

OHIO's **CLAM** **PROGRAM**

Citizen Lake Awareness and Monitoring
Sponsored by The Ohio Lake Management Society

2000 Summary of Results **By Matthew Smith and Robert Carlson**

Introduction

This marks the eleventh year that water quality monitoring has been conducted by the dedicated volunteers of the **Citizen Lake Awareness and Monitoring (CLAM)** program. As we continue to collect these data, we solidify our capability to paint an accurate picture the quality of water in our lakes. Water monitoring data in Ohio were collected from May to October, 2000 by 53 veteran **CLAM** volunteers and 12 new recruits on 31 Ohio lakes, reservoirs, and ponds and in two streams. In addition, there were a total of 34 attendees at **CLAM** workshops during the season held at 6 lake locations. A summary of program results for lake monitoring is presented in this 2000 annual **CLAM** report.

Methods

The **CLAM** lake monitors measured water transparency in inches using a Secchi disk. These data were used to generate a ranking of lakes according to their average 2000 Secchi depths. Trends in water clarity, presented as a positive or negative percent change per year, over time was evaluated using a linear regression analysis. Lakes with a statistically significant amount of annual change in transparency were identified. Only lakes with five years or more of data were included in this calculation.

An evaluation of water color using a Custer Color Strip was also performed by the **CLAM** participants. These data are reported as a number, 1 through 11, corresponding to a color hue involving greens and browns.

To provide an overall view of lake conditions, the other parameters observed by **CLAM** volunteers included: air and water temperature, cloud cover, rainfall, lake depth at sampling site, water level, perceived turbidity and possible reasons, lake management practices, opinions about water quality, aesthetics, and lake impairment, and an estimate on the amount of lake use. This information is presented individually for each **CLAM** monitored lake in 2000 on the Lake Summary Reports.

SUMMARY OF RESULTS

The ranked Ohio **CLAM** monitored lakes according to water clarity in inches for 2000 is presented in Figure 1 on Page 2. Buckhorn Lake had the greatest average transparency at 93.23 inches (over 7 1/2 feet deep). The lowest average Secchi depth, at 9.23 inches, for the monitoring season was observed in Charles Mill Reservoir.

Crystal Lake and Indian Lake had very low average transparencies at less than 13 inches. Seven of the 31 **CLAM** monitored lakes reported an average Secchi depth between 10 and 20 inches. Waynoka and Fisherman's Pond had relatively high average transparencies at greater than 72 inches (6 feet). The remaining monitored lakes reported averages between 20 and 63 inches for water clarity.

Several of the lakes; Atwood Lake, Griggs Reservoir, Silver Lake, Guilford Lake, Lakengren, and Candlewood Lake, had only five or fewer Secchi depth readings available for calculating the average transparency in 2000.

The water color in Ohio CLAM monitored lakes, as an average for the 2000 season, fell between 2 and 8 on the Custer Color Strip, or in a continuum from very light green to darker greens to an amber color (see Figure 1). No lakes, on average, were clear, light brown, brown, very brown, or dark brown.

The water transparency trends toward clearer or more turbid conditions in CLAM monitored lakes are presented as increases or decreases, respectively, to the Secchi depth over time (see Figure 2). Ten lakes appear to be getting clearer with annual increases in water clarity while the data indicate eighteen lakes becoming more turbid.

Seven of the Ten lakes getting clearer have an annual change in Secchi depth of less than four percent per year. Griggs Reservoir and Lake Erie are exhibiting Secchi depth annual increases between four and five percent.

Forked Run Lake is becoming clearer at a much higher rate, over nineteen percent of annual change per year. However this change is not statistically significant due to the variation of the data in previous years. The data indicates that Atwood Lake and Buckeye Lake annual increases in water clarity between five and six percent.

There are several lakes that have slightly negative shifts, less than one percent of annual change per year in Secchi depth, is observed for Nettle Lake, Lake Loramie, Holiday Lakes, Silver Lake, and Fisherman's Pond.

The majority of lakes that are decreasing in transparency, are changing at a rate of one and four percent in annual decreases. Corning Lake is decreasing in percentage of annual change at statistically significant rates.

Four of the lakes, Charles Mill Reservoir, Lake Lorelei, Lake Lakengren, and Leesville Lake, have decreasing annual changes in transparency greater than four percent. This change is showing a more statistically significant turbidity in Lake Lakengren and Leesville Lake.

DISCUSSION

This on going water monitoring program, sponsored by the Ohio Lake Management Society (OLMS), indicates that Ohio CLAM evaluated lakes: 1) should be classified as mesotrophic, eutrophic, or hypereutrophic, 2) are dominated by algal turbidity, not suspended sediment, and 3) exhibit changing water transparencies, several with significance.

The eutrophic (Secchi depth between 20 and 78 inches) and the hypereutrophic (Secchi depth less than 20 inches) classifications describe lakes that have low water clarity and high levels of aquatic weeds. These lakes types have green water due to algae, no oxygen in the bottom water strata, support warm water fisheries, and will have pollution tolerant invertebrate species found in their sediments.

In the extreme eutrophic cases, heavy algal blooms, dense aquatic weed beds, and a complete loss of oxygen causing fish kills can occur in the waterbody.

Eutrophication, or the enrichment of the water by nutrients such as nitrogen and phosphorus, is the process resulting in these lake trophic states which is enhanced by point or non-point source pollution. A loading to the water column of erosional materials, such as silt and clays, from the adjoining watershed also contributes to eutrophic conditions by reducing the lake depth.

Most of the 2000 CLAM monitored lakes had average Secchi depth readings that classify them as either hypereutrophic (8 lakes) or eutrophic (22 lakes). These trophic states are common in the relatively shallow lakes of Ohio because of the rich soils, agricultural practices, land construction and heavy land use in the surrounding watersheds.

The only lake in the [CLAM](#) program, with an average transparency greater than 78 inches, Forked Run, is classified as mesotrophic. This condition is characterized by clearer water with less algae and aquatic weed problems.

This classification scheme, with the associated lake conditions, is only valid if the observed transparency is influenced by algae, not dissolved color or suspended sediment. An evaluation of water color provides an indication as to the cause of low water clarity.

All of the [CLAM](#) monitored lakes exhibited a more green water color, on average, than brown. This suggests that algal biomass, not suspended sediment, dominates the water column in the lakes. Therefore, to classify them as mesotrophic, eutrophic, and hypereutrophic is considered appropriate.

The [CLAM](#) lake trends in transparency indicate that 36% in the analysis are getting clearer while the other 64% are becoming more turbid. The lakes with shifts that are not statistically significant may be normal annual fluctuations or a result of sampling regime or error, so not as important when evaluating changing water conditions over time.

ACKNOWLEDGEMENTS

The Ohio Lake Management Society appreciates the devotion of its many [CLAM](#) volunteer monitors. These exceptional individuals donate their time to provide valuable water quality data in Ohio. Many of them have been with our program for numerous years. We would like to congratulate the inductees into our new **Volunteer Ten Year Club**. This is a very important step as a volunteer program. We would also like to congratulate the new members of our **Volunteer Five Year Club**. As the experience of our volunteers grows so does the acceptability of the data they collect by state and local entities. In addition, a very special "thank you" is extended to our **2000 Gold Star Volunteers**, those who have collected 10 or more samples during the field season. Sixty-four percent of the 2000 monitors receive this honor! Their dedication in providing a complete season of data collecting increases the statistical power of our conclusions. We certainly appreciate this great contribution to the [CLAM](#) program.

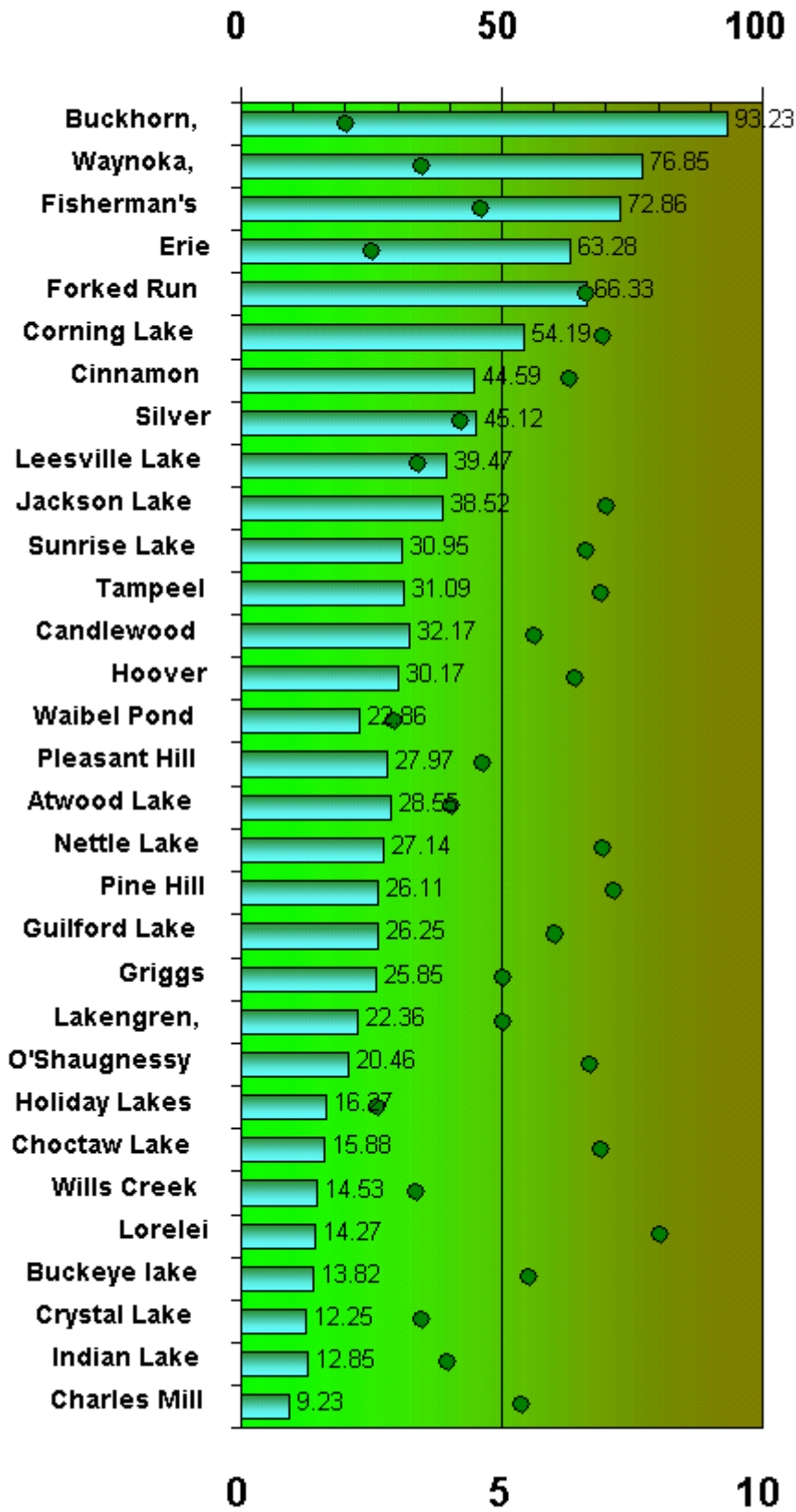
Our organization also recognizes the generous assistance given to [CLAM](#) by our sponsors and supporters. We receive funding thru The U.S. Environmental Protection Agency section 319 of the Clean Water Act. [CLAM](#) is also supported with in-kind contributions from Kent State University, Ohio EPA, Muskingum Watershed Conservancy District, Ohio State University Extension, Hamilton County Park District, Ohio Department of Natural Resources, and the Richland County Soil and Water Conservation District. The collaboration of these groups with OLMS allows watershed education and data collection efforts to continue in Ohio through the [CLAM](#) program!

Figure 1 (below): The ranking of Ohio lakes monitored by [CLAM](#) participants in 2000 according to water clarity. Transparencies are presented as the average Secchi depth in inches. Also shown is the average water color, as determined from a Custer Color Strip, for each [CLAM](#) lake in 2000.

 Secchi Depth

 Water Color

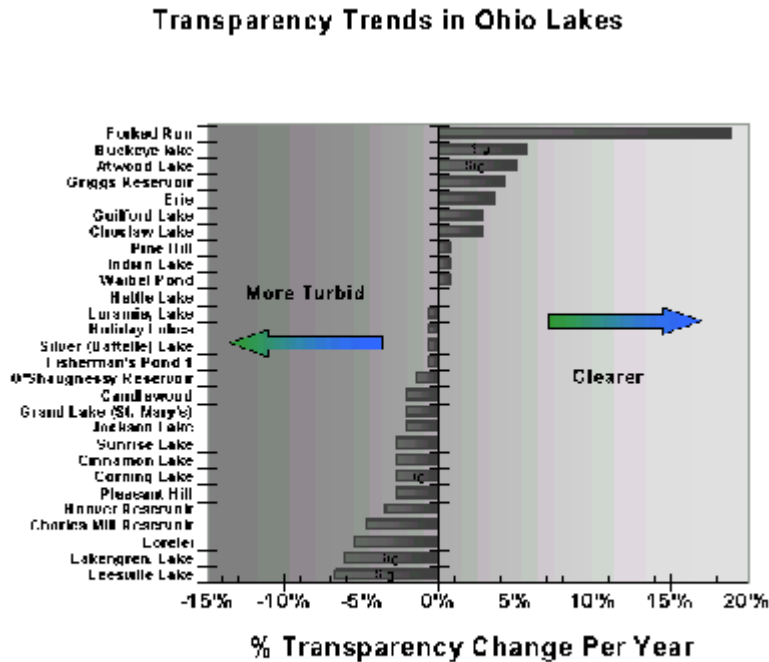
Secchi Disk Values, Recorded in Inches, in Ohio's 2000 Field Season



Light Green - Green - Dark Green - Very Dark Green - Brownish Green - Amber

Average Water Color (Custer Color Strip)

Figure 2 (below): A listing of Ohio CLAM monitored lakes (2000 field season) according to transparency trends of getting clearer or more turbid. Trends in transparency are shown as an increase (+) or decrease (-) percent change per year in Secchi depth. **Sig. indicates a lake with a statistically significant amount of annual change in transparency P > 95%.**



The CLAM Volunteer Ten Year Club

- George Barhorst 10 years 1 site on Lake Loramie
- Robert Biro*** 10 years 1 site on Lake Erie, west basin
- David Bohla*** 10 years 1 site on Indian Lake
- Mark Hausman 10 years 1 site on Atwood Lake
- Clifford Hoenie*** 10 years 2 sites on Indian Lake
- James Mueller*** 10 years 3 sites on Indian Lake
- William Patton 10 years 2 sites on Griggs Reservoir
- John Reinhard*** 10 years 3 sites on Choctaw Lake
- Richard Seiple*** 10 years 1 site on O'Shaughnessy Reservoir
- Bob and Ginny Sundin*** 10 years 1 site on Pine Hill Lake
- John Tholen 10 years 1 site on Silver Lake
- John Walker*** 10 years 3 sites on Buckeye Lake
- Gary Weinheimer*** 10 years 1 site on Fisherman's Pond

The CLAM Volunteer Five Year Club

New Inductees:

- John Frenk 5 years 2 sites on Charles Mill Reservoir
- Marlene & Dick Groff 5 years 2 sites on Charles Mill Reservoir

Norman Johnson 5 years 3 sites on Pleasant Hill
Christopher J. Studer 5 years 2 sites on Pleasant Hill

Current Members:

Dawn Gerlica* 9 years 1 site on Corning Lake
Jonathan Herman* 9 years 1 site on Grand Lake St. Mary's
David Leiter 9 years 1 site on Indian Lake
Pat McKirnan* 9 years 1 site on Grand Lake St. Mary's
James Short* 9 years 2 sites on Nettle Lake
Ginny & Bob Sundin* 9 years 1 site on Pine Hill Lake
Robert Waibel* 9 years 1 site on Waibel Pond
Charlie Wojcik* 9 years 1 site on Lake Lorelei
William and Jenny Burke* 8 years 2 sites on Jackson Lake
Carl Moore* 8 years 3 sites on Sunrise Lake
Gale Osborne* 8 years 2 sites on Forked Run Lake
Dieter Sems 8 years 1 site on Leesville Lake
Paul Adams 7 years 1 site on Silver Lake
Cathy Cattrell 7 years 3 sites on Guilford Lake
Eldon Grapner* 7 years 1 site on Grand Lake St. Mary's
Donald Green* 7 years 4 sites on Cinnamon Lake
Richard and Beth Renken 7 years 2 sites on Lake Lakengren
William Lewis* 6 years 1 site on Indian Lake
Jim and Bev Pelc 6 years 3 sites on Charles Mill Reservoir
Nelson Shogren* 6 years 2 sites on Charles Mill Reservoir

*denotes a **Gold Star Volunteer** with ten or more lake monitoring dates reported in 2000. Not shown above, Phillip Clem from the U.S. Coast Guard Auxiliary (Indian Lake), William Hitt (Hoover Reservoir), Steve James (Pleasant Hill), Robert Yelensky (Holiday Lakes), Dave Ahrns (Lake Loramie), Sharon Johnson (Indian Lake), Robert Marshall (Leesville Lake), W. David Peters (Leesville Lake), Nick Poepelman (Lake Loramie), and Donald Weaver (Leesville Lake) also receive this award. Thank you for your dedication!!

Additional information on individual **CLAM** lakes can be found in the Lake Summary Reports. To request a report, contact

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with your name, address, phone number, and the **CLAM** lake name of interest.