

Ecosystem Technical Working Group Response to IPR Comments

Ecological Evaluation of the Lake Superior Regulation Plans for the International Upper Great Lakes Study: *St. Marys River Evaluation and Restoration Project for Peer Review*

General Comments – Chambers Review

Reviewer noted that the goal of the report is “to help peer reviewers assess the methods used to assess whether or not there will be ecological impacts or benefits resulting in additional ecological restoration opportunities based on operational changes as part of a new Lake Superior water level regulation plan” and noted that this goal is very vague.

Response: The focus of this report was to identify and highlight opportunities for ecological enhancement that would result from potential operational changes of the compensating works and/or hydropower plants within the St. Marys River (and potentially affecting the Upper Great Lakes). However, operational changes made at the compensating works and/or hydropower plants are constrained by the requirements of overall Lake Superior water level regulation and other uses of the St. Marys River such as navigation and hydropower generation.

The reviewer observed that much of the material in the St. Marys River Report duplicates the material in the Integrated Ecological Response Model (IERM2) report that was also submitted for peer review and requested clarification as to the relationship between these reports.

Response: The St. Marys River work is a subset of the overall Upper Great Lakes ecological evaluation and the same St. Marys River PIs and coping zone concepts were incorporated into the IERM2 and Shared Vision Models. Similar to the Upper Great Lakes coping zones, the St. Marys River coping zones were developed to ensure that changes in flow and/or water level regimes due to a regulation plan would not adversely affect the St. Marys River ecosystem. The ETWG used the St. Marys River ecological PIs and IERM2 model to evaluate proposed water level regulation plans in order to 1) protect and maintain the existing ecological functions and biological communities of the St. Marys River, and 2) identify vulnerabilities and potential adaptive management opportunities as a function of resulting changes in flow/water-level regimes in the St. Marys River.

Chapter 4 Comments

The ETWG used local knowledge and expertise to identify ecological enhancement opportunities related to flows at the compensating works and hydropower facilities that may not be related directly to Lake Superior water level regulation. For example, the sea lamprey experiments (section 4.2) and ramping rate adjustments (section 4.3) have minimal to no impact on Lake Superior water level regulation and can be implemented under a broad range of proposed water level regulation plans.

1) There is concern that flow manipulations in the St. Marys River are linked to only 3 of the 10 environmental performance indicators identified in Table 2 of the St. Marys River Report. What will be done to address the other Environmental Performance Indicators?

Response: The St. Marys River ecological performance indicators were developed and applied in order to protect and maintain existing ecological conditions and biological communities in the St. Marys River. In fact, six of the PIs are not directly related to flow but rather to St. Marys River water levels which are in essence, controlled by Lake Michigan-Huron water levels. In general, due to rapid downstream damping effects, these six PIs and the flushing flow PI (St. George Channel) can only be enhanced by direct manipulation of Lake Michigan-Huron water levels or by other types of intervention (e.g. enhancement of hydraulic connectivity, restoration of wetland plant communities) that are beyond the scope of this Study. The ETWG has worked collaboratively with the St. Marys River BPAC to identify other potential restoration opportunities to address these PIs.

2) The Environment Performance Indicator for elimination of sea lamprey spawning areas (Fact Sheet 21) does not provide quantitative evidence linking spawning success (or habitat suitability for spawning) to flow

Response: Subsequent to submission of the St. Marys River report for external peer review, the sea lamprey PI (Fact Sheet 21) was modified to reflect the results of discussions with GLFC sea lamprey control. The GLFC does not view multiple gate openings or high flows at the compensating works as a disastrous Zone “C” condition. The potential utilization of spawning habitat in the upper St. Marys River is currently unknown, and if multiple gate openings/high flows at the compensating works do occur, sea lamprey control will incorporate the small tributaries that flow into the upper St. Marys River into their 5-year sea lamprey stream assessment protocols. The four-gate threshold is now considered to be a Zone “B” condition which can be managed adaptively by sea lamprey control.

“... however, a one-half open gate should be allowed to maintain current habitat for other fishes. One-half open gate equates to 70 m³/s at 183 m lake elevation during June and July (Fig. 1 in Fact Sheet); however this discharge is not mentioned in section 4.2.”

Response: In fact, Section 4.2 that describes ongoing sea lamprey experiments in the tailwaters of the hydropower plants is separate and not related to the sea lamprey PI described in Fact Sheet 21. No comparisons made between the flows presented in section 4.2 (Figure 6) and the flows at the compensating works (Fact Sheet 21) because they are measured at different locations (and different structures) within the River.

The authors state that sea lamprey catch rate is correlated with discharge over higher discharge range (~200-400 m³/s), however this correlation is not apparent (Fig. 6, Section 4.2). Using these data, the authors indicate that adjustments in flow could maximize sea lamprey control. In my opinion, there is little convincing evidence of this.

Response: The GLFC has designed a set of ongoing experiments (funded by the U.S. EPA Great Lakes Restoration Initiative) to test this hypothesis at the Brookfield and Cloverland hydropower plants. Instead of peaking and ponding every day during the months of June and July, Brookfield and Cloverland will be operating at peak flows every other night (instead of ponding). These experiments will clearly demonstrate whether or not there is correlation between peak flows at night and increased trapping efficiency. Operational changes will be made only when these experiments are complete.

3) “Section 4.3 does not provide any new information.”

This PI was not incorporated into the IERM2 model because: 1) this is an operational issue not related to Lake Superior water level regulation, and 2) the implementation time step (hours) is different than the monthly time step used in the IERM2 model. Based on observations reported in the literature and a request from the GLFC St. Marys River Fisheries Task Force, an operational recommendation will be made to the IJC Lake Superior Board of Control to implement gate changes that meet desired ramping rates.

4) Section 4.4 describes relationship between gate openings/discharge and wetted perimeter. Many of the PIs for the St. Marys River relate directly or indirectly to wetted perimeter and hence, information on relationship between gate openings/discharge and wetted perimeter is critical....

Section 4.4 is focused on the St. Mary Rapids. Seven of the ten PIs don't apply to the Rapids and are strongly influenced by Lake Michigan-Huron water levels rather than flow and discharge in the St. Marys River.

Section 5 (Summary) indicates that "several opportunities have been identified to improve the St. Marys River ecosystem by manipulating flows and/or implementing operational changes at the Compensating Works and/or at the St. Marys River hydropower plants". The effects of such changes in aquatic life has not, however, been quantitatively established and, hence, consideration of operational changes in premature in my opinion."

Operational recommendations will be based on experimental results from the GLFC sea lamprey experiments and requests from the resource management agencies (MDNRE, OMNR, and First Nations) responsible for management of the St. Marys River fishery.

Evaluation - Bedford Review

Not clear who wrote pages 1-18.

Response: The St. Marys River Report was authored Dr. Scudder D. Mackey who is the ETWG Project Manager for the International Upper Great Lakes Study.

1) No Response.

2) No Response.

3) No Response.

4) No Response.

5) No Response.

6) The recommendations that appear primarily in Appendix B should be prominent in pp. 1-18, especially those related to adaptive management. The unique biological productivity and diversity of the St. Mary's River ecosystem should be stated more strongly in pp. 1-18; it is quite clearly stated in Appendix A but the appearance of pp. 1-18 before could cause the stronger and better-written Appendix A to be missed.

Response: Report will be modified to highlight critical points as identified by reviewer.

6) No Response.

Comments

A. What is the best/most unique part of the analysis?

No Response.

B. What is the most critical aspect of the study/analysis? Why?

The recommendations that appear primarily in Appendix B should be prominent in pp. 1-18, especially those related to adaptive management. The unique biological productivity and diversity of the St. Mary's River ecosystem should be stated more strongly in pp. 1-18; it is quite clearly stated in Appendix A but the appearance of pp. 1-18 before could cause the stronger and better-written Appendix A to be missed.

Response: Report will be modified to highlight critical points as identified by reviewer.

C. Which aspect of the analysis/modeling is weakest? Why? How can it be improved?

No Response.

D. Are there any other suggestions that are related to how this analysis may be used more effectively or the results explicated in a more understandable manner?

My primary recommendation is that the recommendations pertaining to adaptive management, the uniqueness of the St. Mary's River, and the very real opportunity to restore some of the ecological characteristics of the system, especially with respect to sea lamprey, be stated more clearly and prominently in pp. 1-18.

Response: Report will be modified to highlight critical points as identified by reviewer.

Comments for Transmission to Authors

It would be useful to have both general comments and specific comments for major and minor revision. Please use additional sheets should they be required.

Response: Report will be modified to highlight issues as identified by reviewer.