

1/3/08

To : Lake Puckaway District Board and AMC

From: Mark Sesing - AMC member

RE: Comments and Recommendations Regarding Water Quality of Lake Puckaway as Measured by United States Geological Survey

After looking at the data report and summary from USGS for 2005, 06 and 07 some conditions seem worth highlighting. This data was collected by USGS under a lake planning grant secured by the Lake District. USGS is outstanding re: the quality of data and continuity of collection. They also publish the data annually in a statewide water quality report.

A significant aspect of water quality at Puckaway relates to the water quality differences in the East vs. West Basin. The parameters measured include water clarity, algae as measured by Chlorophyll a, a key nutrient phosphorous, oxygen, and temperature.

There were 3 sites monitored; west basin, east basin and the river outlet.

These relationships in the data are notable:

- Overall the nutrient condition (as measured by phosphorous, Secchi disc, and chlorophyll) of Puckaway in both basins is in the hypereutrophic range. This translates into "high fertility" conditions. High fertility is indicated by calculating a "trophic state index" or TSI value and used to compare nourishment (fertility) levels of lakes. In Puckaway the TSI ranges from 60 to 80. Shallow systems in the region tend to be fertile to highly fertile. Lakes like Buffalo, Park, and Winnebago fall into this range. However, all these lakes very likely are elevated due to man made sources of nutrients.
- The summer average phosphorous concentration was 138 microgram/liter in the west basin and 149 micrograms/liter in the east basin.

- Chl a, a measurement of algae pigment, averages 60 micrograms/Liter in the west basin, and 80 micrograms/liter in the east basin (9 events averaged). The major source of lake turbidity is probably algae (measured as Chlorophyll a), but some is sediment suspension due to wind, carp, motor props, and runoff. . 8 of 9 readings were higher in the west vs. east basin. This correlates with the Secchi disc turbidity and shows water clarity is greater in the west basin
- The average summer clarity in the west basin is 0.60 meters (about 2 ft), the east basin is at 0.45 meter (1 ½ ft). Clarity in other area shallow systems is similar and typically 1 to 3 feet at mid lake sites. It is also likely clarity improves within larger plant stands but is not measured in this project.
- Oxygen is sufficient for supporting fish in all the samplings. This does not mean low oxygen never occurs as the sampling frequency and locations of USGS monitoring is limited. Local depletion could be occurring but not measured in this project.
- pH (measurement of acidity) differences in basins are negligible and values range between 8.3 and 8.8 in June, July, Aug and Sept. High pH levels (esp. above 9.0) have been reported to accelerate the leaching of phosphorous from lake sediments in the region. This has been defined in Fox Lake and Little Green Lake, both highly fertile shallow lakes. It is likely occurring in Park as well. Some internal P addition from lake sediment is likely but is probably minor relative to other sources.
- Temperature is supportive of fish in all the samplings. Differences in basins are negligible. Note: Long term measurements in area lakes are indicating elevating temperature trends due to what we believe is global warming. Ice data from Lake Mendota indicates one month less ice since the 1850's period.

Management Considerations

- Water quality monitoring should be continued and enhanced. Future monitoring for nitrogen, suspended solids and volatile suspended solids is recommended. Nitrogen will allow identification of nutrient conditions (N: P ratio) supporting blue-green algae blooms, a potential health threat. The suspended solids analysis will help to identify the source of turbidity i.e. algae vs. lake sediment suspension (carp, wind, runoff?).
- Long range objectives for nutrient reduction in the Fox River watershed should be promoted.
- Water quality target levels need to be adopted.
- Clarity in the west basin is likely due, in part, to less algae and greater submergent plant occurrence. Efforts to preserve this are critical. Clarity within both basins can be improved through the stabilization of lake sediments and carp control. Improved sediment stability will come with increases in plant coverage and reduced carp biomass, especially in the east basin where plants are sparser. Wind will have less impact, and carp will have less desirable habitat if emergent and submergent plant coverage increases. Relative to preserving water clarity and decreasing carp habitat, adoption of target levels for emergent and submergent plants is recommended.
- Ice data (ice on, ice off dates), if available for Puckaway should be summarized.