

## MICHIGAN STATE UNIVERSITY

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Sherman Lake Association

Re: Limnological Status of Sherman Lake

I have been requested by the Sherman Lake Water Quality Committee to state my impressions on the limnological condition of Sherman Lake with respect to lake productivity and eutrophication.

I first visited Sherman Lake in 1987 and began routine sampling of the plankton in summer 1988. Since 1989 I have sampled Sherman Lake during the summer months for the following parameters: water clarity, temperature, dissolved oxygen, total phosphorus, pH, alkalinity, conductivity, dissolved organics, total particulate organic matter, and plankton biology (algae and zooplankton). Information from this sampling allows a general evaluation of the current conditions in the lake, but does not indicate whether the lake is gradually changing.

Sherman Lake is a relatively shallow lake given its large surface area. Because of this, waters over most of the lake area are of uniform temperature most of the year (little temperature change with depth). It is only in the deepest section of the lake (single deep basin) that bottom waters remain relatively cold year-round. This type of lake basin makes Sherman Lake especially vulnerable to enrichment of the water by nutrients stirred up from the bottom sediments. Hence, most lakes having a basin like Sherman Lake become eutrophic (highly productive) quickly when the shoreline is developed (e.g. septic tanks), or some other source of nutrients (agriculture) enter the lake. Hence, given the extent of shoreline development I expected Sherman Lake to be quite eutrophic when I first visited it. After a few years of sampling, however, I would classify the lake as only mesotrophic (moderate productivity) rather than eutrophic at this time.

By mesotrophic I imply that Sherman Lake is enriched to a moderate amount with nutrients that stimulate growth of algae and macrophytes (aquatic plants). Compared with less productive lakes in the region, Sherman lake develops an abundance of algae in the open water during late summer and the more sheltered shorelines of the lake contain dense beds of macrophytes. However, Sherman Lake is not as productive as several lakes in the region that also have much shoreline development. During the last three years (and there is some evidence from much farther back) Sherman Lake has maintained rather good water clarity (4-5 meters in summer) and total phosphorus is nearly always under 20 micrograms per Liter (parts per billion) in the

surface waters. Eutrophic lakes by comparison typically have water clarity that gets to be less than 2 meters in summer and total phosphorus concentrations of greater than 40 parts per billion. Again, with only a few years of information I can't say anything about the rate of change, but the current status is mesotrophic.

The explanation for why Sherman Lake seems to be only moderately productive despite it's shallow nature and extensive development appears to be it's unique location. Immediately to the east of the lake is the Augusta Creek drainage, immediately to the west is the Gull Creek drainage and to the south is a large groundwater flow to the Kalamazoo River. In fact, Sherman Lake resides upon a large groundwater aquifer (Sherman Lake Aquifer) that is probably fed from the north and drains out in all directions from under Sherman Lake. I do not think anyone has done a hydrologic budget for the lake, but it would not surprise me to find a great deal of groundwater flushing through (down into) the lake sediments.

It is very likely that nutrients that enter the lake are sequestered into the sediments quickly and that the lake is just deep enough that these nutrients are not easily resuspended by wind. Near shore the evidence of these nutrients is rooted macrophyte growth. Moderately low phosphorus levels in the open water result in only a moderate density of algae. Water clarity is further enhanced by the low concentrations of salts in the water (soft water = low in calcium carbonates). In fact, the soft water of Sherman Lake is in strong contrast to the other hard-waters around it (e.g. Gull Lake, Augusta Creek, Three Lakes) and provides further support for an unusual groundwater drainage away from (rather than into) Sherman Lake.

In short, Sherman Lake is lucky in regards to having a small watershed and unusual hydrology. I am sorry that I can't provide any insight into what will happen to Sherman Lake in the future, since such predictions would require a different and much more extensive study than I have been conducting.

Sincerely,



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