



NUTRIENT LOADING AND IMPACTS IN MISSISQUOI BAY, LAKE CHAMPLAIN, AND THE RICHELIEU RIVER

The governments of the United States and Canada, in consultation with Vermont and Québec, requested the International Joint Commission's (IJC) assistance to develop a summary and analysis of work done by governments and others to date addressing harmful algal (cyanobacteria) blooms in Missisquoi Bay. These algal blooms have become increasingly persistent in recent years in this binational cove of Lake Champlain.

A key component of this project has been the development of a suite of recommendations to be considered by management agencies and organizations in both countries to help achieve common management goals and ultimately to work towards mitigative solutions and reduce the frequency of harmful algal and cyanobacterial blooms.

Missisquoi Bay, a Sub-Basin of the Lake Champlain basin, is shared between the Province of Québec (42%) and the State of Vermont (58%). Missisquoi Bay has long been impaired by excessive phosphorus loads and has one of the highest in-lake phosphorus (P) concentrations of any segment of Lake Champlain (Lake Champlain Basin Program, 2018).

The 2016 Vermont phosphorus Total Maximum Daily Load (TMDL) for Missisquoi Bay estimates that a 64.3% reduction in load is needed to meet the TMDL allocation for the Missisquoi Bay segment (US EPA, 2016). The largest source of P loading to the bay is from agricultural activities (Vermont DEC, 2013; OBVBM, 2015). Phosphorus rich sediments have accumulated in Missisquoi Bay over many decades, and the potential release of this phosphorus to the water column presents an additional management challenge.

THE PROJECT HAS INCLUDED FIVE MAIN TASKS:

1. Compilation of materials for a review of existing literature on nutrient loading and impacts on Missisquoi Bay
2. Analysis of materials assembled through the literature review. This task included interviews with experts in Vermont, New York, and Québec to assess the effectiveness of existing efforts, data gaps, and opportunities for strengthening coordination and governance
3. Development of recommended approaches to strengthen current efforts
4. Consultation with the public and agencies in the Basin on recommended approach options
5. Development of a Project Final Report summarizing key findings and recommendations

References :

Lake Champlain Basin Program (2018) - State of the Lake and Indicators Report

US EPA (2016) Phosphorus TMDLs for Vermont Segments of Lake Champlain

Vermont DEC (2013) - Missisquoi Bay Basin Water Quality Management Plan

OBVBM (2015) Plan directeur de l'eau du bassin versant de la baie Missisquoi. OBVBM, Bedford

THE KEY MANAGEMENT RECOMMENDATIONS FOR REDUCING THE NUTRIENT LOADS CAUSING THE PROLIFERATION OF CYANOBACTERIA IN MISSISQUOI BAY INCLUDE:

1. Create and coordinate a Binational Phosphorus Reduction Task Force to strengthen cooperation and accountability between the Parties in order to achieve mutually agreed upon goals
2. Develop a binational mass balance analysis for phosphorus imports and exports in the Missisquoi Bay watershed
3. Reduce phosphorus application to land in the Missisquoi Bay watershed
4. Increase the proportion of crop systems that contribute less phosphorus
5. Increase the protection and enhancement of flood plains, wetlands, and forest lands and ensure their reconnection for nutrient storage
6. Engage with public stakeholders to commit to clean water and healthy ecosystem goals

Beyond these six priority recommendations, the report also includes several additional recommendations organized around the themes of agriculture, regulation and funding, research, developed areas, and legacy sediments in Missisquoi Bay. The development of the recommendations and project report was guided by a Champlain Study Advisory Group comprising lake and watershed science and policy experts in the U.S. and Canada. The Missisquoi Bay basin has been significantly impacted by human activities since the region was settled by Europeans over 400 years ago. In addition to the actions and policies recommended herein, time will be required for the system to recover from these long-term nutrient inputs and landscape impacts. While it is difficult to predict how long the recovery will take, especially with the uncertainties posed by climate change and extreme events, the Champlain Study Advisory Group believes that the actions recommended in this report will accelerate the pace of recovery and increase the likelihood of successful restoration.

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