Lakes in Dickinson County have some of the best water clarity in the state.

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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Photo on page 4 from CLAMP Program.

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

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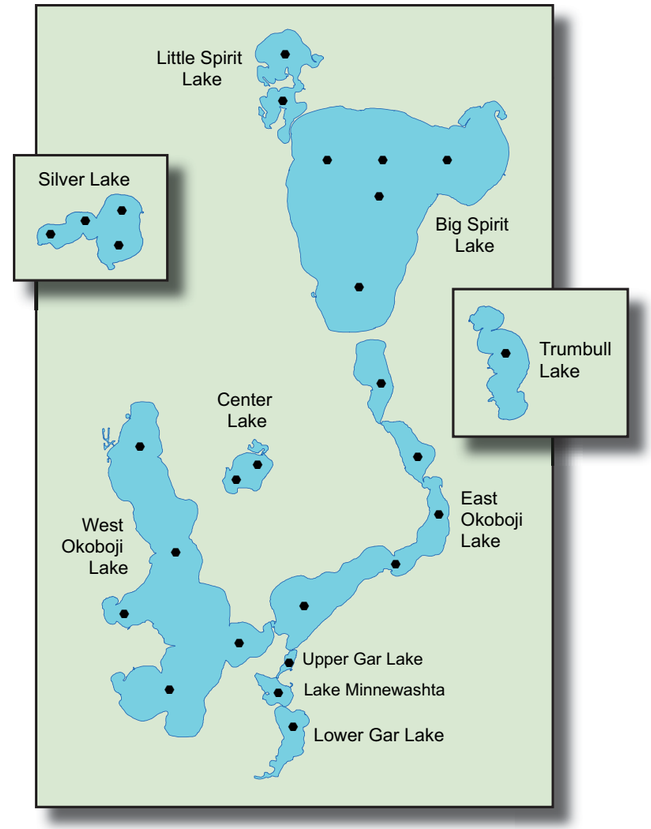
IOWA'S WATER
Ambient Monitoring Program

Cooperative Lakes Area Monitoring Project
Project Overview

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



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

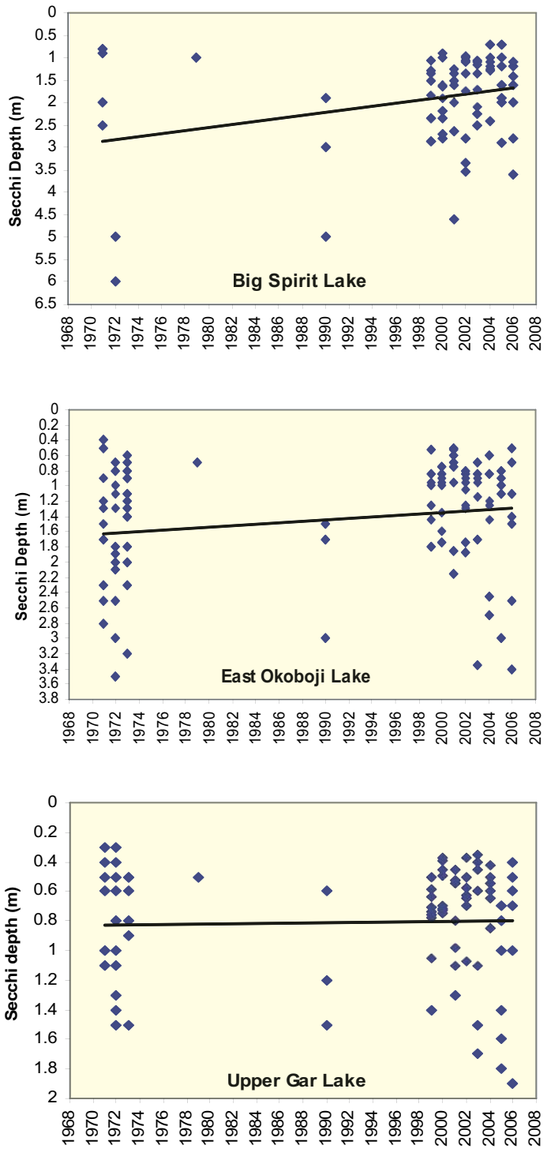


Figure 1. *Long-term trends in Secchi depth for six selected CLAMP lakes (pages 2 and 3). Black line represents change in Secchi depth over time.*

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.

CLAMP Data

Secchi depth ranged from 0.1 meters (m) in Little Spirit, Lower Gar, Trumbull and Silver Lakes to 7.5 m in West Okoboji Lake. West Okoboji and Big Spirit had the deepest Secchi depths, while Trumbull, Silver, Lower Gar, and Little Spirit had the shallowest Secchi depths (Insert 1).

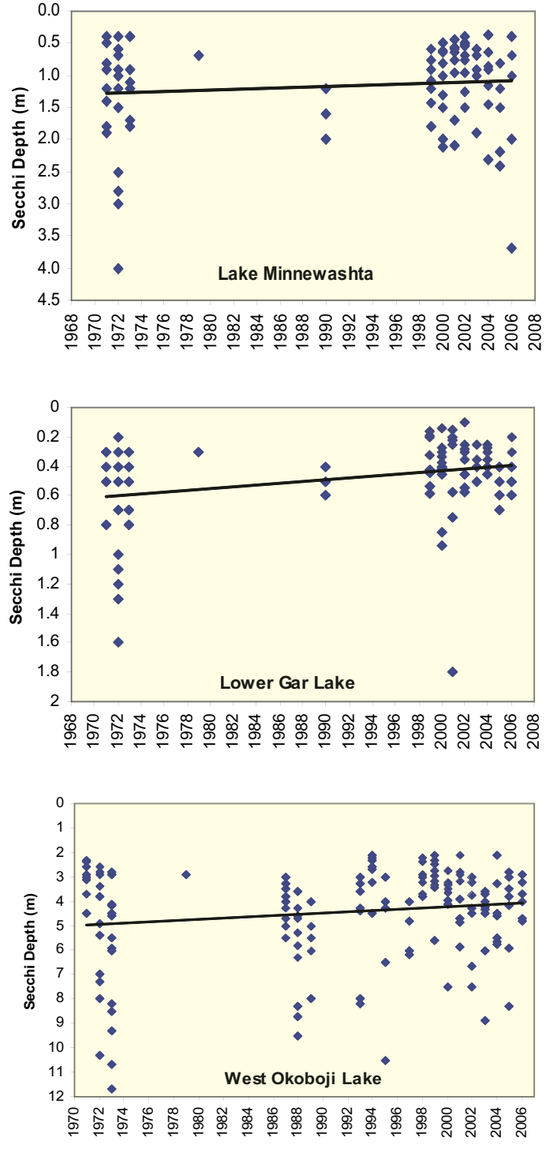
Nutrient concentrations varied greatly in the CLAMP lakes. Total phosphorus and total nitrogen values were lowest in West Okoboji and Big Spirit, and highest in Trumbull and Little Spirit (Insert 1).

Chlorophyll *a* concentrations also varied greatly in the CLAMP lakes. West Okoboji and Big Spirit had the lowest and least variable concentrations, while Trumbull, Little Spirit, Center, and Silver had the highest and most variable concentrations (Insert 1).

Microcystin concentrations ranged from 0.1 nanograms per liter (ng/L) in Silver Lake to 11.1 ng/L in West Okoboji Lake. All microcystin concentrations were below the 20 ng/L threshold the Iowa DNR uses to post warnings at swimming beaches. All lakes also had lower microcystin levels when compared to other glacial lakes in Iowa (Insert 1).

Long-term Trends

The CLAMP data can be compared to previous sampling efforts to determine how the lakes are changing over time. Figure 1 combines Secchi depth data collected in the 1970s as part of a survey of publicly owned lakes in Iowa, and CLAMP data from sites at the deep spot of each lake (for comparison). The trendlines on the graphs show how Secchi depth has changed from the 1970s to the present. Most CLAMP lakes had a slight decrease in water clarity during this time.



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 all CLAMP lakes from 1999-2005. The median TSI score based on Secchi depth for most lakes is *eutrophic*, with West Okoboji *mesotrophic* and Trumbull, Little Spirit and Lower Gar *hypereutrophic*. TSI scores based on chlorophyll *a* are slightly higher in general with most lakes in the *eutrophic* category. Center, Trumbull, and Little Spirit all are considered *hypereutrophic* based on chlorophyll *a* while West Okoboji is *mesotrophic*. TSI scores based on total phosphorus put most lakes in the *hypereutrophic* category, with only Big Spirit being *eutrophic* and West Okoboji being *mesotrophic*.