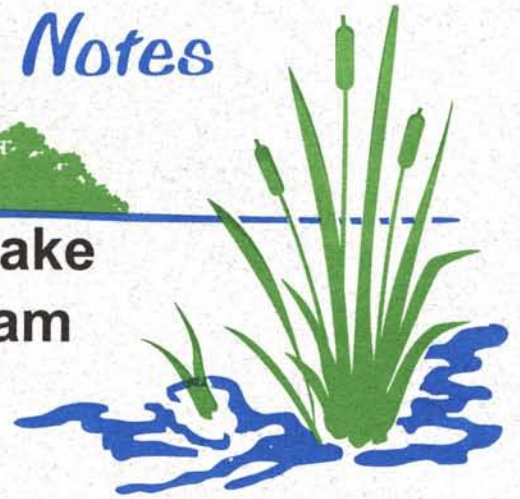


Lake Notes



Illinois Volunteer Lake Monitoring Program (VLMP)

In Illinois there are 3,041 lakes (over six acres in size). Including ponds, there are over 87,000 bodies of water. These bodies of water serve many purposes including industrial and agricultural water supplies, cooling water sources, flood control structures, and recreational uses.

In 1981, the Illinois Volunteer Lake Monitoring Program (VLMP) was established by the Illinois Environmental Protection Agency (Illinois EPA) to gather fundamental information on Illinois inland lakes, and to provide an educational program for citizens. Annually, 150-200 lakes are sampled by approximately 250 citizen volunteers. The volunteers are primarily lake shore residents, lake owners/managers, members of environmental groups, public water supply personnel, and citizens with interest in a particular lake.

Objectives of the VLMP

- ◆ Increase citizen knowledge of the factors that affect lake quality to provide a better understanding of lake and watershed ecosystems and promote informed decision making;
- ◆ Encourage development and implementation of sound lake protection and management plans;
- ◆ Encourage lake involvement in problem solving by promoting self-reliance;
- ◆ Enlist and develop local grass roots support and foster cooperation among citizens organizations and various units of government;

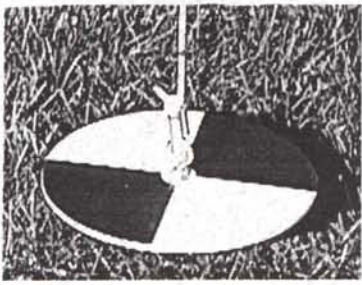
- ◆ Gather fundamental information on Illinois lakes: with this information, current water quality can be determined as well as long-term trends;
- ◆ Provide historic baseline data to document water quality impacts and support lake management decision-making; and
- ◆ Provide an initial screening tool for guiding the implementation of lake protection/ restoration techniques and a framework for a technical assistance program.

The Basic Program

The VLMP relies on volunteers to gather a variety of information on their chosen lake. The primary measurement is the Secchi (pronounced Sĕ-kĕ) disk transparency or Secchi depth.

The Secchi disk was developed in 1865 by Professor P.A. Secchi for a Vatican-Financed Mediterranean oceanographic expedition. At that time it was used to determine if a ship could safely pass over a reef without damaging its hull. It has since become a standard piece of equipment for lake scientists.

The Secchi disk is simply a weighted circular disk about eight inches in diameter with four alternating black and white sections. The Secchi transparency is the depth in the water column that the Secchi disk disappears from view.



Secchi Disk

Analysis of the Secchi disk measurements provide an indication of the general water quality conditions of the lake, as well as the amount of usable habitat available for fish and other aquatic life.

Microscopic plants and animals, water color, and suspended sediments are factors that interfere with light penetration through the water column and lessen the Secchi disk depth. As a rule, two to three times the Secchi depth is considered the lighted or euphotic zone of the lake. In this region of the lake there is enough light to allow plants to survive and produce oxygen. Water below the lighted zone can be expected to have little or no dissolved oxygen.

Other observations such as water color, suspended algae and sediment, aquatic plants, and odor are also recorded. The sampling season is May through October with volunteer measurements taken twice a month.

After a volunteer has completed one year of the basic monitoring program, they are qualified to participate in the Expanded Monitoring Program.

The Expanded Program

The VLMP has been expanded many times since its inception in 1981. The first expansion included the addition of a Water Quality Component in 1985. For this component, selected volunteers are trained to collect water samples that are shipped to the Illinois EPA laboratory for analysis of total and volatile suspended solids, total phosphorus, nitrate-nitrite nitrogen and ammonia nitrogen. These water quality parameters are routinely measured by lake scientists to help determine the general health of a lake ecosystem.

In the spring of 1992, the VLMP was expanded in a pilot effort to encompass two new components, Zebra mussel (*Dreissina polymorpha*) sampling and Dissolved Oxygen/Temperature (DO/T) measurements.

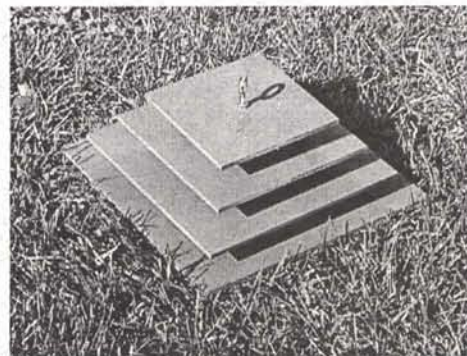
The Zebra mussel first became a concern in June 1988 with its discovery in Lake St. Clair near Detroit

Michigan. Since that time the mussel has migrated throughout the Great Lakes and into Illinois through the Illinois, Mississippi, and Ohio rivers. Why be concerned if the Zebra mussel is in our lakes and rivers? Because Zebra Mussels:

- ◆ clog water supply intake pipes;
- ◆ deplete the aquatic food chain (the adult Zebra mussel will filter one to two liters of water each day, ingesting massive amounts of microscopic plants and animals);
- ◆ remove of spawning habit due to their attachment to the lake or river bed;
- ◆ colonize on boat hulls and motors; and
- ◆ generates odor due to the decomposition of large numbers of mussel shells washed onto beaches.

It is known that the Zebra mussel exists in Lake Michigan, the Mississippi and Illinois rivers, and some smaller Illinois stream systems. It is not known if the Zebra mussel is being transported into Illinois inland lakes. The VLMP was the most logical and cost-effective way to initiate a statewide inland lake Zebra mussel monitoring effort. Twenty-two lakes were selected to participate in the pilot sampling program. The lakes were selected on the amount of trailered boat traffic, lake size, public access, and volunteer interest. Once the lakes were selected, volunteers received a Zebra mussel sampler and instructions.

The Zebra mussel sampler consists of four 1/4" plates made of grey PVC sheeting. The top plate is 6"x6", the second plate is 8"x8", the third plate is 10"x10" and the fourth plate is 12"x12". Each plate is spaced 1" apart.



Zebra Mussel Sampler

Sample sites were located near public boat ramps or areas where invasion was likely to occur. Volunteers attached samplers to either an in-place buoy or dock allowing it to hang one foot below the water surface (periodic adjustments were made as water level changed). Volunteers monitored the sampler once a month throughout the sampling season (May through October). In 1997 because of cost-effectiveness and potential knowledge derived from a Zebra mussel - VLMP monitoring effort, the pilot program expanded to encompass all lakes participating in the VLMP.

A second pilot program was established in 1992 to measure Dissolved Oxygen (DO) and water Temperature (T). These two water quality measurements play important roles in the overall health of lakes. When DO is reduced, organisms are stressed. When DO is absent, oxygen breathing organisms must either move to oxygenated waters or die (i.e., fish kills). Lake water temperature is directly related to the amount of oxygen that water can hold. Oxygen is more soluble in cold water than in warm water. Therefore, typically in the spring of the year, the DO level is high and decreases as water temperature increases.

Hand held DO/T meters were purchased and provided to volunteers at 10 lakes. In summary, volunteers were able to produce reliable data with minimal training. They were enthusiastic about the program. They learned a great deal about their lakes and specifically about the interactions of DO and T, and how they changed throughout the year.

Although reliable, durability of the DO/T sampling equipment was questionable. Concerns with loss of battery power and other troubles maintaining equipment were also raised when evaluating the overall costs vs. benefits. Therefore, it was decided to not proceed with expanding the program on a statewide basis.

In June 1995, *Conservation 2000*, a major natural resources protection bill, was passed by the Illinois General Assembly. The bill provided funding to the Illinois EPA to expand its lake management program activities. A portion of the funding was used to initiate a new Chlorophyll Monitoring Component at 50 VLMP lakes in 1996. Chlorophyll is the green pigment found in algae and plant cells. It is the chemical which allows plants to carry out photosynthesis (the process plants use to convert sunlight, water, and carbon dioxide to oxygen and energy or food). There are many different forms of

chlorophyll. Algal chlorophyll is found as three different types. Chlorophyll *a* (found in all algae), chlorophyll *b* (found in green algae and euglenoids), and chlorophyll *c* (found in diatoms and golden brown algae). By taking a measured sample of lake water and extracting the chlorophyll from the algae cells, a good indication of the type and density of algae present can be determined. The density of the algae population tells lake scientists if an algal bloom is likely to occur. Increased algal respiration at night and on cloudy days may cause deoxygenation of the water column. When a algal bloom dies off, the decay process may also increase the potential for deoxygenation as well as causing taste and odor problems for public water supplies.

The chlorophyll sample is collected from the surface to twice the Secchi depth and is filtered by the volunteer. The water quality sample and the filtered chlorophyll are mailed to the Illinois EPA's laboratory for analysis.

All training, equipment, and analysis is free of charge to volunteers. In 1997, because of it's success, the VLMP was expanded from 50 to 100 lakes.

Use of Data

Users are varied and many. They include state water quality agencies, planners, fisheries biologists, agricultural agencies, parks and recreation staffs, local government planning and zoning agencies, university researchers, and Federal agencies such as the U.S. Fish and Wildlife Services and USEPA.

The Secchi disk transparency, chlorophyll *a*, and total phosphorus data are most commonly used to define the degree of lake **Eutrophication**, or trophic status of a lake. This is the process by which a lake ages via nutrient and sedimentation. Although a natural process, eutrophication can be speeded up by human activities. A lake's trophic status is based on the fact that changes in nutrient levels (measured by total phosphorus) cause changes in algal biomass (measured by chlorophyll *a*) which in turn causes changes in lake clarity (measured by Secchi disk transparency).

A trophic state index is a convenient way to compare one lakes trophic status to another. One popular index was developed by Dr. Robert Carlson of Kent State University. It is used by the Illinois EPA in its VLMP report. Ranges of trophic state index values are often

grouped into trophic state classifications as shown below.

Oligotrophic lakes have low concentrations of plant nutrients and relatively low amounts of plant and animal growth. **Mesotrophic** lakes have a moderate concentration of plant nutrients and a moderate level of plant and animal growth. **Eutrophic** lakes are rich in plant nutrients and are capable of supporting large populations of aquatic organisms. **Hypereutrophic** lakes may have extreme levels of nutrients

and nuisance plant growth. **Hypereutrophication** is usually attributed to human activity.

Once a lake's trophic status has been determined, lake scientists and managers can make more informed decisions on potential lake management activities. Continual monitoring and observation over a period of years can further help identify lake problems and causes, document water quality trends, and helping pinpoint which lake and watershed management strategies are more technically and economically feasible for implementation.

For more information about the VLMP contact the VLMP Statewide Coordinator:

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217/782-3362*

Trophic State	TSI	Secchi Disk	Total Phosphorus	Chlorophyll a
Oligotrophic	<40	>145	<0.012	<2.5
Mesotrophic	>=40<50	>79<=145	>=0.012<0.025	>=2.5<7.5
Eutrophic	>=50<70	>18<=79	>=0.025<0.100	>=7.5<55
Hypereutrophic	>=70	<=18	>=0.100	>=55

Related/Available Publications:

- *VLMP Brochure*
- *VLMP Annual Report*
- *A Guide to Illinois Lake Management*
- *Illinois Water Quality Report*



Lake Notes

is a series of publications produced the Illinois Environmental Protection Agency about issues confronting Illinois' lake resources. The objectives of these publications is to provide lake and watershed residents with a greater understanding of environmental cause-and-effect relationships, and actions we all can take to protect our lakes.

This Lake Notes publication was prepared by Rex Buhrmester, Amy Burns and Steve Kolsto of the Illinois Environmental Protection Agency, Springfield, Illinois.

For more information about other publications in this series and to request copies, please contact: Illinois Environmental Protection Agency, DWPC-Lake and Watershed Unit, P.O. Box 19276, Springfield, Illinois, 62794-9276; 217/782-3362.

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