This article by Bob Werner was published in the Skaneateles Journal *on January 17, 2007.*

A Plan for Monitoring Skaneateles Lake

We often don't appreciate what we have until we lose it. That is certainly the case with many lakes in central New York. Recent studies and news reports have highlighted some of the difficulties that lakes are struggling with at this time. Problems with invasive species, abundant algae affecting the clarity, smell and taste of the water in addition to low oxygen levels in the deeper strata of the lake, which could eventually lead to "dead zones" as was recently reported for Oneida Lake are just a few of the difficulties that local lakes face.

The Skaneateles Town Board has recognized the potential problems that could affect Skaneateles Lake in the future if precautions are not taken. Consequently, in February 2006 they established a Lake Monitoring Committee. Its members include: Dr. Charles Driscoll, John May, Dr. Chris Scholz and Dr. Robert Werner, Chair. This committee will enable the town to fulfill one of the goals of the Comprehensive Plan, which is to insure that the water quality does not decline below levels existing in 1995.

The Lake Monitoring Committee has prepared a plan for Skaneateles Lake. The data collected would include measures of water quality & clarity, productivity, weed buildup and other characteristics that might affect the nature of this exceptional body of water. The plan calls for sampling the lake on a monthly basis at 4 sites from April through October measuring phosphorus, chlorophyll, water clarity, temperature, oxygen and invasive species.

Phosphorus is the nutrient most often in short supply and is normally the primary factor limiting plant growth in lakes. Phosphorus levels in Skaneateles Lake are by far the lowest of any of the Finger Lakes. Small increases in phosphorus normally lead to relatively large increases in algal populations, which lead to decline in water clarity and ultimately reduction in oxygen in the deeper strata of the lake. Thus phosphorus is an important early indicator of eutrophication. Regular measurement of total phosphorus will give the best long-term indicator of phosphorus levels in the lake.

Chlorophyll is the plant pigment that allows for photosynthesis and is thus responsible for capturing energy to support other organisms in the lake. It is found in all photosynthetic plants, particularly algae suspended in the open water (phytoplankton). By measuring chlorophyll in the open water we can get an estimate of the biomass of the phytoplankton. Algae respond to increases in nutrients by rapidly reproducing. While some phytoplankton is necessary for the system to function (it is the base of the food chain), abundant phytoplankton in the lake reduces water clarity and reduces oxygen in the deeper strata of the lake. Thus we need to be aware of changes in the phytoplankton population.

One of the things that make Skaneateles Lake unique is the clarity of its water. If that were to decline it would be perceived as a major deterioration in the water quality of the lake and could have significant ramifications including the requirement to build a filtration plant. Modern limnological methods allow for the measurement not only of the clarity of the water but of the materials that are causing a reduction in water clarity. There are four factors that govern the absorption of light as it passes through water: the water itself; material dissolved in water imparting color to the water; phytoplankton (living particulate matter); and tripton (non-living particulate matter). Knowledge of this type is important in identifying the source of factors governing water clarity and developing means to reduce it. Modern instrumentation measuring light attenuation and scattering will allow for a rapid profile to be developed which will provide the desired information.

Temperature governs most chemical and biological reactions in water. It gives us the information

necessary to determine the depth of various strata in the lake during periods of stratification. It is very easy and inexpensive to measure, and it is very helpful in interpreting chemical and biological data.

The presence of dissolved oxygen (DO) is critical to maintaining life in the lake. Currently Skaneateles Lake enjoys excellent oxygen levels at all depths. The lake trout population survives in Skaneateles Lake because it has cool temperatures and abundant oxygen in the deeper strata during the summer. If the DO were to disappear in the deeper water it could lead to the elimination of lake trout. As the lake becomes more productive, more material settles into the deepest layers in the summer, thus reducing the dissolved oxygen. This rate of decline in DO over time can be used as an index of whole lake productivity.

The successful introduction of milfoil into Skaneateles Lake has clearly indicated the vulnerability of the lake to biological invasions. The spread of these invaders is at least in part a function of the habitat available to them in the lake. In the case of milfoil this means soft sediment in the near shore region. By monitoring milfoil we would be able to keep track of changing habitat in the near shore region of the lake where change is likely to occur most quickly. Currently the Aquatic Invasive Species Committee plans to monitor milfoil and by sharing this data there would be no cost to this committee for conducting such work.

Complementary Studies as funds permit

1. Synthesis of previous work
A variety of studies have been done on Skaneateles Lake ranging from the pioneering Finger Lakes work of Birge and Juday (1914, 1921) through more current efforts. This material needs to be gathered, analyzed and summarized. A graduate student with access to university libraries could collect and synthesize the studies for a nominal cost.

2. Short sediment cores covering the last 250 years using Pb 210.
Analyzing cores for sedimentation rate, eutrophication parameters such as Chl a, phytoplankton community composition and P might provide an historical record of changes in lake from before European settlement of the area, through the deforestation stage leading to the development of agriculture and the advent of lakeshore structures to the present. It could be used for educational purposes. The cores have already been taken. The project would be primarily one of analyzing the cores. It would, however, require a great deal of additional analysis. This could be another possible thesis project for a graduate student. Funding would most likely come from outside, but support of the Town would be helpful.

3. Sedimentation rate at mouth of selected streams
Installation of sediment traps at mouth of streams could give a measure of relative rates of sediment entering lake. This could be very valuable in identifying causes of sedimentation and may suggest management strategies to ameliorate effects.

4. Stream water chemistry, particularly nutrients, and sediment transport.
This data would provide a measure of the sources of nutrient and quantity of sediment inputs.

5. Hydrogeological Studies
Water enters Skaneateles Lake from two sources: surface runoff and subsurface ground water. Estimates of water residence times using surface runoff are in the range of 14-18 years. If subsurface flows are considered then residence times shorten dramatically to around 8 years. One of the possible implications is that subsurface inputs into Skaneateles Lake are large and possibly more significant than previously thought. By gathering information on the hydrogeology of the basin insight into the

quality and quantity of water entering the lake below the surface can be made and evaluated.