

THE STATE OF THE LAKE

UPPER SARANAC LAKE

The Lake and its Watershed

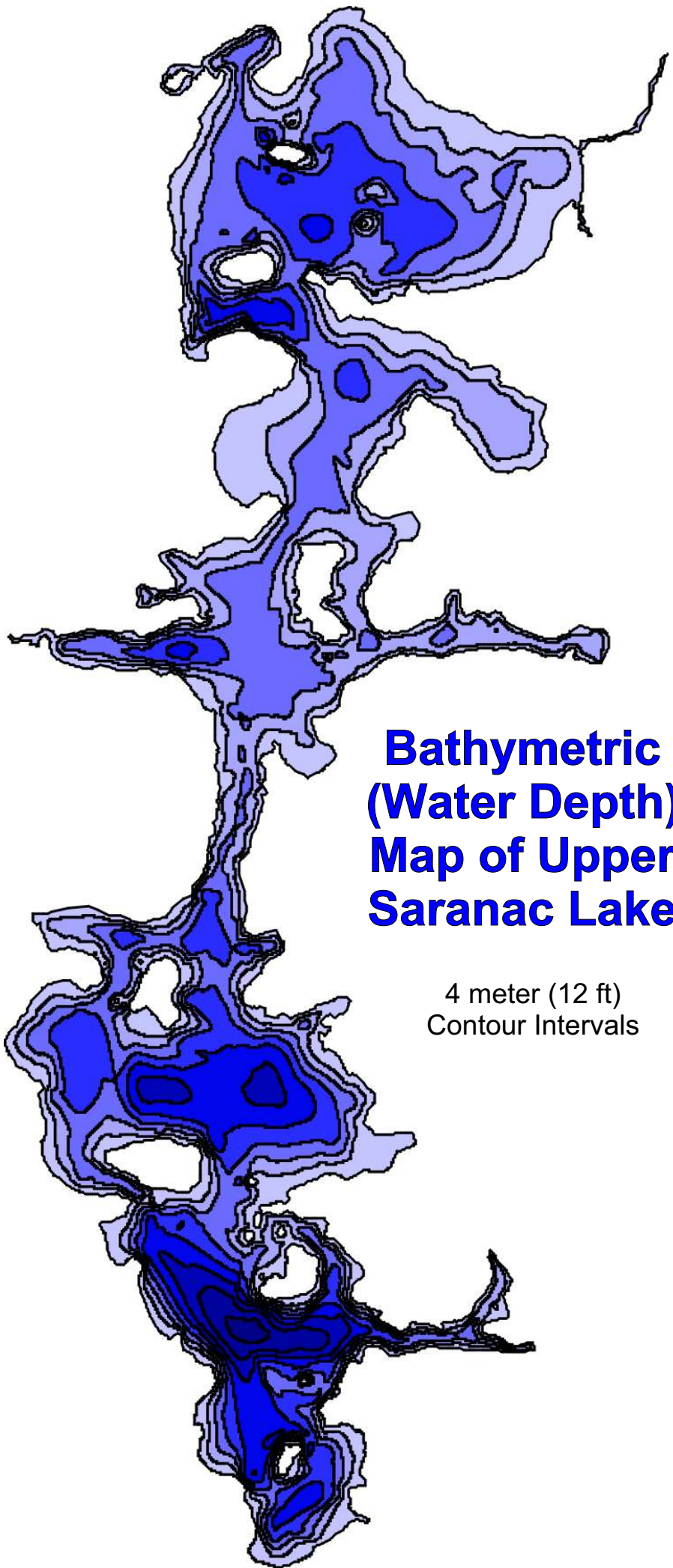
Upper Saranac Lake is a 5,200 acre body of water located in southern Franklin County, NY, roughly midway between the towns of Tupper Lake and Saranac Lake. Upper Saranac Lake and its watershed form the headwaters of the Saranac River, one of the main tributaries to Lake Champlain. The outlet of Upper Saranac Lake drains into Middle and Lower Saranac Lakes. The lake is a highly utilized recreational resource in the Adirondacks, providing a wide variety of water-related activities such as swimming, fishing, water skiing, and boating. Upper Saranac Lake also supports both a warm water and cold water fishery and is equally valued for its exceptional aesthetic value. The user population of the lake includes large numbers of non-residents and local citizens because of a number of large summer camps around the lake. Upper Saranac Lake is also a popular destination for recreational canoeists and is considered a prime destination for recreational activities in the region.

Approximately forty-six percent of the shoreline is in State ownership. Primary camping areas on this State land include Buck Island, Square Bay, Green Island, Indian Point, Picnic Rock and Saginaw Bay. Major access points to Upper Saranac Lake are Bartlett Carry, Fish Creek and Rollins Pond State Campgrounds, the DEC Fishing Access Site at Indian Carry, the DEC Boat Launch at Saranac Inn, and the Weller Pond Carry. The area is also served by a private boat livery, Young Life Village and Eagle Island Girl Scout Camp provide access for large, organized groups from their properties on the lake.

The Upper Saranac Lake watershed lies primarily in two towns: Santa Clara and Harrietstown. A small portion of the western watershed lies within the town of Altamont. Population density within the Upper Saranac Lake watershed is characterized as "low density" by the U.S. Census Bureau (1990). Forty-six percent of the lake's 48,383 acre watershed is classified as either wild, forested, conservation lands or public parks. An additional twenty-one percent of the watershed consists of lakes and ponds. Residential development comprises about seventeen percent of the watershed.

Lake Facts

Lake Surface Area	5,200 acres
Lake Surface Elevation	1,580 feet MSL
Length of Lake	7.5 miles
Greatest Width of Lake	2.0 miles
Length of Shoreline	37 miles
Maximum Depth	95 feet
Average Depth	26 feet
Lake Volume	1.5 million m ³



Background Information

The Saranac Lake chain, including Upper, Middle and Lower Saranac Lakes, is extremely valuable to the local, regional and state economies. Restoring and preserving good water quality in Upper Saranac Lake will protect Middle and Lower Saranac Lakes as well. These lakes provide exceptional recreational opportunities, hence the public at large, the business community and the local, county and state governments will benefit from the implementation of a sound lake and watershed management plan for Upper Saranac Lake.

Lake Classification and standards

The Upper Saranac Lake has been classified as AA which means that the best uses of the lake are:

- a source of water supply for drinking, culinary or food processing purposes;
- primary and secondary contact recreation,
- fishing,
- the waters shall also be suitable for fish propagation, and the waters, if subjected to approved disinfection treatment, with additional treatment if necessary to remove naturally present impurities, meet or will meet DOH drinking water standards and are or will be considered safe and satisfactory for drinking water purposes.

Based on research in the State Department of Health Water Pollution Control Recommended Classifications and Assignment of Standards for Lake Champlain Drainage Basin, September 1954, Upper Saranac Lake was recommended to be classified as AA Special. The reason for this was, "Water is freely used (by individuals) from the various ponds and lakes of the headwaters of the Saranac River, including Upper Saranac Lake, Middle Saranac Lake, Lower Saranac Lake, especially where there are vacation cabins and cottages." However, the lake was classified as AA in DEC final use classifications and has remained that way.

Most of the tributaries are classified as AA(T). The "T" designation is for trout waters and the dissolved oxygen specification for trout waters shall apply thereto.

Diagnostic Study

A Diagnostic Study is used to determine the nature and source of water quality problems in lakes. A Diagnostic Study was conducted on Upper Saranac Lake during 1985 - 1986. Water quality monitoring stations were established within the lake, on major inlets, and the lake outlet. Weather stations were set up within the watershed. Analyzing and interpreting over a million points of collected data on stream flow, lake and stream chemistry, and weather led to the publication of a "State of the Lake" report for Upper Saranac Lake.

The findings of the Diagnostic Study were used, together with input from a Citizen's Advisory Committee, to establish a long-term management plan for the lake and its watershed.

Previous Studies

Studies of the lake to document water quality date back to 1929, when the New York Conservation Department completed surveys of lakes within the Champlain Basin. Studies in 1971 and 1981 were completed to investigate possible water quality problems and a decline in the lake's fishery. The lake was listed on DEC's Priority Water Problems list in 1991 due to use impairment from high phosphorus levels, algal blooms and low dissolved oxygen levels. In response to a noted decline in water quality, the USLA began funding an annual monitoring program in 1989. Following lake-wide blooms of bluegreen bacteria in the winter of 1989 and throughout the summer and fall of 1990, DEC conducted a joint study with the Microcosmic Environmental Research Institute from Paul Smith's College, precursor to AAI. Annual monitoring funded by the USLA continued through 1994.

In 1996, DEC and AAI, acting as a consultant for the USLA, jointly began a large study of Upper Saranac Lake funded by the U.S. Environmental Protection Agency (EPA) Clean Lakes Program. The study was called a diagnostic-feasibility study. A major purpose was to measure phosphorus loading to the lake from its major tributaries and other major sources, and to develop a phosphorus model for Upper Saranac Lake. The model is used to recommend phosphorus load reductions where possible in this Management Plan. The diagnostic study is also known as the State of the Lake Report and was completed in February 1998. This Management Plan is the feasibility portion of the study.

Surficial Geology

Glacial Till	36 percent
Outwash Sand & Gravel	26 percent
Surface Water	21 percent
Kame (fine) Deposits	6 percent
Bedrock	4 percent
Muck & Peat (swamp)	4 percent
Lacustrine (lakebed) Sand	2 percent

Bedrock Geology

Igneous Metamorphic Rock	92 percent
Other Metamorphic Rock	7 percent
Underlying Bedrock unknown	1 percent

Land Use in Watershed

State Lands	46 percent
Water	21 percent
Residential	17 percent
Vacant	9 percent
Community Services	6 percent
Agriculture	< 1 percent
Commercial	< 1 percent
Recreation	< 1 percent
Industrial	< 1 percent

Lake Fisheries

The fish community of Upper Saranac Lake has had few changes since the lake was first surveyed in 1929. However, it is known that many nonnative gamefish were introduced prior to 1929 and had a profound impact on the native fish community. The table to the right lists the current and historic status of the fish species known to inhabit Upper Saranac Lake.

DEC manages Upper Saranac Lake as a two-story fishery. A total of 31,000 lake trout, rainbow trout and brown trout are stocked annually to enhance the Coldwater fishery. Smallmouth bass and northern pike are the major warmwater gamefish. Yellow perch, rainbow smelt, and brown bullhead are other species popular with anglers. Rough estimates of angler use and expenditures for the lake indicate a range of 62,000 ± 14,240 days/year and \$337,000-487,000 in 1988 dollars contributed to the local economy.

STATE OF THE LAKE & MANAGEMENT PLAN SUMMARY

This a summary of two important documents produced to better understand and manage the water quality of Upper Saranac Lake: The State of Upper Saranac Lake, NY and the Management Plan for Upper Saranac Lake. The State of Upper Saranac Lake was prepared by a team of scientists as the culmination of an 18 month lake and watershed study. It was published in February 1998. The Management Plan, prepared by a Citizen Advisory Committee, is a comprehensive outline of actions to be undertaken in order to preserve and restore Upper Saranac Lake. It was published in October 1998.

Water Quality

Lake water quality can be summarized by examining a few key parameters. Those parameters and the water quality of Upper Saranac Lake are described here.

Phosphorus

Phosphorus is one of the three main nutrients of life, along with nitrogen and carbon. In the northeast, phosphorus is the nutrient that most often controls productivity of lake systems. Total phosphorus is a measure of all forms of phosphorus, both organic and inorganic. Total phosphorus concentrations are directly related to the trophic condition (water quality status) of a lake. Excessive amounts of phosphorus lead to algae blooms and loss of oxygen in lakes. Surface water total phosphorus concentrations less than 10 micrograms per liter (µg/L) are associated with oligotrophic (clean, clear water) conditions and concentrations greater than 25 µg/L are associated with eutrophic (nutrient-rich) conditions.

Phosphorus concentrations in Upper Saranac Lake averaged 13.6 µg/L in the north basin and 12.0 µg/L in the south basin during the Diagnostic Study, classifying the lake as mesotrophic (having moderate nutrient enrichment).

Chlorophyll a

Chlorophyll a is the green pigment in plants used for photosynthesis, and measuring it provides information on the amount of algae (microscopic plants) in lakes. Chlorophyll a concentrations can also be used to classify lake trophic state. Chlorophyll a concentrations less than 2 micrograms per liter (µg/L) are associated with oligotrophic conditions, while concentrations greater than 8 µg/L are associated with eutrophic conditions.

Chlorophyll a concentrations in Upper Saranac Lake averaged 9.0 µg/L in the north basin and 7.8 µg/L in the south basin during the Diagnostic Study, classifying the lake as borderline mesotrophic-eutrophic (having moderate to high nutrient enrichment).

Transparency

Transparency is a measure of water clarity in lakes and ponds. It is determined by lowering a 20 cm black and white disk (Secchi disk) into a lake to the depth where it is no longer visible from the surface. Since algae are the main determinant of water clarity in non-stained lakes that lack excessive amounts of inorganic turbidity (suspended silt), transparency is used as an indicator of lake trophic state. Transparencies greater than 4.6 meters (15.1 feet) are associated with oligotrophic conditions, while transparencies less than 2 meters (6.6 feet) are associated with eutrophic conditions.

Transparency in Upper Saranac Lake averaged 4.0 meters in the north basin and 4.6 meters in the south basin during the Diagnostic Study, classifying the lake as mesotrophic (having moderate nutrient enrichment).

pH

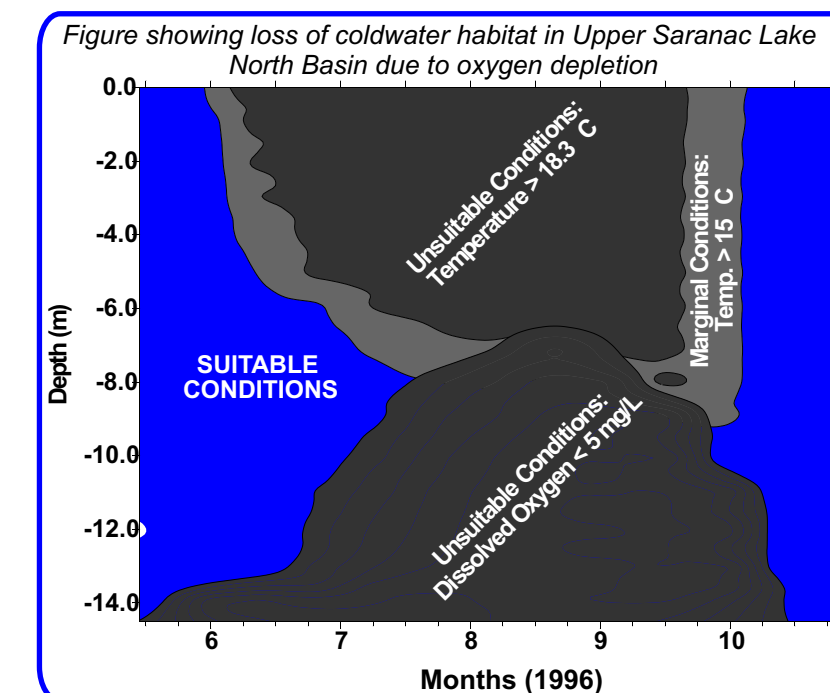
The pH level is a measure of acidity (concentration of hydrogen ions in water), reported in standard units on a logarithmic scale that ranges from one to fourteen. On the pH scale, seven is neutral, lower numbers are more acid, and higher numbers are more basic. In general, pH values between 6.0 and 8.0 are considered optimal for the maintenance of a healthy lake ecosystem. Many species of fish and amphibians have difficulty with growth and reproduction when pH levels fall below 5.5 standard units.

The pH levels in Upper Saranac Lake averaged 6.8 in both basins during the Diagnostic Study, indicating that the lake is not presently acidified.

Dissolved Oxygen

The amount and distribution of dissolved oxygen in a lake ecosystem can affect the health of aquatic organisms and nutrient cycles. For normal growth and reproduction, adult warm water fish (i.e. bass and pike) require oxygen concentrations of at least 5.0 milligrams per liter (mg/L), and adult cold water fish (i.e. trout and salmon) require at least 6.5 mg/L of dissolved oxygen (US EPA 1986). Lakes receive most of their oxygen from the atmosphere through gas exchange at the surface. In deeper lakes like Upper Saranac Lake that stratify in the summer, the cold bottom water is isolated from the oxygen entering the upper water. If the lake sediments are rich in organic matter, bacterial decomposition uses up the oxygen in the bottom waters and the hypolimnion becomes anoxic (without oxygen). If this occurs, cold water fish habitat is lost, and phosphorus within the sediments may be released into the overlying water.

Dissolved oxygen concentrations in the bottom waters of Upper Saranac Lake become depleted during the summer months. A period of anoxia (without oxygen) lasted anywhere from early June/late July through mid-September in the north basin of the lake during the Diagnostic Study. The bottom waters in the south basin of the lake experienced reduced dissolved oxygen concentrations below 5 mg/L from early July/early August. Oxygen levels in the south basin fell below 4 mg/L in September. These reduced levels lasted through October. As a result of summertime depletion of dissolved oxygen, cold-water fish habitat is reduced within Upper Saranac Lake and phosphorus is released from the sediments. This is particularly true in the north basin of the Lake.

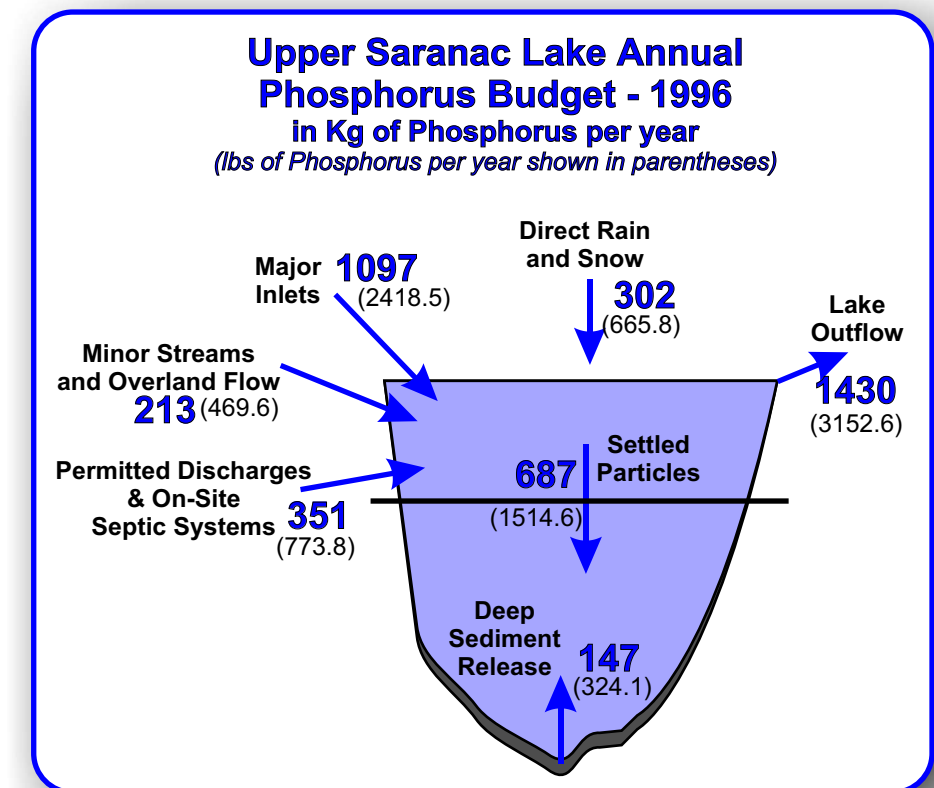


Nutrient Budget

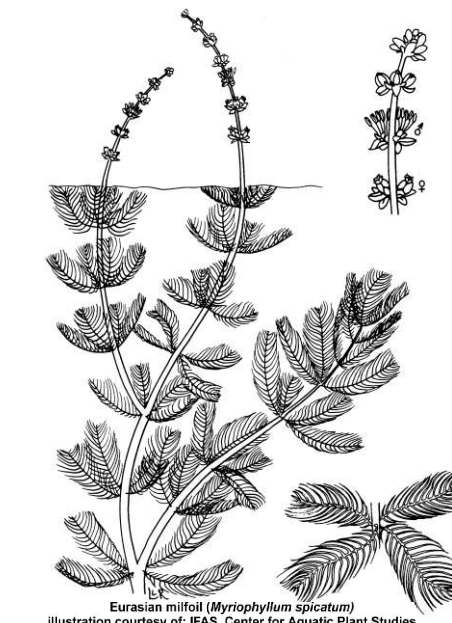
A major issue associated with managing water bodies such as Upper Saranac Lake is preventing the occurrence of algae blooms. Algae blooms are caused by excessive growth of free-floating microscopic plants called phytoplankton. The factor most often limiting phytoplankton growth in fresh water is the supply of the element, phosphorus. Since phosphorus is the factor that limits the growth of phytoplankton in Upper Saranac Lake, a phosphorus budget was developed to:

- identify and quantify the sources of phosphorus that are important in the dynamics of the lake, and
- identify actions that will reduce the loading of phosphorus in a cost-effective manner.

The phosphorus budget for Upper Saranac Lake is below, identifying the sources and movement of phosphorus into and out of the lake. The majority of the phosphorus that impacts Upper Saranac Lake comes from natural sources. All of human-made sources of phosphorus, the controllable phosphorus inputs, can be attributed to individual on-site septic systems and seventeen permitted wastewater discharges, the largest of which is the Adirondack Fish Culture Station.



Eurasian Milfoil Control



The invasive aquatic plant, Eurasian milfoil (*Myriophyllum spicatum*) was discovered in Upper Saranac Lake in 1996. Since that time, the plant has spread from a few locations to cover a great deal of the lake shore. The plant spreads primarily by fragmentation and is capable of covering large areas, excluding native plants, and interfering with recreational lake uses. A detailed description of the plant and its method of spread is presented on the other side of this fact sheet.

An aggressive management program was initiated in 1999, using SCUBA divers to hand-pull the plants from areas where native plants are still present. The SCUBA teams also place PVC mats on the lake bottom in areas where the coverage of Eurasian milfoil has already excluded most native vegetation. These benthic barriers are left in place for one season and then removed, allowing native vegetation to sprout from seeds that are stored in the bottom sediments of the lake.

You can help prevent the further spread of Eurasian milfoil within this lake and to other lakes by doing the following:

- do not boat in areas where aquatic plants are observed
- carefully examine your boat and trailer before leaving or entering any water body. Remove all plant fragments and dispose of them away from shore

Acknowledgments

Citizen Advisory Committee Members:
 Michael DeAngelo, Town of Harrietstown
 Bob Brower, Franklin County Water Quality Coordinating Committee
 Don Burgey, Town of Santa Clara
 Terry Doty, Lake Champlain Chapter of Trout Unlimited
 Henry Douglas, Saranac Lake Fish and Game Club
 George Farrell, Saranac Lake Fish and Game Club
 Pat Farrell, Saranac Lake Fish and Game Club
 Dr. Richard Handler, Upper Saranac Lake Association - Chair of Environmental Committee
 Nancy Howard, The Wawbeek on Upper Saranac Lake
 Brian McDonnell, Adirondack Challenges
 Joe Moore, Adirondack Council
 Lee Robert, Franklin County Federation of Sportsmen
 Molly Sheren, Upper Saranac Lake Association - Treasurer
 Nellie Staves, Franklin County Federation of Sportsmen
 Bill Wellman, Lake Champlain Chapter of Trout Unlimited

Technical and administrative support was provided by:
 Adirondack Aquatic Institute
 Michael Martin, F. X. Browne, Inc.
 Jay Bloomfield, Gena Gallinger, Betsy Lowe, Jim Sutherland
 and Rob Bonham (NYS Dept. of Environmental Conservation)
 Tim Holmes, Holmes and Associates
 Susan Kennedy, NYS Department of Health
 Karen Roy, Adirondack Park Agency

This fact sheet was produced as part of the implementation of the Upper Saranac Lake Management Plan by F. X. Browne, Inc., Saranac Lake NY. Funding was provided by a grant from the New York State Environmental Protection Fund.