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, zoo- plankton, 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

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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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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.

![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.](image-url)