Ripple Effects

Volume 12, May 2006

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

Our five-year Lake Ontario-St. Lawrence River Study is complete. This is our final newsletter. We want to thank each of you for your valuable contributions and for the volunteer hours that so many gave to ensure open communication with the Study Team including the Study Board, the Technical Work Groups and the Public Interest Advisory Group, throughout this Study. Special thanks go to Dan Barletta, Marcel Lussier and Elaine Kennedy for their leadership in assuring open communication through the Public Interest Advisory Group and development of all previous issues of Ripple Effects.

The Study Board forwarded three new candidate regulation plans plus some default options to the International Joint Commission for consideration. Summaries of each of the three candidate plans are contained in this newsletter. Your input this past summer was carefully considered, and the Study Team worked to improve the plans based on that input. The Team conducted an extensive review of these plans using new stochastic (statistically generated hydrologic) data, which allowed the Team to evaluate how the plans would perform under different potential water supply sequences, reflecting a more complete range of climate variability to complement our 101-year historic record.

The Final Report of the Study is now available in Canada and the United States in both French and English. Also, to read the Study's final report and review the candidate regulation plans in more detail, please visit the Study website at: ***www.losl.org****.*

Please continue to stay informed and involved in the decision-making process. The Commission and Control Board are planning several events related to Lake Ontario-St. Lawrence River outflow regulation. Watch the Commission's website at ***www.ijc.org*** *for updates on the schedule.*

If you wish to stay informed through the mailing list and have not already so indicated to us through a sign-in card at our public meetings, the survey on our website, or the mail-back piece in our previous newsletter, please fill out the form on the back page of this newsletter and mail or fax it to either our Buffalo or Ottawa address.

Sincerely,

Eugene Stakhiv
U.S. Co-Director
Study Board

Doug Cuthbert
Canadian Co-Director
Study Board

*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 Study Board Submits Its Regulation Plan Options to the International Joint Commission

Gene Stakhiv and Doug Cuthbert, U.S. and Canadian Study Directors

The International Lake Ontario - St. Lawrence River Study Board held its final meeting with the International Joint Commission (IJC) on December 5, 2005, ending its five-year Study to develop a revised plan for managing Lake Ontario outflows. The Study Board presented three regulation options to the IJC for their consideration. These options were developed over the course of the last three years of the Study, and they reflect the Board's attempts to balance the views, interests and preferences of numerous interest groups and users of the resources of the Lake Ontario - St. Lawrence River System. These views and preferences were solicited through the public outreach activities of the Public Interest Advisory Group, and transformed into numerous regulation plan options. The Final Report was released in May 2006.

This Study represents a unique opportunity to make a change - to literally rebalance the System for the first time in fifty years. But trade-offs have to be made among the competing interests. The Study Team has identified all the significant trade-offs and quantified the relative benefits and costs. The result is an intensive, comprehensive and detailed analysis of the physical and ecological dynamics that are interacting with the human uses of the System.

The final decision by the Commission will be a difficult one, as it tries to balance all interests equitably. The Study Board has given the Commission a comprehensive set of tools, models, supporting data and information that will facilitate that process.

Five years ago on December 11, 2000, the Commission issued a directive to the International Lake Ontario - St. Lawrence River Study Board, which it had appointed to:

- Review the current regulation of levels and flows in the Lake Ontario-St. Lawrence River System, taking into account the impact of regulation on affected interests;
- Develop an improved understanding of the System among all concerned; and
- Provide all the relevant technical and other information needed for the review.

During the Study, hundreds of people and dozens of organizations directly participated in the planning and meetings. Thousands were kept informed through this newsletter and the Study website of the progress and milestones in the Study. The volunteers of the Public Interest Advisory Group were central to the success of the undertaking, contributing significantly and uniquely to the work of the Study Board.

Lake Ontario-St. Lawrence River Study Co-directors Doug Cuthbert and Dr. Eugene Stakhiv officially present the Year Three Report of the Study Board to IJC Chair Herb Gray and Commissioner Irene Brooks.

Advisory Group members were fully integrated into the Study Team, providing advice, feedback and input during all phases of the Study process. This gave the Study Team a practical focus on real-world implications of its decisions. Stakeholder participation and collaboration had a decisive role in the formulation and evaluation of all plans, as well as the selection of the final set of candidate plans that the Study Board presents here. For example, aboriginal issues are complex, and contributions by Native members of the Study Team to the understanding and consideration of issues were very helpful.

Considerable coordination and involvement were necessary by both the Public Interest Advisory Group and the Study Board in the response to issues raised by all interest groups, with Study elements explicitly formulated to accommodate concerns.

What the Study Board Found

During the five-year Study, the Study Team collected considerable new data and performed relevant scientific investigations. It applied innovative technologies to develop and evaluate new regulation plans to provide a better balance among all the interests in the System. Many new findings, conclusions and clarifications of previously uncertain views and theories were developed during the course of this work.

The Study Team formulated and evaluated numerous possible regulation plans. It has selected three candidate plans labeled A+, B+ and D+, which address the range of interests and issues that emerged as part of the extensive evaluation effort. These plans have the designation "+" as they represent improvements over the versions of plans A, B and D that were made public during the Study's summer 2005 outreach activity. Many other possible regulation plans were considered and evaluated (e.g., plans C, E and OntRip3), but were set aside, primarily because they did not perform better than plans A, B, and D, and did not fulfill the guidelines of the Study Board.

The Study Board did not prioritize on the basis of either the desires of interest groups or the performance indicators that were used to evaluate plans. The Study Board derived many performance indicators from the extensive public participation program. The Study Board judged all plans based on an objective appraisal of results of the economic and environmental scores from simulations over stochastic and historical water supply time series.

Each candidate plan fulfills the two main Study Board goals of providing net economic and environmental improvements, when compared to the existing plan. However, it is difficult to satisfy, at all times, the myriad of specialized demands of each of the often competing interests in the Lake Ontario - St. Lawrence River System.

Changes to the criteria and existing operating plan are not possible without harm to some interests. The majority of Board members do not consider these results a "disproportionate loss."

The Study Team's analysis uncovered a number of surprises and challenged conventional wisdom on many fronts, especially in the comparison of various alternative plans against Plan 1958-D with Deviations.

The Study Board Submits Its Regulation Plan (cont)

The current Regulation Plan 1958-D with Deviations comes close to minimizing damages for Lake Ontario shoreline property owners. Even regulation plans developed to optimize conditions benefiting shoreline property interests on Lake Ontario, or in the extreme, that might hold Lake Ontario levels constant, could only improve benefits to Lake Ontario shoreline properties by an average of less than $1 million U.S. per year, while causing major losses elsewhere in the System. Erosion of a certain amount of Lake Ontario shoreline will occur regardless of the regulation plan. The difference between plans lies in how quickly the erosion will happen.

On the lower St. Lawrence River there are some flood damages that, although not large in economic terms relative to some other interests, result in differences between plans that can be significant for the portion of the River downstream of Montreal in the Sorel/Lac St. Pierre area. Shoreline erosion on the lower river downstream of the Moses-Saunders dam is not a major economic issue since most developed properties are already protected.

A key issue raised by recreational boaters throughout the System is the desire to maintain higher water levels until later in the fall, thereby extending the boating season and making it easier to haul boats out of the water.

All plans produce benefits for commercial navigation, with the main difference between the candidate plans being the cost due to delays in shipping on the Seaway. There is usually enough water on Lake Ontario to keep ships fully loaded, and none of the candidate plans is significantly better than the rest in terms of avoiding shallow depths in the Seaway. The plans do differ in how well they maintain minimal acceptable depths at the Port of Montreal, especially during extended droughts.

All plans produce benefits in terms of hydropower. Benefits are greatest when releases are similar to those that would occur without regulation, assuming actions are taken to limit ice jams in the winter and early spring. Natural releases create a higher average difference of water levels before and after the Moses - Saunders dam and tend to be the most stable and predictable.

Municipal, industrial and domestic water-use facilities are generally not vulnerable to the range of expected water level variations. The exceptions are the Russell and Ginna power generating stations and the Monroe County potable water treatment plant in Greece on the south shore of Lake Ontario. The Monroe County facility would experience problems within the historical high water level range, the Ginna station at historical low water levels, and the Russell station at both historical high and low levels. Under any plan, all facilities will require upgrading to remain fully operational under future expected high or low water level conditions. The Study also found that the Montreal water supply system could be at risk under very low flow and level conditions similar to those modeled in the Study for climate change conditions.

The current regulation plan, Plan 1958-D with Deviations, has reduced the range and occurrences of extreme Lake Ontario levels as intended under the existing Orders of Approval. From an environmental perspective, this has resulted in a more narrowly defined transition zone within wetlands from submerged to upland plants, thus reducing the diversity of plant types along the shore and populations of animal species who feed on and live in the environments affected by the reduced water level ranges. Regulation has also caused dewatering drawdowns in the fall through early spring, to the detriment of some habitat.

Since it began its work, the Study's Environmental Technical Work Group has taken the position that the best plan for the natural environment is natural "pre-Moses-Saunders-dam" level and flow conditions. A plan developed during the Study and labeled Plan E is closest to the natural flow conditions, while still maintaining a smooth ice cover on the St. Lawrence River to limit ice jams. However, while Plan E simulates more natural conditions, it does not represent the natural condition before regulation. The System, especially the St. Lawrence River downstream from Ogdensburg, has changed dramatically since the Moses-Saunders dam was built. As a result, the lower river below the Moses-Saunders dam beyond Montreal Harbour is much less sensitive to changes in water level regulation than the lake and Upper River. This is because regulated releases are very diverse, spanning an even greater range than natural releases. Furthermore, the lower river hydrology is influenced not only by the outflows from Lake Ontario, but also by the Ottawa River and local tributary flows.

Many Study Board members believe that the environmental objectives of Plan E should be considered a long-term management goal for the System. But they recognize that, because of historical development, considerable adverse economic impacts are associated with Plan E and therefore do not support its consideration as a candidate plan.

Scientific and Technological Advances

The Study Board has introduced a new planning approach referred to as "Shared Vision Planning." This approach combines scientific and public input in an interactive analytical framework that has helped the Study Team and Public Interest Advisory Group explore numerous plan formulation opportunities, operating nuances and performance impacts in an organized fashion.

The Shared Vision Planning approach used in the Study integrates a hierarchy of advanced models. They include an ecosystem response model, shoreline dynamics models used for flood damage and erosion predictions, and a series of new economic models that describe economic benefits and losses associated with recreational boating, hydropower and commercial navigation.

The Study Board used sophisticated hydrologic modeling to ensure the reliability, resilience and robustness of each plan under a stochastically generated 50,000-year water supply sequence. In addition, the Board analyzed four different climate change scenarios and used them to thoroughly test candidate plans, ensuring that none had fatal flaws that would inhibit their performance under these extreme potential conditions. When choosing options, the Study Board decided that a legitimate comparative analysis of the benefits and costs associated with the various plans should be based on the long-term stochastic hydrologic sequence rather than the 100-year historical record.

The implementation of a candidate plan will impose a new set of requirements on the International St. Lawrence River Board of Control. The new requirements (including information management; greater public communication and outreach; model running, maintenance and upgrading; and the analysis of

The Study Board Submits Its Regulation Plan (cont)

monitored data) must be addressed to enable the Board to remain aware of plan impacts and to know when and to what extent adaptive changes in water management policy should be considered.

New Candidate Regulation Plans

The three new candidate regulation plan options entitled A+, B+ and D+ are all considered by a majority of the Study Board to represent improvements over those presented during the summer 2005 public meetings and the current plan, Plan 1958-D with Deviations. Each of these plan options involves a mixture of benefits and costs. All create overall economic and environmental benefits relative to Plan 1958-D with Deviations, but to varying degrees and with varying trade-offs among interests. All candidate plans achieve the goals mandated by the Commission in its Directive to the Study Board of December 11, 2000.

From an interest perspective, all three candidate plans benefit commercial navigation and hydropower and have no impact on municipal, industrial and domestic water use relative to Plan 1958-D with Deviations. The greatest difference between the plans is in how they address recreational boating, shoreline flooding and erosion or coastal interests and the environment or natural ecosystem.

During the first four months of 2005, Plan Formulation & Evaluation Group efforts and Study Board discussion derived Plans A, B & D that were considered the most promising of the array of plans devised. The Board subsequently took those plans public to assess public response and acceptance of the plan principles and performance. These regulation plans were "frozen" so to speak as of May 1, 2005 in order to provide time to prepare briefing materials in French and English and to avoid the confusion of presenting successive refinements of these plans during the public meeting period.

Plan formulators attended the public meetings and refined plans A, B and D based on the comments they heard from the public and the suggestions from the Study Board. The estimated benefits of these plans also changed slightly for other reasons: technical issues were resolved and errors corrected in the final round of quality control; final research results were factored in for coastal impacts; and the Ogdensburg Reach defined in the recreational boating analysis was split in two to better represent that reach. The base plan to which plans were compared was also refined throughout the plan formulation process. The plans were finalized in September 2005 and labeled A+, B+ and D+ to differentiate them from the versions presented during the summer public meetings.

In all cases the basic principles and objectives of the plans remain unchanged. The + plans are not significantly different from their predecessors, but their overall performance is improved and deficiencies minimized while respecting their original goals and integrity.

A brief summary of the objectives and results of the plan modifications follows. All comparisons are based on evaluations over the historic 101-year time period as the stochastic evaluations were not available until the summer of 2005.

Plan A+

Changes to the May 2005 version of Plan A were directed at reducing coastal damages. The goal of Plan A was to create the largest economic gain possible without hurting the environment or creating disproportionate loss. Plan A created large navigation and hydropower benefits by storing more water on Lake Ontario but that caused some additional coastal damages on the lake and along the river. Plan A+ was more conservative. Using the same supplies, Plan A+ lost over $3 million in hydropower and navigation benefits compared to Plan A, but gained about a half million per year in coastal benefits. It also caused a fairly significant reduction in the environmental score of Plan A. These compromises were accepted because Plan A+ still outperformed Plan 1958-D with Deviations in hydropower and navigation by about $7 million per year, because it still slightly outperformed 1958D with Deviations on the overall environmental index, and because the lower coastal damages better fit the Board guideline of no disproportionate loss.

Plan B+

Modifications of the May 2005 version of this plan were primarily directed at reducing flooding damages on the lower river. The goal of Plan B was to create the largest environmental gain possible while still increasing net economic benefits and without creating disproportionate loss. But Plan B caused the greatest average annual flooding damages along the lower river of all the plans. Plan B+ reduced fall Lake Ontario levels when there was some risk of flooding the following year and implemented specific rules to reduce lake releases during high Ottawa River and local river inflows to reduce lower river flooding. These changes were made after a great deal of experimentation so that there were essentially no losses in other economic categories and with just a small decline in the overall environmental score. Plan B+ was slightly less likely to produce the high Lake Ontario and Upper River levels boaters like in the fall, but the overall recreational boating economic performance for Plan B+ improved over Plan B.

Plan D+

Modifications of the May 2005 version of Plan D were directed at improving performance across the board and particularly in the environmental sector. The goal of Plan D was to improve overall economic and environmental performance while minimizing losses in any sector. The changes that produced Plan D+ were small and numerous, and resulted in slightly better performance in almost every category. Plan D+ improved its overall environmental score by about 7% with gains in 18 of the 32 environmental performance indicators. Plan D+ increased overall economic benefits by $1.45 million and also increased benefits in most categories. Plan D+ had the smaller losses by sector than Plan D, and had the smallest losses by sector of any of the candidate plans.

Figures 1, 2 and 3 show the range of levels that could be expected with each of the options for Lake Ontario and the St. Lawrence River at Long Sault and Montreal Harbor, respectively, based on the long-term stochastic hydrologic sequence using 50,000 years of simulated data. The figures show average, 1% and 99% exceedance values - one percent of the time, levels could be higher (very wet conditions) and one percent of the time, levels could be lower (very dry conditions).

Further "tweaking" of all plans is possible, but may cause the plans to migrate towards a more common central position. For example, the occasional low Lake Ontario levels that produce healthier wetlands under Plan B+ also reduce recreational boating benefits in

The Study Board Submits Its Regulation Plan (cont)

those years. Attempts to "improve" B+ by raising Lake Ontario levels will make it more like Plan D+, with better boating and lower wetlands benefits.

If none of the candidate plans is selected, the Commission has several "default options":

- The current operating Plan 1958-D with Deviations could remain in place with new criteria;
- Plan 1958-D with Deviations could continue with the existing criteria, but it would probably perform differently, depending on the composition of a new International St. Lawrence River Board of Control, and attempts to address environmental and recreational boating interests; or
- The Commission could rely on a combination of the above two options - new criteria and a new International St. Lawrence River Board of Control.

Pages 8 and 9 summarize the economic benefits and environmental performance indicator results for each candidate regulation plan when evaluated using the historical water supply sequence, respectively. Additional economic results based on the stochastic series are available on the Study web site "Board Room" (www.losl.org/boardroom). Pages 10 and 11 show the differences between the revised plan results and those presented during summer 2005.

Figure 1 - Lake Ontario Water Levels: Average, !% and 99% Probability of Exceedence

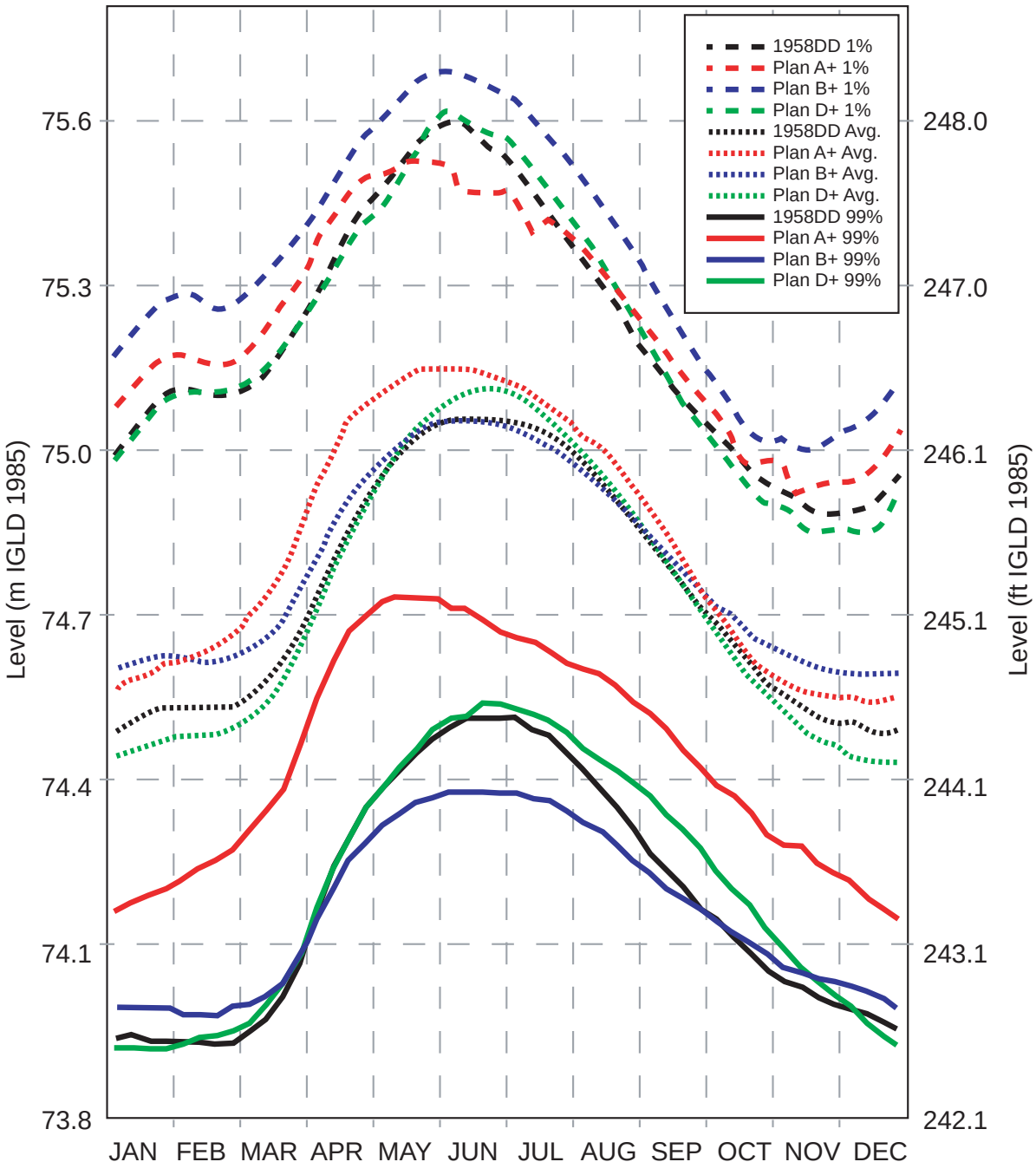

Figure 2 - St. Lawrence River at Long Sault Dam Water Levels: Average, 1% and 99% Probability of Exceedence

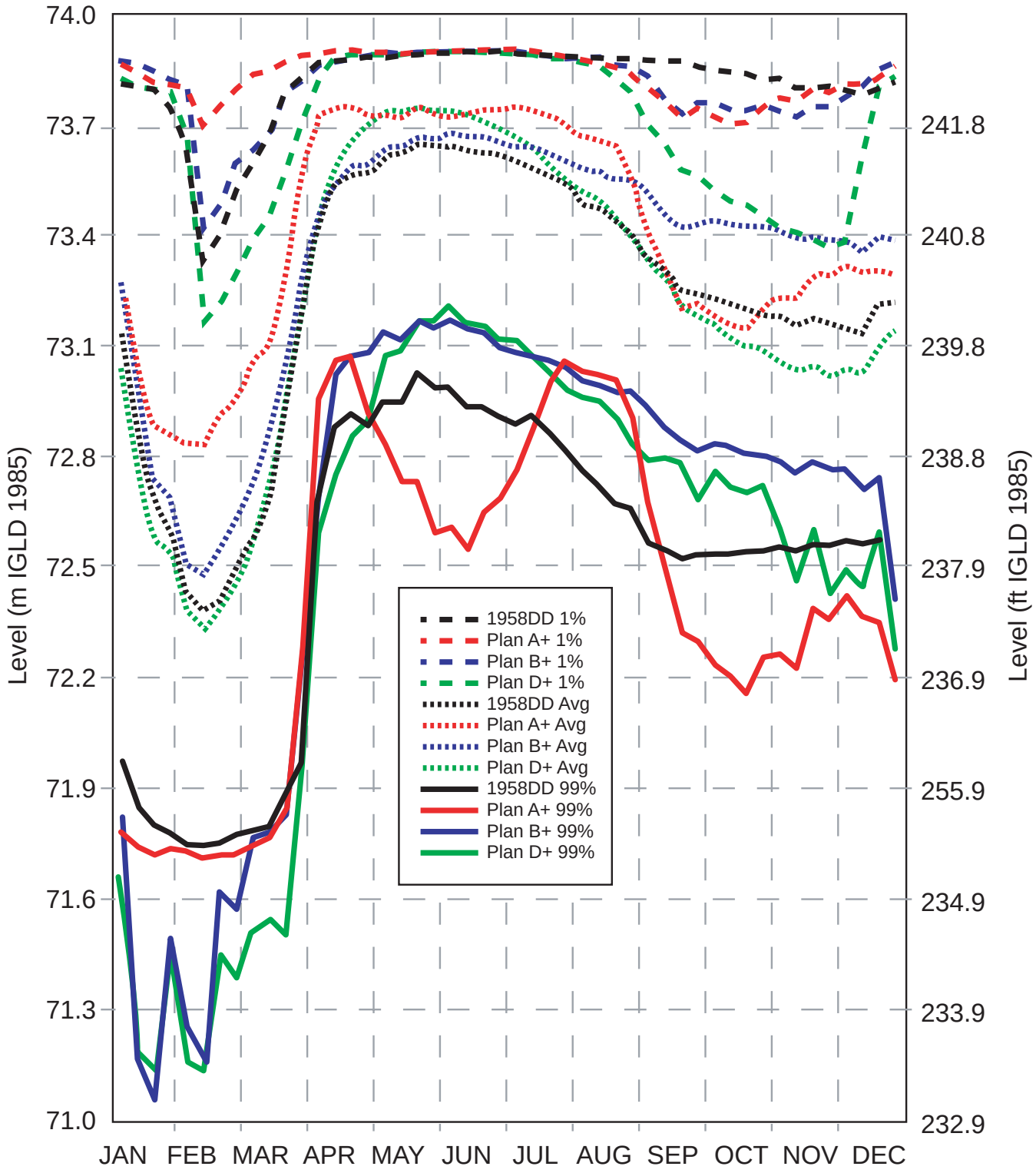

Figure 3 - Montreal Harbour Water Levels: Average, 1% and 99% Probability of Exceedence

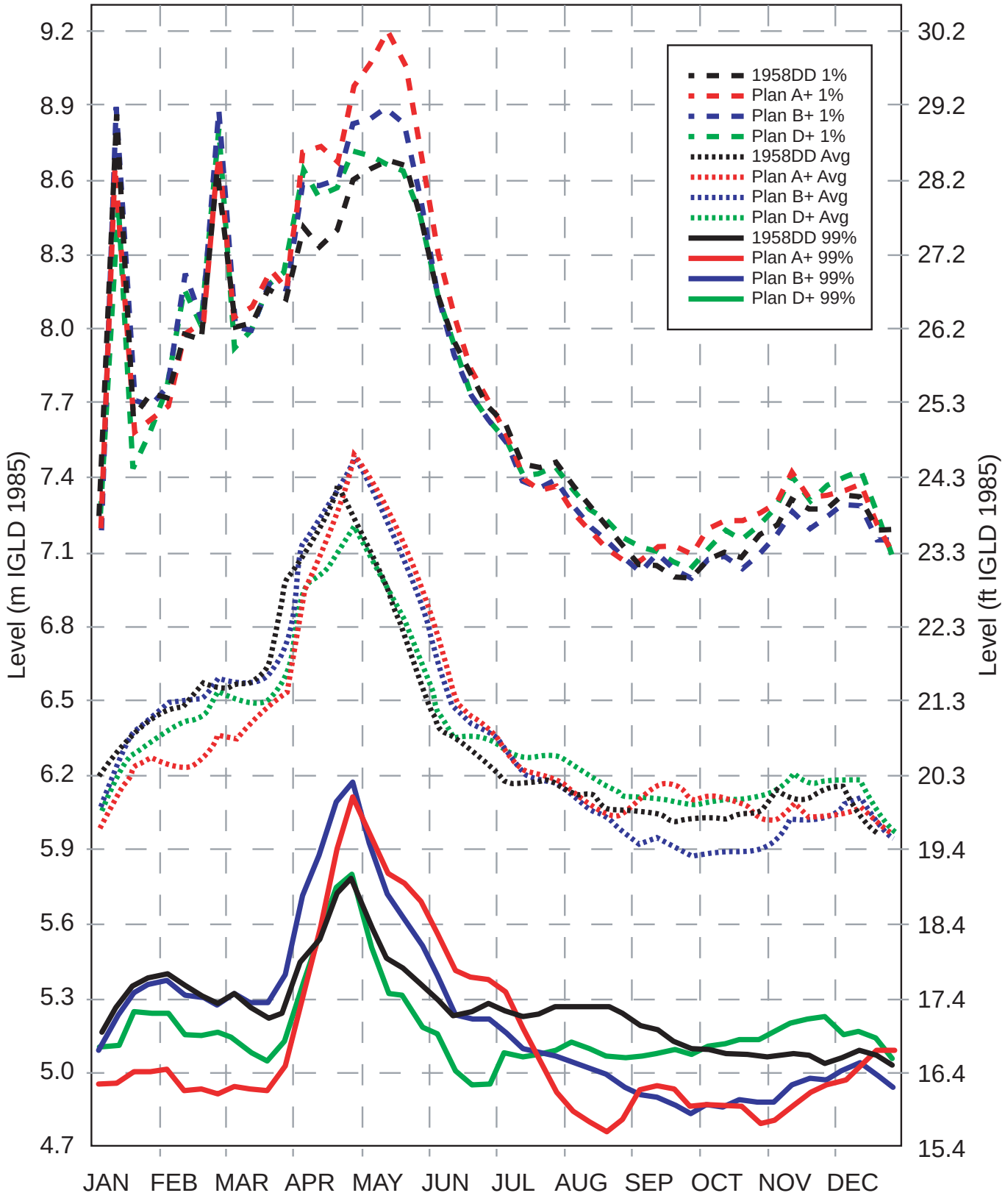

Table 1: Economic results for candidate plans by interest and region based on historical supply sequence.

	Average Annual Net Benefits ($ Million)	A+	B+	D+	E
	TOTAL	**$7.52**	**$6.48**	**$6.52**	**-$12.30**
COASTAL		**-$0.62**	**-$1.11**	**$0.32**	**-$25.96**
	Lake Ontario	**-$0.36**	**-$0.60**	**$0.25**	**-$23.12**
	Shore Protection Maintenance	-$0.23	-$0.49	$0.27	-$12.98
	Erosion to Unprotected Developed Parcels	-$0.13	-$0.10	-$0.02	-$0.29
	Flooding	-$0.01	-$0.01	-$0.01	-$9.85
	Upper St. Lawrence River	**$0.00**	**$0.00**	**$0.00**	**-$1.56**
	Flooding	$0.00	$0.00	$0.00	-$1.56
	St. Lawrence	**-$0.25**	**-$0.51**	**$0.07**	**-$1.27**
	Flooding	-$0.22	-$0.47	-$0.02	-$1.21
	Shore Protection Maintenance	-$0.03	-$0.04	$0.09	-$0.07
COMMERCIAL NAVIGATION		**$0.41**	**$2.20**	**$2.31**	**$4.13**
	Lake Ontario	**-$0.04**	**-$0.02**	**-$0.01**	**-$0.01**
	Seaway	**$0.53**	**$2.28**	**$2.35**	**$4.15**
	Montreal down	**-$0.08**	**-$0.06**	**-$0.03**	**$0.00**
HYDROPOWER		**$3.50**	**$5.97**	**$1.82**	**$14.16**
	NYPA-OPG	**$3.51**	**$4.16**	**$1.04**	**$10.23**
	Hydro Quebec	**-$0.01**	**$1.81**	**$0.78**	**$3.93**
RECREATIONAL BOATING		**$4.23**	**-$0.58**	**$2.04**	**-$4.64**
	Above Dam	**$2.21**	**-$0.62**	**$0.52**	**-$5.91**
	Lake Ontario	$1.29	-$0.64	$0.13	-$5.03
	Alex Bay	$0.89	-$0.05	$0.32	-$0.86
	Ogdensburg	$0.01	$0.00	$0.01	-$0.09
	Lake St. Lawrence	$0.02	$0.06	$0.06	$0.07
	Below Dam	**$2.02**	**$0.04**	**$1.53**	**$1.27**
	Lac St. Louis	$1.13	$0.17	$0.77	$0.78
	Montreal	$0.70	-$0.02	$0.58	$0.41
	Lac St. Pierre	$0.19	-$0.10	$0.17	$0.08
WATER USES		**$0.00**	**$0.00**	**$0.00**	**$0.00**
	SL One Time Infrastructure Costs	**$0.00**	**$0.00**	**$0.00**	**$0.00**
	LSL Water Quality Investments	**$0.00**	**$0.00**	**$0.00**	**$0.00**

Notes for Table 1:

1. Figures are the average annual impact relative to Plan 1958DD and are measured in millions of U.S. dollars. Blue represents a positive net benefit relative to 1958DD and red indicates a negative net benefit relative to 1958DD.
2. These are economic results based on the historic supply series (representing 1900-2000). No discount rate is applied. Plan E is shown for comparison purposes only to represent the natural flow condition. Plan E is not a candidate plan.

Table 2: Environmental performance indicator results (ratios) for candidate plans based on historical supplies.

	Environmental Performance Indicators	A+	B+	D+	E
LAKE ONTARIO	Wetland Meadow Marsh Community	1.02	1.44	1.17	1.56
	Low Veg 18C - spawning habitat supply	0.89	0.95	0.94	0.88
	High Veg 24C - spawning habitat supply	1.05	1.00	1.01	1.08
	Low Veg 24C - spawning habitat supply	1.00	1.02	1.00	1.11
	Northern Pike - YOY recruitment	1.02	1.00	1.05	1.03
	Largemouth Bass - YOY recruitment	0.94	0.98	0.97	0.96
	Least Bittern (IXEX) - reproductive index	0.88	1.04	0.95	1.13
	Virginia Rail (RALI) - reproductive index	0.96	1.11	0.99	1.15
	Black Tern (CHNI) - reproductive index	1.03	1.12	1.01	1.16
	Yellow Rail (CONO) - preferred breeding habitat	0.96	1.01	0.98	1.01
	King Rail (RAEL) - preferred breeding habitat	1.05	1.10	1.03	1.27
UPPER RIVER	Low Veg 18C - spawning habitat supply	1.01	1.01	1.01	1.04
	High Veg 24C - spawning habitat supply	1.03	1.01	1.02	1.02
	Low Veg 24C - spawning habitat supply	1.01	1.01	1.02	1.02
	Northern Pike - YOY recruitment	1.05	1.03	1.01	1.06
	Largemouth Bass - YOY recruitment	0.99	1.00	1.00	1.00
	Northern Pike - YOY net productivity	4.02	2.08	1.17	4.08
	Virginia Rail (RALI) - reproductive index	1.16	1.27	1.31	1.33
	Muskrat (ONZI) - house density in drowned river mouth wetlands	1.42	4.39	1.73	37.25
LOWER RIVER	Golden Shiner - suitable feeding habitat area	1.00	1.00	1.00	1.03
	Wetlands fish - abundance index	0.87	0.90	0.84	0.97
	Migratory wildfowl - habitat area	1.03	1.03	0.97	1.00
	Least Bittern - reproductive index	1.03	1.06	1.00	1.06
	Virginia Rail (RALI) - reproductive index	0.94	0.97	1.06	1.00
	Migratory wildfowl - productivity	1.06	1.00	1.00	1.03
	Black Tern (CHNI) - reproductive index	0.84	0.77	1.00	0.77
	Northern Pike (ESLU) - reproductive area	0.97	0.94	0.94	0.94
	Frog sp. - reproductive habitat surface area	0.87	0.87	1.03	0.94
	Eastern Sand Darter (AMPE) - reproductive area	1.10	1.03	1.13	1.06
	Spiny Softshell Turtle (APSP) - reproductive habitat surface area	1.03	1.06	1.03	1.03
	Bridle Shiner (NOBI) - reproductive habitat surface area	1.00	0.97	1.00	1.03
	Muskrat (ONZI) - surviving houses	1.04	0.88	0.96	0.80
	Percentage "good" scores for each plan	**9%**	**22%**	**16%**	34%
	Overall Environmental Index	**1.06**	**1.35**	**1.10**	**4.04**

Notes to Table 2:

1. Figures are the impact relative to Plan 1958DD expressed as ratios where 1 is the same as 58DD, >1.00 is better than 58DD, and < 1.00 is worse than 58DD.
2. Run using the historic supply sequence (1900-2000).
3. Aqua shading identifies species at risk.
4. Yellow shading are essentially the same as 1958DD within 10% difference.

Table 3: Difference between economic benefits given historic water supplies of Final "+" Options minus Summer 2005 Plans (red indicates lower net benefits in final plan version).				
	Average Annual Net Benefits ($ Million)	A+ vs. A	B+ vs. B	D+ vs. D
	TOTAL	($1.73)	$2.16	$1.47
COASTAL		$0.48	$1.77	$0.18
	Lake Ontario	$0.23	$0.10	$0.07
	Shore Protection Maintenance	$0.08	$0.17	$0.07
	Erosion to Unprotected Developed Parcels	($0.09)	($0.06)	($0.02)
	Flooding	$0.24	$0.00	$0.02
	Upper St. Lawrence River	$0.25	$0.18	$0.11
	Flooding	$0.25	$0.18	$0.11
	St. Lawrence	$0.00	$1.48	$0.00
	Flooding	($0.02)	$1.58	$0.01
	Shore Protection Maintenance	$0.03	($0.10)	($0.01)
COMMERCIAL NAVIGATION		($1.78)	$0.24	$0.36
	Lake Ontario	($0.01)	$0.00	$0.00
	Seaway	($1.73)	$0.23	$0.42
	Montreal down	($0.04)	$0.01	($0.06)
HYDROPOWER		($1.48)	($0.14)	$0.82
	NYPA-OPG	($0.67)	($0.63)	($0.01)
	Hydro Quebec	($0.80)	$0.49	$0.82
RECREATIONAL BOATING		$1.04	$0.29	$0.10
	Above Dam	$1.13	$0.25	$0.16
	Lake Ontario	$0.69	$0.14	($0.01)
	Alex Bay	$0.16	($0.05)	($0.08)
	Ogdensburg			
	Lake St. Lawrence			
	Below Dam	($0.09)	$0.04	($0.06)
	Lac St. Louis	$0.00	$0.00	($0.03)
	Montreal	($0.03)	$0.03	($0.02)
	Lac St. Pierre	($0.06)	$0.01	$0.00
WATER USES		$0.00	$0.00	$0.00
	SL One Time Infrastructure Costs	$0.00	$0.00	$0.00
	LSL Water Quality Investments	$0.00	$0.00	$0.00

Table 4: Comparison of Environmental Performance, Summer 2005 and Final Plans. (Values shown are the Final "+" Option ratios minus the Summer Plan scores).

	Environmental Performance Indicators	A+ vs. A	B+ vs. B	D+ vs. D
LAKE ONTARIO	Wetland Meadow Marsh Community	-0.12	0.01	0.00
	Low Veg 18C - spawning habitat supply	0.00	0.00	0.01
	High Veg 24C - spawning habitat supply	0.01	0.00	-0.01
	Low Veg 24C - spawning habitat supply	0.00	0.00	0.00
	Northern Pike - YOY recruitment	0.01	0.00	0.00
	Largemouth Bass - YOY recruitment	-0.01	0.00	0.00
	Least Bittern (IXEX) - reproductive index	-0.03	-0.03	0.01
	Virginia Rail (RALI) - reproductive index	0.00	0.00	0.04
	Black Tern (CHNI) - reproductive index	0.04	0.00	0.04
	Yellow Rail (CONO) - preferred breeding habitat	-0.01	0.00	0.00
	King Rail (RAEL) - preferred breeding habitat	0.00	0.00	-0.01
UPPER RIVER	Low Veg 18C - spawning habitat supply	0.01	0.00	0.00
	High Veg 24C - spawning habitat supply	0.01	0.00	-0.01
	Low Veg 24C - spawning habitat supply	0.00	0.00	0.00
	Northern Pike - YOY recruitment	0.01	0.00	0.00
	Largemouth Bass - YOY recruitment	-0.01	0.00	-0.01
	Northern Pike - YOY net productivity	0.86	-0.08	0.15
	Virginia Rail (RALI) - reproductive index	-0.07	0.01	0.00
	Muskrat (ONZI) - house density in drowned river mouth wetlands	-1.11	-0.83	0.71
LOWER RIVER	Golden Shiner - suitable feeding habitat area	-0.03	-0.03	0.03
	Wetlands fish - abundance index	-0.06	0.03	0.00
	Migratory wildfowl - habitat area	0.00	0.03	0.03
	Least Bittern - reproductive index	0.00	0.00	0.00
	Virginia Rail (RALI) - reproductive index	0.00	0.00	0.03
	Migratory wildfowl - productivity	0.00	0.00	0.00
	Black Tern (CHNI) - reproductive index	0.03	0.00	-0.03
	Northern Pike (ESLU) - reproductive area	0.03	-0.03	0.03
	Frog sp. - reproductive habitat surface area	0.10	-0.03	-0.03
	Eastern Sand Darter (AMPE) - reproductive area	-0.03	-0.03	0.06
	Spiny Softshell Turtle (APSP) - reproductive habitat surface area	-0.03	0.00	0.00
	Bridle Shiner (NOBI) - reproductive habitat surface area	-0.03	0.00	0.00
	Muskrat (ONZI) - surviving houses	0.08	0.16	0.08
	Overall Environmental Index	-0.09	-0.06	0.07

The Study Board Submits Its Regulation Plan (cont)

The Study Board Recommendations

The International Joint Commission has three significantly different candidate regulation plans to choose from, each of which provides net economic and environmental benefits. The Board is confident that any one of these plans will satisfy a majority of the interest groups.

Conditions and the priorities for lake level and flow regulation always change over time, and new scientific and technological advances will continue to be made. The Commission might consider applying an adaptive management process to support the selected regulation plan and incorporate performance tracking. An initial performance review of the new plan should be undertaken five years after its implementation and a more in-depth evaluation should be carried out ten years from its implementation to include consideration of adaptive changes to the selected plan.

This Study has considered in detail the trade-offs between interests, and this is reflected in the plan rules. The Study Board has agreed that long-term deviations from plan rules and flows have the effect of changing the intended performance of the plans as designed and the benefits that flow from the plans. However, the Board recognizes and supports the need for short-term deviations from plan flows under specified emergency conditions. Under extreme low or high water level and flow conditions that are problematic for interests, the Study Board recognizes that adjustments based on hydrologic and hydraulic data available at the time could remain consistent with the intent of the plans. Therefore, the Study Board also supports Commission action under extreme conditions to consider whether the benefits of deviation from plan flows outweigh the disadvantages, recognizing that there would be a need for considerable public relations support at such times.

A significant opportunity exists to move forward on long-term resolution of a few vexing issues related to fluctuating water levels. During consultations with governments, the Commission might consider acting as a catalyst to promote and advance mitigation of persistent shoreline flood and erosion problems. For example, in light of the findings of this Study, responsible state, provincial and municipal authorities could undertake a review of shoreline management practices and policies. Shoreline management strategies and permitting processes could be revisited and renewed for critical reaches of the shoreline utilizing new data and information gathered during this Study, including water level information for a new regulation plan. This review should help to identify options for dealing with problems affecting land use and existing structures within shoreline flood and erosion hazard zones.

As used in this Study, the general planning approach, termed "Shared Vision Modeling," has proven to be very successful. The Commission should consider applying these same techniques in subsequent studies.

The basic data and information collected, the research undertaken, the models developed and the body of knowledge accumulated during the Study have many possible and potential uses beyond the review of the Commission's Lake Ontario regulation criteria and plan. The Commission and the International St. Lawrence River Board might take steps to make this information as accessible and useful as possible to a broad range of organizations and applications.

The Study Board recommends that additional resources and personnel needed to meet new responsibilities of plan implementation by the International St. Lawrence River Board of Control be sought and provided. As a first priority, a full-time communications officer could be engaged to lead outreach activities relating to implementation of a new plan. Then, as a second priority, more science capacity could be added to develop links with science organizations, monitor regulation plan performance and assume responsibility for seeking out and identifying future adaptation actions and strategies.

Condition (i) of the 1952 Order of Approval as amended in 1956, specifying criteria (a) through (k), will need to be replaced if any one of the candidate plans A+, B+, or D+ is selected for implementation, or will need to be revised if Plan 1958-D is to continue to be applied.

Further recommendations derived from the outreach activities and experiences of the Study Board and Public Interest Advisory Group include the following:

- People living and working along Lake Ontario and the St. Lawrence River shorelines could benefit from access to educational materials with respect to the basic hydrology of the Great Lakes-St. Lawrence System. An education program could be established by the International Joint Commission and/or its International St. Lawrence River Board of Control to address public misconceptions regarding water level and flow management of the System.
- People affected by changing water levels and flows resulting from regulatory actions, in both the short-term (hours) and the long-term (years), need to understand and be informed of these conditions so that they can prepare for and adapt to them. It is recognized that shoreline development, infrastructure and regulatory programs have evolved with some dependence on the current Orders of Approval and regulation plan operations. Changes could be accompanied by education, outreach and help in accommodating a new water level regime and water management decision-making structure.
- The International St. Lawrence River Board of Control could be restructured to better reflect the views of all interests. This restructuring might incorporate a public advisory body. Consideration should be given to renaming the Board, deleting the term "Control."
- For studies such as this, the Commission should appoint Public Interest Advisory Group members for their expertise and ability to reach out to local interest groups. Networking capabilities promote public participation. It is important to reach out to all interests, including First Nations communities, from the very beginning of an investigation.
- The Study Board recommends that the Commission publish the results and encourage related follow-on research. In that vein, the Commission's website could reference current and future study-related publications in order to broaden public awareness.

Divergent Viewpoints

The majority of the Study Board stands behind the planning approach, the research program and the findings and conclusions presented in this report. However, there are a few divergent

The Study Board Submits Its Regulation Plan (cont)

viewpoints within the Study Board on the issue of "improvements" to regulation of water levels and flows on Lake Ontario and the St. Lawrence River. This is not surprising given the complexity of the issues, the fact that people treat trade-offs differently and that perspectives are vastly different. In reporting its findings here, the Study Board does not want to convey the message or impression that agreement or consensus was reached on all issues. Views vary on the candidate plans. For example, a minority of Board members feel that Plan B+ represents too radical a change and that the increase in shoreline damage that could be experienced under this plan constitutes a disproportionate loss. Many believe that environmental degradation has occurred since Plan 1958-D with Deviations was put into operation, and a few on the Study Board feel that none of candidate Plans A+, B+ or D+ goes far enough to address this degradation. Others prefer to retain Plan 1958-D with Deviations with changes to criteria and deviation authority. Some will argue that uncertainties in the Study's science and analysis do not justify a change in regulation plans. Yet the majority believes that the evidence in support of a change is overwhelming.

Wrapping up the Study and Considering New Regulation Plans - What Happens Next?

Russ Trowbridge and Tom McAuley, IJC Staff Liaisons to the Study Board

As the two IJC Staff Liaisons to the Study Board and the PIAG, it has been personally enjoyable and rewarding to work with all of you - the Study Board, the Public Interest Advisory Group, and members of the public - who have engaged over the past five years in the wide-ranging elements of this Study. Public input has been critical for assuring the Commission's awareness of the widest possible range of stakeholder interests, concerns and priorities in the Lake Ontario - St. Lawrence River System. Public engagement has been an important part of the Study and will remain so for the rest of the Orders review.

So what happens next?

The Commission will initiate a 60-day public comment period following the Study Board's release of its Final Report. This will provide time for the public to become familiar with and comment on the Board's Report before the Commission reaches tentative conclusions regarding possible changes in the regulation plan. During this period, the Commission will also be consulting with the two federal governments regarding possible changes.

Following the 60-day period, the Commission will draft and circulate publicly its tentative conclusions regarding future regulation. These conclusions will be the subject of public hearings to be held in various locations around Lake Ontario and the St. Lawrence River. We realize it is important for the public to have time to review the tentative conclusions before the Commission holds the hearings. We will therefore wait until we have a firm public release date for the tentative conclusions before we schedule the hearings. At some point after the hearings, a decision on future regulation will be made and implemented.

*Copies of the Study Board report are available from either address below, or online at **www.ijc.org**. To be most helpful to the Commission, any comments should arrive at the Commission by Monday, July 31. They may be sent by letter, fax or email, to one of the following addresses:*

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Visit the Study website at www.losl.org

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Members of the Public Interest Advisory Group with the International Joint Commission. (All members of the PIAG and IJC are not present).

Photo - Arleen Kreusch

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I would like to be added to the International St. Lawrence River Board of Control mailing list to be kept informed of progress regarding decision and implementation once the Study is finished.

My name and corrections, if any, to my mailing label are below.

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