

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/>.



A CLAMP volunteer filtering a water sample.

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

CLAMP is coordinated by the Iowa Lakeside Laboratory and supported by Friends of Lakeside Lab, the Okoboji Protective Association, the Spirit Lake Protective Association, the Dickinson County Water Quality Commission, and the East Okoboji Improvement Corporation. Data used in this factsheet were provided by Iowa Lakeside Laboratory, Iowa State University Limnology Laboratory, and the University of Iowa Hygienic Laboratory.

The CLAMP program would not be possible without the hard work of the volunteers. Volunteers on Center Lake include: Marlys Catrysse, Catie Catrysse, Craig Cobb, Tim and Deb Grieves, Marv Johnson, Becky Mills, Alex Moffit, Keith Ostenbrug, Gary Rosemore, and Yvonne and Tim Taylor. Thanks also to CLAMP interns: Tasida Barfoot, Ted Klein, Emily Greives, and Laura Guderyahn.

Page 1 photo from Iowa State University Limnology Laboratory. Photo on page 4 from CLAMP Program.

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



Prepared by
Iowa Department of Natural Resources, Geological Survey
109 Trowbridge Hall, Iowa City, IA 52242-1319

IOWA'S WATER

Ambient Monitoring Program

Cooperative Lakes Area Monitoring Project Center 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.



Center Lake in Dickinson County.

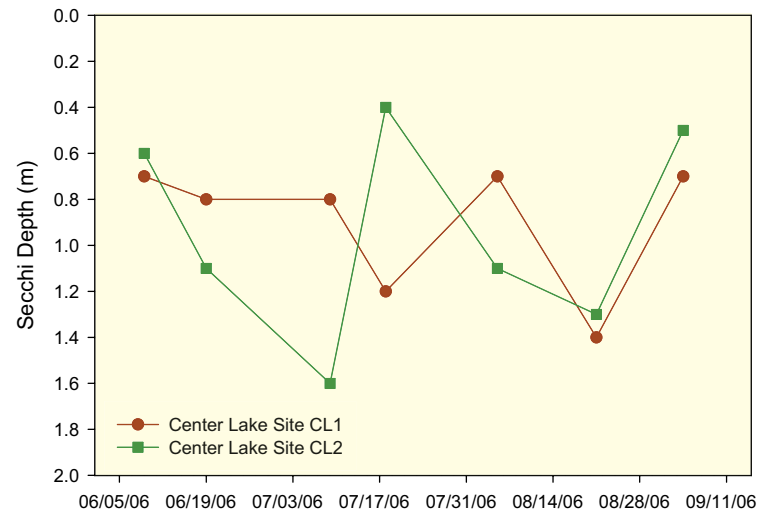
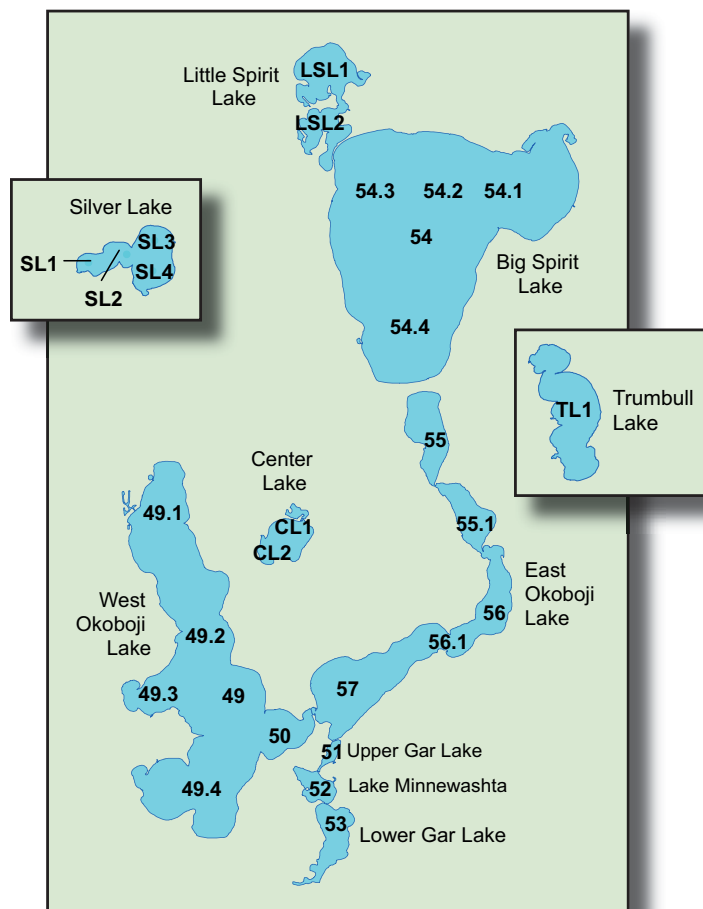


Figure 1. Seasonal and site variation of Secchi depth in 2006 for Center Lake.



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

CLAMP Data

Secchi depth in Center Lake ranged from 0.2 meters (m) on 7/11/2002 to 3.0 m on 6/15/2003, with the deepest Secchi depths occurring in the spring, when algal productivity is lowest, and the shallowest in late summer, when algal productivity is the greatest. Overall, Secchi depths in Center Lake were in the middle of the range of other CLAMP lakes and slightly deeper than the median for other glacial lakes in Iowa (Insert 1).

Total phosphorus and total nitrogen concentrations were slightly higher than other CLAMP lakes as well as being higher than the median value for other glacial lakes in Iowa (Insert 1). Center Lake had median total phosphorus of 0.15 milligrams per liter (mg/L) and median total nitrogen of 2.54 mg/L. Only Trumbull, Little Spirit and Silver Lake had greater median total phosphorus and total nitrogen values.

Chlorophyll *a* concentrations ranged from 6 micrograms per liter ($\mu\text{g/L}$) (9/4/2006) to 218 $\mu\text{g/L}$ (8/5/2001). The median chlorophyll *a* concentration (78 $\mu\text{g/L}$) was greater than all other CLAMP lakes with the exception of Trumbull and Little Spirit (Insert 1) and greater than the median for all glacial lakes.

Microcystin concentrations in Center Lake ranged from 0.9 nanograms per liter (ng/L) to 5.3 ng/L. Center Lake's maximum concentration of 5.3 ng/L falls 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 were slightly lower than the median for other glacial lakes in Iowa.

Figure 1 shows the seasonal and site variation of Secchi depth for Center Lake in 2006. Secchi depths in Center Lake varied greatly in 2006. Site CL2 had the deeper Secchi depth (1.6 m on 7/9/06) as well as the shallower (0.4 m on 7/18/2006).

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.

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. The median TSI scores for Center Lake are in the *hypereutrophic* category for total phosphorus and chlorophyll *a* and the *eutrophic* category for Secchi depth (Insert 2). TSI Scores based on total phosphorus are generally higher than other TSI scores in the CLAMP lakes. This indicates 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 Center Lake by year. Chlorophyll *a* and total phosphorus scores varied more from year to year with total phosphorus scores decreasing from 2004 to 2006. Secchi depth scores remained fairly constant.

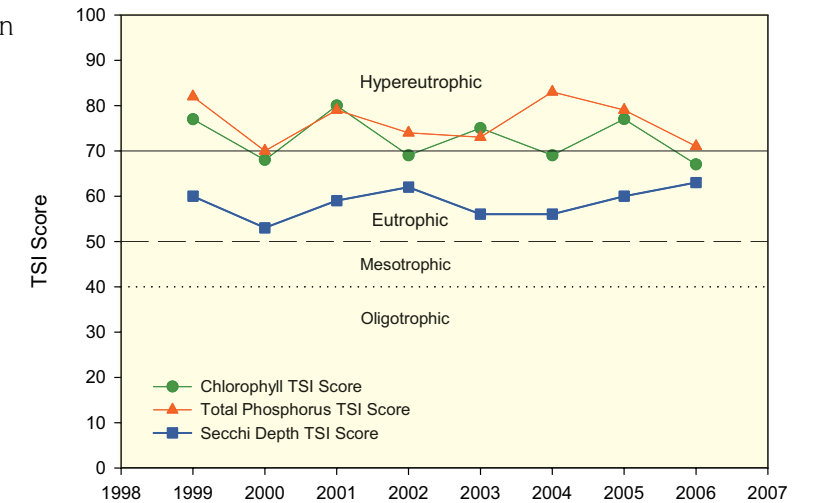


Figure 2. Average Carlson Trophic State Index (TSI) scores by year for Center Lake.