International Management of the Great Lakes-St. Lawrence River Basin

Tom McAuley
Engineering Advisor
IJC Canadian Section
Ottawa, ON

Colloque international sur la gestion de l’eau douce du bassin du fleuve Saint-Laurent et des Grands Lacs
September 13-15, 2007
Sorel-Tracy, Quebec

International Joint Commission
United States and Canada
OUTLINE

- Boundary Waters Treaty and the International Joint Commission
  - Role and Authorities
  - Boards, Studies, and Task Forces
  - International Watershed Initiative

- International Great Lakes – St. Lawrence River Water Management
  - Quality
  - Quantity
  - The Lake Ontario – St. Lawrence River Study and Review of Regulation Orders
  - St. Lawrence River – “le Fleuve”
**Boundary Waters Treaty of 1909**

- Provided Principles and Mechanisms to Prevent and Resolve Disputes Concerning Water Quantity and Water Quality and Other Environmental Issues Along the U.S.-Canada Boundary

- Established the International Joint Commission (IJC)
The IJC in Brief

- Unitary independent treaty organization
- Six Commissioners – Canada 3, U.S. 3
- Decisions by Consensus
- Prevents and Resolves Disputes Over Shared Water and Air
- Watchdog of Great Lakes Restoration Efforts
- Conducts Studies for Governments
- Offices in Ottawa, Washington and Windsor
Other IJC Authorities

• Great Lakes Water Quality Agreement of 1978
• References from Governments
• Orders in Response to Applications
• Columbia River Treaty
• Rainy Convention
• Lake of Woods Convention
The IJC and Water - Current Activities

Transboundary Watersheds
Boards and Task Forces

**INTERNATIONAL BOARDS of CONTROL/COMBINED BOARDS/POLLUTION BOARDS**
- St. Lawrence River Board of Control*
- International Niagara River Board of Control
- Lake Superior Board of Control
- Osoyoos Lake Board of Control
- Rainy Lake Board of Control
- Rainy River Pollution Advisory Board
- Lake of the Woods Board of Control
- Lake Board of Control
- Columbia River Board of Control
- Air Quality Advisory Board
- Red River Board
- St. Croix River Watershed Board **
- Souris River Board
- St. Mary-Milk Rivers Accredited Officers

**GREAT LAKES WATER QUALITY**
- Great Lakes Water Quality Board
- Great Lakes Science Advisory Board
- Council of Great Lakes Research Managers

**INVESTIGATIVE BODIES**
- Health Professionals Task Force
- Lake Ontario-St. Lawrence Study Board
- Upper Lakes Study Board
- Missisquoi Bay Task Force
- St. Mary and Milk Rivers Administrative Measures Task Force
Establishment of First Watershed Board
- The St. Croix River Basin
International Great Lakes – St. Lawrence River Water Management

• Quality
• Quantity
• The Lake Ontario – St. Lawrence River Study and Review of Regulation Orders
• St. Lawrence River – “le Fleuve”
International Great Lakes – St. Lawrence River Water Management

- Quality
- Quantity
- The Lake Ontario – St. Lawrence River Study and Review of Regulation Orders
- St. Lawrence River – “le Fleuve”
Quantity – Diversions, Consumptive Uses

Figure 4: Existing Diversions in the Great Lakes Basin.
Great Lakes
Scenarios 2050s

Air Temp
Daily Average
Great Lakes Regulation
IJC Orders of Approval and Recent Studies

- Niagara
- Moses-Saunders Dam
- St. Marys River works
- Upper Lakes Study
- Ottawa River Basin
- LOSL Study
St. Marys River at Sault Ste. Marie
(Looking East or Downstream)
Chippawa Grass Island Pool Structure is located upstream of the Niagara Falls to control daily and seasonal shares of water between the power plants and Falls.
Moses-Saunders Dam

- operated according to IJC Orders of 1952 & 1956
- overseen by Int. St. Lawrence River Board of Control
The Lake Ontario – St. Lawrence River Study and Review of Regulation Orders

St. Lawrence River – “le Fleuve”
Need for a New Order

*Shift in Lake Ontario Total Supplies*

Supplies used for 56 Orders criteria & Plan1958D
1993 Lac St Louis Daily Levels

Level (m IGLD 1985)

- Actual
- Plan 1958-D
- unregulated

Flood Stage
IMAGE SATELLITE LANDSAT
11 AOÛT 2001, 20.65 m

Kahnawake
Hauts niveaux
(seulement 1 % sont supérieurs)
Tous les plans : écart inférieur à 4 po par rapport au plan actuel
B⁺ 4 pouces plus haut
A⁺ 4 pouces plus bas

Niveaux moyens
B⁺ varient moins durant l’année
D⁺ varient plus

Bas niveaux
(seulement 1 % sont inférieurs)
A⁺ niveaux plus élevés
B⁺ niveaux estivaux plus bas
Hauts niveaux
(seulement 1 % sont supérieurs)
A+ niveaux de pointe plus élevés

Niveaux moyens
A+ cycles de niveaux d’eau différents
B+ varient davantage et plus bas niveaux d’automne
D+ plus bas niveaux de pointe et niveaux d’automne plus hauts

Bas niveaux
(seulement 1 % sont inférieurs)
A+ plus bas en automne et en hiver
B+ plus bas en automne
## Diversions - dates and flows

<table>
<thead>
<tr>
<th>Existing Diversions in the Great Lakes Basin</th>
<th>Operational Date (original project)</th>
<th>Average Annual Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(cms)</td>
<td>(cfs)</td>
</tr>
<tr>
<td>1. Interbasin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long Lac (into Lake Superior basin)</td>
<td>1939</td>
<td>45</td>
</tr>
<tr>
<td>Ogoki (into Lake Superior basin)</td>
<td>1943</td>
<td>113</td>
</tr>
<tr>
<td>Chicago (out of Lake Michigan basin)</td>
<td>(1848)1900</td>
<td>91</td>
</tr>
<tr>
<td>Forestport (out of Lake Ontario basin)</td>
<td>1825</td>
<td>1.4</td>
</tr>
<tr>
<td>Portage Canal (into Lake Michigan basin)</td>
<td>1860</td>
<td>1</td>
</tr>
<tr>
<td>Ohio &amp; Erie Canal (into Lake Erie basin)</td>
<td>1847</td>
<td>0.3</td>
</tr>
<tr>
<td>Pleasant Prairie (out of Lake Michigan basin)</td>
<td>1990</td>
<td>0.1</td>
</tr>
<tr>
<td>Akron (out of and into Lake Erie basin)</td>
<td>1998</td>
<td>0.01</td>
</tr>
<tr>
<td>2. Intrabasin</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Welland Canal</td>
<td>(1829)1932</td>
<td>260</td>
</tr>
<tr>
<td>NY State Barge Canal (Erie Canal)</td>
<td>(1825)1918</td>
<td>20</td>
</tr>
<tr>
<td>Detroit</td>
<td>1975</td>
<td>4</td>
</tr>
<tr>
<td>London</td>
<td>1967</td>
<td>3</td>
</tr>
<tr>
<td>Raisin River</td>
<td>1968</td>
<td>0.7</td>
</tr>
<tr>
<td>Haldimand</td>
<td>1997</td>
<td>0.1</td>
</tr>
</tbody>
</table>
Impacts of diversions, consumptive use, and outlet channel modifications on Great Lakes levels

Table 3: Impacts of diversions, consumptive use, and outlet channel modifications on water levels in the Great Lakes.

<table>
<thead>
<tr>
<th>On Lake Levels in Centimeters</th>
<th>Superior</th>
<th>Michigan - Huron</th>
<th>St. Clair</th>
<th>Erie</th>
<th>Ontario</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recorded Levels 1918-1997 (meters)</td>
<td>183.43</td>
<td>176.49</td>
<td>175.02</td>
<td>174.15</td>
<td>74.75</td>
</tr>
<tr>
<td>Long Lac-Ogoki (160 cms) (inflows)</td>
<td>6</td>
<td>11</td>
<td>N/A</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Chicago (90 cms) (outflows)</td>
<td>-2</td>
<td>-5</td>
<td>N/A</td>
<td>-4</td>
<td>-3</td>
</tr>
<tr>
<td>Welland Canal (280 cms)</td>
<td>-2</td>
<td>-6</td>
<td>N/A</td>
<td>-13</td>
<td>0</td>
</tr>
<tr>
<td>Detroit / St.-Clair modifications</td>
<td>0</td>
<td>-40</td>
<td>N/A</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Niagara River outlet</td>
<td>0</td>
<td>-3</td>
<td>N/A</td>
<td>12</td>
<td>-4</td>
</tr>
<tr>
<td>Existing consumptive uses (1993)</td>
<td>-1</td>
<td>-5</td>
<td>N/A</td>
<td>-5</td>
<td>-6</td>
</tr>
<tr>
<td>Impacts (cm):</td>
<td>1</td>
<td>-43</td>
<td>N/A</td>
<td>-1</td>
<td>-2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>On Flows in Connecting Channels (in cubic meters per second)</th>
<th>St. Mary's R.</th>
<th>St. Clair R.</th>
<th>Detroit R.</th>
<th>Niagara R.</th>
<th>St. Lawrence R.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recorded flows 1918-1997 (cms)</td>
<td>2150</td>
<td>5200</td>
<td>5350</td>
<td>5940</td>
<td>6980</td>
</tr>
<tr>
<td>Long Lac-Ogoki (160 cms) (inflows)</td>
<td>160</td>
<td>160</td>
<td>160</td>
<td>160</td>
<td>160</td>
</tr>
<tr>
<td>Chicago (90 cms) (outflows)</td>
<td>0</td>
<td>-90</td>
<td>-90</td>
<td>-90</td>
<td>-90</td>
</tr>
<tr>
<td>Welland Canal (280 cms)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>-260</td>
<td>0</td>
</tr>
<tr>
<td>Existing Consumptive Uses (1993)</td>
<td>-10</td>
<td>-50</td>
<td>-50</td>
<td>-90</td>
<td>-110</td>
</tr>
<tr>
<td>Total Impacts (cms):</td>
<td>150</td>
<td>20</td>
<td>20</td>
<td>-280</td>
<td>-40</td>
</tr>
</tbody>
</table>

Notes: N/A is Not Available
St. Lawrence River flows measured at Cornwall
Questions?

ijc.org

International Joint Commission
United States and Canada
Water levels in metres referred to Chart Datum

Lakes Michigan-Huron

January 2004

1918-2002

Maximum Monthly Mean

Average Monthly Mean

Minimum Monthly Mean

Forecast Range - High

Recorded Monthly Mean

Forecast Range - Low
Reduced supplies to upper Great Lakes
Channel Alterations – St. Clair River

• Recent low M-H levels may not be entirely due to hydrology, but possibly ongoing physical changes in the St. Clair River.

• Decline in water level difference between Lakes Michigan-Huron and Lake Erie since 1970 implies ongoing St. Clair River erosion.

• IUGL Study includes a thorough investigation of the St. Clair River.
Scatter Plot of Great Lakes Basin Areal Averaged Changes in Temperatures & Precipitation in 2050s


Graphic and Comments - McAuley

Mean Temperature Change (°C)

Mean Precipitation Change (%)

Included for comparison only. Based on IS92a emission scenarios and a 20-year average.
Great Lakes are in the interplay of three major air masses

- **ARCTIC (dry, cold)**
- **PACIFIC (dry)**
- **MARITIME TROPICAL (moist)**