Notes on S.L. ~~temp~~ temp + O_2 profiles 10/24/01

(as determined by John Titus and Nate Munley of the Department of Biological Sciences, SUNY-Binghamton)

1. We first anchored the boat ca. 20% of the distance from the "point" (between thumb and fingers of the Silver Lake "mitten") and the south shore, probably closer to the east shore than the west shore. There we collected all of the samples except the 19 m sample. We then moved to a point ca. 40% of the distance from the point to the south shore, and approximately equidistant from east and west shores. There we collected the 19 m sample. So, the profiles shown on the accompanying graph are actually combined from data collected at two different points. This is a bit unconventional, but we don't think it is seriously misleading.
2. Water samples were collected, approximately between 1:30 and 2:30 in the afternoon, with a Kemmerer water sampler.
3. Temperature was measured with a VWR thermometer inside a bottle as soon as the water was brought up into the boat.
4. Oxygen samples were collected in 300 ml BOD bottles and were fixed in the field.
5. Winkler titrations were completed later in the afternoon with freshly prepared sodium thiosulfate (standardized on 25 October).

Interpretation

The temperature profile shows a thermally stratified lake with a nearly uniform temperature through the presumably well-mixed (by the wind) upper layer, or epilimnion, between the surface and about 9 meters. Temperature then begins to decline with increasing depth, most sharply between 10 and 11 meters (so, one would locate the thermocline at about 10.5 meters on this date). There is a gradual decrease in temperature toward the bottom, with the exception of the rather anomalous (but hardly earth-shaking) slight increase at 17 m. Perhaps there was a local effect of the bottom at the first site.

The oxygen ("O_2") profile shows nearly uniform values between 9 and 9.5 mg O_2/liter in the epilimnion. There appears to be a slight increase in $[O_2]$ (i.e., oxygen concentration) in the middle layer ("metalimnion"), which is not especially unusual. The most important observation of all the data collected on this date is the definite decrease in $[O_2]$ toward the bottom, to a rather low value of 2.8 mg O_2/liter at 19 m. This clearly indicates considerable oxygen depletion in Silver Lake, – most likely the result of the decomposition of algae that died and sank down into the lower zone ("hypolimnion") during the period of thermal stratification. This condition should be a long-term – concern of Silver Lake property owners. Although Silver Lake is typically one of the clearest lakes in this area, it is clearly susceptible to the same problems associated with greener, more productive lakes. That is, nutrient enrichment, or eutrophication, must have been occurring. Eutrophication is probably this country's greatest water quality problem. It has been explained to the lake association in at least one of the past reports I have seen. In a nutshell, too many nutrients spur the growth of too much algae in the epilimnion. Many of the algae sink and decay in the hypolimnion, where oxygen is consequently depleted. Oxygen is vital to the animals that dwell in the hypolimnion. Whatever stress is engendered now to deeper-dwelling animals, – assuming they survive, will be relieved when fall turnover occurs, probably some time in – November. The stress will probably return next year. –

Let me add an anecdote that I don't have actual data to support. It is my impression from snorkeling in the lake toward the end of summer this year that there has been a deterioration in the condition of the aquatic plant communities (i.e., macroscopic rather than microscopic vegetation) in Silver Lake as compared to when I did a study of the aquatic vegetation there in the early 1990's. One manifestation is a considerable growth of algae covering the rooted aquatic plants. I don't recall such a covering from my previous sampling. I hope to resample some of the same areas next summer to quantify any changes that have occurred in the aquatic vegetation.

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