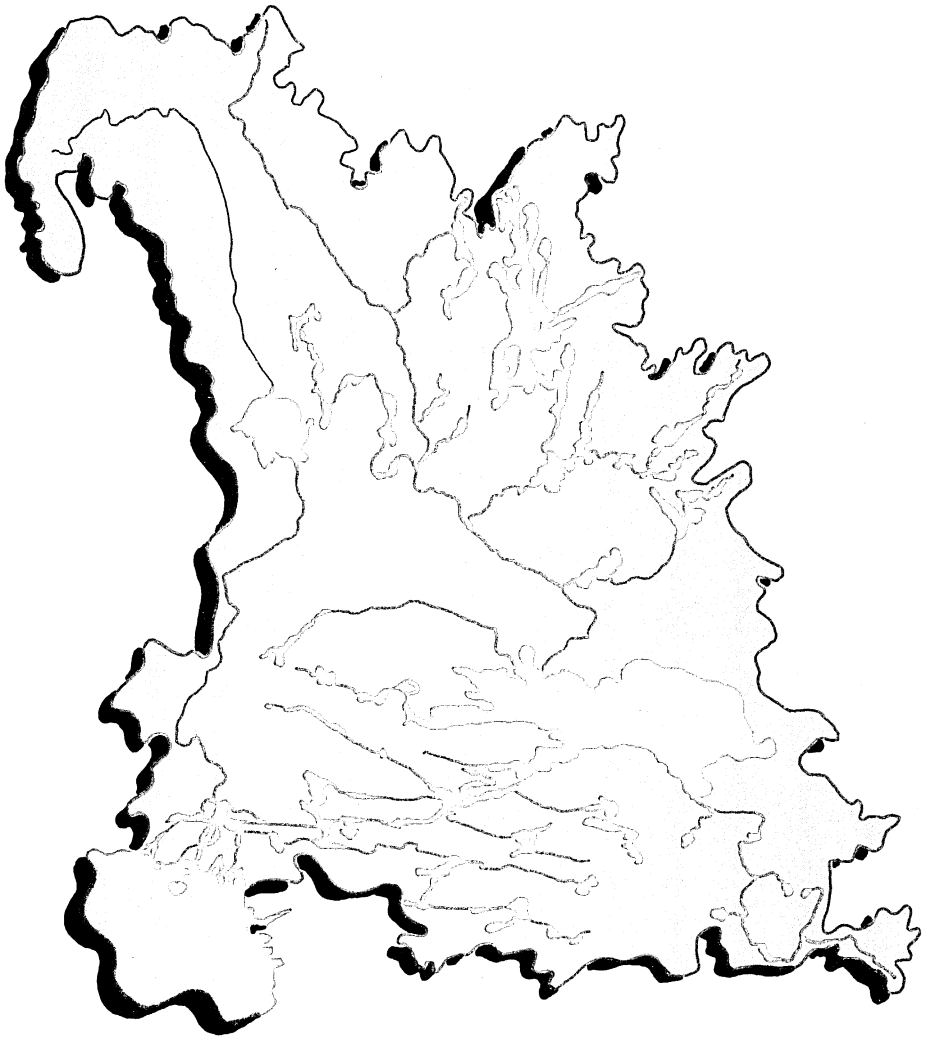
Sturgeon - Nipissing - French Water Management Advisory Board / Ontario Ministry of Natural Resources

Sturgeon River / Lake Nipissing / French River Water Management Plan

March 1992



ACRES

Acres International Limited

Sturgeon - Nipissing - French Water Management Advisory Board / Ontario Ministry of Natural Resources

Sturgeon River / Lake Nipissing / French River Water Management Plan

March 1992

Acres International Limited

March 3, 1992
P9726.01.01
.03.08
.03.10

Sturgeon-Nipissing-French Water
Management Advisory Board
P.O. Box 1336
North Bay, Ontario
P1B 8K5

Attention: Mr. George P. Maroosis
Chairman

Gentlemen:

**Sturgeon River/Lake Nipissing/
French River Water Management Plan**

We are pleased to submit 100 copies of the Water Management Plan, and 25 copies of the Supporting Technical Document.

In addition, we have provided an unbound copy of the report, and one set of diskettes containing WordPerfect 5.1 word processing files.

The Supporting Technical Document covers all of the technical studies related to the plan development. It includes a background discussion of the water resource, a definition of analytic methodologies, identification of water management issues and options, and a presentation of analyses undertaken.

The Water Management Plan includes a summary of background information and a summary of water management issues, but focuses on a plan that will clarify and improve operating policies in the basin. In addition, recommendations for institutional implementation of the plan are also made.

We would like to express our gratitude to the members of the Sturgeon-Nipissing-French Water Management Advisory Board, the Steering Committee and the Ministry of Natural Resources for the very positive and valuable contributions that they have made throughout the study.

We have enjoyed taking part in the evolution of efficient water management in the basin, and look forward to serving you in the future.

Kindest regards,

S. G. Bridgeman
Project Manager

SGB:ch

Attach

cc: Mr. F. Shaver

5259 Dorchester Road, P.O. Box 1001, Niagara Falls, Ontario, Canada L2E 6W1
Telephone 416-374-5200 Telex 061-5107 Facsimile 416-374-1157
Vancouver, Calgary, Winnipeg, Toronto, Burlington, Halifax, Sydney, St. John's

Ministry of Natural Resources
Document Approval

Approved By: _____

Chairman
Sturgeon River-Lake Nipissing-French River
Water Management Advisory Board

Date: _____

Table of Contents

List of References

List of Tables

List of Figures

Background

1 Introduction

1 Introduction

The Watershed

The Sturgeon River/Lake Nipissing/French River (SNF) watershed drains 19 100 km^2 of northeastern Ontario into Georgian Bay. The watershed extends from Lake Wanapitei in the west (see Figure 1.1) to Lake Temagami in the east. The headwaters of the basin are northern portions of the Sturgeon and Wanapitei rivers. Lake Nipissing is located roughly in the center of the basin and is by far the largest body of water and storage reservoir in the basin. The South and Pickerel rivers drain the portion of the basin to the south of Lake Nipissing. The French River drains Lake Nipissing into Georgian Bay, and the Wanapitei River joins the French River in its lower reaches.

Despite a significant number of dams and reservoirs in the watershed, the basin cannot be considered to be highly regulated. By this it is meant that the total volume of storage in the basin is only a fraction of the annual runoff volume, and therefore a high degree of control over flows and water levels in all seasons cannot be achieved.

Plan Objective

The general objective of the Plan is to bring about changes to water management procedures and agencies responsible for the water resource, in order that the value of the resource use in future will be maximized. Agencies include the Ontario Ministry of Natural Resources (MNR), Ontario Hydro, and Public Works Canada (PWC).

Specific objectives are as follows:

- to provide general operating guidelines and plans to be used by operating agencies throughout the year for various water control structures in the basin. The guidelines relate water control decisions to relevant water level and flow conditions.

- to identify future roles, responsibilities, levels of authority and accountability for water resource agencies and the Sturgeon-Nipissing-French Water Management Advisory Board

- assist MNR in developing a communications program to be carried out during the different flow conditions to ensure that external agencies and the public are kept informed as necessary.

Development of the Plan

The Plan was developed in four phases, as listed below.

- Phase 1 - Collection of Background Information
- Phase 2 - Identification and Analysis of Options
- Phase 3 - Preparation of the Draft Plan
- Phase 4 - Preparation of the Final Plan

Public participation was an important aspect in the development of the Plan. Public meetings were held at the end of Phases 1 to 3 at three locations within the basin. The major concerns expressed by the public are identified in Appendix A.

Dams

1 Maskinonge
2 Washagami
3 Temagami
4 Wicksteed
5 Marten River
6 Red Cedar
7 Bear Lake
8 Tilden Lake
9 Tomiko
10 Crystal Falls
11 Sturgeon Falls
12 Craig Lake
13 Twenty Seven Lake
14 Hinsburger lake
15 Loxton Lake
16 Smyth Lake
17 South River (Forest Lake)
18 Bray Lake
19 Sausage Lake
20 Elliot Lake
21 Bingham Lake
22 Nipissing
23 Nepawassi Lake
24 Little French Dam
25 Chaudiere Dam and Portage Dam
26 Scotts
27 Broadwell Lake
28 Memesagemesing Lake
29 Arthurs Lake
30 Pine Lake
31 Le Grous Lake
32 Dutchman Lake
33 Mud Lake
34 Dollars Lake
35 Wanapitei Lake
36 Stinson
37 Coniston
38 McVitties

Fig. 1.1

Sturgeon-Nipissing-French Water Management Advisory Board
Sturgeon River/Lake Nipissing/French River Water Management Plan
Watershed Map

ACRES

P09726.00 MR

2 Background Information

2 Background Information

Existing background information relevant to the Water Management Plan for the SNF system is provided in this section. The watershed was subdivided into the four following geographic areas for the organization of information:

- Sturgeon River system
- Lake Nipissing
- French River
- Wanapitei system.

These areas represent natural water management subsystems.

2.1 Previous Studies

The watershed has been the subject of a significant amount of previous study. All of the available previous studies have been reviewed. The two most important studies are briefly summarized here, and the others are listed in the references.

An MNR report in 1979 summarized the investigations and findings of the Task Force on the Lake Nipissing/French River Watershed. This Task Force was formed with the objectives of examining the implications of the Province of Ontario taking over ownership of the Chaudiere Dams, and examining the water level control problems of Lake Nipissing and the French River. Hydrologic, biologic and economic aspects of water management were studied. Increased conveyance capacity on the French River and additional reservoir storage in the Sturgeon River system were identified as possible solutions to flooding and low water levels. It was determined that channel modifications would have a significant environmental impact, and that the addition of reservoir storage capacity would be quite expensive. Six conclusions were reached and seven recommendations made. Neither channel modifications nor additional storage were explicitly recommended. With the exception of the province acquiring the Chaudiere Dams and a single agency being responsible for water management, all of the other recommendations have been implemented.

A comprehensive study of the watershed was undertaken by MacLaren in 1981 under the Canada/Ontario Flood Damage Reduction Program. The study was conducted after severe flooding took place in the basin in 1979. The objective of the study was to address flooding, while at the same time taking into account competing water uses in the basin.

The principal water management conclusions were as follows.

- In the Sturgeon River system, significant flood control is impossible to achieve by modifying the operating policy of existing reservoirs. Reconstruction of reservoirs at Obabika and Matagamasi would provide flood control to both the Sturgeon River and Lake Nipissing, as would diversion of Lake Temagami flows into the Montreal River.

- Lake Nipissing summer levels should not be changed. Inflow forecasting would improve the freshet operation of Lake Nipissing.

- No significant damage would result from raising the flood limits on the French River by 0.30 m.

The MacLaren report also drew conclusions in the areas of the management structure, land-use regulation, and flood relief activities. Numerous recommendations were made. As part of the current Plan development, the status of each of the recommendations was reviewed and considered as input to this Plan.

2.2 Existing Water Management Agreements

Existing water management agreements fall into the categories of formal multiparty agreements, Licenses of Occupation, and operating policies. A formal agreement, referred to as the tripartite agreement, was entered into in 1937 by Ontario Hydro, the Province of Ontario, and the Abitibi Power and Paper Company. This agreement states the operating costs of storage dams will be shared by Ontario Hydro and the Abitibi Power and Paper Company, and that the storage will be operated so as "...to provide the greatest benefit and most efficient use [of water] to the Crystal Falls and Sturgeon Falls plants...". MacMillan Bloedel is now the owner of Abitibi Power and Paper's Sturgeon River generating facilities.

All Ontario Hydro dams in the SNF system are subject to a License of Occupation issued by the Province of Ontario. The license specifies the maximum level to which water can be impounded behind the dam and other conditions of operation. In the SNF system, most hydro development took place between 1900 and 1940, and the Licenses of Occupation date from that period.

The federal government, as owner and operator of the Chaudiere Dams, holds flood rights on Lake Nipissing up to a specific elevation (196.59 m).

Operating policies exist for all of the structures in the basin. These policies effectively constitute informal operating agreements. Ontario Hydro's operating policies are the most formal, being well documented in their Technical Directives. Ontario Hydro's operating policies do not normally maximize generation subject only to the constraints of the operating license, but rather seek to strike a balance between generation and other water uses, and the water level desires of local residents. In addition, Ontario Hydro's operating policies often reflect agreements made with MNR, relating to water levels for fisheries management. Such agreements with MNR exist on Wanapitei and Red Cedar lakes. Operating policies also exist for lakes managed by MNR, and for Lake Nipissing. These tend to be somewhat less well documented than for lakes managed by Ontario Hydro. The policy for Lake Nipissing is specified by means of a rule curve for the lake and a "Manual of Operation for the French River Dams" which is currently being prepared.

During the freshet period, a weekly conference call is arranged by MNR for agencies responsible for water management, and representatives of user groups. Existing conditions are reviewed, and operating plans for the next week discussed. The existence of the conference call mechanism is another form of informal agreement pertaining to the operation of the SNF system.

2.3 Hydrotechnical Background

The SNF system is quite complicated, being comprised of several large lakes, numerous rivers, and more than 40 control structures and power stations (refer to Figure 1.1). The Sturgeon River, Lake Nipissing, and the French River form a continuous link, from the upper portion of the watershed to Georgian Bay. The Wanapitei system joins the French River system in the last reach of the French River. As shown in the schematic diagram in Figure 2.1 (which shows the system as represented in the computer model), the Wanapitei and SNF systems are only connected in the lowest part of the watershed. This means that operations on the SNF system cannot influence conditions on the Wanapitei system above Ox-Wanapitei Bay, and vice versa.

All of the reservoirs in the SNF system were reviewed to determine which ones had the most potential for water management. A useful measure of how much a basin can be regulated is to compare the available reservoir storage volume to the mean annual runoff. The larger the ratio of these two values, the more regulated the basin is. Table 2.1

presents this information for the largest reservoirs in the SNF system. The Sturgeon system has a storage/runoff ratio of 0.17 which is relatively low. This means that the total volume of storage on the Sturgeon system is equivalent to only 17% mean annual runoff. The South River is even lower at 0.11, and Lake Nipissing (Chaudiere Dams) is significantly higher at 0.34. The Pickerel and Wanapitei rivers ratios are 0.23 and 0.30, respectively. All of these ratios are quite low, as a high degree of regulation would be indicated by a ratio of well above 0.5.

The Sturgeon River system contains seven dams and two power stations. Most of the reservoir storage is concentrated at Temagami and Red Cedar lakes, both of which are operated by Ontario Hydro. The Ontario Hydro reservoirs are currently operated to provide power, recreational and, to some extent, flood benefits. The smaller reservoirs are operated by MNR for recreation.

Lake Nipissing is controlled by the Chaudiere Dams which are owned and operated by PWC. The dams were originally constructed to regulate Lake Nipissing for navigational purposes, and that remains the official principal objective. Recreation and flood control, both on the lake and the French River, are also considered in operation. The South River has 11 dams and generating stations. All of the reservoirs are quite small, and there is very little regulation of the inflow to Lake Nipissing.

The Wanapitei system consists of a large storage reservoir on Lake Wanapitei and three downstream generating stations on the Wanapitei River. Lake Wanapitei is regulated by Ontario Hydro for power generation, flood control and recreation benefits.

2.4 Biophysical Background

Water Quality

The drainage basin of the SNF watershed lies within the Precambrian Shield and, as such, drains exposed bedrock, marsh and glacial deposits. These sources typically contribute to high concentrations of iron, organic material and turbidity, and moderate to low alkalinity and hardness.

The water quality of the SNF watershed is generally considered good. Exceptions to this generalization, however, occur downstream of Sturgeon Falls where discharges from MacMillan Bloedel contribute to high biological oxygen demand (BOD) and low oxygen levels during the summer low-flow period. Installation of digesters at the plant, however, are expected to improve the situation. In addition to effluent

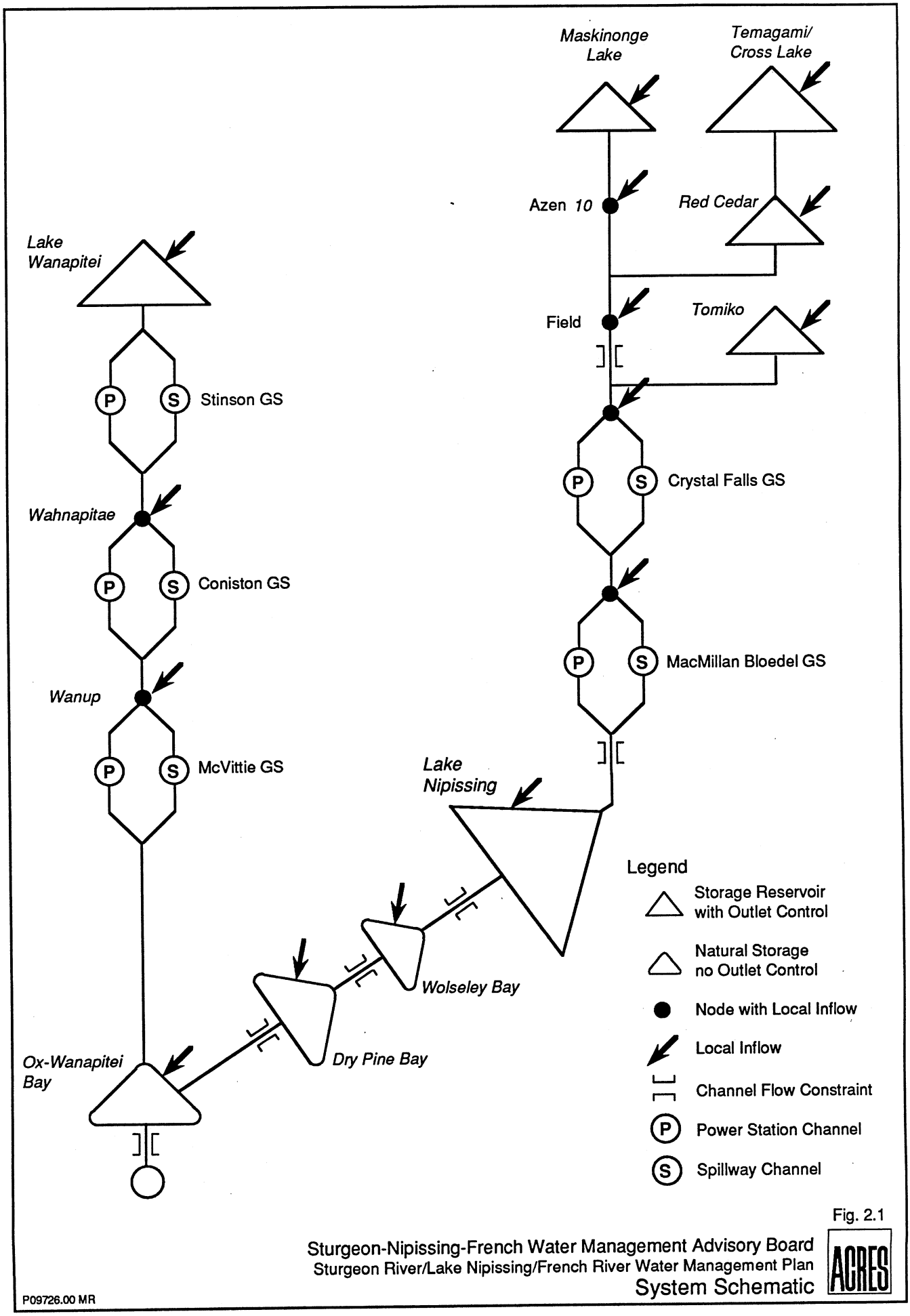


Fig. 2.1

Sturgeon-Nipissing-French Water Management Advisory Board
Sturgeon River/Lake Nipissing/French River Water Management Plan
System Schematic

ACRES

P09726.00 MR

Table 2.1

Storage Characteristics of the Basin

Dam	River	Dam Owner	Drainage Area (km^2)	Live Storage (m^3x10^6)	Mean Annual Runoff (m^3x10^6)	Storage/ Runoff Ratio
Sturgeon River System						
Maskinonge	Chiniguchi	MNR	524.2	49.0		
Washagami	Chiniguchi	MNR	550.9	3.8		
Temagami	Temagami	OH	1370.9	225.0	454.0	0.50
Wicksteed	Marten	MNR	294.5	24.3		
Marten River	Marten	MNR	495.2	12.4		
Red Cedar	Temagami	OH	2309.5	112.2	980.8	0.11
Bear Lake	Tomiko	MNR	150.5	7.5		
Tilden Lake	Tomiko	MNR	211.1	3.0		
Tomiko	Tomiko	OH	552.4	30.8		
Crystal Falls	Sturgeon	OH	6656.3	2.2	2727.9	
Sturgeon Falls	Sturgeon	MBD	6889.4	1.8		
Subtotal				472.0	2823.4	0.17
Lake Nipissing Tributaries						
Craig Lake	South	OH	76.1	11.7		
Twenty Seven Lake	South	MNR	9.3			
Hinsburger Lake	South	MNR	4.3			
Loxton Lake	South	MNR	10.9			
Smyth Lake	South	OH	15.8	5.7		
South River (Forest Lake)	South	MNR	315.2	4.9		
Bray Lake	South	OH	14.0	12.0		
Sausage Lake	South	OH	10.9	1.4		
Elliot Chute	South	OH	655.3	5.1		
Bingham Lake	South	OH	699.3	0.7		
Nipissing	South	OH	795.1	0.7	372.1	
Subtotal				42.2	372.1	0.11

Table 2.1

Storage Characteristics of the Basin – 2

Dam	River	Dam Owner	Drainage Area (km^2)	Live Storage (m^3x10^6)	Mean Annual Runoff (m^3x10^6)	Storage/ Runoff Ratio
Nepawassi Lake	Veuve	MNR	209.8	16.0		
Barlow Lake	Amateewakee	MNR	106.2	0.3		
French River System						
Chaudiere Dams	French	PWC	12405.0	1210.8	5108.8	
Subtotal				1741.3 *	5108.0	0.34
Scotts	Restoule	MNR	464.0	5.7		
Broadwell Lake	Memesagemesing	MNR	627.0	0.4		
Memesagemesing Lake	Memesagemesing	MNR	134.7			
Arthurs Lake	Pickerel	MNR	126.4	2.4		
Pine Lake	Pickerel	MNR	220.0	4.3		
Le Grous Lake	Pickerel	MNR	270.9	3.2		
Dutchman Lake	Pickerel	MNR	287.0	16.1		
Mud Lake	Pickerel	MNR	24.6			
Dollars Lake	Pickerel	MNR	912.0	63.2		
Subtotal				95.2	384.0	0.23
Wanapitei River System						
Wanapitei Lake	Wanapitei	OH	2451.0	345.0		
Stinson	Wanapitei	OH	2662.0	3.9		
Coniston	Wanapitei	OH	2820.0			
McVitties	Wanapitei	OH	3266.0		1166.8	
Subtotal				348.9	1166.8	0.30

*Including upstream storage.

discharges into Lake Nipissing from North Bay, nutrient enrichment from its tributaries (some of which comes from farm fertilizers) appears to be contributing to increased aquatic plant growth. The French River receives nutrient input from numerous cottages and several primary sewage treatment facilities; however, the assimilative capacity of the river appears to be adequate for these sources.

Fishery

Angling in the watershed is a major recreational pastime. Major sport fish include walleye, lake trout, muskellunge, northern pike and smallmouth bass. Major winter fisheries exist on Lake Temagami and Lake Nipissing. On Lake Temagami, the winter fishery targets lake trout and lake whitefish primarily, while whitefish, cisco, walleye, yellow perch and northern pike are fished on Lake Nipissing. Fish stocks are managed primarily through natural reproduction, although walleye stocking is practiced in many parts of the basin.

2.5 Socioeconomic Background

The purpose of the socioeconomic background is to indicate the benefits or impacts that would accrue to different groups within the watershed, from changes in the management of water levels and flows at different times and places.

Socioeconomic issues fall into the general categories of fisheries, flood damages, hydropower generation, navigation and recreation. Socioeconomic data and analysis enables these impacts to be quantified and compared to each other. A water management option which improves the fishery but reduces hydropower generation can be compared by translating the fishery gain and hydropower loss into monetary values.

As part of Phase 2, the major water uses and impacts in the basin that could be affected by the Water Management Plan were valued in monetary terms. The following were identified.

(a) Red Cedar Lake fishery is the basis for commercial tourist operations with revenues of about $750,000 annually.

(b) Lake Nipissing flooding can result in damages of $10.0 million, $7.0 million and $2.7 million for 1:100-, 1:50-, and 1:10-yr return period floods, excluding the effects of wind.

(c) The Lake Nipissing fishery is the basis for commercial tourist operations with revenues of about $27.0 million annually. This does not include recreational fishing by local residents, the value of which is also very large but cannot be quantified.

(d) The French River fishery is the basis for commercial tourist operations with annual revenues of some $9.6 million. As for Lake Nipissing, recreational uses which are not obtained through tourist businesses on the French River are not included.

(e) Hydropower generation in the basin produces energy worth about $5 million annually.

It must be emphasized that these are not the only water uses with high value. For example, Lake Temagami recreation, Sturgeon River flooding, and Wanapitei recreation and flooding are also high values, but they are uses which are not affected by identified water management options.

3 Definition of Water Management Issues

3 Definition of Water Management Issues

Water management issues in the SNF basin were identified by researching the background information, talking to agencies and individuals, and participating in the public meetings. These issues are summarized in this section. In the course of the Plan development, numerous options were identified to address the water management issues. The options which were found to further the basin's water management objectives were incorporated into the operating policies presented in Section 4. All of the options considered are listed in Appendix B, but it must be emphasized that many of the options listed were rejected during the development of the Water Management Plan. A detailed evaluation of each option can be found in Section 5 of the Supporting Technical Document, the companion volume to this report.

3.1 Sturgeon River System

(a) Issue--Red Cedar Lake Drawdown

Red Cedar Lake is subject to a 4.25-m annual drawdown which may be adversely affecting lake trout and walleye stocks. The lake trout spawn in the fall on submerged beds, but, before the eggs hatch in the spring, the level drops so that either ice grounds on these beds or they actually become exposed. The drawdown is also believed to affect the walleye by reducing the area of lake bottom they have available to feed from and by making it impossible for them to enter tributaries during their spring spawning period.

The extent of these problems is unknown. The availability of optimum habitat for lake trout is limited even when the lake is at summer operating level.

(b) Issue--Flow Range at Island Lake

Island Lake (also known as Thistle Lake) is situated immediately downstream of the Red Cedar Lake dam. The lake is in reality a reach of the Temagami River, and is subject to large water level variations. A commercial camp on the lake can be quite badly flooded at flows above 100 m^3/s. In the past, such flows have been reasonably common. The flow is controlled by the Red Cedar Lake dam, but problems arise when the maximum level is reached on Red Cedar Lake and Lake Temagami. The usual practice is then to pass incoming flood flows directly through these lakes. The inflows are often far in excess of 100 m^3/s, as the drainage is quite large.

Island Lake also experiences problems with low flows below 10 m^3/s. Boat travel on the lake is restricted, and this can pose a safety problem as water levels can change so fast that people have actually become stranded.

(c) Issue--Water Quality at Sturgeon Falls

From chemical studies in the Sturgeon River, the Lake Nipissing Fisheries Assessment Unit has determined that in the summer, when flows in the Sturgeon River fall below 30 m^3/s, the dissolved oxygen in the water falls below 5 ppm, with the result that fish die.

(d) Issue--Cross Lake Drawdown

Concern has been expressed about the spring drawdown of Cross Lake, which is greater than the drawdown in Lake Temagami. This drawdown is necessary in order to achieve sufficient discharge from Lake Temagami to avoid flooding there. However, it may have a detrimental effect on lake trout, whitefish and cisco, which are all fall spawners, and it could affect the walleye population as well.

(e) Other Issues

The lower Sturgeon River, in the vicinity of Field, floods recurrently. After the disastrous 1979 flood, residential homes in Field were relocated, but commercial and public buildings are still prone to flooding. The 1981 MacLaren study recommended additional reservoir storage dedicated to flood control and/or a diversion of flow from Lake Temagami to the Montreal River system. Additional reservoir storage is not currently being pursued, and the diversion of flows has been rejected.

3.2 Lake Nipissing

Issue--Lake Water Levels

Both high and low water levels on Lake Nipissing are water management issues. Significant damage occurs when the lake rises above 196.22 m, and a high wind can further increase the water level and associated damage. Low water levels inconvenience shoreline residents whose docks are too high out of the water, or who may have trouble getting their boats into the docks. Navigation on the lake is also affected by low water.

Current water levels are quite acceptable to the Lake Nipissing fishery. However, any change in the existing levels, to address other issues, will impact on the fishery. For example, low water levels in spring greatly affect the availability of shoreline spawning shoals.

3.3 Wanapitei System

Issue--Lake Wanapitei Water Levels

Lake Wanapitei can experience both undesirably high and low levels. High levels principally affect lawns, docks and outbuildings. Low water affects the operation of several marinas and general navigation, and reduces the attractiveness of the shoreline. Low water is believed to be the more important of the two issues. On the Wanapitei River, flooding occurs in the towns of Wanapitei and Wanup. This flooding can be quite severe, submerging secondary roads and bridges and causing considerable property damage. At very low flows on the river, the wells of some homes run dry.

3.4 French River

Issue--French River Flooding

Large water level fluctuations have historically been an issue on the French River. The river has also experienced high flood flows. In 1985, PWC unilaterally raised the flood limit on the French River. Both the levels and fluctuations are water management issues.

Some residents perceive that the use of higher flood limits precipitates a legal issue. Land titles on the French River, or "patents", as they are referred to in Sudbury district, use the term "high water mark" in the legal description of the property. Residents were concerned that if the flood limit is altered, the boundaries of their property would change. However, it has been clarified by MNR that the "high water mark" is a level which has already been defined for the purposes of property descriptions, and is not affected by the French River flood limits.

Issue--French River Fishery

Large changes in the French River water levels can devastate the fish spawn. The commercial camps rely heavily on the fishing to attract tourists, and cottagers also place importance on fishing.

3.5 Basin Wide

Issue--Water Quality

Water quality was one of the issues most frequently raised by the public. Concern primarily focused on bacterial pollution of North Bay beaches and aquatic plant and algae growth throughout the basin.

The mandate for the development of this Plan was to address the water management from the perspective of controlling flows and levels in the system. Aspects of water quality which can be addressed by flows and levels (principally minimum flows) were considered in the development of this Plan. Most water quality issues are best dealt with by focusing on the source of pollution, and this is the specific mandate of several other studies currently being carried out. The two most important studies are the "Lake Nipissing Pollution Control Plan" and the "Lake Nipissing Neutrification Study". When these studies are completed, their findings regarding the management of water quality should be incorporated into this Plan.

The Plan

4 Operating Policies

4 Operating Policies

4.1 General Operating Philosophy

The objective of the operating policies for the water control structures in the basin is to maximize the benefit of the water resource to all users. Maximizing the benefit means regulating conditions in the basin so they are compatible with recreation, fisheries, flood control, commercial navigation and hydroelectric generation.

The general operating philosophy being promoted in this Plan is the equalization of conditions throughout the basin. This means that in a dry year, when water levels in lakes cannot be held up to their desired levels, each lake should be roughly the same percentage below its target level[1]. Likewise, during years with high spring runoffs, all of the lakes and channels should be exceeding their maximum levels by about the same amount. This philosophy of sharing the available water under both desirable and undesirable conditions is the most equitable approach to water management in the basin.

4.2 Existing Operating Policies

The operating policies for water control structures should be the current operating policies, modified in accordance with the recommendations given in Section 4.3.

Operating policies are principally expressed as rule curves for the lakes and flow constraints for the rivers. The rule curve represents the most desirable level or range of levels for the lake throughout the year. Flow restrictions are stated as a desirable flow range, defined by minimum and maximum values of flow. Water quality, fisheries, and navigation are all reasons for observing a minimum flow. Flooding and/or ice damage are the usual reasons for observing a maximum flow limit.

With the exception of the changes contained in the following subsection, the operating policies should remain as currently practiced. None of the rule curves for the lakes are being changed, with the exception of Lake Wanapitei. Although the target levels for the lakes are not being changed, some small changes in level may occur as a result of the other recommended changes. An example is the recommended change to the regulation of flows on the French River during the fish spawn. While the Lake Nipissing rule curve

---

1 'Percentage Drawdown' enables lakes of different size and drawdown range to be compared. If two lakes have 50 cm and 20 cm between their maximum and minimum summer levels, 25 cm and 10 cm drawdown, respectively, represent 50% drawdown (25/50 = 50% and 10/20 = 50%).

has not been changed, the implementation of the fish spawning policy will have a small temporary effect on the water levels in the lake. These carryover effects have been fully investigated for each of the recommended changes and judged to be acceptable compared to the benefit resulting from the recommended change.

The rule curves and flow constraints for the major lakes and channels in the basin are provided in Figures 4.1 and 4.2 and Table 4.1. Together, these curves and flow constraints summarize the operating policy for the basin. The curves and flows provided in these figures and table incorporate the operating policy changes recommended in the next section. The existing operating policies are described in more detail in Section 2.2 of the Supporting Technical Document. Ontario Hydro's existing operating policies are fully documented under their 'Technical Directives' (Reference 9). PWC's existing policies are described in their 'Manual of Operation - French River Dams' (Reference 8). It is a recommendation of this plan that MNR compile a similar set of written operating procedures for their structures. The following sections propose changes to the existing operating policies.

4.3 Recommended Changes to the Existing Policies

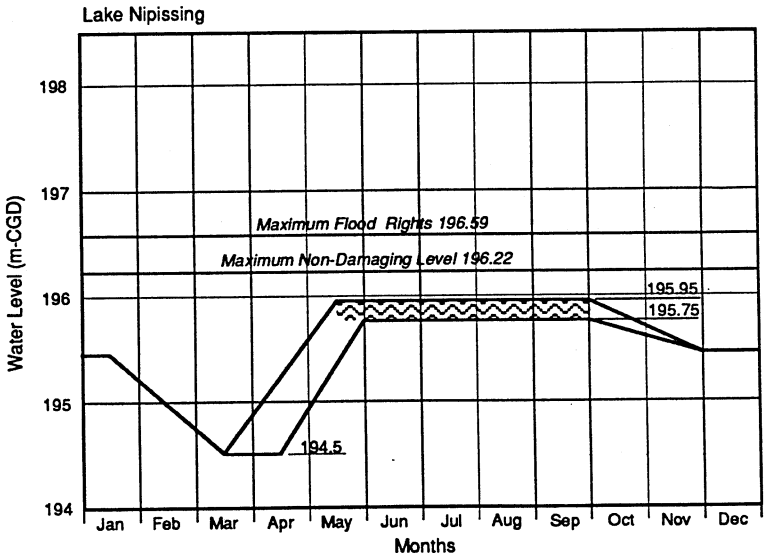
All of the existing operating policies for the basin were examined as part of the development of this Plan. The following specific changes to the existing policies are recommended.

4.3.1 Integrated Decision Making

When an operating decision is required for one specific part of the basin, the effect on the entire basin should be considered. This can be effected by defining interrelationships between water levels and flows in the operating policy. In practice, it can only be efficiently implemented with the supplementary use of a computer model. The benefit of integrated decision making is the ability for other parts of the basin to compensate for aberrations in a small portion of the basin.

Examples of the benefits resulting from integrated decision making are as follows.

- During the spring, if Lake Nipissing is approaching critical flood levels, water can be stored in the upper Sturgeon system.



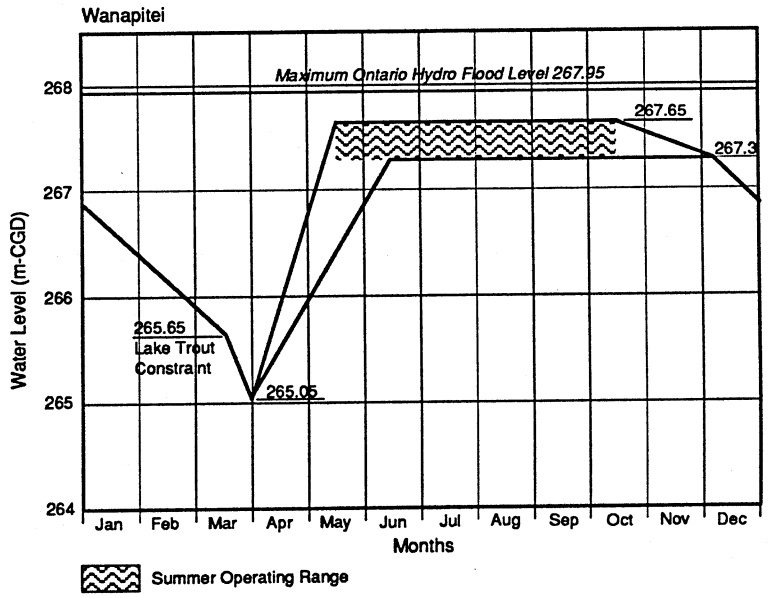
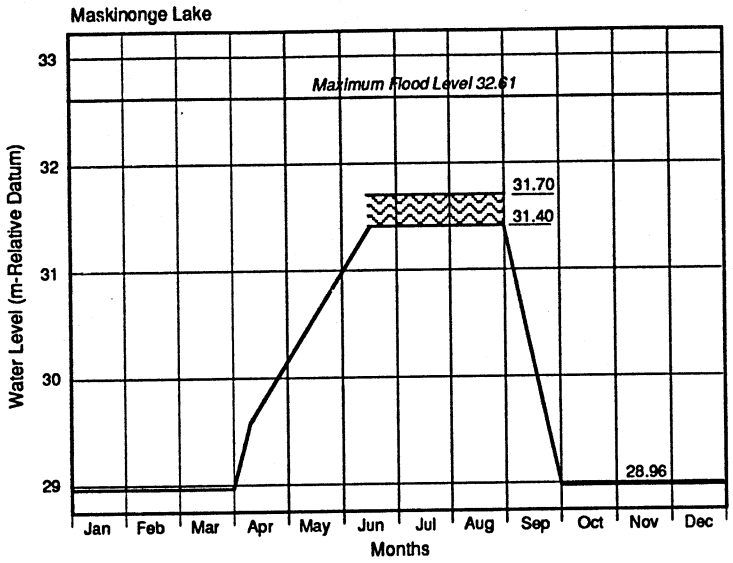


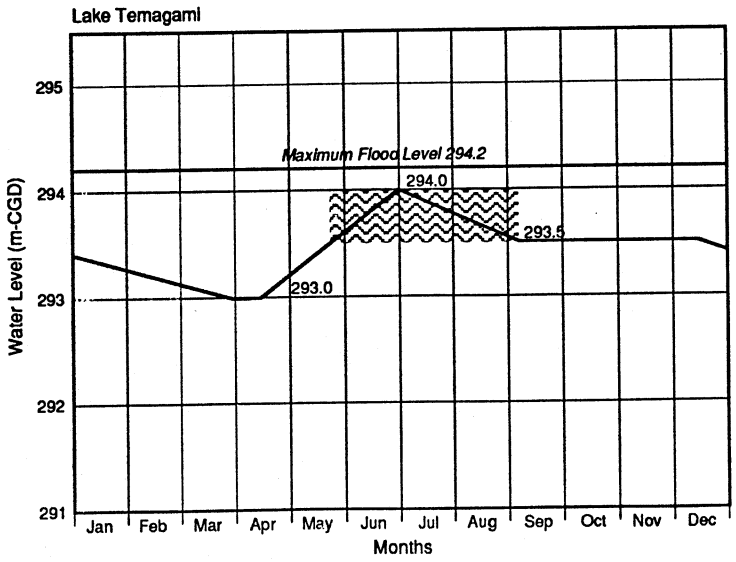
Fig. 4.1

Sturgeon-Nipissing-French Water Management Advisory Board
Sturgeon River/Lake Nipissing/French River Water Management Plan
Lake Nipissing and Wanapitei Operating Curves

ACRES

P09726.00 MR





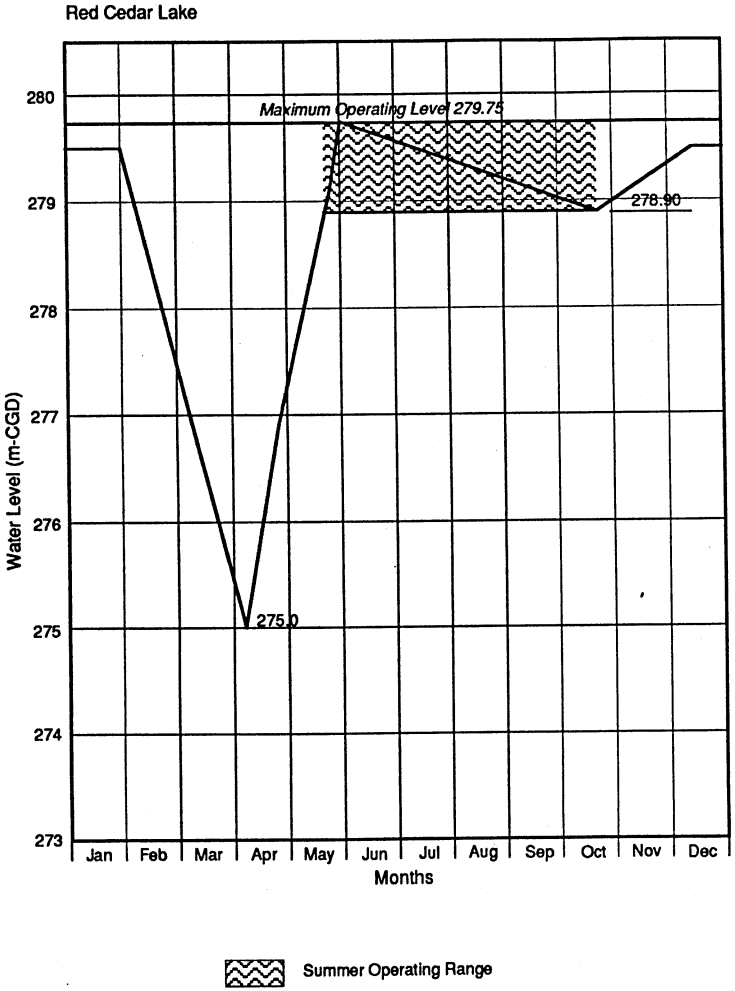


Fig. 4.2

Sturgeon-Nipissing-French Water Management Advisory Board
Sturgeon River/Lake Nipissing/French River Water Management Plan
Sturgeon River Reservoir Operating Curves

ACRES

P09726.00 MR

Table 4.1

Channel Flow Constraints

	Minimum Flow (m^3/s) Constraints	Maximum Flow Constraints (m^3/s)		
		Damage Levels		
		Minor	Medium	Major
Temagami River below Red Cedar Lake (Thistle or Island Lake)	10		100	
Sturgeon River at Field		340		425
Sturgeon River at Sturgeon Falls				795
Wanapitei River at Wanup	3	100	128	200
French River at Wolseley Bay			390	477
French River at Dry Pine Bay			447	539

- Releases from Nipissing and Wanapitei lakes can be coordinated to avoid high releases at the same time which result in very high water levels in Ox-Wanapitei Bay.

- During the late summer, if lakes in the lower portion of the basin are proportionally lower than lakes in the upper basin, water could be released to equalize the conditions throughout the basin.

The principle of integrated decision making must be embodied in the operating policies of each of the agencies with water control structures in the basin.

4.3.2 French River Fishery Policy

The Chaudiere Dams are currently operated by PWC, principally to maintain navigation levels in Lake Nipissing. The French River fishery requires constant or increasing water levels on the river during the spring walleye spawning and incubation periods which normally takes place between mid-April and the end of May. This required flow regime on the French River can be best achieved by amending the operating policy for the Chaudiere Dams, as follows.

- Three days before spawning is expected to begin in the Dry Pine Bay reach of the river, the dams should be set to obtain a target flow of about 200 m^3/s in Dry Pine Bay.

- Throughout the spawning and incubation periods, releases from the dams should be manipulated to maintain the target flow in the river. If the lake is above its desired level, the river flow can be increased above the target flow and then later reduced, but not below the original target flow.

An important aspect of this policy is that both the spawning date and target flow must be considered flexible, and should be chosen to match each year's specific conditions. The spawning date and length of the incubation period should be based on actual observations of conditions on the river provided by the French River Resorts Association and MNR biologists. The target flow should be calculated from a volume balance, based on the current lake level, expected inflows, and the target level at the end of the incubation period. In wet years, the target flow will be greater than 200 m^3/s, and, in dry years, it will be less.

Occasionally inflows will be either much higher or lower than expected. In wet conditions, as long as Lake Nipissing remains below 195.95 m, outflows should be reduced as much as is necessary, to hold Dry Pine bay flows to the target flow. If the lake is in danger of going above 195.95 m the target fisheries flow will have to be abandoned. In dry conditions, outflows sufficient to maintain the target flow should be maintained until the lake level reaches the lower filling rule curve, at which time outflows should be reduced to keep from going below that curve. The ability to stay between the desired filling curves and meet the fisheries flow will be highly dependent on a good choice for the target flow.

4.3.3 French River Flood Limit Policy

The philosophy of managing floods on Lake Nipissing and the French River should be to equalize the damage and risk of damage. The current PWC policy regarding flood handling needs to be modified and made more specific. **The following policy pertaining to the French River flood limits is recommended.**

(a) River flows should be kept below the **old** flood limits[1] as long as Lake Nipissing remains below 195.95 m. There is one exception to this policy. Before May 15 when the lake is being filled, if the lake begins to rise rapidly and excessively above the upper filling rule curve, and, in the opinion of the operating authorities, there is a significant risk of flood conditions in the near future on either the lake or river, then the new flood limits[2] should be utilized to lower the lake to an acceptable level.[3] This exceptional action should only be taken after consultation with the lead agency coordinating water management in the basin, as defined in Section 5.3.

(b) For Lake Nipissing levels between 195.95 and 196.59 m, flows on the river up to the **new** flood limits would be allowed.

(c) When the lake is above 196.59 m, an emergency situation exists and the flood limit does not apply. At this level, serious damage will be occurring on both the

---

1 The old flood limits are 187.87 m, or 390 m^3/s, measured at the public wharf in Wolseley Bay and 182.54 m, or 447 m^3/s, at Sand Beach in Dry Pine Bay.

2 The new flood limits are 188.20 m or 477 m^3/s, measured at the public wharf in Wolseley Bay and 182.85 m, or 539 m^3/s, at Sand Beach in Dry Pine Bay.

3 An example of such a circumstance would be the spring 1991 conditions, when the lake began to rise very rapidly while there was still an ice cover.

lake and river. The dams should continue to be operated so that the cost of damage is shared equitably between the lake and the river. Under current PWC policy, in these circumstances, the dams would be set to release the natural outflow which would have occurred if no dams had been built. **It is recommended that the policy of natural outflow during flood events be dropped. It is also recommended that guidelines be established for operating under emergency conditions.**

Both the French River fishery and flood limit policies will have an effect on Lake Nipissing levels and a very small effect on the conditions all the way up the Sturgeon River system. These effects have been closely examined, (refer to Section 5 of the Supporting Technical Document) and are justified compared to the benefits accruing to the French River from these policies.

4.3.4 Lake Wanapitei Filling Flexibility

The current rule curve for Lake Wanapitei requires that the lake reach at least the minimum summer level by May 15. A more flexible policy would allow the lake to be filled by May 15 in dry years, but, in wet years, filling could be delayed until June 15 to provide flood control. Such a policy would result in less flooding on the Wanapitei River. Flooding at Wanup, for example, would be both less frequent and of a smaller magnitude. Furthermore, a flexible filling policy would allow this flood abatement to be achieved without causing Lake Wanapitei to rise as high as it has in the past. Finally, fish would likely benefit from the spring flow regime that would result from this policy.

4.3.5 Island Lake Minimum Flow

The existing operating policies for the Red Cedar Lake dam do not currently provide for any downstream minimum flow in the reach of the Temagami River known as Island, or Thistle Lake. Ontario Hydro's operating policy for the dam should be amended to provide a minimum flow through Island Lake of 10 m^3/s during the summer recreation season. At flows below 10 m^3/s, boat travel becomes impossible on the lake, and because the flow can be reduced over a matter of hours, people can become stranded as a result of flow reduction below 10 m^3/s.

The water to provide the minimum flow at Island Lake should be taken from all upstream lakes (Temagami, Red Cedar, and Wicksteed) as an equal percentage of the available summer storage volume.

4.4 Additional Operating Recommendations

In addition to the specific changes to the existing operating policies outlined in Section 4.2, there are several technical actions which should be taken to improve the general approach to water management in the basin.

4.4.1 Survey of Lake Nipissing and French River Flood Damages

Accurate knowledge of monetary flood damages as a function of water level on Lake Nipissing and the French River would enable the most equitable French River flood limit policy to be determined. Existing information on flood damages was collected in 1980 and is not representative of current conditions.

4.4.2 Utilization of Risk Analysis in Lake Nipissing Operation

Lake Nipissing is a large lake which is quite difficult to operate as a result of having limited outflow capability and the potential for very high inflows. Many operating decisions are guided by the risk of what could happen if a flood or wind storm were to occur, rather than the current conditions. While the operators currently do their best to take the risks into account when making operating decisions, the risk analysis should be formalized to ensure it is being carried out in the best possible manner. This would probably require a consultant to develop a risk management procedure to be used in conjunction with the computer model referred to in Section 4.3.1. A more detailed description of risk analysis is included as Appendix C.

4.4.3 Red Cedar Lake Fisheries Study

The current License of Occupation held by Ontario Hydro for Red Cedar Lake allows a drawdown of 4.75 m from the maximum summer level to minimum winter level (refer to Figure 4.2). Concern has been expressed that this large drawdown is adversely affecting the fish population in the lake. The effect of drawdown on the fishery is complex, because while it is undoubtedly detrimental to winter habitat, the drawdown may also have a negative impact on spawning areas, the extent of which is dependent on the distribution and morphology of potential spawning areas. It is recommended that MNR design and undertake, in cooperation with Ontario Hydro and local tourist operators, a fisheries study of Red Cedar Lake to determine the location of spawning areas, and the effect of the drawdown on these areas. If the

drawdown is found to have a significantly adverse effect on the fishery, then the drawdown should be reduced by 1 m by amending the License of Occupation.

5 Institutional Implementation

5 Institutional Implementation

This section focuses on how the Water Management Plan should be implemented. The existing institutional structure is explained and the future institutional needs are identified. A general approach to the implementation of the Plan is then presented, followed by a recommendation for the next steps to be followed. The approach to the implementation of the Plan in Section 5.3 is relatively general, emphasizing what should be accomplished rather than how it should be accomplished. To provide more detail on how to implement the Plan, Appendixes D, E and F expand on the Memorandum of Understanding, Communications Plan, and Resource Requirements, respectively.

5.1 Existing Situation

The SNF watershed is currently managed by informal agreement among three agencies. Each agency's approach to operations is as follows.

(a) PWC owns and operates the Chaudiere Dams at the outlet from Lake Nipissing into the French River. The management of the Chaudiere Dams has recently shifted from PWC's office in North Bay to its offices in Toronto. Management is done remotely; however, PWC has two permanent staff on site to monitor conditions, to make operational recommendations and, in an emergency, to react to the development of events.

(b) Ontario Hydro operates three dams and one power station on the Sturgeon River and one dam and three power stations on the Wanapitei River. There are also several run-of-river stations on the South River. Operations are coordinated by the Northeastern Region Operating Department in Hanmer (near Sudbury), with technical backup as required from the River and Reservoir Utilization Group at Ontario Hydro's head office.

(c) MNR operates a number of small dams throughout the basin. MNR also has the general responsibility for resource management in the broadest sense, including fishery, forests and recreation. Indirectly, it also has significant control over tourism since it is so dependent on the fishery. Nevertheless, despite its legislative authority and the fact that most public concerns are directed to its offices, MNR has little responsibility for any of the significant water management activities. This, coupled with stronger data bases and technical skill possessed

by Ontario Hydro and PWC, restricts the extent to which MNR can carry out its responsibilities.

The Sturgeon-Nipissing-French Water Management Advisory Board has a general mandate to review operating policies of the three other groups and to consider, as in the development of this Plan, new approaches and priorities for water management. The Board currently has eight members, all of whom are appointed by the Minister of Natural Resources. It is, however, strictly an advisory board.

Until fairly recently, the agencies operated more or less according to the individual mandates. This is no longer the case. Both Ontario Hydro and PWC now acknowledge water management responsibilities beyond the scope of their original narrow mandates. Both agencies consciously make an effort to provide flood control and to assist in fisheries management. Ontario Hydro, particularly, has good working relations with many members of the community. MNR has taken the lead in coordinating the actions of the other two agencies through regular conference calls during spring and by providing a public information call-in number on conditions in the basin.

In the last few years, this informal but coordinated approach to water management has worked quite well, with each of the three agencies keeping in regular touch with each other and aware of the many and sometimes conflicting goals of water management. The fact remains, however, that the structure is informal, depends heavily on interpersonal relationships and has no operating guidelines. Most important, the structure has no accepted arbiter in the case of disputes. In short, no one agency is ultimately in charge and therefore responsible or accountable for the management of the watershed. It also follows that it is not clear to the public who is in charge.

5.2 Future Needs

Section 4 outlined policy changes and the concept of an integrated management approach to the control of flows and water levels in the SNF system. Such an approach involves the use of a computer model such as the one Acres has used in the development of this Plan, and implies the existence of some person or agency with the authority and responsibility to make the necessary analyses, tradeoffs and, ultimately, decisions.

This implies that

(a) institutional arrangements must be formalized to establish central authority management; ultimately, a single agency needs to have the authority to adjust operating guidelines being used in the watershed

(b) a single and more suitable set of operating guidelines needs to be established

(c) the internal communications system between groups must be improved

(d) the public focus must be clarified and provisions for public input enhanced.

5.3 Approach

The coordinated approach to water management in the basin has worked reasonably well over the last few years. Rather than creating a new agency, it is preferable to build on the interagency cooperation that presently exists and to take advantage of the strengths of each organization. The following approach is suggested.

Formal Agreement

A formal agreement should be implemented to integrate water management in the SNF basin. It should be based on principles of mutual trust and should reflect a balance between hydropower generation, flood control, recreational needs and fisheries management. The agreement should take the form of a Memorandum of Understanding between all operating agencies. It would define the following facets of water management:

- common objectives
- operating guidelines, sensitive to local concerns
- mechanism of day-to-day water management, embodying a negotiated approach
- procedure to resolve conflicts

- mechanism for periodic review and performance auditing to promote accountability

- communication requirements with the public.

The organizational structure of an integrated approach to water management in the SNF basin is shown in Figure 5.1. The content of a Memorandum of Understanding is outlined in Appendix D.

Transfer of Chaudiere Dams

Water management in the basin would benefit from the transfer of the Chaudiere Dams from the federal government to MNR. The public bears the same costs for the dams regardless of which level of government owns them; therefore, the dams should be owned by the government which can best serve the local public interest. It is MNR's mandate to manage the basin's natural resources in the manner most beneficial to the public, but MNR needs to control the Chaudiere Dams to fulfill that mandate. With MNR ownership of the Chaudiere Dams, all of the water control structures would be under provincial jurisdiction and ultimately accountable to MNR. This would ensure that single agency responsibility occurs. Therefore, all possible mechanisms by which the Chaudiere Dams could be transferred to the province should be examined. Figure 5.2 shows the organizational structure of an integrated approach to water management with ownership of the Chaudiere Dams transferred to MNR.

If a negotiated transfer of the dams to the province cannot be achieved, a workable, but less desirable, alternative would be for PWC to continue to own and operate the dams, but to operate in accordance with the policies in this Plan, and under the coordination of the lead agency. For example, an agreement could be sought whereby PWC continues to own and physically operate the dams, but MNR makes all of the operating decisions. Under such an arrangement, MNR would accept responsibility for the operations. Also in this scenario, PWC would be a party to the Memorandum of Understanding, as discussed in the previous section.

Single Agency Responsibility

One agency should be assigned central responsibility for the coordination of the integrated management approach. MNR is recommended for the following reasons.

- The implementation of an integrated approach to water management is within the MNR's legislated mandate.

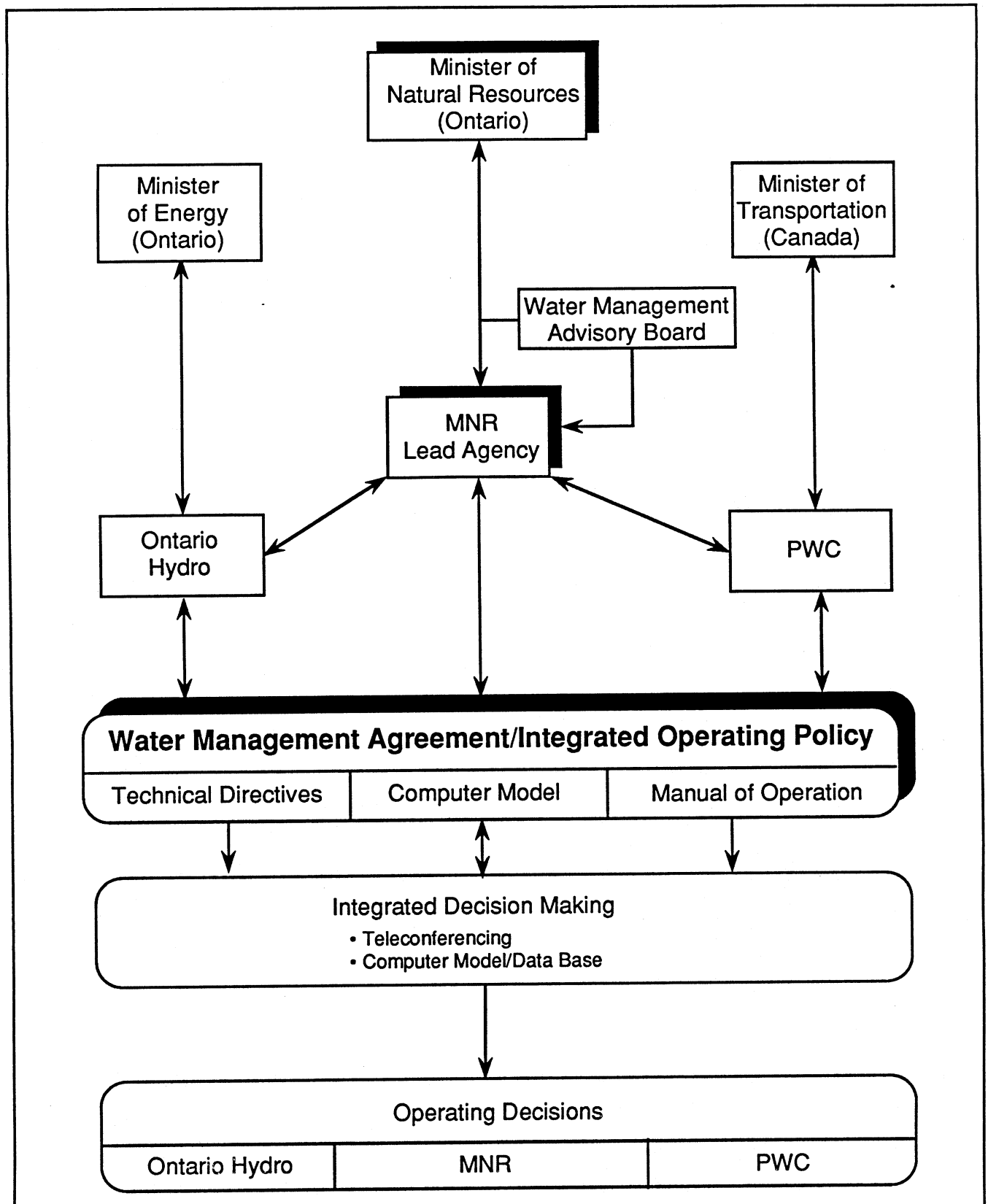


Fig. 5.1

Sturgeon-Nipissing-French Water Management Advisory Board
Sturgeon River/Lake Nipissing/French River Water Management Plan
Integrated Water Management - With Formal Agreement

ACRES

P09726.00 MR

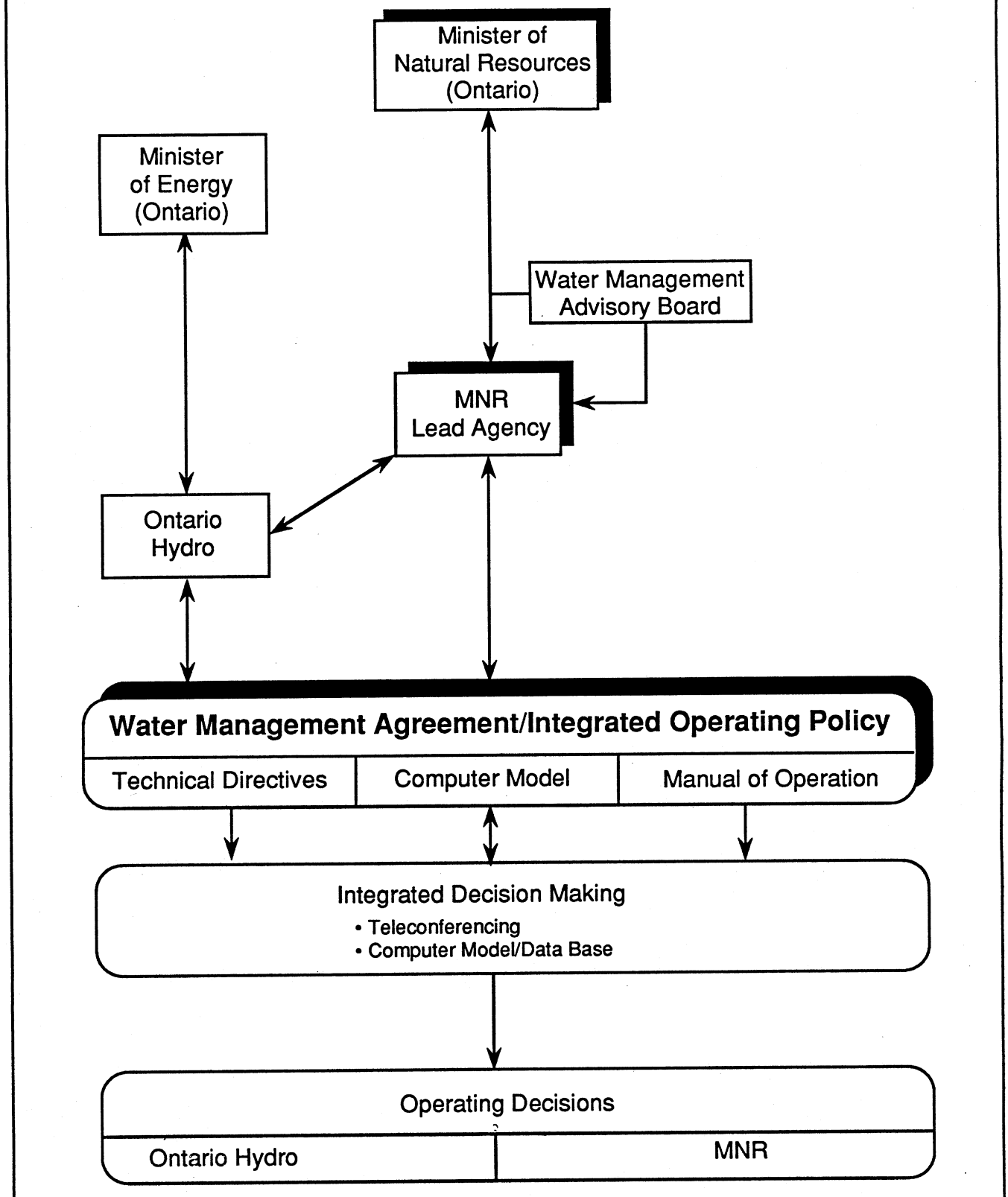


Fig. 5.2

Sturgeon-Nipissing-French Water Management Advisory Board
Sturgeon River/Lake Nipissing/French River Water Management Plan
Integrated Water Management - With MNR Ownership of Chaudiere Dams

P09726.00 MR

- MNR is currently the provincially designated flood emergency coordinating agency.

- PWC has no desire to expand its role in the basin.

- As a primarily single-use manager, Ontario Hydro may be seen as having too much of an inherent bias to permit it to assume the lead role.

Public Communication and Review

Important aspects of managing the basin's water resources are communicating with the public and providing for public review. A public communications strategy is required to

- maintain access by the public to the management of resources

- provide input on perceived needs, problems and local management issues to the operating agencies

- provide a review mechanism for the implementation of the management agreement by the operating agencies

- monitor the suitability of existing practices and make recommendations to the Minister of Natural Resources for future review

- oversee a public information program that includes regular information dissemination and an annual report to keep the public informed of conditions in the basin and management practices.

A specific communications plan is outlined in Appendix E.

It is suggested that the Board continue as an advisory board, charged with the regular review of operations, and adherence to water management. The Board would be responsible for recommending changes to the Memorandum of Understanding to the Minister of Natural Resources.

Since the Board's composition has been criticized for being somewhat biased toward the resort industry, it is recommended that its composition be reviewed. Board members should have 3-yr staggered terms, with representation as follows:

- two persons from each of the major regions

  - the Sturgeon River System
  - Lake Nipissing
  - the Wanapitei System
  - the French River

- one each from Ontario Hydro, MNR, the native community, and PWC (if the last is still involved).

5.4 Implementation Plan

This section briefly summarizes the specific, chronological action to be taken for water resource agencies to follow the Management Plan.

(a) Obtain informal agreement among the three operating agencies to adopt the recommendations of this Plan, while a formal agreement is being negotiated.

(b) Negotiate and implement a water management agreement in the form of a Memorandum of Understanding amongst the agencies responsible for operating water control structures in the basin.

(c) Pursue transfer of Chaudiere Dams from the federal government to the province.

(d) Compile, in written form, comprehensive dam operating procedures for each of the agencies. This entails obtaining existing Ontario Hydro and PWC operating policies and developing comprehensive written policies for MNR structures. The operating policies should incorporate integrated decision making as a fundamental principal and reflect the specific changes outlined in Section 4.3.

(e) As the lead water management agency, MNR requires technical strengthening to be able to implement the water management agreement. Use of a water management model as a decision support system requires

  - a services contract with a suitable consultant to implement a model

  - the dedication of a suitable staff position and/or access to qualified support staff, e.g., a water resources engineer or technologist. It is estimated that a 1/2- or full-time position will be required.

A water management computer model, and its application to the risk analysis described in Appendix C, are very important if the French River fisheries and flood limit operating changes (Sections 4.3.2 and 4.3.3, respectively) are to be successfully implemented.

Specific resource requirements to implement the Water Management Plan are addressed in Appendix F.

6 Plan Review and Amendment

6 Plan Review and Amendment

The Plan was developed with the expectation that it would guide water resource management in the basin for the next 20 years. Planning and management are continuous processes which must be responsive to changing needs, information and technology.

In Section 5, it is noted that the water management should be examined on a yearly basis, by means of an annual general meeting of the Water Management Advisory Board. This is meant to be a review of the implementation of the policies contained in this Plan, rather than of the policies themselves. Plan review should be carried out initially in 5 years, and every 10 years thereafter. The Plan can also be reviewed at any other time as deemed necessary by MNR. Plan review will involve full public consultation, and involve many (but not necessarily all) of the steps in the development of the Plan.

During the life of the Plan, circumstances may change such that an amendment to the Plan is necessary. If it is felt an amendment might be appropriate, the following procedure will be followed.

- The need for an amendment is identified and the amendment is designated as either minor[1] or major[2].

- Terms of reference to examine the amendment are developed and implemented.

- Approval must be obtained from the appropriate level of authority to implement an amendment.

---

1 Minor amendments would generally consist of changes which do not alter the original intent of the Plan, the MNR target or objectives, or have an effect on the public.

2 Major amendments significantly affect the policies of the Plan, alter targets and objectives and/or impact on the public.

List of References

List of References

1 Ontario Ministry of Natural Resources, **Summary Report on the Chaudiere Dams and Water Level Regulation Investigations on the Lake Nipissing-French River Watershed**, July 1979.

2 MacLaren Plansearch, **Flood Damage Reduction Study Sturgeon River/Lake Nipissing/French River System**, October 1981.

3 S. A. Kirchhefer Limited, **Review and Implementation of Recommendations of the Sturgeon River, Lake Nipissing, French River System**, March 1984.

4 MacLaren Plansearch, **A Study of Improvements to the Method of Forecasting Inflows to Lake Nipissing**, 1985.

5 Ottawa Engineering Limited, **Dokis Small Hydro Feasibility Study for the Dokis Indian Band**, February 1989.

6 Northland Engineering, **Lake Nipissing Pollution Control Plan - Phase II - General Report,** June 1991.

7 Ontario Ministry of the Environment, **The Chemical Water Quality of Lake Nipissing 1988 - 1990**, February 1992.

8 MacLaren Engineers, **Manual of Operations - French River Dams, Ontario,** May 1991.

9 Ontario Hydro, **Technical Directives**

H02149	Lake Temagami and Cross Lake	December 1987
H02139	Red Cedar Lake	November 1987
H02140	Tomiko Lake	November 1987
H02157-R2	Crystal Falls GS	July 1989
H01026-R1	Wanapitei River Operating Procedure During Critical Flood Situation	April 1987
H02106	Stinson GS	October 1987
H02105	Coniston GS	October 1987
H02109-R1	McVittie GS	September 1989
H02115	Elliot Chute GS	October 1987
H02107	Bingham Chute GS	October 1987
H02114	Nipissing GS	October 1987

10 Ontario Hydro, **North Bay District Operating Instruction - South River Water Control,** February 1982.

11 Baird and Associates, **Lake Nipissing North Bay Shoreline Management Study**, draft expected February 1992, final report expected March 1992.

12 Fred C. Shaver, **Planning for Flood Emergencies--North Bay District**, January 1992.

Appendixes

Appendix A

Public Consultation

Appendix A

Public Consultation

Public input was an integral part of the development of the Water Management Plan. The beginning of the Plan development process was announced at a news conference in North Bay on January 8, 1991, and was publicized by the local media. Public meetings were held in the Lake Nipissing, Sturgeon River, and French River areas of the watershed at the conclusion of the first three phases of the Plan development. Public input was received verbally at the meeting, as responses to questionnaires handed out at the meetings, and in the form of correspondence sent to the Board, Steering Committee members and the consultant. Commercial operators dependent on water resources constitute a significant proportion of the public input received.

The majority of public comments can be briefly summarized as follows.

Sturgeon River System

- Lake Temagami would benefit from an outlet to the Ottawa River system.

- The present water level regime of Lake Temagami should be preserved.

- Flooding on the lower Sturgeon River continues to be a serious problem.

Lake Nipissing

- Water quality, low water, high water, and shoreline erosion are all frequent problems.

- Existing water level targets are acceptable, but should be more closely adhered to.

French River

- The 'new' 1985 flood limits are damaging.

- Fish spawning is being negatively impacted by the operation of the Chaudiere Dams.

Some of the comments and suggestions made by the public related to aspects of water management which were outside the terms of reference for the development of the Water Management Plan. The two most frequent categories of these comments were related to water quality concerns and engineering solutions to water management, such as new dams, reservoirs, or channel improvement.

Appendix B

Water Management Options

Appendix B

Water Management Options

Section 3 of the Water Management Plan summarized the water management issues in the SNF basin. Numerous feasible options to address these issues and improve water management were identified and are summarized in this appendix. Each of the options listed in the following section is evaluated in Section 5 of the Supporting Technical Document. Most of these options were not adopted.

Engineering options, such as channel enlargement, diking, or new reservoirs, have been assessed by MNR and found not to be cost effective, or to have very significant environmental impacts. Therefore, only management options were considered in the development of this Plan.

B1 Sturgeon River System

(a) Issue--Red Cedar Lake Drawdown

Option--Limit Red Cedar Drawdown
Winter drawdown elevation on Red Cedar Lake could be limited to a level above the current minimum elevation.

Status: Not recommended.

(b) Issue--Flow Range at Island Lake

Option--Limit Range of Flows Through Island Lake
The range of flows could be limited to 10 to 100 m^3/s, except in extreme circumstances.

Status: Recommended

B2 Lake Nipissing

(a) Issue--Lake Water Levels

Option--Delay Filling of Lake Nipissing

The target lake levels could be adjusted to reach the summer level by June 1 or June 15 rather than May 15. This would have some flood protection benefits on Lake Nipissing in wet years by providing more flood storage during the spring. It would also provide more operational flexibility to supply the French River with water during the spawning season.

Status: Not Recommended

Option--Widen the Summer Operating Range

The existing minimum summer level could be lowered by 20 cm to provide a wider range over which the lake could be maintained during the summer. This option would make operation of the lake easier, and encourage more realistic public perceptions about late summer levels, as the lake so often falls below the existing summer minimum during that period.

Status: Not Recommended

Option--Increase Winter Drawdown

The level to which the lake is drawn down each winter could be lowered. The objective would be to reduce flooding by providing more flood storage. Summer levels might be affected, and, in many years, it might not be possible to draw the lake down to a lower level.

Status: Not Recommended

Option--Decrease Winter Drawdown

Reducing the level to which the lake is drawn down in the late winter might ensure that the lake could be filled each year, providing more water for the French River during the spawning period.

Status: Not Recommended

B3 Wanapitei System

(a) Issue--Lake Wanapitei Water Levels

Option--Flexibility to Delay Filling

The existing filling date of May 15 could be moved back to June 1 or June 15 to reduce floods and perhaps increase hydro generation.

Status: Recommended

B4 French River

(a) Issue--French River Flooding

Options--Restrict Use of New Flood Limits

Use of the flow range between the old[1] and new[2] (post-1985) flood limits could be restricted to situations where flood damages on Lake Nipissing were imminent. This would provide a more equitable flood tradeoff between the lake and the river.

Status: Recommended

Option--Limit Flows in Ox-Wanapitei Bay

Releases from Lake Nipissing and Wanapitei could be coordinated so as to avoid Ox-Wanapitei Bay receiving high releases from both lakes simultaneously. The objective would be to reduce very high flows.

Status: Not Recommended

Option--Impose Flow Constraint During Fish Spawning

A flow constraint could be given priority on the French River from the end of April to early June. During this period, Lake Nipissing outflows would be adjusted to

---

1 The old flood limits are 187.87 m, or 390 m^3/s, measured at the public wharf in Wolseley Bay and 182.54 m, or 447 m^3/s, at Sand Beach in Dry Pine Bay.

2 The new flood limits are 188.20 m or 477 m^3/s, measured at the public wharf in Wolseley Bay and 182.85 m, or 539 m^3/s, at Sand Beach in Dry Pine Bay.

hold the releases and water levels constant, thereby improving the natural reproduction of fish in the French River and benefiting lodge and cottage owners.

Status: Recommended

Appendix C

Risk Analysis

Appendix C

Risk Analysis

C1 Definition and Objective

Risk analysis is a technique which a water manager can use to investigate the implications of an operating decision. The basic objective of risk analysis is to answer the operator's question: "If I make a certain operating decision today, what are the possible effects 2 weeks (or 2 months) from now?".

Water managers are constantly faced with the difficult task of having to make an operating decision at a current point in time, while not knowing whether the weeks and months ahead will be wet or dry. If the operator knew what the future conditions would be, he or she could always, confidently, make the best operating decision. This type of dilemma is very similar to the situation of an individual having to renew the mortgage on their home in a period of fluctuating interest rates. The predicament is whether to renew for a short term, in hopes that rates will fall, or for a long term, to hedge against rising rates. Neither future hydrologic conditions, nor interest rates, can be forecasted with any degree of certainty. Therefore, one of the most useful approaches is risk analysis. Risk analysis, in its simplest form, basically consists of investigating the implication of a particular decision.

C2 Application

Risk analysis could be applied to the entire SNF basin, but has the greatest potential for benefit on Lake Nipissing. The application of risk analysis can be best explained by providing a specific example of how an operator would use it. Figure C2.1 depicts conditions on Lake Nipissing and the French River as of April 22. The solid line shows that the filling trajectory prior to April 22 has largely been within the target zone, and is now exactly at the top of the zone. From April 22 to the end of August, three different trajectories (lines) are shown. The top line shows what would happen if the wettest hydrology on record (1979) were to begin at the present time, and continue for the rest of the season. The lake would rise into the damage zone, but not exceed PWC's

maximum flood rights.[1] The middle line shows the trajectory the lake would take if average hydrologic conditions prevailed. This trajectory follows the top of the target zone, which is the agreed upon most desirable level for the lake. The lower line shows what would happen if the driest hydrology on record (1964) were to occur. The lake level would soon stop rising, decline slightly to supply water to the French River fish spawn, and then gradually rise to the bottom of the target zone in early July. The lower portion of Figure C2.1 illustrates what is simultaneously happening on the French River in all three circumstances.

Of the possible future lake levels, shown in Figure C2.1, average conditions result in ideal levels, and dry conditions result in lower than preferred levels, but still largely within the target zone. Wet conditions cause the lake to rise above the level at which damages are known to occur. This would be a very undesirable situation. In summary, an April 22 position at the top of the target zone would be acceptable for expected average or dry conditions, but unacceptable for wet conditions.

Figure C2.2 shows the same analysis, assuming the April 22 level was at the bottom of the target zone, rather than the top, as was previously assumed. In this case, the outcomes under the three hydrology scenarios are somewhat different. With the wettest hydrology, the lake is above the target zone, but no longer reaches the damage level. With average hydrology, the lake fills in mid-June. With the driest hydrology, the bottom of the target zone cannot be reached until the end of August, despite the fisheries flow being abandoned due to low lake levels halfway through the incubation period.

The trajectories in Figure C2.2 show acceptable levels for wet or average conditions, but a very unsatisfactory level for dry conditions. The dry trajectory shown in Figure C2.2 may be less desirable than the wet trajectory in Figure C2.1 because, although the latter results in some damage, the duration of very high levels is short and occurs early in the year, whereas dry conditions in Figure C2.2 result in prolonged very low levels throughout the prime summer recreational period.

Now assume that the current date is not April 22, but rather 1 week earlier (April 15), and the operator has to make a decision on how much water to release from Lake Nipissing. The hydrologic conditions over the next week can be reasonably accurately estimated, and the operator has a choice of being able to be at the top or bottom of the target zone at the end of the week (April 22). From the two examples presented, it is apparent that

---

[1] The lake level would be significantly lower than the level that actually occurred in 1979, because in 1979 the lake was much higher than the top of the target zone on April 22.

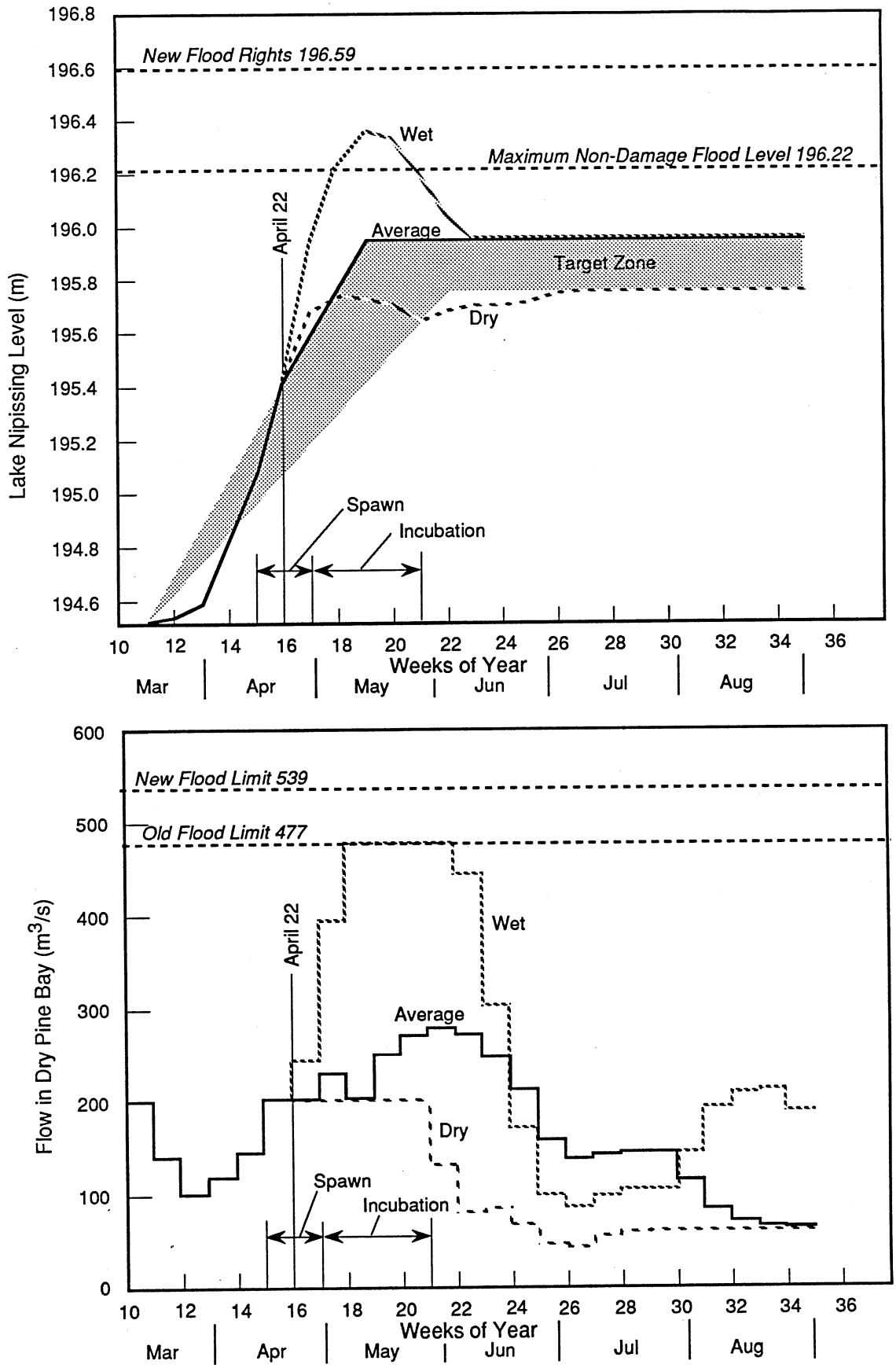


Fig. C2.1

Sturgeon-Nipissing-French Water Management Advisory Board
Sturgeon River/Lake Nipissing/French River Water Management Plan
Risk Analysis - Starting at Upper Rule Curve

ACRES

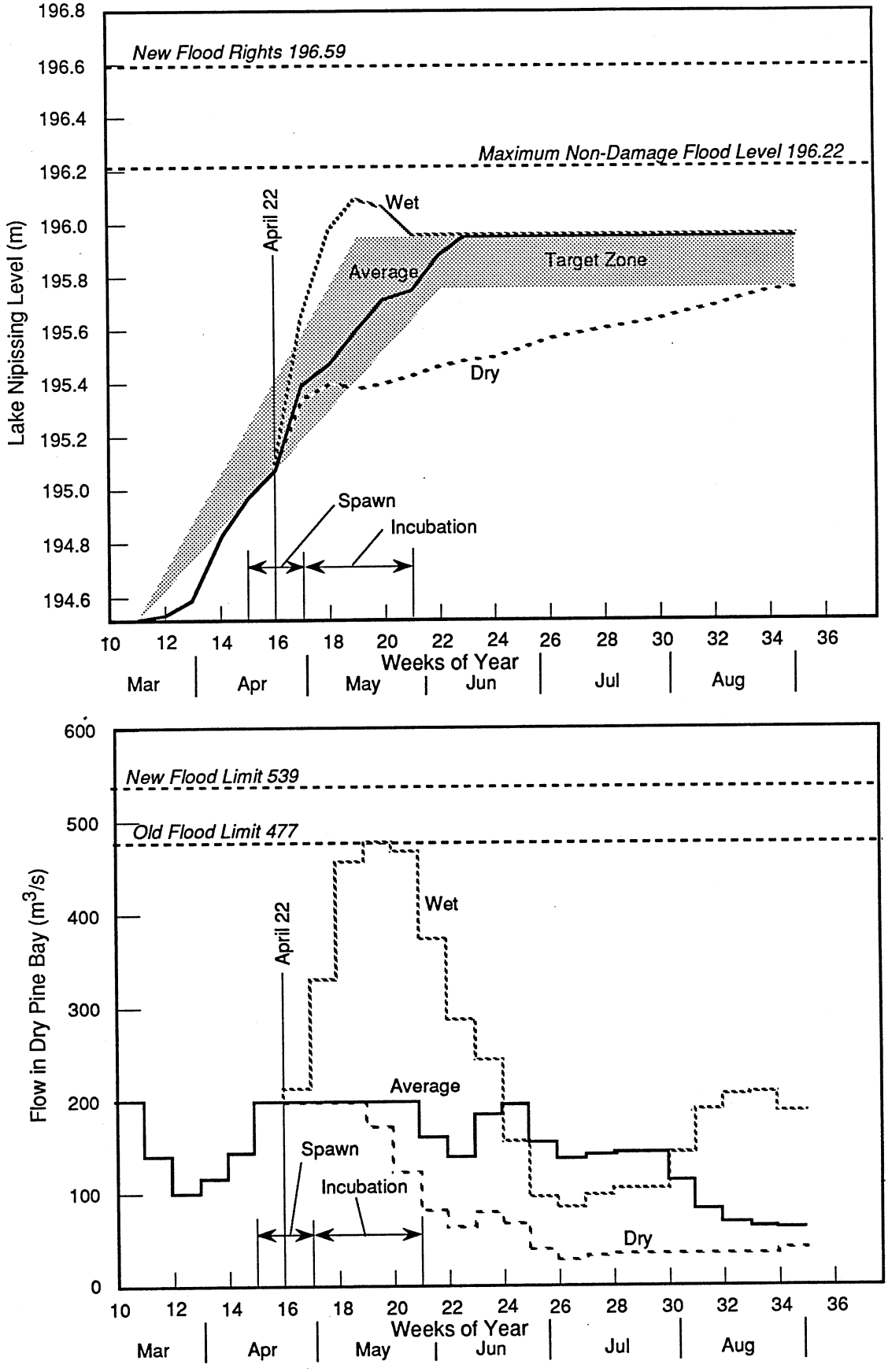


Fig. C2.2

Sturgeon-Nipissing-French Water Management Advisory Board
Sturgeon River/Lake Nipissing/French River Water Management Plan
Risk Analysis - Starting at Lower Rule Curve

ACRES

lake levels would evolve quite differently, depending on whether the lake was taken to the top or bottom of the target zone (or somewhere in between) over the course of the next week. Unless there was a very large snowpack still in existence, suggesting extremely wet conditions might be possible, the operator would probably choose to move close to the top of the target zone to avoid the risk of very low summer water levels. The important point is that he would make this decision by being able to look ahead and see what could happen under various hydrologic conditions.

The type of analysis presented in these examples could be carried out relatively easily on a routine basis, with aid of the computer simulation model used in the development of this Water Management Plan.

Appendix D

Memorandum of Understanding

Appendix D

Memorandum of Understanding

The most important aspect of the institutional implementation of the Water Management Plan is the concept of a formal agreement among the agencies operating water control structures in the watershed. Section 5.3 of the Plan indicates this agreement should be in the form of a Memorandum of Understanding (MOU) between the operating agencies, and outlines the areas of water management which should be covered. This appendix provides some additional detail on the most important components of the MOU.

The MOU should be created through negotiations between the operating agencies. It must be structured in such a way so as to make it a legal multiagency agreement. Some of the key components which should be considered for inclusion are the following.

Agreement to Comply

The basic principle of the MOU is that all of the operating agencies will agree upon a specific approach to manage the water resources of the SNF Basin, and then commit to adhering to this approach. The water management approach is defined in this Plan.

Water Management Plan and Agency Operating Procedures

The MOU should include, or reference, this Water Management Plan and the operating procedures of each agency. Together these constitute the approach to water management which the parties to the MOU are agreeing to follow. Ontario Hydro and PWC have adequate existing written operating procedures to fulfill this role. MNR needs to prepare more fully documented operating procedures. The Water Management Plan must be accepted to supersede individual agency operating procedures where an inconsistency exists (for example, PWC's procedures on the French River flood limit). The best approach would be to revise the individual agency operating procedures in accordance with the Plan, for incorporation in the MOU.

Agency Operational Control

Within the framework of the MOU, it is expected that each operating agency would retain day-to-day operational control over its structures. They would, of course, be obliged to operate these structures in accordance with policies specified by the MOU. The lead agency should be responsible for reviewing conditions in the entire basin,

and recommending operational actions, made on the basis of an integrated decision making model, to the other agencies. While retaining their own operational control, the other agencies would normally follow the lead agency's recommended action. Fully integrated decision making would require the use of computer model and associated data base. The data base should be set up in such a way that all of the operating agencies contribute to its content, and have equal access to other parties' data. MNR would have the responsibility of applying the computer model, but the model would also be available to any of the other agencies if they chose to use it.

Lead Agency

The MOU should confirm MNR as the lead agency. The roles and responsibilities of each of the parties to the MOU should be clearly defined.

Amending Procedure

If the lead agency or the Advisory Board believes certain operating practices of a particular agency, while within the policies prescribed by the MOU, are not in the best interests of the basin as a whole, then either the MOU must be amended or the agency's License of Occupation for the structure altered to change the way in which operations are conducted.

The MOU must contain provisions whereby the parties can amend the operational policies. This would presumably be done with the consensus of all parties and fulfill MNR requirements for public notification and major or minor Plan amendment (refer to Section 8 of the Plan).

Advisory Board

The MOU should define the role and responsibility of the Advisory Board. These are expected to be principally the areas of public liaison, and as an independent check on the operating agencies. The main function of the Board would be to monitor operations, review the plan, hold an annual public meeting, and produce an annual report.

Appendix E

Communications Plan

Appendix E

Communications Plan

Section 5.3 of the Water Management Plan laid out the objectives and requirements for public communication and review. This appendix provides a brief description of the specific elements of a communications plan which would fulfill the objectives given in Section 5.3.

The communications plan has the following principal objectives:

- to keep the public informed regarding the Advisory Board and operating agencies' water management activities

- to keep the public and related agencies informed as to the current and expected water level and flow conditions in the watershed.

To accomplish these objectives, a communications plan with the following elements is recommended.

Annual Public Meeting

An annual public meeting should be hosted by the Advisory Board with participation by the operating agencies. The purpose of the meeting is to make those responsible for water management in the watershed visible to the public, and to provide a forum for verbal and written comments to be received. The meeting should be held in late summer and could be held in three separate locations in the watershed, or rotated from area to area in the watershed each year, depending on public response. The first annual meeting should be held in three locations.

Annual Water Management Report

An annual report should be published by the Advisory Board, summarizing water management activities and conditions for the past year. Water levels for the entire year should be shown graphically for the major lakes and river reaches. The report should cover a calendar year, and be available in the spring of the following year, well before the annual public meeting. The report should be distributed to relevant agencies and the public, based on a current mailing list.

Spring Media Announcements

The existing successful program of running weekly newspaper advertisements, providing current conditions in the basin, should be continued. If conditions are expected to deviate significantly from normal, press releases should also be made to the general media, and public service announcements sought on commercial radio. If serious flood conditions threaten, the flood emergency plan would be invoked by Ministry of Natural Resources. This Plan contains its own communications procedures.

Recorded Status Message

The existing system of having a recorded telephone message providing system conditions should be continued. The existence of the service and telephone number should be publicized in the newspaper advertisements.

Marina Posters

Each month during the summer recreational season, a poster should be prepared which graphically shows water levels on the major lakes and river reaches. The levels should be shown from the beginning of the season to the current date, and also show the maximum and minimum summer range. The posters should be distributed by mail to marinas, commercial operators and related agencies, with the request that they prominently display them. An 11-in. by 17-in. master poster could be initially drawn up, with additional data and comments being added over the course of the year. This size would allow inexpensive reproduction by high quality photocopying.

Notification of Operating Changes

Throughout the year, notification should be given of major operating changes, such as significant flow increases or decreases. The objective is to give 2 or 3 days notice to enable docks and boats, etc, to be moved or adjusted to accommodate rapidly changing water levels. Notification, by means of a fax, should be given by the coordinating agency (MNR). The notification should be sent to a fax list of commercial operators and entities known to be affected by the operating changes. The fax list will be refined over time.

Appendix F

Resource Requirements

Appendix F

Resource Requirements

Implementing the Water Management Plan will require an allocation of human and monetary resources. A portion of these resources will be new, and the remainder will be a reallocation of resources currently being expended. The resource requirements fall in the following two areas:

- resources necessary for the MNR to assume the lead agency role

- resources required to own and operate the Chaudiere Dams.

MNR as Lead Agency

This Plan has recommended that MNR take the formal role of the lead agency for water management in the SNF basin. To do this, MNR will require additional resources in North Bay. It is expected that managing the water resource will require a 25% to 50% time commitment by a qualified individual. The qualifications necessary would be formal education as a water resources engineer or technologist.

In addition to the human resource requirement, MNR will also have to acquire additional technological tools to assist in water management. The principal tool will be a water management computer model, of the form used to develop this Plan. Implementation of a model and training could be facilitated by a contract with a water resources consultant. MNR already is in possession of a similar version of this model in its Sudbury Regional Engineering Office, and has some experience with it.

Putting the human and technical resources in place will require an additional start-up effort (possibly as much as a full person-year in the first year), but, once the systems are in place and the role defined, this should rapidly decline to approximately 1/4-time.

Resources for Chaudiere Dams

In the Water Management Plan, several scenarios for the ownership and operation of the Chaudiere Dams are presented. It is believed that the water resources of the SNF basin could be best managed by MNR taking over responsibility for the dams from PWC.

The dams are currently operated with a staff of two full-time dam tenders located at the dams, and a time commitment for water management by a PWC engineer in Toronto of approximately 50% on average, and up to 100% during peak operating seasons. In addition to staff, there are annual maintenance expenses for the structures themselves and the water level monitoring system. There is also the periodic replacement of components when they have reached the end of their service lives. PWC is in the process of refurbishing the structures and modernizing them to make remote control possible, and to reduce the amount of manual work required at the site. Currently Big Chaudiere Dam has two remotely operable steel gates, and Little Chaudiere and Portage dams are both stop log structures requiring manual manipulation. PWC has firm plans to rebuild the Portage Dam and equip it with gates.

If ownership of the Chaudiere Dams was transferred to MNR, sufficient funding would be required to cover the operating and maintenance costs of the structures. If PWC were to retain ownership, but operate according to instructions from MNR, MNR would not require any resources in addition to those necessary to assume the lead agency. The water management capability necessary to function as a lead agency would be adequate to make operating decisions for the dams.