

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

The goal of this 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” (pg 1) . As stated, the goal is very vague – helping reviewers assess methods to assess potential impacts. As a reviewer of a recent IJC report entitled “Documentation of the Integrated Ecological Response Model (IERM2) for the International Upper Great Lakes Water Levels Study”, I can’t help wonder how the St. Marys report relates to the previous report. The first 9 pages of the St. Marys report contain much of the same information that is in the IERM2 report – description of the study area (albeit somewhat more focused on St. Marys River), Lake Superior regulation plans, and approach of assessing impacts (including the notion of coping zones). Moreover, all of the St. Marys River Environmental Performance Indicators presented in Appendix B of the St. Marys report can be found in the appendix to the IERM2 report. The only new information in the St. Marys report is Chapter 4 (St. Marys River Environmental Restoration), although much of this material is covered in Environmental Performance Indicators in Appendix B.

Focusing my attention on Chapter 4, I have several comments:

- 1) it is not clear how the Environmental Performance Indicators relate to the restoration efforts described in Sections 4.2, 4.3 and 4.4. In these Sections, flow manipulations in the St. Marys River are linked to only 3 of the 10 Environmental Performance Indicators identified in Table 2. What will be done to address the other Environmental Performance Indicators?
- 2) The Environmental 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 – only a plot (Fig 1 in Fact Sheet 21) which was interpreted to indicate that lamprey control would be optimal at zero flow (i.e., no habitat); 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 lake elevation during June and July (Fig. 1 in Fact Sheet); however this discharge is not mentioned in Section 4.2. The authors state that sea lamprey catch rate is correlated with discharge over a higher discharge range (~200-400 m³/s), however this correlation is not apparent (Fig. 5, 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.
- 3) Section 4.3 does not provide any new information but summarizes the findings of PI 23 and recommends that gate changes be automated to ensure water level change rates meet the recommended change rate.
- 4) Section 4.4 describes the 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. In my opinion, future endeavors would be best to focus on: (1) better quantifying the relationship between gate openings / discharge and wetted perimeter by considering a number of cross-sections, with the goal of describing the percent area of entire St. Marys channel (and selected reaches) that is wetted under specific gate openings; (2) relating biotic condition to wetted perimeter; and (3) based on the this new information, manage the St. Marys River to by controlling the timing, frequency and extent of sufficient wetter perimeter to optimize ecological condition (i.e., minimal wetted perimeter at night during June/July to control lampreys but higher wetter perimeter during Sept-March to protect desired species) but not “spill” excess water. This likely a more achievable goal than managing for ten PIs, some of which have as yet not quantified relationship with discharge.

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 is premature in my opinion.