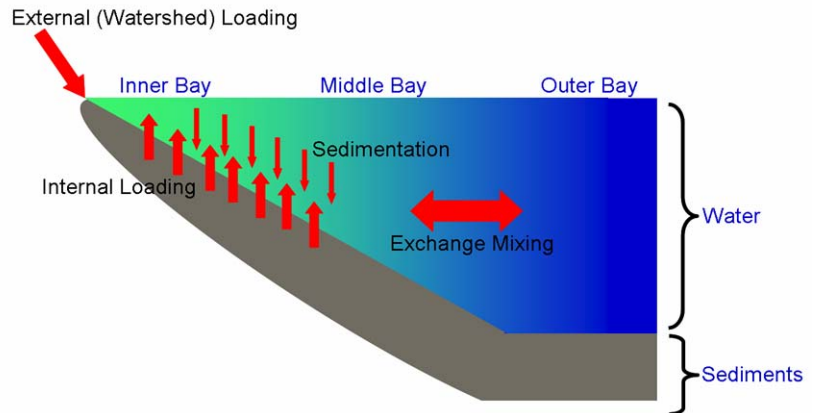


St. Albans Bay Studies

The Problem

Phosphorus has accumulated in the sediments of St. Albans Bay from decades of excessive loading from point and nonpoint sources in the watershed. This sediment store of phosphorus is now recycling back into the water and is continuing to feed algae blooms in the bay in a process called “internal loading.” Water quality standards in St. Albans Bay may not be achieved until this internal phosphorus loading from the bay’s sediments declines.



The phosphorus cycle in St. Albans Bay, showing internal phosphorus loading from the bay’s sediments.

The Program

The Lake Champlain Phosphorus TMDL proposed consideration of treating the sediments with alum (aluminum sulfate) to control the internal loading. The TMDL plan indicated that such a treatment should be conducted only if it is shown to be technically feasible and environmentally acceptable, and only after progress is made in reducing the existing nonpoint source phosphorus loading from the bay’s watershed.

A St. Albans Bay sediment core study funded by Clean and Clear and conducted by the University of Vermont Department of Geology during 2004 found that a substantial reservoir of phosphorus remains in the sediments of St. Albans Bay and that this stored phosphorus has the potential to recycle back into the water of the bay for a long period of time into the future. Given these findings, the Agency of Natural Resources initiated a feasibility study for the control of internal phosphorus loading in St. Albans Bay using Clean and Clear funds.

The feasibility study was designed to be conducted in two phases. The purpose of the first phase was to compare treatment options for the control of internal phosphorus loading in St. Albans Bay as to their feasibility, likelihood of success, environmental impacts, and cost. Phase 1 of the feasibility study was completed by ENSR Corp. in 2007³. The report included an evaluation of several alternatives including artificial circulation, hydraulic dredging, and phosphorus inactivation in lake sediments and/or tributary inflows with chemicals such as alum.

³ ENSR Corp. 2007. Feasibility Study for the Control of Internal Phosphorus Loading in St. Albans Bay, Lake Champlain. Prep. for Vermont Agency of Natural Resources. Waterbury, VT.
<http://www.anr.state.vt.us/cleanandclear/StAlbansBay-FinalReport-Phase1.pdf>

Program Accomplishments

Phase 2 Feasibility Study for Control of Internal Phosphorus Loading

After considering the findings and recommendations in the Phase 1 study report and the advice from a Project Advisory Committee composed of basin scientists, resource managers, and local citizens, the Vermont ANR has determined that the next phase of the feasibility study should proceed. The purposes of Phase 2 will be to develop a detailed design for an in-lake treatment project including refined cost estimates, and to prepare a full environmental evaluation including all information needed for state and federal permitting. By proceeding with feasibility studies for the control of internal loading concurrently with renewed efforts to reduce nonpoint source loads from the bay's watershed, a future in-lake treatment could be closer to realization once a judgment is made that watershed loads are sufficiently reduced to justify such a treatment.

The Vermont ANR worked successfully during 2008 with the U.S. Army Corps of Engineers and the Lake Champlain Basin Program to secure technical approval and funding for the Phase 2 study through Section 542 of the U.S. Water Resources Development Act of 2000. A Project Management Plan is currently in preparation by the Corps of Engineers.

The specific treatment alternatives that will be the focus of the Phase 2 analysis will be (1) phosphorus inactivation of the sediments within the Black Creek Wetland and inner St. Albans Bay using aluminum compounds (alum and sodium aluminate), and (2) hydraulic dredging of an area limited to the open-water portion of the Black Creek Wetland.

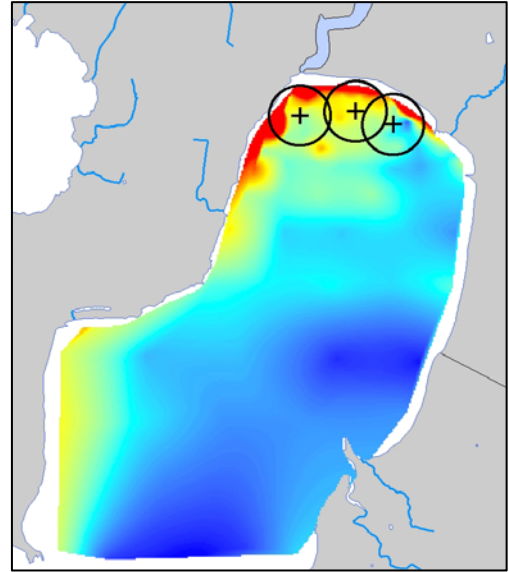
New Flow Gage and Monitoring Stations

There has been no regular monitoring of phosphorus loads in the St. Albans Bay watershed since 1992. This is because the streams in this watershed fell below the drainage area cutoff initially used in designing the Lake Champlain Long-Term Monitoring Program, and because no stream gages existed in the watershed to support phosphorus loading estimates. However, it is recognized that long-term monitoring of phosphorus loading rates to St. Albans Bay is important for assessment of progress in controlling nonpoint sources in this high-priority watershed.

At the request of the Vermont ANR, the Lake Champlain Basin Program approved funding this year for the installation of a new stream flow gage by the U.S. Geological Survey on Jewett Brook. This new gage became operational in October, 2008. Flow data from this new gage and from an existing gage on Stevens Brook in the City of St. Albans will support the calculation of phosphorus loading rates to St. Albans Bay from these two tributary streams. With the addition of this flow measurement capability, phosphorus sampling stations on these two streams have been added to the sites sampled regularly as part of the Lake Champlain Long-Term Monitoring Program. Phosphorus loading estimates for St. Albans Bay tributaries will be included in future reports from this program.

Artificial Circulation Study

In an effort to provide some near-term localized relief from algae blooms in St. Albans Bay, the Town of St. Albans and the St. Albans Area Watershed Association conducted a trial installation of artificial water circulation devices in St. Albans Bay with grant support from the Vermont ANR. Three SolarBee® devices were operated in St. Albans Bay during May-September 2007 with the goal of reducing algae levels and improving water clarity over an area of approximately 100 acres off the town beach at the northern end of the bay. The Vermont ANR evaluated the effectiveness of the circulators by lake monitoring during the deployment period, and issued a report⁴ in 2008 on the results of the study. The ANR study found no evidence that the circulators in St. Albans Bay reduced algal concentrations, improved water clarity, or inhibited blue-green algae in the bay. Unfortunately, the treatment goal of producing an approximately 100-acre zone of clear, low-algae water at the northern end of St. Albans Bay was not achieved by the circulator deployment.



Distribution of algal chlorophyll-a concentrations in St. Albans Bay on July 26, 2007 in relation to the three 35-acre SolarBee treatment zones (circles)⁴. Highest chlorophyll concentrations are shown in red.

⁴ Smeltzer, E., P. Telep, A. Shambaugh, and P. Stangel. 2008. Evaluation of the effectiveness of SolarBee® water circulation devices in reducing algae blooms in St. Albans Bay, Lake Champlain. Vermont ANR. Waterbury, VT. <http://www.anr.state.vt.us/cleanandclear/SolarBee%20Report%20Final.pdf>