Ripple Effects

Volume 9, July 2004

Contents

Dear Friend of Lake Ontario and the St. Lawrence River,

Our summer meetings begin soon! The locations are set and we look forward to seeing you. It is important for you to share your views with us this summer so that your ideas can be worked into our decision-making process. Ultimately, your concerns will be reflected in the recommendations that the Study Board will make to the International Joint Commission in 2005.

Our meeting schedule, along with the locations and times, is listed on the back page for you to tear out and post. Each meeting room will be open from 6 p.m. to 7 p.m. for a poster session. Our presentation will begin at 7 p.m.; followed by a question and answer session. Please mark your calendar with the date of the meeting nearest you. Feel free to contact the communications representative from your country to receive additional copies of this schedule for posting in your area.

We hope to see you this summer!

Sincerely,

Dan Barletta, D.D.S.
U.S. Lead
Public Interest Advisory Group

Marcel Lussier
Canadian Lead
Public Interest Advisory Group

*The International Lake Ontario-St. Lawrence River Study was set in motion in December 2000 by the International Joint Commission to assess and evaluate the Commission's Order of Approval used to regulate outflows from Lake Ontario through the St. Lawrence River. The Study is evaluating the impacts of changing water levels on shoreline communities, domestic and industrial water uses, commercial navigation, hydropower production, the environment, and recreational boating and tourism. The Study will also take into account the forecasted effects of climate change. The Public Interest Advisory Group is a volunteer group appointed by the International Joint Commission to ensure effective communication between the public and the International Lake Ontario-St. Lawrence River Study Team. This newsletter is published by the Public Interest Advisory Group to help keep you informed about the Study.

St. Lawrence River Institute of Environmental Sciences Conference

Compiled by Arleen Kreusch and Michelle Tracy, Study Staff, from abstracts provided for the Conference

On May 18, 19, and 20, 2004, the St. Lawrence River Institute of Environmental Sciences in Cornwall, Ontario, hosted the 11th Annual International Conference titled "Managing our Waters: Great Lakes/St. Lawrence River Ecosystem." Over twenty of the topics discussed at this conference were regarding the science behind our Study. Some of these topics are highlighted in this article.

Environmental

Wetland Habitats

Scientists from Environment Canada, St. Lawrence Centre, presented papers on two models that they created to predict impacts of water-level changes on wetland plants and submerged plants. For the first model, they sampled sites of wet meadows, shallow marshes, floating leaves and underwater plants. With this model, they were able to determine that high-level years favored shallow marsh and underwater plant habitats, while low-level years caused high marshes to emerge. These changes alter quantity and quality of food for the animals living in the marshes.

For the second model, they looked at factors such as water temperature, color, turbidity, and light penetration on wetland habitats. They were able to show that from 1960-2002, Lake St. Pierre had alternated between a lake and a marsh, making it highly sensitive to water-level regulation and to low levels expected under climate change scenarios.

Christiane Hudon, Pierre Gagnon, Jean-Pierre Amyot, Guy Létourneau, Martin Jean, Céline Plante, Daniel Rioux, Chantal Vis and Martin Deschênes, St. Lawrence Centre, Environment Canada

Jean Morin, working on both the Hydrology and Hydraulics TWG and the Environmental TWG, presented a paper, along with other scientists, on modeling wetland vegetation of the St. Lawrence River floodplain.

Wetland Birds

Wetlands associated with Lake Ontario and the St. Lawrence River shoreline play a vital role in the life cycle of complex plant, fish and wildlife communities. Many of these wildlife species are birds that depend on wetland habitat diversity for breeding and migration. The most important ecological process in maintaining this diversity of wetland habitats and the communities they support are seasonal and annual variations in water levels and flows. Variations in levels and flows due to regulation or climate change can result in changes in the wetland habitats. In turn, this could have significant repercussions on many bird populations frequenting freshwater wetlands along Lake Ontario and the St. Lawrence River, particularly during the breeding season.

Black terns use wetlands for their nesting grounds.

Photo - John Mitchell

Wetland breeding bird abundance, richness and reproductive success evaluation criteria are being developed as environmental performance indicators due to their direct and quantitative association with wetland plant community abundance, diversity, and water levels. More specifically, the Environment TWG has developed models that will provide estimates of habitat suitability and reproductive success for a selected list of wetland bird species. The bird models that incorporate annual estimates of wetland plant community abundance, mean water levels and magnitude of water-level changes during the spring breeding season, will allow the Environmental TWG to assess potential changes in wetland breeding bird communities.

The great blue heron, a wetland bird.

Photo - Dana L. Darrow

The bird models and performance indicators make up one part of the computer model being developed by the Environmental TWG. The group will use the model to compare different regulation plans and develop environmental water-level regulation criteria for consideration in the Study.

Jean-Luc DesGranges, Bruno Drolet, Caroline Savage, Canadian Wildlife Service, Quebec Region; Joel Ingram, Canadian Wildlife Service, Ontario Region; Jean Morin, Meteorological Service of Canada; Daniel Borcard, Département de sciences biologiques, Université de Montréal.

Domestic, Industrial, and Municipal Water Uses

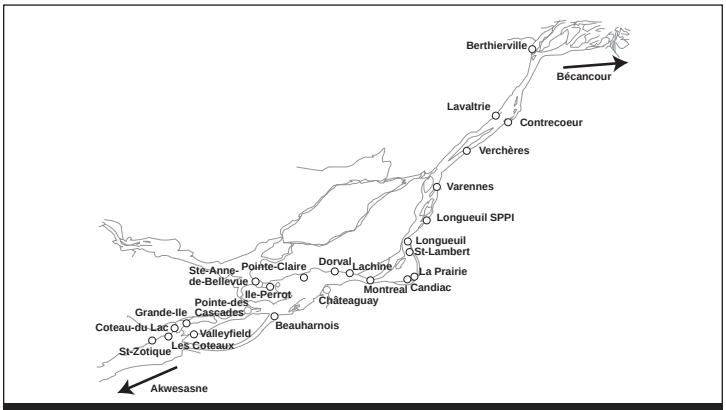
A team at École Polytechnique de Montréal, working for the Domestic, Industrial and Municipal Water Uses Technical Work Group (TWG), evaluated the impacts of water levels on water treatment plants (both wastewater and drinking water utilities) in the Lower St. Lawrence River, from the Ontario border down to Trois-Rivières.

The team visited and surveyed thirty drinking water treatment plants in the study zone. This survey highlighted the potentially vulnerable situation of several plants in the Quebec portion of the St. Lawrence River. In light of this,

the team analyzed the information in order to determine:

- the critical water levels for the proper operation of drinking water treatment plants;
- the potential sources of a decrease in water quality related to water levels; and
- the potential adverse impacts of water levels on wastewater treatment plants.

Low water levels can cause more problems for drinking water treatment plants than high water levels. The capacity of a water intake depends not only on the depth of water above the intake, but also on the shape and size of the intake (pipe diameter, length, etc.). The team defined the critical level of operation for a plant as the level at which it can no longer supply the maximum allowable capacity it was designed for. The team compared water levels for each plant in order to identify the most vulnerable utilities.



Water use sites on the lower St. Lawrence River.

Annie Carrière

The calculations of critical levels highlighted that several plants are vulnerable to lower water levels in the study area. For a water level of 20.35 meters (66.77 feet) in Pointe-Claire, four treatment plants would reach their critical level and could run into problems. Among the four most affected plants are the Montreal Atwater and DesBaillets plants. These plants represent more than 64 percent of the population of the lower St. Lawrence River study area. The consequences of reaching the critical water levels differ among the plants and span from a total loss of service to a partial loss of production.

Among the other impacts of lower water levels are increased pumping costs. For the entire study area, a decline of one meter in water levels (from the average level) was estimated to increase pumping costs by approximately $160,000 per year.

The team approached the water quality issues related to water levels by evaluating the increase in treatment costs and by evaluating the costs of upgrading water treatment plants in order to address more frequent and severe taste and odor problems (which were observed under low level conditions). First, the Ottawa River was proven to have an impact on water quality at the Montreal intake, especially in springtime. The opening of the emergency intake (necessary under low water conditions) was also shown to influence water quality through the demonstration of increased chemical costs. For the Atwater treatment plant, the team demonstrated that the additional chlorine dosage required to treat lower quality waters induced an increase in annual treatment cost of $73,000 (Canadian).

The total annual cost of upgrading the 14 treatment plants not presently equipped to treat taste and odor depends on the technology selected. Overall, the total annual costs would be favorable to the use of ozone over powder activated carbon ($3.7 versus $4.1 million Canadian) but the costs remain very important.

High water levels can cause more problems for wastewater treatment plants, as such conditions can limit their discharge capacity. The team performed a survey, but the information suggests that this situation does not represent a major issue, as only two utilities provided the team with a critical high water level.

Annie Carrière, Research Associate
Polytechnique de Montréal, Montréal, QC

Information Management

Information Management Strategy

An information management system is needed to help people find information quickly and provide tools for assessing the quality of the information. In this way, good information management helps people assess economic and ecological impacts of water control through the system. The Study's information management strategy has three key components:

- data finding tools;
- data storage and maintenance; and
- web mapping capabilities (see summary below).

As a starting point, the project team is focusing on geospatial "framework data" layers, often used in geographic information systems.[1] These layers include shoreline, political units, transportation features, watersheds, charts of flows and levels, conservation management areas, satellite pictures and elevation data. This system is scalable with respect to new participants, data types, geographies, and data uses. The Information Management strategy also aims to document and make widely available all procedures, policies and lessons learned by the Study.

Roger Gauthier, U. S. Army Corps of Engineers, Detroit District; Great Lakes Commission; and U. S. Co-Lead, Information Management Technical Work Group

Web Mapping

Our Study has become a focus of state, provincial and federal agencies and other organizations interested in integrated watershed management. As a result, the Information Management TWG is constructing a comprehensive web portal that will contain all available information related to habitat restoration, floodplain management, navigation, water levels, shoreline erosion and sedimentation, and future land use on the basin. This portal will focus on four main components:

- a document management system containing reports, documents, and other data products;
- web mapping, simulation and visualization tools;
- a user interface; and
- a processing system that allows users to transfer information among all the components.

The document management system will rely upon the development of a database, which will be continually updated. The functionality will give the user increased search capabilities, such as querying by keyword, geographic coordinates, or subject theme. New technologies allow information to be stored, maintained and updated at a series of networked locales, with distributed web services providing near-instantaneous access. The Study

[1] A computer system that shows data in a visual way for geographic locations.

web portal is vital to storing the volume of data and information generated from the Study and will provide the ability for mapped features to be instantaneously linked across national, state and provincial divides.

Kevin Yam, Great Lakes Commission

Hydrology and Hydraulics

Modeling of the St. Lawrence River

The Boundary Water Issues Division of Environment Canada, working for the Hydrologic and Hydraulic Technical Work Group, developed a model of the St. Lawrence River system from Lake Ontario at Kingston/Cape Vincent areas to the dam at Cornwall/Massena. To build the model, bathymetry (data describing the water depth) was obtained from the Department of Fishery and Ocean's Canadian Hydrographic Service (CHS). Water level and flow measurements from the Water Survey of Canada, the U. S. Army Corps of Engineers, and CHS were used to calibrate the model. This model, which determines detailed levels, velocities, and flows in the upper St. Lawrence River from Kingston to Cornwall Ontario, will help the technical work groups evaluate suggested regulation plans.

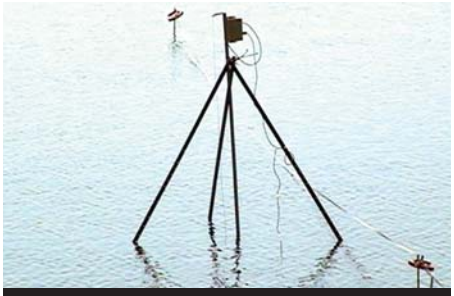
Aaron F. Thompson, Boundary Water Issues Division, MSC-Ontario, Environment Canada

Coastal Processes

Can you see the tripod in the foreground?

Photo - Pacific International Engineering

The Coastal Processes Technical Work Group is looking at erosion and flooding processes all around the Lake and River, including along the St. Lawrence downstream from the Moses-Saunders Power Dam. The lower portion of the St. Lawrence is characterized by erodible marine clay banks interspersed with sheltered wetlands. The study of the evolution of the clay shores of the River, along with the computer modeling tools are providing the Coastal Processes TWG with new insights into the processes that affect and control the erosion of combined marine clays. Data from the shore is helping the TWG to understand flood damages in economic terms. Field



This instrument was used to measure waves caused by ship wakes.

Photo - Pacific International Engineering

Notice the wave action created by the ship wake on the shoreline.

Photo - Pacific International Engineering

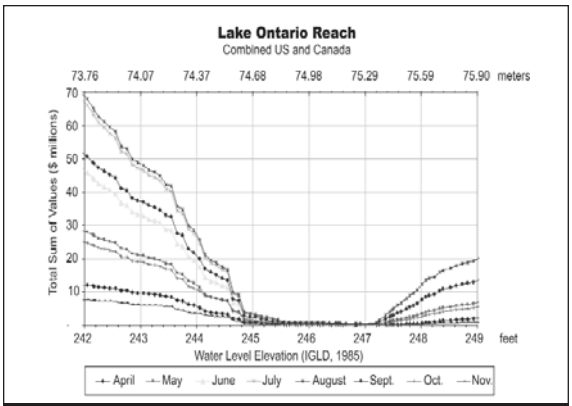
observations and models showing ship waves have helped the TWG develop an erosion model to predict the response of river banks to the combined effects of river flow, wind waves, and ship waves.

M. H. Davies and N. J. MacDonald, Pacific International Engineering Corporation

Recreational Boating and Tourism

The Recreational Boating and Tourism Technical Work Group discussed the stage damage curves developed for each geographic area showing the relationship between water levels and impacts to recreational boating and tourism. The Group discussed the procedures they used to develop these curves and presented their suggested regulation criteria. The chart below is a water-level-impact curve for Lake Ontario. The values represent combined damages to U. S. and Canadian recreational boaters and related tourism for a range of water levels. Loss of boater days and dollar-damage impacts to boaters due to water-level variations are examples of the Group's performance indicators. The Group used these indicators to develop proposed criteria for minimum and maximum levels preferred by recreational boaters during the boating season for each geographic area.

Jean-François Bibeault, St. Lawrence Centre, Environment Canada; Nancy Connelly, Cornell University; and David White, New York Sea Grant



Minimum (245 feet or 74.68 meters) and maximum (247 feet or 75.29 meters) recommended levels in the draft criteria developed by the Recreational Boating and Tourism Group.

Hydroelectric Power

Members of the Study Team toured the R. H. Saunders Dam during the St. Lawrence River Ecosystems conference in Cornwall, Ontario.

Photo - Arleen Kreusch

Hydroelectric Power Technical Work Group members provided general descriptions of the Beauharnois-Les Cèdres Complex and the Moses-Saunders Power Generation System on the St. Lawrence River, including their main operation constraints and specific operation methods, such as ice control. They also discussed the main impacts of the regulation plan on power generation.

S. Robert, Hydro-Québec and C. Levean, New York Power Authority

Commercial Navigation

The Commercial Navigation Technical Work Group developed a computer model to evaluate the economic impacts of water levels and flows on commercial shipping under proposed water-level regulation plans. This model takes various performance indicators and converts them into formulae that calculate the costs and impacts of various water-level schemes.

Luc Lefebvre, Chief, Operational Services; Canadian Co-Lead, Commercial Navigation Technical Work Group

Recreational Boater Survey Results

The Recreational Boating and Tourism Technical Work Group gathered information from marina owners and operators in Canada and the United States during the first and second years of the Study. During the second and third years of the Study, information was also gathered from recreational boaters. The methods used and the results gathered from the recreational boater surveys are summarized below.

U. S. Results

Nancy Connelly, Cornell University

From a list of boaters registered in New York State in 2002, 94,747 indicated that they used their boats primarily in a county bordering Lake Ontario or the St. Lawrence River. The survey group sent letters to 10,382 of those boat owners indicating that they would be contacted for an additional telephone screening. Of the 3,553 boaters interviewed on the telephone that said they boated on Lake Ontario or the St. Lawrence River in 2002, 3,412 were sent mail-in questionnaires; 2,388 of those questionnaires were completed and returned.

Low water levels restrict access to docking facilities.

Photo - Arleen Kreusch

From the telephone information gathered, the group estimated the number of boats on the Lake or River in 2002 was 45,800. Of these, 41 percent of boats (18,900 boats) accessed the Lake or River from boat launch ramps. Slightly over one third (36 percent or 16,400 boats) used private docks; the remaining 23 percent (10,500 boats) gained access via marinas or yacht clubs.

Boaters using Lake Ontario and the St. Lawrence River boated an estimated 1.3 million days or an average of 28.4 days per boat on these waters in 2002. Boaters spent an average of $137 (U.S.) per day in New York State counties bordering Lake Ontario and the St. Lawrence River in 2002. They spent an additional $18.50 per day in areas outside the New York State bordering counties. Boaters spent an estimated $178 million in New York State bordering counties in 2002. They spent an additional $24 million in areas outside the bordering counties.

Canadian Results

J. F. Bibeault, St. Lawrence Centre, Environment Canada

The Recreational Boating and Tourism Technical Work Group wanted to perform a survey in Canada similar to United States survey; however, the federal boat license database was not updated and sufficiently valid for surveying. For this reason, another two-staged approach was followed. First, a general population survey was conducted in order to identify potential respondents for a more extended mail survey. After excluding those who didn't boat in 2002, or those who used another watershed, the proportion of boat owners by geographic area was established as follows: 3.2 percent for Lake Ontario (42,300), 9.9 percent for the Upper River (19,400) and 0.9 percent for the Lower River (9,400). A random sample of households was selected and called from the boat owners considered.

In order to have more cost-effective and valid information, the Group selected a sub-group of respondents, representing all the geographic areas of the Study, from the Canadian Power and Sail Squadron. Most of the detailed data comes from this particular mailing survey, for which the response rate was 30 percent (2,604 questionnaires sent). Respondents indicated that the Lower River was their main access point (55.7 percent), followed by the Upper River (27.8 percent) and the Lake (27.4 percent). Approximately 9 percent did have access through a New York State access point and another 0.2 percent indicated an access point outside the areas considered.

The general and detailed (mail) surveys did not permit separation of the main access point boat owners were using. In fact, most of them were using marina and yacht club access points. Boat-launch-ramp users were estimated based on total boat owners in the area, less those who can use marinas and private docks located in the areas. A specific check was made for the Upper River near Gananoque. The proportion of boat-launch-ramp users was estimated at 47 percent for the Lower River, 74.4 percent for the Upper River and 62.7 percent for Lake Ontario.

In general, 76 percent of boat owners in the Lake area, 88 percent in the Upper River and 93 percent in the Lower River have boats that are less than 25 feet long. On average, the group estimated 47 boating days, totaling, on a yearly basis, 2,836,050 days for all three geographic areas considered.

Between 55 and 60 percent of boat owners do short trips (one- or two-day trips). The others do 10 to 20 day or 20 to 30 day trips. For them, July and August are the typical peak boating months, followed by June, September, May and October.

The Group established daily expenses in Canadian dollars at $101/day (Lake) and $125/day (Lower River). Added to these numbers is the boat owners' willingness to pay (WTP) in order to maintain their activity. The adjusted WTP is between $153 and $188/day depending on the area considered. In addition to daily expenses and WTP, boat owners do spend an additional $3,330/year on such things as insurance, and boat improvement and repairs.

Water level-impact relationships were calculated based on the information the surveys provided. The Recreational Boating and Tourism Technical Work Group is well on its way to having a useful watershed database that will be entered into the Shared Vision Model and used to compare and evaluate regulation plans for the Study Board.

Performance Indicator Suggestions and Responses

Arleen Kreusch and Michelle Tracy, Study Staff, based on responses from the Technical Work Groups

Our Study aims to look at how Lake Ontario and the St. Lawrence River function as a continuum. Overall, the greatest asset of the Study is the fact that scientists, managers and user groups are looking at the system collectively. This represents a step in a holistic approach that should lead to better management of the system.

As part of this approach, the Study Board is developing performance indicators to evaluate the economic, social and environmental health of the system. Performance indicators will help the managers make decisions about different water regulation plans. In the summer and fall of 2003, we actively sought input regarding our draft performance indicators through a survey that was distributed at the PIAG's summer meetings, through a mail-back piece in Ripple Effects, Volume 6, and through the Study website at **www.losl.org**.

Thank you to those of you who submitted suggestions for performance indicators: overall we received 76 suggestions! This article provides you with a brief description of the suggestions we received and the responses from the Technical Work Groups.

Coastal Processes

The Coastal Processes Technical Work Group received 17 suggestions. Many of the performance indicators you submitted to the group expressed concern regarding loss of land. The impacts of water-level regulation plans on shore property owners are the focus of several performance indicators. Where possible, we are developing performance indicators in economic terms.

Most riparians construct shore protection rather than risk the loss of their land or buildings due to erosion. We have developed two performance indicators that recognize the economic loss due to erosion and the typical response of constructing shore protection. One performance indicator considers the impact that different rates of erosion will have on the need for property owners to build shore protection. This indicator is based on the premise that a faster rate of erosion will necessitate the construction of shore protection sooner than if the erosion rate is slower. The cost of shore protection for unprotected threatened properties is included in this erosion performance indicator.

Another performance indicator considers the potential need of property owners to modify existing shore protection if higher water levels make it possible for bigger waves to reach the shore. This indicator considers the impact that higher water levels have on wave damage to shore protection and on the design requirements of shore protection. For the performance indicator dealing with existing shoreline protection structures, we considered the cost of upgrading existing protection, if required, as a result of higher lake levels due to a new regulation plan. The flood and erosion evaluation techniques developed for this Study recognize the importance of wind-generated forces as well as water level fluctuations and incorporate these factors.

The blue flags were used as water level indicators during the beach user survey performed by the Coastal Processes Group.

Photo - Baird & Associates

You also submitted performance indicators that showed a concern for loss of beaches. Water levels are one of many factors in the rate of erosion and the presence of beaches. We recognize that water levels affect beach width and riparian access to the shore, but this is very difficult to quantify in economic terms on an individual basis. However, we developed a beach access performance indicator for public beaches based on user surveys in 2003 at two popular Lake Ontario swimming beaches. The results of this work show a link between each width and park attendance.

Commercial Navigation

You submitted one concern about the possible link between shipping in Montreal and lower Lake levels. The Commercial Navigation Technical Work Group explained that vessels coming from overseas to Montreal are loaded based on forecasted water levels (usually a two-week forecast). Three to four times a year, a vessel will arrive loaded such that water levels do not permit safe transit of the vessel, even though it had loaded according to the forecasted level. In such a case, the International St. Lawrence River Board of Control's Operational Advisory Group is requested to provide additional water for a 24 to 36 hour window to accommodate the vessel. These deviations are tracked, and this information is available from the International St. Lawrence River Board of Control.

Domestic, Industrial, and Municipal Water Uses

Some of the performance indicator suggestions that we received from you were outside the mandate of the Study. Although we can appreciate your concerns about urban runoff and the addition of petrochemicals to the ecosystem by storm water flows, the purpose of the Study is to evaluate the impacts of water-level regulation plans. Contaminated storm water runoff is caused by land use practices and not affected by lake levels. We expect the quality of urban runoff to remain the same regardless of which water-level regulation plan is in effect.

Environmental

This group received the largest amount of suggestions (27) with a variety of concerns. Where possible, the Environmental Technical Work Group will try to link their performance indicators to the geographic regions of the Study. They have broken down their responses into the following categories: waterfowl and migratory birds, wetland habitats, fish, macro-invertebrates, herpetiles, water quality and invasive exotic species.

Waterfowl and Migratory Birds

Lake Ontario and St. Lawrence River wetland bird abundance and diversity are greatly influenced by Lake and River hydrology. As a result, we gave priority to bird use of the Lake Ontario and St. Lawrence River near shore environment. We are developing wetland breeding bird abundance and diversity indicators as environmental performance indicators due to their direct link with wetland emergent plant community abundance and diversity (another environmental performance indicator).

Lake Ontario and the St. Lawrence River also support large numbers of migratory birds during the spring and fall. While migratory birds are influenced by wetland plants and seasonal water-level fluctuations, several other variables such as zebra mussels, changes in water clarity, agriculture waste, and ice-free periods also affect them. This is especially the case for the diving duck guilds of migratory waterfowl. The interactions and influences of the many environmental and human-related variables on migratory waterfowl abundance and diversity currently prevent us from developing specific migratory bird performance indicators.

We have developed two performance indicators in order to assure that waterfowl will have access to sufficient staging grounds and breeding sites within the lower St. Lawrence River. The first performance indicator on migration will favor water levels that maintain minimum flooded plains within the Lake St. Pierre area, one of the most important flooded plains of the whole lower St. Lawrence River, and one of the most heavily used staging grounds during the spring migration (up to 600,000 birds at the peak of the migration).

During the fall migration, numbers of waterfowl decrease significantly to about 50,000 birds, mostly composed of diving ducks (scaups and goldeneyes). Birds then mostly gather on Lakes St. Pierre and St. Louis. During years when water levels are low, the non-managed flooded marshes and farmlands are almost completely deserted. Because of the importance of Lake St. Pierre flooded plains during the spring migration, we will strongly recommend to maintain high water levels during the most intensive period of the migration (mid April until the first week of May), to preserve the integrity of the area and be sure that birds will have access to quality feeding sites.

The second performance indicator will favor water-level regulation plans that prevent nest flooding during the nesting season. Significant increases in water levels [more than 20 cm (7.87 inches)] during the critical periods of the nesting season (mid May until the beginning of July) could have detrimental effects on the breeding population of dabblers, substantially decreasing their productivity.

Wetland Habitats

Fluctuating water levels play a role in the maintenance of habitats and biodiversity. This has been a core concept in the workings of the Environmental Technical Work Group. Most of the animal-life indicators revolve around the potential responses of different types of wetlands (barrier beaches, open embayments, protected embayments, and drowned river mouths) to the water-level scenarios being considered.

Least bitterns are an indicator of habitat diversity.

Photo Christiane Hudon

Wetlands in many regions, including Lake Ontario, are subject to highly variable water levels within a growing season and longer-term 'wet-dry' hydrologic cycles of several years. Although 'varying stability' is critical to the maintenance of all wetland habitats, including Lake Ontario coastal wetlands, this should not preclude us using species or communities that prefer more stable water conditions as performance indicators.

Northern Pike make a viable indicator because they require habitats with fluctuating water levels for spawning. They are also a key predator and fishery resource. Muskrats are an important indicator as well, because water-level management dramatically affects their life cycles. Muskrats are also important, as they affect wetland plant populations: cattails are one of their main food sources, and there is a remarkable abundance of cattails growing on Lake Ontario and Upper River shorelines.

Fish

The long-term changes in the fish community of the St. Lawrence River are currently used as a performance indicator. The analysis is based on records of fish abundance and diversity made at the experimental trap fishery operated by the Aquarium of Quebec. The continuous time series of data (since 1975), which includes information on 40 fish species, has allowed the development of relationships between long-term water-level fluctuations and fish abundance for the lower part of the River. Other long-term data series for specific species exist for the upper St. Lawrence River and some Lake Ontario sectors and these will be examined; however, we do not have the proper fish community data to assess the fish biodiversity response in Lake Ontario.

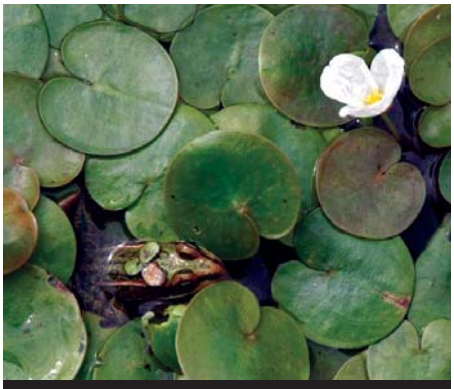
As part of the Plan of Study, the relationship between water-level fluctuations and migratory behavior of a variety of fish species has been examined and analyzed for the fish community of the lower St. Lawrence River. We found that several fish species (more than 25) including walleye, lake whitefish, perch, catfish, and sauger among others showed large-scale migratory behavior within the St. Lawrence River. We also found that the seasonal timing of this migratory behavior depended on fluctuations in water levels. We plan to use some of these relationships as performance indicators.

We are calculating habitat supply, including wetland area, for several guilds of fish that would include some migratory species for different life stages (including fry) of each of the representative guilds in Lake Ontario and the Upper St. Lawrence River. It is not possible for us to look at total densities of all the fish community. We are looking at all near-shore habitat and not just wetlands. We are incorporating the survival of eggs and stranding into four fish population models for the Lake and upper River.

Macro-Invertebrates: (crayfish, mussels, aquatic snails, aquatic worms, and the larvae of aquatic insects)

Fluctuations in water flows and levels can affect macro-invertebrates. Given the great diversity of species in that group (as well as in other major biological groups, such as insects and algae), the Environment TWG developed a habitat approach favoring the protection of key habitats being most sensitive to water level fluctuations. We are looking at key habitats of wetland plants, fish, amphibians and reptiles. By developing habitat protection criteria for plants and animals at the bottom and the top of the food chain, we will ensure that those in the middle (such as macro-invertebrates) will also be protected.

Herpetiles: (frogs, tree frogs, snapping turtles)



Leopard frog on European frog bit (an invasive alien species).

Photo Christiane Hudon

It is possible to find 16 species of reptiles and 21 species of amphibians in the lower St. Lawrence River. Most of these are characterized by small numbers, and many species are rare. The major causes of the decline of herpetiles are habitat artificialization and fragmentation, disturbance, contamination and diseases. Unfortunately, we have very little information on population trends or diversity of herpetiles in the St. Lawrence River. The only existing monitoring program is for frog species' calls. All observations are recorded using abundance codes as follows:

- no frogs or toads seen or heard;
- frog(s) or toad(s) seen but not heard;
- individuals can be counted, calls not overlapping;
- some individuals can be counted, other calls overlapping; and
- full chorus, calls continuous and overlapping, individuals not distinguishable.

This survey occurred from April to June 2004. A master's degree student will analyze the data over the next year.

Water Quality

We are aware of your concerns about water quality - particularly about algae problems - but a specific study has not yet been conducted to look at relationships between water quality and water level regulation. In addition, we believe that the relationship between algae proliferation and water level regulation is secondary relative to other influences such as agricultural nutrient pollution and climate change. In the lower St. Lawrence River, years of low-level conditions are coinciding with warmer, clearer, less turbid, less colored waters, all factors that favor underwater plant growth. These interactions have been described in a performance indicator that allows us to determine the biomass of underwater plants in response to different water-level conditions. We are also looking at temperature in Lake Ontario and the upper St. Lawrence.

Dense algae growth can create problems for recreational boaters.

Photo Christiane Hudon

Exotic Invasive Species

The introduction of exotic species represents an important stress to the integrity of any aquatic ecosystem. Invasive species are considered a growing threat to the future of Great Lakes resources. Two current performance indicators include exotic invasive species in the St. Lawrence River: reed-grass and zebra mussels, which are both considered major invaders of the River and which are very sensitive to water level and flow alterations. In these two cases a low water regime would favor the spread and establishment of these two exotic species. While we also recognize the impact of invasive species on the fish community, it is not within the scope of the Study for us to assess the impacts of invasive fish species, because their interactions with water-level regulation are unknown. We also prefer considering the effects on important
wetland and near-shore habitats that are more directly related to water level management. An adaptive management approach would assist us in monitoring changes in the ecosystem following a change in water level management policy. Enhanced monitoring may shed light on the effects of invasive species on the system and the role of water levels.

Étude internationale sur le lac Ontario et le fleuve Saint-Laurent
International Lake Ontario - St. Lawrence River Study

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Hydroelectric Power

Both of the suggestions we received for this group talked about replacement power. The Hydroelectric Power Group provided this response: "The source of any replacement power in the U.S. and Canadian electric grids is a function of many factors, including cost, fuel characteristics, environmental compliance requirements, etc. Hydropower generated on the St. Lawrence system is highly reliable, and has base-load characteristics. The fossil fuel of choice for new development in many areas is natural gas, because of its environmental performance. New nuclear generation is not being pursued anywhere in the region. Ontario, Quebec, and New York are all investigating measures to provide incentives for the addition of new renewable generation sources (such as wind and solar) within their jurisdictions. These resources, however, do not have the reliability and cost performance characteristics of hydropower."

One of the suggestions we received mentioned the value of peaking and ponding. Peaking capability of Ontario Power Generation and New York Power Authority facilities has been authorized by the IJC since 1960. Quebec Hydro does not peak. Peaking capability was an important component of the response to the August 2003 blackout. Additionally, peaking provides the ability to produce more power during the high demand hours of the day and to reduce production during the low demand hours.

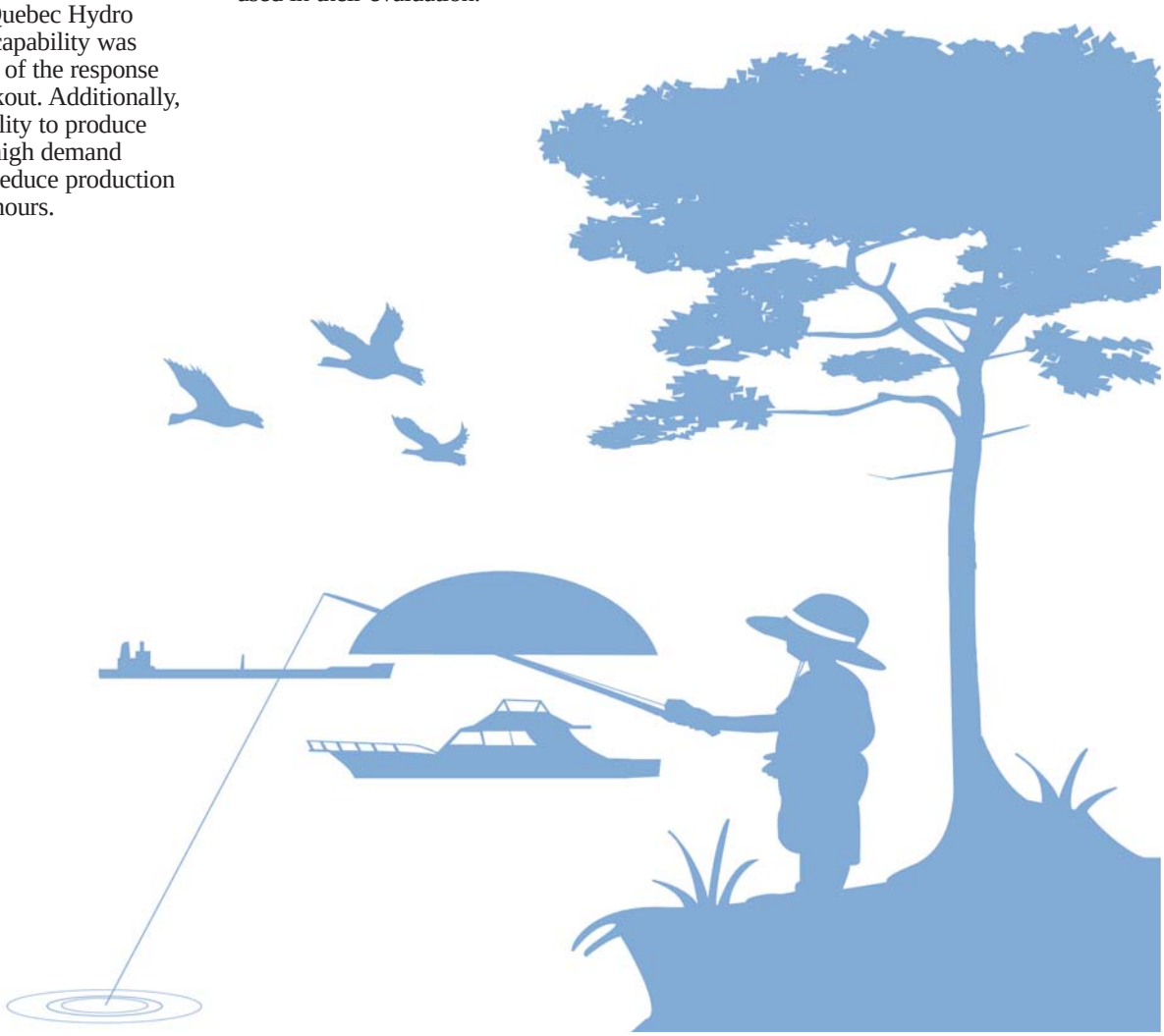
Recreational Boating and Tourism

We have thoroughly examined the recreational boating needs of the general boating community. All boaters utilizing Lake Ontario or the St. Lawrence River have been represented in the analysis. The 15 performance indicator suggestions received for this group expressed concern regarding the length of the boating season, the socio-economic benefits of boating, keel depths and the cost of repairing boats due to varying water levels. We evaluated recreational boating impacts based on boaters' daily expenditures and their willingness to pay beyond those expenditures along with the indirect impact on the local economy.

The effect of Lake levels on haul-out is of particular concern to you and is a primary focus of lake level criteria determination. Based on the input we received from this group's marina surveys and its recreational boater surveys, we have submitted criteria for the range of acceptable levels from mid-April through mid-October along with performance indicators, in the form of water-level damage curves, to the Plan Formulation and Evaluation Group to be used in their evaluation.

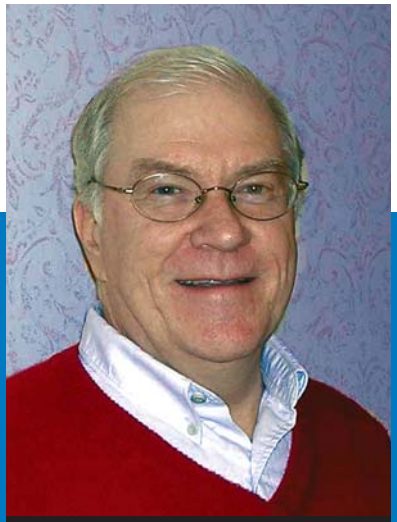
Thank you again for all of your performance indicator suggestions!

The input from all of you helped the Study make a better assessment of the various interests that are prevalent around Lake Ontario and the St. Lawrence River.



Henry Stewart, Public Interest Advisory Group, Rochester, New York

Photo - Arleen Kreusch



John Hall, Public Interest Advisory Group, Burlington, Ontario.

Photo - Arleen Kreusch

PIAG Speakers Bureau

The Public Interest Advisory Group membership would like to meet with you. A representative in your area can give a presentation about the Study to your group, no matter the size. Please contact the communications staff listed at the end of this newsletter to request a presentation.

United States

Dan Barletta, D.D.S. - Rochester, NY
Paul Finnegan - Albany, NY
Thomas McAuslan - Oswego, NY
Tony McKenna - West Amherst, NY
Jon Montan - Canton, NY
Henry Stewart - Rochester, NY
Max Streibel - Rochester, NY
Paul Thiebeau - Clayton, NY
Scott Tripoli - Mannsville, NY
Stephanie Weiss - Clayton, NY

Canada

Marcel Lussier - Montréal, QC
Larry Field - Toronto, ON
Michel Gagné - Montréal, QC
John Hall - Burlington, ON
Marc Hudon - Trois-Rivières, QC
Elaine Kennedy - Cornwall, ON
Anjuna Langevin - Rimouski, QC
Sandra Lawn - Prescott, ON
Paul Webb - Brockville, ON
Al Will - Hamilton, ON

Stephanie Weiss, Public Interest Advisory Group, Clayton, New York

Photo - Arleen Kreusch

Summer Meeting Schedule

Please mark the date of the meeting nearest you on your calendar and post this notice in your area! There will be a poster session open house beginning at 6 p.m. before each meeting. Our presentation will begin at 7 p.m.; followed by a question and answer session.

Thursday, August 12, 7 p.m.
Akwesasne Mohawk School
School Road
Cornwall Island

Wednesday, August 18, 7 p.m.
Quality Inn
10 West Orvis Street
Massena, NY 13662

Thursday, August 19, 7 p.m.
River Edge Resort Hotel
17 Holland Street
Alexandria Bay, NY 13607

Wednesday, September 1, 7 p.m.
Henderson Community Hall
8939 State Route 178
Henderson, NY 13650

Thursday, September 2, 7 p.m.
Hewitt Union Ballroom
SUNY Oswego Campus
State Route 104
Oswego, NY 13126

Wednesday, September 15, 7 p.m.
Cutter's Restaurant
6483 Catchpole Shore Road
North Rose, NY 14516

Thursday, September 16, 7 p.m.
Greece Town Hall
1 Vince Tofany Boulevard
Greece, NY 14216

Friday, September 17, 7 p.m.
Olcott Fire Hall
1691 Lockport-Olcott Road
Olcott, NY 14126

Wednesday, August 18, 7 p.m.
Beacon Harbourside Best Western
2793 Jordan Boulevard
Jordan, Ontario L0R 1S0

Thursday, August 19, 7 p.m.
The National Yacht Club
1 Stadium Road
Toronto, Ontario M5V 3H4

Wednesday, September 1, 7 p.m.
Ramada Inn on the Bay
11 Bay Bridge Road
Belleville, Ontario K8P 3P6

Thursday, September 2, 7 p.m.
Best Western Country Squire Resort
715 King Street East
Gananoque, Ontario K7G 1H4

Wednesday, September 15, 7 p.m.
Ramada Inn
805 Brookdale Avenue
Cornwall, Ontario K6J 4P3

Thursday, September 16, 7 p.m.
The Royal St.Lawrence Yacht Club
1350 Bord-du-lac
Dorval, Quebec H9S 2E3

Friday, September 17, 7 p.m.
Hôtel des Gouverneurs
975 Hart Street
Trois-Rivières, Quebec G9A 4S3

Contacting Us

If you are interested in sharing your concerns about water levels in Lake Ontario and the St. Lawrence River, would like to receive more information about the Study, or would like to participate in one of our meetings, please contact the communication representative in your country.

U.S.

Arleen Kreusch
Public Affairs Specialist
1776 Niagara Street
Buffalo, NY 14207-3199
Tel: (716) 879-4438
Fax: (716) 879-4486
arleen.k.kreusch@lrb01.usace.army.mil

Canada

Roseline Mouana
Public Information Officer
234 Laurier Avenue West • 22nd Floor
Ottawa, ON K1P 6K6
Tel: (613) 992-5727
Fax: (613) 995-9644
mouanar@ottawa.ijc.org

Visit the Study website at: ***www.losl.org***

Study News

Environment Canada Gives Study Priority

This spring, Environment Canada, Quebec Region, identified the Study as a regional priority in the context of clean, safe and reliable water supplies. The Ministry focused on the research of the Environment TWG and recognized that the Region is hard at work finalizing environmental criteria.

Team Arrivals

Roseline Mouana is welcomed as the new Public Information Officer of the Canadian Secretariat. She holds a Bachelor of Fine Arts with a Major in Art Direction and Design from Concordia University as well as a Multimedia/Web Certificate from the Department of New Media Corporate Training at Algonquin College. In the context of her freelance career, she has acquired noteworthy experience in graphic design, advertising and translation for an international clientele, including public and media relations for the Department of Canadian Heritage. She has worked in Costa Rica for Casa Alianza (Covenant House Latin America) and at the National Capital Commission as a Web Consultant. Her broadcasting experience ranges from radio show host and researcher to the recording of station identification and public service announcements. She is fluent in French and English and has a working knowledge of Spanish.

Connie Hamilton is welcomed as the new Canadian Co-lead for the Information Management Technical Work Group. She brings experience from a technical background in web technology and understands the challenges in delivering information in collaboration with partners, such as the USEPA. As well, Connie was an early pioneer involved in knowledge management initiatives for Environment Canada. Connie will be involved with the Study, helping to assemble and coordinate the document management application for the Technical Working Group on behalf of Environment Canada.

Welcome!

Team Departures

We sincerely wish to thank **Michelle Tracy** for all of the time and hard work she provided to the Study.

Thank you!

Featured in our Next Issue

Summaries of our summer meetings.

Performance indicator responses from the Hydrology and Hydraulics TWG, Canadian Recreational Boating and Tourism TWG, and the Study Board

Printed on recycled, Chlorine-free paper with soy-based inks

International Joint Commission
U.S. Secretariat Study Office
1776 Niagara Street
Buffalo, NY 14207

Summer Meeting Schedule Inside