Other Monitoring

Iowa DNR - Ambient Lake Monitoring Program. Along with the volunteer monitoring that occurs through the CLAMP program, the lakes are routinely monitored throughout the summer by the Iowa State University Limnology Laboratory (2000-2006) and the University of Iowa Hygienic Laboratory (2005-2006). Through this program, the lakes are monitored for a number of parameters including nutrients, solids, common field parameters, phytoplankton, zooplankton, and microcystin. Results can be found at http://limnology.eeob.iastate.edu/lakereport/ and http://wqm.igsb.uiowa.edu/iastoret/.

Iowa DNR – Beach Sampling Program. Six state-owned beaches (Emerson Bay, Gull Point, Triboji, Pikes Point, Marble, and Sandy) and one county beach (Orleans) are monitored weekly during the outdoor recreation season for bacteria and microcystin. Results of beach monitoring can be found on the DNR website http://wqm.igsb.uiowa.edu/activities/beach/beach.htm.

Volunteer Opportunities

IOWATER – Iowa's Volunteer Water Monitoring Program. Email: iowater@iowater.net
Website: http://www.iowater.net.

Anyone interested in becoming a CLAMP volunteer should contact Jane Shuttleworth, CLAMP Volunteer Coordinator: 712-337-3669 ext. 7.

References

Carlson, Robert E. (1977) A Trophic State Index for Lakes. Limnology and Oceanography, Vol. 22, No. 2 (Mar., 1977), p. 361-369.

Acknowledgements

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The CLAMP program would not be possible without the hard work of volunteers. Volunteers on East Okoboji Lake include: Charlotte and Bud Abbott, Ron Baack, Keith Bare, Tasida Barfoot, Don Brown, Jim Burke, Serena Dion, Edgar Fairchild, Julie, Keith and Matt Feilmeier, Tom and Kathy Hakes, Pam and Rick Hughs, Steve Holcomb, Jerry and Glenna Kaltved, Jane Lieb, Dick Lineweaver, Frank Lorch, Mike Pederson, Jerry, Eileen, and Cameron Perra, Gary Phillips, Jan Richards, Larry Ross, Dave Schultz, Kate Shaw, Matt Spevak, Barbara Tagami, Matt Van Maanen, Bob Van Guilder, Lee Wendt, Jerry Wickamp, and Stan Wood. Thanks also to CLAMP interns: Tasida Barfoot, Ted Klein, Emily Greives, and Laura Guderyahn.

Photo on page 1 from Iowa State University Limnology Laboratory.

Iowa Watershed Monitoring and Assessment Program Web Site – wqm.igsb.uiowa.edu

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IOWA'S WATER
Ambient Monitoring Program

Cooperative Lakes Area Monitoring Project
East Okoboji Lake

The Cooperative Lakes Area Monitoring Project (CLAMP) began in 1999 as a joint partnership between Iowa Lakeside Laboratory and Friends of Lakeside Laboratory to take advantage of a rich tradition of volunteer involvement in the Iowa Great Lakes region. CLAMP combines efforts of multiple organizations into a long-term, unified program for assessing the quality of the lakes in the region. A group of volunteers was organized and trained to monitor water quality on 10 lakes in northwest Iowa. CLAMP focuses on monitoring nutrient levels (nitrogen and phosphorus) as well as chlorophyll *a* (an index of algal abundance) and Secchi depth (an index of water clarity). By monitoring these parameters, CLAMP volunteers provide an integrated measure of each lake's water quality. To address concerns of excessive algae growth, phytoplankton and microcystin were recently added to the program. Phytoplankton are microscopic plants, mainly algae, that live in water. Microcystin is a toxin produced by cyanobacteria, a type of algae.

Since its inception in 1999, over 100 volunteers have participated in CLAMP. These volunteers have taken over 3500 samples on 10 lakes in Dickinson County: Big Spirit, Center, East Okoboji, Little Spirit, Lower Gar, Minnewashta, Silver, Trumbull, Upper Gar, and West Okoboji. By volunteering their time, CLAMP participants are providing a long-term data set that will be useful in protecting these prized resources while learning more about water quality issues and the ecology of the lakes.

East Okoboji Lake in Dickinson County.

CLAMP Data

Secchi depth in East Okoboji Lake ranged from 0.5 meters (m) to 3.4 m, with the deepest Secchi depths occurring in the spring, when algal productivity is lowest, and the

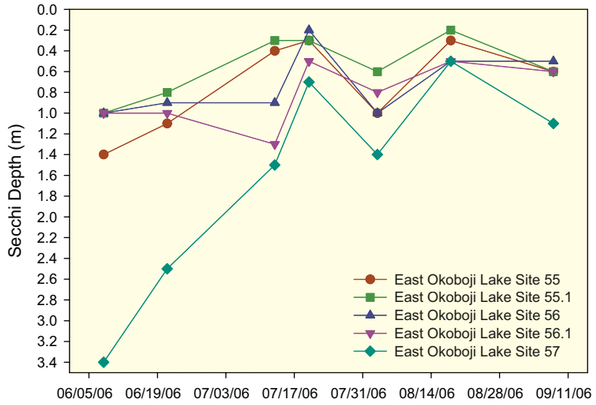
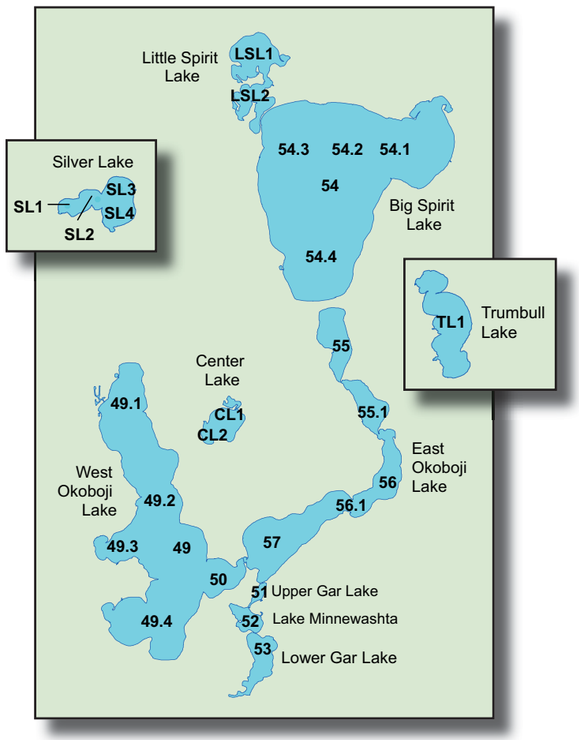


Figure 1. *Seasonal and site variation of Secchi depth in 2006 for East Okoboji Lake.*



CLAMP *sampling locations*. NOTE: *data used for this fact sheet were from the deepest spot in each lake (for comparison).*

shallowest in late summer, when algal productivity is greatest. Overall, Secchi depths in East Okoboji were in the middle of the range when compared to other CLAMP lakes and were deeper than the median for other glacial lakes in Iowa.

Total phosphorus and total nitrogen concentrations in East Okoboji were in the middle of the range when compared to other CLAMP lakes (Insert 1). East Okoboji had the fifth highest median total phosphorus concentration (0.13 milligrams per liter [mg/L]) and the seventh highest median total nitrogen (1.3 mg/L) out of 10 lakes. East Okoboji had a slightly higher median total phosphorus and a slightly lower median total nitrogen compared to other glacial lakes in Iowa (Insert 1).

Chlorophyll *a* concentrations ranged from 1 microgram per liter (μg/L) (6/8/2005) to 161 μg/L (9/16/2004). East Okoboji had the third lowest median chlorophyll *a* concentration behind West Okoboji and Big Spirit and a lower concentration than other glacial lakes in Iowa.

Microcystin concentrations in East Okoboji ranged from 0.5 nanograms per liter (ng/L) to 6.8 ng/L. East Okoboji's maximum concentration of 6.8 ng/L is below the 20 ng/L threshold the Iowa DNR uses to post warnings at swimming beaches. Overall, microcystin concentrations were similar to other CLAMP lakes and lower when compared to the median concentration for other glacial lakes in Iowa.

Figure 1 shows the seasonal and site variation of Secchi depth in 2006. Overall, Secchi depths were deepest in June and were shallowest in mid-July and August. Site 57 had the deepest Secchi depths, while Site 55.1 generally had the shallowest Secchi depths.

Carlson's Trophic State Index

The large amount of water quality data collected by CLAMP can be confusing and difficult to evaluate. In order to analyze all of the data collected it is helpful to use a trophic state index (TSI). A TSI condenses large amounts of water quality data into a single, numerical index. Different values of the index are assigned to different concentrations or values of water quality parameters.

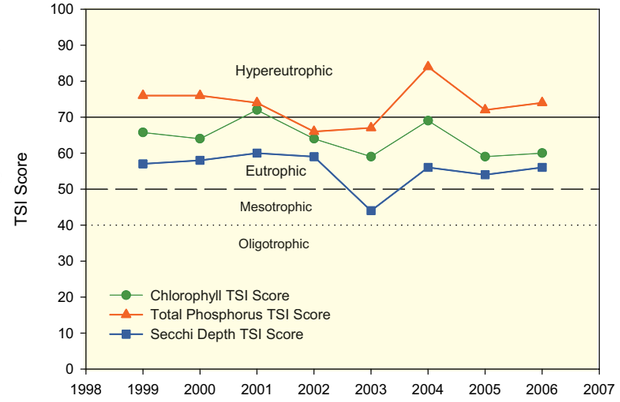


Figure 2. *Average Carlson Trophic State Index (TSI) scores by year for East Okoboji Lake.*

The most widely used and accepted TSI, called the Carlson TSI, was developed by Bob Carlson (1977). Carlson TSI values range from 0 to 100. Each increase of 10 TSI points (10, 20, 30, etc.) represents a doubling in algal biomass. The Carlson TSI is divided into four main lake productivity categories: *oligotrophic* (least productive), *mesotrophic* (moderately productive), *eutrophic* (very productive), and *hypereutrophic* (extremely productive). The productivity of a lake can therefore be assessed with ease using the TSI score for one or more parameters. Mesotrophic lakes, for example, generally have a good balance between water quality and algae/fish production. Eutrophic lakes have less desirable water quality and an overabundance of algae or fish. Hypereutrophic lakes have poor water quality and experience frequent algal blooms and a lack of oxygen in deep water.

Insert 2 shows the TSI scores for Secchi depth, chlorophyll *a*, and total phosphorus for all CLAMP lakes. East Okoboji Lake is considered *eutrophic* based on Secchi depth and chlorophyll *a* scores and *hypereutrophic* based on total phosphorus scores. TSI scores based on total phosphorus are higher than the other TSI scores, indicating that phosphorus is not limiting algae growth. Possible other factors that could limit algae include: light limitation due to excessive algal or non-algal turbidity, nitrogen limitation, zooplankton grazing, or toxin production.

Figure 2 shows the mean or average TSI scores for East Okoboji by year. TSI scores remained about the same from 1999 to 2002, followed by a slight drop in 2003 and increase in 2004 before returning to lower values in 2005. Possible explanations for this variation include: yearly climatic variability and changes in the watershed.