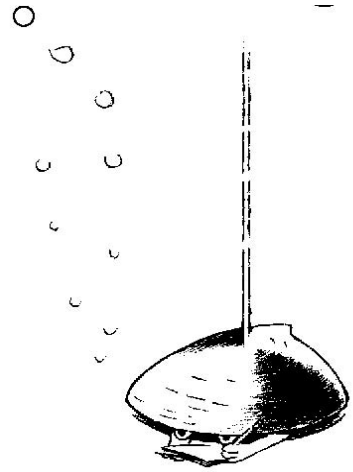
Citizen Lake Awareness & Monitoring



Handbook for Lake Monitors

Updated

April 2023

Table of Contents

What is CLAM?	3
CLAM Contacts and Regions	4
Safety First	5
Data Collection Method	6
On Shore Preparations	9
On the Lake	12
Completing the Data Reporting	14
Appendix (Data Forms)	15

What is CLAM?

The Citizen Lake Awareness and Monitoring (CLAM) program enables the Ohio public to take an active role in learning about aquatic ecology, lake and stream water quality, and pollution prevention. Participants become trained citizens that gather vital water quality data to document the changing conditions of Ohio waterbodies. CLAM then provides this information to concerned individuals, water management groups, and to local, state, and federal agencies to evaluate and improve Ohio lakes and their watersheds. The CLAM program is also an excellent networking opportunity for citizens and environmental organizations.

CLAM's mission is: To care for Ohio lakes and their watersheds.

CLAM's goals are:

1. To promote citizen awareness of the impact of nonpoint source (NPS) pollution on lakes and watersheds.
2. To encourage local watershed-based initiatives to control NPS source pollution.
3. To generate the formation and growth of lake management organizations to ameliorate the impacts of NPS pollution.
4. To provide educational opportunities for citizens to learn about the biological, geological and sociological relationships between lakes and the surrounding watershed.
5. To maintain a database of the water quality information to be used by concerned individuals, environmental organizations, local, state and federal agencies, and the CLAM monitors to evaluate and improve Ohio lakes and their watersheds.

Sponsorship

Ohio Lake Management Society and **Ohio Environmental Protection Agency** are working together to provide training for volunteers to achieve Qualified Data Collector status. Technical support, equipment, data collection and quality control are the responsibility of OLMS.

CLAM is sponsored by the **Ohio Lake Management Society (OLMS),** with support from; **Ohio Environmental Protection Agency (OEPA), Kent State University (KSU), Ohio Department of Natural Resources (ODNR), Ohio State University (OSU) Extension**, and the **Muskingum Watershed Conservancy District (MWCD).**

For more information, see our web site at:

www.wmao.org

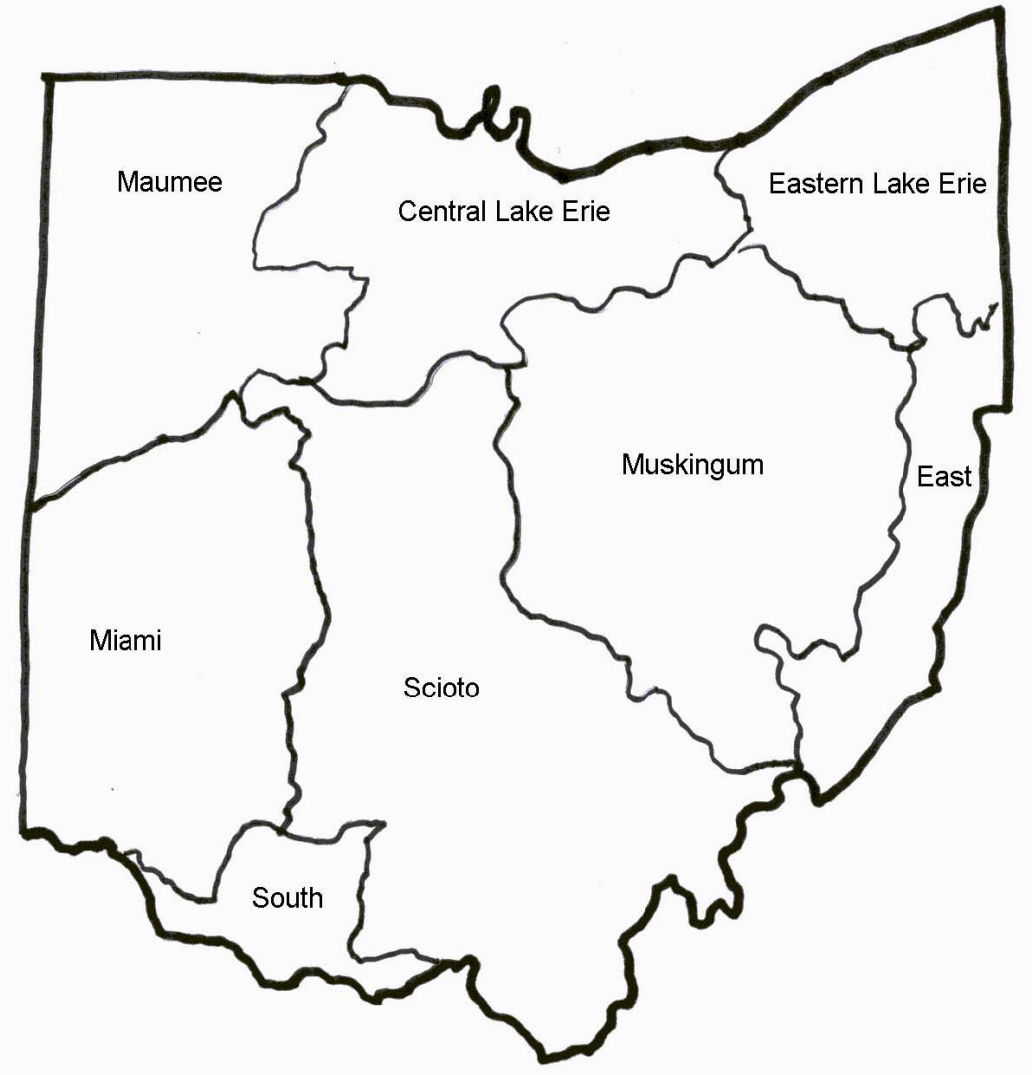
CLAM Contacts

The following people comprise the staff of the CLAM program. If you have any requests or questions regarding CLAM or the monitoring methods, please write or call the CLAM Program Manager. See the map below for a listing of Ohio CLAM regions.

CLAM Program Administrator:
Dana Oleskiewicz
Ohio Lake Management Society
8584 E. Washington St. #206,
Chagrin Falls, OH 44023
330-466-5631; oleskiewicz@windstream.net

CLAM Program Manager:
Susan James
Ohio Lake Management Society
419-560-2567; smjames63@gmail.com

CLAM Regions



Safety First

Your personal safety is our (and should be your) primary concern. Be sure to follow all boat safety rules when taking readings. Some definite rules to follow include:

Do not go onto the lake if your safety would be at risk.

Do not go onto the lake if it is raining or if the weather even suggests that it might rain. **Lightening**, of course, is the primary reason for not going out, but also the possibility of **high winds**; **waves** and **limited visibility** are safety considerations. Remember that you should be taking Secchi readings on clear or partly cloudy days only; clouds may produce erroneous readings. Get off the lake immediately if there is thunder or lightning.

Do not take readings if heavy boat traffic or lake users (water skiers or jet skis) could put your safety at risk.

The Coast Guard requests that you wear your life jacket at all times. Even if you can swim, remember that you are required to wear a life jacket. You will be leaning over the edge and there is always the possibility that you will fall overboard.

Always anchor your boat. You need to do so to get good readings. And, if you happen to fall out, your boat won't leave you out there alone.

Be careful about the stability of your boat. If possible, don't use a canoe or flat-bottomed boat because they are unstable and prone to tipping. If you use one of these boat types, keep your center of gravity well within the boat; don't lean too far out to see the Secchi disk.

Take along a friend. Use the buddy system so that if something happens to you, there will be someone else who can help.

Data Collection Method

Introduction

One of the goals of the program is to train the monitors to do basic lake quality monitoring. Two of the most common measurements taken are the Secchi disk depth and water temperature.

With this information, we can start to compile a computerized record of the lake, allowing us to document the condition of the lake over time. This helps us to determine what management plans, if any, should be implemented and if they are working. Even if your lake does not have a pollution problem, it is a good idea to have background information on record to alert you to any changes in the lake condition.

Sampling Sites

Site Selection

When you are selecting the location of a sampling site or sites, it is recommended that you have a map available that shows the different depths of the lake. The first sample site should be at the deepest part of the lake and can be easily located by referring to your map. If you cannot obtain a map of the lake, the deepest part of a reservoir will usually be near the dam or if it is a pond, near the spillway.

The second and third sites are optional and are not necessary for smaller lakes and ponds. If you would like to collect data at additional sample sites for the larger lakes and reservoirs, you are encouraged to do so. These additional sites could be located near the headwaters, the center of the lake, in large coves, or other branches of the lake. If two people monitor the same lake, each monitor can sample a different site or be an alternate in the event that someone is unable to sample at their site at any given time.

Finding and Marking Your Site

The first time you are out on the lake, use a map to help you locate the sampling site. Once you have located the site, look for several landmarks you can use to help you find the site the next time. It is important that you use the same site on each monitoring trip. Try to locate at least three different landmarks and write them down on the back of the data sheet. Better yet, draw a map that contains the landmarks. This will help you remember the landmarks and, if you are going to miss a sampling date, a QDC-trained alternate can use them to find the site(s). Take photographs at your site in each of the cardinal directions (North, East, South, West), and send those photographs to the CLAM Program Manager.

This method of using landmarks to locate a position is called **triangulation**. It is important that the Secchi depth readings be taken in the same general area. Using triangulation will aid you in locating the same sampling site each time you collect data.

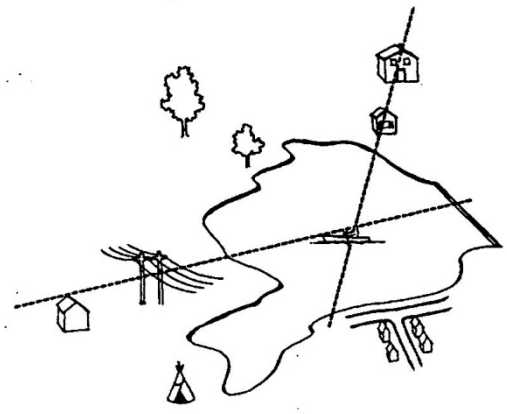


Figure 1. The lake monitor in this illustration is triangulating his position by lining up the tops of two houses in one direction with the line-up of the house and power poles in the other. When all four objects are in line, the monitor is over the sampling site.

If you own or have access to a handheld GPS (Global Positioning System) receiver or have a GPS app for your phone or tablet, your device can be used to more accurately determine the location of your site(s). **The use of GPS is the preferred method for recording your site location.**

If you are collecting data on ponds or smaller lakes, you may want to use a marker buoy to mark your sampling site so you can always return to the same spot. If you do not have a buoy, you can easily make one using an old plastic milk carton filled with Styrofoam beads anchored to some kind of weight. Buoys are not recommended for public lakes or reservoirs, since the buoy may interfere with boating or other recreational activities.

The Equipment

Secchi Disk

Water transparency is one of the easiest measurements to make and can provide valuable data about the lake. The Secchi disk is a simple scientific instrument used to measure water transparency. The Secchi disk is eight inches in diameter and has alternating black and white quadrants. The disk is attached to a non-stretchable rope so that it can be suspended in the water column. It is named after Pietro Angelo Secchi, a Jesuit astronomer who used the disk to measure the transparency of the Mediterranean in 1865. The operation of the Secchi disk is simple: you just lower the disk until the disk disappears. The depth of disappearance, measured with a ruler in inches, is called the Secchi depth and is an indicator of the transparency of the water. It can provide a rough estimate of light penetration in the water column. For example, the greater the Secchi depth reading, the greater the water clarity is documented.

This is important for a number of reasons. For example, as a general rule, sunlight for aquatic plants can penetrate to a depth of 2 times the Secchi depth. If the Secchi depth was 5 feet, then sufficient light for algal or rooted plant growth can penetrate to a depth of 10 feet (5 feet x 2 = 10).

The Secchi disk depth can be affected by dissolved color in the water, algae, or suspended sediment. Dissolved water color comes from the decay of plant material in the watershed and the lake itself. Small lakes surrounded by a forested watershed or small bogs may have water deeply stained and have a diminished transparency. Second, the microscopic plants called algae are an important part of the food web in a lake. At high densities, algae will reduce the Secchi depth.

Finally, suspended sediment is the largest water pollutant by volume in the United States. Sediment can be brought into the lake from a variety of sources and, depending on the type of lake, can easily be re-suspended in the water column. In a shallow lake, winds can mix the water causing the sediment to be re-suspended off the lake bottom. Rough fish such as carp and bullheads will often stir up sediment while searching for food. When sediment is suspended in the water, it gives the water a muddy or cloudy appearance and reduces the water transparency

Water Color Chart

When submitting your Secchi depth data, we know what the water transparency is, but we don't know whether the transparency was affected by dissolved color, algae, or suspended sediment. The color of the water has been found to help us decide what type of substance may be affecting transparency.

If the lake has a small Secchi depth and a green color, we know that algae were reducing the water transparency. If the lake is a muddy brown color, then sediment was reducing the water clarity. Finally, if the lake has a relatively large transparency but has a brown water color, then the lake may be influenced by dissolved color in the water.

Thermometer

The thermometer supplied will be used to take the air temperature and the water temperature. Water is collected one foot below the surface in a container and the temperature stabilized at least three (3) minutes before recording the temperature reading.

On Shore Preparations

When to Monitor

The Secchi depth data should be collected during **alternate weeks (every other week) of each month, May through October,** between the hours of **10:00 a.m. and 4:00 p.m.** Try to allow a two-week period (or at least ten days) between sampling dates to get an overall view of conditions during the month. Attempt to monitor on bright, calm days, however, this may not be possible.

Equipment Check

Before leaving home, check to make sure you have all the equipment and the Data Reporting Forms with you. Go through the checklist in your manual and make sure you have all the equipment in your vehicle so that nothing is left behind.

Data Sheet Entries

Some of the data can be recorded before you leave the dock or while you are waiting in line at the boat ramp. Please try to fill in as much as possible before leaving the shore, except for the specific site data (Secchi depth, water temperature, water depth, etc.). The data entry process is much faster if you enter the following information **prior to going onto the lake**.

Monitor Name and Contact Information: Put the name, CLAM ID#, and QDC # of the QDC-trained monitor who will take the Secchi readings. **Do not put the names of any non-QDC guests on the form.**

Date: Write the complete date (i.e., May 4, 2007). Do not use only numbers (5/4/07) because of potential confusion as to whether the month or day comes first.

Lake Name: Please enter the full name of the lake, pond or reservoir and the CLAM-assigned ID# for that body of water.

Site Location: Record each CLAM-assigned site number, and the corresponding location in decimal degrees with at least 5 digits of accuracy (i.e., record 41.25678, not 41.26). **Do not "round" latitude and longitude locations.**

Cloud Cover: Record an X in the description of clouds present when you reach your first sampling site. The amount of cloud cover can affect your readings, so try to visit your site on clear or partly cloudy days. Under **no circumstances** should you try to get a reading when it is raining. Remember, your safety is more important than a Secchi reading. If you are on the lake and it starts to thunder, get off the lake immediately!

Rainfall: Put an X where appropriate if rain occurred on the monitoring date (today) or one to three days prior. You may want to start recording rainfall the three days before the monitoring day so you do not have to look it up later. We use this data to see if rainfall and subsequent runoff may affect Secchi readings. Indicate whether the rain or another factor (provide details) has made the site unusually turbid.

Wind Direction: Mark the direction **from which** the wind is blowing.

Lake Level: Some reservoirs have a lake level or staff gauge located at the dam. If there is a gauge at your lake, you can record lake level to the nearest hundredth of a foot (two decimal places) while on the lake. If there is not an easily accessible gauge, lake level can be obtained by accessing the USGS website. Even a small change in water level can mean a large change in the water volume of the lake. Current water levels for lakes in the MWCD can be found at http://www.mwcd.org/levels.

Management Practices: Please note if anything has been done to manage the algae, weeds, sediments, etc. since your last visit. When was it done? Practices might include the application of copper sulfate, weed harvesting, grass carp, or dredging.

Water Quality: On page 2 of the data sheet, mark the description that best describes your opinion today on how suitable the lake water is for each recreation and aesthetic enjoyment.

Excellent, No Problems - beautiful, could not be any nicer
Minor Problems - very minor problems, excellent for this purpose
Slight Use Impairment - use for this purpose is slightly impaired
Substantial Impairment - desire to use the lake for this purpose is reduced
Use Totally Impaired - enjoyment of the lake for this purpose is nearly impossible

The term "overall water quality" should include your general impression of the quality of the lake today (or in the past two weeks). Do not include factors such as weather.

Next mark what you believe to be the biggest problems of your lake (site) today (or in the past two weeks). Please check all that apply. Use the classification above to estimate the degree of impairment caused by any of these factors. If other factors seem to be impairing the use of the lake, please note them as well.

Number of People/Boats: We are trying to estimate the number of people using our lakes. Please mark the number of people or boats involved in the various categories.

None - no one present on the lake
Light - a few people on the lake
Moderate - a typical weekend crowd
Heavy - a very large crowd of people

Other Information: Write any other information that you think might be useful in our understanding of your lake (i.e. fish kills, development in the watershed, etc.). If you have access to a camera, document your lake's water quality with photographs and send those to the CLAM Program Manager.

Communications: Need more Data Reporting Forms? Your thermometer broke? Have any suggestions or questions? Please call the CLAM Program Manager for a prompt response. Do not hesitate to be critical. The CLAM program and QDC training can only improve with your help.

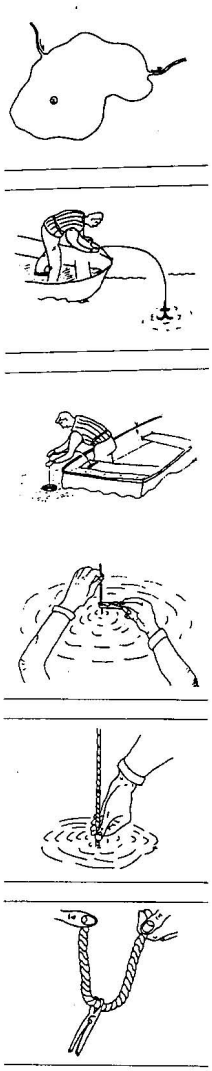
On the Lake

Sampling Site

1. Using the techniques described on pages 6-7 (GPS, triangulation or buoy marking), go to your designated site.

Time of Observation

1. Please put the time you **arrive** at your site. Do not forget to mark AM or PM, even though it may seem obvious to you.



Anchoring at the Site

Anchor the boat to prevent drifting. Be careful not to disturb the sediments on the bottom when anchoring since this could cloud the water and interfere with the Secchi disk reading, especially in shallow lakes.

Taking the Secchi Disk Depth

1. Once you are properly anchored at the sampling site, go to the shady side of the boat and if you are wearing sunglasses, remove them.
2. Lower the Secchi disk straight down into the water until the disk just disappears from sight. Mark the rope at the water level with a clothespin.
3. Lower the disk about another foot. Slowly raise the disk up until it reappears. Mark the rope at the water level with your with the other clothespin.
4. To find the Secchi depth, grasp both clothespins in one hand and find the center of the loop of rope. Move one clothespin to that point and remove the other. This point is one-half the distance between the point of disappearance of the disk and the point where it reappeared. Measure the distance from this point to the Secchi disk.
5. Record the Secchi depth on your data card to the nearest inch.
6. The OEPA form requires two Secchi readings and the average of the two readings recorded.

Courtesy of Wisconsin Department of Natural Resources self-help Lake Monitoring Handbook, 1986.

Taking the Air Temperature

1. Place the thermometer in an open, shaded area, with ample airflow, for at least three (3) minutes. Record the air temperature to the nearest degree. Do not rely on online weather stations for air temperature. Always record the air temperature **at your site**.

Estimating Water Color

1. **Lower the Secchi disk to one-half** the recorded Secchi disk average depth.
2. Describe the color by **comparing the water color against the white quadrants** of the Secchi disk with the color strip. Record the number for the best color estimate.

Taking the Water Temperature

1. Lower the container one foot below the water level and fill it with water.
2. Bring the container out of the water and insert the thermometer into the container. Wait at least three (3) minutes and read the temperature without removing it from the water.
3. Record the temperature to the nearest degree on the data sheet. **Do not rely on boat equipment to determine water temperature. Please use the provided calibration thermometer.**

Measure Water Waves

1. Record the type of the waves at the site your best choice of 1 – 4 according to the description **(NOT INCHES or feet)**.

Measuring Water Depth

1. After taking your Secchi depth and color measurement, use the Secchi disk to find the water depth. This depth should be about the same each time you sample. If the depth is different (over two feet), check your landmarks to make sure you have triangulated to the proper location. Remember that heavy rains or drawdown can change the lake level and affect the water depth at the sampling site.
2. Lower the Secchi disk to the bottom and read the water depth from the marks on the line. **Record the depth to the nearest half foot.** Please, do not measure the water depth before you take your Secchi reading; the disk will disturb the bottom mud and ruin your reading.

Completing the Data Reporting

After Collecting Data

1. Record any miscellaneous information you may consider important.
2. Check over the data form before you leave the site to make sure everything is complete.
3. Make a copy of the form for your records. Send the originals of the completed forms at the end of July and October to:

   OLMS/CLAM
   8584 E. Washington St., #206
   Chagrin Falls, OH 44023

4. Clean off the Secchi disk and the other equipment. Store them in a safe place.

Quality Assurance/Quality Control = The key word is "consistency".

Quality Assurance requires consistency in making sure equipment is functional and calibrated with every use, and in preparations, monitoring schedule and location. Quality control requires that collection and methods should always be consistent, and that data is precise and accurate. Accuracy can be assured by always collecting data correctly (per protocol), so that the recorded result could be verified by another individual performing the same steps of collection with the same equipment. Precision is often dictated by the equipment being used. For example, temperature in the CLAM program can only be recorded in whole degrees, because the thermometers do not read to a smaller increment.