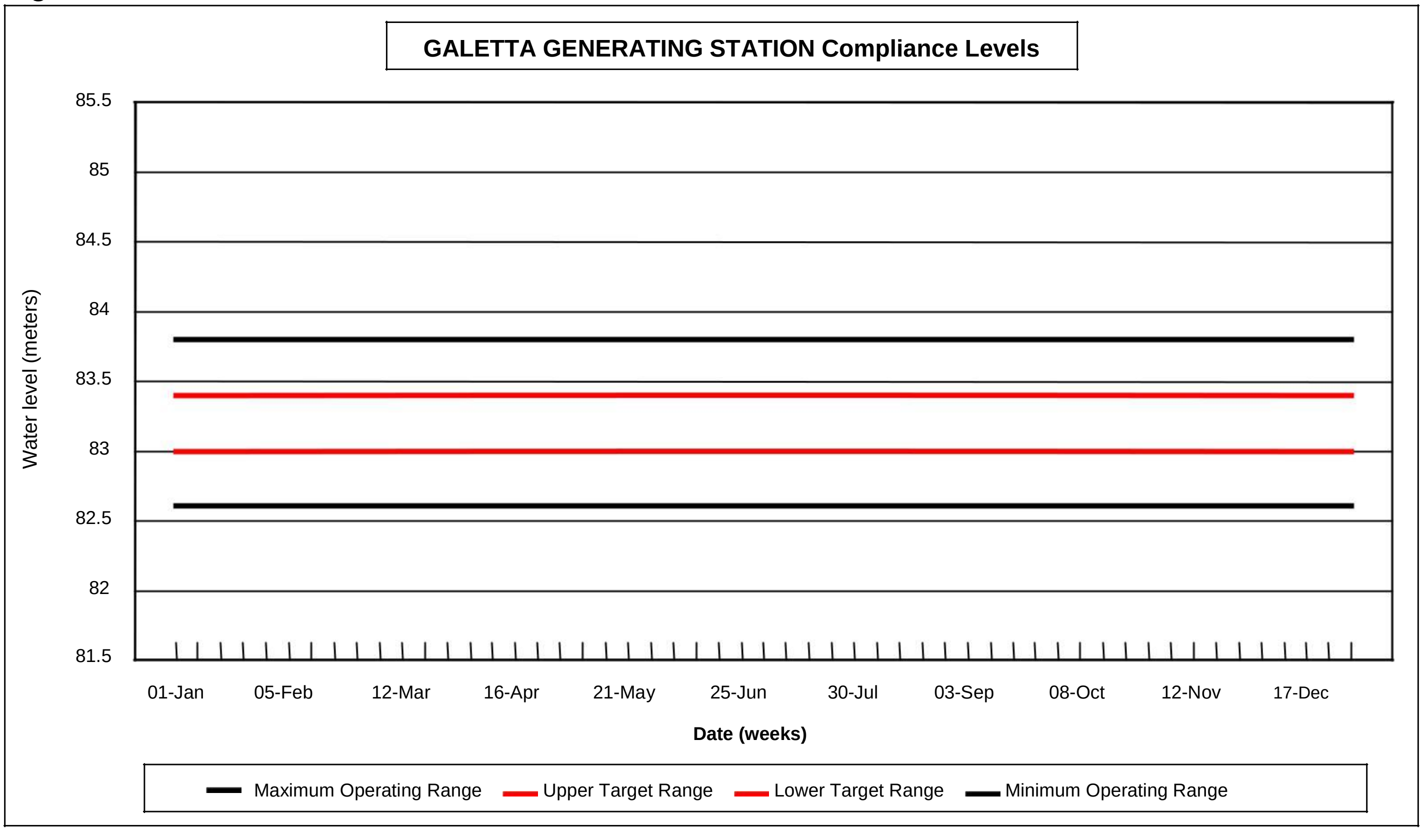
**Figure 30**




## Galetta Generating Station

Daily readings are considered sufficient for compliance reporting.

**Figure 31**




### 6.2 High and Low Water Indicators

The guidelines defined the high and low water triggers that would take individual structures out of compliance.

High water triggers are identified by the guidelines as:

- Water level in the head pond/ reservoir is at or above the maximum water level stipulated in the approved WMP; and
- Head pond / reservoir level is increasing; and
- Discharge facilities have been operated to discharge the maximum discharge possible (while minimizing upstream and downstream flood damages).

Low water triggers are identified by the guidelines as:

- Outflow from the facility is at or below the minimum flow required in the WMP;
- Water level in the head pond/ reservoir is at or below the minimum water level stipulated in the approved WMP; and
- Head pond / reservoir level is decreasing.

The MRWMP planning team has further defined these triggers for high water as flood response indicators which will take all structures subject to compliance out of the plan. These are:

High Falls G.S. – outflows above 40 cms.
This indicates when flooding on Dalhousie is about to or is occurring. This dam and those upstream are operated to mitigate flooding upstream and downstream as much as possible at this flow rate.

Appleton G.S. and all structures downstream – flows at the Appleton stream gauge exceeding 143 cms. This is the 2 year return period and represents flooding which is occurring on Mississippi Lake, and along the river at flood damage centres at Appleton, Almonte, Pakenham and Galetta. All dams are operated to mitigate flooding upstream and downstream as much as possible at this point . The lower section of the Mississippi River (downstream of Almonte) usually reaches flows of 143 cms well before the Appleton stream gauge due to the significant tributaries that enter the system downstream of the gauge. Until such time as an automated stream gauge exists on the river near Galetta, the determination of out of plan flows at Galetta will be the combined flows from Appleton and the Indian River gauge and will be the responsibility of MVC to notify MNRF and power producers when this occurs.

Frazil ice formations can have significant impact on the ability of dam operators to pass water through their structures. Two structures on this river system have historically had frazil ice problems which have severely reduced their ability to pass flows, the Appleton and Mississippi River Power Generating Stations. Further to the values listed above as high water indicators, these two stations will also not be deemed to be out of compliance if levels exceed the identified maximum compliance from mid December to April if, frazil ice on the structures is the cause of the failure to comply. Operators must still continue to do everything possible to maintain flows and levels and must report and document the initial occurrence of exceeding the value and when the dam is fully functional again.

### 6.3 Data Management

Owners will maintain records of all level and/or flow information that are required by the plan for a retention period of the term of the Mississippi River Water Management Plan plus five years. It is recognized that water level measurements may be unavailable from time to time due to equipment failure or environmental conditions.

- OPGI will maintain data for OPGI facilities at its Evergreen Energy Control Centre and make it available to MNRF upon request for audit activities.
- MVC will maintain data for its facilities at the MVC Office and make it available to MNRF upon request for audit activities.
- CHD will maintain data for its facilities at the Canadian Hydro Developers Head Office and make it available to MNRF upon request for audit activities.
- MRPC will maintain data for its facility at the Mississippi River Power Office and make it available to MNRF upon request for audit activities.
- Enerdu will maintain data for its facility at Enerdu and make it available to MNRF upon request for audit activities.

### 6.4 Non-Compliance Notification:

The proponents are required to verbally notify MNRF for all instances of non-compliances to meet mandatory components of the operating plan within 24 hours of the incident being discovered. The following is the information to be provided in the verbal notification:

a. the owner/operator will explain the nature of the incident
b. why it happened
c. what is being done to bring the operation back into compliance with the plan, and
d. how long it will be before the operation is back in compliance
e. any corrective action required

### 6.5 Non-Compliance Reporting:

a. The proponents will be required to provide a written report of all instances of non-compliance with the WMP to MNRF within 30 working days, together with a rationale for the deviations, and proposals for remediation of any problems, if necessary.

b. MNRF will have 90 days to respond and will take into account the nature, severity and the reasons for the non-compliance. Facility operators will be provided with a fair and reasonable opportunity to explain what happened and their actions before any enforcement action is taken. It is recognized that weather conditions are a source of on-going uncertainty to the management of waterpower facilities and other control structures. For example, where flood, drought or energy emergency conditions have been determined to exist, and notice has been given to facility operators confirming such conditions, operating regimes different from those in the approved WMP can be negotiated between MNRF and the facility operators to address the emergency situation. These amended operating regimes will provide the facility operators with greater latitude to operate their facilities outside of commitments agreed upon in the WMP under such conditions.

### 6.6 Out of Compliance Enforcement

a) Companies that do not operate their waterpower facilities in accordance with their approved WMP will be held accountable.

b) MNRF will determine the response to non-compliance in accordance with legislation and policy.

c) In instances of non-compliance, MNRF will conduct an investigation. Investigations will take into account a number of factors including the severity of impact, weather, the intent of the offender, failure of equipment and unforeseen events.

d) Procedures will be developed to help determine the most appropriate enforcement action (including warnings, orders and laying charges under s. 28 of the LRIA) based upon the history of the offender and the impacts of the offence.

### 6.7 Annual Reporting:

The proponents will prepare an Annual Compliance Report by January 30th of each year outlining:

- Summary of operations
- Summary of incidents

This report will be submitted to the MNRF.

## Shabomeka Lake Dam (Mississippi Valley Conservation)

| | Current Operation | | | | Alternative Option | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Issue Objective** | **Target/Existing Voluntary Constraint** | **Strategy** | **Benefits** | **Conflict or Concern** | **Option** | **Target/Strategy** | **Benefits** | **Conflict or Concern** | **Rationale for selection of Preliminary Preferred** |
| **Fisheries:**<br>Improve lake trout spawning success on Shabomeka Lake. | - 7 of 8 stoplogs removed beginning mid September ending early October and replaced in the spring<br>- Minimum lake elevation of 269.40 m achieved prior to Lake Trout spawn which typically occurs Mid to late October | To stabilize water levels at minimum prior to start of spawning. | To prevent lake trout from spawning in areas where eggs would freeze once ice is on the lake. | The lake is drawn down too far preventing Lake trout from accessing best suitable shoals. | Option 2a - Lake maintained at a higher minimum levels prior to freeze up by removing one less stoplog (increase water level by 0.3m) to improve lake trout spawning habitat. | - 6 of 8 stoplogs removed beginning mid September ending early October and replaced in the spring<br>- Minimum lake elevation of 269.70 m achieved prior to Lake Trout spawn which typically occurs Mid to late October | Access is provided to prime spawning shoals and cover for lake trout. | None | Alternative option selected to improve the potential for natural lake trout spawning success. |
| **Navigation:**<br>Maintain water levels for navigation (including boat access only properties) opportunities throughout the system. | - All stoplogs remain in dam from mid May to mid September unless levels exceed 271.06 m<br>- Normal summer lake levels are maintained within the target range of 270.86 to 271.06 m | To maintain stable water levels from mid May through mid September for boat access only properties. Levels may fluctuate as a result of significant rainfall events. | Allows stable water levels from May to September for boat only access properties. | The timing of the drawdown affects access to boat only properties from September to November. | Option 2b - To delay removal of stoplogs from dam until after Thanksgiving Weekend. | To extend access period to boat only access properties by leaving stoplogs in the dam until Thanksgiving weekend. | A longer recreational season and use of the lake, through easier access to boat only access properties. | - A direct conflict with returning lake to a naturally reproducing lake trout lake. Spawning success through this option would be unlikely.<br>- Boat access only properties still have access under existing operations and this will be enhanced through new option for fisheries. | Current operation preferred for the benefit of fisheries. |
| **Recreation:**<br>Maintain or improving recreation opportunities on Shabomeka Lake. | - All stoplogs remain in dam from mid May to mid September unless levels exceed 271.06 m<br>- Normal summer lake levels are maintained within the target range of 270.86 to 271.06 m | Maintain stable water levels from mid May through mid September for recreation. Levels may fluctuate as a result of significant rainfall events. | Maintain stable water levels from mid May through mid September for recreation. Levels may fluctuate as a result of significant rainfall events. | None | Option 2b - To delay removal of stoplogs from dam until after Thanksgiving Weekend. | To extend access period to boat only access properties by leaving stoplogs in the dam until Thanksgiving weekend. | A longer recreational season and use of the lake through easier access to boat only access properties. | - A direct conflict with returning lake to a naturally reproducing lake trout lake. Spawning success through this option would be unlikely<br>- Boat access only properties still have access under existing operations and this will be enhanced through new option for fisheries | Current operation preferred for the benefit of fisheries. |
| **Flooding:** | | | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Minimize property damage due to flooding downstream. | - Remove stoplogs in the fall to provide storage in the lake for the spring runoff<br>- Maintain levels below 271.25 m to prevent overtopping of the Shabomeka Lake Road<br>- Dam overtops at 271.45 m | To remove stoplogs in the fall to provide storage in the lake for the spring runoff.<br>- Maintain levels below 271.25 m to prevent overtopping of the Shabomeka Lake Road<br>- Dam overtops at 271.45 m | - 100 homes/cottages on lake | None | | | | | No alternate option for maximizing flood protection. |
| **Aquatic Ecosystem Health:**<br><br>Maintain or improve aquatic ecosystem health throughout the system. | - 7 of 8 stoplogs removed beginning mid September ending early October and replaced in the spring<br>- Minimum lake elevation of 269.40 m achieved prior to freeze up<br>- Stable water levels after ice out for loons/nesting birds if possible | - Water levels stabilized at minimum prior to freeze up allowing animals time to establish nests, burrowing depths etc<br>- Stable water levels after ice out for loons/nesting birds if possible | - Reduces mortality of animals through dropping water levels after ice on<br>- Reduces mortality of nesting birds from water level fluctuation minimized | | Option 2a - Lake maintained at a higher minimum levels prior to freeze up by removing one less stoplog (increase water level by 0.3m) to improve lake trout spawning habitat. | - 6 of 8 stoplogs removed beginning mid September ending early October and replaced in the spring<br>- Lake stabilized at or near 269.70 m prior to ice on<br>- Stable water levels after ice out for loons/nesting birds if possible | - Water levels stabilized at minimum prior to freeze up allowing animals time to establish nests, burrowing depths etc<br>- Reduces mortality of nesting birds from water level fluctuation minimized<br>- Additional depth may provide better access for beaver and muskrat lodges | | Alternate Option preferred to benefit Fisheries. |
| **Social Economics:**<br>Maintain economic and social opportunities throughout the system. | - Approximately 100 cottages / homes on lake | | | | | | | | No issue identified to date. |
| **Public Safety and Property Damage:**<br><br>Minimize damage due to ice and erosion. | | | | None | Option 2a - Lake maintained at a higher minimum levels prior to freeze up by removing one less stoplog (increase water level by 0.3m) to improve lake trout spawning habitat. | - 6 of 8 stoplogs removed beginning mid September ending early October and replaced in the spring<br>- Lake stabilized at or near 269.70 m prior to ice on | Increase flexibility in dam operations to minimize movement of ice in winter. | | Alternative option to reduce ice damage. |
| **Power Generation:** | | | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Maintain and enhance power generation on a seasonal and daily basis. | | | | | | | | | |

## Mazinaw Lake Dam (Mississippi Valley Conservation)

| | Current Operation | | | | Alternative Option | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Issue Objective** | **Target/Existing Voluntary Constraint** | **Strategy** | **Benefits** | **Conflict or Concern** | **Option** | **Target/Strategy** | **Benefits** | **Conflict or Concern** | **Rationale for selection of Preliminary Preferred** |
| **Fisheries:** | | | | | | | | | |
| Provide appropriate lake trout habitat to maintain or improve its natural life cycle | There is an understanding that the current operations, beginning the drawdown during the first of November, of Mazinaw Lake Dam is detrimental to Lake Trout spawning in Campbell's Bay. This has previously been addressed through the authorization for harmful alteration or destruction of fish habitat from the Department of Fisheries and Oceans. However, fisheries population assessment projects conducted by the Ministry of Natural Resources in spring 2004 found evidence of natural reproduction of Lake Trout in Mazinaw Lake suggesting that Lake Trout are successfully spawning at other, as yet unidentified, locations. | | | | Option 3a - Revise drawdown date to mid to late September. | Stabilize lake at minimum levels prior to lake trout spawning so active shoal in Campbell's Bay doesn't get used and eggs freeze. | Greater chance for spawning success and survival for shallow water spawners. | - Existing authorization requiring operating guidelines of previous dam is still in effect. DFO has expressed concern that unless new evidence is shown that current procedures are having an effect on survival of lake trout their decision would not change. New evidence shows spawning survival of various ages does exist in the lake.<br>- Navigational concerns through the narrows and for boat access only properties arise<br>- Impact on drawdown rates and timing of Kashwakamak Lake must be considered and potential impact on Wild Rice crops in Ardoch.= | Given current constraints and evidence of naturally reproducing Lake Trout current operation is the preferred option. |
| Provide appropriate walleye habitat to maintain or improve its natural life cycle | Spawning walleye on the lake are addressed through the natural spring operation. Prime spawning shoals downstream of the dam must have steady flows during the spawning cycle to spawning success. | Maintain minimum flow to cover the spawning ground for the duration of six weeks. | - Fisheries downstream | - Fisheries upstream<br>- Recreation upstream<br>- Navigation upstream | | | | | No issue identified for option consideration. Current option preferred. |
| **Navigation:** | | | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Maintain water levels for navigation throughout the system. | Maintain level between 267.60 m and 267.90 m until 1st week of November to allow navigation through the narrows and for boat access only properties. | Operate dam to maintain levels. Drawdown does not begin until November. | - Navigation<br>- Extended recreational season<br>- Allows downstream lake to complete most of drawdown prior to freeze up.<br>- No impact on Wild Rice Crop downstream | - Lake trout<br>- Ice damage on Kashwakamak Lake<br>- Benthic vertebrate on Mazinaw and Kashwakamak potentially freeze | | | | | No issue identified if current operating guidelines followed. No issue identified for option consideration. Current option preferred. |
| **Recreation:**<br>Maintain or improving recreation opportunities on Mazinaw Lake. Lake. | Maintain level between 267.60 m and 267.90 m until 1st week of November to allow navigation through the narrows and for boat access only properties. | Operate dam to maintain levels. Drawdown does not begin until November. | - Navigation<br>- extended recreational season<br>- Allows downstream lake to complete most of drawdown prior to freeze up.<br>- No impact on Wild Rice Crop downstream | - Lake trout<br>- Ice damage on Kashwakamak Lake<br>- Benthic vertebrate on Mazinaw and Kashwakamak potentially freeze | | | | | No issue identified for option consideration. Current option preferred. |
| **Flooding:**<br>Minimize property damage due to flooding downstream. | Undertake a fall drawdown to maximize storage in the lake for spring runoff. | Remove 8 stoplogs from dam from 1st week of November to mid December to allow lake to reach minimum level of 266.70 by mid January. | - Reduce downstream flooding in spring<br>- Reduce potential of flooding on lake in the spring | - None | | | | | No issue identified for option consideration. Current option preferred. |
| Minimize property damage due to flooding downstream. | Maximum level of 268.00 m, emergency bypass elevation 268.20 m- dwelling flooding begins at 268.55 m- dam overtops at 269.00 m | Whenever possible, only one stoplog will be removed from the dam in a day. | - Mitigate downstream flooding | - May result in increased flooding upstream and downstream | | | | | No issue identified for option consideration. Current option preferred. |
| **Cultural Heritage:**<br>Operate dam to ensure viewing of the pictographs on Mazinaw Rock | Maintain level between 267.60 m and 267.90 m until 1st week of November to allow navigation through the narrows and for boat access only properties. | Operate dam to maintain levels. Drawdown does not begin until November. | - Navigation<br>- Extended recreational season<br>- Allows downstream lake to complete most of drawdown prior to freeze up.<br>- No impact on Wild Rice Crop downstream | - Lake trout<br>- Ice damage on Kashwakamak Lake<br>- Benthic vertebrate on Mazinaw and Kashwakamak potentially freeze | | | | | No issue identified for option consideration. Current option preferred. |
| **Aquatic Ecosystem Health:** | | | | | | | | | |

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| - Maintain or improve aquatic ecosystem health throughout the system. | - None | | | May be detrimental to the winter survival of the beaver, muskrat, frogs and other benthic vertebrates. | Option 3a - Revise drawdown date to mid to late September. | Stabilize lake at minimum levels prior to hibernation of beaver, muskrat, frogs and benthic vertebrates. | A greater chance for survival for the aquatic ecosystem. | - Existing authorization requiring operating guidelines of previous dam, which has expired is still in effect. DFO has expressed concern that unless new evidence is shown that current procedures are having an effect on survival of lake trout their decision would not change. New evidence shows spawning survival of various ages does exist in the lake.<br>- Navigational concerns through the narrows and for boat access only properties arise<br>- Impact on drawdown rates and timing of Kashwakamak Lake must be considered and potential impact on Wild Rice crops in Ardoch | Given current constraints, current operation is the preferred option. |
| **Social Economics:**<br>Maintain economic and social opportunities throughout the system. | - 450 homes / cottages on lake<br>- 1 provincial park<br>- 5 resorts / marinas on lake | Maintain summer levels between 267.70 m and 267.90 m on a reasonable effort basis. | - Recreation<br>- Tourism<br>- Navigation | None | | | | | No issue identified for option consideration. Current option preferred. |
| **Public Safety and Property Damage:**<br>Minimize damage due to ice and erosion. | | | | | | | | | No issue identified for option consideration. Current option preferred. |
| **Power Generation:**<br>Maintain and enhance power generation on a seasonal and daily basis. | None | Fall drawdown supplies some water downstream to allow potential for continued generation of hydro electricity. | | | | | | | No issue identified for option consideration. Current option preferred. |

## Big Gull Lake Dam (Mississippi Valley Conservation)

| Issue Objective | Current Operation: Target/Existing Voluntary Constraint | Current Operation: Strategy | Current Operation: Benefits | Current Operation: Conflict or Concern | Alternative Option: Option | Alternative Option: Target/Strategy | Alternative Option: Benefits | Alternative Option: Conflict or Concern | Rationale for selection of Preliminary Preferred |
|---|---|---|---|---|---|---|---|---|---|
| **Fisheries:** Maintain spring spawning opportunities by having steady flow or rising levels for walleye. | Water level of lake must be 253.1 m (estimated elevation) prior to spawning and maintained above this once spawning starts. | Stoplogs replaced at a rate that will meet this requirement | - Walleye spawning survival | None | | | | | No issue identified for option consideration. Current option preferred. |
| **Navigation:** Maintain water levels for navigation throughout the system. | Maintain lake level between 253.30 m and 253.50 m from Victoria Day weekend to Thanksgiving Weekend. | Replace all logs in the dam prior to Victoria Day weekend or once lake has stabilized at 253.40 m and left alone unless levels exceed 253.50 m. | - Safe access to all cottages / homes on the lake | - Reduces use of this lake for low flow augmentation | | | | | No issue identified for option consideration. Current option preferred. |
| **Recreation:** Maintain or improving recreation opportunities on Big Gull Lake. | Maintain lake level between 253.30 m and 253.50 m from Victoria Day weekend to Thanksgiving Weekend. | Replace all logs in the dam prior to Victoria Day weekend or once lake has stabilized at 253.40 m and left alone unless levels exceed 253.50 m. | - Safe access to all cottages / homes on the lake | - Reduces use of this lake for low flow augmentation | | | | | No issue identified for option consideration. Current option preferred. |
| **Flooding:** Minimize property damage due to flooding downstream. | Undertake a fall drawdown to maximize storage in the lake for spring runoff. | Remove 8 stoplogs from dam from Thanksgiving weekend to early November to allow lake to reach minimum level of 252.40 m before freeze up. | - Reduces downstream flooding in spring<br>- Reduces potential of flooding on lake in the spring | Dry springs may result in insufficient water available to refill lake for recreation / navigation / fisheries requirements. | | | | | No issue identified for option consideration. Current option preferred. |
| **Public Safety & Property Damage:** Minimize damage due to ice and erosion. | Maintain levels below 253.55 m. | Replace all logs in the dam prior to Victoria Day weekend or once lake has stabilized at 253.40 m and left alone unless levels exceed 253.50 m. | - Recreation on lake<br>- Navigation on lake | - Eliminates use of lake for low flow augmentation | | | | | No issue identified for option consideration. Current option preferred. |

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|---|---|---|---|---|---|---|---|---|---|
| **Aquatic Ecosystem Health:**<br>Maintain or improve aquatic ecosystem health throughout the system. | - 8 of 12 stoplogs removed beginning early October and ending early November and replaced in the spring<br>- Minimum lake elevation of 252.40 m achieved prior to freeze up<br>- Stable water levels after ice out for loons/nesting birds if possible | - Water levels stabilized at minimum prior to freeze up allowing animals time to establish nests, burrowing depths etc.<br>- Stable water levels after ice out for loons/nesting birds if possible. | - Prevents freezing of fur bearing animals (beaver and muskrat) and benthic vertebrates (frogs) | | | | | | No issue identified for option consideration. Current option preferred. |
| **Social Economics:**<br>Maintain economic and social opportunities throughout the system. | - 450 homes / cottages on lake<br>- 6 resorts / marinas on lake | Summer levels maintained between 253.30 m and 253.50 m on a reasonable effort basis. | - Recreation<br>- Tourism<br>- Navigation | None | | | | | No issue identified for option consideration. Current option preferred. |
| **Power Generation:**<br>Maintain and enhance power generation on a seasonal and daily basis. | Fall drawdown supplies water to refill Crotch Lake and ensure continued flow of water throughout the winter months to generate some hydro electricity. | 8 stoplogs are removed beginning early October and ending mid November and replaced in the spring. | | | | | | | No issue identified for option consideration. Current option preferred. |

## Kashwakamak Lake Dam (Mississippi Valley Conservation)

| | Current Operation | | | | Alternative Option | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Issue Objective | Target/Existing Voluntary Constraint | Strategy | Benefits | Conflict or Concern | Option | Target/Strategy | Benefits | Conflict or Concern | Rationale for selection of Preliminary Preferred |
| **Fisheries:**<br>Maintain or improve aquatic ecosystem health throughout the system. | Water level of lake must be 260.50 m (estimated elevation) prior to spawning and maintained above this once spawning starts. | Stop logs replaced at a rate that will meet this requirement. | - Walleye spawning survival | None | | | | | The best available information does not support a change in operation. |
| Operate the dam to maintain or improve bass habitat such as spawning beds | Maintain stable water levels throughout June to ensure coverage of spawning shoals. | Maintain stable water levels throughout June to ensure coverage of spawning shoals. | - Bass spawning survival | None | | | | | The best available information does not support a change in operation. |

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|---|---|---|---|---|---|---|---|---|---|
| **Navigation:** Maintain water levels for navigation throughout the system. | Maintain lake level between 261.00 m and 261.20 m from Victoria Day weekend to Thanksgiving Weekend. | Replace all logs in the dam prior to Victoria Day weekend or once lake has stabilized at 261.13 m and left alone unless levels exceed 261.20 m. | Safe access to all cottages / homes on the lake. | Reduces use of this lake for low flow augmentation. | | | | | The best available information does not support a change in operation. |
| **Recreation:** Maintain or improve recreation opportunities throughout the system. | Maintain lake level between 261.00 m and 261.20 m from Victoria Day weekend to Thanksgiving Weekend. | Replace all logs in the dam prior to Victoria Day weekend or once lake has stabilized at 261.13 m and left alone unless levels exceed 261.20 m. | Safe access to all cottages / homes on the lake. | Reduces use of this lake for low flow augmentation. | | | | | The best available information does not support a change in operation. |
| **Flooding:** Minimize property damage due to flooding downstream. | Undertake a fall drawdown to maximize storage in the lake for spring runoff. | Remove 14 stop logs from dam from Thanksgiving weekend to mid December to allow lake to reach minimum level of 259.60 m by mid January. | - Reduces downstream flooding in spring<br>- Reduces potential of flooding on lake in the spring | None | | | | | The best available information does not support a change in operation. |
| Operate dam to ensure no flooding on Kashwakamak Lake while mitigating potential flood damage downstream. | - Maximum level of 261.35 m, emergency bypass elevation 261.67 m<br>- Dwelling flooding begins at 261.60 m | Whenever possible, only one stop log will be removed from the dam in a day during the growth cycle of the wild rice. | Mitigate downstream flooding. | May impact growth and or harvest of wild rice crops downstream. | | | | | The best available information does not support a change in operation. |
| **Cultural Heritage:** Consistent flows required from June through October to ensure growth and harvest of Wild Rice at Mud Lake at Ardoch. | Reduce flows by replacing all logs prior to June 1 and flows then mimic a natural flow regime. | Replace all logs in the dam prior to Victoria Day weekend or once lake has stabilized at 261.13 m and left alone unless levels exceed 261.20 m. | - Wild rice below dam<br>- Recreation on lake<br>- Navigation on lake | - Eliminates use of lake for low flow augmentation<br>- Flooding on lake<br>- Erosion | | | | | The best available information does not support a change in operation. |
| **Public Safety and Property Damage:** | | | | | | | | | |

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|---|---|---|---|---|---|---|---|---|---|
| Minimize damage due to ice and erosion. | Maintain levels below 261.20 m | Replace all logs in the dam prior to Victoria Day weekend or once lake has stabilized at 261.13 m and left alone unless levels exceed 261.20 m | - Wild rice below dam<br>- Recreation on lake<br>- Navigation on lake | - Eliminates use of lake for low flow augmentation<br>- Flooding on lake<br>- Erosion | | | | | The best available information does not support a change in operation. |
| **Aquatic Ecosystem Health:**<br>Maintain or improve aquatic ecosystem health throughout the system. | - 14 stoplogs removed beginning early October and ending mid November and replaced in the spring<br>- Lake stabilizes at 260.30 m once Mazinaw drawdown begins providing some protection to furbearers and benthic vertebrate<br>- Stable water levels after ice out for loons/nesting birds if possible | - Water levels stabilized close to minimum prior to freeze up allowing animals time to establish nests, burrowing depths etc<br>- Stable water levels after ice out for loons/nesting birds if possible | Prevents freezing of fur bearing animals (beaver and muskrat) and benthic vertebrates (frogs). | - Mazinaw Lake drawdown restricts dropping lake to minimum lake level prior to freeze up likely causing some loss of benthic vertebrate<br>- Additional drop in water levels should not seriously impact wildlife | Option 4a - Drawdown eliminated after Mazinaw Lake drawdown is complete, to maintain water level at lake elevation. | Replace stoplogs as required to maintain stable winter water levels at lake elevation achieved prior to Mazinaw Lake drawdown. | A reduction in mortality rates of benthic hibernating vertebrate (frogs, turtles etc). | - A reduction in available storage for spring runoff, will vary each year<br>- Increased shoreline damage from ice due to ice forming at higher elevations<br>- May adversely impact hydro generation | The best available information does not support a change in operation. |
| **Social Economics:**<br>Maintain economic and social opportunities throughout the system. | - 400 homes / cottages on lake<br>- 5 resorts / marinas on lake | Maintain summer levels between 261.00 m and 261.20 m on a reasonable effort basis. | - Recreation<br>- Tourism<br>- Navigation | None | | | | | The best available information does not support a change in operation. |
| **Power Generation:**<br>Maintain and enhance power generation on a seasonal and daily basis. | - Fall drawdown supplies water to refill Crotch Lake and ensure continued flow of water throughout the winter months to generate some hydro electricity | 14 stop logs removed beginning early October and ending mid November and replaced in the spring. | | | | | | | The best available information does not support a change in operation. |

## Crotch Lake Dam (OPGI)

| | Current Operations | | | | Alternative Option | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Objective** | **Target/Existing Voluntary Constraint** | **Strategy** | **Benefits** | **Conflict or Concern** | **Options** | **Target/Strategy** | **Benefits** | **Conflict or Concern** | **Rationale for selection of Preliminary Preferred** |
| **Fisheries:** | | | | | | | | | |
| - Maintain or improve aquatic ecosystem health throughout the system<br>- Maintain spring spawning opportunities by having steady flow or rising levels for walleye. | - Elevation held or raised during walleye spawn on the lake<br>- MNRF notifies MVC which notifies OPGI to hold or raise the level when the walleye begin to spawn<br>- Flows downstream of Crotch lake are reduced as much as possible to maintain constant flow for river walleye spawning success for 6 week period (weather permitting). | At the onset of walleye spawn, the level is held or raised to prevent egg exposure. | - Improves walleye spawning success | The drawdown reduces the overall availability of habitat. | Option 5k - To maintain spill point at or above weir height of 240.00 m. | - Eliminate drawdown by maintaining the dam as a weir | - Increased fish habitat<br>- Emulates components of a natural system | _ This option fails to maintain ecological integrity (water quality, flushing rates etc.) of lower river system, recreational opportunities on Mississippi Lake and Dalhousie Lake as well as the river<br>- Significant economic constraints associated with the two lakes (1700 cottages/homes, 4 marinas, numerous B&B's and 6 communities located downstream<br>- Significant loss in power production.<br>- Significant impact on flooding downstream | Current operation protects critical fish spawning habitat while at the same time ensuring downstream ecological integrity. |
| Maintain spring spawning opportunities by having steady flow or rising levels for bass. | During the month of June outflows are maintained to ensure survival of bass spawn in river below dam and lake levels remain building or stable to ensure survival of spawn on lake. | Ensure lake is still building in early June so flows can be augmented downstream in late June if required. If possible reach or slightly exceed 240.00 m. | - Improves bass spawning success. | - The drawdown reduces overall availability of habitat | Option 5k - To maintain spill point at or above weir height of 240.00 m. | - Eliminate drawdown by maintaining the dam as a weir | - Increased fish habitat<br>- Emulates components of a natural system | - Fails to maintain ecological integrity (water quality, flushing rates etc.) of lower river system, recreational opportunities on Mississippi Lake and Dalhousie Lake as well as the river<br>- Significant economic constraints associated with the two lakes (1700 cottages/homes, 4 marinas, numerous B&B's and 6 communities located downstream<br>- Significant loss in power production.<br>- significant impact on flooding downstream. | Current operation protects critical fish spawning habitat while at the same time ensuring downstream ecological integrity. |

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| Maintain spring spawning opportunities by having steady flow or rising levels for northern pike. | Filling Crotch Lake beginning in March as per normal operations meets northern pike spawning requirements. | Begin Filling Crotch lake in mid to late March to meet northern pike spawning requirements. | The drawdown improves northern pike spawning success. | The drawdown reduces overall availability of habitat. | Option 5k - To maintain spill point at or above weir height of 240.00 m. | The drawdown will be eliminated by maintaining the dam as a weir. | - Increased fish habitat<br>- Emulates a natural system | - Fails to maintain ecological integrity (water quality, flushing rates etc.) of lower river system, recreational opportunities on Mississippi Lake and Dalhousie Lake as well as the river<br>- Significant economic constraints associated with the two lakes (1700 cottages/homes, 4 marinas, numerous B&B's and 6 communities located downstream<br>- Significant loss in power production<br>- Significant impact on flooding downstream | Current operation protects critical fish spawning habitat while at the same time ensuring downstream ecological integrity. |
| **Navigation:**<br><br>- Maintain water levels for navigation throughout the system<br>- Maintain water levels suitable for access to Twin Island and Fawn Lakes | Crotch Lake is operated as a reservoir to maintain the needs of the lower river system. Water levels fluctuate from approximately 240.00 m to 237.00 m from July through October, reverse from October through January and repeat from January through March. | | Maintains navigation benefits on Crotch Lake and provides some benefits to downstream navigation. | Cuts access off to Twin Island and Fawn Lakes from mid August through to the end of the boating season. | - Option 5a - Reduce summer drawdown toa level of 238.50m to improve recreational opportunities by restricting the release of water from Crotch Lake once this is achieved<br><br>- Option 5b - Reduce summer drawdown to a level of 238.50 m and utilize water from the upper lakes to maintain existing downstream flow conditions | Requires maintaining lake levels at or above 238.50 m. | This allows access to Twin Island and Fawn Lake throughout the summer period. | - Option 5a - conflict with legal requirement for drawdown dates on Mazinaw Lake<br>- Navigational opportunities impacted on Mazinaw (450 residences, 5 resorts & a provincial park) Shabomeka (100 residences) Kashwakamak (400 residences & 5 resorts), Big Gull (450 residences & 6 resorts) and Mississagagon (200 residences & 3 resorts)<br>- Wild Rice growth cycle altered due to water level change<br><br>- Option 5b - fails to maintain low flow augmentation resulting in impacts on ecological integrity and recreational opportunities downstream.<br>- Navigational opportunities impacted on Mississippi (1700 residences & 4 marinas), Dalhousie (195 residences & 1 resort) and 6 downstream communities<br>- Significant loss in power production<br>- Impact on municipal requirements for water intakes, drinking water and flushing rates for water | Current operation maintains navigation. |

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| | | | | | | | | quality. | |
| **Recreation:**<br>Maintain or improving recreation opportunities on Crotch Lake. | Crotch Lake is operated as a reservoir to maintain the needs of the lower river system. Water levels fluctuate from approximately 240.00 m to 237.00 m from July through October, reverse from October through January and repeat from January through March. | To maintain access to Crotch Lake as part of the existing operation. | This operation maintains recreation on Crotch Lake. | Stable water levels are not maintained on the Lake throughout the recreational season. | - Option 5a - Reduce summer drawdown toa level of 238.50m to improve recreational opportunities by restricting the release of water from Crotch Lake once this is achieved<br>- Option 5b - Reduce summer drawdown to a level of 238.50 m and utilize water from the upper lakes to maintain exisitng downstream flow conditions | Requires maintaining lake levels at or above 238.50 m. | This allows access to Twin Island and Fawn Lake throughout the summer period. | See Option 5a and 5b of navigation. | |
| **Flooding:**<br>Minimize property damage due to flooding downstream. | - Weir elevation is at 240.00 m<br>- Structure stability concern as water levels approach 240.50 m<br>- Ensure Crotch lake is at or near 237.00 m by mid March | - To operate the dam to maintain maximum levels as close as possible to 240.00 during late spring early summer<br>- Winter maximum elevations should not exceed 240.00 m to ensure maximum storage in the spring and a safety factor in case of an early spring thaw<br>- Only bottom 4 stoplogs (which can not be removed) should remain in dam by mid to late March depending on meteorological conditions to | - Provides maximum flood protection for downstream residents as much as possible<br>- Reduced flood damages to major damage centers downstream of this lake | - The system is always most susceptible to flooding in June when all storage throughout the system has been utilized to meet all other system objectives<br>- Ice fluctuations from dropping water levels over winter has impact on shorelines | - Current operations mitigates flooding | | | | - The current operation mitigates flooding<br>- No alternate options |

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| | | provide maximum flood prevention capacity of this lake | | | | | | | |
| **Cultural Heritage:**<br>- Maintain and improve walleye habitat<br>- Maintain cultural opportunities throughout the system | Crotch lake walleye fishery is addressed above under fisheries. | | | | | The Gull Creek outlet requires further investigation to determine the water level requirements to meet this concern. | - improve spawning success on these shoals. | May seriously impact on storage requirements to prevent downstream flooding. | Data gap - elevation of Gull Creek spawning shoals. |
| **Public Safety & Property Damage:**<br>Minimize damage due to ice and erosion. | No issue identified to date. | | | | | | | | - no alternate options. |
| **Aquatic Ecosystem Health:**<br>Maintain or improve aquatic ecosystem health throughout the system. | Lake level at or near 240.0m by July 1 will ensure minimum flows of 5 cms can be maintained downstream through to mid September. | To provide low flow augmentation for as long as possible from July 1 to the middle of March. | - This ensures sustainability of fish and wildlife downstream of Crotch Lake<br>- Maintain flushing rates downstream<br>- Maintain minimum flow requirements for the municipal water supply and treatment facilities<br>- Mitigate flooding | - There is an impact on wildlife resources on Crotch Lake<br>- Economic concern regarding dock movement. | - Option 5c - Eliminate the winter drawdown by leaving all the logs in and attempt to maintain a level of 239.50m<br><br>- Option 5d - Eliminate the winter draw down by not refilling Crotch Lake in the fall (all removable logs left out of dam after October) | Eliminate the winter drawdown. | - Water levels will be established prior to beaver, muskrat, turtles and aquatic invertebrates enter winter hibernation on Crotch Lake<br>- Stable ice conditions on Crotch Lake<br><br>- Option 5c - reduces the risk of winter kill of fish<br><br>- Option 5d - maximize power generation from October to January | - Water levels will not be established prior to beaver, muskrat, turtles and aquatic vertebrates entering winter hibernation downstream of Crotch Lake<br>- Ice damage on areas downstream of Crotch Lake due to either increased flows when ice is forming or dropping water levels after the ice has formed<br><br>- Option 5c - reduces flood storage to mitigate flooding for the prime flood damage centers of Dalhousie and Mississippi Lake and the 6 communities downstream<br><br>- Option 5d - would reduce the efficiency of High Falls G.S. and Enerdu G.S. by necessitating spilling water from October to January.<br>- Significant loss in power production | Current operations maintains ecosystem health. |
| **Social Economics:** | | | | | | | | | |

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| Maintain economic and social opportunities throughout the system. | | | | Three lodge owners require more work in maintaining / moving docks with dropping water levels. | - Option 5a - Reduce summer drawdown toa level of 238.50m to improve recreational opportunities by restricting the release of water from Crotch Lake once this is achieved<br><br>- Option 5b - Reduce summer drawdown to a level of 238.50 m and utilize water from the upper lakes to maintain exisitng downstream flow conditions. | Summer band 240.00 - 238.50 m Victoria Day weekend to Thanksgiving weekend on a reasonable effort basis. | Three lodge owners would require less work into maintaining / moving docks with dropping water levels. | - Navigational and recreational opportunities are reduced to upstream and downstream users as per Option A in Navigation<br>- Eliminates hydro generation on the river system from mid August through to October | Current operation maintains social economic opportunities throughout the system. |
| **Power Generation:**<br>Maintain and enhance power generation on a seasonal and daily basis. | A normal operating range 240.00 - 237.00 m allows minimum flow of 5 cms to be maintained which is sufficient to produce power at High Falls GS and other stations if additional flows exist in tributaries downstream to supplement Crotch lake flow. | - To remove a stoplog on average every 10 days to maintain an average flow of 5 cms in downstream channel<br>- When resources are available, to maintain higher flows up to 15 cms to reach peak efficiency at the High Falls G.S. | - Fisheries<br>- Navigation<br>- Recreation<br>- Flood mitigation<br>- Hydro generation<br>- Ecological integrity | Power generation is not utilised at maximum efficiency at all faculties. | - Option 5j - Maximize hydro generation | - Voluntary constraints are eliminated to operate Crotch Lake for generation requirements.Outflow will be increased on Crotch Lake and a diurnal operations used for High Falls<br>- Fluctuate flows from Crotch Lake to meet power generation demands. | Power generation will increase on the river system. | - The amount of time it takes for water to travel from Crotch Lake to High Falls restricts the ability to meet peak demand.<br>- Increased fluctuating water levels downstream of Crotch Lake.<br>- Fisheries<br>- Navigation<br>- Recreation<br>- Flood mitigation<br>- Ecological integrity | - Operating the system solely for the benefit of power generation would be detrimental to all other objectives for the system<br>- There is A finite supply of water in the system, which restricts this option from being viable<br>- The current operations provide the best balance for power generation, the environment and society |

# Mississippi River Water Management Plan

*An integrated approach to maximize all uses of the river including Waterpower, Flood Control & Low Flow Augmentation, Fish & Wildlife, Tourism & Recreation*

Scoping Report
Draft
April 27, 2004

ONTARIO POWER GENERATION

CANADIAN HYDRO DEVELOPERS, INC.

Mississippi Valley Conservation

***Mississippi River Power Corporation***

***Enerdu, Inc.***

Ministry of Natural Resources / Ministère des Richesses naturelles
Ontario

## Table of Contents

# 1. Introduction

The Mississippi River is shown on Figure 1. It has a drainage area of 3750 square kilometres and is composed of a complex network of rivers, streams and lakes. The river is 212 kilometres in length, from its headwaters in Denbigh Township to its outlet in the City of Ottawa upstream from the Village of Fitzroy Harbour at the Ottawa River.

The residents and communities along the Mississippi River system rely on the river for its natural resources. The waters of the Mississippi system provide a diversity of aquatic habitats (fish, waterfowl, furbearers, wetlands, wild rice, etc.) and provide a variety of opportunities for recreational, cultural and commercial purposes, including hydro production. Management of the water levels and flow through the operation of the water control structures also provides benefits to society including flood control and low flow augmentation.

The management of water levels and flows in the upper Mississippi River system has been examined a number of times over the past two decades. This planning exercise will build on those processes and Mississippi Valley Conservation Authority's (MVC's) experience with management of the river system and will incorporate operations at hydro owned facilities and control structures.

## 1.1. Water Management Planning (WMP) Objectives for the Mississippi River

The overall objectives of this process are to:

1. **review and document** the current operation and management of existing hydro-electric generating stations and dams and any other water control structures on the Mississippi River which impact on hydro electric generation from an ecosystem and water management perspective;
2. **set water management objectives** for the Mississippi River as a system which will attempt to balance environmental, social and economic values and considerations;
3. **enhance public understanding** of water management on the Mississippi system and provide meaningful opportunities for broad public, First Nations, stakeholder and interest group involvement in the development of the plan; and
4. **define individual operating plans** for each hydro facility/dam and water control structure on the Mississippi River for the normal range of operating conditions.

## 1.2. Guiding Principles of the Water Management Plan

There are seven principles guiding the preparation of the plan. They are:

- **maximum net benefit to society** - maximize net environmental, social and economic benefits derived from operation of water power facilities and associated water level control structures in terms of water flows and levels;
- **riverine ecosystem sustainability**;
- planning based on best available information and **establishment of baseline conditions**;
- **evaluation of the need for changes** to the existing water management operations for water level and flow management to address objectives and issues;
- planning will be without prejudice to **the rights of Aboriginal people** and treaty rights;
- **public & stakeholder participation** - Communications and integration are paramount to this planning exercise;
- **adaptive management** - effectiveness monitoring to assist future planning.

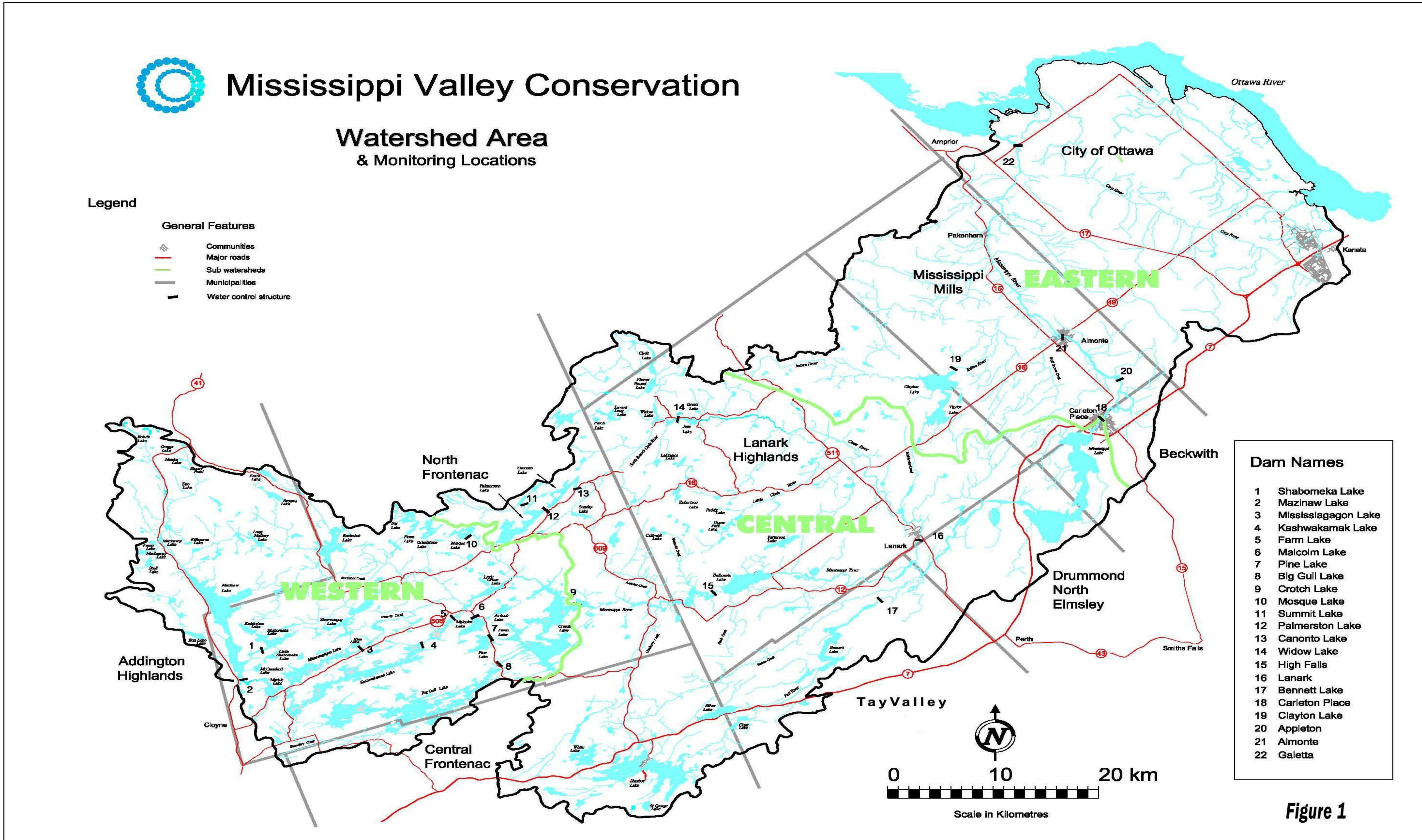

Mississippi Valley Conservation
Watershed Area
& Monitoring Locations
Legend
General Features
Communities
Major roads
Sub watersheds
Municipalities
Water control structure
Ottawa River
Arnprior
City of Ottawa
Kanata
Pakenham
Mississippi Mills
EASTERN
Almonte
Carleton Place
Beckwith
North Frontenac
Lanark Highlands
CENTRAL
Lanark
Drummond North Elmsley
Perth
Smiths Falls
WESTERN
Addington Highlands
Cloyne
Central Frontenac
TayValley
0
10
20 km
Scale in Kilometres
Dam Names
1 Shabomeka Lake
2 Mazinaw Lake
3 Mississiagagon Lake
4 Kashwakamak Lake
5 Farm Lake
6 Malcolm Lake
7 Pine Lake
8 Big Gull Lake
9 Crotch Lake
10 Mosque Lake
11 Summit Lake
12 Palmerston Lake
13 Canonto Lake
14 Widow Lake
15 High Falls
16 Lanark
17 Bennett Lake
18 Carleton Place
19 Clayton Lake
20 Appleton
21 Almonte
22 Galetta

Figure 1

Environmental, social and economic issues that are not related to the manipulation of water flows and levels will not be addressed through this water management planning process. The WMP, for example, will not address issues related to over-fishing, water quality, or urbanization.

In the case of extreme events such as drought and flood conditions, protocols and procedures defined in the operating plans for individual structures for these events will be followed. E.g. In the case of drought situations, for instance, a drought response team is brought together to determine actions for the associated situation.

### 1.3. Goal of the WMP

The goal of water management planning across the province 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.

The goal of the Mississippi River Water Management Plan (MRWMP) is to develop a water level and flow management plan for the Mississippi River that builds on the current operating regime for the system and integrates environmental and socio-economic values and considerations.

### 1.4. Scope of the MRWMP

The plan will be prepared according to the Water Management Planning Guidelines for Waterpower (May 2002) and other applicable direction, such as the Aquatic Ecosystem Guidelines, and will result in a comprehensive water management plan (WMP) being prepared for the Mississippi River system.

In general, the scope of the MRWMP will include:
- Baseline conditions (environmental, social and economic) present at the time of planning;
- A focus on the current management of water levels and flows;
- Operating regimes required at the waterpower facilities and associated water control structures;
- The relative scale of effects of waterpower operations and their related issues; and
- Other water resources users and the public interest in water.

The study area has been defined as the Mississippi River and interconnecting lakes. Not all water control structures within the watershed are included in the scope of the study, specifically those with little or no influence on flows and levels on the Mississippi River.

The hydro facilities and water control structures that are subject to planning include:

- Shabomeka Lake Dam
- Mazinaw Lake Dam
- Kashwakamak Lake Dam
- Big Gull Lake
- Mississagagon Lake Dam
- Crotch Lake Dam
- High Falls Generating Station
- Carleton Place Dam
- Appleton Generating Station
- Mississippi River Power Corp. Generating Station
- Enerdu Power Systems Ltd. Generating Station
- Galetta Generating Station

Issues that were raised in public consultation, which are determined to be outside of the scope of this plan by the Planning Team will be forwarded to the appropriate organizations and documented in the final MRWMP.

New and/or proposed significant modifications to waterpower facilities or water control structures are beyond the scope of this WMP, as they require prior Environmental Assessment Act approvals prior to its endorsement.

Tributaries of the Mississippi River system are also not included, since they lack storage, flow and level influence.

During the spring, these uncontrolled tributary flows can have a significant impact on flood levels. Under normal conditions the remainder of the year, they cannot be operated to increase or decrease flows anywhere on the Mississippi River to enhance conditions for power production or any other purposes.

## 2. General Characteristics of Dam Operations, Physical and Biological Resources

### 2.1 Physical Resources

The geologic features within the watershed are quite complex, with the area being divided by underlying Precambrian bedrock to the west and Palaeozoic bedrock formations to the east. The Mississippi River generally follows the contact of these two formations which extend from the Village of Galetta to a point in the vicinity of Bells Corners in Bathurst Township.

The Precambrian complex consists of crystalline limestone, quartzite and gniess which were intruded, deformed and metamorphosed by bodies of granite, syenite and other igneous rocks. The Palaeozoic rocks consist of sandstones, limestones, dolomites and shale that were deposited approximately 500 million years ago.

The surficial geology is largely a result of glaciation, from which till was deposited in the characteristic forms of moraines, drumlins and till plains.

Other features found on the river system include eskers and spillways of clay and sand plains. These landforms have a more sorted and uniform composition as a result of their origin from glacial and post-glacial waters.

The soils within the watershed are closely related to the bedrock and surficial geology. The nature and properties of the soils are related to the characteristics of the parent materials from which they developed. The irregular terrain of the western area has very shallow soils with frequent outcroppings. Internal drainage of these soils is good due to the coarse texture of the deposit. The soils in the eastern area, which are underlain by the flat Palaeozoic rock formation, are more basic, finer textured and generally deeper. The types of soils in this area are numerous and inconsistent in nature as a result of the variable parent materials and active geologic processes which operated. Internal drainage within these soils is also variable, ranging from very poor to good.

The Mississippi River watershed can be described as consisting of broad geographic areas reflecting the underlying geologic features, topography and settlement patterns:

#### 2.1.1. The Western Watershed

This area starts at Kilpecker Creek, the headwater of the system and extends to the dam at the outlet of Crotch Lake. It includes the vast majority of the lakes in the watershed and virtually all available reservoir storage for stream flow regulation. The region is generally underlain by Precambrian bedrock with thin soils, which has largely shaped the areas history and development.

The headwaters of the Mississippi River originate in Denbigh Township in Rolufs Lake and Crooked Lake on Kilpecker Creek. Mazinaw Lake is the first significant lake on the Mississippi River system. Bon Echo Creek and Semi-circle Creek are the two significant streams which enter the lower Mazinaw Lake. Bon Echo Creek is an unregulated stream, which flows from Bon Echo Lake through the Bon Echo Provincial Park. Semi-circle Creek contains the first major water control structure on the system, at the outlet of Shabomeka Lake.

The second major water control structure is located at the outlet of Mazinaw Lake. From Mazinaw Lake, the river flows through the smaller lakes of Little Marble, Marble and Georgia Lakes into Kashwakamak Lake. The inlet to Kashwakamak Lake is known as Whitefish Rapids.
The third major control structure in this sub-watershed is located at the outlet of Kashwakamak Lake. From here, the river flows through a smaller lake known as Farm Lake, which is maintained by an overflow weir. The Mississippi River then flows through the Village of Ardoch. A unique concern with regards to dam operations and water levels exists here. While flooding and erosion are a

concern, the wild rice growing in this area is of great significance to the native Algonquin First Nations who harvest the rice each fall.

One of the most significant tributaries of the Mississippi River is Buckshot Creek. Draining an area of 309 sq. km, this tributary enters the Mississippi River from the north, just below the Village of Ardoch and between Farm Lake and Crotch Lake. There are not man made control structures on the main channel of the creek, however numerous beaver dams exist along its length. The Mississagagon Lake Dam, which controls Mississagagon Lake, is on Swamp Creek which is a tributary of Buckshot Creek. The only significant settlement on this tributary is the Village of Plevna.

Side Dam Rapids are situated at the inlet of the Mississippi River into Crotch Lake. Another significant body of water, Big Gull (Clarendon) Lake also flows into Crotch Lake near Colonel's Island via Gull Creek. This lake is a headwater lake, having a very limited drainage basin not much larger than the size of the lake itself.

The most significant reservoir on the system with regards to flood mitigation and low flow augmentation is Crotch (Cross) Lake. The dam at the outlet of Crotch Lake marks the eastern boundary of this sub-watershed.

#### 2.1.2. The Central Watershed

The central portion of the watershed extends from the outlet of Crotch lake through rolling terrain and marginal farmland to the inlet of Mississippi Lake. The river itself is not heavily developed in this section of the watershed.

The remnants of a log chute constructed during the 1860's can be found at the outlet of Kings Lake. The river then flows through a series of rapids to Millers Lake. The most significant set of rapids is at Ragged Chutes where a drop in elevation of over 20 meters exists.

Two major tributaries empty into the Mississippi River just below Miller Lake, being Antoine Creek and Cranberry Creek. Both tributaries drain areas dominated by beaver swamps and are completely uncontrolled. Butternut Falls, at the outlet of Antoine Creek in the Village of Snow Road has a history of flooding.

From Miller Lake, the river flows through the hamlet of Snow Road into Stump Bay, which is the forebay of the first hydro electric generating station on the river, High Falls. The outflow from High Falls flows into Dalhousie Lake at Geddes Rapids: Dalhousie being the second last significant lake on the Mississippi River system. There is a natural rock outcrop at the head of Sheridan Rapids which controls levels on Dalhousie Lake, especially during the summer months. From Sheridan's Rapids, the river winds westward through the Playfairville Rapids to the confluence of the two most significant tributaries on the Mississippi River system: being the Clyde River and the Fall River.

The Clyde River, having numerous tributaries of its own is the most significant tributary of the Mississippi River in terms of size, with a total drainage area of 614 sq. km. The headwaters of the river are in the Canadian Shield and are characterised by numerous small lakes, many of which are spring fed. There is virtually no storage available on the controlled lakes within this drainage area. The most significant settlement on this river is the Village of Lanark, which historically has annual flooding and low flow problems.

The Fall River has three significant lakes, Sharbot and Silver which are uncontrolled and Bennett, which has a dam at the outlet within its watershed. There is also one significant tributary: Bolton Creek.

This Fall River drains an area of 495 sq km and is predominantly rolling hills and glacial deposits. Within its boundaries are the Village of Sharbot Lake and the hamlet of Fallbrook. Many pasture farms can be found throughout this sub-watershed.

From here, the Mississippi River flows easterly through the hamlet of Ferguson Falls and the Village of Innisville into Mississippi Lake, which is the last lake on the Mississippi River proper. Lakeshore development in this area is quite dense, with a recent trend toward converting from seasonal to permanent dwellings.

### 2.1.3. The Eastern Watershed

The Eastern watershed holds the bulk of the population. Several communities, including Carleton Place, Almonte, Pakenham, Galetta, and a portion of the City of Ottawa, are situated along the main channel. As well, Mississippi Lake itself has over 1700 homes / cottages built along its shoreline. The terrain is much flatter here, with farmland dominating the rural areas outside of the communities.

One significant tributary, McIntyre Creek, flows into Mississippi Lake. It empties near the inlet of the Mississippi River at a location which is a Wildlife Sanctuary.

The Carleton Place Dam is located on Mississippi Lake, at a point from which the river travels northward into the Town of Carleton Place. Not intended for hydroelectric production, it maintains recreational levels on Mississippi Lake and provides minimal flood control benefits for it and the downstream municipalities.

From Carleton Place the river flows through the community of Appleton. The Appleton Generation Station was built here in 1993 at the site of the abandoned and derelict structure formally belonging to the textile mill.

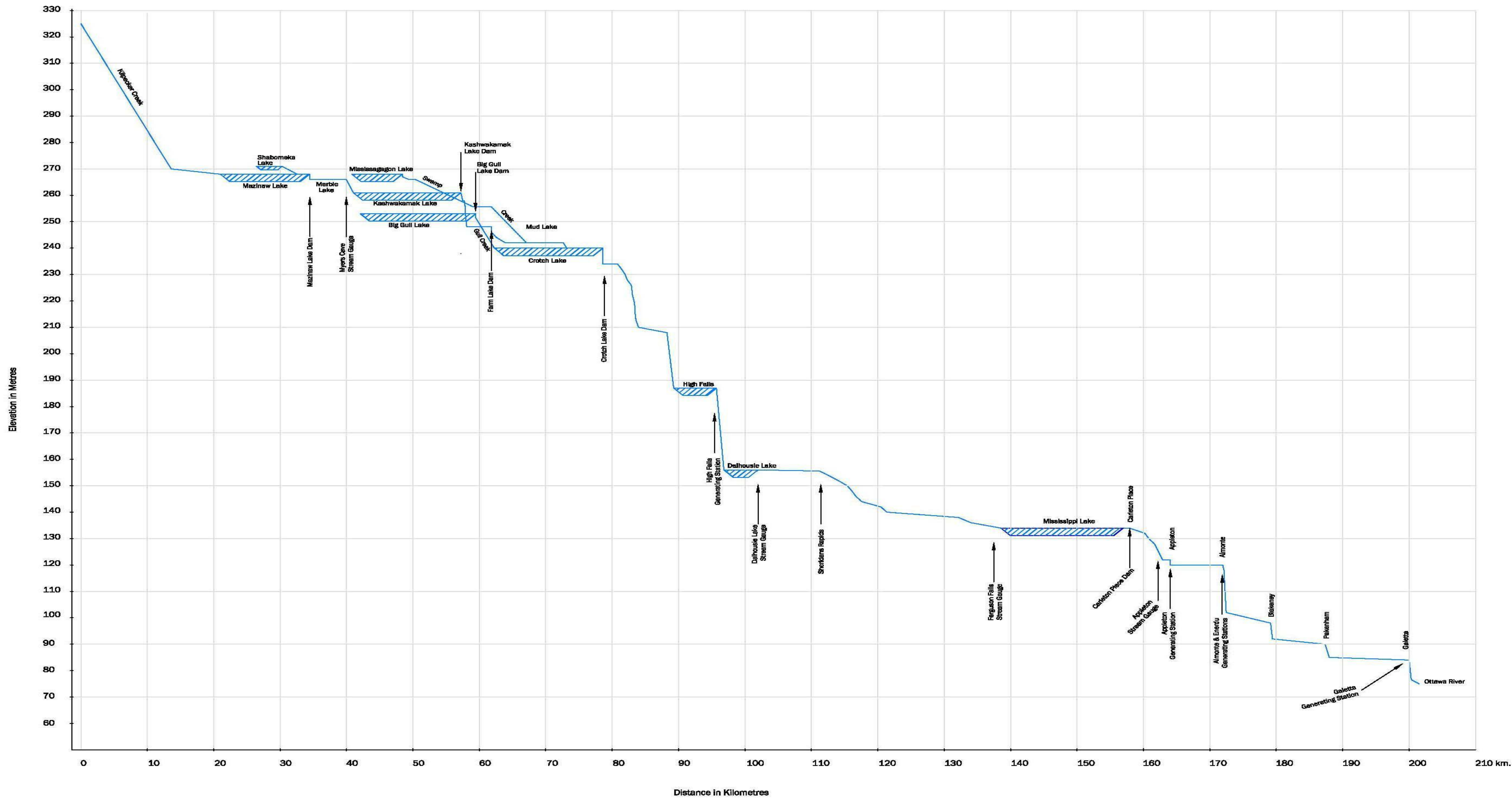
The river continues north through the Town of Almonte, where two generating stations are located. The first station - the Enerdu Generating Station was built in 1995, while the Mississippi River Power (formerly Almonte PUC) Generating Station, was originally constructed in1890.

Several smaller tributaries and the Indian River flow into the Mississippi River between Almonte and the next community downstream community: Pakenham. Below Pakenham, the last two significant uncontrolled tributaries enter the Mississippi River: Indian Creek and Cody Creek.

The Mississippi River then flows through the Village of Galetta, which is the last community on the system and to the Galetta Power Generating Station, which is the last control structure. It then empties into the Ottawa River at Chats Lake, just above the Chats Falls Generating Station.

**Figure 2 – Profile of the Mississippi River** - The accompanying profile of the river graphically represents the study area of the plan. It's a scaled representation of the slope over a distance of the river from the headwater tributary of Kilpecker Creek to the outlet at the Ottawa River. The lakes are scaled to their longest reach but are not scaled by vertical depth.

# Mississippi River Water Management Plan




**Mississippi Valley Conservation**

# Mississippi River Profile

**Figure 2**

## 2.2 Biological Resources

The Mississippi River system contains both cold and warm-water fish species. In the western portion of the watershed most lakes support populations of walleye, although lakes such as Mazinaw contain lake trout and support both warm and cold-water populations. The central and eastern portions of the Mississippi River system contain primarily warm-water fish species such as northern pike, walleye, smallmouth bass, bluegill, pumpkinseed, rock bass and yellow perch.

The Mississippi River system has a diversity of aquatic habitats (spawning grounds, nursery, rearing, food supply and migration areas) upon which fish depend directly or indirectly to carry out their life processes. Many of the important fish spawning areas are located below sections of rapids and dams and along shorelines of lakes and the river proper.

Water levels and flows are important to fish species during the spawning and incubation periods of the eggs which can last from ice break-up to early summer for most species. Walleye spawn in spring on rocky areas in whitewater below dams or rapids in the river. Walleye in lakes will spawn on cobble or gravel on shoals. Lake trout spawning occurs mainly in October on rocky shoals found in lakes.

The Mississippi River system is home to a wide diversity of mammal, reptile, amphibian and bird species. In many cases the life cycles of these species are directly related to the river and the corresponding land-water interface. One example of this important linkage would be the numerous wetland areas found along the river and the shores of some lakes. Loons, ducks and other waterfowl use these wetlands for nesting and staging areas. Furbearing mammals such as beaver, muskrat and raccoon, derive food and shelter from wetlands. Reptiles depend on wetlands for much or all of their life cycle and osprey and herons benefit from the shallow water feeding opportunities they provide. Certain wetland habitats on Kashwakamak Lake provide suitable habitat for a rare turtle species known as Blanding's turtle.

The Mississippi River system is also home to several species at risk. These rare species are considered to be of concern because so few populations exist in Ontario. The river supports a total of 10 known species at risk including 4 dragonfly species, 3 fish species, 2 bird species and 1 turtle species.

Furthermore, the Mississippi River is the site of many natural heritage features. Natural heritage refers to ecological features that perform various beneficial functions on the landscape. These natural heritage features include wetlands that form the interface between aquatic and terrestrial ecosystems, areas of natural and scientific interest (ANSI) which provide recognition and protection to significant natural features, fish habitat, and species at risk.

One such natural heritage feature in the Mississippi River system is wild rice. Wild rice is an edible wild grain that is a staple for aboriginal communities and is still harvested today. An integral part of shallow lake and river ecosystems, this tall aquatic grass provides food for waterfowl and habitat for snails and water insects, which are also eaten by waterfowl. Wild rice beds also provide habitat for furbearers and other wildlife. Water levels are important to maintaining wild rice stands as high water levels can drown these plants.

The information contained in Appendix A represents the best available information on the biological resources and is not necessarily a comprehensive list of species found in the Mississippi River system.

## 2.3 Dam Operations

The following briefly outlines the general guidelines of how the system is operated.

There are six major lakes in the watershed which have control structures at their outlet which are operated to provide some flood storage in the spring to alleviate flooding downstream of Crotch Lake. These are Shabomeka, Mazinaw, Kashwakamak, Big Gull, Mississagagon and Crotch lakes. Every fall, the dams are operated to draw down the lakes, thereby providing storage for the spring runoff. As snowmelt and spring rains occur, the lakes are gradually filled to reach their summer target levels for recreation and tourism.

Streamflow and water level conditions must be monitored and regulated so that targets can be reached, while ensuring adequate storage remains to accommodate late spring rainfalls. Sufficient flows and levels must be maintained for warm water fisheries spawning (pike, walleye, bass etc.). Coincidentally, there is a reduction in flooding to downstream areas as the uncontrolled runoff from the central and eastern portions of the watershed move through the system. Once the runoff has receded, all of these dams, except for the Crotch Lake Dam, are operated to maintain relatively stable water levels on the lakes throughout the summer months for recreational purposes.

Crotch Lake is unique, as it is the only true reservoir lake on the system. It is operated throughout the summer to maintaining adequate water levels and flows for the various users downstream. It provides between 60 and 100 percent of the total flow in the river downstream of Crotch Lake from July through September.

## 3. Specific Physical and Biological Resources and Dam Operating Guidelines

The following is a brief outline of the physical description, the operating guidelines, and a biological summary of the fish and wildlife considerations associated with each dam within the study area.

### 3.1 Shabomeka Lake

**Physical Description**

Located on Semi Circle Creek, Shabomeka Lake (a.k.a. Buck Lake) is a headwater lake, which flows into Mazinaw Lake.

The lake has:

- A drainage area of 41 sq. km
- A maximum depth of 32 m
- An average depth of 12.4 m
- A total storage volume of 536 ha. m.
- Approximately 99 residential buildings on this lake, with about 1/4 of them having boat access only

Flooding of the access road, shoreline flooding, and overtopping the dam have been a concern in the past. Ice damage can be a concern especially in years where there is little to no snow to ensure filling of the lake in the spring.

**Dam Operations**

The dam consists of a single concrete sluice containing eight 0.25 m x 0.25 m x 2.44 m stoplogs. An earth embankment on either side of the sluice forms the remainder of the dam. The dam is owned and operated by MVC with the actual removal and replacement of stoplogs done by a local contractor.

The dam is operated early in the spring to capture runoff to ensure summer levels are met. Lake levels are maintained between 270.90 m (above sea level - a.s.l.) and 271.10 m throughout the summer months, with virtually no outflow from the lake during this period under normal conditions. The fall drawdown begins mid September with 7 of the 8 stoplogs in the dam being removed by early October. The early drawdown is undertaken in an attempt to have lake levels stable prior to the lake trout spawning. The lake normally reaches its minimum level of 269.50 m by early November.

**Biological Resources**

Lake trout have been documented spawning at several locations throughout Shabomeka Lake. The shoals, however, are susceptible to the fall drawdowns, and concerns have been raised regarding the survival of lake trout eggs here over winter. A spawning habitat rehabilitation project at this site to address this concern was completed on two shoals on the south shore of the lake in 1988, and lake trout were observed utilizing one of the two rehabilitated sites in 1990. Currently, the lake trout population in Shabomeka Lake is maintained through artificial stocking. Spawning sites of other species have not been assessed.

## 3.2 Mazinaw Lake

### Physical Description

Located on the main channel of the Mississippi River, this is the first major lake on the river system and is also considered a headwater lake, although it is not operated as such due to the significant drainage area above the dam.

The lake has:
- A total drainage area of 338 sq. km
- A maximum depth of 145 m
- An average depth of 41.2 m
- A total storage volume of 3423 ha. m
- Two distinct basins – upper and lower which are separated by a narrow channel at the base of Mazinaw rock
- Approximately 314 residential buildings, at least 4 marinas, and one provincial park (all of the residential buildings on the east shore are boat access only)

Flooding of low properties and docks and overtopping of the dam's emergency bypass channel has occurred. Downstream flooding, specifically on Little Marble and Marble Lake, are a common occurrence if the dam has to be operated under high flow conditions.

### Dam Operations

The dam is a concrete structure consisting of two sluices each containing seven 0.25 m x 0.30 m x 3.95 m stoplogs. An emergency bypass channel, which is at an elevation of 268.20 m acts as the access to the dam. The dam is owned and operated by MVC, with the actual removal and replacement of stoplogs done by a local contractor.

This lake is not normally operated in the spring until levels have stabilized from runoff. Stoplogs are then replaced to either maintain or bring lake levels up to summer requirements while maintaining adequate flow for walleye spawn below the dam. Lake levels are maintained between 267.90 m and 267.60 m throughout the summer months with a minimal flow being passed through the dam to keep water in the downstream channel. Although this is a lake trout lake, the fall drawdown does not occur until after the deer hunting season, which is usually the 2nd week of November. This ensures adequate water in the lake to allow navigation through the narrows, between the upper and lower lakes, as well as access to the east shore residences. The lake normally reaches it minimum levels in mid January at 266.70 m. Eight of the total 14 stoplogs in the dam are removed between mid-November and mid-December.

### Biological Resources

There are three identified lake trout spawning shoals in Mazinaw Lake; the primary shoal is located on the south shore of Campbell Bay. This shoal is susceptible to the fall drawdowns, and concerns have been raised regarding the survival of lake trout eggs here over winter. A habitat rehabilitation project at this site to address this concern was completed in recent years; however, its success has not yet been assessed. The other known lake trout spawning sites are located at the Narrows, and on the east shore of the south basin. Deep water spawning activity is suspected in Mazinaw Lake, although no sites have been confirmed.

Walleye spawn throughout the south basin, as well as at inflows in Campbell Bay, German Bay, and at the extreme north end of the lake.

Spawning sites of other species have not been assessed.

## 3.3 Kashwakamak Lake

Physical Description

Located on the main channel of the Mississippi River, Kashwakamak Lake (a.k.a. Long Lake) is dominated by numerous inlets and shallow bays.

The lake has:

- A total drainage area of 417 sq. km
- A maximum depth of 22 m
- An average depth of 8.4 m
- A total storage volume of 3822 ha. m
- Approximately 377 residential structures on the lake and at least 5 resorts
- Other than property on islands, there are no boat access only dwellings on this lake

Flooding of property and docks has occurred on occasion in the past although flooding of dwellings has not been a problem.

**Dam Operations**

The dam is a concrete structure consisting of two sluices each containing ten 0.30 m x 0.30 m x 3.43 m stoplogs and an overflow weir with an elevation of 261.06 m, which regulates levels throughout most of the summer. MVC owns and operates this structure.

As runoff starts to occur in the spring, the dam is operated to slowly bring lake levels up to summer requirements, while trying to minimize shoreline damage from ice movement. It is important to have the lake level near summer target levels prior to the start of the walleye spawn if possible, due to the existence of a prime spawning shoal at the head of the lake at Whitefish Rapids. Lake levels are maintained between 261.00 m and 261.20 m throughout the summer months, with a minimal flow being passed through the dam to keep water in the downstream channel. The fall drawdown begins after Thanksgiving weekend with 14 of the 20 stoplogs removed during the drawdown. Lake levels normally drop to around 260.20 m by the end of October and remain relatively constant as the drawdown of Mazinaw Lake commences. The lake reaches its minimum winter elevation of 259.65 m by the end of February.

**Biological Resources**

Kashwakamak Lake has an abundant walleye population that is known to spawn near the main inlet at Whitefish Rapids and at several locations along the north shore of the lake.

Bass reproduction has been assessed in the lake with nesting activities having been documented throughout. Higher nest densities tend to occur in shallow bays on the north and east ends of the lake.

Northern pike reproductive activities have been recorded at two shallow sites in the extreme eastern end of the lake.

Kashwakamak Lake once supported lake trout, however this species has been extirpated from the lake.

Certain shoreline wetland habitats on the lake provide suitable habitat for a turtle species at risk, known as Blanding's turtle.

## 3.4 Mississagagon Lake

**Physical Description**

Located on Swamp Creek, a small tributary of Buckshot Creek, this lake has the least impact on the overall system of the lakes in this area.

The lake has:

- A total drainage area of 22 sq. km
- A maximum depth of 24 m
- An average depth of 9 m
- A total storage volume of 490 ha. m
- Approximately 127 residential buildings on the lake and at least 3 resorts/marinas
- Other than property on islands, there are no boat access only dwellings on this lake

Flooding of property and docks has occurred on occasion in the past, although flooding of dwellings has not been a problem.

**Dam Operations**

The dam is a concrete capped rock filled timber crib weir, with a single sluice in the centre of the dam containing six 0.15 m x 0.15 m x 1.33 m stoplogs. Due to their size, the stoplogs are bolted together in two sets, one of 4 and one of 2. The dam is owned and operated by MVC.

The stoplogs are replaced early in the spring to ensure summer target levels can be reached. Lake levels are maintained between 268.10 m and 268.30 m throughout the summer months, with virtually no flow being passed through the dam. The fall drawdown on this lake begins after the Thanksgiving weekend, with all the stoplogs removed from the dam. The lake normally reaches its minimum level of 267.60 m by early November.

**Biological Resources**

Walleye have been historically documented as spawning throughout the lake. Spawning assessments in 1987 and 2003, however, show that walleye spawn in small numbers at a small number of sites located on the north shore and small islands in the western portion of the lake. Although spawning activities have been observed on Mississagagon Lake, the lake struggles to support a self-sustaining population, and has received rehabilitative stocking of walleye for many years.

Mississagagon Lake formerly supported lake trout, although that species has been extirpated from the lake.

Spawning sites of other species have not been assessed.

## 3.5 Big Gull Lake

**Physical Description**

Located on Gull Creek, Big Gull Lake (a.k.a. Clarendon Lake) is a headwater lake, which empties into Crotch Lake.

The lake has:

- A total drainage area of 135 sq. km
- A maximum depth of 26 m
- An average depth of 4 m
- A total storage volume of 3048 ha. m
- Approximately 323 residential structures on the lake and at least 5 resorts
- other than property on islands, there are no boat access only dwellings on this lake

Flooding of shoreline and docks has occurred. Historically, there has been greater concern with reaching summer target levels than with flooding. As such, this lake is generally the first to be operated in the spring. As a headwater lake, it is extremely important to capture all spring runoff early to ensure reaching the summer target level.

Walleye spawning shoals have been built on the lake, which makes it important to have the lake level above 253.10 m prior to the start of the spawn, if possible.

**Dam Operations**

The dam is a concrete structure consisting of two sluices and an overflow weir. It is owned an operated by MVC. The sluices have different configurations with the north sluice containing seven 0.25 m x 0.30 m x 2.90 m stoplogs and the south sluice containing five, 0.25 m x 0.30 m x 2.29 m stoplogs. Although the dam has an overflow weir, water levels rarely get to its top height of 253.66 m.

Lake levels are maintained between 253.30 m and 253.50 m throughout the summer months with virtually no flow being passed through the dam. The fall drawdown begins after Thanksgiving weekend with 8 of the 12 stoplogs (4 from each sluice) removed during this process. Lake levels normally drop to around 252.60 m by the end of February. .

**Biological Resources**

Walleye are known to spawn throughout Big Gull Lake. The lake has limited walleye spawning substrate. Numerous enhancement projects have been undertaken to supplement the existing walleye spawning habitat in recent years by the local cottage associations.

Although Big Gull Lake formerly supported lake trout, this species has since been extirpated from the lake.

Spawning sites of other species have not been assessed.

## 3.6 Crotch Lake

**Physical Description**

Crotch Lake (a.k.a. Cross Lake) is the most significant lake on the Mississippi River with respect to flood control and low flow augmentation. It is the only true reservoir lake in the watershed.

The lake has:
- A total drainage area of 1030 sq. km
- A maximum depth of 31 m
- An average depth of 8.4 m
- A total storage volume of 7617 ha. m
- Three resorts on the lake and a few residential buildings
- Primarily surrounded by Crown or OPG owned land

**Dam Operations**

The dam consists of two main components: a single concrete sluice containing sixteen 0.30 m x 0.30 m x 4.20 m stoplogs and a 110 m rock filled gabion basket weir designed to be overtopped at elevations above 240.00 m (the design specifications limit the overtopping to 0.50m). The dam is owned and operated by OPG with the actual removal and replacement of stoplogs done by MVC.

The lake fluctuates by up to 3 m twice a year to augment downstream flows and provide storage for spring runoff thus reducing downstream flooding. In the spring, the lake level is drawn down to an elevation of approximately 237.00m with up to 12 logs removed from the sluice. As runoff begins in the spring, stoplogs are replaced to increase lake levels. It is extremely important to determine when walleye begin spawning on the lake as water levels cannot drop below the elevation at which they began to spawn for a period of six weeks. The lake is filled to an elevation between 239.50 m and 240.00 m and operated to maintain these levels until late June. Usually beginning around the first of July, one stoplog is removed from the dam about every 10 days to maintain at least an average downstream flow of 5 cms throughout the remainder of the summer. The lake declines steadily and by mid to late September is again near an elevation of 237.00 m. After Thanksgiving weekend, the logs are replaced in the dam to capture the water from the drawdowns being done on the upper lakes, while maintaining at least a minimum downstream flow of 5 cms. By mid January, the lake is normally between an elevation of 239.00 m and 239.50 m. Stoplogs are again removed to maintain at least the minimum average downstream flow of 5 cms.

**Biological Resources**

Walleye are documented as spawning in high numbers at several locations in Crotch Lake. The primary spawning shoal and staging area is located at Sidedam Rapids. A seasonal fish sanctuary is in force from 01 March until the first Monday in June to protect fish spawning in this area. Another important spawning site for walleye is documented at King Falls, both above and below the dam. Walleye spawning has also been documented around islands in the north basin, as well as at two inlets to Fawn Lake and on Gull Creek, upstream from Crotch Lake.

Crotch Lake formerly supported lake trout. This species, however, has been extirpated from the lake.

Spawning sites of other species have not been assessed.

Crotch Lake has been the site of nesting bald eagles. This bird species at risk is listed as endangered by the Committee on the Status of Species at Risk in Ontario (COSSARO). This means the species is at risk of extinction or extirpation in Ontario.

## 3.7 High Falls Generating Station

**Physical Description**

The High Falls Generating Station is located on the Mississippi River downstream of Snow Road Village. The forebay for the dam is known locally as Stump Bay. Flows through this dam effect all aspects of the river from the dam to Mississippi Lake.

The generating station has:
- A total drainage area of 1233 sq. km
- A total storage volume in Stump Bay of approximately 130 ha. m

**Dam Operations**

The High Falls Generating Station consists of two major components, the generating station and a concrete control structure having four sluices and an overflow weir.

The generating station has the total capacity to discharge 14.3 cms.

There are a total of 56 stoplogs in this dam, with 20 in the first sluice and 12 in each of the other three sluices. The stoplogs are each 0.30 m x 0.30 m x 4.67 m. The elevation of the weir is 187.61 m. The plant has a maximum plant output of 2.3 MW.

The High Falls Generating Station is a run-of-the-river type station owned by Ontario Power Generation (OPG). A run-of the river facility is defined by the Water Management Planning Guidelines as “a generating station with minimal forebay storage that passes some or all of the inflow through one or more turbines on a consistent basis, with the remainder, if any, going over an existing falls or spillway”. Therefore, any flows, which exceed 14.3 cms, must be passed through the four stoplog sluices or over the concrete weir.

OPG endeavors to maintain water levels within the operating range of 187.56 m and 187.00 m while producing power from the available streamflow, which, for much of the year are limited to an average of 5 cms from Crotch Lake. This amounts to approximately 1/3 of the plants overall efficiency. During the spring, the plant can normally run at peak efficiency due to higher flows.

There is a significant walleye spawning shoal located at Geddes Rapids at the inlet to Dalhousie Lake, immediately downstream of the dam. Care must be taken to try to maintain constant flows through the plant and control structure once spawning has begun.

Historically, flooding in the Snow Road area has historically been a problem. For this reason, levels must be maintained below 187.65 m when possible. Due to the lack of available storage volume in the station's headpond, there is no ability to mitigate flooding downstream and must be operated to pass streamflows as they occur. Replacement of the stoplogs once streamflows begin to recede should mimic the reduction in inflows (i.e. water levels should remain relatively constant above the dam such that inflow equals outflow).

**Biological Resources**

Walleye spawning occurs upstream at Geddes Rapids and downstream of the High Falls Generating Station. White sucker have been seen spawning here as well.

#### 3.7.1. Dalhousie Lake

**Physical Description and Biological Resources**

Dalhousie Lake is a relatively shallow lake, approximately five kilometers long and one kilometer wide. Most of the shoreline development, primarily in the form of cottages, is found at the eastern and western ends of the lake. Dalhousie Lake is the first significant flood damage centre on the main channel of the Mississippi River. The lake has:

- Approximately 195 residential buildings on this lake, many of which have been converted to year round dwellings
- One in 100 yr flood elevation for Dalhousie Lake is 158.00 m

Flooding on the lake begins when water levels reach 187.20 m. Water levels throughout the summer are generally maintained by outflows from Crotch Lake at approximately 5 cms, resulting in a water level on Dalhousie Lake of between 156.00 and 156.10 m. This can normally be sustained throughout the summer, however, high evaporation rates can result in lower streamflows and water levels.

The lake is home to large and diverse colonies of mollusks. Studies in the mid-1990s discovered at least 7 species of freshwater clams. The lake also provides a high quality sport fishery for warm-water species and has been the focus of numerous fisheries management activities over the years.

The mouth of the Mississippi River at Dalhousie Lake is used as a staging area by walleye prior to spawn and serves as a nursery and feeding area for walleye post-spawning. Walleye are also known to spawn in the Mississippi River at the Dalhousie Lake outlet. Water levels and flows can affect both these spawning areas. Also, two shoals on the lake, the Promontory and Gull Rocks, are known to support walleye feeding.

Northern pike spawn on the northeast shore of the lake near the lake outlet. It is also suspected that pike may spawn in the vegetated shores of the Mississippi River downstream of Dalhousie Lake.

Most smallmouth bass spawning on Dalhousie Lake occurs along the southern and southeastern shores in the gravel-cobble substrate.

The spawning of other species has not been evaluated.

#### 3.7.2. Dalhousie Lake to Sheridan's Rapids

This section of the Mississippi River is quite shallow and many of the adjacent lands are treed swamps. It contains numerous areas for northern pike, yellow perch and bullhead spawning. The floodplain surrounding this stretch provides important waterfowl, bullfrog and turtle habitat.

#### 3.7.3. Sheridan's Rapids to Playfairville Rapids

This section of the river is extremely shallow and is only accessible by canoe or kayak. Walleye spawn below the rapids while smallmouth bass spawn in gravel along the riverbank.

#### 3.7.4. Playfairville Rapids to Fergusons Falls

The upstream portion of the stretch is again very shallow and accessible only by canoe or kayak. As the river descends from the Canadian Shield it deepens and widens. This section of the river provides excellent bullfrog habitat. Walleye spawn below the rapids and wild rice stands cover large areas.

#### 3.7.5. Fergusons Falls to Innisville Rapids

The river begins to become shallow again through this stretch. The rapids at Innisville are an important walleye spawning ground. Spawning shoals have been built in the river here to enhance the survival rate of the spawn.

### 3.8 Mississippi Lake and Carleton Place Dam

**Physical Description**

Mississippi Lake, one of the largest inland lakes in Southeastern Ontario, is the last major lake on the river system. Mississippi Lake is one of the largest inland lakes in southeastern Ontario. A structural survey of the lake completed by MVC in 1985 estimated that there were 68 residential buildings, which would be subjected to flooding above the first floor elevation in the event the 1 in 100 year flood elevation of 135.60 m occurred.

The lake has:

- A shoreline of 58 km
- A surface area of 3030 ha.
- A maximum depth of 9.2 m
- An average depth of 3 m
- The lake has two basins, separated by a long narrow channel at Squaw Point
    - The south basin is the deeper portion of the lake
    - The north basin mainly between 2 and 3 m deep
- Approximately 1700 residential structures along the shores of the lake
- A water intake pipe, located between the lake and the dam.

Water levels are influenced to some degree by the operation of the Carleton Place Dam. Located on the Mississippi River within the Town of Carleton Place, this dam maintains water levels on the river through the town. The narrowing of the river channel from the outlet of the lake to the dam and the height of the bed of the river through the town (specifically above the main street bridge) limits the ability of this structure to reduce flood levels on Mississippi Lake and in the community. At streamflows below 20 cms, water levels at the dam and on the lake are virtually the same and typically range from 134.35 m to 133.95 m. Once flows exceed 20 cms, water levels between the dam and Mississippi Lake become influenced by channel constrictions upstream of the dam. Normal flows in late August and September are between 5 and 10 cms. Once flows exceed 150 cms (average spring flow conditions), the Carleton Place Dam has little influence on water levels on Mississippi Lake.

**Dam Operations**

The dam is a concrete structure (owned by MVC) with five sluices containing a total of 48 stoplogs and a 75 m overflow weir. There are a total of ten stoplogs in each of the first three sluices and nine stoplogs in the last two sluices, with all stoplogs being 0.25 m x 0.25 m x 4.25 m. The weir elevation is 133.92 m.

The normal operating range for the dam is 133.93 m to 134.50 m with a summer target range between 134.35 m and 134.00 m. Each fall, between 10 and 20 stoplogs are removed from the dam (depending on streamflows) and levels are maintained between 133.95 and 134.20 m. As streamflows increase in the spring, additional stoplogs are removed to keep ice on the river and the lake as stable as possible. Once 25 logs are removed from the dam, its influence on upstream flood levels is effectively negated and operations are undertaken to keep levels in the river below 134.50 m. As streamflows and water levels recede, stoplogs are replaced with the objective of having the lake at an elevation of 134.35 m for the long weekend in May. The dam is not operated over the summer unless significant precipitation increases water levels on the lake above 134.35 m.

**Biological Resources**

The lake is divided into two basins separated by a stretch of islands and shoals.

Innisville wetland is a provincially significant wetland found at the southwest end of the lake. This portion of the lake is also home to a federal migratory bird sanctuary and a provincial Area of Natural and Scientific Interest (ANSI). Other wetland areas are situated along the west shore of the lake and in Kinch Bay. Wild rice grows in many of these wetlands and shallow bays.

Mississippi Lake is home to a number of warm water fish species. It also supports a large number of fishing tournaments each year including several professional bass competitions.

Walleye from Mississippi Lake participate in an impressive spawning run in the Mississippi River near Innisville at the southwestern end of the lake.

Northern pike and largemouth bass are known to spawn in Mississippi Lake's vegetated bays. These shallow areas also provide critical nursery habitat and serve as feeding areas.

Smallmouth bass spawn along rocky portions of the shoreline including Brown's Point, Rocky Point and the Cooke's shoreline.

## 3.9 Appleton Generating Station

**Physical Description**

This section of river, from the Carleton Place dam to the Appleton Generating Station, is a relatively shallow section of the river highlighted by a series of small rapids. Development has taken place along most of this section of the river.

The generating station has:

- A total drainage area of 2932 sq. km
- No storage capacity – impacts only the section of the river approximately 0.5 km upstream of the dam.

**Dam Operations**

The Appleton Generating Station, which is owned by Canadian Hydro Developers Inc. (CHDI), consists of a powerhouse, a concrete control structure containing four sluices, a mechanical gate and an overflow weir. The four sluices each have six 0.30 m x 0.30 m x 6.71 m stoplogs in them. The mechanical gate is 2.13 m x 6.71 m. The weir is 30.5 m long with an elevation of 123.00 m and the capacity to hold flashboards on the crest of the weir. It has a maximum plant output of 1.3 MW.

This station is a "run-of-the-river" structure with no forebay. The generating station can pass a maximum flow of 35 cms through the plant. Any excess must be spilled through the stoplogs or over the weir. Flashboards are installed in the summer on the weir to increase head in the river to maximize hydro production and are removed in late fall. Flood levels within the Village of Appleton are reached when levels exceed 124.00 m.

**Biological Resources**

Walleye are also thought to spawn below the Carleton Place structure while the riverbanks provide ample smallmouth bass spawning substrate. Spawning locales of other species is not known.

## 3.10 Enerdu & Mississippi River Power Generating Stations

Physical Description

The river from Appleton to Almonte is moderately deep and a provincially significant wetland complex stretches along the riverbanks for much of the stretch. Agriculture dominates most of the shoreline through this section of the river, until the Town of Almonte.

The Enerdu Generating Station has:

- A total drainage area of 3012 sq km
- Limited storage capabilities due to the rock outcrop approximately 0.5 km upstream of the dam.

**Dam Operations**

The Enerdu Generating Station consists of a powerhouse with an overflow weir. Flashboards are added to the top of the weir in the summer to increase the head at the dam. It has a maximum plant output of 0.35 MW.

This station is a "run-of-the-river" operation located within the Town of Almonte on the Mississippi River. The dam can pass approximately 14 cms through the generating station with excess water being spilled over the weir

The Almonte Generating Station is owned by Mississippi River Power Corporation (MRPC) and consists of a power house with a debris bypass stoplog sluice and an overflow weir. It has a maximum plant output of 2.4 MW.

This plant is also a "run-of-the-river" operation located within the Town of Almonte on the Mississippi River, immediately downstream of the Enerdu Generating Station. The dam can pass approximately 34 cms through the generating station, with excess flows going over the falls beside the generating facility or down the chancery channel and over the Willards Falls.

**Biological Resources**

Walleye and white sucker spawn below the Appleton Generating Station while the vegetated banks provide spawning for northern pike, bullheads and perch. This portion of the river is also home to many turtles and bullfrogs.

## 3.11 Galetta Generating Station

**Physical Description**

This stretch of the river from Almonte to Galetta is moderately deep and begins immediately below the Almonte waterfalls. A series of rapids break up the river with the most notable being Blakeney, Pakenham and Galetta.

Downstream of Pakenham, the river becomes quite deep with very little slope. The adjacent lands are devoted primarily to agriculture.

The Galetta Generating Station has:

- A total drainage area of 3684 sq km and influences water levels from Galetta through to the falls in Pakenham.
- Limited storage capabilities .

**Dam Operations**

The Galetta Generating Station is owned by CHDI and consists of a power house with 3 stoplog sluices, each containing seven 0.30 m x 0.30 m x 5.95 or 4.95 m stoplogs. Two sluices are 6 m wide while the 3rd is 5 m wide. The dam has an emergency spillway in the intake channel leading to the powerhouse, which contains 6 stoplogs. It also has a weir, approximately 35 m in length. The elevation of the crest is approximately 1.40 m below the flood elevation in Galetta. It has a maximum plant output of 1.6 MW.

This station is also a "run-of-the-river" operation, located within the village of Galetta on the Mississippi River. The dam can pass approximately 30 cms through the generating station, with excess flows throughout control section or over the weir. Flashboards are installed once low flows exist. This provides additional head in the river to maximize power production.

During high flows on the weir, the bridge immediately downstream of this plant acts as a control structure and restricts the flow from the tailrace to the outlet of the river. This can result in a quick and substantial increase in the tailrace area of the plant.

**Biological Description**

The rare River Redhorse sucker is found throughout much of this river section, but most notably below the rapids at Blakeney. Walleye, smallmouth bass, northern pike and several other warm water species are also thought to spawn throughout this section of the river, mainly around the rapids.

From below the Galetta Generating Station to the confluence with the Ottawa River, the Mississippi River runs through a set of rapids and a treed wetland.

**Figure 3 Structure Description - Summary**

| Control Structure | Drainage Area (sq km) | Maximum Depth (m) | Average Depth (m) | Surface Area (ha) | Total Storage Volume (ha m) # | Operating Range (m a.s.l.) | Usable Storage Volume (ha m) ! | No. of Residential Properties* |
|---|---|---|---|---|---|---|---|---|
| Shabomeka | 41 | 32 | 12.4 | 268 | 536 | 269.50- 271.00 | 402 | 99 |
| Mazinaw | 339 | 145 | 41 | 1630 | 3423 | 266.70- 268.00 | 1793 | 314 |
| Kashwakamak | 417 | 22 | 8 | 1274 | 3822 | 259.50- 261.33 | 1911 | 377 |
| Mississagagon | 22 | 24 | 9 | 545 | 491 | 267.45- 268.36 | 382 | 127 |
| Big Gull | 135 | 26 | 4 | 2540 | 3048 | 252.11- 253.55 | 1524 | 323 |
| Crotch | 1030 | 31 | 8 | 1953 | 7617 | 236.80- 240.20 | 5859 | Not Available |
| High Falls G.S. | 1233 | n.a. | n.a. | 264 | 132 | 186.90- 187.65 | 132 | Not Available |
| C.P. Dam | 2876 | n.a. | n.a. | 3030 | 3787 | 133.93- 134.50 | 1273 | Not Available |
| Appleton G.S. | 2932 | n.a. | n.a. | n.a. | n.a. | 122.00- 123.80 | n.a. | Not Available |
| Enerdu G.S. | 3012 | n.a. | n.a. | n.a. | n.a. | not available in a.s.l. | n.a. | Not Available |
| Almonte G.S. | 3012 | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | Not Available |
| Galetta G.S. | 3684 | n.a. | n.a. | n.a. | n.a. | 82.61- 83.80 | n.a. | Not Available |
| | | | | | | | | |
| Dalhousie Lk | | 13 | 7 | 521 | n.a. | n.a. | n.a. | 195 |
| Mississippi Lk | 2876 | 9.2 | 3 | 3030 | 3788 | n.a. | 1273 | 1700 |

\# Total storage based on height of stoplogs times surface area of the lake. Big Gull and Carleton Place are influenced by the channel above the dam and are based on number of logs which impact water levels on the lake.

! Usable storage refers to the actual operating range currently in place (maximum of summer target range to minimum fall level), not maximum spring level to sill elevation of structure.

• Number of dwellings based on MVC structural surveys undertaken between 1985 and 1989.

(n.a.) Not applicable

Not Available - total number of homes along the river sections affected by the dams is not currently available. No structural survey was completed on Crotch Lake.

## 4. Planning Issues on The Mississippi River System

Public participation and stakeholder participation is a guiding principle in the preparation of the MRWMP. To date, the planning process has afforded a variety of opportunities for the public and stakeholders to provide input to the preparation of the management plan for the Mississippi River system.

An "Invitation to Participate" (paid advertisement) was placed in local and regional newspapers in February, 2003 to announce the beginning of planning. In addition to identifying individuals interested in serving on the project's Public Advisory Committee, this first step in consultation resulted in a mailing list created for this project.

Two open houses were held in July 2003, one in the western portion of the watershed in Cloyne and the second in the central part of the watershed at the Mississippi Valley Conservation office in Lanark. The open houses displayed general information on water management planning and a description of the planning process and time lines for this project. Background information about the current water management system and the fish and wildlife values of the system were also displayed. Participants at the open houses had the opportunity to identify matters of interest and concern by speaking to the dam and hydro facility owners, Ministry of Natural Resources (MNRF) staff and Public Advisory Committee (PAC) representatives.

Questionnaires were provided to the participants at the open houses. 44 questionnaires, as well as 5 emails and one letter, were received. The majority of the input provided at the open houses focused on the lakes in the western portion of the system and their interaction and influence on the downstream sections of the system.

Notice of the open houses appeared in advertisements placed in local and regional newspapers. Direct mailings to municipalities, cottage associations and interest groups were also utilized, as were project mailing lists.

An information notice was posted on the Environmental Bill of Rights Registry which advised of the dates and locations of the open houses and the 30 day comment period. In addition to the open house input, additional written contributions were received from municipalities, lake associations and the general public during the consultation period.

A 12 member PAC was established in April, 2003 to bring forward the broad spectrum of interests associated with water level and flow management on the Mississippi system. The PAC's principle duties are to assist the plan proponents in carrying out public consultation and to provide advice and comment on the content of the MRWMP. Appendix B contains Section 12 – Water Level Management Issues & Questions for Planning which is an excerpt from the Public Advisory Committee – Public Consultation Findings – Issues Report.

During the planning process for the MRWMP, First Nations with an interest in the Mississippi River system will be consulted separately and the views arising from such consultations will be heard, documented and addressed. Meetings with the Sharbot Mishigma Anishnabe Algonquin First Nation, Ardoch Algonquin First Nation and Ardoch Algonquin First Nation and Allies have taken place to present information on the planning process and to provide background data on the river system. Valuable input was received during these meetings.

A project website, containing background information, meeting minutes and other information related to the MRWMP has been set up and can be accessed at www.mississippiwaterpowerplan.com.

Concerns, related to the management of water levels and flows, submitted through public and First Nations consultations, are summarized in the following section.

## 4.1. Shabomeka Lake

### Fisheries and Fish Habitat

4.1.1 Leaving more water in Shabomeka Lake in the fall will / will not improve the Lake Trout Fishery.

### Shoreline/Infrastructure Protection

4.1.2 Leaving more water in Shabomeka Lake will cause more shoreline damage.

### Low Flow Augmentation

4.1.3 The drawdown on this lake is unnecessary.
4.1.4 The drawdown is done too early and reduces access to boat only access properties in the early fall. Can the recreational season extend beyond the current Victoria Day to Labor Day weekends?

### Ecological Integrity

4.1.5 Beaver lodges are left high and dry after the drawdown. Does this adversely affect the beaver population?

## 4.2. Mazinaw Lake – Marble Lake

### Low Flow Augmentation

4.2.1 Lowering water level of Mazinaw Lake over the summer or earlier in the fall would impact navigation on the lake and make boat access only properties inaccessible.

### Fisheries and Fish Habitat

4.2.2 Dropping the water levels on Mazinaw Lake after walleye and lake trout spawn cause the eggs to dry up.

### Current Water Management Regime

4.2.3 There does not appear to be any serious reason to change the current situation or maintenance program.

4.2.4 The residents and cottagers absolutely expect stable water throughout the recreational season. Current water level regulations are acceptable for local residents, cottagers and fish species. Also, Damage would be expected to boats and docks if levels were to fluctuate significantly during the regular season.

### Shoreline/Infrastructure Protection

4.2.5 Unstable water levels also have a negative impact on shorelines as the water action creates changes to shoreline.

## 4.3. Marble Lake

### Water Level Fluctuations

4.3.1 The operation of Mazinaw Lake dam affects water levels on Little Marble Lake, Marble and Georgia Lake.

### Shoreline/Infrastructure Protection

4.3.2 Stable ice in the winter is a concern for recreational users and shoreline damage.

## 4.4. Kashwakamak Lake

**Current Water Management Regime**

4.4.1 We (the cottage association representing 200 members) are happy with the current operations and no changes should be made to it.

**Ecological Integrity**

4.4.2 The fall drawdown is detrimental to fish and their habitat, benthic invertebrate, wildlife etc. Is it necessary? Does it drawdown continue after the lake has frozen over?

**Low Flow Augmentation**

4.4.3 The low summer levels of 2003 a direct result of dam operations? How is the dam operated during drought conditions?

**Shoreline/Infrastructure Protection**

4.4.4 Stable ice in the winter is a safety concern for recreational users and shoreline damage.

4.4.5 Increased outflow out of Kashwakamak Lake causes erosion on Farm Lake.

4.4.6 Some years, water levels come up in the spring before the ice is out, damaging docks.

**Wild Rice**

4.4.7 Water flow fluctuations from the outlet of Kashwakamak Lake can affect the growth cycle of wild rice at Ardoch.

## 4.5. Big Gull Lake

**Low Flow Augmentation**

4.5.1 Too much water taken out of Gull Lake in fall and the stoplogs are not put back in soon enough in spring, resulting in low summer water levels.

**Fisheries and Fish Habitat**

4.5.2 The walleye spawning shoals are left uncovered in dry springs. The historic walleye spawning area on Gull Creek also experiences low flow.

**Navigation/Access**

4.5.3 Navigation

## 4.6. Mississagagon Lake

**Ecological Integrity**

4.6.1 The lowering of the water level in the fall impacts shoreline aquatic life.

## 4.7. Crotch Lake

**Fisheries and Fish Habitat**

4.7.1 Concern regarding fluctuating water levels, particularly during the spawning season. It is indicated in the background report that you do not raise the water level during the spawning season. We live on the lake and can attest to the fact that this is not a true statement.

4.7.2 In spring, water is lowered shortly after walleye spawn and eggs dry up.

4.7.3 The rate of drawdown on Crotch Lake leaves the bass spawn (in the Snow Road area) in shallow water so it dies.

4.7.4 The twice annual 12 to 14 foot drawdown on the lake has serious impacts on the walleye population and has resulted in fish being trapped and dying in small pockets of water.

**Low Flow Augmentation**

4.7.5 Upper lakes should have to share their water.

4.7.6 Is Crotch Lake more valuable economically as a reservoir or as a prime recreational destination?

4.7.7 5 cms is what is required to operate one generator at High Falls. Is 5 cms what is required for downstream users or is this a hydro generation requirement? How was the 5cms for High Falls determined? What percentage of system inflow occurs below Crotch Lake discharge?

**Navigation/Access**

4.7.8 Access navigation, launching and retrieving boats as well as providing usable and adequate docking are hampered by the excessive drawdowns during the extended recreational season. The new boat launch access for Crotch Lake is inaccessible when the lake is at its lowest levels. Also makes it difficult to access Crotch Lake and adjacent lakes (Twin and Fawn) for recreation. The extreme extent of the drawdowns produce navigational boating safety concerns and makes the boat launch inaccessible in the late summer.

**Fisheries and Fish Habitat**

4.7.9 The twice-annual drawdown puts stress on existing fish populations through aquatic habitat alteration and destruction. Did this practice result in the demise of the native lake trout population?

4.7.10 As a result of the winter drawdown, the best walleye spawning areas are left high and dry in April.

## 4.8. Dalhousie Lake

**Water Level Fluctuations**

4.8.1 A narrower band in fluctuation of water levels on Dalhousie Lake would be preferable. Current 1 – 1.5 m is too wide a range. A clear rationale and explanation of how Dalhousie Lake levels are regulated is required.

**Low Flow Augmentation**

4.8.2 Put more logs in the dams to store more water in upper lakes having more water available for low flow, hydro and Crotch Lake wouldn’t have to fluctuate as much. Use smaller logs in all of the dams to reduce the amount of fluctuation of water levels down stream.

**Flooding**

4.8.3 The incidence of lake flooding appears to have increased and if so why?

4.8.4 Flooding of 1998 and not allowing Crotch Lake to fill to alleviate flooding.

**Navigation/Access**

4.8.5 The summer water levels need to be raised to improve navigation and dock access.

## 4.9. Mississippi Lake – Ottawa River

**Fisheries and Fish Habitat**

4.9.1 Is fish habitat such as the walleye spawning shoals and the significant wetlands between Dalhousie Lake and Mississippi Lake considered in the operating regimes of any of the control structures?

**Flooding**

4.9.2 The incidence of lake flooding appears to have increased and if so why?

**Low Flow Augmentation**

4.9.3 Ensure minimum flows for municipal water intakes and sewage treatment plants.

## 4.10. General Watershed Comments

**Fisheries and Fish Habitat**

4.10.1 Bass and walleye spawning shoals in the riverine areas of the watershed, such as Snow Road, Innisville, Appleton.

**Ecological Integrity**

4.10.2 Effects of winter drawdown across the watershed on burrowing amphibians, wildlife and benthic invertebrate.

4.10.3 Eels and endangered species such as the River Redhorse.

**Power Generation**

4.10.4 Maximizing hydroelectric power to help offset current electrical shortages.

**Public Safety**

4.10.5 Maintaining stable ice conditions on rivers and lakes is a safety hazard for recreational users of the watershed. –

**Water Level Fluctuations**

4.10.6 Fluctuating water levels and/or pollution cause algae blooms.

**Low Flow Augmentation**

4.10.7 The summer levels are too low during drought periods.

4.10.8 Water taking from the river (golf course irrigation).

4.10.9 What is the economic value of the watershed and what is the comparative value of hydro production vs. recreation? What is the hierarchy of priority?

## 4.11. Issues Out of the Scope

It is noted that in addition to the above summary of issues, additional matters were raised in public consultation which were outside the scope of this planning process. These issues are summarized below and will be forwarded to the agencies and/or individuals that have a mandate to consider these matters.

- Land use, shoreline development
- Septic systems
- Watercraft impacts & speed limits
- New water control structures or major alterations to existing structures
- New hydro facilities
- First Nations fishing rights

- Water quality related to non-point source pollution, agricultural practices, exotic species
- Sport fisheries in decline, loss of species, over-fishing
- Ice safety for recreation
- Boat launch issues not related to water levels
- Structures & tributaries that do not affect water levels and flows to hydro facilities
- Need for watershed planning

## 5. Criteria for Option Development

Many of the components in this section of the report will be utilized during the option development phase of the Mississippi River Water Management Plan. As part of the options development phase of the plan, options will be considered and assessed on their ability to achieve the objective. These options will be assessed, while considering the general and planning constraints and operational considerations outlined below.

### 5.1. Plan Objectives

These objectives are specific to this plan only. These objectives were developed in response to the issues from the public consultation process.

It should be noted that the planning process will aspire to achieve each of the stated planning objectives. However, not all may be achieved to the same extent due to their inherent conflicts and the existence of various constraints.

5.1.1 Maintain or improve aquatic ecosystem health throughout the system.

- Improve lake trout spawning success on Shabomeka and Mazinaw by modifying the drawdown.
- Maintain spring spawning opportunities by having steady flows or rising levels for pike, walleye and bass.
- Minimize water level fluctuations as they affect aquatic/riparian wildlife.
- Where possible emulate the natural flow regime.
- Improve aquatic ecosystem health by maintaining flow through the system.
- Ensure abundance of wild rice is not reduced due to fluctuating water levels.

5.1.2 Address public safety and minimize property damage due to flooding and ice.

- Minimize flooding throughout the system.
- Minimize ice damage throughout the system.

5.1.3 Maintain water levels for navigation (including boat access only properties), recreation, cultural and social opportunities throughout the system.

- Maintain stable water levels for navigation and recreation throughout the system during the recreation season.
- Maintain water levels suitable for access to Twin Island and Fawn Lakes.

5.1.4 Maintain economic, recreation, cultural and social opportunities throughout the system.

- Maintain access to Wild rice and Pictographs

5.1.5 Recognize power generation values from the system.

- Maintain or enhance power generation on a seasonal and daily basis.

5.1.6 To develop public awareness on the overall constraints, objectives and natural processes that are considered in the operation of the Mississippi River system.

- Constraints and objectives
- Foster an understanding of how the system operates
- Current conditions

## 5.2. Operating Constraints by Reach

Weather and climatic conditions which exist across the watershed (i.e. precipitation, runoff and evaporation), are naturally occurring phenomena with a high degree of variability and uncertainty. Operational considerations, which must contend with these constraints, include the timing and magnitude of localized weather conditions as well as the reliability of weather forecasts.

The operational constraints considered in this plan have been categorized under two headings:

**a) Planning Constraints**

These are physical constraints due to the topography of the watershed and the configuration and size of a dam or channel leading up to a dam, which restricts the ability of the structure to influence flows and levels. Modifications to these constraints are considered to be outside the scope of this plan.

**b) Operational Considerations**

These represent environmental, socio-economic or safety considerations, which have been identified over time and which guide operating procedures under various watershed conditions. While these may be modified, changes should be supported through a cost /benefit analysis which weighs the various options and outcomes. Certain factors affecting these considerations (i.e: land use) may be beyond the scope of the water management planning process, however, their implications must be considered in examining the various option.

**Shabomeka Lake**

| Planning Constraints | |
|---|---|
| Hydraulic Characteristics | Drainage Area - 41 sq. km<br>Hydraulic Capacity – 12.0 cms<br>Total storage – 536 ha. m<br>Elevation of Deck of Dam – 271.67 m<br>Weir Elevation – Not applicable<br>Embankment Elevation at 271.45 m |
| Flooding | Flooding of municipal road occurs at 271.25 m<br>Flooding of main dwellings occurs above 272.00 m |
| **Operational Considerations** | |
| Lake Trout | Timing and magnitude of the drawdown to enhance reproductive success |
| Ice Damage | Limited inflows results in early operations potentially resulting in ice damage |
| Shoreline Flooding | Flooding complaints occur at 271.20 m |

**Mazinaw**

| Planning Constraints | |
|---|---|
| Hydraulic Characteristics | Drainage Area - 338 sq. km<br>Hydraulic Capacity – 48 .0 cms<br>Total Storage – 3423 ha. m.<br>Elevation of Deck of Dam – 269.00 m<br>Weir Elevation – Not Applicable<br>Emergency Spillway Elevation – 268.20 m |
| Flooding | Flooding of main dwellings occurs above 268.55m |
| Navigational Aspects of Narrows | Less than 2 m depth at the normal summer optimum level of 267.80m. |
| Downstream Channel Capacity | Little Marble/Marble – flooding occurs if more than one log or significant outflows occur out of Mazinaw Lake due to channel restrictions |
| Legal | Drawdown restricted to historical operations as per DFO order |
| **Operational Considerations** | |
| Lake Trout | Timing of drawdown to enhance reproductive success |
| Shoreline Flooding | Flood complaints occur at 268.00 m |
| Pictographs | Historical cultural significance, accessible with current summer levels |
| Provincial Park | Only P.P. within scoping area – significant tourist attraction |
| Walleye Spawning Downstream | Below Dam/Whitefish Rapids – Some flow out of Mazinaw must be maintained throughout spawning season to ensure spawn survival in river |
| Low Flow Augmentation | Some flow maintained throughout summer to ensure flow in river |

**Kashwakamak**

**Planning Constraints**

| | |
|---|---|
| Hydraulic Characteristics | Drainage Area – 417 sq. km<br>Hydraulic Capacity – 65.0 cms<br>Total Storage – 3822 ha. m<br>Elevation Of Deck of Dam – 262.26 m<br>Weir Elevation – 261.06 m<br>Emergency Spillway Elevation – 261.67 m |
| Flooding | Flooding of main dwellings occurs above 261.60 m |
| Shallow Bays/Navigation | Access to developed bays hampered at 261.00 m, 10 cm below optimum levels |

**Operational Considerations**

| | |
|---|---|
| Walleye/Bass Spawning Shoals | Water high enough in early spring to ensure coverage at Whitefish Rapids for walleye and maintained throughout June for bass |
| Wild Rice@ Ardoch | Stable and minimal outflows are required from early June through end of September to ensure growth and harvest of wild rice crop |
| Shoreline Flooding | Nuisance Flooding occurs at 261.30 m |

**Big Gull**

**Planning Constraints**

| | |
|---|---|
| Hydraulic Characteristics | Drainage Area - 135 sq. km<br>Hydraulic Capacity – 25 cms<br>Total Storage – 3048 ha. m<br>Elevation of Deck of Dam – 254.76 m<br>Weir Elevation – 253.66 m<br>Emergency Spillway Elevation – 254.47 m |
| Flooding | Flooding of main dwellings occurs above 253.90 m |
| Navigation | Numerous shallow shoals exist making navigation hazardous at levels 30 cm below target of 253.40 m |

**Operational Considerations**

| | |
|---|---|
| Shoreline Flooding | Nuisance flooding occurs at 253.55 m |
| Walleye Spawning | Levels above spawning shoals (estimated at 253.15 m) prior to spawn beginning. Spawning shoal identified at outlet of Gull Creek |
| Ice Damage | Limited inflows results in early operations potentially resulting in ice damage |

**Mississagagon Lake**

**Planning Constraints**

| | |
|---|---|
| Hydraulic Characteristics | Drainage Area - 22 sq. km<br>Hydraulic Capacity – 3 cms<br>Total Storage – 491 ha. m<br>Elevation of Deck of Dam – 268.45 m<br>Weir Elevation – 268.42 m<br>Emergency Spillway Elevation – Not applicable |
| Flooding | Flooding of main dwellings – 268.50 m |

**Operating Constraints**

| | |
|---|---|
| Walleye Spawning | Lake levels can not drop once spawning has begun |
| Shoreline Flooding | Nuisance Flooding occurs at 278.35 m |

**Crotch Lake**

**Planning Constraints**

| | |
|---|---|
| Hydraulic Capacity of Structure | Drainage Area – 1030 sq. km<br>Hydraulic Capacity – 68 cms<br>Total Storage – 7617 ha. m<br>Elevation of Deck of Dam – 241.67 m<br>Weir Elevation – 240.00 m<br>Emergency Spillway Elevation – Not Applicable |
| Flooding | Dam stability in question at elevations above 240.50 m<br>Flooding of main dwellings not applicable |
| Construction | Bottom 3 stoplogs are bolted together and anchored into the dam so they can not be removed |

**Operating Considerations**

| | |
|---|---|
| Walleye Fishery | Lake levels must not drop below elevation at start of spawning level until at least mid May. Also a consideration for Sidedam Rapids and Gull Creek |
| Walleye Spawning downstream | Outflows must be as stable and as consistent as possible to ensure survival of walleye downstream of dam as far as Dalhousie Lake inlet. |
| Bass spawn downstream of lake | Outflows maintained from mid May through late June to ensure adequate coverage of shoals in Snow Road area |
| Low Flow Augmentation | Lake must be at or near 240.0 m by July 1 to ensure minimum flows of 5 cms can be maintained downstream through mid September |
| Hydro Generation | When levels exceed the operating range due to substantial rainfall/runoff, higher flows will be maintained to maximize hydro production at High Falls GS and other downstream benefits until levels on the lake return to the operating range. |

**High Falls**

**Planning Constraints**

| | |
|---|---|
| Hydraulic Characteristics | Drainage Area – 1233 sq. km<br>Hydraulic Capacity – 14.3 cms through plant and 82 cms stoplog section<br>Total Storage –<br>Elevation of Deck of Dam –<br>Weir Elevation – 187.61 m<br>Emergency Spillway Elevation - |
| Flooding | Upstream flooding in Snow Road Village occurs at |

**Operating Considerations**

| | |
|---|---|
| Bass Spawning | Maintain levels above 187.00 m above the dam to ensure adequate coverage of spawning shoals throughout June |
| Walleye Spawning | Maintain consistent and stable flows throughout the spawning period of early April to late May |

**Dalhousie Lake**

**Planning Constraints**

| | |
|---|---|
| Channel Configuration | Limited channel capacity at Sheridan's Rapids |

**Mississippi Lake**

**Planning Constraints**

| | |
|---|---|
| Upstream Channel Capacity (between lake and dam) | Carleton Place Dam has limited ability to reduce flood levels beyond the 1:2 year return periods |
| C.P. Water Intake | Elevation to be defined |
| Weir elevation | C.P. Dam weir elevation – 133.92 m |

**Operational Considerations**

| | |
|---|---|
| Flooding | Flooding within Carleton Place occurs at 134.65 m |
| Flooding | Flooding on Mississippi Lake occurs at 135.00 m with property damage at 135.20 m |

**Appleton G.S.**

**Planning Constraints**

| | |
|---|---|
| Hydraulic Capacity of Structure | No storage capabilities at all – stop logs -<br>Maximum flow through plant of 35 cms |
| Dam Configuration | Weir elevation 123.00m |

**Operational Considerations**

| | |
|---|---|
| Ice Problems | Significant ice problems every winter from frazil ice |

**Enerdu G.S.**

| Planning Constraints | |
|---|---|
| Hydraulic Capacity of Structure | No storage capabilities at all<br>Maximum flow through plants of 14 cms |
| Tail Race | Flashboards – elevation to be defined |
| **Operational Considerations** | |
| Ice Problems | Significant ice problems every winter from frazil ice |

**Mississippi River Power Generating Station**

| Planning Constraints | |
|---|---|
| Hydraulic Capacity of Structure | No storage capabilities at all<br>Maximum flow through plant of 34 cms |
| **Operational Considerations** | |
| Ice Problems | Significant ice problems every winter from frazil ice |

**Galetta G.S.**

| Planning Constraints | |
|---|---|
| Hydraulic Capacity of Structure | Minimal storage capabilities<br>Maximum flow through plant of 30 cms |
| | |
| Upstream Channel Configuration | Under high flows |
| Dam Configuration | Weir elevation 82.61 m |
| **Operational Considerations** | |
| Ice Problems | Significant ice problems every winter from frazil ice |

## 5.3. Key Gaps in Baseline Data and Information

The identified data gaps are based on information required to consider the issues raised during the public consultation process and assess potential options. To date the data gaps identified that need to be filled during this process are:

- Bathymetric Mapping on Shabomeka Lake, Mazinaw Lake and Crotch Lake – to identify spawning shoals and navigational issues
- Socio-economic profile along the Mississippi River
- Modeling - to assess cumulative benefit of current operations
  - to analyze the cumulative impact on potential options
- Elevation of spawning shoals
- Elevation for Enerdu (a.s.l.)
- Literature search and habitat requirements for considerations such as: wild rice, eels, etc.

Data gaps and suggested studies following completion of the plan will be identified during option development and included in the final report.

### 5.4. Next Steps

The next steps of the Mississippi River Water Management Plan will be to:

- Present the scoping report to the public for their review
- Respond to issues brought forward by the public, First Nations and various agencies.
- Develop a range of options through consideration of planning constraints and operational considerations identified above as limiting guidelines.
- Upon approval of the options, a report on option development will be produced.
- A consultation process will occur for this phase, followed by
- The selection of a preferred option

Plans for public consultation of the scoping report are as follows:

- posting of scoping report on website http://www.mississippiwaterpowerplan.com/
- information notice on Environmental Bill of Rights Registry
- report available in hard copy at MNRF, MVC, MRPC offices
- mail out notice to mailing list
- presentation to Mississippi Valley Conservation Board of Directors

Scoping Report Review Period: 30 days

Estimated timeline for the Option Development Phase will be April 1, 2004 to August 31, 2004.

# APPENDICES

## Appendix A – Fish and Wildlife Summary Tables Report Natural Heritage Dams and Structures, Maps 1-10

### Shabomeka Lake

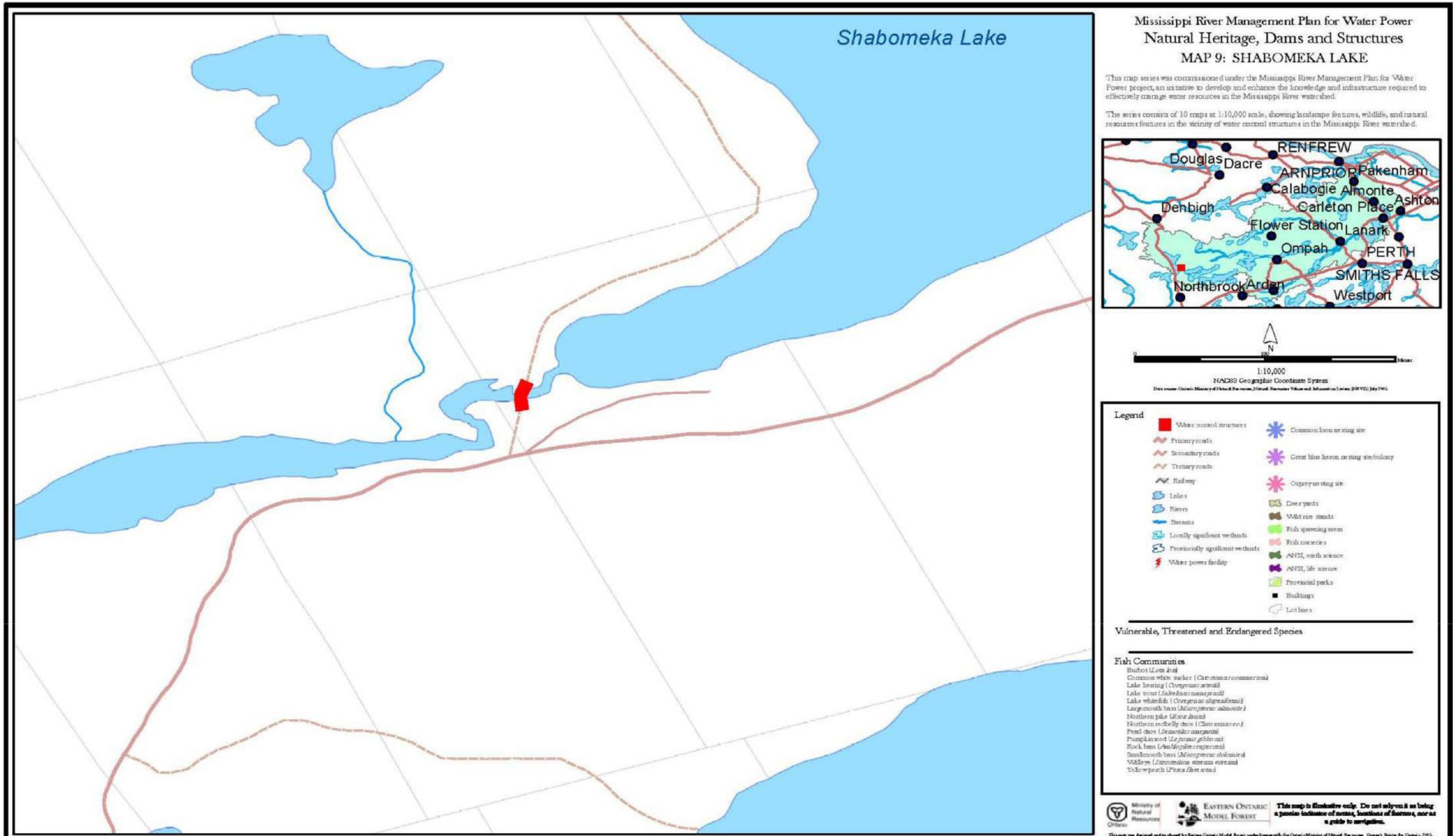
**Table 1: Physical and Chemical Characteristics**

| | |
|---|---|
| Geographic Township | Barrie |
| Location | 4454 7709 |
| Elevation (mean metres ASL) | 268 |
| Surface Area (ha) | 270 |
| Maximum Depth (m) | 32 |
| Mean Depth (m) | 12 |
| Volume (m3) | 3.3 x 107 |
| Perimeter (km) | 13.7 |
| Shoreline Development Factor | 2.352 |
| Precipitation (mm/yr) | |
| Lake Evaporation (mm/yr) | |
| Flushing Rate (times per year) | 0.43 |
| PH | 7.5 |
| Total dissolved solids (mg/L) | 57 |
| Secchi depth (m) | 6 |
| Total phosphorus (kg/yr) | 9.0 |
| Thermocline depth (m) | 4.5 – 9.0 |

**Documented Fish Species**
Burbot (Lota lota)
Common white sucker (Catostomus commersoni)
Lake herring (Coregonus artedii)
Lake trout (Salvelinus namaycush)
Lake whitefish (Coregonus clupeaformis)
Largemouth bass (Micropterus salmoides)
Northern redbelly dace (Chrosomus eos)
Pearl dace (Semotilus margarita)
Pumpkinseed (Lepomis gibbosus)
Rock bass (Ambloplites ruperstris)
Smallmouth bass (Micropterus dolomieu)
Yellow perch (Perca flavescens)

**Species at risk**
None known

**Natural heritage features**
Bon Echo Provincial Park
Bon Echo Park proposed addition


Shabomeka Lake
Mississippi River Management Plan for Water Power
Natural Heritage, Dams and Structures
MAP 9: SHABOMEKA LAKE
This map series was commissioned under the Mississippi River Management Plan for Water Power project, an initiative to develop and enhance the knowledge and infrastructure required to effectively manage water resources in the Mississippi River watershed.
The series consists of 10 maps at 1:10,000 scale, showing landscape features, wildlife, and natural resources features in the vicinity of water control structures in the Mississippi River watershed.
RENFREW
Douglas
Dacre
ARNPRIOR
Pakenham
Calabogie
Almonte
Ashton
Denbigh
Carleton Place
Flower Station
Lanark
Ompah
PERTH
SMITHS FALLS
Northbrook
Arden
Westport
N
0
Metres
1:10,000
NAD83 Geographic Coordinate System
Legend
Water control structures
Primary roads
Secondary roads
Tertiary roads
Railway
Lakes
Rivers
Streams
Locally significant wetlands
Provincially significant wetlands
Water power facility
Common loon nesting site
Great blue heron nesting site/colony
Osprey nesting site
Deer yards
Wild rice stands
Fish spawning areas
Fish nurseries
ANSI, earth science
ANSI, life science
Provincial parks
Buildings
Lot lines
Vulnerable, Threatened and Endangered Species
Fish Communities
Burbot
Common white sucker
Lake herring
Lake trout
Lake whitefish
Largemouth bass
Northern pike
Northern redbelly dace
Pearl dace
Pumpkinseed
Rock bass
Smallmouth bass
Walleye
Yellow perch
Ministry of Natural Resources
Ontario
Eastern Ontario Model Forest

## Shabomeka Lake to Mazinaw Lake (Semicircle Lake)

**Table 1: Physical Characteristics**

| | |
|---|---|
| Geographic Township | Barrie |
| Section Length (km) | 1.5 km |

**Documented Fish Species**

Common white sucker (Catostomus commersoni)
Lake trout (Salvelinus namaycush) (unverified)
Largemouth bass (Micropterus salmoides)
Northern pike (Esox lucius)
Pumpkinseed (Lepomis gibbosus)
Smallmouth bass (Micropterus dolomieu)
Yellow perch (Perca flavescens)

**Species at Risk**

None known

**Natural heritage features**

Bon Echo Provincial Park proposed addition

## Mazinaw Lake

**Table 1: Physical and Chemical Characteristics**

| | |
|---|---|
| Geographic Township | Abinger & Barrie |
| Location | 4455 7712 |
| Elevation (mean metres ASL) | |
| Surface Area (ha) | 1590 |
| Maximum Depth (m) | 145 |
| Mean Depth (m) | 42 |
| Volume (m3) | 685 x 106 |
| Perimeter (km) | 51.4 |
| Shoreline Development Factor | 3.636 |
| Precipitation (mm/yr) | |
| Lake Evaporation (mm/yr) | |
| Flushing Rate (times per year) | 0.17 |
| PH | 7.2 |
| Total dissolved solids (mg/L) | 56.6 |
| Secchi depth (m) | 5.2 |
| Total phosphorus (kg/yr) | 9.0 |
| Thermocline depth (m) | 4.5 – 9.0 |

**Documented Fish Species**

Bluegill (Lepomis macrochirus)
Brown bullhead (Ictalurus nebulosis)
Burbot (Lota lota)
Common white sucker (Catostomus commersoni)
Lake chub (Couesius plumbeus)
Lake herring (Coregonus artedii)
Lake trout (Salvelinus namaycush)
Lake whitefish (Coregonus clupeaformis)
Largemouth bass (Micropterus salmoides)
Northern pike (Esox lucius)

Pumpkinseed (Lepomis gibbosus)
Rock bass (Ambloplites ruperstris)
Smallmouth bass (Micropterus dolomieu)
Walleye (Sander vitreus)
Yellow perch (Perca flavescens)

**Species at risk**
None known

**Natural heritage features**
Bon Echo Provincial Park
Bon Echo Park proposed addition
Mazinaw Lake Enhanced Management Area

**Mazinaw Lake to Kashwakamak Lake (Marble Lake)**

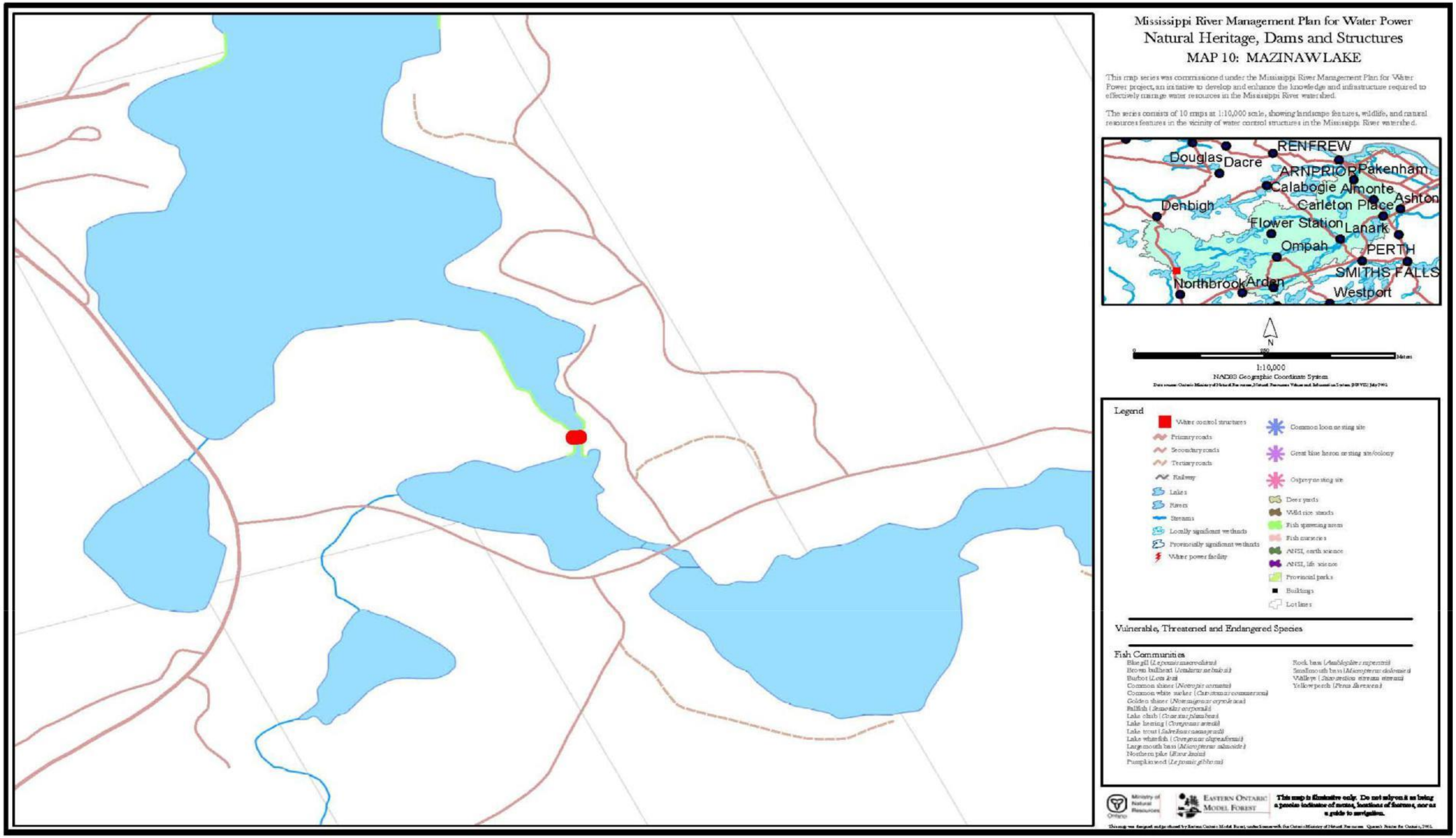
**Table 1: Physical Characteristics**

| | |
|---|---|
| Geographic Township | Barrie |
| Section Length (km) | 7.5 km |

**Documented Fish Species**
Brown bullhead (Ictalurus nebulosis)
Common shiner (Notropis cornutus)
Common white sucker (Catostomus commersoni)
Golden shiner (Notemigonus crysoleucas)
Fallfish (Semotilus corporalis)
Lake herring (Coregonus artedii)
Lake whitefish (Coregonus clupeaformis
Largemouth bass (Micropterus salmoides)
Northern pike (Esox lucius)
Pumpkinseed (Lepomis gibbosus)
Rock bass (Ambloplites ruperstris)
Smallmouth bass (Micropterus dolomieu)
Walleye (Sander vitreus)
Yellow perch (Perca flavescens)

**Species at Risk**
None known

**Natural heritage features**
None known



Mississippi River Management Plan for Water Power
Natural Heritage, Dams and Structures
MAP 10: MAZINAW LAKE
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The series consists of 10 maps at 1:10,000 scale, showing landscape features, wildlife, and natural resources features in the vicinity of water control structures in the Mississippi River watershed.
RENFREW
Douglas
Dacre
ARNPRIOR
Pakenham
Calabogie
Almonte
Ashton
Denbigh
Carleton Place
Flower Station
Lanark
Ompah
PERTH
SMITHS FALLS
Northbrook
Arden
Westport
N
0
950
Metres
1:10,000
NAD83 Geographic Coordinate System
Legend
Water control structures
Primary roads
Secondary roads
Tertiary roads
Railway
Lakes
Rivers
Streams
Locally significant wetlands
Provincially significant wetlands
Water power facility
Common loon nesting site
Great blue heron nesting site/colony
Osprey nesting site
Deer yards
Wild rice stands
Fish spawning areas
Fish nurseries
ANSI, earth science
ANSI, life science
Provincial parks
Buildings
Lot lines
Vulnerable, Threatened and Endangered Species
Fish Communities
Bluegill (Lepomis macrochirus)
Brown bullhead (Ameiurus nebulosus)
Burbot (Lota lota)
Common shiner (Notropis cornutus)
Common white sucker (Catostomus commersoni)
Golden shiner (Notemigonus crysoleucas)
Fallfish (Semotilus corporalis)
Lake chub (Couesius plumbeus)
Lake herring (Coregonus artedii)
Lake trout (Salvelinus namaycush)
Lake whitefish (Coregonus clupeaformis)
Largemouth bass (Micropterus salmoides)
Northern pike (Esox lucius)
Pumpkinseed (Lepomis gibbosus)
Rock bass (Ambloplites rupestris)
Smallmouth bass (Micropterus dolomieu)
Walleye (Stizostedion vitreum vitreum)
Yellow perch (Perca flavescens)
Ministry of Natural Resources
Ontario
EASTERN ONTARIO MODEL FOREST
This map is illustrative only. Do not rely on it as being a precise indicator of routes, locations of features, nor as a guide to navigation.

**Kashwakamak Lake**

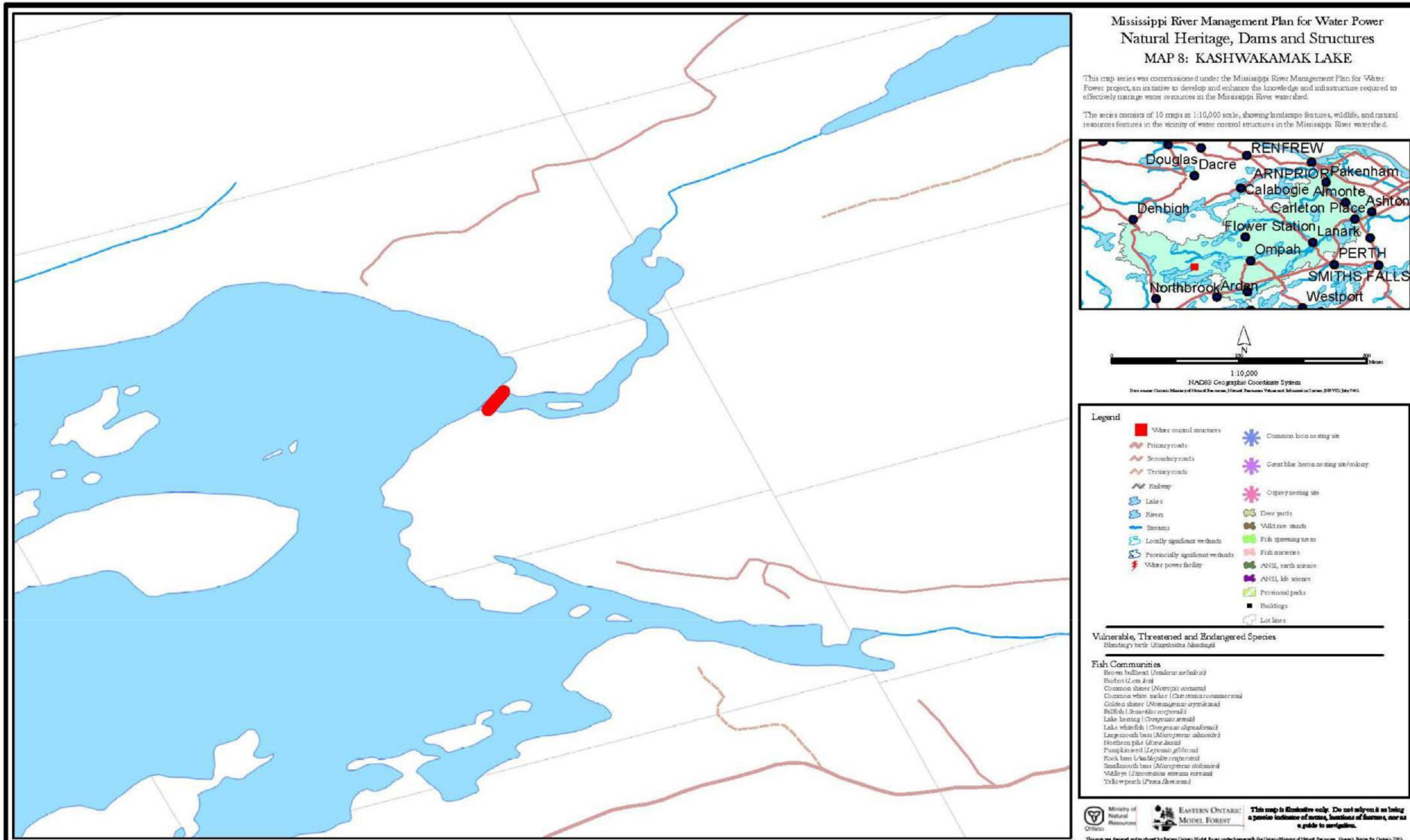
**Table 1: Physical and Chemical Characteristics**

| | |
|---|---|
| Geographic Township | Barrie & Clarendon |
| Location | 4451 7705 |
| Elevation (mean metres ASL) | 268 |
| Surface Area (ha) | 1191 |
| Maximum Depth (m) | 22 |
| Mean Depth (m) | 8 |
| Volume (m3) | 9.7 x 107 |
| Perimeter (km) | 66 |
| Shoreline Development Factor | 5.397 |
| Precipitation (mm/yr) | |
| Lake Evaporation (mm/yr) | |
| Flushing Rate (times per year) | 1.49 |
| PH | 7.0 |
| Total dissolved solids (mg/L) | 68.3 |
| Secchi depth (m) | 5.4 |
| Total phosphorus (kg/yr) | 8 |
| Thermocline depth (m) | |

**Documented Fish Species**
Brown bullhead (Ictalurus nebulosis)
Burbot (Lota lota)
Common white sucker (Catostomus commersoni)
Golden shiner (Notemigonus crysoleucas)
Fallfish (Semotilus corporalis)
Lake herring (Coregonus artedii)
Lake whitefish (Coregonus clupeaformis
Largemouth bass (Micropterus salmoides)
Northern pike (Esox lucius)
Pumpkinseed (Lepomis gibbosus)
Rock bass (Ambloplites ruperstris)
Smallmouth bass (Micropterus dolomieu)
Walleye (Sander vitreus)
Yellow perch (Perca flavescens)

**Species at risk**
Blanding's turtle (Emydoidea blandingii)

**Natural heritage features**
No data



Mississippi River Management Plan for Water Power
Natural Heritage, Dams and Structures
MAP 8: KASHWAKAMAK LAKE
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Calabogie
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Ashton
Denbigh
Carleton Place
Flower Station
Lanark
Ompah
PERTH
SMITHS FALLS
Northbrook
Arden
Westport
N
0
250
500
Metres
1:10,000
NAD83 Geographic Coordinate System
Legend
Water control structures
Primary roads
Secondary roads
Tertiary roads
Railway
Lakes
Rivers
Streams
Locally significant wetlands
Provincially significant wetlands
Water power facility
Common loon nesting site
Great blue heron nesting site/colony
Osprey nesting site
Deer yards
Wild rice stands
Fish spawning areas
Fish nurseries
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ANSI, life science
Provincial parks
Buildings
Lot lines
Vulnerable, Threatened and Endangered Species
Blanding's turtle
Fish Communities
Brown bullhead
Burbot
Common shiner
Common white sucker
Golden shiner
Fallfish
Lake herring
Lake whitefish
Largemouth bass
Northern pike
Pumpkinseed
Rock bass
Smallmouth bass
Walleye
Yellowperch
Ministry of Natural Resources
Ontario
Eastern Ontario Model Forest
This map is illustrative only. Do not rely on it as being a precise indicator of routes, locations of features, nor as a guide to navigation.

**Kashwakamak Lake to Crotch Lake (including Mud Lake)**

**Table 1: Physical Characteristics**

| | |
|---|---|
| Geographic Township | Clarendon & Palmerston |
| Section Length (km) | 16.8 km |

**Documented Fish Species**

Largemouth bass (Micropterus salmoides)
Northern pike (Esox lucius)
Smallmouth bass (Micropterus dolomieu)
Walleye (Sander vitreus)

**Species at Risk**

None known

**Natural heritage features**

Mud Lake Provincially Significant Wetland
Wild Rice stands at Mud Lake

**Mississagagon Lake**

**Table 1: Physical and Chemical Characteristics**

| | |
|---|---|
| Geographic Township | Barrie |
| Location | |
| Elevation (mean metres ASL) | 268 |
| Surface Area (ha) | 524 |
| Maximum Depth (m) | 24 |
| Mean Depth (m) | 9 |
| Volume (m3) | 4.8 x 107 |
| Perimeter (km) | 35.4 |
| Shoreline Development Factor | 4.362 |
| Precipitation (mm/yr) | |
| Lake Evaporation (mm/yr) | |
| Flushing Rate (times per year) | 0.13 |
| pH | 7.5 |
| Total dissolved solids (mg/L) | 108.8 |
| Secchi depth (m) | |
| Total phosphorus (kg/yr) | |
| Thermocline depth (m) | |

**Documented Fish Species**

Brown bullhead (Ictalurus nebulosis)
Common white sucker (Catostomus commersoni)
Lake herring (Coregonus artedii)
Largemouth bass (Micropterus salmoides)
Northern pike (Esox lucius)
Pumpkinseed (Lepomis gibbosus)
Rock bass (Ambloplites ruperstris)
Smallmouth bass (Micropterus dolomieu)
Walleye (Sander vitreus)
Yellow perch (Perca flavescens)

**Species at risk**

None known

### Natural heritage features
None known

### Mississagagon Lake to Mud Lake (Swamp Creek)

**Table 1: Physical Characteristics**

| | |
|---|---|
| Geographic Township | Clarendon |
| Section Length (km) | 15.0 km |

### Documented Fish Species
Largemouth bass (Micropterus salmoides)
Northern pike (Esox lucius)
Smallmouth bass (Micropterus dolomieu)
Walleye (Sander vitreus)

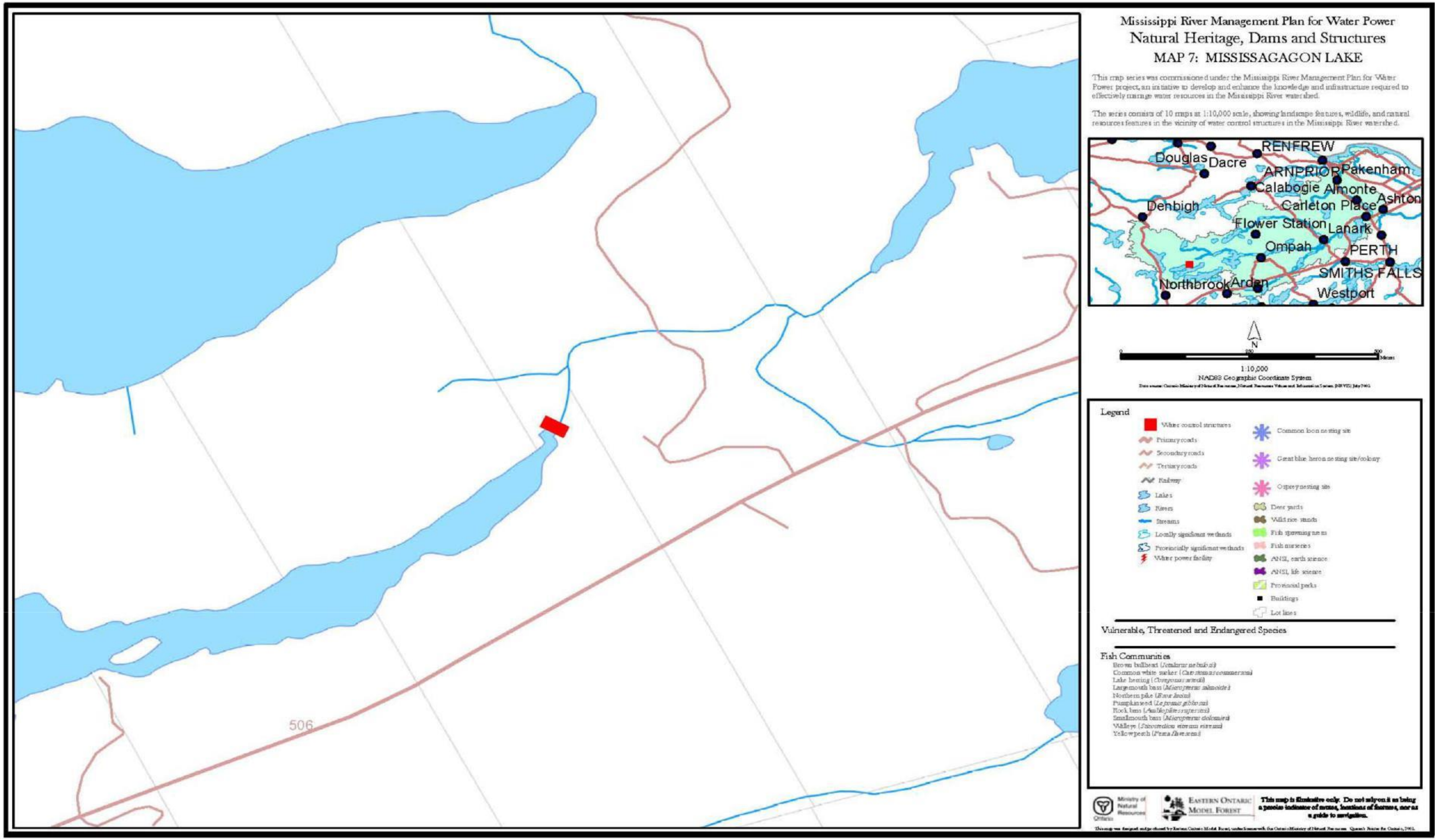
### Species at Risk
None known

### Natural heritage features
None known

### Big Gull Lake

**Table 1: Physical and Chemical Characteristics**

| | |
|---|---|
| Geographic Township | Barrie & Clarendon |
| Location | 4450 7658 |
| Elevation (mean metres ASL) | 253 |
| Surface Area (ha) | 2360 |
| Maximum Depth (m) | 26 |
| Mean Depth (m) | 4 |
| Volume (m3) | 9.2 x 107 |
| Perimeter (km) | 89 |
| Shoreline Development Factor | 5.168 |
| Precipitation (mm/yr) | |
| Lake Evaporation (mm/yr) | |
| Flushing Rate (times per year) | |
| PH | 7.7 |
| Total dissolved solids (mg/L) | 53.3 |
| Secchi depth (m) | |
| Total phosphorus (kg/yr) | |
| Thermocline depth (m) | |


Mississippi River Management Plan for Water Power
Natural Heritage, Dams and Structures
MAP 7: MISSISSAGAGON LAKE
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Douglas
Dacre
ARNPRIOR
Pakenham
Calabogie
Almonte
Ashton
Denbigh
Carleton Place
Flower Station
Lanark
Ompah
PERTH
SMITHS FALLS
Northbrook
Arden
Westport
N
0
250
500
Metres
1:10,000
NAD83 Geographic Coordinate System
506
Legend
Water control structures
Primary roads
Secondary roads
Tertiary roads
Railway
Lakes
Rivers
Streams
Locally significant wetlands
Provincially significant wetlands
Water power facility
Common loon nesting site
Great blue heron nesting site/colony
Osprey nesting site
Deer yards
Wild rice stands
Fish spawning areas
Fish nurseries
ANSI, earth science
ANSI, life science
Provincial parks
Buildings
Lot lines
Vulnerable, Threatened and Endangered Species
Fish Communities
Brown bullhead
Common white sucker
Lake herring
Largemouth bass
Northern pike
Pumpkinseed
Rock bass
Smallmouth bass
Walleye
Yellow perch
Ministry of Natural Resources
Ontario
EASTERN ONTARIO MODEL FOREST
This map is illustrative only. Do not rely on it as being a precise indicator of routes, locations of features, nor as a guide to navigation.

**Documented Fish Species**
Bluegill (Lepomis macrochirus)
Brown bullhead (Ictalurus nebulosis)
Burbot (Lota lota)
Common white sucker (Catostomus commersoni)
Golden shiner (Notemigonus crysoleucas)
Lake herring (Coregonus artedii)
Lake whitefish (Coregonus clupeaformis
Largemouth bass (Micropterus salmoides)
Northern pike (Esox lucius)
Pumpkinseed (Lepomis gibbosus)
Rock bass (Ambloplites ruperstris)
Smallmouth bass (Micropterus dolomieu)
Walleye (Sander vitreus)
Yellow perch (Perca flavescens)

**Species at risk**
None known

**Natural heritage features**
Hungry Lake Conservation Reserve

**Big Gull Lake to Crotch Lake (Gull Creek)**

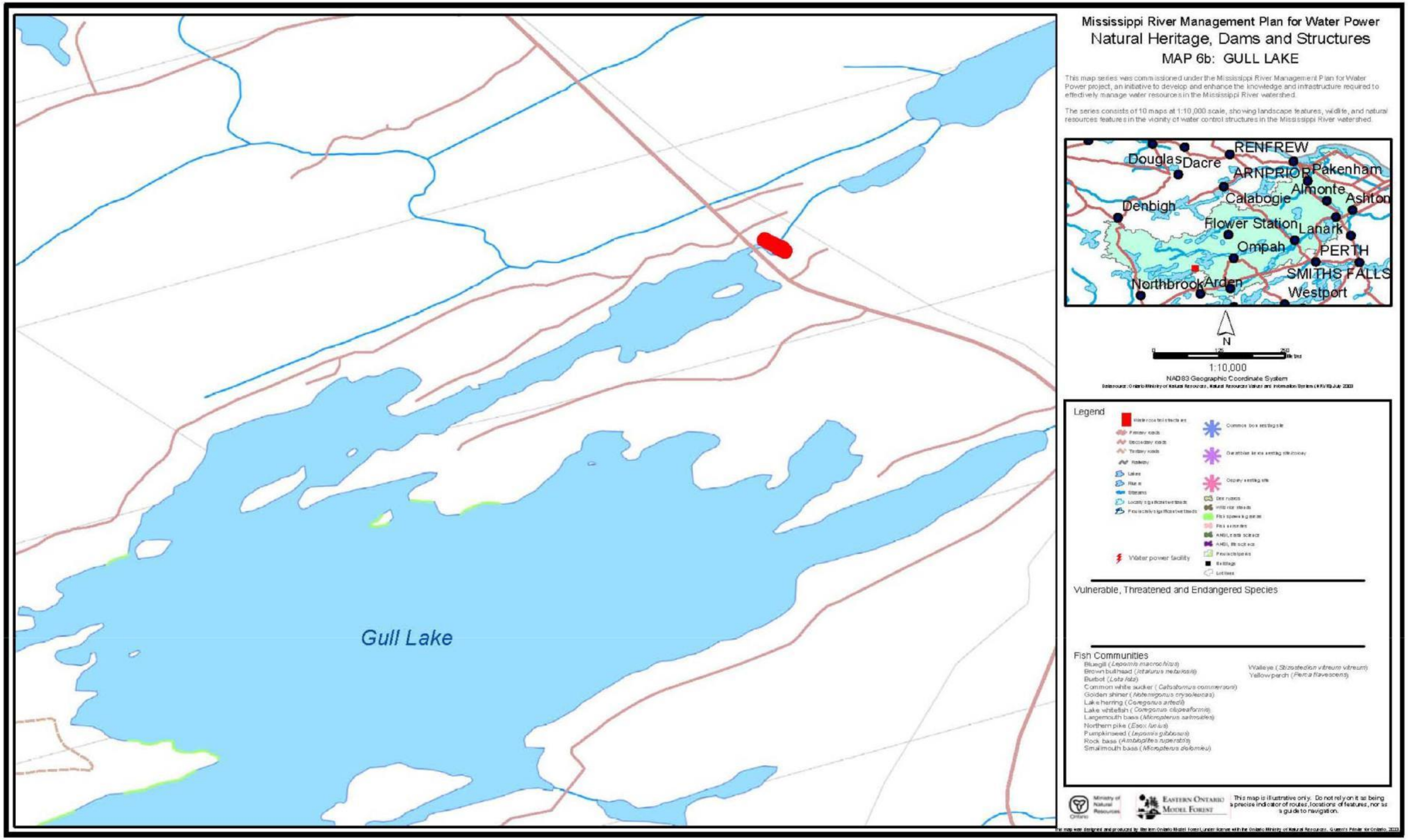
**Table 1: Physical Characteristics**

| | |
|---|---|
| Geographic Township | Clarendon |
| Section Length (km) | 3.5 km |

**Documented Fish Species**
Walleye (Sander vitreus)

**Species at Risk**
None known

**Natural heritage features**
None known


Mississippi River Management Plan for Water Power
Natural Heritage, Dams and Structures
MAP 6b: GULL LAKE
This map series was commissioned under the Mississippi River Management Plan for Water Power project, an initiative to develop and enhance the knowledge and infrastructure required to effectively manage water resources in the Mississippi River watershed.
The series consists of 10 maps at 1:10,000 scale, showing landscape features, wildlife, and natural resources features in the vicinity of water control structures in the Mississippi River watershed.
RENFREW
Douglas
Dacre
ARNPRIOR
Pakenham
Almonte
Calabogie
Ashton
Denbigh
Flower Station
Lanark
Ompah
PERTH
SMITHS FALLS
Northbrook
Arden
Westport
N
1:10,000
NAD83 Geographic Coordinate System
Legend
Water power facility
Vulnerable, Threatened and Endangered Species
Fish Communities
Bluegill (*Lepomis macrochirus*)
Brown bullhead (*Ictalurus nebulosis*)
Burbot (*Lota lota*)
Common white sucker (*Catostomus commersoni*)
Golden shiner (*Notemigonus crysoleucas*)
Lake herring (*Coregonus artedii*)
Lake whitefish (*Coregonus clupeaformis*)
Largemouth bass (*Micropterus salmoides*)
Northern pike (*Esox lucius*)
Pumpkinseed (*Lepomis gibbosus*)
Rock bass (*Ambloplites rupestris*)
Smallmouth bass (*Micropterus dolomieu*)
Walleye (*Stizostedion vitreum vitreum*)
Yellow perch (*Perca flavescens*)
Ministry of Natural Resources
Ontario
EASTERN ONTARIO MODEL FOREST
This map is illustrative only. Do not rely on it as being a precise indicator of routes, locations of features, nor as a guide to navigation.
Gull Lake

## Crotch Lake

**Table 1: Physical and Chemical Characteristics**

| | |
|---|---|
| Geographic Township | Palmerston |
| Location | 4455 7648 |
| Elevation (mean metres ASL) | 240 * |
| Surface Area (ha) | 2160 * |
| Maximum Depth (m) | 31 * |
| Mean Depth (m) | 11 * |
| Volume (m3) | 1.2 x 108 * |
| Perimeter (km) | 87.5 * |
| Shoreline Development Factor | 6.953 * |
| Precipitation (mm/yr) | |
| Lake Evaporation (mm/yr) | |
| Flushing Rate (times per year) | 7.4 |
| PH | 7.5 |
| Total dissolved solids (mg/L) | 83.2 |
| Secchi depth (m) | 4.9 |
| Total phosphorus (kg/yr) | 12 |
| Thermocline depth (m) | |

* These factors are highly variable due to the water management regime on Crotch Lake.

### Documented Fish Species

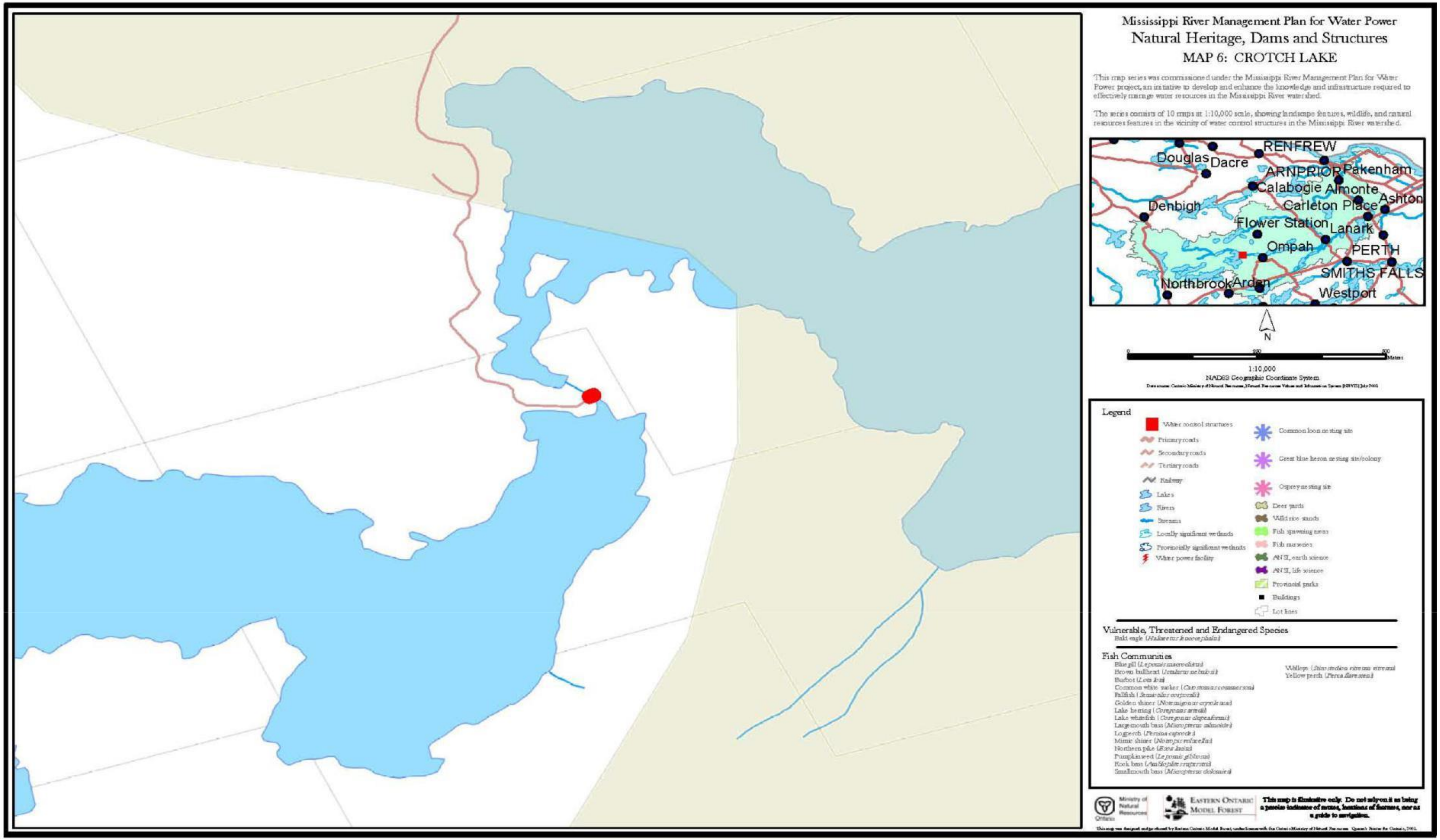
Bluegill (Lepomis macrochirus)
Brown bullhead (Ictalurus nebulosis)
Burbot (Lota lota)
Common white sucker (Catostomus commersoni)
Fallfish (Semotilus corporalis)
Golden shiner (Notemigonus crysoleucas)
Lake herring (Coregonus artedii)
Lake whitefish (Coregonus clupeaformis
Largemouth bass (Micropterus salmoides)
Logperch (Percina caprodes)
Mimic shiner (Notropis volucellus)
Northern pike (Esox lucius)
Pumpkinseed (Lepomis gibbosus)
Rock bass (Ambloplites ruperstris)
Smallmouth bass (Micropterus dolomieu)
Walleye (Sander vitreus)
Yellow perch (Perca flavescens)

### Species at risk

Bald Eagle (Haliaeetus leucocephalus)

### Natural heritage features

Crotch Lake Conservation Reserve
Crotch Lake Enhanced Management Area



Mississippi River Management Plan for Water Power
Natural Heritage, Dams and Structures
MAP 6: CROTCH LAKE
This map series was commissioned under the Mississippi River Management Plan for Water Power project, an initiative to develop and enhance the knowledge and infrastructure required to effectively manage water resources in the Mississippi River watershed.
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Douglas
Dacre
ARNPRIOR
Pakenham
Calabogie
Almonte
Ashton
Denbigh
Carleton Place
Flower Station
Lanark
Ompah
PERTH
SMITHS FALLS
Northbrook
Arden
Westport
N
0
250
500
Meters
1:10,000
NAD83 Geographic Coordinate System
Legend
Water control structures
Primary roads
Secondary roads
Tertiary roads
Railway
Lakes
Rivers
Streams
Locally significant wetlands
Provincially significant wetlands
Water power facility
Common loon nesting site
Great blue heron nesting site/colony
Osprey nesting site
Deer yards
Wild rice stands
Fish spawning areas
Fish nurseries
ANSI, earth science
ANSI, life science
Provincial parks
Buildings
Lot lines
Vulnerable, Threatened and Endangered Species
Bald eagle (Haliaeetus leucocephalus)
Fish Communities
Bluegill (Lepomis macrochirus)
Brown bullhead (Ameiurus nebulosus)
Burbot (Lota lota)
Common white sucker (Catostomus commersoni)
Fallfish (Semotilus corporalis)
Golden shiner (Notemigonus crysoleucas)
Lake herring (Coregonus artedi)
Lake whitefish (Coregonus clupeaformis)
Largemouth bass (Micropterus salmoides)
Logperch (Percina caprodes)
Mimic shiner (Notropis volucellus)
Northern pike (Esox lucius)
Pumpkinseed (Lepomis gibbosus)
Rock bass (Ambloplites rupestris)
Smallmouth bass (Micropterus dolomieu)
Walleye (Stizostedion vitreum vitreum)
Yellow perch (Perca flavescens)
Ministry of Natural Resources
Ontario
EASTERN ONTARIO MODEL FOREST
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**Crotch Lake to Stump Lake**
**(including Kings Lake, Otter Lake, and Millers Lake)**

**Table 1: Physical Characteristics**

| | |
|---|---|
| Geographic Township | Palmerston |
| Section Length (km) | 10.5 km |

**Documented Fish Species**
Largemouth bass (Micropterus salmoides)
Northern pike (Esox lucius)
Smallmouth bass (Micropterus dolomieu)
Walleye (Sander vitreus)

**Species at Risk**
None known

**Natural heritage features**
None known

**Stump Lake**

Stump Lake is a very shallow stretch of water that was originally created to facilitate floating timber downstream.

**Table 1: Physical and Chemical Characteristics**

| | |
|---|---|
| Geographic Township | North Sherbrooke Township |
| Location | |
| Elevation (m ASL) | |
| Surface Area (ha) | 127.17 |
| Maximum Depth (m) | |
| Mean Depth (m) | |
| Volume (m3) | |
| Perimeter (km) | |
| Shoreline Development Factor | |
| Precipitation (mm/yr) | |
| Lake Evaporation (mm/yr) | |
| Flushing rate (times per year) | |
| pH | 7.5 |
| Total dissolved solids (mg L-1) | 65 |
| Secchi disc (m) | |
| Total phosphorus (kg/yr) | |
| Thermocline depth (m) | |

**Documented Fish Species**
Bluegill (Lepomis macrochirus)
Northern pike (Esox lucius)
Pumpkinseed (Lepomis gibbosus)
Rock bass (Ambloplites ruperstris)
Smallmouth bass (Micropterus dolomieu)
Walleye (Sander vitreus)
Yellow perch (Perca flavescens)

**Species at risk**
None known

**Natural heritage features**
Stump Lake Provincially Significant Wetland

### Gedde's Rapids

This stretch of the Mississippi River lies immediately downstream of the High Falls Generating Station. These rapids provide an important spawning area for walleye.

**Table 1: Physical Characteristics**

| | |
|---|---|
| Geographic Township | Dalhousie Township |
| Section length (km) | 1.0 |

**Documented Fish Species**
Community not sampled – likely includes the following species:
Brown bullhead (Ictalurus nebulosis)
Northern pike (Esox lucius)
Pumpkinseed (Lepomis gibbosus)
Smallmouth bass (Micropterus dolomieu)
Walleye (Sander vitreus)
White sucker (Catostomus commersoni)

**Species at risk**
None known

**Natural heritage features**
None known

## Dalhousie Lake

**Table 1: Physical and Chemical Characteristics**

| | |
|---|---|
| Geographic Township | Dalhousie Township |
| Location | 44º 58’ 76º 54’ |
| Elevation (m ASL) | 156.4 |
| Surface Area (ha) | 603.5 |
| Maximum Depth (m) | 16.8 |
| Mean Depth (m) | 5.2 |
| Volume (m3) | 3.15 x 7 |
| Perimeter (km) | 13.5 |
| Shoreline Development Factor | 1.55 |
| Precipitation (mm/yr) | 800 |
| Lake Evaporation (mm/yr) | 500 |
| Flushing rate (times per year) | 10.5 |
| pH | 6.7-8.5 |
| Total dissolved solids (mg L-1) | 76-98 |
| Secchi disc (m) | 2.8-5.8 |
| Total phosphorus (kg/yr) | 4,776 |
| Thermocline depth (m) | 6-7 |

### Documented Fish Species

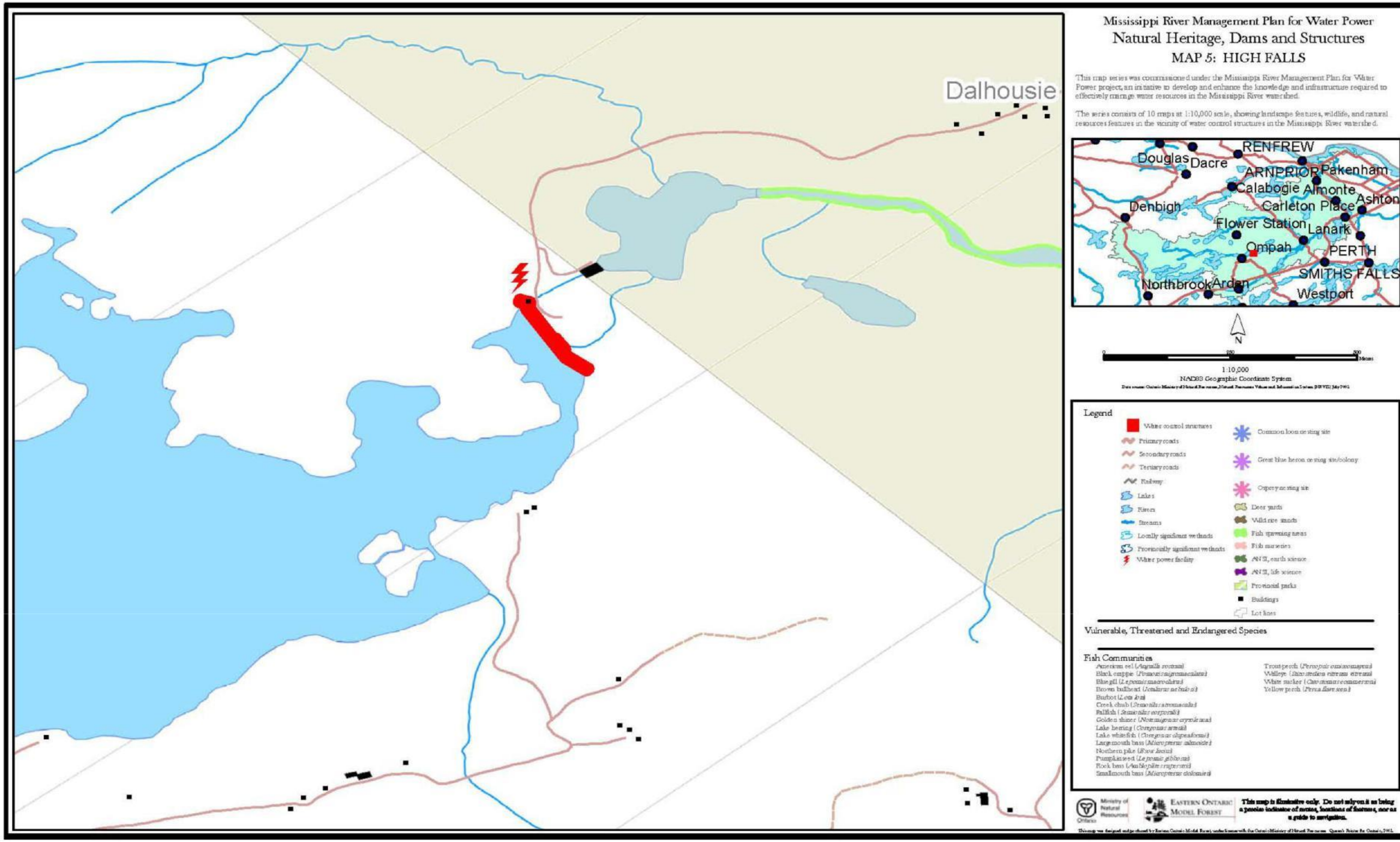
American eel (Anguilla rostrata)
Black crappie (Pomoxis nigromaculatus)
Bluegill (Lepomis macrochirus)
Brown bullhead (Ictalurus nebulosis)
Burbot (Lota lota)
Creek chub (Semotilus atromaculus)
Fallfish (Semotilus corporalis)
Golden shiner (Notemigonus crysoleucas)
Lake herring (Coregonus artedii)
Lake whitefish (Coregonus clupeaformis)
Largemouth bass (Micropterus salmoides)
Northern pike (Esox lucius)
Pumpkinseed (Lepomis gibbosus)
Rock bass (Ambloplites ruperstris)
Shorthead redhorse (Moxostoma macrolepidotum)
Smallmouth bass (Micropterus dolomieu)
Trout-perch (Percopsis omiscomaycus)
Walleye (Sander vitreus)
White sucker (Catostomus commersoni)
Yellow perch (Perca flavescens)

### Species at risk

None known

### Natural heritage features

Wild rice stands


Mississippi River Management Plan for Water Power
Natural Heritage, Dams and Structures
MAP 5: HIGH FALLS
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Dalhousie
RENFREW
Douglas
Dacre
ARNPRIOR
Pakenham
Calabogie
Almonte
Ashton
Denbigh
Carleton Place
Flower Station
Lanark
Ompah
PERTH
SMITHS FALLS
Northbrook
Arden
Westport
N
0
250
500
Metres
1:10,000
NAD83 Geographic Coordinate System
Legend
Water control structures
Primary roads
Secondary roads
Tertiary roads
Railway
Lakes
Rivers
Streams
Locally significant wetlands
Provincially significant wetlands
Water power facility
Common loon nesting site
Great blue heron nesting site/colony
Osprey nesting site
Deer yards
Wild rice stands
Fish spawning areas
Fish nurseries
ANSI, earth science
ANSI, life science
Provincial parks
Buildings
Lot lines
Vulnerable, Threatened and Endangered Species
Fish Communities
American eel
Black crappie
Bluegill
Brown bullhead
Burbot
Creek chub
Fallfish
Golden shiner
Lake herring
Lake whitefish
Largemouth bass
Northern pike
Pumpkinseed
Rock bass
Smallmouth bass
Trout-perch
Walleye
White sucker
Yellow perch
Ministry of Natural Resources
Ontario
Eastern Ontario Model Forest
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### Dalhousie Lake to Sheridan's Rapids

**Table 1: Physical Characteristics**

| | |
|---|---|
| Geographic Township | Dalhousie Township |
| Section length (km) | 8.0 |

**Documented Fish Species**
American eel (Anguilla rostrata)
Brown bullhead (Ictalurus nebulosis)
Channel catfish (Ictalurus punctatus)
Largemouth bass (Micropterus salmoides)
Northern pike (Esox lucius)
Pumpkinseed (Lepomis gibbosus)
Rock bass (Ambloplites ruperstris)
Smallmouth bass (Micropterus dolomieu)
Walleye (Sander vitreus)
White sucker (Catostomus commersoni)
Yellow bullhead (Ameriurus natalis)
Yellow perch (Perca flavescens)

**Species at risk**
None known

**Natural heritage features**
McCullouch's Mud Lake Provincially Significant Wetland

### Sheridan's Rapids to Four Stepstone Rapids

This section of the river is extremely shallow and is only accessible by canoe or kayak. Walleye spawn below the rapids while smallmouth bass spawn in gravel along the riverbank.

**Table 1: Physical Characteristics**

| | |
|---|---|
| Geographic Township | Dalhousie Township |
| Section length (km) | 1.5 |

**Documented Fish Species**
Community not sampled – likely consist of at least the following species:
Brown bullhead (Ictalurus nebulosis)
Northern pike (Esox lucius)
Pumpkinseed (Lepomis gibbosus)
Smallmouth bass (Micropterus dolomieu)
Walleye (Sander vitreus)
White sucker (Catostomus commersoni)

**Species at risk**
None known

**Natural heritage features**
None known

### Four Stepstone Rapids to Playfairville Rapids

This stretch of river is very similar to the river immediately upstream.

**Table 1: Physical Characteristics**

| | |
|---|---|
| Geographic Township | Dalhousie Township |
| Section length (km) | 3.0 |

**Documented Fish Species**

Community not sampled – likely includes the following species:
Brown bullhead (Ictalurus nebulosis)
Northern pike (Esox lucius)
Pumpkinseed (Lepomis gibbosus)
Smallmouth bass (Micropterus dolomieu)
Walleye (Sander vitreus)
White sucker (Catostomus commersoni)

**Species at risk**

None known

**Natural heritage features**

None known

**Playfairville Rapids to Fergusons Falls**

The upstream portion of the stretch is again very shallow and accessible only by canoe or kayak. As the river descends from the Canadian Shield, it deepens and widens. This section of the river provides excellent bullfrog habitat. Walleye spawn below the rapids and wild rice stands cover large areas.

**Table 1: Physical Characteristics**

| | |
|---|---|
| Geographic Township | Bathurst/Drummond Township |
| Section length (km) | 11.0 |

**Documented Fish Species**

American eel (Anguilla rostrata)
Brown bullhead (Ictalurus nebulosis)
Channel catfish (Ictalurus punctatus)
Largemouth bass (Micropterus salmoides)
Margined madtom (Noturus insignis)
Northern pike (Esox lucius)
Pumpkinseed (Lepomis gibbosus)
Rock bass (Ambloplites ruperstris)
Smallmouth bass (Micropterus dolomieu)
Walleye (Sander vitreus)
White sucker (Catostomus commersoni)
Yellow bullhead (Ameriurus natalis)
Yellow perch (Perca flavescens)

**Species at risk**

Margined madtom (Noturus insignis) - fish
Rusty snaketail (Ophiogomphus rupinsulensis) - dragonfly

**Natural heritage features**

Playfairville Locally Significant Wetland
Upper and Lower Mud Lake Provincially Significant Wetland Complex

**Fergusons Falls to Innisville Rapids**

The river begins to become shallow again through this stretch. The rapids at Innisville are an important walleye spawning ground.

**Table 1: Physical Characteristics**

| | |
|---|---|
| Geographic Township | Drummond Township |
| Section length (km) | 3.0 |

**Documented Fish Species**
American eel (Anguilla rostrata)
Brown bullhead (Ictalurus nebulosis)
Channel catfish (Ictalurus punctatus)
Largemouth bass (Micropterus salmoides)
Northern pike (Esox lucius)
Pumpkinseed (Lepomis gibbosus)
Rock bass (Ambloplites ruperstris)
Smallmouth bass (Micropterus dolomieu)
Walleye (Sander vitreus)
White sucker (Catostomus commersoni)
Yellow bullhead (Ameriurus natalis)
Yellow perch (Perca flavescens)

**Species at risk**
Halloween Pennant (Celithemis eopnina) - dragonfly

**Natural heritage features**
Innisville Wetland Provincially Significant Area of Natural and Scientific Interest (ANSI)
Steward/Haley Lake Provincially Significant Wetland Complex

**Mississippi Lake**

**Table 1: Physical and Chemical Characteristics**

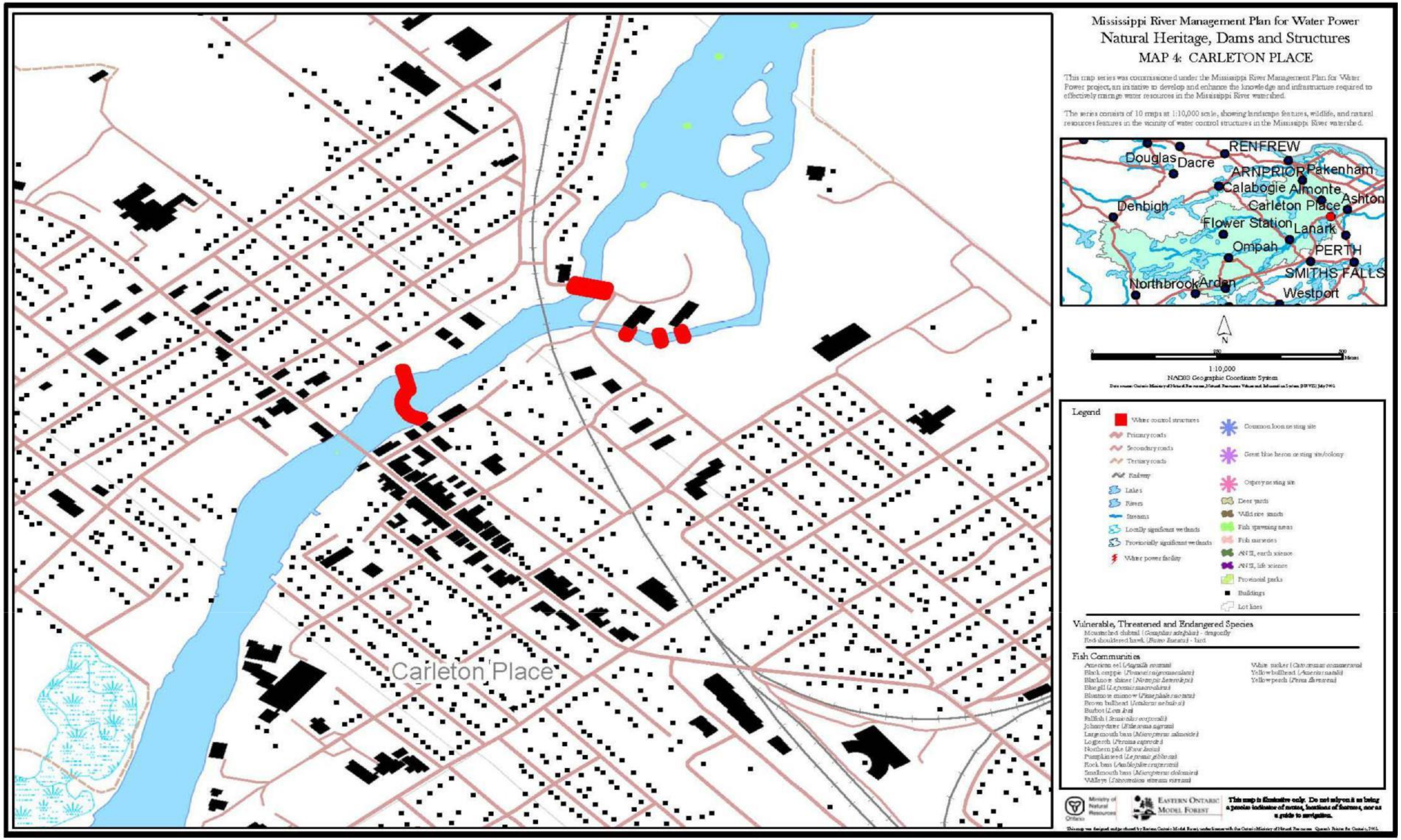
| | |
|---|---|
| Geographic Township | Drummond/Beckwith Township |
| Location | 45º 05’ 76º 10’ |
| Elevation (m ASL) | 134.4 |
| Surface Area (ha) | 2349.0 |
| Maximum Depth (m) | 9.2 |
| Mean Depth (m) | 52.7 |
| Volume (m3) | 6.36 x 107 |
| Perimeter (km) | 55.9 |
| Shoreline Development Factor | 3.25 |
| Precipitation (mm/yr) | |
| Lake Evaporation (mm/yr) | |
| Flushing rate (times per year) | |
| pH | 6.7-7.5 |
| Total dissolved solids (mg L-1) | 103-124 |
| Secchi disc (m) | 3-5 |
| Total phosphorus (mg L-1) | 0.014 |
| Thermocline depth (m) | |

**Documented Fish Species**
American eel (Anguilla rostrata)
Black crappie (Pomoxis nigromaculatus)

Blacknose shiner (Notropis heterolepis)
Bluegill (Lepomis macrochirus)
Bluntnose minnow (Pimephales notatus)
Brown bullhead (Ictalurus nebulosis)
Burbot (Lota lota)
Fallfish (Semotilus corporalis)
Johnny dater (Ethesoma nigrum)
Largemouth bass (Micropterus salmoides)
Logperch (Percina caprodes)
Northern pike (Esox lucius)
Pumpkinseed (Lepomis gibbosus)
Rock bass (Ambloplites ruperstris)
Smallmouth bass (Micropterus dolomieu)
Walleye (Sander vitreus)
White sucker (Catostomus commersoni)
Yellow bullhead (Amerius natalis)
Yellow perch (Perca flavescens)

**Species at risk**
Moustached clubtail (Gomphus adelphus) - dragonfly
Red-shouldered hawk (Buteo lineatus) - bird

**Natural heritage features**
Wild rice stands
McEwen Bay Provincially Significant Wetland
McEwen Bay Migratory Bird Sanctuary
Mississippi Lake Provincially Significant Wetland
O-Kee Lee Locally Significant Wetland


Mississippi River Management Plan for Water Power
Natural Heritage, Dams and Structures
MAP 4: CARLETON PLACE
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ANSI, life science
Provincial parks
Buildings
Lot lines
Vulnerable, Threatened and Endangered Species
Fish Communities
Carleton Place

### Carleton Place to Appleton

This section of river, beginning at the Carleton Place water control structure and ending at the Appleton Generating Station, is generally wider and deeper than the river upstream of Mississippi Lake. Walleye are thought to spawn below the Carleton Place structure while the riverbanks provide ample smallmouth bass spawning substrate.

**Table 1: Physical Characteristics**

| | |
|---|---|
| Geographic Township | Beckwith/Ramsay Township |
| Section length (km) | 5.0 |

**Documented Fish Species**

Community not sampled – likely includes the following species:
Brown bullhead (Ictalurus nebulosis)
Northern pike (Esox lucius)
Pumpkinseed (Lepomis gibbosus)
Smallmouth bass (Micropterus dolomieu)
Walleye (Sander vitreus)
White sucker (Catostomus commersoni)

**Species at risk**

None known

**Natural heritage features**

None known

### Appleton to Almonte

**Table 1: Physical Characteristics**

| | |
|---|---|
| Geographic Township | Ramsay Township |
| Section length (km) | 8.0 |

**Documented Fish Species**

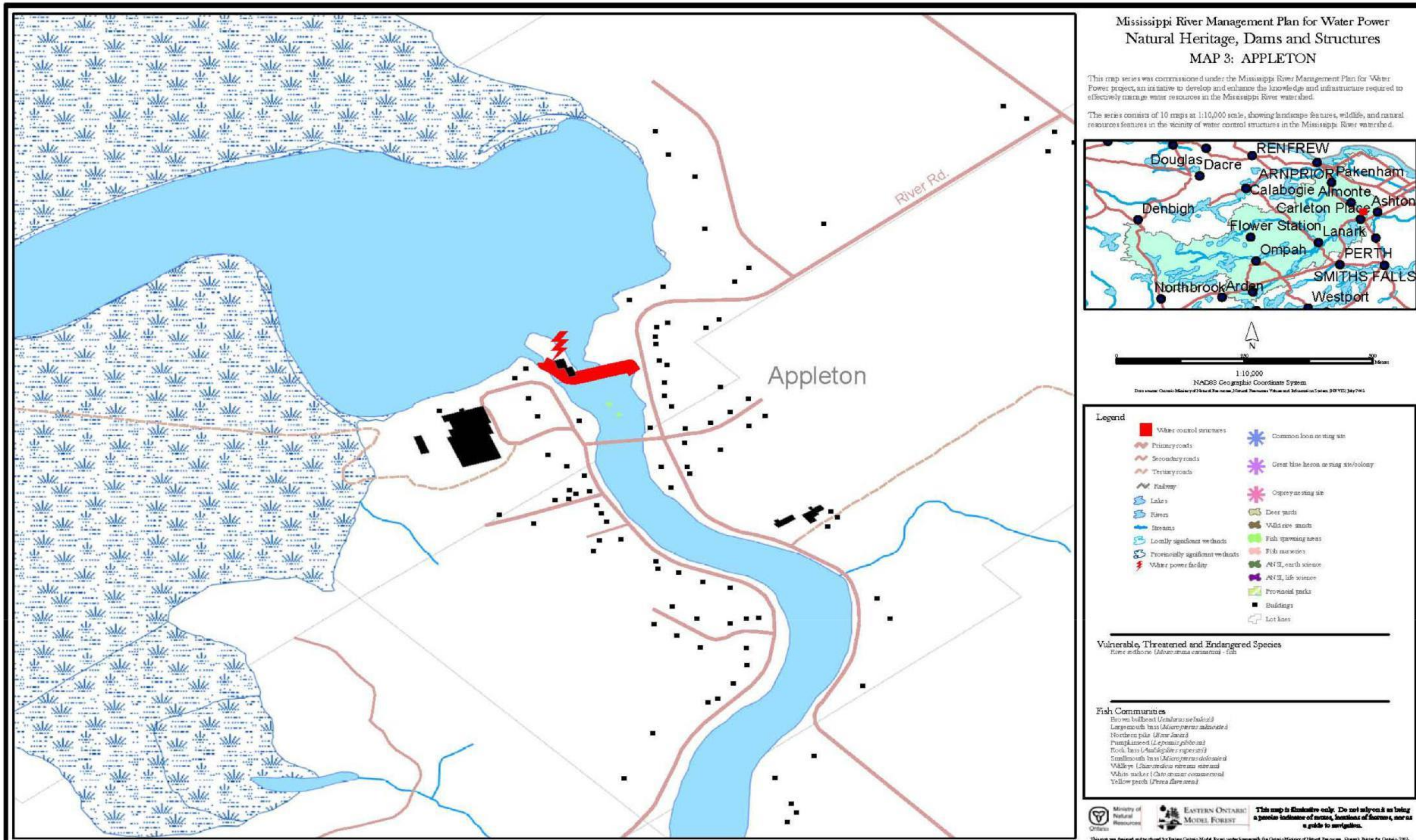
Brown bullhead (Ictalurus nebulosis)
Largemouth bass (Micropterus salmoides)
Northern pike (Esox lucius)
Pumpkinseed (Lepomis gibbosus)
Rock bass (Ambloplites ruperstris)
Smallmouth bass (Micropterus dolomieu)
Walleye (Sander vitreus)
White sucker (Catostomus commersoni)
Yellow perch (Perca flavescens)

**Species at risk**

River redhorse (Moxostoma carinatum) - fish

**Natural heritage features**

Appleton Provincially Significant Wetland
Appleton Swamp Provincially Significant Candidate ANSI


Mississippi River Management Plan for Water Power
Natural Heritage, Dams and Structures
MAP 3: APPLETON
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River redhorse - fish
Fish Communities
Brown bullhead
Largemouth bass
Northern pike
Pumpkinseed
Rock bass
Smallmouth bass
Walleye
White sucker
Yellow perch
Ministry of Natural Resources
Ontario
Eastern Ontario Model Forest
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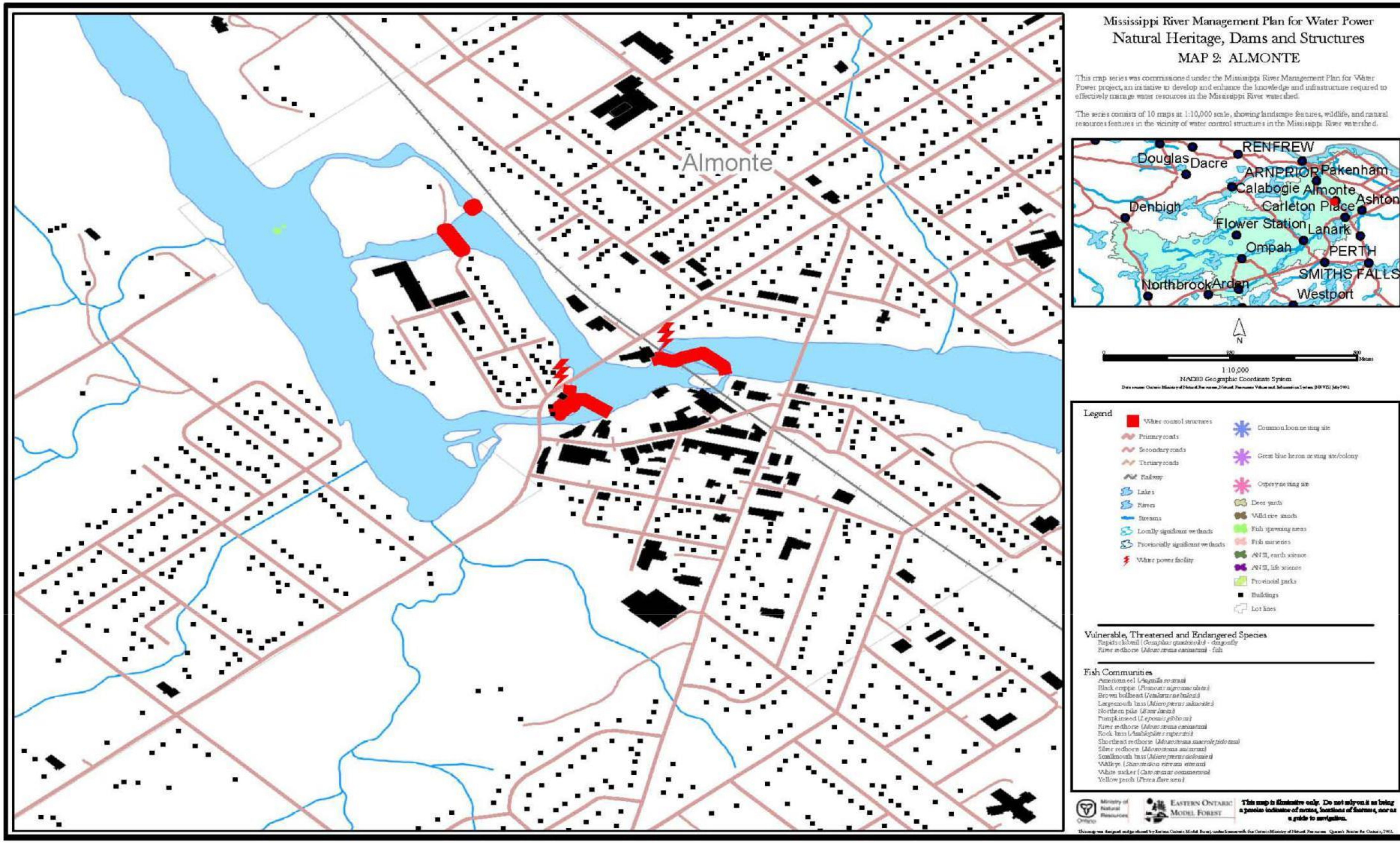
Almonte
Mississippi River Management Plan for Water Power
Natural Heritage, Dams and Structures
MAP 2: ALMONTE
This map series was commissioned under the Mississippi River Management Plan for Water Power project, an initiative to develop and enhance the knowledge and infrastructure required to effectively manage water resources in the Mississippi River watershed.
The series consists of 10 maps at 1:10,000 scale, showing landscape features, wildlife, and natural resources features in the vicinity of water control structures in the Mississippi River watershed.
RENFREW
Douglas
Dacre
ARNPRIOR
Pakenham
Calabogie
Almonte
Ashton
Denbigh
Carleton Place
Flower Station
Lanark
Ompah
PERTH
SMITHS FALLS
Northbrook
Arden
Westport
N
0
250
500
Metres
1:10,000
NAD83 Geographic Coordinate System
Legend
Water control structures
Primary roads
Secondary roads
Tertiary roads
Railway
Lakes
Rivers
Streams
Locally significant wetlands
Provincially significant wetlands
Water power facility
Common loon nesting site
Great blue heron nesting site/colony
Osprey nesting site
Deer yards
Wild rice stands
Fish spawning areas
Fish nurseries
ANSI, earth science
ANSI, life science
Provincial parks
Buildings
Lot lines
Vulnerable, Threatened and Endangered Species
Rapids clubtail (Gomphus quadricolor) - dragonfly
River redhorse (Moxostoma carinatum) - fish
Fish Communities
American eel (Anguilla rostrata)
Black crappie (Pomoxis nigromaculatus)
Brown bullhead (Ictalurus nebulosus)
Largemouth bass (Micropterus salmoides)
Northern pike (Esox lucius)
Pumpkinseed (Lepomis gibbosus)
River redhorse (Moxostoma carinatum)
Rock bass (Ambloplites rupestris)
Shorthead redhorse (Moxostoma macrolepidotum)
Silver redhorse (Moxostoma anisurum)
Smallmouth bass (Micropterus dolomieu)
Walleye (Stizostedion vitreum vitreum)
White sucker (Catostomus commersoni)
Yellow perch (Perca flavescens)
Ministry of Natural Resources
Ontario
EASTERN ONTARIO MODEL FOREST
This map is illustrative only. Do not rely on it as being a precise indicator of routes, locations of features, nor as a guide to navigation.

**Almonte to Pakenham**

**Table 1: Physical Characteristics**

| | |
|---|---|
| Geographic Township | Ramsay/Pakenham Township |
| Section length (km) | 15.0 |

**Documented Fish Species**

American eel (Anguilla rostrata)
Black crappie (Pomoxis nigromaculatus)
Largemouth bass (Micropterus salmoides)
Northern pike (Esox lucius)
Pumpkinseed (Lepomis gibbosus)
River redhorse (Moxostoma carinatum)
Rock bass (Ambloplites ruperstris)
Shorthead redhorse (Moxostoma macrolepidotum)
Silver redhorse (Moxostoma anisurum)
Smallmouth bass (Micropterus dolomieu)
Walleye (Sander vitreus)
White sucker (Catostomus commersoni)
Yellow perch (Perca flavescens)

**Species at risk**

Rapids clubtail (Gomphus quadricolor) – dragonfly
River redhorse (Moxostoma carinatum) – fish

**Natural heritage features**

Pakenham Bridge Outcrop Provincially Significant Candidate ANSI

**Pakenham to Galetta**

**Table 1: Physical Characteristics**

| | |
|---|---|
| Geographic Township | Pakenham/Fitzroy Township |
| Section length (km) | 11.0 |

**Documented Fish Species**

American eel (Anguilla rostrata)
Black crappie (Pomoxis nigromaculatus)
Greater redhorse (Moxostoma valenciennesi)
Largemouth bass (Micropterus salmoides)
Northern pike (Esox lucius)
Pumpkinseed (Lepomis gibbosus)
River redhorse (Moxostoma carinatum)
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Smallmouth bass (Micropterus dolomieu)
Walleye (Sander vitreus)
White sucker (Catostomus commersoni)
Yellow perch (Perca flavescens)

**Species at risk**

Greater redhorse (Moxostoma valenciennesi) - fish
River redhorse (Moxostoma carinatum) - fish

**Natural heritage features**
Lower Mississippi Provincially Significant Wetland
Cody Creek Black Maple Forest Provincially Significant Candidate ANSI
Galetta Black Maple Forest Provincially Significant Candidate ANSI

**Galetta to Ottawa River**

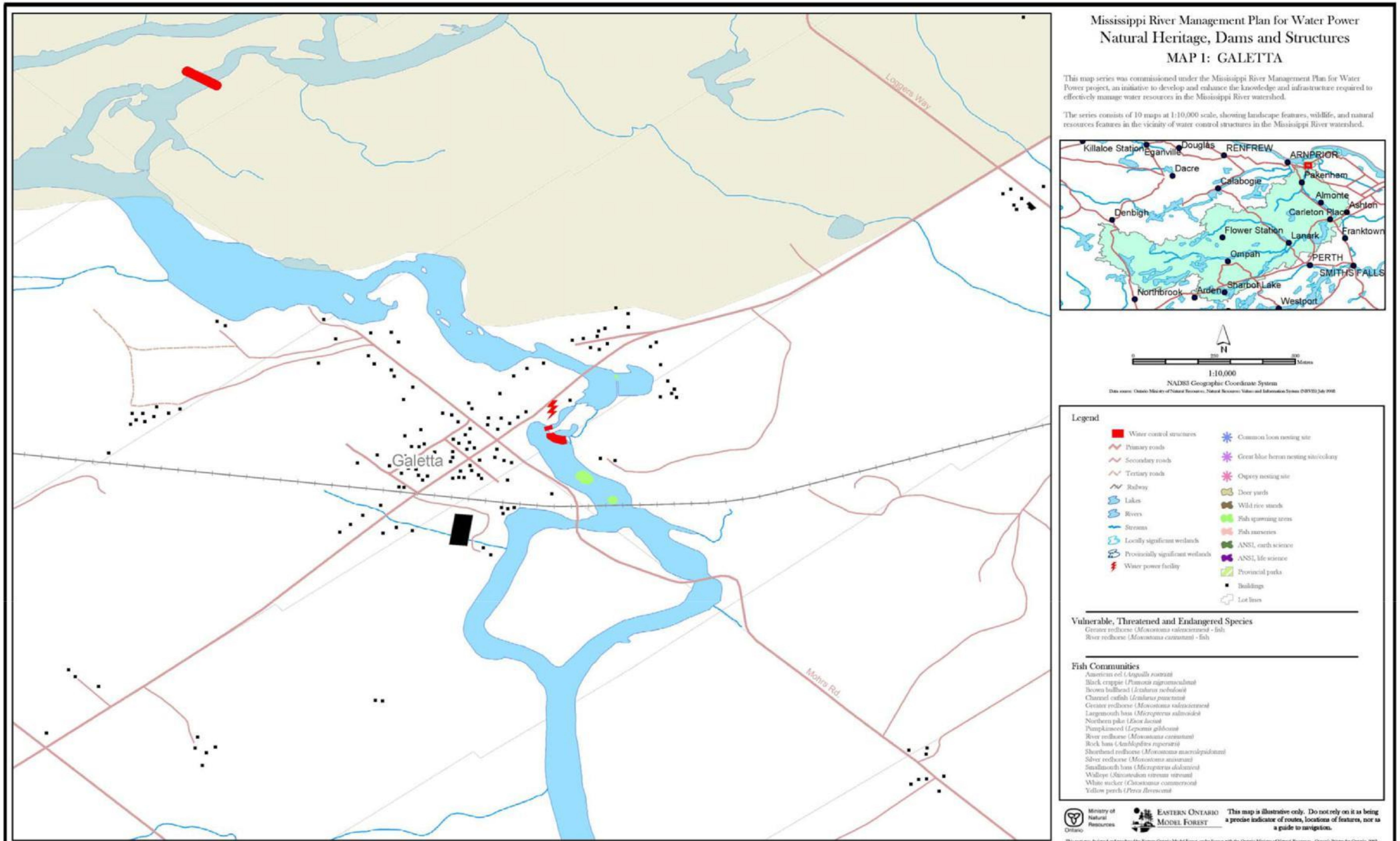
**Table 1: Physical Characteristics**

| | |
|---|---|
| Geographic Township | Fitzroy Township |
| Section length (km) | 3.5 |

**Documented Fish Species**
American eel (Anguilla rostrata)
Black crappie (Pomoxis nigromaculatus)
Brown bullhead (Ictalurus nebulosis)
Channel catfish (Ictalurus punctatus)
Largemouth bass (Micropterus salmoides)
Northern pike (Esox lucius)
Pumpkinseed (Lepomis gibbosus)
River redhorse (Moxostoma carinatum)
Rock bass (Ambloplites ruperstris)
Shorthead redhorse (Moxostoma macrolepidotum)
Silver redhorse (Moxostoma anisurum)
Smallmouth bass (Micropterus dolomieu)
Walleye (Sander vitreus)
White sucker (Catostomus commersoni)
Yellow perch (Perca flavescens)

**Species at risk**
River redhorse (Moxostoma carinatum) - fish

**Natural heritage features**
Mississippi Snye Wetland Provincially Significant Candidate ANSI


Mississippi River Management Plan for Water Power
Natural Heritage, Dams and Structures
MAP 1: GALETTA
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Killaloe Station
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Franktown
Ompah
PERTH
SMITHS FALLS
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Ministry of Natural Resources
Ontario
Eastern Ontario Model Forest
This map is illustrative only. Do not rely on it as being a precise indicator of routes, locations of features, nor as a guide to navigation.
Loggers Way
Galetta
Mohrs Rd.

# Appendix B – Water level Management Issues and Questions for Planning (This is an excerpt of Section 12 from the Mississippi River Water Management Plan Public Advisory Committee - Public Consultation Findings report.)

## 12.1 Mazinaw Lake

12.1.1 Fall Draw Down
A number of lake residents lose access to water with the fall draw down. Depending upon ownership of 'drowned lands' they may have to cross a neighbour's property to get to the lake when water levels have been drawn down.

12.1.2 Fall Draw Down Timing
Several lake residences are water access only. Their properties become inaccessible by boat once the fall draw down has occurred, since both the marina and their property dockage are high and dry. Many residents now consider the deer hunting season to be a part of the extended cottage season. Residents do not wish to see the Mazinaw Lake draw down any sooner than after mid-November. (Statement)

12.1.3 If we can't support both fisheries in the operating plan for this system, which should we be favoring, lake trout or walleye?

## Kashwakamak Lake

12.2.1 Fall Draw Down
A number of lake residents lose access to water with the fall draw down. Depending upon ownership of 'drowned lands', they may have to cross a neighbour's property to get to the lake when water levels have been drawn down.

12.2.2 Ice damage to docks and boathouses.
Some years, water levels come up in the spring before the ice is out, damaging docks. Can anything be done to minimize this problem?

12.2.3 Low summer water levels
Low levels such as those experienced during drought summers, limit water access to some properties. As long as Kashwakamak Lake has inflows (including springs) which exceed evaporation, can the outflow be set to maintain a minimum navigable water level?

12.2.4 Winter Ice Safety
Kashwakamak Lake is heavily used by snowmobilers and skiers. Can water levels be stabilized during winter sports season to provide safe shore ice access?

## Marble Lake

12.2.5 Low Summer Water Levels
Water level management on this lake is primarily a summer issue.
The populous western end of the lake has a gently sloping bottom, which exaggerates the relatively modest drop in water level. What can be done to stabilize summer season water levels on this lake?

## Little Marble Lake

No Issues

## Georgia Lake

No Issues

**Shawenegog and Sand Lakes**

No Issues

## 12.3 Shabomeka Lake

12.3.1 Trout populations
Residents believe the winter draw down to be a principle cause of declining lake trout populations. Is this a factor?

12.3.2 Beaver Lodges
Beaver lodges are left high and dry after the draw down. Does this adversely affect the beaver population?

**Malcolm Lake**

12.3.3 Summer Water Levels
Summer water levels need to be maintained to allow access to Green Lake from Ardoch. Can minimum levels be established and maintained?

**Farm Lake**

12.3.4 Shock Flow Erosion
When water is dumped from Kashwakamak, it causes shore line erosion. Can outflow shock be reduced to minimize this?

**Mississagagon Lake**

12.3.5 Shore resident wildlife
Is lowering the water in the fall detrimental to the shore resident wildlife that inhabit the marshy area around Sucker Creek?

## 12.4 Big Gull Lake

12.4.1 Summer Water Levels
Residents feel that the current summertime water levels are too low. Can they be increased?

12.4.2 Walleye Spawning
Does the current water level management plan make accommodation for walleye spawning in Big Gull Lake?

12.4.3 Spring Runoff Catchment
Are the stop logs being installed early enough in the season to catch the entire spring run off?

## 12.5 Crotch Lake and Fawn Lake

12.5.1 Annual Draw-downs

Can the twice annual draw downs on Crotch Lake be reduced or minimized? Since water resources are considered finite and no new water is produced, then why are the upper lakes pulled down rapidly in the fall to fill one lake with the same water? Why not allow the upper lakes to dump the same water gradually over the course of the winter so that one lake does not experience the double drawdown? Would this not replicate the natural drawdown in all the upper lakes while water for the spring freshet is held in storage in the form of ice and snow? How was the 5 CMS for High Falls determined?

12.5.2 Spawning Habitat

Potential spawning sites for walleye have been identified in various parts of Crotch Lake. These shoreline spawning beds are flushed and cleaned every year with the twice annual draw-downs. Spawning bed construction has occurred at the mouth of Gull Creek and the Whitefish Rapids by MNRF (former Tweed District). Water levels are stabilized during the walleye spawning period which creates a problem when the water levels in Crotch Lake do not rise sufficiently to cover these spawning sites. How can this problem be addressed if Crotch Lake does not get filled until the end of June under the present operating regime?

12.5.3 Lake Ecology Concerns

What is the impact on aquatic life caused by draw- downs? Is the impact on aquatic life compounded by twice annual draw-downs? What measures can be taken to alleviate some of this impact? Crotch Lake has limited, weedy, shallow areas. What is the impact on fish communities when water is removed from these weedy, shallow areas?

12.5.4 Economic Value

Is Crotch Lake more valuable economically as a reservoir or as a recreational lake? How can this be measured?

12.5.5 Boat Access and Navigation

The Municipality of North Frontenac attempts to maintain and provide public access at two sites on Crotch Lake. The extent of the late summer draw down makes the public access unusable for most recreational activities. The extent of the drawdown denies access to the lake by property owners, local residents, as well as recreational users via the public accesses. The extreme extent of the draw-downs produces navigational and boating safety concerns. Can the extent of the drawdown be reduced so that continued access is maintained over the recreational season? How are boating safety and navigational issues to be addressed? How are access problems during the late recreational season to be addressed?

12.5.6 Access to Fawn and Twin Island Lakes

The extent of the late summer draw down lowers the water below a level that allows boat access to Fawn or Twin Island lakes. Can the draw down be reduced to a level that allows continued access?

12.5.7 Marina and Dock Operations

The two tourist operations at the south end of Crotch Lake have designed and built extensive docking systems to allow for the major fluctuating water levels. More than 1000 feet of docking have to be stored on shore during the winter months, re-installed each spring, pulled in the spring as water levels increase until the end of June, pushed out and relocated with the summer and fall drawdown, and removed again at the end of the tourist season in the fall. Docks are moved twice a week during the summer draw down period. Two staff are required to move the docks and this usually takes an hour. The ramps used for launching boats move as the water levels change. A permanent ramp is impossible to maintain. A 4 wheeled-drive vehicle must be available to launch and retrieve boats at all times.

12.5.8 Walleye Fishing

According to FWIN surveys, Crotch Lake (1997), Big Gull (1998), and Kashwakamak (1999) and despite fishing regulation changes in 1992 to enhance and conserve the walleye fishery in Crotch Lake, Crotch Lake ranks behind both Kashwakamak and Big Gull as a walleye fishery. Why?

12.5.9 Reservoir Status

If Crotch Lake is to continue in its role as the principal reservoir for the lower watershed, then how do you compensate or help this lake in other ways for the problems caused by excessive, twice annual draw-downs?

## 12.6 Kings, Otter, Miller, Stump, lakes to High Falls

12.6.1 Water Surges
Residents dislike the rise and fall of the river system associated with the strong outflow surge from the Crotch Lake outflow control structure. Residents wish to know if smaller draw down increments (logs) could be used.

## 12.7 Dalhousie Lake

12.7.1 Loon Nesting Areas
Fluctuating lake levels in spring are believed to be causing destruction of nesting areas for loons. Are loons adversely affected by spring water level fluctuations?

12.7.2 Bass Spawning
Does the current water management plan consider bass spawning in this lake?

12.7.3 Low Summer Levels
Low summertime levels prohibit access to Docks in Purdon Bay and both public and private launch structures, and make boat navigation difficult from the lake the river outflow. Can this be improved?

12.7.4 Flash Flooding
Residents believe the incidence of lake flooding has increased. Is this a fact, and if so, can something be done to reduce the frequency or severity of the incidences?

## 12.8 River from Dalhousie - Mississippi Lake

Consideration needs to be given in the operating regime for the walleye spawning areas at the outflow end of Dalhousie Lake, at Four Stepstone Rapids, Playfairville Rapids and Innisville Rapids north of the Hwy. #7 bridge.

## 12.9 Mississippi Lake

12.9.1 Flooding
Residents believe the incidence of lake flooding has increased. Is this a fact, and if so, can something be done to reduce the frequency or severity of the incidences?

12.9.2 Ice Safety
This lake has a very active winter time activity level. Maintaining steady winter sports season lake levels for ice safety is of major importance.

12.9.3 Summer Drought
Residents would like to minimize summer water levels reduction

12.9.4 Loon Nesting Areas
Lake residents feel that high water levels during nesting adversely affects reproduction

## 12.10 Carleton Place

12.10.1Town Water Supply
Adequate flow maintenance to provide a stable drinking water supply is a critical local issue.

## 12.11 Carleton Place to Appleton to Almonte

12.11.1Boat Access
Boat ramp-Low summer water levels make boat launching at the Appleton ramp difficult. Can this be improved?

## 12.12 Town of Almonte

12.12.1Boat Access
Low summer water levels make boat launching at the town ramp impossible. Can this be improved?

## 12.13 Almonte to Pakenham to Galetta

No issues

## 12.14 Tributaries

12.14.1 Tributary Contribution
Can the water in the tributaries be managed to stabilize flow and water levels in the river system?

12.14.2Tributary Exclusion
Why are tributaries excluded from the water management plan?

12.14.3 Control Structures
If funding was not the issue, are there possible control structure sites that would allow the tributaries contribution to be managed?

12.14.4Tributary significance
If funding was not an issue, would the managed contribution of the tributaries make any significant difference?

## 12.15 Watershed Issues

12.15.1 Winter Draw down
From an ecological point of view, there is a contention that winter draw downs are considered destructive. (statement)

12.15.1.1 Can winter draw downs be eliminated or are they essential?

12.15.1.2 If they are essential, can their impact be lessened by reducing the number of lakes drawn down?

12.15.1.3 Could a study be created, whereby an upper watershed lake be exempt from the winter draw down for a number of years to comparatively study the ecological impact?

12.15.1.4 Has a literature review been conducted to research the impacts of winter draw downs? If no, could one be conducted?

**12.16 Operating Policy Issues**

12.16.1 What was the original source (historic) of the 5 cubic metres per second (m3/s) operating policy at High Falls?

12.16.2 What is the hierarchy of priority for: stable lake water levels, flood control and hydro generation in the watershed management plan?

12.16.3 Can the watershed be managed more adaptively to include predictive climate data to reduce possibly unnecessary draw downs?

**12.17 Flow Issues**

12.17.1 What percentage of system inflow occurs below the Crotch Lake discharge?

**12.18 Economic Drivers**

12.18.1 Are there any economic incentives for hydro producers to operate at maximum conversion efficiency?

12.18.2 Are the current water usage fees based on water consumption or hydro produced?

12.18.3 Why is Appleton the only plant on the system with a variable flow turbine?

12.18.4 What is the economic value of the watershed?

12.18.5 What sectors compete for water as a resource, and which have complementary use?

12.18.6 What is the comparative value of hydro production versus recreation?

**12.18 General Watershed Issues**

12.18.1 What data will be used to demonstrate to the public that there is no better way of moving water on this watershed than the present operating policy?

12.18.2 PAC feels that it is the public's perception that the watershed is operated for the exclusive benefit of the generators and dam owners.

12.18.3 How can this perception be overcome?

12.18.4 Can it be proven that the managed movement of water has no net loss of fish or habitat?

12.18.5 If as stated, hydroelectric generation in the Mississippi River watershed is produced by "run of the river" how does hydro electric generation influence water management policy on the watershed?

12.18.6 If there were no hydroelectric generation sites on the watershed, would water be managed differently?

# Appendix C – GLOSSARY OF TERMS AND ABBREVIATIONS

**Area of Natural and Scientific Interest** -area with special resource management provisions designed to protect significant earth and life science values; usually has a management plan that guides activities permitted and restricted in this area. Bathymetry -detailed topography or contour profile of the bottom of lake or river

**Bedrock Outcrops** -areas where the underlying bedrock underground layers of rock foundation are exposed above the soil layer

**Cubic meters per second** – cms or m3/s

**Drainage Area** – The total area of land which drains to a point on a watercourse.

**Ecosystem** -An ecological community together with its environment, functioning as a unit.

**Flashboards** – one or more boards projecting above the top of a dam (usually a weir) to increase the depth of the water. They are normally designed to fail under high flow conditions so that they do not increase flood levels.

**Headwater** -streams flowing from the sources of a river: usually associated with upland areas.

**Hectare meters** – ha m or 10, 000 m3

**Hydraulic Capacity** – the total volume of water which can be passed through all sluiceways of a structure but not including any weir or emergency spillway. It is based on all stoplogs (which can be removed) out of the dam and the head being the difference between the normal summer optimum level and the sill (or top elevation of any irremovable logs ) of the dam and the clear opening width of each sluice.

**Hydraulic Characteristics** – Physical characteristics of a dam or watershed area affecting a dam which can not be changed.

**Hydrologic Model** - a model of the properties, distribution, and effects of water on the earth's surface, sometimes in the soil and the underlying rocks, and in the atmosphere.

**Littoral Zone** -the area of the shore of a lake where light is able to penetrate to the bottom; often more than 60 percent of the flora and fauna in the lake or other body of water exists in the littoral zone.

**Nuisance Flooding** – associated with flooding of docks, shoreline and possibly outbuildings but not effecting the access, egress or main dwelling on a lot.

**Ontario Low Water Response** (formerly Water Response 2000) -is intended to ensure provincial preparedness, to assist in co-ordination and to support local response in the event of a drought. This plan is based on existing legislation and regulations and builds on existing relationships between the province and local government bodies.

**Provincially Significant Wetlands** -wetlands that have special characteristics of natural or cultural importance; PSWs are evaluated wetlands that are assessed and scored in terms of their characteristics (i.e. Have valued hydrological function such as flood attenuation capacity; Contain vulnerable, threatened or endangered flora or fauna); development in and around PSW s is restricted and limited.

**Reach** -Any length of river under study, with definable features; reaches on the Mississippi River are defined or separated by waterpower facilities, water control structures or obvious natural features that cause a change in the characteristics of the river.

**Riparian Properties** - properties or land parcels along a riverbank or on lakefront.

**Run of the River** -a generating facility is called a run of the river operation when it has minimal forebay storage, passes all or most of the inflow of water from upstream through one or more turbines on a consistent basis, with the remainder of the water spilling over existing falls or the dam's spillway.

**Spring Freshet** -wet conditions in a watershed associated with spring rains, melting snow cover, often high water table levels, and sometimes surface water flooding.

**Total Storage** – is based on the height of the stoplogs multiplied by the surface area of the lake.

**Water Taking Permits** - under Section 34 of the Ontario Water Resources Act, the MOE regulates the withdrawal and use of large quantities of surface and ground water (i.e. 50,000 L per day or greater requires a water taking permit); the ecosystem approach and impacts to supply of water in the watershed is to be taken into consideration when the MOE reviews and approves permits;

Permit applications are posted on the Environmental Bill of Rights Registry. For more information see www.eco.on.ca

**Waterpower**- Generating electricity by conversion of the energy of running water.

**Watershed** - a line of separation between waters flowing to different rivers, or basins; area of and drained by a single river and its tributaries or creeks.

**Weir** – a dam in a stream to raise the water level or divert the flow.

# Comments And Responses Report

## March 2005

## *Introduction*

The Mississippi River Water Management Plan (MRWMP) was prepared in accordance with the Water Management Planning Guidelines for Waterpower (May 2002) and has resulted in an operating plan related to management of water levels and flows for specific water control structures and hydro electricity generating facilities on the Mississippi River system. The structures and facilities subject to planning are: Shabomeka Lake Dam, Mazinaw Lake Dam, Kashwakamak Lake Dam, Big Gull Lake Dam, Mississagagon Lake Dam, Crotch Lake Dam, High Falls Generating Station (G.S.), Carleton Place Dam, Appleton G.S., Enerdu Power Systems Ltd. G.S., Mississippi River Power Corporation (Almonte) G.S. and Galetta G.S.

Public and stakeholder participation is a guiding principle in the preparation of the MRWMP. To date, the planning process has afforded a variety of opportunities for the public and stakeholders to provide input to the preparation of the MRWMP. This document includes a summary of all comments received to date, including input received from open houses at the Scoping and Options Development stages and from the MRWMP's Public Advisory Committee. It is organized and summarized by waterbody, commencing from the upstream reaches of the Mississippi system and concluding with comments which apply to the system as a whole or are general in nature.

The comments received in the MRWMP planning process, cover a wide range of interests, concerns and issues. The response that follows each comment in this document was prepared with a view to:

- Providing background information that is relevant to a particular comment;
- Documenting the comments received which will be examined through the Options Development process for the Mississippi River Water Management Plan;
- Identifying and forwarding comments which are out of the scope of the MRWMP to a public agency with a mandate for the specific issue;
- Identifying further action that is proposed to be undertaken by the MRWMP planning team to address the comments received.

It is noted that many comments received in the MRWMP exercise to date are beyond the scope of water management planning and the project's terms of reference. While these comments include matters that are of interest and concern to riparian owners, stakeholders and the public, they cannot be addressed in this exercise as they are not related to the manipulation of water flows and levels at the structures subject to planning in the MRWMP. By including these comments and responses in this document they become part of the public record and can, as opportunities arise, be considered in future planning exercises. This document was first provided to the public for comment in September 2004.

## *1.0 SHABOMEKA LAKE*

**Summary of Comments Received:**

The following comments have been derived from the PAC members, agencies, open houses and comment periods. As a result of the open houses and scoping report comment period, a total of five questionnaires, one email and one letter were returned with comments from people having property or comments regarding Shabomeka Lake. Results of the questionnaires did not indicate any problems with water levels in the winter, spring, and summer and a few had concerns about low water in the fall from a fishery and navigational point of view. One questionnaire was received with no comments indicating the fall levels were too low and a concern regarding water levels for boating and recreation from the spring through the fall and for lake trout and bass year round. Some comments indicated that levels as they exist are preferred.

***1.1 Comment:*** *Leaving more water in the lake in the fall of the year might be beneficial to the lake trout and should be done if this will improve the fishery. Changes have been made in the past, which were supposed to help the fishery but it has continued to decline over the years. Residents believe the winter draw down to be a principle cause of the declining lake trout populations. Does the draw down currently have a negative impact on the lake trout spawn?*

Response: Shabomeka Lake's operating guidelines were changed in 1981 to a mid-September draw down in order to accommodate the lake trout spawning in mid-October. Despite observations of excellent lake trout spawning habitat in several areas of the lake, a self-sustaining population has not become re-established; currently the lake trout population is sustained entirely through the provincial stocking program.

The belief of the members of the planning team is that the best lake trout spawning habitat is exposed after the September draw down, and that lake trout are simply not finding adequate substrate for spawning. We are proposing to continue with the mid-September drawdown, but removing one less log from the dam in order to ensure that there is water covering the spawning habitat throughout the spawning and incubation period (October – April).

The bathymetric survey which has already been completed along with an inspection of the shoals in fall 2004, will confirm if the proposed 0.30 m elevation change will adequately cover the spawning shoals to a depth that will enhance the survival rate of the spawn. It is believed that due to the current operating practices, the spawning shoals which existed 30 years or more ago have been silted over, thereby reducing the available shoals to the lake trout. By leaving more water in the lake other areas will have the potential to become spawning areas and contribute to the rehabilitation of a self-sustaining lake trout population into this lake.

Action by MRWMP: To be considered during Option Development (reducing the drawdown by 0.3 metres on Shabomeka Lake).

***1.2 Comment:*** *These spawning shoals have been exposed for 50 years. They were never part of the original lake in the first place and therefore no additional water should be left in the lake in the winter. This would cause more ice damage to docks and shorelines for speculation that this proposal might benefit the Lake Trout. To improve the Lake Trout population, stop the ice fishing.*

Response: This process will consider all implications that proposed changes in the current operating regimes and guidelines will have on the improvement of fisheries, flood storage, potential ice damage etc. before making any recommendations for change.

The original shoreline of Shabomeka Lake would have been located at about the existing minimum water drawdown level. The land area above the original shoreline was probably well vegetated and soil and sand covered the bedrock before the dam was built. When this area was flooded, after the dam installation, all of the soil and sediment would have been eroded away by the water and wave action and was deposited at the present low water mark. The area that had been subject to erosion is where the native lake trout would have spawned on rock rubble substrate.

Shabomeka Lake's water management strategy was changed in 1981 to a mid-September draw down in order to accommodate the lake trout spawning in mid-October. Unfortunately, a self-sustaining population of lake trout has not become re-established; currently the lake trout population is sustained entirely through the provincial stocking program.

Our belief is that the best lake trout spawning habitat is exposed after the September draw down, and that lake trout are simply not finding adequate substrate for spawning. The substrate below the low water mark is largely covered with sediment, as a result of the erosion of the shoreline through the summer high -water period. MNRF has observed areas of potentially excellent lake trout spawning habitat in several areas of the lake during the high-water period, but these areas are exposed during the spawning season.

Regarding the elimination of ice fishing, the objective of fisheries managers is to optimize fishing opportunities, while considering the health of the resource. Regulations are in place to protect the fishery from excessive winter harvest. The elimination of ice fishing on this lake is outside the scope of this report.

<u>Action by MRWMP:</u> The Planning Team has proposed continuing with the mid-September drawdown and raising the winter water levels in Shabomeka Lake 0.30m (one log) from the current strategy, in order to ensure that there is water covering the spawning habitat throughout the spawning and incubation period (October – April). Comment to be examined in the option development phase.

***1.3 Comment:*** *The draw down on this lake is unnecessary.*

<u>Response:</u> The draw down of the lake is necessary for several reasons. First, it reflects the natural process of the lake were the dam not in place, which would have taken place in late spring or early summer, allowing the lake to clean its shorelines, oxygenate lower levels of the lake etc. It allows the spring runoff to be captured in the lake thereby assisting in reducing downstream flooding while reducing flooding on the lake itself. The water from this draw down procedure is also used to assist in maintaining downstream flows for other users of the system. Without the drawdown, no storage in the lake would exist making it much more vulnerable to overtopping in the spring and flood damages around the shoreline.

<u>Action by MRWMP</u>: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***1.4 Comment:*** The drawdown is done too early and reduces access to boat only access properties in the early fall. Can the recreational season be extended beyond the Victoria Day to Labour Day weekends?

<u>Response:</u> The date of the fall draw down for this lake was changed 1981 to enhance the survival rate of the lake trout spawn by having the lake at its minimum prior to the onset of

spawning activities. With the objective still being to return the lake to a viable natural reproducing lake trout lake, returning to a later draw down date is not practical. While boat access properties are adversely affected by the date of the drawdown, this was agreed upon by the cottage association at the time and has been in place for many years. People, who purchased property after the change occurred, will have had this condition exist since they situated on the lake.

With the conversion of properties from seasonal to year-round, more people want to extend the recreational season as much as possible. Unfortunately, the most unsettled weather is the spring, which means that it is difficult to establish an earlier stable level on the lakes. As well, consideration of all of the other interests at stake across the watershed in the spring need to be taken into account (including but not limited to flooding, erosion, ice damage, spawning fish [northern pike and bass] and ensuring adequate water supply for the remainder of the year). Some years allow residents to get out on the lakes earlier than others late spring or early summer storms can cause levels to fluctuate resulting in potential damages. Extending the fall season has the potential to have significant consequences to fish (lake trout), wildlife and shorelines, as there is a greater potential for the lake to freeze over before minimum levels are achieved. It must be noted that each year brings its own unique characteristics regarding the weather, which is why operating plans are general guidelines as to how and why the individual dams are operated and what can be done in one year might not be achievable in other years. The current operating plans have taken this into account to provide the most likely stable situation for all users of the watershed to rely on.

<u>Action by MRWMP:</u> some benefit may be gained by the option investigated in Comment 1.1, however given the constraints of trying to rehabilitate the lake trout, this is not a viable option. No further action is proposed by the MRWMP planning team.

***1.5 Comment:*** *Fish and aquatic habitat should take priority over human requirements. Beaver lodges are left high and dry by the fall drawdown. Does this adversely affect the beaver population?*

<u>Response:</u> In order to provide the best possible plan for all users of the watershed and lakes, the interests of people, fish and wildlife and industry are being considered when looking at the current system and potential changes.

Winter denning furbearers, especially muskrat and beaver, and hibernating amphibians need stable water levels in late fall and during ice cover. The furbearers build an entrance to their den below the low water level to ensure an entrance free from winter ice. Water levels dropped too low after these species have entered their winter habitats can essentially freeze them out. There is currently no evidence to suggest that this occurs on this lake.

Amphibians over-winter in water, burying themselves in the bottom mud of streams and lakes or hiding under a sunken log. Amphibians require well oxygenated water to survive the winter and dropping water levels after they have entered winter habitat can cause ice to freeze to their depth or crowd the habitat such that oxygen is severely depleted.

The planning team recommends a continued strategy to begin the fall draw down in mid-September, such that winter water levels are achieved prior to these furbearers and amphibians settling entering their winter habitats. This winter water level should be maintained into early spring to minimize impacts.

Action by MRWMP: since winter levels will be established slightly earlier in the season, the option of establishing a higher winter water level on Shabomeka Lake (1.1) may also be beneficial for riparian wildlife, and will be investigated as part of the options development process.

***1.6 Comment:*** *The average cottager has his/her own interests at heart. Do what is best for the lake and the fish if the cottagers don't like it let them move.*

Response: This planning process will take into account the diversity of interests that pertain to a lake and the watershed as a whole and will establish an operating protocol that will be most beneficial.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***1.7 Comment:*** *Sewage systems**, s**eptic tanks and pit privies need more stringent rules and methods of checking them.*

Response: Matters related to sewage systems, septic tanks and pit privies are governed by the Environmental Protection Act administered by municipalities and are not within the scope of the MRWMP. It is noted, however, that on many lakes, cottage associations are taking it upon themselves to have septic systems inspected and maintained. For more information, contact the local municipality.

Action by MRWMP: This comment will be forwarded to the local municipality and a copy of the final Water Management Plan will be distributed to all municipalities.

***1.8 Comment:*** More water sports (large motors, sea doos) are creating problems for wildlife and habitat.

Response: This is outside the scope of this exercise, however, it is up to cottage associations and users of the lakes to take an active role in controlling what happens on their lakes through education.

Any request for a speed limit or motor ban on a lake or waterway (outside of the main channel of the Trent-Severn Waterway and Rideau Canal) by an individual or group (i.e. cottage association) must be made to the municipality who, in turn, must pass a motion in council. A formal application is then sent to the Ministry of Natural Resources, who, upon review will forward the application to the Canadian Coast Guard. Any decision to implement speed limits or a motor ban will be made by the Canadian Coast Guard as per the Boating Restriction Regulations under the Canada Shipping Act.

The Boating Restriction Regulations provide for a "Universal Shoreline Speed Limit" on all lakes and waterways greater than 100 metres in width. It restricts the speed of all vessels to a maximum of 10 kilometres per hour within 30 metres of the shore.

The restriction was put in place to address safety issues regarding swimmers and boaters within proximity of the shore, not to control shoreline damage, although that can be construed as a positive side -effect. It is generally enforced by the OPP, although Marine officers can also enforce it. If everyone living on the lake promotes wise use and ensures that their guests do as well, many problems revolving around this comment will be resolved.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***1.9 Comment:*** Why has there not been a flood plain study done for this region, similar to the one conducted in the Quinte Conservation Area.

Response: Flood plain mapping has been completed along portions of the Mississippi River system, however the need for a flood plain study for Shabomeka Lake has not been identified to date. Requests for flood plain mapping studies within the Mississippi River system should be directed to Mississippi Valley Conservation.

Action by MRWMP: The comment is addressed in the response and the Mississippi Valley Conservation, as part of the MRWMP, has received this comment. No further action is proposed by the MRWMP planning team.

## *2.0 MAZINAW LAKE*

A total of five questionnaires and two emails were returned with comments from people and the local conservation organization, regarding Mazinaw Lake. Most of the respondents indicated that summer and winter levels were ok with a few indicating that spring levels were too high and fall levels were too low. The fall levels dealt with fishery and navigational concerns, the spring with flooding of docks and yards. Three questionnaires were submitted without comments, all indicating that they had no concerns with water levels at all.

***2.1 Comment:*** *Lowering water level of Mazinaw Lake over the summer or earlier in the fall would impact navigation on the lake and make boat access only properties inaccessible.*

Response: Following the reconstruction of the dam in 1992, the operating plan for the structure was ratified between the Department of Fisheries and Oceans and the Coast Guard and a decision was made that no change to the timing of the drawdown would take place.

No option is being considered to lower water levels in the summer on this lake which would impact navigation or boat access only properties.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***2.2 Comment:*** *Dropping the water levels on Mazinaw Lake after walleye and lake trout spawn cause the eggs to dry up.*

Response: Walleye and Lake Trout spawn at different times of the year. Walleye typically spawn in early April. In a lake environment they require water levels to stay at or above the elevation in which they began to spawn. In a river environment, flows must remain relatively constant for a six-week period. The operating plan for Mazinaw Lake allows the lake to fill on its own from rain and snowmelt in the spring. Once inflows into the lake begin to subside, stoplogs are replaced to mimic the natural reduction of inflow so that stable levels are achieved on the lake. At the same time, a walleye spawning area exists immediately downstream of the dam; the dam is operated to reduce the flows as early as possible so that a constant flow can be maintained for a longer period of time.

Lake trout typically spawn in mid to late October. The draw down on Mazinaw Lake occurs throughout November and December with winter levels typically achieved in January. The historic and current operating regime exposes known spawning shoals after the end of the spawning period and results in some egg mortality.

In the early 1990’s there was a proposal to begin the drawdown prior to the onset of lake trout spawning, thereby ensuring that spawning would take place in areas that would not subsequently be dewatered. However, because the lower water levels would interfere with navigation on the lake, the proposed change to the operating regime required approval by Canada Coast Guard under the provisions of the Navigable Waters Protection Act. Although fish habitat management staff from the Department of Fisheries and Oceans supported the proposed change, there was some evidence that the lake continued to support a self-sustaining population of lake trout, despite the late fall drawdown. Since it could not be demonstrated that the proposed change to the operating regime was critical to the sustainability of the lake trout, the Coast Guard denied approval of the proposed change to the operating regime.

Subsequently, MNRF has determined that Mazinaw Lake continues to support a self-sustaining population of lake trout. The provincial stocking program on Mazinaw was discontinued in 1996, as part of the Management Strategy for Lakes with Naturally Reproducing Populations of Brook Trout and Lake Trout (MNR 1995). MNRF completed a lake trout population assessment in the spring of 2004. The results of the netting project included native lake trout of various ages, indicating that natural recruitment is occurring under the current operating regime. Although the late fall drawdown undoubtedly affects lake trout, which spawn on the known, shallow-water shoals, these findings support the theory of deep-spawning lake trout in Mazinaw Lake. Natural reproduction seems to be sustaining the lake trout population in Mazinaw Lake, and as a result, there is no need to revisit the option of an earlier drawdown to accommodate lake trout.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

2.3 Comment: **The fish / lake trout are disappearing from the lake and are being overvalued as a sport fishery. Which fish species (walleye / lake trout) is more valuable and have the operations been geared towards?**

Response: In Ontario, management of a lake for any given species of fish is not mutually exclusive; in other words, the lake is not necessarily managed for *either* lake trout *or* walleye.

Lake trout are a valuable species native to Ontario, which contains approximately 25% of the world's lake trout waters. However, lake trout lakes are limited in number, comprising only 6% of the total inland waters of southeastern Ontario. Shoreline development, acid rain, overfishing, species introductions, and global warming have all contributed to the alteration of fish populations in many lakes in southeastern Ontario. Many lakes that once supported natural populations of lake trout are now extirpated of the species, or require artificial stocking.

Habitat requirements of lake trout are generally more demanding than other native sport fish species. Further, lake trout can act as an 'environmental barometer', serving as an early warning indicator of the general state of the environment. By protecting lake trout, most other cohabitating species are also automatically preserved.

Recent genetic sampling of Mazinaw lake trout has shown that the native population belongs to a newly identified, rare genetic strain of lake trout, unique to the Addington Highlands area. Preservation of this unique strain is a priority in Bancroft District.

MNRF recommends that Mazinaw Lake continue to be managed for a self sustaining lake trout fishery. Further information can be obtained from the MNRF Bancroft District.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***2.4 Comment:*** *Fish (walleye) have all but disappeared from Mazinaw Lake.*

Response: Walleye are not native to the Mississippi River watershed, however, they have become naturalized, and self-sustaining populations now exist in the entire watershed downstream from Irvine Lake. Deep and clear, Mazinaw Lake has a limited amount of optimal habitat for walleye, most of the lake being more suitable for lake trout. The walleye in Mazinaw Lake have never been particularly abundant. MNRF has not conducted any projects to assess the health of the walleye population in recent years, however, anecdotal reports from anglers do not lead us to believe there has been any significant change.

Further information can be obtained from MNRF Bancroft.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***2.5 Comment:*** *There does not appear to be any serious reason to change the current situation or maintenance program.*

Response: This process, legislated by Provincial Government, will review and formalize the operating plans of all dams affecting water levels and flows to hydro facilities.

Action: The Mississippi River Water Management Plan will be completed as per the Water Management Planning Guidelines for Waterpower.

2.6 Comment: **Unstable water levels also have a negative impact on shorelines as the water action creates changes to shore line.**

Response: The Water Management Plan will strive to balance the objective of emulating the natural flow regime with the respect to all of the other planning objectives as identified in section 5.1 of the Scoping Report.

***Dams are operated over the course of the year to achieve various levels and objectives. At any time of the year, stable water levels will exist if flows into and out of the lake are the same. When inflows change either through runoff from snowmelt and or rainfall, water levels will rise until such time as the outflow matches the inflow. The dam is operated to try to achieve this.***

***In a flood situation the inflows will exceed the outflows. The dam is operated to balance flood conditions on the lake and areas downstream. Once the lake stabilizes, water levels begin to drop again as the inflows recede and the outflows exceed the inflows. The dam is then operated to reflect the reduction in inflows to return levels to a stable situation. The dam is not operated after every event unless flooding is an issue, so natural increases and decreases will occur over the course of the summer in response to those events. During extremely dry years, more water will be lost through evaporation, which in turn causes water levels to drop as the summer progresses. The dam may be operated in this situation to ensure the ecological integrity of the system is maintained by allowing some water to flow through the structure. The operating guidelines allow for a target range of 20 cm (8 inches) band around the optimum level to allow some fluctuation to occur. While a change in the water levels may have some impact on shoreline through erosion, erosion is a natural process and part of the natural evolution of a watercourse.***

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

2.7 Comment: **The residents and cottagers absolutely expect stable water throughout the recreational season. Current water level regulations are acceptable for local residents, cottagers and fish species. Also, damage would be expected to boats and docks if levels were to fluctuate significantly during the regular season.**

***Response:*** ***The Water Management Plan will strive to balance the objective of emulating the natural flow regime with respect to all of the other planning objectives as identified in Section 5.1 of the Scoping Report.***

***Dams are operated over the course of the year to achieve various levels and objectives. At any time of the year, stable water levels will exist if flows into and out of the lake are the same. When inflows change either through runoff from snowmelt and or rainfall, water levels will rise until such time as the outflow matches the inflow. The dam is operated to try to achieve this.***

In a flood situation the inflows will exceed the outflows. The dam is operated to balance flood conditions on the lake and areas downstream. Once the lake stabilizes, water levels begin to drop again as the inflows recede and the outflows exceed the inflows. The dam is then operated to reflect the reduction in inflows to return levels to a stable situation. The dam is not operated after every event unless flooding is an issue, so natural increases and decreases will occur over the course of the summer in response to those events. During extremely dry years, more water will be lost through evaporation, which in turn causes water levels to drop as the summer progresses. The dam may be operated in this situation to ensure the ecological integrity of the system is maintained by allowing some water to flow through the structure. The operating guidelines allow for a target range of 20 cm (8 inches) band around the optimum level to allow some fluctuation to occur. While a change in the water levels may have some impact on shoreline through erosion, erosion is a natural process and part of the natural evolution of a watercourse.

This process has been legislated by the Provincial Government and will review and formalize the operating guidelines of all dams affecting the water levels and flows to hydro facilities within the study area. It will assess various options for change starting from maintaining the status quo for all structures. Any option to be considered will be assessed with regard to the objectives. In order for an option to be accepted, a net gain to the system would have to be evident and then a public review of that option would be undertaken. Concerns that residents have regarding reducing the summer levels and the potential impact on navigation, docks, etc. will be taken into consideration when developing options.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

2.8 Comment: **Can the recreational season extend beyond Victoria Day to Labour Day.**

Response: The dam is currently operated from the Victoria Day weekend to the first week of November to meet recreational / tourism objectives.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***2.9 Comment:*** *What are the priorities for operation for this lake?*

Response: Under the current operating guidelines, the priorities for this lake are flood control, fisheries, recreation, tourism, and navigation and low flow augmentation in accordance with the Spatial and Temporal Chart.

Figure 1: Spatial and Temporal Constraints Chart.

| Mazinaw Lake Dam | Spring (Mar 1 – May 31) | Summer (May 23 – Oct 15) | Fall (Sept 15 – Dec 1) | Winter (Nov 15 – Mar 15 |
|---|---|---|---|---|
| | | | | |
| Flooding | Maximum 268.00m, emergency bypass floods at 268.20 m, dam overtops at 269.00 m, dwelling flooding begins at 268.55 m. | Maximum 268.00m,.Dock / Nuisance flooding at 268.00 m | Maximum 268.00m,.Dock / Nuisance flooding at 268.00 m | No concern on lake due to draw down. Draw Down assists in reduction of spring flood magnitudes downstream |
| Fisheries Lake Trout | No concern | No concern | Draw down - mid November after spawn has taken place, potential cause of reduction in spawn survival | Stable levels at or above 266.8 m not reached until January after ice is on lake |
| Walleye on lake - downstream of dam | No concern, covered by natural filling of lake in spring Critical to slow flow and maintain flow before or early in spawn period | No concern | No concern | No concern |
| Bass | Not applicable | Not applicable | Not applicable | Not applicable |
| Other | Not applicable | Not applicable | Not applicable | Not applicable |
| Wildlife | Stable water levels after ice out for loons/nesting birds if possible | No concern | Burying amphibians, reptiles etc and wildlife muskrats, beaver etc at risk since lake doesn’t reach minimum levels until after ice on. | Burying amphibians, reptiles etc and wildlife muskrats, beaver etc at risk since lake doesn’t reach minimum levels until after ice on. |
| Recreation / Tourism | Stable levels at 267.80 (+/- 0.10) m from long weekend in May through September | Stable levels at 267.80 (+/- 0.10) m Allow access to pictographs, beach at Bon | Stable levels at 267.80 (+/- 0.10) m | Stable ice conditions for ice fishing / snowmobiling / cottage access |

| | | | | |
|---|---|---|---|---|
| | | Echo | | |
| Erosion | No concern | No concern | No concern | No concern |
| Navigation | No concern | No concern | Access to boat only access properties and through narrows must be maintained until after hunting season | No concern |
| Ice | Limit ice movement until soft to reduce shoreline damage | Not applicable | Not applicable | Limit ice movement until soft to reduce shoreline damage |
| Low Flow Aug | Not applicable | Maintain minimal flow (undefined) | Use all of target range to 267.60 m if required | Drawdown used to assist in refilling Crotch Lake |
| Power Generation | Not applicable | Not applicable | Not applicable | Not applicable |

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***2.10 Comment:*** *Concerned about the movement of native fishing rights disrupting walleye runs.*

Response: Section 35 of the Constitution Act, 1982, recognizes existing Aboriginal and Treaty rights of aboriginal people in Canada. The Algonquins are asserting an aboriginal right to harvest fish within their traditional territory. While native fishing rights are beyond the scope of this process, it is important to understand that any such rights are subject to conservation of the species.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***2.11 Comment:*** *Has the Department of Fisheries and Oceans done any assessment of the compensation package carried out by MVC to mitigate the impact on the spawning shoals by not changing the drawdown date.*

**Response:** No final report was required or completed on the results of the work undertaken as part of the compensation package. The former, fish habitat compensation agreement is outside the scope of the current planning process.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***2.12 Comment:*** *The current operating levels on the lake are good, however, given today's technology, a small space-age electricity generating unit at the Mazinaw Lake Dam is a possibility and should be considered. What impacts would operating the structures for Hydro generation have on this structure?*

Response: This is out of scope of the process.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***2.13 Comment:*** *Bathymetric mapping for all lakes should be completed by MNRF and made available to the public. Spawning shoals should be more precisely pinpointed on the maps and also made available to the general public.*

Response: Location of spawning shoals is considered sensitive information by MNRF and is generally not available to the public.

Bathymetric maps for some lakes are available to the public from MNRF offices.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***2.14 Comment:*** *Was there a final report completed on the Fish Habitat Compensation Agreement undertaken when the dam was rebuilt as part of continuing on with the existing operation plan? Is it available to the general public?*

Response: No final report was required or completed on the results of the work undertaken as part of the compensation package. The former, fish habitat compensation agreement is outside the scope of the current planning process.

Further information can be obtained from MVC.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***2.15 Comment:*** *Concerned about land use planning around Mazinaw Lake and impact on lakeshore habitat.*

Response: This is outside the scope of this process. Other processes such as watershed plans and municipal land use plans are the appropriate vehicles to address this issue. Specific comments and concerns in this regard could be directed to MVC and local municipalities

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***2.16 Comment:*** *The background report does not deal with other issues such as water quality and tourism and recreation. Total environment and social costs need to be included.*

Response: Water quality issues are outside the scope of this process, as outlined in 2.15.

Socio-economic costs will be dealt with as part of the process when determining net benefits of any proposed changes to existing operating plans.

Action: This is out of the scope of this process. A copy of the final report will be distributed to all appropriate agencies. Water quality issues should be directed to MOE, MVC, municipalities and/or local health unit.

## 3.0 MARBLE LAKE

A total of one survey was returned from an individual living on Marble Lake. Marble Lake is an uncontrolled lake between Mazinaw and Kashwakamak Lakes on the Mississippi River.

***3.1 Comment:*** *What impact does the operation of Mazinaw Lake dam have on water levels on Little Marble Lake, Marble and Georgia Lake. Water level management on this lake is primarily a summer issue. What can be done to stabilize summer season water levels on this lake?*

***Response:*** ***The removal and replacement of stoplogs at Mazinaw Lake dam does have an impact on water levels in the downstream lakes. In the spring the dam is operated to ensure that Mazinaw Lake will reach its normal summer level near the long weekend of May while at the same time helping to reduce any downstream flooding by utilizing the storage available in this lake. The objective is to maintain a relatively stable outflow from the lake from early April through mid May as there is a walleye spawning shoal immediately downstream of the dam. Further, we must ensure that storage is not reduced in the lake too soon so that late spring runoff will not necessitate the removal of more than one log at a time from the dam. This can affect water levels on Little Marble and Marble Lakes. If there is the possibility of the structure being overtopped then the dam is operated to try to ensure that this does not occur. During the summer the dam is typically not operated unless significant rain events occur which increases lake levels near or above the established operating range for the dam. In these circumstances the dam is operated to stabilize lake levels by matching inflow and outflow until levels return to normal. The dam is only operated during the summer months to respond to rain events. Unless the storage capacity of Mazinaw Lake is increased, the fluctuations on Marble Lake as a result of a rainfall event cannot be reduced.***

***The physical constraints of the Mazinaw Lake Dam prohibit the ability to increase the storage capacity to decrease outflows from significant rainfall events. This can only be achieved by maintaining lower summer levels on Mazinaw Lake, which would compromise tourism and recreation use and navigation constraints on the lake. Therefore this is not a viable option.***

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

3.2 Comment: **Stable ice in the winter is a concern for recreational users and shoreline damage.**

***Response:*** ***Due to the legal constraint on Mazinaw Lake drawdown, winter levels will not stabilize on Marble Lake until after the ice is in.***

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***3.3 Comment:*** *A weir is required at the outlet of Marble Lake to maintain summer levels approximately one foot higher than present.*

Response: This is beyond the scope of this process. The process to construct a dam would require an individual to make an application to the applicable agencies. Public funding for this type of construction is not likely to be available.

The process to construct a dam, however, would require an agreement from the majority of property owners on the lake as to what elevations are desired. Some of the details that would be required are funding sources, structural design, environmental impact assessment, ownership, construction, monitoring, operating and maintaining the structure.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

## *4.0 KASHWAKAMAK LAKE*

A total of one questionnaire with comments was returned from a person having property on or comments regarding Kashwakamak Lake. Five questionnaires were submitted with no comments but indicating water levels were ok year round. As well, a letter was submitted by the Kashwakamak Lake Cottage Association, signed by members of the Board of Directors for the Association, indicating that the 200 member association "is satisfied with the water levels currently being maintained in the lake by MVC through its operation of the dams."

***4.1 Comment:*** *Increased outflow out of Kashwakamak Lake causes erosion on Farm Lake and will adversely impact wild rice stocks in Ardoch.*

Response: With the exception of the fall drawdown, dams are operated to pass flows from rainfall and/or snowmelt events. Significant increases in stream flows or water levels can create erosion, which is a natural process. Under normal operating conditions for Kashwakamak Lake dam, no more than two stop logs are removed at any one time, to minimize downstream erosion and flooding.

Wild rice requires a flowing system to exist in a water body. Wild rice is sensitive to long term changes to water levels. Changes to water levels in Farm and Mud Lake would potentially affect the location and abundance of wild rice.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***4.2 Comment:*** *Low levels such as those experienced during drought summers, limit water access to some properties. As long as Kashwakamak Lake has inflows (including springs), that exceed evaporations, can the outflow be set to maintain a minimum navigable water level?*

Response: Under normal conditions for this lake, once the logs are all in (usually mid May to mid June), the dam is not operated and the overflow weir controls water levels.

The upper lakes are not typically operated to assist in maintaining downstream flows until at least mid-August. Under drought conditions, this lake will slowly drop over the course of the summer through evaporation and the level will likely be at or near the lower end of the target range of 261.00 metres a.s.l.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***4.3 Comment:*** *Ice damage to docks occurs when the lake is filled too early in the year. Cottagers should be required to use removable docks. Fluctuating levels once the ice is on the lake is a safety concern for residents.*

Response: This concern is addressed in the current operating plan for the dam. While it is preferable to not put stoplogs back in the dam before the ice is at least soft, every year presents a different situation and may require stoplogs to be put in earlier than desired. Winters with well below average precipitation, either rain or snow, necessitate the need to put logs in early in order to ensure reaching summer target levels. Occasionally this causes problems when wet springs occur, but without the availability of ry accurate long range forecasts this will continue. As well, occasionally, very early freshets or significant events occur which can either raise the lake directly or require the use of these upper lakes to help offset severe flooding downstream which necessitates the replacement of stoplogs when the ice is still solid on the lake.

The damages to docks could be somewhat alleviated by cottage owners using removable docks however, there is no mandatory requirement for this and is outside the scope of this process.

Ice safety for recreation is also outside the scope of this process. Anyone using ice for recreational purposes should be aware of the ice conditions. Under unusual flow conditions, MVC may issue a watershed conditions bulletin outlining safety concerns.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

4.4 Comment: **Is the fall drawdown detrimental to fish and their habitat, benthic vertebrae wildlife (amphibians and reptiles)? Does the fall drawdown continue after the lake has frozen over?**

Response: Fall drawdowns affect some species more than others. Fall spawning species like lake herring and lake whitefish can be adversely affected if spawning habitat and eggs are dewatered. Warm water species like walleye, pike and bass spawn in spring and early summer and are not affected by fall drawdown. By the time the fall drawdown begins, young-of-year fish of most species have grown to sub-adult size, and have migrated to their overwintering habitat in the pelagic areas of the lake. Those fish species that remain littoral at this time of year are mobile enough to migrate with the drawdown. The magnitude of the drawdown on Kashwakamak is less than 1.5m; there would still be sufficient vegetation available for cover at the reduced depth.

Aquatic hibernating amphibians and reptiles do best when stable water levels exist in late fall and during ice cover. They over-winter in water, burying themselves in the bottom mud of streams and lakes. These hibernating creatures have limited ability to move to avoid dewatering after the onset of hibernation.

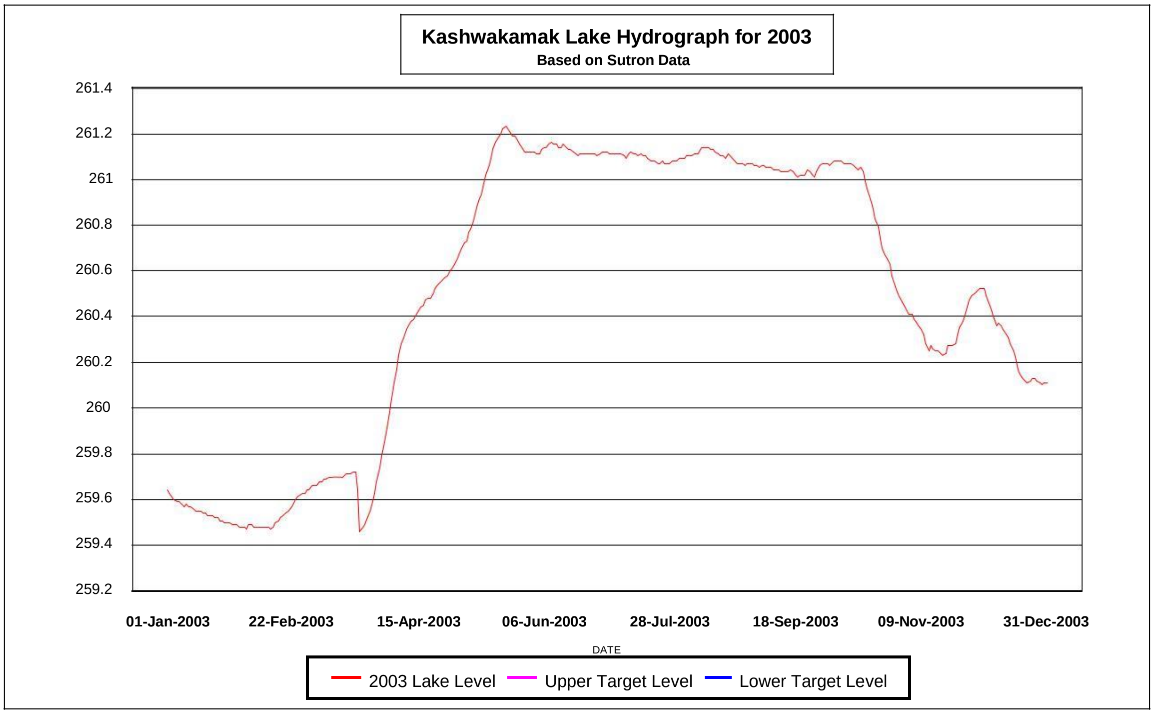
On Kashwakamak Lake, most of the drawdown has been completed prior to the lake freezing over, which allows some protection for these animals. Kashwakamak remains relatively constant until the drawdown on Mazinaw Lake is complete and continues to drop, reaching its minimum level around early- to mid-January. The continued drawdown after the ice is on the lake may result in some hibernating amphibians and reptiles in the dewatered areas not surviving. The legal constraint on Mazinaw Lake does not allow an earlier drawdown on Mazinaw Lake.

Action: The option of discontinuing the drawdown on Kashwakamak Lake once Mazinaw Lake drawdown is completed will be examined.

4.5 Comment: **Were the low summer levels of 2003 a direct result of dam operations? How is the dam operated during drought conditions?**

Response: Records indicate that the levels on Kashwakamak Lake for 2003 remained well within the 20 cm target range that the dam is currently operated throughout the summer to the Thanksgiving weekend.

Figure 2: Kashwakamak Lake Hydrograph




As the summer and drought conditions progress, the dams throughout the system are operated to maintain minimum flows through the Mississippi River. The operation of each dam depends on the severity and timing of the drought as well as conditions upstream and downstream. Minimum flows are necessary to maintain ecological integrity throughout the system. Typically, the lakes initially drop to the lower level of the target range through maintaining some minimal flows and evaporation, which is 10 cm below the optimum summer level. If levels drop below this elevation, spacers may be installed between the top logs to ensure some flow continues downstream.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***4.6 Comment:*** *Some years, water levels come up in the spring before the ice is out, damaging docks. Can anything be done to minimize this problem?*

Response: This concern is addressed in the current operating plan for the dam. While it is preferable to not put stoplogs back in the dam before the ice is at least soft, every year presents a different situation and may require stoplogs to be put in earlier than desired. Winters with well below average precipitation, either rain or snow, necessitate the need to put logs in early in order to ensure reaching summer target levels. Occasionally this causes problems when wet springs occur, but without the availability of very accurate long range forecasts this will continue. As well, occasionally, very early freshets or significant events occur which can either raise the lake directly or require the use of these upper lakes to help offset severe flooding downstream which necessitates the replacement of stoplogs when the ice is still solid on the lake.

The damages to docks could be somewhat alleviated by cottage owners using removable docks however, there is no mandatory requirement for this and is outside the scope of this process.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***4.7 Comment:*** *A number of lake residents lose access to water with the fall drawdown. Depending upon ownership of "drowned lands" they may have to cross a neighbour's property to get to the lake when water levels have been drawn down.*

Response: Navigational access to property is one of the objectives for this process. Maintaining higher fall water levels on Kashwakamak Lake for ecosystem benefits may benefit navigational access to property.

Action: The option of discontinuing the drawdown on Kashwakamak Lake once Mazinaw Lake drawdown is completed will be examined.

***4.8 Comment:*** *When water is dumped from Kashwakamak Lake it causes shoreline erosion. Can outflow shock be reduced to minimize this?*

Response: Erosion is a natural process. The operating regime cannot eliminate the potential for erosion along the shoreline. Under normal fall drawdown conditions, stoplogs are removed at a rate of no more than two per day, to lessen the degree of flooding and erosion to downstream areas. This is a function of the current operating guidelines. There are ecologically sound methods to protect shoreline from erosion. This is the responsibility of individual shoreline owners to undertake this work with the necessary authorization and permits. Permits are required from agencies including Department of Fisheries and Oceans, Mississippi Valley Conservation and the Ministry of Natural Resources.
Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

## *5.0 MALCOLM LAKE*

The following comment was submitted in a report prepared by the PAC members.

***5.1 Comment:*** *Can minimum levels on Malcolm Lake be established and maintained to allow access to Green (Ardoch) Lake from Ardoch.*

Response: Malcolm Lake has a structure that is operated as an overflow weir that cannot manipulate water levels and flows and is therefore outside of the scope of this process. However, there is an operating plan for this structure, which is followed. Under normal conditions, the dam is not operated and water levels on Malcolm and Green Lakes are directly maintained by rainfall and snow melt inputs. Green Lake is not accessible from the Village of Ardoch, as it does not flow directly into the Mississippi River.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

## *6.0 BIG GULL LAKE*

A total of one questionnaire with comments was received from an individual having property or comments regarding Big Gull Lake. One questionnaire without comments was also received indicating summer levels were too low and winter levels were ok. Concern for summer level was from a boating/navigation concern. Three additional emails were received following the scoping report indicating that residents prefer that the lake remain as it is.

***6. 1 Comment:*** *Too much water taken out of Gull Lake in fall and the stoplogs are not put back in soon enough in spring, resulting in low summer water levels.*

Response: With Big Gull Lake being a large headwater lake with very few tributaries to supply water in the spring, this is always a concern. Past operations have shown that the magnitude of draw down is the most effective in minimizing downstream flooding by storing water. Also required is enough runoff to adequately fill the lake without causing flooding on the lake. Occasionally, dry springs have resulted in lower water levels early in the spring and in the case of the drought of 2001, low water levels throughout the summer. This facility is operated in expectation of historical climatic conditions, however due to the potential impact of climatic change, the drawdown of this lake will continue to be assessed to determine if a change is warranted.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***6.2 Comment:*** *Does the current water level management plan make accommodation for walleye spawning in Big Gull Lake? The walleye spawning shoals are left uncovered in dry springs.*

Response: The walleye spawning shoals are considered when operating the dam, however they are not formally addressed in the current operating guidelines. The shoals are covered by water early in the process of filling the lake. Water levels in the lake are not reduced as a result of dam operations once optimum levels have been reached, unless flooding is a concern on the lake. Once levels return to within the target range no dam operations occur. Exposure of walleye shoals during the spring spawning and incubation period is only an issue during unusually dry springs such as the spring of 2001 when optimum summer water levels were never achieved.

This facility is operated in expectation of historical climatic conditions. However due to the potential impact of climatic change, the drawdown of this lake will continue to be assessed to determine if a change is warranted.

Action: The current operating guidelines will be updated to acknowledge the significance of the spawning shoals.

***6.3 Comment:*** *Residents feel that the current summertime water levels are too low. Can they be increased?*

Response: All stoplogs are replaced in the dam early in the spring in accordance with the current operating guidelines. Increasing water levels beyond current target ranges results in flooding concerns. Maintaining the level within the target range throughout the summer is dependent on precipitation and evaporation.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***6.4 Comment:*** Concern has been expressed about the reduction of flows into Gull Creek impacting walleye spawning.

Response: Big Gull Lake is a headwater lake with limited inflows from tributaries. Under normal circumstances, it relies entirely on spring runoff to refill it after the fall drawdown. In order to meet its objectives for fisheries on the lake, tourism and recreation, it may be necessary to completely shut off flows to capture all possible runoff, especially during spring with little to no snowfall. This ensures the survival of the walleye spawn on the lake, however will have a detrimental impact on the walleye spawning shoals at the outlet of Gull Creek into Crotch Lake.

Walleye spawning activity has been documented for many years at the mouth of Gull Creek where it enters Crotch Lake. MNRF observations at this spawning site have shown that the number of walleye using the site has been relatively small. Low quality spawning substrate and intermittent flow rates maybe contributing to low use by spawning walleye.

Walleye spawning activity out from the mouth of Gull Creek in the Colonel Island area is not affected by flow rates from Gull Creek. These shoal spawning areas are affected by the water level in Crotch Lake and the availability of suitable spawning habitat. In 1987 MNRF conducted a walleye spawning habitat inventory survey; however, no potential shoal spawning areas were identified in this location.

The current water management strategy for Crotch Lake ensures that water levels do not decrease during the spawning and incubation period for walleye. Suitable spawning habitat for walleye is found at various depths throughout Crotch Lake. Walleye are opportunistic spawners; rather than using a ‘traditional’ shoal for spawning, walleye will utilize the best habitat available to them for spawning, in order to maximize their success. MNRF has not identified any problem with walleye recruitment on a lake wide basis. Sites like Colonel Island make variable contributions to the overall walleye recruitment in Crotch Lake as a result of varying lake levels and the resulting effect on available spawning habitat.

Action: Consideration will be given to amend the operating guidelines to address this concern. The elevation and location of the spawning shoals in question will be determined. They will attempt to address the spawning requirements in the creek without impacting on the current priorities for the lake (including the spawning success of walleye on the lake).

***6.5 Comment:*** *Public comments contained in the Scoping Report regarding Big Gull Lake are inadequate, misleading or incorrect (specifically section 4.5 and 12.4).*

Response: The information contained in section 4 of the scoping report is a summation of all of the issues that have been raised through the open houses and by the PAC. This was used to help to develop the objectives for this process. These issues have been brought forward by a small number of people and may not reflect the views of the majority of the people on the lake. The issues shown in section 12 are directly from the PAC report.

It is the responsibility of the Planning Team to respond to these issues.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

## *7.0 MISSISSAGAGON LAKE*

A total of one questionnaire without comments was received from an individual having property or comments regarding Mississagagon Lake, indicating summer, winter and spring levels were too low and fall levels were ok.

***7.1 Comment:*** *Is lowering the water in the fall detrimental to the shore resident wildlife that inhabits the marshy area around Sucker Creek?*

Response: Obviously the marshy areas around Sucker Creek that are dewatered as a result of the drawdown will cause a change in wildlife habitat. However, typically the fall draw down begins Thanksgiving weekend and is complete before the lake freezes over. Winter denning furbearers, especially muskrat and beaver, and hibernating amphibians and reptiles need stable water levels in late fall and during ice cover. The furbearers build an entrance to their den below the low water level to ensure an entrance free from winter ice. Water levels dropped too low after these species have entered their winter habitats can essentially freeze them out. Species like beaver and muskrat can adapt to moderate changes in water levels in late fall and winter.

Amphibians and reptiles over-winter in water, burying themselves in the bottom mud of streams and lakes. Amphibians require well oxygenated water to survive the winter and dropping water levels after they have entered winter habitat can cause ice to freeze to their depth or crowd the habitat such that oxygen is severely depleted.

The current operating guidelines require the fall draw down to be completed prior to the lake freezing over, such that winter water levels are achieved prior to these wildlife species entering their winter habitats. This winter water level is maintained into early spring to minimize impacts. Periodically wet falls such as 2003 can cause problems for the animals but this would not be the norm.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

## *8.0 CROTCH LAKE*

A total of ten questionnaires and two emails were received from individuals having property on or comments regarding Crotch Lake. One questionnaire without comments was received indicating summer levels were too low and a concern for the loons.

***8.1 Comment:*** *Can the twice annual drawdowns on Crotch Lake be reduced or minimized? Since water resources are considered finite and no new water is produced, then why are the upper lake pulled down rapidly in the fall to fill one lake with the same water? Why not allow the upper lakes to dump the same water gradually over the course of the winter so that one lake does not experience the double drawdown? Would this not replicate the natural drawdown in all the upper lakes while water for the spring freshet is held in storage in the form of ice and snow?*

Response: Management of the Mississippi River has evolved over several decades in response to changing economic, social and environmental conditions throughout the watershed.

The operating regimes for Crotch Lake and upstream lakes have been integrated to provide the greatest potential to equitably allocate the available water among a wide range of uses and interests. Due to this integration, changes in individual operating regime may have significant implications to existing uses and expectations.

As part of the WMP process a range of options will be assessed through modeling to address this question and its implications.

Action: Based on historical data, the implications of different operating regimes including the reduction in the magnitude of the drawdown, timing of the drawdowns and a single drawdown, will be assessed.

***8.2 Comment:*** *Concern regarding fluctuating water levels, particularly during the spawning season. It is indicated in the background report that you do not raise the water level during the spawning season. We live on the lake and can attest to the fact that this is not a true statement.*

Response: The background report states: “In the spring the lake is down to approximately 237.00 m with up to 12 logs out of the control section or sluice. As runoff begins the stoplogs are replaced to capture that water. It is extremely important to determine when walleye begin spawning on the lake, as levels cannot drop below the elevation they start to spawn at for a period of six weeks. The lake is filled to an elevation between 239.50 and 240.00 m and operated to maintain levels there until late June.”

In the early 1990’s, Ontario Hydro, Dalhousie Lake Working Group, representatives from Crotch Lake, MNRF and MVC, revised the operating plan for Crotch Lake to ensure that the walleye fisheries on Crotch Lake and at the inlet to Dalhousie Lake were both addressed as much as possible during spring operations.

As Crotch Lake begins to fill in early April, MNRF is to advise MVC when the walleye spawn has begun on Crotch Lake and at Dalhousie Lake. Crotch Lake is then filled to accomplish its many roles in the system with the understanding that as long as the lake does not fall below the level the walleye started spawning at, the eggs on the lake should survive.

The requirements for the walleye, below High Falls, are to maintain a constant flow for as long as possible once the spawning activities have started. The flows at High Falls are reduced as much as possible prior to the spawn so that the lower flow can be maintained for a longer period of time. This is not always possible, as the High Falls G.S. is a run of the river dam with no significant ability to store water. When significant rains occur or the snowmelt runoff diminishes, there is no ability to reduce or augment flows through operations of this structure. What is happening on Crotch Lake and the upper system is then looked at to try to offset conditions at High Falls while ensuring summer levels can be reached. Ensuring there is sufficient water in the lake so flows can be maintained into late June for the bass which spawn in the Snow Road area, needs to also be considered.

In the event of an unusually dry spring, Crotch Lake is critical for maintaining the ecological integrity of the downstream river system through low flow augmentation. Therefore, it is important to build water levels in Crotch Lake through the spring runoff period. This may result in flows being reduced, affecting the walleye spawning success in the river, downstream of High Falls at the inlet to Dalhousie Lake. However, this is a rare situation and mimics a natural system under this condition. Walleye spawning activities in Crotch Lake would be protected.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***8.3 Comment:*** *In spring the water is lowered shortly after walleye spawn and eggs dry up.*

Response: See response to 8.2.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***8.4 Comment:*** *The rate of drawdown on Crotch Lake leaves the bass spawn in shallow water so it dies.*

Response: The critical spawning period for bass extends from approximately the last week of May through the first week of July. The operating guidelines specify that water levels be maintained at or near the upper target level during this period. Bass spawning is not specifically addressed in the operating guidelines, however it benefits from this operation.

Historically, concerns regarding bass spawning have arisen in the Snow Road area. The operations on the lake have been refined over the years to ensure that as long as there is sufficient water in the system, flows and levels are maintained through the Snow Road area during this time period to ensure spawning success. In the event of an unusually dry spring, Crotch Lake is critical for maintaining the ecological integrity of the downstream river system through low flow augmentation. Therefore, it is important to build water levels in Crotch Lake through the spring runoff period. This may result in flows being reduced, affecting the bass spawning success in the river, through Snow Road area. However, this is a rare situation and mimics a natural system under this condition.

Action: Current operating guidelines will be updated to reflect bass spawning considerations.

***8.5 Comment:*** *The 12 to 14 foot drawdown on the lake has serious impacts on the walleye population and has resulted in fish being trapped and dying in small pockets of water.*

Response: A review of the bathymetric data that was recently collected for Crotch Lake suggests that the areas where this is likely to be a concern are limited to Fawn and Twin Island Lakes, due to depth restrictions in the channels to Crotch Lake. Fawn Lake has a deep- water basin that is in excess of 30 feet (9 metres) deep. When Crotch Lake is drawn down this basin is isolated from the main basin of Crotch Lake, but is of a sufficient depth to support walleye over the winter period. Twin Island Lake does not have a deep water area, however, the rate of draw down (on average, one log every ten days) allows an opportunity for walleye and other fish species to migrate out of shallow areas, into the main body of Crotch Lake. The likelihood of walleye being trapped in small pockets of water is remote and has not been observed or documented by MNRF.

A drawdown of up to 14 feet (over 4 metres) will affect the total amount of available walleye habitat in Crotch Lake, simply through the reduction in the lake volume. However, despite the magnitude of the biannual drawdown, recent MNRF walleye population assessments indicate a healthy fishery.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***8.6 Comment:*** *The fishing was best when the water levels would drop to the lowest level at the end of the summer and stay there over the winter. The fish could follow the change and the fishing remained healthy.*

Response: There are many factors which contribute to the health of the walleye fishery in a given lake, including water chemistry, water transparency, weed growth, spawning and nursery habitat, basin morphometry, shoreline development, angling pressure, and fish community. Assessment of results from recent (2001) Fall Walleye Index Netting (FWIN) studies conclude that, when compared to other walleye lakes in Southern Ontario, Crotch Lake is considered to support a “healthy” walleye fishery. This classification is based on a number of biological indicators evaluated as part of the FWIN analysis, including catch per unit effort, age distribution, female growth rates, lake size and character.

The operating guidelines for Crotch Lake have remained essentially unchanged for more than fifty years; it is unlikely that water management alone has been the cause of any measurable difference in the quality of angling on Crotch Lake in recent memory.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***8.7 Comment:*** *Reduction in Crotch Lake drawdown from 12’ to 5‘ would return the lake to its previous reputation as a great lake to fish. Upper lakes should have to share their water.*

Response: Please refer to the response for 8.1 and 8.6

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***8.8 Comment:*** *The water level in September and March is too low and results in fish being stranded in pools. Also makes it difficult to access the lake for recreation.*

Response: The rate of draw down (on average, one log every ten days), allows an opportunity for walleye and other fish species to migrate out of shallow backwater areas, into the main body of Crotch Lake. The likelihood of numerous fish being trapped in small pockets of water is remote and has not been observed or documented by MNRF.

The municipal boat launch at the south end of Crotch Lake was constructed in mid -summer before the lake reached its minimum level. This has resulted in access issues in late summer when water levels drop. Another municipal boat launch exists at the north end of the lake at

Side Dam Rapids, which allows access throughout the summer. This is a structural issue with the design of the boat launch and therefore outside the scope of this process.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***8.9 Comment:*** *High water in early summer makes fishing difficult.*

Response: The effects on fishing quality that are observed during the high water period in early summer may be based on the fact that fish have more habitat to utilize. This may cause any fish species in the lake to be more widely distributed and harder to find.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***8.10 Comment:*** *Fishing was best in Crotch Lake when the lake dropped to its minimum level and stayed there over winter. This has only changed in the last 15 years. The drawdown in February causes the ice to drop thereby trapping fish in the pockets and killing them.*

Response: The operating guidelines for Crotch Lake have remained essentially unchanged for more than fifty years; it is unlikely that water management alone has been the cause of any measurable difference in the quality of angling on Crotch Lake in recent memory.

A drawdown of up to 14 feet (over 4 metres) will affect the total amount of available walleye habitat in Crotch Lake, simply through the reduction in the lake volume. However, despite the magnitude of the biannual drawdown, recent MNRF walleye population assessments indicate a healthy fishery.

In winter, walleye seek out habitat that is adjacent to steeper shorelines and deeper water areas. In winter, deeper water is warmer than shallow water. Walleye inhabit these areas to survive cold water temperatures in winter. This natural migration helps to ensure that walleye populations will survive the February drawdown.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

8.11 Comment: **Does the twice, annual drawdown, put stress on existing fish populations through aquatic habitat alteration and destruction. Did this practice result in the demise of the native lake trout population?**

Response: The operating plan for Crotch Lake ensures that fisheries on Crotch Lake are addressed as much as possible during spring operations. The timing of the summer drawdown may contribute to small, localized incidences of summer kill of cyprinids (minnows) and forage fish in Fawn and Twin Island Lakes, however, it is unlikely that this translates to any actual effect on the Crotch Lake fishery.

The winter drawdown may have some effect on benthic invertebrates, amphibians and turtles, which hibernate in littoral mud.

The extirpation of native lake trout from Crotch Lake is a complicated issue. Prior to the construction of the original Crotch Lake dam for logging in the 1860s, Crotch Lake would have existed as two smaller, separate lakes, each of which supported a population of lake trout. The construction of the original dam and the resultant increase in productivity of the new Crotch

Lake would have caused a temporary boom in the relative abundance of lake trout. However, once the lake productivity had normalized, the lake trout population would have been reduced, and further compromised by competition/predation by walleye, which were stocked in the lake, beginning in the 1930s. As a result, the Department of Lands and Forests began supplemental stocking of lake trout in Crotch Lake.

The construction of the current dam, and the establishment of the mid-winter draw down in the 1950s would have made natural reproduction of lake trout impossible in Crotch Lake; spawning shoals that were covered by water in mid-October would be exposed in the middle of the incubation period, causing egg mortality. The Department of Lands and Forests discontinued the lake trout stocking program in the early 1950s – remnant lake trout may have existed in the lake for many years after that.

Clearly, the current water management regime makes natural reproduction of lake trout impossible in Crotch Lake. However, it should be noted that Mississagagon, Kashwakamak and Big Gull Lakes also once supported lake trout. The loss of lake trout in these lakes is primarily attributed to population changes, initiated by the introduction of walleye: none of these lakes has a late winter draw down. Clearly, while the disappearance of lake trout from Crotch Lake may have been expedited by the winter draw down, with the introduction of walleye, bass, pike, perch and rock bass, it was inevitable nonetheless. Under MNRF's current fisheries management plan this lake is now managed as a walleye fishery.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

8.12 Comment**: As a result of the winter drawdown are the best walleye spawning areas high and dry in April?**

Response: MNRF staff conducted walleye spawning surveys in spring 1995, and found evidence of walleye reproductive activities at numerous locations in the lake. The following is an excerpt from the report of the 1995 survey:

"It is noteworthy that due to the lack of spring runoff and little rain during the spring of 1995, water flows into the lake were considerably reduced and the lake level was approximately 2 metres below normal springtime levels…despite the unusually low water levels which left extensive areas of suitable spawning habitat exposed along the shoreline, there was an abundance of suitable clean spawning rubble available for egg deposition by walleye."

The current water management strategy for Crotch Lake ensures that water levels do not decrease during the spawning and incubation period for walleye. Suitable spawning habitat for walleye is found at various depths throughout Crotch Lake. Walleye are opportunistic spawners; rather than using a 'traditional' shoal for spawning, walleye will utilize the best habitat available to them for spawning.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***8.13 Comment:*** *Based on the FWIN (Fall Walleye Index Netting) survey results, why is the walleye fishery in Crotch Lake ranked behind both Kashwakamak and Big Gull Lakes.*

Response: Fall Walleye Index Netting (FWIN) is a standardized protocol used by the MNRF to assess the health of walleye populations in Ontario lakes. The "ranking" referred to in this comment is a comparison of the Catch per Unit Effort (CUE) of recent FWIN results on Crotch

Lake (2.0 fish per net) to those of nearby Big Gull (3.6 fish per net) and Kashwakamak Lakes (7.1 fish per net).

It is inappropriate to compare the results of FWIN netting among three lakes based solely on the CUE. CUE alone cannot be regarded as an indication of the health of the walleye population in any given lake. FWIN analysis generates many other values, which are used in the assessment of the health of the fishery, including size distribution, age distribution, mortality, growth, condition, sex ratio, maturity and reproductive characteristics.

Further, there are many factors which contribute to the health of the walleye fishery in a given lake, including water chemistry, water transparency, weed growth, spawning and nursery habitat, basin morphometry, shoreline development, angling pressure, and fish community. FWIN does not assess any of these variables.

A complete analysis of the FWIN results for Crotch (2001), Big Gull (1998), and Kashwakamak Lakes (2000) is available from the Bancroft MNRF office. Briefly, however, when compared to other walleye lakes in Southern Ontario, Crotch Lake, Big Gull and Kashwakamak are all considered to support "healthy" walleye fisheries. This classification is based on a number of biological indicators evaluated as part of the FWIN analysis, including catch per unit effort, age distribution, female growth rates, lake size and character.

<u>Action by MRWMP:</u> The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

8.14 Comment: **Is Crotch Lake more valuable economically as a reservoir or as a prime recreational destination?**

<u>Response:</u> This lake is valuable as a recreational destination. It is also valuable as a reservoir to maintain the ecological health of the river downstream. It is recognized that the lake is currently used to the benefit of both, however any options developed will consider the benefits and costs associated with these objectives.

<u>Action:</u> This comment will be addressed under the action for Crotch Lake 8.1.

***8.15 Comment:*** *What is the impact on aquatic life caused by the drawdowns? Is the impact compounded by twice, annual drawdowns? What measures can be taken to alleviate some of this impact? Crotch Lake has limited weedy, shallow areas. What is the impact when water is removed from these areas?*

<u>Response:</u> The magnitude of the drawdown of Crotch Lake will have obvious effects on the available fish and wildlife habitat. However, the effects of the summer and winter drawdowns are mutually exclusive; the effects of one do not relate directly to the effects of the other.

Winter drawdowns affect some fish species more than others. Fall spawning species like lake herring and lake whitefish can be adversely affected if spawning habitat and eggs are dewatered. Warm water species like walleye, pike and bass spawn in spring and early summer and are not affected by fall drawdown.

Aquatic hibernating amphibians and reptiles do best when stable water levels exist in late fall and during ice cover. They over-winter in water, burying themselves in the bottom mud of streams and lakes. These hibernating creatures have limited ability to move to avoid dewatering after the onset of hibernation.

Winter denning furbearers, especially muskrat and beaver, need stable water levels in late fall and during ice cover. The furbearers build an entrance to their den below the low water level to ensure an entrance free from winter ice. Water levels dropped too low after these species have entered their winter habitats can essentially freeze them out.

A drawdown of over 4 metres will affect the total amount of available walleye habitat in Crotch Lake, simply through the reduction in the lake volume. However, despite the magnitude of the biannual drawdown, recent MNRF walleye population assessments indicate a healthy fishery.

The shallow, backwater, weedy areas provide important spawning habitat for some species of fish, notably pike. The current operating regime does not allow water levels to drop during the critical spawning period for pike, thereby protecting their reproductive activities.

<u>Action by MRWMP:</u> The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***8.16 Comment:*** *Rock Bass and freshwater clams have all disappeared from Crotch Lake. There are almost no loons left on the lake.*

<u>Response:</u> MNRF does not maintain any information regarding freshwater clam populations in Crotch Lake~~s~~. Crotch Lake FWIN results from 1996 and 2001 show healthy abundance of rock bass within the lake. MNRF does not have any other information to support or refute this claim.

Rock bass and freshwater clams are not species that are specifically managed by MNRF. Both of these species are mobile and can migrate with changing water levels. Further, both organisms are tolerant generalists; it seems unlikely that these species would disappear from the lake while other, less tolerant species continue to exist.

The Common Loon nests on many of the lakes in the Mississippi River system. Nests are often found very close to the water's edge on small islands or within a few meters of the shore on large masses of emergent vegetation. Typical nests include those located in vegetation, hummocks, stumps, old beaver or muskrat lodges and artificial platforms. The Common Loon is susceptible to being negatively impacted by fluctuating water levels during the incubation period when a sudden change in water levels could flood the nest or strand an incubating parent. This incubation period generally lasts a month or so beginning in mid- to late -May. In order to meet the requirements of the objectives for this lake, maintaining a constant water level during the Common Loon incubation period cannot normally be achieved. Artificial floating nesting platforms have been used with some success where water levels fluctuate.

Interest groups are encouraged to work with Stewardship Councils and MNRF to establish floating nest platforms.
<u>Action by MRWMP:</u> The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***8.17 Comment:*** *Access, navigation, launching and retrieving boats as well as providing usable and adequate docking is hampered by the excessive drawdowns during the extended recreational season. The new boat launch access for Crotch Lake is inaccessible when the lake is at its lowest levels and it is difficult to access Crotch Lake and adjacent lakes (Twin and Fawn) for recreation.*

<u>Response:</u> The drawdown of Crotch Lake has remained relatively unchanged for more than 50 years. Any development, which has occurred since that time, has been subject to the existing

drawdown regime. As part of the options development phase the implications of a modified drawdown will be assessed considering a range of issues, including impacts on docks.

The municipal boat launch at the south end of Crotch Lake was constructed in mid -summer before the lake reached its minimum level. This has resulted in access issues in late summer when water levels drop. Another municipal boat launch exists at the north end of the lake at Side Dam Rapids, which allows access throughout the summer. This is a structural issue with the design of the boat launch and therefore outside the scope of this process.

Access to Twin Island and Fawn Lakes for recreational purposes has been identified as a sub-objective in the Scoping Report.

Action: The feasibility of ensuring navigable passage into Twin Island and Fawn Lakes will be assessed in the action of Crotch Lake 8.1.

***8.18 Comment:*** *Agreement with strong lake associations to protect their docks in the winter should be rescinded. Floating or removable docks should be mandatory on a system that is used for hydro generation and flood control.*

Response: There are no agreements in place with any cottage association to maintain specific levels with regard to docks. There are operating plans for every dam to maintain a range of levels, as much as possible, for the benefit of everyone on and using the lakes. Dams in the upper watershed are not operated specifically to prevent ice damage to docks, but it is a consideration that is taken into account when planning to remove or replace stoplogs.

The damages to docks could be somewhat alleviated by cottage owners using removable docks however, there is no mandatory requirement for this and is outside the scope of this process.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***8.19 Comment:*** *Crotch Lake, in its role as the main reservoir for the watershed, experiences twice annual drawdowns, which benefits the entire watershed. It enables the upper lakes to get down to winter storage levels before freeze-up. It allows for stable ice conditions and protection of the lakeshore ecosystem in the upper lakes. It captures valuable water resources for hydroelectric production during the late fall and winter. It allows for a sustained flow of water resources to meet the downstream requirements during the low flow period during the winter months. But Crotch Lake experiences loss of fish and fish habitat during both drawdown events. How do you help Crotch Lake biologically in compensation for its tremendous contribution to the health and safety of the rest of the watershed? For example, is walleye stocking an option to compensate for the loss of fish and fish habitat? Can water levels be raised quicker in the spring run-off to get the best spawning shoals covered in time for the spawn without risking the lack of storage capability for late spring or early summer flood event like June 2002? Can the range of the annual drawdown be accommodated to reduce fish and fish habitat destruction and still meet downstream water requirements?*

Response: MNRF staff conducted walleye spawning surveys in spring 1995, and found evidence of walleye reproductive activities at numerous locations in the lake. The following is an excerpt from the report of the 1995 survey:

"It is noteworthy that due to the lack of spring runoff and little rain during the spring of 1995, water flows into the lake were considerably reduced and the lake level was approximately 2 metres below normal springtime levels...despite the unusually low water levels which left extensive areas of suitable spawning habitat exposed along the shoreline, there was an abundance of suitable clean spawning rubble available for egg deposition by walleye."

The current water management strategy for Crotch Lake ensures that water levels do not decrease during the spawning and incubation period for walleye. Suitable spawning habitat for walleye is found at various depths throughout Crotch Lake. Walleye are opportunistic spawners, rather than using a 'traditional' shoal for spawning. Walleye will utilize the best habitat available to them for spawning. Since no walleye habitat is dewatered during the spawning and incubation period and no eggs are destroyed, habitat compensation for walleye is not warranted.

Recent Fall Walleye Index Netting (FWIN) projects on Crotch Lake indicated that the walleye fishery in the lake is " healthy " when compared to other walleye lakes in southern Ontario. The MNRF *Guidelines for stocking fish in inland water of Ontario* states: "Stocking hatchery-reared fish in waters which already provide adequate fishing opportunities is unnecessary. There is a considerable amount of evidence that supplemental stocking (i.e., planting of non- native fish stocks in waters where a naturally reproducing stock of the same species exists) can have significant negative ecological impacts, is inefficient and seldom cost-effective. As a general rule, supplemental stocking should be discouraged in those waters which contain viable...populations of native or naturalized fish of the same species".

Supplemental stocking of walleye on Crotch Lake is not warranted.

Please also refer to the responses for 8.1, 8.2, 8.5, 8.11, and 8.13

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***8.20 Comment:*** *How was the 5cms for High Falls determined?*

Response: Historically, 5cms came from a "gentleman's agreement" to provide a minimum flow for downstream users from Crotch Lake. Coincidentally, under normal conditions, storage volumes from Crotch Lake can maintain an average outflow of 5cms throughout the summer. When significant rainfall occurs, higher flows are maintained to improve ecological integrity, tourism, recreation and hydro generation downstream. During drought conditions flows may be less than 5cms, once the storage has been used out of Crotch Lake.

Action: Potential for option development.

***8.21 Comment:*** *What percentage of system inflow occurs below Crotch Lake discharge?*

Response: There are many variables to be considered in a response to this comment. Generally, system inflows are a result of rainfall, snowmelt and groundwater; therefore vary according to frequency, magnitude, duration and location of precipitation events.

The drainage area for the Crotch Lake Dam is 1030 square kilometers while the total drainage area of the Mississippi River watershed is approximately 3700 square kilometers.

Roughly 70% of the total watershed area lies below Crotch Lake. However, this area is uncontrolled (no reservoir storage). This condition limits the ability of this area to contribute to flows on the lower section of the Mississippi River. In the summer for example, the contribution to flows from this area would amount to 0%-40% of the total, dependent on precipitation.

Action: A full hydrological summary of the watershed will be included in the final report**.**

***8.22 Comment:*** *Correction of the repair done to Crotch Lake Dam in 1998, should be high on the list of priorities to be undertaken and at the same time raising the level as supposedly approved by the environmental study.*

Response: Modifications to existing structures is outside the scope of this process. OPG to respond.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

## 9.0 DALHOUSIE LAKE

A total of three surveys, four emails and two letters were received from individuals having property or issues with Dalhousie Lake.

***9.1 Comment:*** *A narrower band in fluctuation of water levels on Dalhousie Lake would be preferable. Current 1 – 1.5 m is too wide a range. A clear rationale and explanation of how Dalhousie Lake levels are regulated is required.*

Response: Dalhousie Lake does not have a water control structure at the outlet of the lake and therefore it is unregulated. Water levels on the lake will fluctuate based on inflows and the elevation of the riverbed at Sheridan's Rapids. On average, the lake naturally fluctuates 1 – 1.9 m over the period of a year.

The high water levels on Dalhousie Lake occur during high flow events. During these events run-off is stored in the upper lakes to the extent possible in order to mitigate potential flood conditions downstream.

With respect to inflows, the current operating regime on Crotch Lake generally provides a minimum average flow of 5 cms, as long as there is water in the system to do so. During severe drought situations the flows are augmented to some degree by the upper lakes as well according to their operating plans.

It is unlikely that higher flow rates can be sustained throughout the summer. However, minor changes to flow rates will be assessed during the modeling exercise. It is important to recognize that minor changes to flow rates are unlikely to significantly influence water levels on Dalhousie Lake.

Action: Through the modeling exercise, changes to inflow rates will be assessed to determine the impact on water levels.

***9.2 Comment:*** *Put more logs in the dams to store more water in upper lakes having more water available for low flow, hydro and Crotch Lake wouldn't have to fluctuate as much.*

Response: The dams upstream of Dalhousie Lake were not designed to hold more logs than the maximum number that are currently used.

Increasing the water stored in the upper lakes has a number of implications in terms of physical limitations and safety consideration of the dam and impacts on upstream and downstream properties, such as the potential for increased flood damage.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***9.3 Comment:*** *Has the incidence of lake flooding increased and if so why?*

Response: Dalhousie Lake has experienced two major floods in the last 6 years, the spring of 1998 and the summer of 2002. Both were a direct result of the amount of runoff entering the system and the watershed dams were operated, to the extend possible, to mitigate flooding.

Information is not available to indicate whether the incidence of flooding has increased.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***9.4 Comment:** During public consultation, concern was adamantly expressed by residents of Dalhousie Lake that, the incidence of flooding had increased. Of particular concern, was the flood of 1998, which residents felt could have been alleviated if Crotch had been allowed to fill. Flooding of 1998 and allowing Crotch Lake to fill to alleviate flooding.*

Response: The flood of 1998 was a direct result of several meteorological events occurring at the same time to produce significant runoff resulting in the flood.

As the rivers were peaking from the snowmelt a very significant storm occurred across the northern portion of the watershed. At the time of the peak on Dalhousie Lake, it is estimated that between 80 and 100 cms were entering Dalhousie Lake from the Mississippi River (estimated flows in Antoine and Cranberry Creeks combined at roughly 80 cms) and the other tributaries, which feed into Dalhousie Lake. At that time, less than 10 cms was coming out of Crotch Lake as it and all of the upper lakes were being operated to store as much of the runoff as possible.

The dams in the upper Mississippi River system provide benefits, which minimize the impacts of flooding and this function will be recognized in the Water Management Plan.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***9.5 Comment**: Does the new bridge at the outlet of Dalhousie Lake impact spring flood levels?*

Response: Engineering studies done at the time of reconstruction of the County bridge showed no impact on spring flooding. Current concerns associated with the bridge are outside the scope of this planning process.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

9.6 Comment: **Low summer time levels prohibit access to docks in Purdon Bay with both public and private launch structure and make boat navigation difficult from the lake to the river outflow. Can this be improved?**

Response: Dalhousie Lake does not have a water control structure at the outlet of the lake and therefore its outflow is unregulated. See 9.1. Water levels in the summer are typically low and fluctuate with inflow making it difficult for navigation in parts of the lake. This condition can also be aggravated through increased sedimentation.

Action: Options being considered for Crotch Lake will be assessed to determine their influence on water levels and flows on Dalhousie Lake.

9.7 Comment: **Do the fluctuating water levels on Dalhousie Lake have a neg. impact on the bass spawning shoals, the benthic populations in the fall and loon nesting in the spring either on the lake or in the river downstream of it.**

***Response:** The water levels on Dalhousie Lake reflect the natural reduction in flows in late spring and early summer. A significant drop in water levels after spawning, typically in June, has the potential to have a negative impact on the spawn in any given year. The*

***Kerr Report, The Fishery of Dalhousie Lake, 1998, states "… that the abundance and relative composition of the Dalhousie Lake fish community has been relatively stable over the past twenty years."***

***Aquatic hibernating amphibians and reptiles do best when stable water levels exist in late fall and during ice cover. They over -winter in water, burying themselves in the bottom mud of streams and lakes. These hibernating creatures have limited ability to move to avoid dewatering after the onset of hibernation. Barring any significant rainfall events, which cause Dalhousie Lake to increase, the lake is relatively stable from June through to March. Therefore, the impact on benthic populations in the fall is not an issue.***

***The Common Loon nests on many of the lakes in the Mississippi River system. Nests are often found very close to the water's edge on small islands or within a few meters of the shore on large masses of emergent vegetation. Typical nests include those located in vegetation, hummocks, stumps, old beaver or muskrat lodges and artificial platforms. The Common Loon is susceptible to being negatively impacted by fluctuating water levels during the incubation period when a sudden change in water levels could flood the next or strand an incubating parent. This incubation period generally lasts a month or so beginning in mid to late May. Artificial floating nesting platforms have been used with some success where water levels fluctuate.***

***<u>Action:</u> Interest groups are encouraged to work with Stewardship Councils and MNRF to establish floating nest platforms.***

***9.8 Comment:*** *Install an inflatable weir at Dalhousie Lake outlet to resolve water level issues on that lake.*

<u>Response:</u> This is beyond the scope of this process. The process to construct a dam would require an individual to make an application to the applicable agencies. Public funding for this type of construction is not likely to be available.

The process to construct a dam, however, would require an agreement from the majority of property owners on the lake as to what elevations are desired. Some of the details that would be required are funding sources, structural design, environmental impact assessment, ownership, construction, monitoring, operating and maintaining the structure.

<u>Action by MRWMP:</u> The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***9.9 Comment:*** *Public and private launch areas are inaccessible during early June and late August to September on Dalhousie Lake.*

<u>Response:</u> Presently there are inadequate downstream controls available to maintain adequate levels for convenient boat launching. Concerns with respect to public boat launches should be directed to the local municipality.

<u>Action by MRWMP:</u> The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***9.10 Comment:*** *There is a massive silt buildup at the outlet of Dalhousie Lake affecting water levels and navigational interests and is on of the contributing factors to the weed buildup in the lake and the river above Sheridan's Rapids.*

Response: Silt buildup at the outlet of the lake may be caused by a number of natural or man made factors, including erosion to shorelines and infilling of the lake. This has had a cumulative impact on the lake as sediment moves downstream with the currents. This creates shallower water levels as the bed of the lake has risen and resulted in navigational issues. This may also have an impact on weed growth, however, many other environmental factors (such as zebra mussels improving clarity and improper removal of weed cuttings enhancing the growth of weeds) could be attributed to this problem.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***9.11 Comment:*** *Is the 158- meter a.s.l. the new working water level for Dalhousie Lake. Will this plan allow OPG to move water through High Falls Dam to a "legal" level of 158 meters.*

Response: The elevation of 158.0 meters reflects the 1/100-year flood elevation on the lake. It is based on a statistical analysis of recorded flow rates and water levels Dalhousie Lake and has a 1% chance of being exceeded in any given year.

Under normal circumstances OPG is only able to pass a minimum flow of 5 cms due to the amount of water available in the system. To operate at maximum efficiency at High Falls Generating Station, a flow of 14.3 cms must be passed. This would produce an elevation on Dalhousie Lake of 156.5 to 156.55 metres. Any flows exceeding 14.3 cms result in water bypassing the generating facility. The flow required to produce the 158 meter elevation would be in excess of 100 cms. Flows of this nature can only be derived from runoff as a result of significant rainfall and/or snowmelt events.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***9.12 Comment:*** *Why was flood plain mapping undertaken on Dalhousie Lake?*

Response: Flood plain mapping was completed at the request of Lanark Highlands Township to address the flood potential to existing and future development around Dalhousie Lake.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***9.13 Comment:*** *The Scoping Report identifies wild rice stands as being a natural heritage feature on this lake. We disagree as there are no wild rice stands on Dalhousie Lake.*

Response: The MNRF records show the existence of two stands of wild rice on Dalhousie Lake. This is reflected in the 1998 Kerr Report, entitled The Fishery on Dalhousie Lake.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***9.14 Comment:*** *Residents are concerned with duck mite infestations in deep waters of Dalhousie Lake.*

***Response:* This is a concern, however it is outside the scope of this process.**
For more information contact the local Health Unit.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

## ***10.0 MISSISSIPPI LAKE***

A total of one questionnaire without comments and one email were received from individuals having property or comments regarding Mississippi Lake, indicating fall and spring levels were too high.

***10.1 Comment:*** *Mississippi Lake is used as a reservoir.*

Response: Currently, Mississippi Lake is not used to augment flows downstream of the Carleton Place dam, which is how a reservoir would operate. Under normal summer conditions all of the logs are left in the dam. Water levels on Mississippi Lake fluctuate based on the amount of rainfall received over the summer. Flows downstream of Carleton Place dam are determined by the amount of water flowing over the weir.

The dam has minimal flood reduction capabilities upstream or downstream of the structure. In high flows the physical characteristics of the channel (the narrowing of the river and the elevation of the bed of the river) between Mississippi Lake and Carleton Place dam controls water levels on the lake.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***10.2 Comment:*** *Is fish habitat such as the walleye spawning shoals and the significant wetlands between Dalhousie Lake and Mississippi Lake considered in the operating regimes of any of the control structures.*

Response: In order to meet the requirements of the walleye spawning at the head of Dalhousie Lake, through the normal operation of Crotch Lake Dam and High Falls G.S. the requirements needed for walleye spawning between Dalhousie Lake and Mississippi Lake are also met.

The upper lakes are key to maintaining the ecological integrity of the downstream river system through low flow augmentation, year round, for aquatic ecosystem and downstream needs. The operating guidelines recognize this objective.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***10.3 Comment****: Has the incidence of lake flooding increased and if so why?*

Response: There is no evidence to suggest that flooding has increased in frequency. This lake experienced flooding above the 1/100-year flood level in 1998 and set a record in June 2002 when levels reached those normally expected in April. Both were a direct result of the amount of runoff entering the system and the watershed dams were operated, to the extend possible, to mitigate flooding.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***10.4 Comment:*** *This lake has a very active wintertime activity level. Maintaining steady winter sports season lake levels for ice safety is of major importance.*

Response: This is part of the existing operating guidelines. The Carleton Place Dam is normally only operated in the winter, to maintain stable ice levels, for the protection of water intakes and reduce shoreline damage should an increase in inflows from rainfall or snowmelt occur.

Ice safety for recreation is outside the scope of this process. Anyone using ice for recreational purposes should be aware of the ice conditions. Under unusual flow conditions, MVC may issue a watershed conditions bulletin outlining safety concerns.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

## ***11.0 GENERAL COMMENTS*** *ERROR! BOOKMARK NOT DEFINED.*

The following comments have been derived from the PAC members, the public, agencies, open houses, questionnaires and the scoping report comment period.

***11.1 Comment:*** *If there were no hydroelectric generation sites on the watershed, would the water be managed differently? If as stated, hydroelectric generation in the Mississippi River watershed is produced by "run of the river" how does hydroelectric generation influence water management policy on the watershed.*

Response: If there were no hydro stations, but dams still existed in these locations, on the river system, there would be minor changes to the overall operation of the system as there would be one less competing interest for the water.

The overall goal is to maximize the use of the water for the people and wildlife living in, on, near or using the system. Water management within the Mississippi River has evolved to the point where the priorities are:

- flood control
- low flow augmentation
- ecological integrity
- recreation/tourism
- hydro generation

(Note: the priorities vary on importance depending on the time of year, location and circumstances.)

Hydro generation is the lowest priority because all the generating stations are "run of the river" and have limited impact on the overall operation of the system.

Occasionally, when there is sufficient water, the system can be operated to maximize generation however, it is never operated to the detriment of the other priorities. As with any of the other competing interests on the system, the overall goal is to maximize the use of the water in the system for the people and wildlife living in, on, near or using the system.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***11.2 Comment:*** *What are the general priorities for how this system is operated throughout the year?*

Response: The overall goal is to maximize the use of the water for the people and wildlife living in, on, near or using the system. Water management within the Mississippi River has evolved to the point where the priorities are:

- flood control
- low flow augmentation
- ecological integrity
- recreation/tourism
- hydro generation

(Note: the priorities vary on importance depending on the time of year, location and circumstances.)

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

11.3 Comment**: Are bass and walleye shoals in the riverine areas of the watershed, such as Snow Road, Innisville and Appleton considered in any operating plans.**

<u>Response:</u> The operation of Crotch Lake Dam and High Falls G.S. meet the requirements of the walleye spawning, downstream of this area.

The bass spawning shoals in the Mississippi river at Snow Road have been incorporated into the operations of both Crotch Lake Dam and the High Falls G.S. The bass spawning requirements of Appleton Dam are dealt with through the normal operation of the dam, which maintain stable water levels through the village in the month of June.

<u>Action by MRWMP:</u> The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

11.4 Comment**: Would smaller logs in any of the dams reduce fluctuating water levels down stream?**

<u>Response:</u> Fluctuations in the water levels downstream would not be affected by the size of the stop logs. Fluctuations are a function of runoff conditions, which influence the operation of the dams.

<u>Action by MRWMP:</u> The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

11.5 Comment: **Maintain steady winter lake levels so the ice remains safe for winter use.**

***Response: Ice safety for recreation is outside the scope of this process. Anyone using ice for recreational purposes should be aware of the ice conditions. Under unusual flow conditions, MVC may issue a watershed conditions bulletin outlining safety concerns.***

<u>Action by MRWMP:</u> The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

11.6 Comment: **Are there any economic incentives for hydro producers to operate at maximum conversion efficiency?**

***<u>Response:</u> Hydro generating stations would like to maximize their power production to make the stations 100% efficient in their use of the resource and their ability to produce a profit. This is not how this river system is operated however; all proponents understand that there is just not enough water available in the system to allow them to meet this objective.***

<u>Action by MRWMP:</u> The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***11.7 Comment:*** *Why are the tributaries not included in the study area. They have a significant influence on water levels in the river and on dam operations.*

***<u>Response:</u> The study area has been defined as the Mississippi River and interconnecting lakes. Not all water control structures within the watershed are included in the scope of the study, specifically those with little or no influence on flows and levels on the Mississippi River.***

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

11.8 Comment: **At what cost will this document be produced and to what benefit?**

***Response:* There is a legal requirement to produce a water management plan under the Lakes and Rivers Improvement Act. The benefit to producing this plan is accountability for the proponents to protect the public interest. The final cost to produce this document is unknown at this time.**

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***11.9 Comment:*** *Can the summer levels be maintained higher during a drought.*

***Response:* No. Significant rainfall events are required to increase or maintain higher summer levels, which would not be associated with a drought situation.**

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***11.10 Comment:*** *Are winter drawdowns essential and if they are can their impact be lessened by reducing the number of lakes being drawn down.*

Response: Drawdowns on the lakes are required to meet the objective of reducing flood damages across the watershed. A reduction in the magnitude of drawdown on any of those lakes would have an impact on their ability to reduce downstream flooding.

Action: Potential for Option Development.

***11.11 Comment****: Could a study be created, whereby an upper watershed lake is exempt from the winter drawdown for a number of years to comparatively study the ecological impact. Has a literature review been conducted to research the impact of the winter drawdown and if not could one be conducted?*

Response: Drawdowns on the lakes are required to meet the objectives for the system. A literature review with regard to impacts of winter drawdowns is being undertaken and the findings considered as part of this process.

Action: Conduct literature research.

***11.12 Comment:*** *What mechanisms will be developed to measure the impact of any potential changes of lake levels on fish and wildlife**.***

Response: Effectiveness monitoring (EM) is a key component of water management planning. If a change is considered, an effectiveness monitoring plan (EMP) will assist in determining whether the operational change made to flows and levels, through the water management planning process, are effective in meeting the objectives of a WMP.

Action: An effectiveness monitoring plan will accompany each WMP.

***11.13 Comment:*** *What is the economic value of the watershed and what is the comparative value of hydro production vs. recreation. What is the hierarchy of priority?*

Response: Hydro production and recreation are not mutually exclusive. While determining the exact values of hydro production and recreation are difficult, hydro production has minimal impact on recreational opportunities. The system is currently operated for the benefit of both.

Any options developed will be considered along with all of the priorities.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***11.14 Comment:*** *Are eels or the River Redhorse sucker adversely affected by the current operation of the hydro stations in the lower reaches of the Mississippi River? Did MNRF determine the cause of the deformed bass found in the river near Appleton a few years ago?*

Response: The eel situation is a complex problem and considerable research is required. While the presence of hydro-electric facilities and dams on the Mississippi River, the Ottawa River and the St. Lawrence River is one of the factors that has impacted eel migrations and populations, altering the operation of these facilities will not resolve the problem. If new methods are developed to ensure safe eel migration, it may be possible to alter the design of the dams in the future.

On the Mississippi River system, the River Redhorse Sucker is known to exist between Appleton and the Ottawa River. There is no evidence that the River Redhorse Sucker is adversely affected by the operation of hydro facilities. Ongoing data collection is of interest to the MNRF and the hydro producers.

Recent netting identified the existence of deformed bass in this area and further information can be obtained from the Kemptville MNRF office.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***11.15 Comment:*** *Can the watershed be managed more adaptively to include predictive climate data to reduce possibly unnecessary drawdowns?*

Response: Predictive or forecasted climate data is not sufficiently accurate to allow for a preemptive decision.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***11.16 Comment:*** *Drinking water year round should be a major consideration in this process.*

Response: While this is of paramount importance, water quality and drinking water are outside the scope of this process.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

**11.17 Comment**: Water quality seems to be improving but should not be complacent.

***Response:* While this is of paramount importance, water quality and drinking water are outside the scope of this process.**

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***11.18 Comment:*** *Development along the river is a concern especially concerning water quality.*

Response: While this is of paramount importance, water quality and drinking water are outside the scope of this process.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***11.19 Comment:*** *Cattle in the river downstream of Carleton Place and Almonte continue to be a large source of pollution.*

Response: This is a water quality issue, which is outside the scope of this process.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***11. 20 Comment:*** *Concerns about the potential pollution from Lanark village WWTP discharge on downstream receiving waters.*

***Response: While this is of paramount importance, water quality and drinking water are outside the scope of this process.***

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***11.21 Comment:*** *Water taking permits from the river i.e. golf course irrigation is a growing concern.*

Response: All water taking permits are reviewed through the Ministry of the Environment (MOE) Permit to Take Water process. MOE has the responsibility for determining the impact on flows and the approval of the permit.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***11.22 Comment:*** *When the Appleton dam was rebuilt was there any consideration to returning water levels back to what they were pre- development.*

Response: The historical levels of the previous dam were considered during the rehabilitation of the Appleton Dam.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***11.23 Comment:*** *Boat ramp access in Almonte and Appleton, is inhibited by low levels.*

Response: Presently there are inadequate downstream controls available to maintain adequate levels for convenient boat launching. Concerns with respect to public boat launches should be directed to the local municipality.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***11.24 Comment:*** *Why is Appleton the only plant on the system with a variable flow system.*

Response: Appleton is not the only plant on the system with a variable flow system. All hydro stations can operate under variable flows.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***11.25 Comment:*** *Water levels in the fall of 2003 were extremely high and ice conditions damaged shoreline.*

Response: Water levels in the fall of 2003 were extremely high across the watershed. Conditions remained relatively normal as drawdowns began on the upper lakes. Unusually heavy rainfall resulted in significant runoff from late October through early January creating high flows for this time of year. To compensate for this, the rate of drawdown on some of the upper lakes was reduced downstream in an attempt to minimize flood damages downstream, specifically Dalhousie Lake. This maintained higher flows for a longer period of time as more water than normal was in the system.

As a result ice formed on many of the lakes at a higher elevation, resulting in MVC issued a watershed conditions bulletin outlining the potential damages and danger of the higher ice conditions. The system was then operated to return levels back to normal as soon as possible to prepare for the spring runoff.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***11.26 Comment****: MVC does not consider the information provided by lake volunteers, in operating the dams.*

Response: MVC considers the information provided by their volunteers to be crucial in operating the system as a whole. Dam operations are based on a variety of watershed conditions, including but not limited to the information provided by the volunteers.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***11.27 Comment:*** *Water levels and flows impact on water quality issues and therefore should be addressed in the Water Management Plan. Ignoring these impacts is inconsistent with the stated principle of "maximum net benefit to society".*

Response: Consideration is given to the impacts and benefits that flows and levels have on water quality i.e. municipal supply in Carleton Place and flushing rates on various lakes. This is not a watershed plan, which would appropriately deal with the comprehensive issues around water quality and drinking water.

Action: The effect flows and levels, specifically low flow augmentation, have on municipal supplies and flushing rates will be considered.

11. 28 Comment: **What is the impact of the introduction of foreign and exotic species such as zebra mussels and millfoil.**

Response: This is a concern, however it is outside the scope of this process.
***For more information contact MNRF.***

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***11.29 Comment:*** *Weed growth is becoming a major concern*

Response: This is a concern, especially the introduction and prolific growth of exotic species such as Eurasion Millfoil however, it is outside the scope of this process.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***11.30 Comment****: What is the impact on fish species from the large number of tournaments (summer and winter tournaments) on the various lakes.*

***Response: This is out of the scope of this process. Any information or concerns should be directed to MNRF.***

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

***11.31 Comment:*** *There is clearly a lack of integration of the water control structures with the natural environment to give the respect they deserve for the function they perform. Landscape materials such as natural rock and plants are poorly used.*

Response: Given the nature of what a dam is constructed to do, plants and trees are not considered to be a part of the design, as they will weaken a structure as they continue to grow. Where possible, dams that are designed and constructed with earth embankments use local materials as much as possible to reduce costs. In order to reduce maintenance costs, most new structures are built from concrete.

Action by MRWMP: The comment is addressed in the response. No further action is proposed by the MRWMP planning team.

# *Appendix 9: Administrative Amendment Text Changes*

## *February 2018*

| | | Existing Sections Subject to Amendment | Amendment Text |
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| PLAN NAME | | MISSISSIPPI River WMP | None |
| DISTRICT | | Kemptville | None |
| Sections to be amended | | Expiry- Section 10.2<br>Amendments - Section 10.1<br>SAC – To be added (Section 11.1)<br>Compliance – Section 9.2.4, 9.2.5, 9.2.6<br>Effectiveness Monitoring- Section 9.1<br>Implementation Reporting- To be added (Section 9.3) | |
| Expiry Date | | December 2017<br><br>~~10.2 Plan Review and Renewal~~<br>~~The Mississippi River Water Management Plan will be subject to review and renewal, on average, once every 10 years.~~<br>~~Given the moderate complexity of the plan, but the absence of significant issues, the review process should be initiated approximately 1 year prior to the end of its term. The plan review process will mirror the steps involve in the plan preparation, with new data and information considered during the review as a basis of continuing with the status quo or recommending changes (MNR 2001).~~ | *Expiry date will be removed, and the WMP no longer expires.* |
| Proponents, indicate lead if multiple | | Enerdu Power Systems Inc., Ron Campbell<br>Mississippi Valley Conservation Authority, Paul Lehman<br>Mississippi River Power Corporation, Scott Newton<br>Ontario Power Generation, Marc Bisson; Donald Ferko; Jordan Hughes<br>TransAlta, Jeff Bretzlaff (Appleton); Neil Findlay (Galetta) | |
| Amendment Text | | *The existing Section 10 will be removed and updated text, outlined in the column to the right, will replace it to form the new Section 10.*<br><br>~~Section 10.1: Under certain circumstances, amendments may be required to the water management plan prior to the plan review and renewal. These amendments would likely arise as a result of new scientific research and studies being conducted or other information becoming available as specified in the plan or through other data gathering exercises. If changes are of such magnitude that a change in operating regime is considered at one or more of the structures, then the Ministry of Natural Resources (MNR) will issue an order to amend the plan. Amendments may also be considered when a new issue arises, for example a change in dam ownership. A change such as this may require a revision to the monitoring plan or possibly to the operating regime. Amendments may be made to the water management plan and individual operating regimes during the planning cycle, provided outcomes remain consistent with the objectives defined in the water management plan.~~<br><br>~~The Standing Advisory Committee will be informed of all amendments and given the opportunity to provide comments. MNR, in consultation with the plan proponents, will decide the appropriate degree of public and First Nations consultation required for plan amendments. Water Management Plan amendments may be categorized as administrative, minor or major.~~<br><br>~~Administrative amendments include those changes that will not affect the implementation of the plan (i.e. a change to the presentation of information in the plan). Minor amendments include changes that are anticipated~~ | **10 PROVISION FOR PLAN AMENDMENTS**<br><br>**10.1 Plan Amendments**<br><br>In order for the Mississippi River WMP to remain current and to address future issues, the plan may be amended by following the amendment process set out in this section. Any change to the Mississippi River WMP requires an amendment to be submitted to the plan proponents and approved by MNRF. From time to time, new data, information, or issues may arise. MNRF retains the authority to amend a plan at any time, or issue an Order for the plan proponent(s) to amend the WMP.<br><br>**10.2 The Amendment Process**<br><br>Any party (Plan Proponent, MNRF, or 3rd Party) with an interest in the WMP may request an amendment to the WMP by bringing forward issues to the attention of the plan proponent(s).<br><br>An amendment request must be accompanied by sufficient information to allow the proponent(s) to determine whether the proposed amendment should proceed, and |

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| | | ~~to affect a small geographic scale (i.e. in the immediate vicinity of the dam) or where OMNR and the Steering Committee agree that no significant impact is anticipated as a result of the amendment. Major amendments may involve a significant geographical scale (i.e. extensive areas up and or downstream of a dam) or have significant impact on the balancing of the environmental, social and economic attributes.~~ | whether the amendment should be treated as minor or major. Proponent(s) must apply due diligence when considering proposed amendments.<br><br>The plan proponent(s) are responsible for:<br>• Receiving amendment requests;<br>• Assessing amendment requests based on criteria outlined in this section;<br>• Proposing amendments to MNRF; and<br>• Preparing amendment proposals for MNRF review<br><br>The multiple proponents for this WMP will work together when assessing an amendment request and prepare an amendment proposal (where necessary).<br><br>MNRF will review proposed amendments to ensure that plan proponents screen and process amendments consistent with the 2016 Maintaining Water Management Plans Technical Bulletin.<br><br>*10.2.1 Types of Amendments*<br><br>Changes to the Mississippi River WMP may include simple text corrections to significant modifications to an operating regime. In order to provide flexibility for a range of potential amendment requests, two categories of amendments (minor and major) exist. The categories are mainly differentiated by the expected level of public interest in the proposed change to the WMP.<br><br>Amendments may be subject to public and First Nations and Métis community engagement or consultation, dependent on the category of amendment (described below), as detailed in Section 3.5 of the Maintaining Water Management Plan Technical Bulletin, 2016.<br><br>*10.2.1.1 Minor Amendments*<br><br>Minor amendments are changes that do not affect the operating regime, plan objectives, are not expected to generate a high level of public interest, and are not expected to adversely affect Aboriginal and treaty rights. Minor amendments will not be subject to public and First Nations and Métis community engagement or consultation beyond discussions with a SAC (if applicable). Minor amendments may include:<br>• Changes in the presentation of information, factual or text corrections; and/or<br>• Changing a WMP to include a new dam and its associated Operating Plan (Section 2.1 of the Maintaining Water Management Plan Technical Bulletin, 2016)<br><br>*10.2.1.2 Major Amendments*<br><br>Major amendments are more significant in scale such as: changes to the operating regime or plan objectives, changes that could be expected to generate a high level of public interest or changes that might adversely affect Aboriginal and treaty rights. A major |

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| | | | amendment will be subject to public, First Nations, and Métis community engagement or consultation. For major amendments where equivalent consultation and engagement has previously occurred through another process (e.g. previous notification that a change will be required, or amendments required after public consultation in other planning processes), MNRF may exercise discretion to process the proposed change as a minor amendment on a case by case basis.<br><br>*10.1.2 Amendment Request*<br><br>Individuals submitting an amendment request shall clearly articulate concerns and potential solutions. Amendment requestors shall participate in good faith opportunities undertaken to obtain Indigenous Communities, public and stakeholder input on proposed major amendments and should consider their ability to contribute towards those engagement opportunities.<br><br>An amendment request should provide sufficient information to allow plan proponent(s) to determine whether an amendment request should be investigated further. It is the responsibility of the individual(s) requesting the amendment to demonstrate that the request is credible, worthy of consideration and within the scope of the Mississippi River WMP and the LRIA.<br><br>The amendment request must contain the following information:<br>• A description of the changes being requested;<br>• The rationale for the changes being requested;<br>• Results of any pre-consultation completed with potentially affected parties; and<br>• Where changes in operations are proposed, a description of how the proposed operation changes may impact other dams subject to the WMP.<br><br>Upon receipt of an amendment request from a third party, the plan proponent(s) will acknowledge receipt of the request in writing to the third party and notify the MNRF that a request has been received. Where the MNRF receives an amendment request from a third party, the request will be forwarded to the plan proponent(s).<br><br>Where plan proponent(s) are considering submitting an amendment request to the MNRF, prior consultation with the MNRF, the SAC (if applicable) and other plan proponents may occur.<br><br>Plan proponents will maintain records for all amendment requests.<br><br>*10.13 Review of Amendment Request and Categorization of Amendment*<br><br>The proponent(s) is responsible for screening amendment requests to determine if the request should proceed through the amendment process, and for categorizing the amendment as minor or major.  This determination will ensure the appropriate degree of public consultation for the plan amendment. |

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| | | | The assessment will consider the following criteria:<br>a) Is the amendment consistent with this Technical Bulletin?<br>b) Is the amendment consistent with the Mississippi River WMP objectives, or does the amendment propose a change to the WMP objectives?<br>c) Is there an alternative method to deal with the request rather than amending the WMP?<br>d) Is the request within the scope of the Mississippi River WMP?<br>e) Is the request related to any ongoing data or effectiveness monitoring commitments?<br>f) Is the request supported by other potentially affected parties?<br>g) Is the amendment required to comply with other regulatory requirements?<br>h) Has the amendment request been considered previously?<br>i) Does the amendment have the potential to negatively affect dam safety/public safety?<br>j) Does the amendment have potential impacts on socio-economic or environmental considerations?<br><br>Where an amendment request does not contain sufficient information to complete an assessment or make a recommendation to MNRF, the plan proponent will return the proposed amendment to the third party with a request for additional information.<br><br>When a plan proponent(s) has completed the screening of the amendment request, written notification will be provided to MNRF. The notification will include: a summary of the amendment request and supporting rationale, results of the assessment, a recommendation of whether the request should be further considered, and if so, the appropriate category for the amendment.<br><br>*10.1.4 Review of Assessment Results*<br><br>The MNRF will review the plan proponent's screening results and will:<br>• Agree with the recommendation;<br>• Request additional information; or<br>• Disagree with the recommendation.<br><br>Where the plan proponent(s) recommends against proceeding with the amendment request, and the MNRF is in agreement, the plan proponent(s) will notify the requestor of the decision with supporting rationale.<br><br>Where the MNRF agrees that the amendment request should proceed, the plan proponent(s) will develop and submit the final amendment proposal for MNRF consideration. The plan proponent(s) will undertake any necessary planning, consultation, information gathering or other investigative activities associated with the amendment. Where the amendment is requested by a third party, the third party may be expected to support engagement activities.<br><br>Where the MNRF disagrees with the recommendation, the MNRF will discuss the proposed amendment with the plan proponent(s). The MNRF may subsequently direct |

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| | | | the plan proponent(s) to proceed with consideration of the plan amendment.<br><br>**10.3 Ordering an Amendment**<br><br>When a decision is made to proceed through the plan amendment process, the MNRF may formalize the decision through the issuance of an Order to prepare an amendment or approve the amendment under the authority of LRIA Section 23.1(6). Plan proponent(s) may also request that the MNRF issue an Order to amend the plan.<br><br>The MNRF retains the authority to require a plan proponent to undertake a WMP amendment where the plan proponent is unwilling to consider reasonable requests or where there are significant concerns regarding a facility's operation.<br><br>When MNRF intends to order a plan proponent to amend a plan, the proponent(s) will be provided a notice of intent to issue an Order to amend the plan prior to the issuance of the Order. Upon receipt of a notice of intent to issue an Order to amend a plan, the proponent(s) has 15 days to submit a request for an inquiry to the MNRF. Requests for an inquiry under the LRIA are referred by the MNRF to the Office of the Mining and Lands Commissioner (OMLC). Additional detail regarding appeals to the OMLC are referenced in MNRF's LRIA Administrative Guide and Section 11 of the LRIA.<br><br>**10.4 Amendment Preparation**<br><br>Where the MNRF has determined that a proposed amendment request should proceed, the plan proponent(s) shall prepare the final amendment proposal, including completing consultation activities or information gathering in support of the proposed amendment. Where the amendment is requested by a third party, the third party requester should discuss opportunities for collaboration in preparing the amendment.<br><br>For minor amendments, the plan proponent(s) must engage the MNRF, other plan proponent(s) and the SAC (if applicable). Public and First Nations and Métis community engagement and consultation requirements for major amendments are described in the subsections 10.1.4.1 and 10.1.4.2.<br><br>*10.4.1 Consultation and Engagement Requirements for Major Amendments*<br><br>Plan proponent(s) and in certain circumstances third party amendment requestors, shall undertake public and First Nations and Métis community engagement and consultation when developing a major amendment. Specific requirements shall be discussed with the MNRF in advance. The scope of consultation and engagement may vary depending on:<br>• Scope and scale of the proposed major amendment;<br>• Level of public, stakeholder and First Nation and Métis community interest in dam operations;<br>• Level of potential impact on Aboriginal and treaty rights;<br>• Potential impacts on other regulatory approvals; and |

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| | | | • Potential impacts within the scope of the LRIA and the WMP.<br><br>Consultation and engagement approaches may include:<br>• Direct written notice;<br>• Open houses;<br>• Information sessions;<br>• Public notice; and/or<br>• Community meetings or workshops/focus groups.<br><br>Sufficient opportunity for reasonable engagement shall be provided and information regarding the amendment shall be communicated in concise plain language.<br><br>*10.4.2 Consultation and Engagement Requirements Where EA Applies*<br><br>In some instances, proposed changes to existing operations of the WMP will be subject to the Environmental Assessment (EA) Act, such as MNRF's Resource Stewardship and Facility Development Class EA, or the OWA Class EA.<br><br>In such cases, the EA Act requirements shall be completed in advance of submitting an amendment request. The plan proponent(s) is not required, but may elect, to incorporate WMP amendment considerations during the EA Act process.<br><br>Where proposed changes are subject to an EA, the proponent may not be required to complete any additional public and First Nations and Métis community engagement and consultation in support of the proposed WMP amendment where sufficient engagement activities have been completed as part of the EA process.<br><br>MNRF determination of whether consultation and engagement completed during the EA is sufficient for purposes of a WMP amendment shall be made as part of the Ministry's assessment of the WMP amendment screening results. Additional consultation and engagement shall not be required, unless the MNRF concludes that the EA consultation was insufficient. In this case, the MNRF will determine the scope and scale of additional consultation and engagement necessary for the purposes of the WMP amendment.<br><br>**10.5 Amendment Submission**<br><br>Following completion of any applicable consultation requirements, the plan proponent(s) will provide the MNRF, other plan proponent(s) where appropriate, and any third party requesters, a copy of the final amendment proposal including:<br>a) Amendment request and supporting rationale;<br>b) Proposed changes (replacement text) as they would appear within the approved plan;<br>c) Map of the area affected by the amendment (if applicable);<br>d) Record of consultation identifying the type of form of feedback sought, issues identified and steps taken by the proponent to modify the proposed amendment |

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| | | | in response to comments (if applicable); and<br>e) Any other supporting information deemed applicable to the proposed amendment.<br><br>**10.6 Amendment Review**<br><br>All amendments to the Mississippi River WMP must be approved by the MNRF.<br><br>The MNRF will complete a review of the amendment submission. For proposed minor amendments, the MNRF will complete a review within 30 days of receipt of a complete submission. For proposed major amendments, MNRF will complete a review within 60 days of receipt of a complete submission.<br><br>During and/or following the review of the proponent's amendment submission, the MNRF may, with supporting rationale, request additional information required to complete the MNRF's review.<br><br>*10.6.1 Requests for Additional Information*<br><br>Where additional information is required, the MNRF will identify in writing the additional information requested and the rationale for the request. In such circumstances, the MNRF review timeline will be put on hold until the MNRF receives the requested information.<br><br>Upon receiving a request for additional information from the MNRF, the proponent may:<br>• Agree to provide the additional information by the specified time;<br>• Request a change to the specified time for submitting the information;<br>• Request a review by the Regional Director of the required information; or<br>• Refuse to provide the additional information.<br><br>Further details regarding the above scenarios can be found in Section 3.7.1 of the Technical Bulletin (2016).<br><br>**10.7 Issuance of Decision**<br><br>In issuing a decision on the proposed amendment, the MNRF shall either:<br>• Approve the amendment;<br>• Approve the amendment subject to changes considered advisable to further the purposes of the Act; or<br>• Refuse the amendment.<br><br>MNRF will provide the plan proponent(s) and any third party requester, as appropriate, written confirmation of its decision and supporting rationale.<br><br>If the amendment is approved, the WMP will be revised and a record of the amendment |

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| | | | will be appended to the approved WMP.<br><br>Where the MNRF intends to refuse an amendment, a Letter of Intent to Refuse approval of the amendment will be issued to the proponent identifying the supporting rationale and any additional measures the proponent(s) can take to address any outstanding concerns. The Letter of Intent to Refuse approval of amendment will notify the proponent that unless the MNRF receives a request within 15 days from the proponent for an inquiry, the amendment will be refused.<br><br>Requests for an inquiry under the LRIA are referred by the Ministry of the Office of Mining and Lands Commissioner (OMLC). Additional information on appeals to the OMLC is detailed in MNRF's LRIA Administrative Guide. |
| SAC Text | | *No process outlined in existing text, with the exception of one mention of the Standing Advisory Committee in Section 10.1. New Section 11.1 (text in the right column) is to be included in the WMP.* | **11.1 STANDING ADVISORY COMMITTEE**<br><br>A SAC is no longer a mandatory requirement for complex WMPs. SACs are recommended as a best management practice to provide plan proponent(s) with a mechanism for engaging First Nation and Métis communities and the public. Any proposal to discontinue an established SAC should be informed by advice from the MNRF, advice from the SAC and consideration of the level of public, stakeholder and First Nation and Métis community interest in dam operations. Where a plan proponent(s) makes this recommendation, an amendment to the WMP with appropriate rationale will be required to remove the provision for a SAC from this WMP.<br><br>Plan proponent(s) are responsible for administering the SAC (if applicable), and SACs will work directly with the plan proponent(s). Proponents are required to report on the status of the SAC (if applicable) every five years as a component of ongoing Implementation Reports as outlined in Section 9.3.<br><br>The role of the SAC (if applicable) is to serve as an advisory group, as defined through a terms of reference. The terms of reference will outline the membership, scope, duration and roles and responsibilities of the SAC and its relationship with the plan proponents. MNRF will define what role it will have, if any, in a SAC.<br><br>A SAC (if applicable) should include representatives with a broad range of interests on the river such as First Nation and Métis communities, riparian land owners, municipalities and interested groups. |

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| Compliance Text | | *Section 9.2 outlines Compliance Monitoring requirements. All specific requirements for self-monitoring continue to apply. Proponents will still be required to maintain records as outlined in these sections and sub-sections, and make this data available to MNRF upon request.*<br><br>**9.2.4 Data Management for Compliance Monitoring**<br>Owners will maintain records of all level and/or flow information that are required by the plan for a retention period of ~~the term of the Mississippi River Water Management Plan plus five years.~~ *15 years. (This change is to accommodate no plan term (i.e., 10 years and the additional 5 years required to retain records.)*<br>It is recognized that water level measurements may be unavailable from time to time due to equipment failure or environmental conditions.<br>• OPGI will maintain data for OPGI facilities at its Evergreen Energy Control Centre and make it available to MNR upon request for audit activities.<br>• MVC will maintain data for its facilities at the MVC Office and make it available to MNR upon request for audit activities.<br>• CHD will maintain data for its facilities at the Canadian Hydro Developers Head Office and make it available to MNR upon request for audit activities.<br>• MRPC will maintain data for its facility at the Mississippi River Power Office and make it available to MNR upon request for audit activities.<br>• Enerdu will maintain data for its facility at Enerdu and make it available to MNR upon request for audit activities.<br><br>*The crossed-out text below will be removed from the plan and replaced with the new Section 9.2.5 and 9.2.5.1 in the column to the right.*<br><br>~~**Section 9.2.5: Non-Compliance Notification:**~~<br>~~The proponents are required to verbally notify MNR for all instances of non-compliances to meet mandatory components of the operating plan within 24 hours of the incident being discovered. The following is the information to be provided in the verbal notification:~~<br>~~a. the owner/operator will explain the nature of the incident~~<br>~~b. why it happened~~<br>~~c. what is being done to bring the operation back into compliance with the plan, and~~<br>~~d. how long it will be before the operation is back in compliance~~<br>~~e. any corrective action required~~<br><br>~~**9.2.6 Non-Compliance Reporting**~~<br>~~The proponents and MNR shall be responsible for the following reporting mechanisms:~~<br>~~i. The proponents will be required to provide a written report of all instances of noncompliance with the WMP to MNR within 30 working days, together with a rationale for the deviations, and proposals for remediation of any problems, if necessary.~~<br>ii. MNR will have 90 days to respond and will take into account the nature, severity and the reasons for the non-compliance. Facility operators will be provided with a fair and reasonable opportunity to explain what happened and their actions before any enforcement action is taken. *(This remaining text to be included as the last sentence in Section 9.2.5)* | ***9.2.5 Self-Monitoring, Data Reporting and Incident Notification***<br><br>All facilities are required to self-monitor mandatory water flow and level limits, and report on any incidents where a deviation from the operating requirements of the WMP (mandatory flows and levels), or other mandatory conditions of the Mississippi River WMP. All incidents must be reported to the MNRF.<br><br>An initial notification to the MNRF is required within 24 hours of the occurrence of the incident or when the proponent(s) first becomes aware of the incident.<br><br>The report should include:<br>• The date, time and nature of the deviation;<br>• The extent of the deviation;<br>• Possible causes of the deviation;<br>• Known or anticipated impacts associated with the deviation; and<br>• Steps taken or to be taken, including the timeframe, to correct the deviation.<br><br>The facility owner/operator is then required to provide a written report to the MNRF within 30 days, outlining the details of the incident, any additional information not provided in the incident notification and subsequent remediation. The report must be signed and dated.<br><br>***9.2.5.1 Annual Compliance Reports***<br><br>Each individual plan proponent will prepare and submit an Annual Compliance Report. The report will contain a summary and description of all incidents and any remedial action(s) proposed or undertaken. In the event there were no recorded incidents of noncompliance, the report will state as such. |

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| Effectiveness Monitoring Text | | *Section 9.1 outlines the Effectiveness Monitoring requirements for the WMP. All specific requirements for effectiveness monitoring remain in effect. Text in the column to the right will be added into the beginning section, which outlines how this information shall be reported.* | *Text to be added:*<br><br>Reporting on the results of data the Effectiveness Monitoring Plan will occur through submission of the Implementation Report as outlined in Section 9.3. |
| Implementation / Reporting Text | | No existing text on Implementation Reporting. | *The following Section will be added to the plan.*<br><br>9.3 Implementation Reporting<br><br>Plan proponents for the Mississippi River WMP shall submit an Implementation Report to the MNRF every five years. This report shall be a collective submission from all plan proponents.<br><br>The Implementation Report will provide status updates, transparency of dam operations and inform adaptive management considerations. The Implementation Report is not intended to initiate a fundamental review of the WMP.<br><br>The Implementation Report will include:<br>• Summary of all amendment requests received, including the rationale for completed amendments and how proposed amendments that did not proceed were addressed;<br>• Status of the Standing Advisory Committee, where applicable;<br>• Report on the results of the effectiveness monitoring program (EMP), if applicable, including a summary of monitoring conducted and findings, a determination of whether operations are having a negative or unintended impact, and an assessment of whether revisions to the facility operations, or the EMP, are required; and<br>• Status and results of any data or information collection outlined in the WMP's |

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| | | | data collection program, if applicable, and a determination of whether revisions to the program are required.<br><br>The MNRF will review the report for completeness but will not formally approve the report. If the report is not complete, the MNRF will request that additional information be provided. The MNRF may also audit records used by the proponent(s) to prepare the Implementation Report and may request any additional information to verify the information presented.<br><br>Upon confirmation from the MNRF that the Implementation Report is complete, plan proponents will make the report publicly available.<br><br>***Note:** During MNRF's meeting with plan proponents on September 27, 2017, we proposed and sought feedback on a one-year timeline for submission of the initial Implementation Report following the date of approval of this amendment. MNRF continues to work to finalize a schedule for submission of the initial Implementation Report. Once this schedule is confirmed, a formal timeline for initial submission of the Implementation Report will be amended into the MRWMP. In accordance with the Technical Bulletin, Implementation Reports must be submitted every five years thereafter.* |