

REPORT TO CONESUS AND SILVER LAKE ASSOCIATIONS

Summer - Fall Survey, 1984*

by

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I am deeply indebted to the two lake associations for the opportunity to make the 0 and plus 10 year surveys of Silver and Conesus Lake, respectively. I join you in our thanks to the Monroe County Environmental Health Laboratory which was able to provide skilled analyses of water samples in exchange for my assistance with training and reference in knowledge of submersed vegetation.

It was a special pleasure to have the assistance of Kenneth J. Korndoerfer for a brief "reunion", since we worked together 1977-9. The best assistant I ever had.

Preface

Both lakes were similar in water chemistry before the construction and operation of the perimeter sewer around Conesus Lake in 1974. It is valuable to report on both to each of the lake associations, because the Silver Lake perimeter sewer will become operational soon. Some comparison can be made between the two lakes, but every lake has a unique ecosystem which responds in a different way from all others. Two unique features of Silver Lake are its unusual closely located inlet and outlet, and its small watershed.

Three ecosystem components were chosen for maximum information return. The limited data obtained is amplified in value because a good data base was established during a period of about 15 years, ending in 1979. The Conesus studies to approximately 1975 only have been published, but very little has been reported for Silver Lake. Stewart and Martin (1981) did publish on the movement of water between inlet and outlet.

This report is non-technical, as far as possible, as requested by the sponsors. The technical information will be preserved at the State University College at Geneseo in my files and ultimately at the Milne Library.

Background and Selection of Features to be Studied

The first published comparison of Conesus and Silver Lake was by W. Muenscher of Cornell University. Samples of algae and submersed flowering plants (also called macrophytes and, wrongly, water weeds) were collected in August of 1926 and the findings published in 1927. Earlier (1910) chemical and physical data was obtained for Conesus, but not for Silver Lake. The record for submersed plants is older, since preserved specimens collected even in the 19th Century have been located and studied.

Interpretation of lake condition through kind, variety, and amount (size of total crop) of submersed plants was developed at Geneseo during the 1970s. Several other indices to lake condition have been used in lake studies. Three index features were selected for the 1984 survey:

1. Submersed plants. A high variety of different kinds stabilize a lake, and a high crop in a fertile lake prevents a sizeable amount of nutrients from going into algae. There are also individual "indicator" species which go with clean or polluted waters.
2. Algae. The total amount at any one time or as an annual average indicates fertility, and, here too, the kind of algae indicates condition.
3. Transparency. Clarity of the water has been used in the past as an index to fertility. However, studies at Geneseo, Cornell, and Minnesota have shown that fertile

lakes can be clear - Conesus is the classic example. Clarity, then, reflects a healthy ecosystem of infertile or fertile lakes.

Methods

1. Submersed plants were collected in August when the crop was at height. Variety, amount and extreme depth were observed.
2. Algae were collected in a tube, so that the sample integrates the community from the surface to 10 meters (33 feet).
As a bonus, it was possible to measure detritus (organic products of decay), too. These particles reduce water clarity, and indicate a deficiency of small grazing animals in the lake.
3. Transparency. The secchi disk (a circular disk with alternate black and white quarters) was used. Although there are more "modern" instruments, use of the secchi disk made comparison possible with earlier data.

Data and samples were collected at two-week intervals from mid-August to mid-October. Unusually mild fall weather in October delayed the turn-over of the lake so that the last scheduled collecting date (Oct. 30) was cancelled because no marked change had occurred.

Summary of Findings and Interpretation

Conesus Lake has been relatively clear since the first record in August 1910 when the secchi depth was 6.3 meters (18.1 feet). The average from 1969 through 1973 was approximately 5 meters. During the 1984 survey the secchi depth ranged from 3 - 5 meters, or less than before sewerage. However, 1984 was an unusual year, with August rainfall among the highest on record, and following a dry period.

In comparison, Silver Lake has been less clear, the secchi disk ^{visibility} indicates depth averaging 2 - 3 meters. During the 1984 survey, the depth was 1 meter (3.25 feet).

One cause of murkiness or turbidity is the suspended algae in the water. The Conesus averages for the secchi disk do not reflect the worst episodes of algae growth, or "blooms". In 1971, a bloom year, the secchi depth went from 6.5 m in June to 25m in September. In other years, there was a huge bloom in the autumn, possibly fertilized by dying rooted vegetation. There were years when the water near the eastern shore turned milky blue, and when the outlet looked like a stream of pea soup. While such blooms might happen with an unusual combination of circumstances after sewerage, they are highly unlikely.

To apply the Conesus pattern to Silver Lake after sewerage, the episodes of algal growth to bloom proportions should decrease. The average clarity of the water should increase, but the clarity of Conesus should not be expected.

Another index to the condition of the lakes is the kinds of algae which are the most common. The blue-green algae indicate highly fertile waters when they occur in high numbers. Although the total variety of algae found in Conesus Lake in 1984 was similar to earlier years, it is quite evident that there are fewer blue-green algae. None were abundant enough to be counted except on September 4th. In contrast, in the summer of 1972, they were the second most important in biomass (total weight) exceeded only by the unusually large armored flagellate alga. During the bloom episodes previously discussed, blue-greens would have a very high biomass.

In comparison, blue-green algae were the most common group in Silver Lake throughout the 1984 survey. For example, on August 22, three species of blue-green algae made up 90% of the total. Furthermore, the total amount of algae in Silver Lake was consistently much higher than in Conesus. Even when the number of individual algae or colonies, were about the same, the amount (as volume or weight) was easily five times as high in Silver Lake.

Unquestionably, Conesus Lake now produces less algae and a smaller proportion of blue-greens than before sewerage. These changes may now be expected benefits for Silver Lake.

There is a second biological factor which reduces water clarity. This is partly decayed organic matter, detritus. On one date, September 18, the total of algae plus detritus was about equal in the two lakes. This is unusual. One reason that Conesus is clear is its good population of small crustacea

(related to shrimp, crawfish) which "vacuum" the detritus. When these energetic eaters are few, as in Hemlock Lake, much detritus remains suspended to reduce water clarity. It cannot be predicted whether a reduction in the algae of Silver Lake will enable a parallel clean-up bonus for Silver. This is a case where the ecosystem structure (what organisms and how many) is more important than simply the amount of fertilizer available to the algae.

Submersed vegetation (macrophytes or rooted plants) were neglected in most lake studies during the past Century. The studies conducted at Geneseo since 1967 have established the value of submersed plants in revealing the quality of lake water. Algae come and go rapidly, but the rooted plants remain year after year. Some even remain green under ice. It is unfortunate that they have been called "weeds". Rather they are natural vegetation as forest or prairie.

Similarly, when the community is disturbed, foreign species can invade. When the natural community deteriorates, then the "alien" species (which can establish in poor conditions and multiply rapidly) can come in. Both Conesus and Silver Lake have two foreign species, but these are kept in check by healthy native plant growth. However, Silver has suffered a greater loss of native species than Hemlock. As a smaller, shallow lake with limited flow, Silver has been subjected to more human wastes than Conesus. Conesus was initially a more varied and stable ecosystem than Silver.

When the nutrient fertilizer input is lowered, the deficiency can be observed for the algae, the rooted plants or both. In Conesus, both algae and rooted plants were reduced in quantity. It is less certain what will happen in Silver Lake. When water is so murky that light cannot penetrate past a short distance, the rooted plants are restricted to shallow waters. If pollution control reduces the amount of algae, more, not less, rooted plants should be expected.

With the very shallow light penetration recorded at Silver Lake, the extreme depth of plants in 1984 was only about 8 feet (less than 3 meters). During the 1970s, the extreme depth was 12 feet. Algae and detritus have made growth impossible from 12 to 8 feet in depth. This is probably a short range rather than a long range trend, but it underscores the urgency of the sewer project. In terms of a single season, the water must have been clear earlier, or growth would have been impossible even to 8 feet. During late season, the plants were just holding on.

The weight of standard samples (computed as grams/meters²) for Silver Lake was about the same in 1984 as in the 1970s. However, the total amount in the lake would be less, because of the shallower depth of growth.

In Conesus Lake, the crop of rooted plants was the greatest for any year since the sewer was built, but it was still one-third below pre-sewer levels. There was an unusual dislodging and wash-in of eel grass in the north end of

Conesus Lake in 1984, which made the plants visible to shore residents. Usually, they are well submersed.

The variety and relative importance of species in both Conesus and Silver Lake appear unchanged from the period when they were regularly observed (1967-1979).

Finally, as an aquatic ecologist, I do not feel that either lake has a "weed problem". Commercial exploitation has created the problem to a great extent. When submersed plants really do interfere with an activity locally, they may be controlled locally by simple cutting and gathering, but this should be done in the spirit that a gardener trims a rose bush or thins flower beds. In the complex workings of the lake ecosystem, these plants are a valuable link in the lake's productivity and stability. Mass eradication of rooted plants simply diverts nutrients (fertilizer minerals) to the algae, not only worsening the appearance of the water, but upsetting the delicate network of organisms which were responsible for keeping the lake from getting worse.