Figure 20. Water level – impact relationship using total possible boating days lost by month for all Canadian Lower St. Lawrence River – Montreal Contrecoeur Reach users.
Figure 21. Water level – impact relationship using net economic values lost by month for all Canadian Lower St. Lawrence River – Montreal Contrecoeur Reach users.
Lower St. Lawrence River - Lake St. Pierre Reach
Combined Canada

Figure 22. Water level – impact relationship using total possible boating days lost by month for all Canadian Lower St. Lawrence River – Lake St. Pierre Reach users.
Table 29. Revenue of boat dealers and marinas in 2001 by region (million $).

<table>
<thead>
<tr>
<th>Region</th>
<th>Marinas revenues</th>
<th>New boats and Engines revenues</th>
<th>Total revenues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ontario</td>
<td>267.4</td>
<td>180.6</td>
<td>448.0</td>
</tr>
<tr>
<td>Quebec</td>
<td>139.9</td>
<td>110.8</td>
<td>250.7</td>
</tr>
<tr>
<td>Total</td>
<td>407.3</td>
<td>291.4</td>
<td>698.7</td>
</tr>
</tbody>
</table>


Province-wide estimates show that boater expenditures are mainly made for food and beverages, followed by fuel (Table 30). The relative costs of these items can change through time and induce changes in behavior and in consumption habits. This data is not available at the sub-provincial level.

Table 30. Recreational boater expenditures in 2001 by region (based on 1988 data) (million $).

<table>
<thead>
<tr>
<th>Region</th>
<th>Fuel</th>
<th>Marine supplies</th>
<th>Accommodations</th>
<th>Food and beverage</th>
<th>Shopping</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ontario</td>
<td>310.6</td>
<td>92.2</td>
<td>121.8</td>
<td>434.2</td>
<td>152.5</td>
</tr>
<tr>
<td>Quebec</td>
<td>149.3</td>
<td>44.3</td>
<td>58.5</td>
<td>208.8</td>
<td>73.3</td>
</tr>
<tr>
<td>Total</td>
<td>459.9</td>
<td>136.5</td>
<td>180.3</td>
<td>643.0</td>
<td>225.8</td>
</tr>
</tbody>
</table>


Boat types continue to evolve. From 1990 to 1998 in North America, the proportion of yachts constructed under 19 ft. has increased from 50% of total yachts constructed to 77%. Although some boats may be sold elsewhere (e.g. Europe), it seems from this data that there is a tendency towards smaller yachts (Industry Canada 2003). That being said, a survey done by DBSF (2002) indicated that 50.4% of respondent were thinking about eventually buying a bigger boat. In our survey conducted with marina operators in 2001 (Boudier and Bibeault 2001), half of the respondents saw a potential for bigger boats (boaters are more experienced, have more money) and half saw a potential for smaller boats (younger boaters buy smaller boats, economic uncertainties, gas prices as a limiting factor).
Looking at specific data relevant to the Lower St. Lawrence River, we found in the Quebec region the number of boats (of all types) increased by 22% from 1995 to 2000, with the highest increases for motor boats of less than 20 feet (26%) and for rowboats (22%). Sailboats of more than 20 feet have also increased by 12% (DFO 2004). According to Duchesne et al. (2004), over this same period, use of power boats and rowboats has increased, but use of sailboats has decreased on the Lower St. Lawrence River. Although difficult to forecast precisely, it is likely that the number of boats will increase on the Lower St. Lawrence River in the coming years.

For tour boats, there has been increasing development in the Great lakes and the St. Lawrence River. Tour boats are dependent on tourists visiting the region. If tourists hear about low water levels, for example, this could impact their decision to visit the area or ride on a tour boat. Most of this concern has been linked to the St. Lawrence River and Gulf. In the Great Lakes, cruising lines have expanded a lot in recent years, but by using the Seaway, they have not been impacted as much by water level fluctuations. For the Quebec region, the economic impact has been estimated at $121 million for “croisières excursions” or tour boats, plus $47 million for ferry-boats and shuttles (Chaire de tourisme de l’UQAM 2003). In Ontario “outdoor activists” (defined as intense outdoor visitors) are the most likely to benefit from Great Lakes boat tours (Lang Research 2001).

Audet (2002) examined the impacts of fluctuating water levels on the marine tourism industry operating in the Montréal Old Port sector of the St. Lawrence River. Information used in the study came from published reports and brochures, interviews with Old Port officials, and operators of tour boat and excursion craft during the summer of 2001. The study found that low water levels were associated with various problems, including reducing the usability of embarkation and disembarkation ramps and floating docks, increased probability of vessel damage from running aground or striking submerged rocks, restricted ranges of operation and exposure of passengers to risk of injury. Costs could be as high as $100,000 for dock adaptation, $20,000 for boat ramp and access point physical modification, $25,000/year for damages associated with low water level and up to $20,000 for new navigation devices (this last figure being for one company). Interviews by Audet (2002) also revealed that if water levels were maintained at zero chart datum, damages could be considered as negligible.
U.S. AND CANADA AGGREGATED WATER LEVEL – IMPACT RELATIONSHIPS

Methods

U.S. and Canadian performance indicators were aggregated by reach for Lake Ontario and the Upper St. Lawrence River. (The Lower St. Lawrence River is wholly within Canada and thus, final water level – impact relationships for those reaches have been reported previously in the Canadian Research section.) When the two data sets were integrated, not every U.S. water level measurement had an equivalent Canadian measurement and visa versa. Therefore, at those specific water levels, estimates for the missing data were made by assuming a straight line relationship between known water levels. Known water levels were never more than half a foot apart. Economic indicators measured in dollars were all converted to 2002 U.S. dollar equivalents. Water levels are reported in both meters and feet.

Results

Figures 24 and 25 represent our best estimates of the water level – impact relationships for the Lake Ontario Reach. Figure 24 depicts the relationship in terms of total possible days boated by month and Figure 25 uses net economic value (willingness-to-pay) as its y axis. The shapes of the curves are virtually identical; only the y axis scale differs. The largest losses would occur in the summer months of July and August, followed by the shoulder seasons of June and September. Losses appear minimal between 244.8 ft. and 247.2 ft.

For the Upper St. Lawrence River - Alexandria Bay Reach, there appears to be no water level without any impacts for boaters (Figs. 26 and 27). A few boaters are experiencing problems with low water at the same time other boaters are experiencing problems with high water. The least amount of impact appears to occur between 245 ft. and 247.2 ft.

The Ogdensburg Reach of the Upper St. Lawrence River has fewer boaters than the other sections and consequently, estimates of impacts are smaller (Figs. 28 and 29). Impacts appear to be minimal above 243.8 ft. Impacts due to high water levels are quite small compared with low water impacts below 242.5 ft.

Additional Performance Indicator Curves

Another performance indicator that may be of interest to some is the one that sums direct local expenditures, net economic value, and regional economic impacts. Although regional economic impacts are not available on the Canadian side, this “total” indicator gives a sense of what would be lost to the local communities in addition to the loss to boaters. For this reason, water level – impact curves are presented using this indicator for the six reaches at the end of Appendix B (Figs. B22 through B27). These curves should not be used in any comparisons with other interest groups because of the fungibility issue.
Figure 24. Water level – impact relationship using total possible boating days lost by month for all US and Canadian Lake Ontario Reach users.
Figure 25. Water level – impact relationship using net economic values lost by month for all US and Canadian Lake Ontario Reach users.
Figure 26. Water level – impact relationship using total possible boating days lost by month for all US and Canadian Upper St. Lawrence River – Alex. Bay Reach users.
Figure 27. Water level – impact relationship using net economic values lost by month for all US and Canadian Upper St. Lawrence River – Alex. Bay Reach users.
Figure 28. Water level – impact relationship using total possible boating days lost by month for all US and Canadian Upper St. Lawrence River – Ogdensburg Reach users.
Figure 29. Water level – impact relationship using net economic values lost by month for all US and Canadian Upper St. Lawrence River – Ogdensburg Reach users.
ASSESSMENT OF VALIDITY OF WATER LEVEL – IMPACT RELATIONSHIPS

Several assumptions were made in the conduct of this study that bear further discussion. On the U.S. side, we assumed that the population of boaters from which we drew our survey sample (those whose county of principal use as listed on their boating registration bordered the study area) included all boaters who used Lake Ontario and the St. Lawrence River. This was the only population from which a cost efficient sample could be drawn. In 2003, New York Sea Grant funded a statewide survey of boating in New York State which allowed us to estimate the magnitude of this conservative assumption. The results of the Sea Grant study showed that 36% of Lake Ontario or St. Lawrence River boaters listed a county away from the Lake or River as their county of principal use. The Sea Grant study did not ask willingness to pay, but at-site expenditures were similar for boaters whose county of principal use borders the study area versus other boaters. This suggests that willingness to pay for the two groups would be similar. Thus, our U.S. estimates of boating use and net benefits on the Lake and River are likely underestimated by as much as 36% (Connelly et al. 2004). It is also possible that boats registered outside New York State were launched on the Lake or River. We inquired about non-NYS registered boats in our survey of marina operators (the most likely place where out-of-state boats would be berthed) and found them to be a very small percentage (<2%) of all boats.

On the Canadian side, a telephone survey of the general population living near the Lake and River was conducted to estimate the number of boaters. The survey area extended approximately 50 miles north of the Lake and River (Gardner Pinfold Consulting 2003). We believe the number of boaters who come from outside the area surveyed is very small because the population outside the survey area is small and many other boating sites exist outside the survey area. We were unable to get good depth measurements at boat launch ramps on Lake Ontario or the Upper St. Lawrence River. Therefore, net economic value lost for these boaters are not included in the water level – impact relationship curves calculated for those reaches. Thus, the curves presented are conservative estimates.

The other major assumption is that boaters in fact behave consistently with the curves shown in our results. We do not have independent data from a year of high or low water to test this assumption (although other factors also affect participation). Thus, we have to examine the assumption deductively. Regarding boater behavior during low water levels, we took depth measurements at marinas and boat launch ramps and asked private dock owners for an estimated water depth on a particular day (Labor Day of 2002). These measurements when merged with the depth requirements of boats of various sizes incorporated no safety margin. Thus, stage damage curves for low water levels may be conservative for two reasons: (1) some boaters will not want to risk damage to their boat or propeller without some safety margin, and (2) many marinas are located on inlets in situations where siltation occurs in the channel leading to the marina slips, and in some cases the depth at the slip is not the most shallow depth the boater
faces in getting out to open water. Regarding high water levels, we assumed boater days were lost when fixed docks at marinas were inundated. Although no further measurements were taken, at many marinas boats have to pass under a bridge to get to open waters, and at levels where docks are inundated, larger boats can not get under these bridges. We assumed boaters at launch ramps and private docks could boat at any high water level, a conservative assumption, because of the cost of obtaining valid data.

Related to the above is the assumption that boaters don’t move to another area during times of water level problems, and thus once water levels hit certain low or high thresholds, all boating benefits are lost. We believe this is a safe assumption for private dock owners, whose boats are in the water at that site and thus are closely tied to the site. We also believe it is a safe assumption for boats that use marinas, on a year-to-year basis. We are aware of some cases in which boaters using marinas were forced to find a substitute site only for hauling out their boats (Boudier and Bibeault 2001). Most marinas and yacht clubs charge an annual slip rental which is paid in advance, and thus it is unlikely that the boater will have his boat hauled out and move to another marina (which may have no slip vacancies) mid-season. Boaters who trailer their boats and use launch ramps have more flexibility, and may be able to move to another facility in low-water situations. However, they may lose the boating day when they assumed they would launch their boat, and water levels may affect nearby ramp facilities similarly.

Given these assumptions, we believe net economic benefits lost at given water levels are understated because on balance, the assumptions are conservative. However, we don’t believe the estimates seriously understate lost benefits.

The performance indicator of net benefits lost is based on willingness to pay data asked of boaters. This is the conceptually correct measure to compare net benefits lost from recreational boating with net benefits lost from other sectors. Because of its hypothetical nature, this method is sometimes criticized. However, we used methods generally approved by resource economists and survey researchers to arrive at the most valid estimates possible. First, we defined and eliminated outlier estimates. Second, we asked if boaters provided an inflated estimate of willingness to pay in order to enhance the value (consumer surplus) of recreational boating. Those who responded affirmatively were assigned the mean value provided by other boaters (which was, on average, a reduced value) rather than the value they gave.

Considering various water level plans and possible ranking of those plans, we believe it is unlikely that changes to any of these assumptions would affect plan ranking for recreational boating. Changes in assumptions might affect the proportional loss for recreational boating as compared with other interests.
CRITERIA SELECTION

Background

One of the principal study objectives of the technical work group was to determine the ideal criteria based on hydrologic/hydraulic parameters of Lake Ontario and the St. Lawrence River at each of the various established study reaches that would best meet the needs of recreational boaters and associated businesses. The criteria developed from the RBTTWG, and other TWG’s would serve to assist the Plan Formulation & Evaluation and Hydrologic & Hydraulic Technical Work Groups to develop new regulation plans. Specifically, technical work groups were tasked to review the current criteria and operating plan and deliver recommendations, if any, for new criteria and updated plan for water level and flow regulation for consideration by the IJC.

Plan 1958D with Deviations

The current regulation plan, Plan 1958D, was developed to satisfy criteria set forth in the Order of Approval for Regulation of Lake Ontario as part of the Boundary Waters Treaty. The criteria were developed for hydropower, commercial navigation, municipal and industrial water supply and flood damage reduction to riparian interests along Lake Ontario and the St. Lawrence River. The regulation plan consists of a family of operating curves for different trends in the water supply conditions for Lake Ontario. Depending upon the supply conditions in the lake, a specific curve is selected and the outflow is adjusted.

Accordingly, the regulation plan calls for computing weekly outflows based on a number of factors including the current Lake Ontario level, upper basin supplies, season of the year and high and low outflow limits in an attempt to satisfy these criteria. Discretionary deviations from the plan flow occasionally occur and are based on the St. Lawrence Board of Control’s review of future supply forecasts and other situations on Lake Ontario and the St. Lawrence River such as Criteria (k).

<table>
<thead>
<tr>
<th>Criteria (k)</th>
</tr>
</thead>
<tbody>
<tr>
<td>“In the event of supplies in excess of the supplies of the past...provide all possible relief to the riparian owners upstream and downstream. In the event of supplies less than supplies of the past...provide all possible relief to navigation and power interests”</td>
</tr>
</tbody>
</table>

Over the past several decades, many attempts were made through studies to improve or replace Plan 1958D. One of the recommendations of the International Great Lakes Levels Reference Study (Citizens Advisory Committee 1993) was to develop a new regulation plan that takes into consideration the needs of the recreational boater interests and also that of the environment.
Developing Criteria for Recreational Boating and Tourism Technical Work Group

The hydrologic/hydraulic parameter with the greatest affect upon the RBTTWG is water levels. Though velocities resulting from flow changes on the St. Lawrence River are of some concern to the RBTTWG, the principal parameter affecting the recreational boating interests is water levels. Over the course of the boating season, under Plan 58D with deviations, there are two water level related scenarios that affect boaters. In years with higher than average levels, typically in the spring or early summer, private and public fixed docks in various locations in the study area, may become inundated rendering them inaccessible for use. High water levels also have the potential to adversely impact launch ramps and even some entrance channels with bridge constraints. In years with lower than average levels, typically in the late summer and fall, boaters may face restricted use due to insufficient depths at their docks, launch ramps and access channels.

Performance Indicators and Initial Criteria

The RBTTWG upon initial review of the performance indicators (Water Level - Impact Relationships), for each reach identified the ideal monthly mean water level (the water level, which minimized adverse impacts) and the range of water levels around the ideal level which could be deemed acceptable for the boating constituency overall. The RBTTWG discussed what constitutes a reasonable range for a maximum low level to a minimum high level for each reach. Consideration was given to developing a range of levels that not only minimized adverse impacts but that also provided a reasonable spread in consideration to regulation plan formulation. Upon examination of the physical relationship of water levels between the Lake Ontario and upper St. Lawrence River reaches, the RBTTWG realized that the initial criteria ranges presented by reach might be in conflict with one another. The following two tables (Tables 31 and 32) illustrate this. Depending on the discharge (flow) out of Lake Ontario, the difference in elevation between Lake Ontario and Alexandria Bay (and Ogdensburg) vary.

Table 31. Difference in elevation between Cape Vincent and Alexandria Bay at various flows & at selected elevations on Lake Ontario.

<table>
<thead>
<tr>
<th>Alex Bay</th>
<th>74</th>
<th>74.25</th>
<th>74.75</th>
<th>75.25</th>
<th>75.75 &lt;- meters</th>
</tr>
</thead>
<tbody>
<tr>
<td>flow (cfs)</td>
<td>242.78</td>
<td>243.60</td>
<td>245.24</td>
<td>245.88</td>
<td>248.52 &lt;- feet</td>
</tr>
<tr>
<td>5,000</td>
<td>0.26</td>
<td>0.26</td>
<td>0.22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6,000</td>
<td>0.35</td>
<td>0.30</td>
<td>0.26</td>
<td>0.22</td>
<td></td>
</tr>
<tr>
<td>7,000</td>
<td>0.40</td>
<td>0.34</td>
<td>0.29</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8,000</td>
<td>0.43</td>
<td>0.37</td>
<td></td>
<td></td>
<td>For example: when L.O. is at 245.24, and the flow is 7000 cfs, the difference in elevations between LO and Alex Bay is 0.43 feet.</td>
</tr>
<tr>
<td>9,000</td>
<td>0.53</td>
<td>0.46</td>
<td></td>
<td></td>
<td>and Alex Bay is 0.4 feet.</td>
</tr>
<tr>
<td>10,000</td>
<td>0.65</td>
<td>0.56</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11,000</td>
<td>0.67</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 32. Difference in elevation between Cape Vincent and Ogdensburg at various flows & at selected elevations on Lake Ontario.

<table>
<thead>
<tr>
<th>Ogdensburg</th>
<th>74</th>
<th>74.25</th>
<th>74.75</th>
<th>75.25</th>
<th>75.75 &lt;= meters</th>
</tr>
</thead>
<tbody>
<tr>
<td>flow (cfs)</td>
<td>242.78</td>
<td>243.60</td>
<td>245.24</td>
<td>246.88</td>
<td>248.52 &lt;= feet</td>
</tr>
<tr>
<td>5,000</td>
<td>0.62</td>
<td>0.56</td>
<td>0.47</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6,000</td>
<td>0.77</td>
<td>0.65</td>
<td>0.55</td>
<td>0.48</td>
<td></td>
</tr>
<tr>
<td>7,000</td>
<td>0.86</td>
<td>0.73</td>
<td>0.63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8,000</td>
<td></td>
<td></td>
<td>0.93</td>
<td>0.80</td>
<td></td>
</tr>
<tr>
<td>9,000</td>
<td></td>
<td></td>
<td>1.16</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>10,000</td>
<td></td>
<td></td>
<td>1.42</td>
<td>1.21</td>
<td></td>
</tr>
<tr>
<td>11,000</td>
<td></td>
<td></td>
<td></td>
<td>1.46</td>
<td>0.86 feet.</td>
</tr>
</tbody>
</table>

For example: when L.O. is at 245.24 and the flow is 7000 cfs, the difference in elevations between LO and Ogdensburg is 1.46.

Also, an analysis of historical elevation differences between Lake Ontario (at Cape Vincent) and Alexandria Bay and Ogdensburg revealed that the monthly variation differences were not significant to warrant criteria refinements by month. This is presented in Table 33.

Table 33. Differences in average elevations between Lake Ontario and Ogdensburg and between Lake Ontario and Alex. Bay by boating season month.

<table>
<thead>
<tr>
<th>Period</th>
<th>Alex Bay &amp; L. Ont diff</th>
<th>Ogdensburg &amp; L. Ont diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>06/01/83 -</td>
<td>Average</td>
<td>Standard</td>
</tr>
<tr>
<td>12/31/03</td>
<td></td>
<td>Deviation</td>
</tr>
<tr>
<td>April</td>
<td>0.38</td>
<td>0.11</td>
</tr>
<tr>
<td>May</td>
<td>0.42</td>
<td>0.11</td>
</tr>
<tr>
<td>June</td>
<td>0.43</td>
<td>0.10</td>
</tr>
<tr>
<td>July</td>
<td>0.43</td>
<td>0.10</td>
</tr>
<tr>
<td>August</td>
<td>0.45</td>
<td>0.09</td>
</tr>
<tr>
<td>September</td>
<td>0.45</td>
<td>0.08</td>
</tr>
<tr>
<td>October</td>
<td>0.43</td>
<td>0.09</td>
</tr>
<tr>
<td>November</td>
<td>0.40</td>
<td>0.11</td>
</tr>
<tr>
<td>Average</td>
<td>0.42</td>
<td></td>
</tr>
</tbody>
</table>

Refined Criteria

The RBTTWG upon review of the final performance indicators established the range of water levels which we thought is still acceptable for the boating constituency overall and is logically consistent between the Lake and Upper River reaches. The RBTTWG reached a consensus that a ± 1.4-foot variance around the ideal level of 246.2 ft. (75.04 m.) for Lake Ontario was a reasonable water level range for boaters. Taking into account the average difference in water level elevations between Lake Ontario and the Upper St. Lawrence River (Table 33), we determined that water levels on the Upper
St. Lawrence River resulting from the Lake Ontario criteria would also be within an acceptable range. For the Lower St. Lawrence River, the acceptable range is greater considering that the river flow is not regulated. Differences in Lower River sections are associated with specific hydrologic conditions and topography of each section.

It is important to note that the critical period during the boating season subject to unacceptable water levels has historically occurred from late August through mid October. Thus, the greatest incremental gains to recreational boating would be if higher water levels could be achieved during the fall. Therefore, the RBTTWG strongly emphasizes that the range specified is to be applied for the full extent of the boating season 15 April through 15 October.

Table 34 presents the preliminary ideal target level by reach along with the acceptable lower and upper bounds.

Table 34. Ideal criteria for water levels by reach for recreational boating interests for the boating season 15 April through 15 October. (Chart datum is shown for reference.)

<table>
<thead>
<tr>
<th>Study Reach</th>
<th>Chart Datum</th>
<th>Ideal Level</th>
<th>Minimum Level</th>
<th>Maximum Level</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(ft)</td>
<td>(m)</td>
<td>(ft)</td>
<td>(m)</td>
</tr>
<tr>
<td>Lake Ontario</td>
<td>243.3</td>
<td>74.3</td>
<td>246.2</td>
<td>75.04</td>
</tr>
<tr>
<td>Alexandria Bay</td>
<td>243.0</td>
<td>74.1</td>
<td>245.8</td>
<td>74.92</td>
</tr>
<tr>
<td>Ogdensburg</td>
<td>242.5</td>
<td>73.9</td>
<td>245.1</td>
<td>74.70</td>
</tr>
<tr>
<td>Lake St. Louis</td>
<td>66.9</td>
<td>20.4</td>
<td>70.5</td>
<td>21.5</td>
</tr>
<tr>
<td>Lake St. Pierre</td>
<td>12.5</td>
<td>3.8</td>
<td>14.8</td>
<td>4.5</td>
</tr>
<tr>
<td>Montreal - Contrecoeur</td>
<td>15.7</td>
<td>4.8</td>
<td>21.3</td>
<td>6.5</td>
</tr>
</tbody>
</table>
RBTTWG RECOMMENDATIONS TO THE IJC

The Recreational Boating and Tourism Technical Work Group makes the following recommendations.

- We suggest that the IJC develop a new regulation plan for Lake Ontario and St. Lawrence River that includes the following criteria:
  A. Maintain the level on Lake Ontario between a ± 1.4-foot variance around the ideal level of 246.2 ft. (75.04 m.) for the period 15 April thru 15 October.
  B. Maintain the level at Alexandria Bay between a ± 1.4-foot variance around the ideal level of 245.8 ft. (74.92 m.) for the period 15 April thru 15 October.
  C. Maintain the level at Ogdensburg between a ± 1.4-foot variance around the ideal level of 245.1 ft. (74.70 m.) for the period 15 April thru 15 October.
  D. Maintain the level on Lake St. Louis between 68.6 ft. (20.9 m.) and 74.8 ft. (22.8 m.) for the period 15 April thru 15 October.
  E. Maintain the level on Lake St. Pierre between 13.9 ft. (4.25 m.) and 17.1 ft. (5.2 m.) for the period 15 April thru 15 October.
  F. Maintain the level at Montreal - Contrecoeur between 18.0 ft. (5.5 m.) and 32.8 ft. (10.0 m.) for the period 15 April thru 15 October.

- We recommend that the IJC insure that a member of the Board of Control be an individual with a working knowledge of lake level issues and impacts regarding recreational boating on Lake Ontario and the St. Lawrence River.

- The IJC should implement a Communications Plan for improving communications between the St. Lawrence River Board of Control and Lake Ontario and St. Lawrence River recreational boating interests. The Communications Plan should include the following:
  A. Establish Board of Control liaison to the Lake Ontario and St. Lawrence River boating community.
  B. Develop and maintain a list of Lake Ontario and St. Lawrence River boating community Point Of Contacts.
  C. Provide information regarding forecasted extreme levels via “early alert system” to boating community and promote subscribing to water levels bulletins to boaters.
  D. Provide information from monitoring efforts to boaters on a regular basis.
  E. Develop education program for all interests to better understand water level issues including water level control.

An example of a communications plan that could be modified for recreational boating, if desired, can be found in Appendix D.

- The public generally does not understand the capabilities of the IJC and the Board of Control nor how they reach their decisions. The decision making process
needs to be more transparent. How the Board of Control reaches consensus rather than majority decisions is particularly not well understood. Improved communications and education are needed. As an example, perhaps a FAQ section on the web site would be helpful to those interested enough to be seeking more information.

• Considering that the data and analysis conducted for this effort will be outdated in the near future and that the new plan should be adaptive (Study Board Principle), we suggest implementing a monitoring plan or system for recreational boating.
  A cost-effective plan should be based on:
  A. an actual data collection system with relevant stakeholders;
  B. focus on the most sensitive areas (e.g., Gananoque area, Lake St. Louis, Alexandria Bay, North Sandy Pond)
  C. consider using continuous data collection tools (e.g., Internet short survey);
  D. involve boat related associations (e.g., OMOA, Canadian Squadron).
  E. a periodic review (e.g., each five years) in order to assess trends (e.g., new needs, adaptation options, etc.) in the boating activity and industry.

Finally, an adaptive management team (or any other relevant institutional mechanism) should be created to insure a bi-national and coordinated effort.
LITERATURE CITED


Boudier, H. and J.F. Bibeault. 2001. Exploratory survey on Lake St. Louis and Montreal-Contrecouer areas for boat related services managers and operators (in French), TWG on recreational boating and tourism, for the International Joint Commission, November.


The Freedonia Group. 2001. Recreational boating to 2005 – market size, market share and demand forecast. The Freedonia Group, Cleveland, OH.


MIG (Minnesota IMPLAN GROUP) Inc. 2000. IMPLAN Pro user’s guide, analysis guide, data guide, version 2.0. Stillwater, MN.


In 2001, the Ontario population was 11.41 million and Quebec, 7.237 million (Statistic Canada 2003). 2001 Census Analysis Series- A profile of the Canadians population: where we live, 96F003XIE010012001. www.statcan.ca.

2 At a more local scale, DBSF (2002) asked how many people were on board for a Lower St. Lawrence River survey and found a mean of 2.7 people per boat. Zins Beauchesne et Associés et Groupe SECOR, (1997) using a small sample of 100 respondents, found variability depending on whether the additional people were family members (mean= 2.7) or friends and/or visitors (mean= 3.5).

3 The breakdown was done by M. Villeneuve, Economic Division and Regulatory Affairs, Environment Canada, in 2003.

4 A similar geographic breakdown was used for these two surveys. The intent was to have a follow-up on the most popular practices on the St. Lawrence River, the estuary and the Gulf. Issues related to recreational boating, water intake, fishing and swimming were considered. The two references used were (1) Dewailly, E., Grondin, J., Gingras, S., Gagnon, F., Laliberté, C., LaRue, R. et L.M. Bouchard (1999). Health survey on perceptions and uses - St. Lawrence River, St. Lawrence Vision 2000, Government of Canada and Government of Quebec, 196 p. et annexes; and (2), Duchesne, J.F., Bibeault, J.F., Gauvin, D., Grondin, D., Laliberté, C., Levallois, P., Lévesque, B., Therrien, G. et S. Gingras (2004). Perceptions and uses monitoring for riparian - ST. Lawrence River, St. Lawrence Vision 2000, Government of Canada and Government of Quebec, 165 p. et annexes.

5 Interest in Canal Lachine is also demonstrated through the management plan recently developed by Parks Canada. Parcs Canada (2004). Canada's National historical site of Canal-de-Lachine, Main plan, Direction générale de Parcs Canada, 95p. An estimated 6,984 boaters have used this canal and 23,594 others have used the Canal Sainte-Anne-de-Bellevue (Pêches et Océans Canada, 2004. Study on recreational boating in Quebec, Direction des politiques et de l’économique, région du Québec, power point presentation), ensuring another link between Lake St. Louis and Lac des Deux-Montagnes.


7 There is a difference between active anglers and general anglers. For Québec the difference was not shown in the data, but for Ontario the number of active anglers was estimated at 815,000. Pêches et Océans Canada (DFO) (2004). Enquête sur la pêche récréative au Canada. www.dfo-mpo.gc.ca/communique/statistics/recenvirional/canada2000.


9 But this comment was based only on two references; “Socio-Economic Impacts of Fluctuating Water Levels on Recreational Boating on the Great Lakes”, Ulrike Bergmann-Baker, Janet Bolton and Geoffrey Wall, in Canadian Water Resources Journal, Vol. 20, No. 3, 1995, pp. 185-194. “St Lawrence River Water level fluctuation impacts on boat related tourism in Montreal sector”, report from Nicolas Audet, presented to the International Joint Commission (in French), March 2002.

10 However, the description of recreational boating in the Montreal area was extensive. At that time, it was estimated that the boat capacity of the Archipelago was 5000, 55% being in Lake St. Louis and the St. Lawrence River between Longueuil and Varennes (p.4, Cournoyer, S., 1982. Projet Archipel, Some aspects of nautism in Montreal Archipelago region (in French), Direction de l’analyse et de la Recherche socio-économique, Ministère du Loisir, de la Chasse et de la Pêche, 145 p.). In 1981 and for Lake St. Louis only, boat users were estimated to be near 29,000 for a total of 254,000 boat-days, with an estimated 8.76 days per boat user, plus 183,770 boat-days for the St. Lawrence River between Montreal and Varennes (MLCP, 1982). For Lake St. Louis, a more recent estimate was 56,000 boat
users in 1994 and 93,000 for the River from Montreal to Varennes (Enquête Jolicoeur et Associés et INRS-Urbanisation, 1994 dans Tecson, 1995). The only relationship established was between estimated draft classes (less than 0.9 m, 0.9 to 1.2 m, and more than 1.2 m) and lake area available according to these depth classes (see Boisclair, J. 1982. Physical aspects of recreational boating in Montreal Archipelago (in French), Projet Archipel, M.L.C.P., Direction de l’aménagement, Service des plans directeurs).

11 It was done by CH2M Hill (2001) and St. Lawrence Center (1999-2000) using comparable data sheets and DGPS measurements at docks sampled from each marina covered: 75 in Lake Ontario, 25 in Upper River and 43 in Lower River.

12 For the Lower St. Lawrence River, Pointe-Claire was the reference for Lake St. Louis, Varennes for Montreal-Contrecoeur and Sorel for Lake St. Pierre. For this study we used three stations instead of only one as proxy for the River to capture possible local variability.

13 Information from survey instruments coming from the Level of Reference Study (1993) was not used because the geographic area considered all the five Great lakes, plus St. Lawrence River and differences in methodological approaches between the U.S. and Canada made it difficult to compare regulation plans. At some point only U.S. data were considered (Recreational Navigation Work Group Report, Working Committee 3, Task group 4, Levels reference Study Board, International Joint Commission, phase II, January 1993, 68 p.). Furthermore, sampling was very limited, especially for the Lower St. Lawrence River. This was a problem and prevented good estimates for Lake St. Louis, according to the authors (Comments on the Report entitled “Non riparian Recreational Boater and marine Operation Study: Canadian section”, by U. Bergmann-Baker, J. Broton and G. Wall, June 1992).

14 A meeting with Customs Canada revealed that the amount of work needed just to select boaters would have taken no less than one to two years of full-time work. Plus, the actual licensing system can induce counting problems. According to the Great Lakes Commission (2000) report, Recreational Boating and the Great Lakes-St. Lawrence Region, Feature report, “…there is no renewal period for licensed vessels in Canada, so a craft can potentially remain licensed even after it has been destroyed or removed from the province. Moreover, potential double-counting of previously licensed vessels might occur when a boat is sold and new license issued.”-- p.2.

15 Telemarketing calls on different days show that after 559 calls only two questionnaire forms were completed (Gardner Pinfold Consulting, 2003, Final report, Survey methods in Appendix C, p.4).

16 Boudier, H. et J.F. Bibeault (2001). Enquête exploratoire auprès des opérateurs et gestionnaires de services nautiques “pour les secteurs lac Saint-Louis et le tronçon fluvial Montréal-Contrecoeur, Groupe technique sur la plaisance et le tourisme, pour la Commission mixte internationale, novembre. A semi-quantitative approach was chosen, using 1.5 hour interviews exploring details and context with 25 owners/operators (over 33 marinas and yacht clubs identified). One interviewee was selected for each municipality (N=16); for bigger municipalities such as Montreal, choosing the right person was a challenge.

17 Duplicate surveys were received from three households; only one of the duplicates was retained in the analysis database.

18 These data are adjusted to 2002 dollar estimates and represent income before income tax according to Statistique Canada (2004). Tableau: certains concepts de revenu en 2002 pour les familles économiques (households) de deux personnes ou plus par province.
http://www.statcan.ca/Daily/francais/04520/q04520b.htm

19 Zins Beauchesne et Associés et groupe SECOR, 1997 gave an estimate of 20 days/year (for one-day-trip) + 6 trips of more than two days (with one night, 2 days reported), for a potential total of 42 to 46 days/year, mostly on the St. Lawrence River. A couple of years before, DFO (1994) cited by Industry Canada (1999) had estimated 25.72 days for pleasure boating in Canada (between 18 to 41 days according to boat type). For anglers only, we have an estimate of 13.1 days/year (9.4 trips) for Quebec province and 17.9 days/year (13.1 trips) for Ontario Region – 1996 data (Environment Canada, 2000), though we do not know how many use a boat for their activity. Villeneuve et al. (2001) have estimated 12.2 days/year for outdoor activities in natural areas; 14.02 days/year for wildlife viewing and 15.92 days/year for fishing in the Great Lakes basin.
20 This picture is more for Quebeckers (though not very different from Ontario and US visitors). It doesn’t make specific the difference between boat owner and user. Le Groupe DBSF (2002). *Boat related tourism marketing and development strategic plan, Final report* (in French), Tourisme Québec.

21 For reference, Tourisme Québec (1999) estimated $52/boat/day; Zins Beauchesne and Associés and Groupe Scanor (1997) estimated $48.92 for one day (or less than one day) trip and $144.75/boat/day (1995) for more than one day trip. This figure is closer to the Gardner Pinfold consulting (2003) estimates. The reference numbers were estimated for boaters in general not just boat owners who have higher costs (e.g., boat maintenance). For anglers, Environment Canada (2000) estimated expenses from $28 to $29/day in 1996 (respective means for Ontario and Quebec provinces). Cornwall Regional convention and Visitor Bureau has given a figure of $52.27 for motor boating and $80.63 for non-motorized boating (e.g., yachts) in 1993 (Sustainable Futures, Indeco strategic consulting inc., IREE (Ottawa University), Econometrics research Ltd. and Anapace Copconsulting Services (1995)). MLCP (1982) has estimated $36.50/day more than 25 years ago. DBSF (2002) shows an estimate of $259/day when going out for more than 3 days. Goss Gilroy Inc. (2003) estimated $150.04/day as a mean for Canadian boaters for daily expenditures (p.18). These references seem to show a difference between boaters in general (magnitude of $50-80/day) and boat owners (magnitude of $150-250/day) who have to support more costs.

22 We used the 10% truncated mean, thus excluding 10% high and low values.

23 See Appendix E, Figure E3 in Gardner Pinfold Consulting (2003).

24 See Table 4.2.13 in Gardner Pinfold Consulting (2003).

25 For anglers, Environment Canada (2000) estimated yearly expenses of $378/year (Quebec region) to $496/year (Ontario region).

26 The total was 43 marinas, yacht clubs or services. There were 6 no answers and 3 refusals (Table 1 in Zins Beauchesne et Associés, 2002. *Survey on marinas and yacht clubs operators, final report (Quebec, in French)*, TWG on recreational boating and tourism, International Joint Commission, multiple paging and appendices.

27 Analysis of the total of 100 interviews was done by McCullough Associates and Diane Mackie and Associates (2002). *Ontario Marina Impact Study*, research report, prepared for International Joint Commission Lake Ontario-ST. Lawrence River Study, 62 p. and appendix. For the total number of marinas we used the estimation of CH2MHill and Scott N. Duff Planning, Environment and Research (2001). Field survey of marinas/Yacht Clubs and Public Boat Launch Sites – Lake Ontario and the Upper St. Lawrence River, Final Report, prepared for International Joint Commission-International Lake Ontario and St. Lawrence River study. Total estimated number was 120 (85 for Lake Ontario and 35 for Upper River), based on on-site visits.

28 Gardner Pinfold Consulting (2003) first used a number of sources to develop a list of yacht clubs and marinas for the three geographic areas: (1) a list of contacts for Ontario marinas and some yacht clubs from the Ontario Marina Operators Association (OMOA); (2) the Internet to identify other marinas not on the OMOA list; (3) an internet search for Quebec and a review of tourism publications on yacht clubs and marinas; and (4) the list from the previous survey. Postal codes were used by their subcontracting telemarketing company to identify all marinas and yacht clubs listed in the yellow pages within the postal code areas identified in Annex A of their report.

29 See an example from the Dutch land by Lengkeek, J. (2000). *Commercial and Club Marinas: pay money or do the chores*, Society and Leisure, vol.23, no.2, pp.371-388. He indicated that berth fees can generate 86% of clubs revenue and 65% for commercial marinas where sidewalks such as sale and hire, and use of a jetty is more important.

30 In all, 61 respondents answered this survey question.

31 These figures should be treated with caution because they do not appear to be adjusted for inflation, the time period over the expenditures took place is unclear, and they are based on small sample sizes.

33 Based on the increase in the number of people on cruising boats in the Seaway from 1,500 in 1997 to 14,000 in 2000 (www.grandslacs-voiromaritime.com) and an article by Wright (2002, “Les croisieres sur les Grand Lacs, un secteur en gestation,” Magazine Maritime 19:42-47).
Lake Ontario and St. Lawrence River

Boater Survey – 2002

Human Dimensions Research Unit
Department of Natural Resources
Fernow Hall
Cornell University
Ithaca, New York 14853-3001
LAKE ONTARIO

AND

ST. LAWRENCE RIVER

BOATER SURVEY

2002

Research conducted by the
Human Dimensions Research Unit
Department of Natural Resources
Cornell University

You were chosen to participate in this survey because during a brief telephone interview with Cornell researchers this fall you said you boated on Lake Ontario or the St. Lawrence River in 2002. The purpose of this mail survey is to learn more about your boating activity and expenditures. We would like to get more information about the value you place on your boating experiences and to learn if you have been impacted by recent low or high water levels on Lake Ontario and the St. Lawrence River. Information from this study will help the International Joint Commission better regulate water levels on the Lake and River to meet the needs of all users, including recreational boaters.

Please complete this questionnaire at your earliest convenience, seal it, and drop it in any mailbox (no envelope is needed); return postage has been provided. Your response is extremely important to us. The information you provide will represent many other Lake Ontario/St. Lawrence River boaters. Your responses will remain confidential and will never be associated with your name. The questionnaire has an identification number so your name can be crossed off our list when you return it. Your prompt response will keep us from bothering you with unnecessary reminder letters.

THANK YOU FOR YOUR HELP!

Printed on recycled paper

OMB 0710-0001
1. Please tell us about each of the boats you own and used on Lake Ontario or the St. Lawrence River so far this year? (Please write in the length and draft of your boat and check whether it is power or sailboat.)

<table>
<thead>
<tr>
<th></th>
<th>Length</th>
<th>Draft (including propeller)</th>
<th>Powerboat or Sailboat (check one)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boat used most often</td>
<td>_____</td>
<td>_____</td>
<td>_____</td>
</tr>
<tr>
<td>Other boat 1</td>
<td>_____</td>
<td>_____</td>
<td>_____</td>
</tr>
<tr>
<td>Other boat 2</td>
<td>_____</td>
<td>_____</td>
<td>_____</td>
</tr>
<tr>
<td>Other boat 3</td>
<td>_____</td>
<td>_____</td>
<td>_____</td>
</tr>
</tbody>
</table>

2. How many days have you gone boating in any of the boats you own on Lake Ontario (including bays, such as Sodus Bay or Irondequoit Bay) or the St. Lawrence River so far this year (2002)?

<table>
<thead>
<tr>
<th>Month</th>
<th>Lake Ontario and Bays</th>
<th>St. Lawrence River</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td># of days of boating</td>
<td></td>
</tr>
<tr>
<td>January</td>
<td>_____</td>
<td>_____</td>
</tr>
<tr>
<td>February</td>
<td>_____</td>
<td>_____</td>
</tr>
<tr>
<td>March</td>
<td>_____</td>
<td>_____</td>
</tr>
<tr>
<td>April</td>
<td>_____</td>
<td>_____</td>
</tr>
<tr>
<td>May</td>
<td>_____</td>
<td>_____</td>
</tr>
<tr>
<td>June</td>
<td>_____</td>
<td>_____</td>
</tr>
<tr>
<td>July</td>
<td>_____</td>
<td>_____</td>
</tr>
<tr>
<td>August</td>
<td>_____</td>
<td>_____</td>
</tr>
<tr>
<td>September</td>
<td>_____</td>
<td>_____</td>
</tr>
<tr>
<td>October</td>
<td>_____</td>
<td>_____</td>
</tr>
<tr>
<td>November</td>
<td>_____</td>
<td>_____</td>
</tr>
</tbody>
</table>
When you launched your boat onto Lake Ontario, was it usually from a private dock?

____ No (GO TO Question 3)
____ Yes (Please answer Parts A and B below)

A. Approximately how much water was under the keel or lowest part of the boat you used most often at your private dock on Labor Day (Sept. 1), 2002?

____ less than 1 foot
____ 1 – 2 feet
____ 2 – 3 feet
____ 3 – 4 feet
____ more than 4 feet
____ don’t know

fill in actual amount under keel _____ feet _____ inches on Labor Day

B. How confident are you that the above estimate is accurate?

____ very confident
____ moderately confident
____ not very confident

3. Think back to a typical trip you took on the boat you used most often on Lake Ontario or the St. Lawrence River this past year. How many days were you away from home on that typical trip?

____ # of days  (if you were just out for the day, please write in 1 day)

3b. How many people, including yourself went on the trip?

____ # of people, including yourself

3c. Where did you access the Lake or River?

(Check only one. Refer to map on cover, if needed.)

FROM NEW YORK STATE    FROM CANADA

____ Niagara Co.  ____ Cayuga Co.  ____ Ontario
____ Orleans Co.  ____ Oswego Co.  ____ Quebec
____ Monroe Co.  ____ Jefferson Co.
____ Wayne Co.  ____ St. Lawrence Co.
3d. For this typical trip, approximately how much did you and others on your boat spend in the following business categories: (1) in NYS counties bordering the Lake or River, and (2) in areas outside those counties en route to the Lake or River? (Please include expenditures made traveling to and from your boat.)

<table>
<thead>
<tr>
<th>Typical Trip Expenditures</th>
<th>PLACE OF EXPENDITURES:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Bordering NYS Counties</td>
</tr>
<tr>
<td>Marinas or yacht clubs (rental or launching fee, fuel, supplies)</td>
<td>$_________</td>
</tr>
<tr>
<td>Bait and tackle shops</td>
<td>$_________</td>
</tr>
<tr>
<td>Restaurants or bars</td>
<td>$_________</td>
</tr>
<tr>
<td>Grocery or convenience type stores</td>
<td>$_________</td>
</tr>
<tr>
<td>Hotels, motels, B&amp;Bs, campgrounds</td>
<td>$_________</td>
</tr>
<tr>
<td>Entertainment (movies, amusement parks, boat tours)</td>
<td>$_________</td>
</tr>
<tr>
<td>Gas stations (fuel, sundries)</td>
<td>$_________</td>
</tr>
<tr>
<td>Other retail stores</td>
<td>$_________</td>
</tr>
<tr>
<td>Other: (____________________)</td>
<td>$_________</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>$_________</td>
</tr>
</tbody>
</table>

4. Consider the total amount you and others spent on the typical trip listed above. Now suppose the cost of this trip had been substantially higher. This could have been because of a large increase in the price of gasoline, food and lodging, or any other expense items. If your total cost for this trip had been 3 times what your group actually spent, would you still have taken this trip?

   ______ No (GO TO Question 6)
   ______ Yes (GO ON TO Question 5)

5. If the total cost of this trip had been 4 times what your group paid, would you still have taken this trip?

   ______ No (GO TO Question 7)
   ______ Yes (GO TO Question 7)
6. If the total cost of this trip had been 2 times what your group paid, would you still have taken this trip?

____ No
____ Yes

7. What is your best estimate of the MAXIMUM total amount you and others would have been willing to pay for this trip before you would have decided not to go?

$_______ MAXIMUM total cost your group would have paid

8. How do you feel about the answer you provided in Question 7 above? (Please check any item you feel is true; you may check more than one item.)

____ The amount I wrote in is a good estimate of the most I would have been willing to pay without canceling the trip.

____ It is possible that I would have been willing to spend even more than the amount I wrote in.

____ The trip would really have been worth more to me, but this is all I could have paid.

____ I probably wouldn’t really be willing to spend as much as I wrote in, but I wanted to indicate that boating on Lake Ontario or the St. Lawrence River means a lot to me.

____ I really have no idea what the upper limit is on what I would be willing to spend for a boating trip on Lake Ontario or the St. Lawrence River.
9. Were there any days in 2002 when you wanted to go boating on Lake Ontario or the St. Lawrence River, but couldn’t because of HIGH water level conditions?

   _____ No (GO TO Question 11)
   _____ Yes → How many days did that happen to you in the following months of 2002:
      _____ March
      _____ April
      _____ May
      _____ June
      _____ July

10. What did you do instead of boating on Lake Ontario or the St. Lawrence River (when HIGH water level conditions prevented you from doing so)? (Check all that apply.)

      _____ boated on another waterway
      _____ chose another recreational activity
      _____ did something else with my time

11. Have you done anything or had anything done to adapt your boat, dock, or property for use during HIGH water conditions on Lake Ontario or the St. Lawrence River?

       _____ No (GO TO Question 13)
       _____ Yes

12. What was the most recent adaptation that was made, and roughly how much did it cost?

       Describe the adaptation: ________________________________

       Adaptation Cost: $__________

       Year adaptation made: __________
13. Were there any days in 2002 when you wanted to go boating on Lake Ontario or the St. Lawrence River, but couldn't because of LOW water level conditions?

____ No (GO TO Question 15)

____ Yes → How many days did that happen to you in the following months of 2002:
    ____ July
    ____ August
    ____ September
    ____ October
    ____ November

14. What did you do instead of boating on Lake Ontario or the St. Lawrence River (when LOW water level conditions prevented you from doing so)? (Check all that apply.)

____ boated on another waterway
____ chose another recreational activity
____ did something else with my time

15. Have you done anything or had anything done to adapt your boat, dock, or property for use during LOW water conditions on Lake Ontario or the St. Lawrence River?

____ No (GO TO Question 17)

____ Yes

16. What was the most recent adaptation that was made, and roughly how much did it cost?

Describe the adaptation: __________________________________________________________

Adaptation Cost: $_______

Year adaptation made: _________
17. Thinking back to last fall (2001) when water levels were lower than this year, were there any days when you wanted to go boating on Lake Ontario or the St. Lawrence River but couldn’t because of LOW water level conditions?

_____ No, because I did not boat in 2001
_____ No, I was not impacted by low water levels
_____ Yes → How many days did that happen to you in the following months of 2001: (Please write in “?” if it happened, but you can’t remember how many days.)

# of days
_____ August
_____ September
_____ October
_____ November

18. What, in your opinion, is the cause of fluctuating water levels on Lake Ontario and the St. Lawrence River?

_____ Mostly natural forces
_____ Mostly man-made factors
_____ Both natural and man-made factors
_____ Don’t know

19. Please indicate how strongly you agree or disagree with each of the following statements: (Circle one number for each statement.)

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Agree</th>
<th>Somewhat Agree</th>
<th>Somewhat Disagree</th>
<th>Strongly Disagree</th>
<th>Don’t Know</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Water level fluctuations are necessary for wetlands, wildlife and fisheries.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>b. Water level fluctuations create problems for boaters.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>c. The government manages lake levels to satisfy the needs of shipping.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>d. The government manages lake levels to satisfy the needs of hydro-electric power interests.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>e. The government manages lake levels to satisfy the needs of lake shore residents.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>9</td>
</tr>
<tr>
<td>f. The government manages lake levels to satisfy the needs of recreational boaters.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>9</td>
</tr>
</tbody>
</table>
20. What is your primary source of information about lake levels? *(Check only one)*

- personal experience
- government publications
- neighbors
- Extension or university publications
- newspapers, magazines, television
- web sites/internet
- other (please specify: ____________________________)

21. Would you be interested in additional information about water levels on Lake Ontario and the St. Lawrence River (e.g., water level forecasts, regulation changes)?

- No
- Yes ➔ What are the best ways to reach you with that information? *(Check all that apply.)*

- Newsletter / special mailing
- Local workshops / meetings
- Boater organizations
- Web site on the Internet
- Other (please specify: ____________________________)

The following information will help us categorize boating participation on Lake Ontario and the St. Lawrence River and predict future interest. All information is kept strictly confidential and is never associated with your name.

22. How many years have you boated Lake Ontario or the St. Lawrence River?

- # of years

23. Do you own a second home or seasonal cottage in any of the following counties that you use when you boat on Lake Ontario or the St. Lawrence River?

- Niagara
- Cayuga
- Orleans
- Oswego
- Monroe
- Jefferson
- Wayne
- St. Lawrence
24. In what year were you born?  19____

25. Are you male or female?  ______Male  ______Female

26. How many children under age 18 do you have living currently in your household?  (If none, please write in zero.)

__________  # of children

27. Please circle your approximate 2001 TOTAL HOUSEHOLD INCOME before taxes, in thousands of dollars:

Less than 20  20  25  30  35  40  45  50  55
60  65  70  75  80  85  90  95  100  110
120  130  140  150  More than 150

Please use the space below for any comments you wish to make.

THANK YOU FOR YOUR TIME AND EFFORT!

To return this questionnaire, simply seal it (postage has been provided) and drop it in the nearest mailbox.
APPENDIX B: WATER LEVEL – IMPACT RELATIONSHIPS
Figure B-1. Water level – impact relationship using total possible boating days lost by month for US Upper St. Lawrence River – Alex. Bay Reach boat launch ramp users.
Figure B-2. Water level – impact relationship using net economic values lost by month for US Upper St. Lawrence River – Alex. Bay Reach boat launch ramp users.
Figure B-3. Water level–impact relationship using total possible boating days lost by month for US Upper St. Lawrence River – Ogdensburg Reach boat launch ramp users.
Figure B-4. Water level – impact relationship using net economic values lost by month for US Upper St. Lawrence River – Ogdensburg Reach boat launch ramp users.
Figure B-5. Water level – impact relationship using total possible boating days lost by month for US Lake Ontario Reach private dock users.
Figure B-6. Water level – impact relationship using total possible boating days lost by month for US Upper St. Lawrence River – Ogdensburg Reach private dock users.
Figure B-7. Water level – impact relationship using net economic values lost by month for US Upper St. Lawrence River – Ogdensburg Reach private dock users.
Figure B-8. Water level – impact relationship using total possible boating days lost by month for US Lake Ontario Reach marina and yacht club users.
Figure B-9. Water level – impact relationship using total possible boating days lost by month for US Upper St. Lawrence River – Alex. Bay Reach marina and yacht club users.
Figure B-10. Water level – impact relationship using net economic values lost by month for US Upper St. Lawrence River – Alex. Bay Reach marina and yacht club users.
Figure B-11. Water level—impact relationship using total possible boating days lost by month for US Upper St. Lawrence River—Ogdensburg Reach marina and yacht club users.
Figure B-12. Water level – impact relationship using net economic values lost by month for US Upper St. Lawrence River – Ogdensburg Reach marina and yacht club users.
Figure B-13. Water level – impact relationship using total possible boating days lost by month for US Lake Ontario Reach charter boat operators.
Figure B-14. Water level – impact relationship using total possible boating days lost by month for US Upper St. Lawrence River – Alex. Bay Reach charter boat operators.
Figure B-15. Water level – impact relationship using net economic values lost by month for US Upper St. Lawrence River – Alex. Bay Reach charter boat operators.
Figure B-16. Water level – impact relationship using total possible boating days lost by month for all US Lake Ontario Reach users.
Figure B-17. Water level – impact relationship using total possible boating days lost by month for all US Upper St. Lawrence River – Alex. Bay Reach users.
Figure B-18. Water level – impact relationship using total possible boating days lost by month for all US Upper St. Lawrence River – Ogdensburg Reach users.
Figure B-19. Water level – impact relationship using total possible boating days lost by month for all Canadian Lake Ontario Reach users.
Figure B-20. Water level – impact relationship using total possible boating days lost by month for all Canadian Upper St. Lawrence River – Alex. Bay Reach users.
Figure B-21. Water level – impact relationship using total possible boating days lost by month for all Canadian Upper St. Lawrence River – Ogdensburg Reach users.
Figure B-22. Water level – impact relationship using total sum of values lost (local expenditures, net economic value, regional economic impacts) by month for all US and Canadian Lake Ontario Reach users.
Figure B-23. Water level – impact relationship using total sum of values lost (local expenditures, net economic value, regional economic impacts) by month for all US and Canadian Upper St. Lawrence River – Alex. Bay Reach users.
Figure B-24. Water level – impact relationship using total sum of values lost (local expenditures, net economic value, regional economic impacts) by month for all US and Canadian Upper St. Lawrence River – Ogdensburg Reach users.
Figure B-25. Water level – impact relationship using total sum of values lost (local expenditures, net economic value) by month for all Canadian Lower St. Lawrence River – Lake St. Louis Reach users.
Figure B-26. Water level – impact relationship using total sum of values lost (local expenditures, net economic value) by month for all Canadian Lower St. Lawrence River – Montreal Contrecoeur Reach users.
Figure B-27. Water level – impact relationship using total sum of values lost (local expenditures, net economic value) by month for all Canadian Lower St. Lawrence River – Lake St. Pierre Reach users.
### APPENDIX C. CRITICAL AREAS AND TIMES IDENTIFIED BY TOUR BOAT OPERATORS FOR WATER LEVEL PROBLEMS

#### Table C1
Critical areas and critical times of year identified by tour boat operators to be avoided because of water level problems

<table>
<thead>
<tr>
<th>Time of year</th>
<th>Area to avoid</th>
</tr>
</thead>
<tbody>
<tr>
<td>When levels are low</td>
<td>Around the Isles of Sorel-Berthier, near Lake St. Pierre, Lower River</td>
</tr>
<tr>
<td>April</td>
<td>Lake Ontario for lake Trout fishing areas and shallow shoals</td>
</tr>
<tr>
<td>April-May and September-October</td>
<td>Toronto Islands and areas in Western gap, Lake Ontario</td>
</tr>
<tr>
<td>May</td>
<td>Lower River, Lachine Rapids (wave called «big John»)</td>
</tr>
<tr>
<td>May and June</td>
<td>Hay Bay, Lake Ontario</td>
</tr>
<tr>
<td>June to August</td>
<td>Docks and fishing grounds in close, Lake Ontario</td>
</tr>
<tr>
<td>August to October</td>
<td>Near Heart Island, Lake Ontario</td>
</tr>
<tr>
<td>End of July to mid-September</td>
<td>Wellington Harbour, Upper St. Lawrence</td>
</tr>
<tr>
<td>July</td>
<td>Shoals and rocks in Upper River</td>
</tr>
<tr>
<td>July to October</td>
<td>Island Lagoons, Lake Ontario</td>
</tr>
<tr>
<td>August</td>
<td>Toronto Islands, Lake Ontario</td>
</tr>
<tr>
<td>August to October</td>
<td>Near Zavieon Island, Upper River</td>
</tr>
<tr>
<td>July and August</td>
<td>Port Darlington, Lake Ontario</td>
</tr>
<tr>
<td>August to October</td>
<td>Long Pond, Lake Ontario</td>
</tr>
<tr>
<td>September</td>
<td>Credit River, Lake Ontario</td>
</tr>
<tr>
<td>September</td>
<td>Channels at Toronto Islands, western access to Ontario Place</td>
</tr>
<tr>
<td>September to December</td>
<td>Oakville, Bronte and Cobourg ports, areas in Toronto Islands lagoons</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Area</th>
<th>Limiting causes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wellington, Lake Ontario</td>
<td>Water depth at docks, shallow water</td>
</tr>
<tr>
<td>Toronto Harbour, Lake Ontario</td>
<td>Water depth at docks, shallow water, high water, aquatic plants (lagoons)</td>
</tr>
<tr>
<td>Belleville/Hay Bay, Lake Ontario</td>
<td>Water depth at docks, shallow water, rocks and ledges</td>
</tr>
<tr>
<td>Kingston, Lake Ontario</td>
<td>Water depth at docks, shallow water, high water, rocks and ledges</td>
</tr>
<tr>
<td>Gananoque, Upper River</td>
<td>Shallow water</td>
</tr>
<tr>
<td>Bowmanville Creek, Lake Ontario</td>
<td>Shallow water</td>
</tr>
<tr>
<td>Bronte Harbour, Lake Ontario</td>
<td>Shallow water</td>
</tr>
<tr>
<td>Rockport, Upper River</td>
<td>Water depth at docks, shallow water</td>
</tr>
<tr>
<td>Lachine Rapids, Lower River</td>
<td>Water depth at docks, shallow water, high water, rocks and ledges, aquatic plants</td>
</tr>
<tr>
<td>Port of Montreal, Lower River</td>
<td>Water depth at docks, shallow water, rocks and ledges, dangerous currents</td>
</tr>
<tr>
<td>Boucherville, Lower River</td>
<td>Shallow water, aquatic plants</td>
</tr>
</tbody>
</table>

APPENDIX D: EXAMPLE OF A COMMUNICATIONS PLAN (provided by D. White)

Proposed Activities
International St. Lawrence River Board of Control Communications Plan

1. Educate stakeholders regarding actions of the ISLRBC and how those actions are developed and implemented;

2. Assist the ISLRBC in consulting with the public on the Board's activities and promoting a dialogue between the ISLRBC and stakeholder and among stakeholders regarding such activities across the Lake Ontario-St. Lawrence River Basin;

3. Increase stakeholder understanding of the ISLRBC’s mission and activities; and,

4. Assist the ISLRBC in effectively and efficiently communicating with its stakeholders.

These goals will be accomplished by:

a. Writing, publishing and distributing outreach education materials pertaining to ISLRBC outflow strategy, including relevant scientific background used to develop such strategy. This may include (but not necessarily be limited to) media releases, public presentations (electronic or projection slides), fact sheets, brochures and other publications;

b. Maintaining stakeholder and media contact lists appropriate to ISLRBC public information and outreach efforts.

c. Assisting the ISLRBC with scheduling public information/education outreach activities, including logistical support, publicity, and implementation;

d. Evaluating ISLRBC outreach programs and stakeholder participation efforts and recommending new strategies to increase the effectiveness of such programs;

e. Identifying opportunities for the ISLRBC to increase its outreach to stakeholders, including identification of undeserved stakeholders and developing activities to better reach those stakeholders; and,

f. Prepare reports to the ISLRBC on the public outreach education activities undertaken and materials prepared at timely intervals during the contract period.