Lake St. Catherine Conservation Fund, Inc.
Wells & Poultney, Vermont

Lake Recovery and Restoration Strategy

This document presents a strategy for the restoration of Little Lake St. Catherine to accustomed use of the past. History shows that the lake has been in existence as a lake for at least hundreds of years, and our goal is to re-establish the conditions that prevailed during the many years the lake was a beautiful body of water suitable for boating, fishing, swimming, and other water recreational activities, an era that existed consistently until only a few decades ago. In the Lake St. Catherine Conservation Fund's pursuit of this objective, we have set forth a list of specific aims that we will accomplish over time:

- Reduce sediment / increase depth
- Reduce and control Eurasian milfoil
- Reduce and control native nuisance weeds
- Improve navigation
- Improve fish habitation
- Provide for swimming
- Stabilize and maintain the lake as a balanced system
- Reduce nutrient runoff from surrounding properties

In achieving these goals we have carefully investigated the benefits and disadvantages of the application of various procedures which we have studied and continue to research. We have observed restoration procedures in three other lakes. Listed here are among the many common lake management practices in use in the United States and around the world.

- Hydro-raking
- Application of herbicides
- Aeration
- Hydraulic Dredging
- Enzyme / Bacterial treatment (Bioremediation)
- Suction Harvesting
- Mechanical Harvesting
- Septic system innovations and upgrades (e.g. peat moss system)
- Weed-eating carp
- Native Weevil used to stabilize milfoil
- Creation of buffer gardens to prevent runoff
- Lake Draw-down
- Benthic Barriers
- UV-blocking dyes

We have created a plan for the lake restoration by selecting from among these and other options those implementations that appear to hold the most potential for achieving our aims. During the period of restoration, we will conduct conscientious assessments of our progress and monitor all the aspects of change to insure that safe and healthy conditions prevail as we proceed toward a return to accustomed use. Our lake is an ecosystem containing many living organisms that interact with one another and with their environment, in a balanced web of life. This lake restoration process will restore and maintain that vital balance. These restoration techniques will remove bottom organic muck, greatly improve fish growth and health, and reduce aquatic weeds, algae, foul odors and disease bacteria. This water restoration process not only helps to improve water quality, it also enhances aesthetic value and life forms in and around the water body. The degeneration we have been experiencing due to the ongoing process of eutrophication, which has been defined as "the increase in mineral and organic nutrients that results from a deficiency in dissolved oxygen, producing an environment that favors plant life over animal life," can be reversed.

Left: Little Lake St. Catherine is loaded with Eurasian watermilfoil. Residents are constantly raking their lakefront areas.

Right: Algae blooms leave a disgusting slick on the surface of the lake in spring and summer.

Lake History: Our thorough research of the historical records and maps of Little Lake and the channels has produced the following particulars:

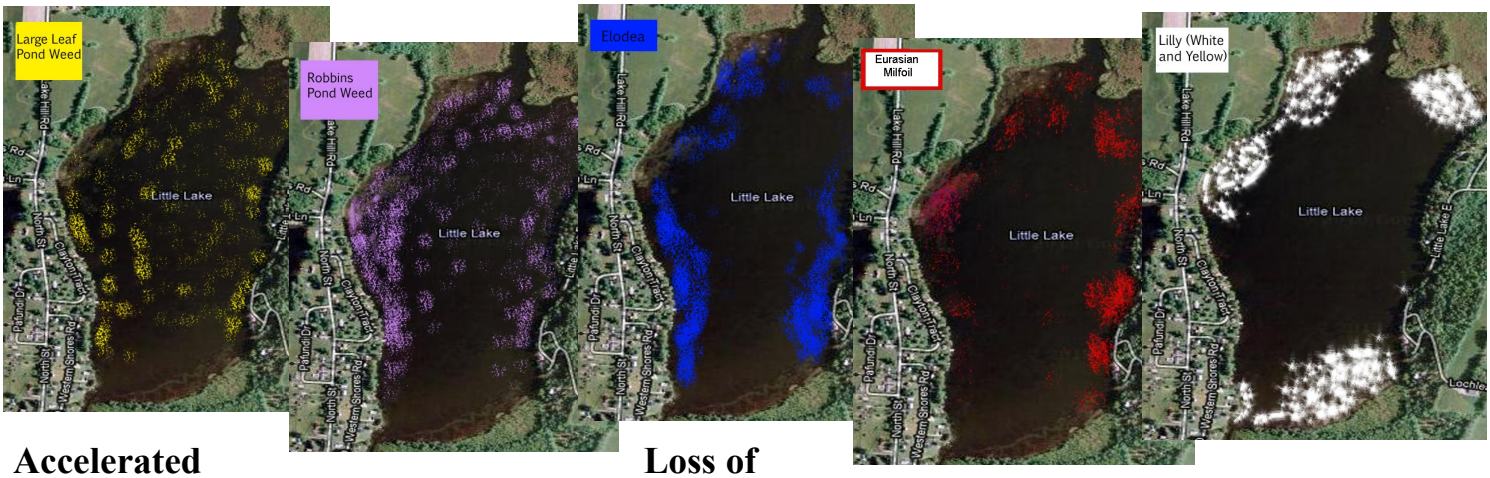
- Little Lake has been a Lake for thousands of years. Like the main lake it was carved out by the glaciers during the last ice age that ended 12 thousand years ago.
- It has functioned as a *settling basin* for organic material and sediment since then. The shallow lower channel indicates the northern end of the channel probably provided a natural dam for much of this history, undoubtedly aided by beaver activity.
- The settling basin has inevitably filled up, accelerated by high levels of human activity in recent history.
- Many residents attest to swimming and boating easily in parts of the Little Lake as recently as 25 years ago that are now impassable due to banks of weeds and even mud flats.

<u>Conclusion:</u> Little Lake has had a bright, healthy multi-use past, including the very recent past. Therefore, it is most appropriate to consider restoration techniques and investment in this invaluable resource to return it to "accustomed use."

Mapping Aquatic Vegetation: Using ANR's Lay Monitoring Program as our pattern, the LSCCF has developed an Aquatic Vegetation Survey Program for the Little Lake portion of the Lake St. Catherine Lake System.

Proper management of any lake's aquatic vegetation is not merely a process of killing unwanted invasive species, but rather a challenge to maintain the delicate balance of native aquatic plant life as to best serve a diverse ecosystem.

The first step in a well- thought-out management plan is understanding the state of current conditions. The following maps give us a general idea of the aquatic vegetation of the Little Lake as of early July 2010. These maps are based on visual recognition of the plant life and its locations:



Accelerated Loss of Water Depth:

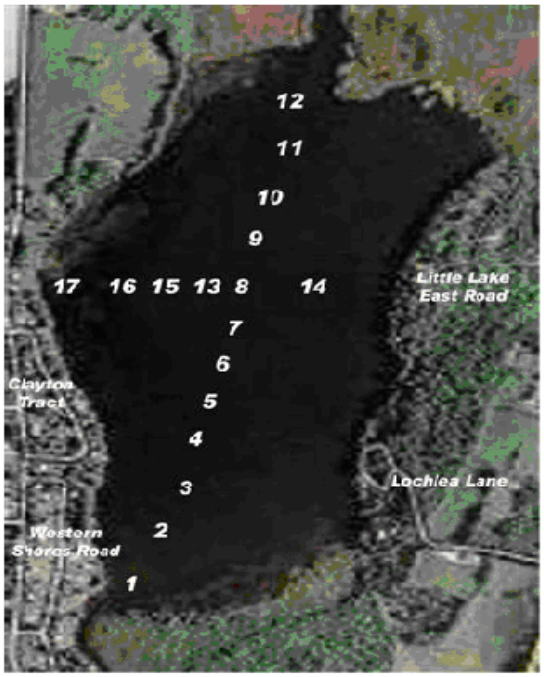
A recent report suggested that the lake is filling in at the rate of about 1" – 2" per decade. This estimate was offered as a mathematical average, based on a change over a period of several decades. It presumes that the change takes place at a consistent or linear rate. However anyone who has observed the conditions in the lake can easily testify that the change in the last decade has been dramatically greater than an inch or two. With the sediment layer increasing annually, the water depth continues to diminish. The process is not linear, but accelerates on a curve with time: As vegetation dies off the sediment layer is increased, and the water depth is decreased. Shallower conditions allow more sunlight to reach the substrate for plant life. The greater amounts of vegetation continue the cycle and the process continues to accelerate at an even greater pace.

Members of the LSCCF have watched and carefully measured the depth of the lake as seen on the previous page. The following chart compares our findings over the last three years, from 2007 to 2010, with both survey figures based on mid-summer readings. It is clearly evident that the loss of water depth is occurring at a rate that seriously threatens the future use of the lake for accustomed use.

Comparison of Water Depth Measurements in Little Lake St. Catherine from 2007 to 2010

Location see depth survey map	Year 2007 depth (in inches)	Year 2010 depth (in inches)	Change in depth	% Decrease in depth
1	48	42	-6	0.13
2	60	46	-14	0.23
3	60	48	-12	0.20
4	60	46	-14	0.23
5	48	42	-6	0.13
6	54	44	-10	0.19
7	60	48	-12	0.20
8	60	48	-12	0.20
9	60	48	-12	0.20
10	60	50	-10	0.17
11	60	50	-10	0.17
12	72	58	-14	0.19
13	48	42	-6	0.13
14	48	42	-6	0.13
15	42	38	-4	0.10
16	30	24	-6	0.20
17	18	10	-8	0.44

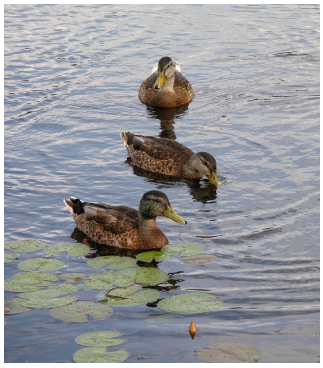
Average change in water depth = - 9.3 inches
Average % decrease in water depth = 19%



Consistency with Vermont Regulatory Statutes: The restoration plan of the Lake St. Catherine Conservation Fund, Inc. is in keeping with Vermont statutes as it aims to restore the Lake St. Catherine lake system for the public good, as defined in Vermont Statute as the "***effect … on water quality, fish and wildlife habitat, aquatic and shoreline vegetation, navigation and other recreational and public uses, including fishing and swimming, consistency with the natural surroundings and consistency with municipal shoreland zoning ordinances or any applicable state plans.***" (Title 29: Public Property and Supplies, Chapter 11: Management of Lakes and Ponds, Paragraph 405) We proceed with these goals in good faith in the obligation of the state of Vermont to protect the public trust, as stated in VERMONT AGENCY OF NATURAL RESOURCES, DEPARTMENT OF ENVIRONMENTAL CONSERVATION, EXPLANATION OF PUBLIC TRUST: ***Vermont law declares that the lakes and ponds of the state and the lands lying underneath them are held in trust by the state for the benefit of all Vermonters. This basic concept is referred to as the Public Trust Doctrine, a concept which can be traced back through English common law to Roman law. As trustee of these waters and lands, the state, through the Department of Environmental Conservation, has an obligation to manage Vermont's lakes and ponds in a manner which preserves and protects a healthy environment, guarantees the right of Vermonters to hunt, fish, boat, swim, and enjoy other recreational opportunities, and provides the greatest benefit to the people of the state.***

About the Lake St. Catherine Conservation Fund: The Lake St. Catherine Conservation Fund, Inc. is a 501 c3 public charity organized in 2009 to address the problems facing the lake system. With Wells resident Bill Steinmetz as president, and 11 directors, the LSCCF has over 91 member families. LSCCF's vice president, Ron Dreher, serves on the board of directors of the Federation of Vermont Lakes and Ponds.

Focusing first on the Little Lake and its channels, the LSCCF found that the lake is undergoing a degrading process called eutrophication. Unhealthy levels of sediment have accumulated and nuisance levels of aquatic vegetation—native and invasive—are taking over the lake. The profuse nuisance vegetation creates an unsightly surface, renders parts of the lake no longer navigable by motorboats, degrades fishing, and creates an unhealthy environment for aquatic diversity. Applications of herbicides over recent years have failed to effect an improvement in Little Lake. The LSCCF aims to use various techniques to restore the lake to an ecologically balanced condition that offers the accustomed uses of the past: boating, fishing, swimming, and an aesthetically pleasing appearance.



Through surveys, research, observation, and monitoring, the LSCCF has found information about the Little Lake dating back to the 1700's. These data have helped to formulate a long-term strategy that will begin to bring about the desired controls and changes.

Restoration techniques being considered by the LSCCF are hydraulic dredging, a technology called bioremediation, weed harvesting, and the targeted use of herbicides.

In 2010 the LSCCF was awarded its first permit by the Vermont Agency of Natural Resources to conduct a dredging operation in the lower channel. This will temporarily improve shore owners' properties, allow for navigation, and permit better current flow.

In October of 2010, the LSCCF held its first annual Lake Summit, bringing together three representatives of the Vermont ANR, a limnologist from Rensselaer Polytechnic Institute, the Director of Fisheries, the manager of the Poultney-Mettowee ConservationDistrict, and the president of the Lake George Association. Two contractors specializing in bioremediation and a specialist in hydraulic dredging made presentations. Also in attendance were two mayors who gave testimony about the restoration of their own local lakes, ones which had been examined by LSCCF representatives earlier in the year. The meeting was enthusiastically attended by over 85 people.

This document presents a restoration strategy that is the result of nearly one year of study by the LSCCF of the history of Lake St. Catherine, the current conditions, and contemporary lake management technology. The LSCCF strategy seeks to use the lake management methods described herein wisely and effectively as conditions indicate. The LSCCF awaits permits from the Vermont ANR to implement these techniques. In addition, the LSCCF is seeking grant funding from the Lake Champlain Basin Grant program.

Research Initiatives: Initiate necessary steps to move toward all implementation of initiatives in October 2010. Provide adequate data to substantiate the actions through these actions:

- Conduct depth survey with GPS notations of the Little Lake by radar during winter of 2010-2011.
- Survey northwest corner and eastern shore for depth and aquatic plants.
- Conduct weed and plant surveys with detailed GPS controlled maps on Little Lake and channels.
- Advance discussions on herbicide usage based upon Allied Biological Report
- Investigate Little Lake bottom conditions.
- Documentation of the efficacy of bioremediation, including October 29 Lake Summit Conference in Wells. Begin formulating a plan for implementation.
- Document the efficacy of hydraulic dredging, and begin formulating a plan for its implementation.
- Collect further input from scientists, including Larry Eichler of Rensselaer Polytechnic Institute.
- Acquire input from the Fish and Wildlife division as well as the Rutland Bass fishing club, with documentation of the optimum plant–to-open water ratio for a healthy ecosystem.
- Continue search for examples of other lakes that have been successfully restored from similar conditions.
- Continue to update, extend, modify and improve this strategy.

Implementation Program: In view of the above considerations, we recommend the following plan as a beginning to the restoration of the Little Lake:

- Winter 2010 onward: Encourage local and state government in siltation management initiatives, including back roads improvements.
- Winter 2010 / 2011 onward: Encourage shore property owners in planting runoff barriers and cleaning septic field issues.
- Spring 2011 onward: Review of broad spectrum of herbicides and consider treatments earlier in the season, as recommended by Allied Biological.
- Spring 2011 onward: Conduct a program of dredging in targeted areas.
- Spring 2011 onward: Conduct a program of bioremediation in significant areas of the Little Lake and channels.
- Spring 2011 onward: Continue to provide a service for cleaning around property owners' shorelines; either by suction harvesting, hydraulic dredging, or hydro-raking. Develop a program for the channels.
- Summer 2011: Begin a program of weed harvesting (either mechanical or diver-assisted) coordinated with other implementation initiatives.

The Lake St. Catherine Conservation Fund is a 501 c 3 Public Charity, qualified to receive tax deductible donations under the Internal Revenue Service code.