Citizen Lake Awareness and Monitoring

2010 Summary of Results

Sponsored by the **Ohio Lake Management Society**
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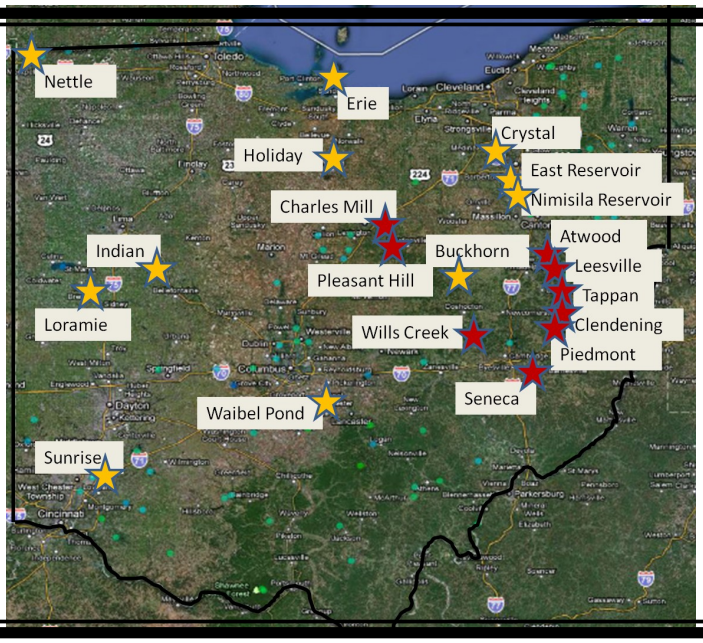
Introduction

The 2010 CLAM lake monitoring season was successful at gathering field data, performed by trained volunteers, and the recruitment of Lake Keepers in the Muskingum River Watershed. In addition to surface temperature, Secchi depth transparency, and water color, Lake Keepers recorded depth profiles for dissolved oxygen and water temperatures, and collected water samples for chemical analysis. Twenty-two volunteers submitted data on 20 Ohio lakes (*shown below*), with twelve volunteers being new to the program. Data were collected May through October 2010 and used to determine lake productivity.

CLAM 2010 Volunteers:

Bob Biro
David Bucknavich*
Steve James
Betty Kaser-Lyle*
William Lewis
Jeff Love*
Carl Moore
Glenn Moretz*
James Short
Mike Short
Joseph Stephens
Bill Trommer*
Robert Waibel
James Weybright*



Muskingum Watershed Lake Keepers:**

Richard Bassetti
Maureen Coleman*
Don Dieffenbaugher*
Don Driver*
Loren Griffiths*
Mark Hausman
Mark Tondra*
Dick Zimmerman*

*New volunteers in 2010
**Lakes indicated with red star

Methods

CLAM lake monitors measured water transparency in inches using a Secchi disk. These data were used to generate a ranking of lakes according to average 2010 Secchi depths. Trophic state classifications as mesotrophic, eutrophic, and hypereutrophic for each lake were determined.

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

To provide on overall view of lake conditions, other parameters reported 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, perceptions about water quality, aesthetics, and lake impairment, and an estimate on the amount of lake use. Some of this information is presented individually for each CLAM monitored lake on a Lake Summary Report (www.eyesonthewater.com/olms). These data on CLAM lakes are also available for further analyses, as needed.

Trends in water clarity, presented as a positive or negative percent change per year, was evaluated over time using Kendall's Tau Trend Analysis of the Trophic State Index (TSI). 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.

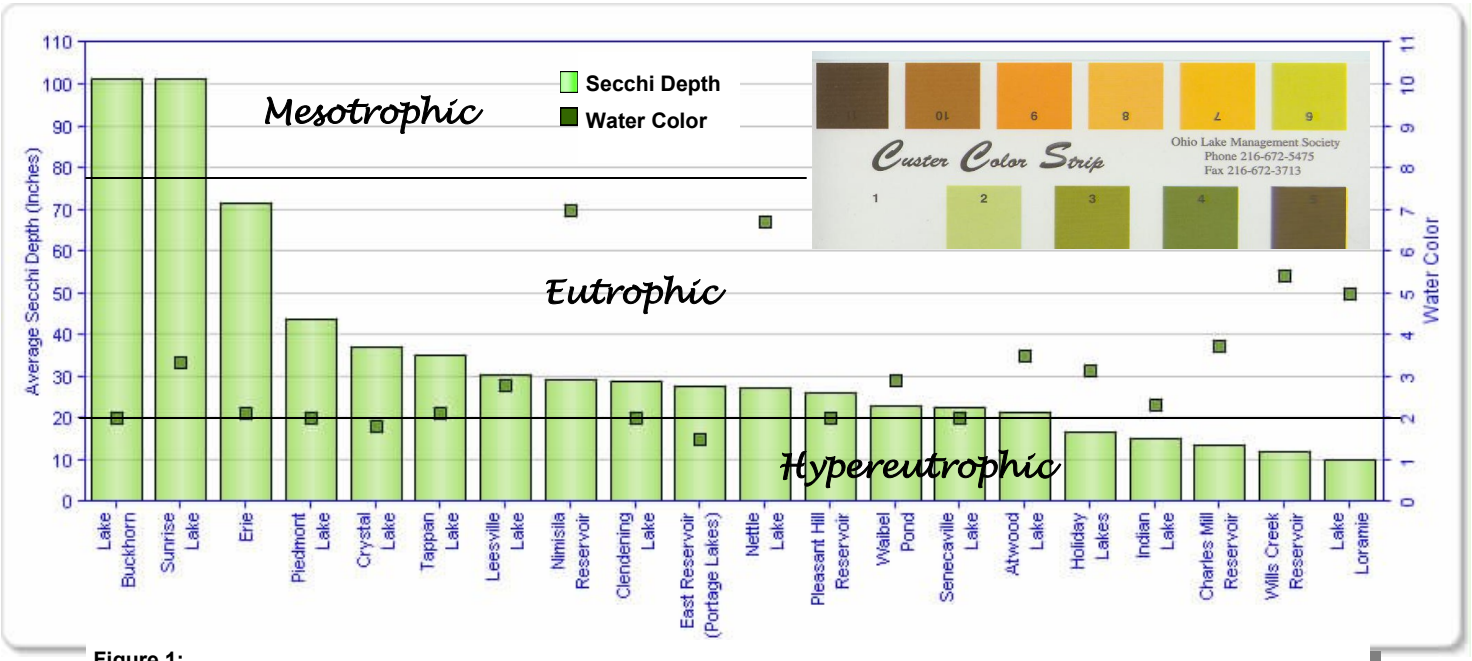


Figure 1:
CLAM lakes in 2010 with average Secchi depth values, recorded in inches, and average water color (Custer Color Strip, *shown above*). Trophic state classifications are also presented; Secchi depths less than 20 (hypereutrophic), between 20 and 78 (eutrophic), and greater than 78 inches (mesotrophic).

Seasonal dissolved oxygen and water temperature depth profiles at one meter increments were recorded by Lake Keepers on lakes owned by Muskingum Watershed Conservancy District using YSI ProODO Meters. Water samples and filter residue at an inflow and outflow reservoir location were also collected to determine total suspended sediment concentration, Chlorophyll *a*, total nitrogen, and total phosphorus. Results from these analyses can be obtained upon request (www.olms.org).

Summary of Results

Water Transparency

Average Secchi disk transparencies and water colors for the 2010 sampling season are shown on Figure 1. Lake Buckhorn and Sunrise Lake reported the greatest average transparencies at 102.19 and 101.22 inches, respectively. Lake Erie, near the shoreline of Ottawa County, recorded just over 70 inches for average transparency in 2010. Lake Loramie had the least average transparency at 10.38 inches.

Four of the 20 lakes monitored had average transparency between 30 and 45 inches; Piedmont Lake, Crystal Lake, Tappan Lake, and Leesville Lake. Average transparencies near one foot in depth occurred in Holiday Lake, Indian Lake, Charles Mill Reservoir, and Wills Creek Reservoir. The remaining eight lakes reported between 20 and 30 inches of average transparency.

Two new lakes in 2010 had fewer than five data points collected to calculate average transparency; East Reservoir (Portage Lakes) and Nimisila Reservoir in Summit County. Atwood Lake has been a CLAM monitored lake since 1991 and in 2010 had 6 samples recorded. All other lakes had 12 or more datasets submitted, with the most information reported from Tappan Lake at 52 and Sunrise Lake at 64 samples.

Water Color

The average water color in the lakes monitored by CLAM volunteers all ranged between two and seven on the Custer Color Strip, except for East Reservoir that reported 1.5 as an average (Figure 1). None of the lakes monitored had average readings of 1 (clear) or 8 to 11 (clays or silt particles).

Water Clarity Trends

Trend analysis of the Trophic State Index (TSI) indicated increasing or decreasing lake water transparencies as a negative or positive percent change per year, respectively, for CLAM lakes with five or more years of data. Twelve of the 20 CLAM lakes in 2010 have the required amount of data to calculate trends, as shown within circles on Figure 2.

Discussion

Lake water monitoring by CLAM volunteers in 2010 show lakes; 1) to be eutrophic or hypereutrophic, except Lake Buckhorn and Sunrise Lake, 2) are dominated by algal turbidity, and 3) exhibit changing water transparencies.

Eutrophication, or the enrichment of the water by nutrients such as nitrogen and phosphorus, is the process that results in eutrophic lakes. This process is enhanced by point or non-point source pollution. A loading to the water column of materials from erosion, such as silt and clays from adjoining watersheds, also contributes to eutrophic conditions by reducing lake depth.

Eutrophic (Secchi depth between 20 and 78 inches) and hypereutrophic (Secchi depth less than 20 inches) describe lake trophic states that have low water clarity and high levels of aquatic weeds. These lakes 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 the sediments.

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

Thirteen of the CLAM lakes monitored in 2010 are classified as eutrophic and five as hypereutrophic. These trophic states are common in Ohio for lakes that are relatively shallow. This is due to Ohio's rich soils, agricultural practices, land construction, urban encroachment, and heavy land use in the surrounding watersheds.

Lake Buckhorn in Holmes County and Sunrise Lake in Warren County are classified as mesotrophic. Transparencies in the 100 inch range mark these lakes as rare in the CLAM program. Mesotrophic is characterized with fairly clear visibility and cleaner substrate containing a more pollution intolerant macroinvertebrate community. Lakes in this condition should minimize nutrient loading by encouraging best management practices (BMP's) on neighboring property.

Trophic state classification, and 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. Therefore, to classify them as mesotrophic, eutrophic, and hypereutrophic is appropriate.

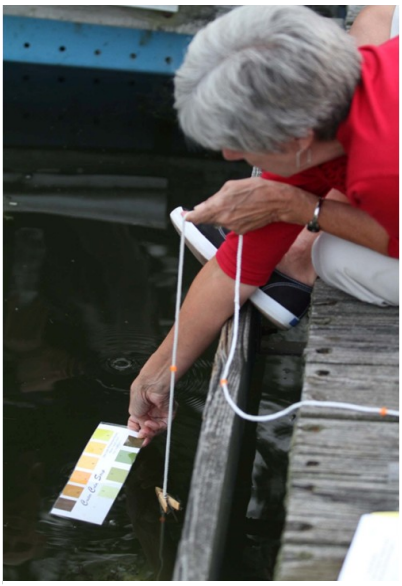
Six of the 2010 CLAM lakes exhibited a trend towards becoming clearer, seen as increased transparency, with Atwood Lake, Holiday Lake, and Sunrise Lake showing a statistically significant change. Conversely, of the six lakes exhibiting decreasing transparency, Pleasant Hill Reservoir and Leesville Lake data indicate a statistically significant trend towards more turbid conditions.

Additional lakes shown on Figure 2 are historical lakes within the CLAM program that were not actively monitored in 2010.

Acknowledgements

The Ohio Lake Management Society would like to thank the dedicated CLAM volunteers for the numerous hours they give in monitoring the lake in which they serve. Without these individuals, the condition of many Ohio lakes would not be documented. An experienced and diverse volunteer base is critical to the existence of a strong volunteer monitoring program.

There were twelve new monitors this season and eight volunteers in 2010 (36%) have 10+ years of experience with the CLAM program (Table 1). This dedication greatly increases the value of the data collected with long-term reliable information. In 2011, two CLAM volunteers will even make it to 20 years of lake monitoring!



CLAM volunteer trainee at Portage Lakes in Summit County learning to measure water color, September 2010. (photo by LewStampPhotography.com)

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CLAM Volunteer Ten+ Club

Robert Biro*	19 years	Lake Erie, west basin
Mark Hausman	19 years	Atwood Lake
Steve James	13 years	Pleasant Hill
William Lewis*	15 years	Indian Lake
Carl Moore*	17 years	Sunrise Lake
James Short*	18 years	Nettle Lake
Joseph Stephens*	10 years	Buckhorn, Lake
Robert Waibel*	18 years	Waibel Pond

***Gold Star Volunteer** with ten or more monitoring samples reported in 2010.

Table 1:
List of 2010 CLAM volunteers with ten or more years of lake water monitoring.

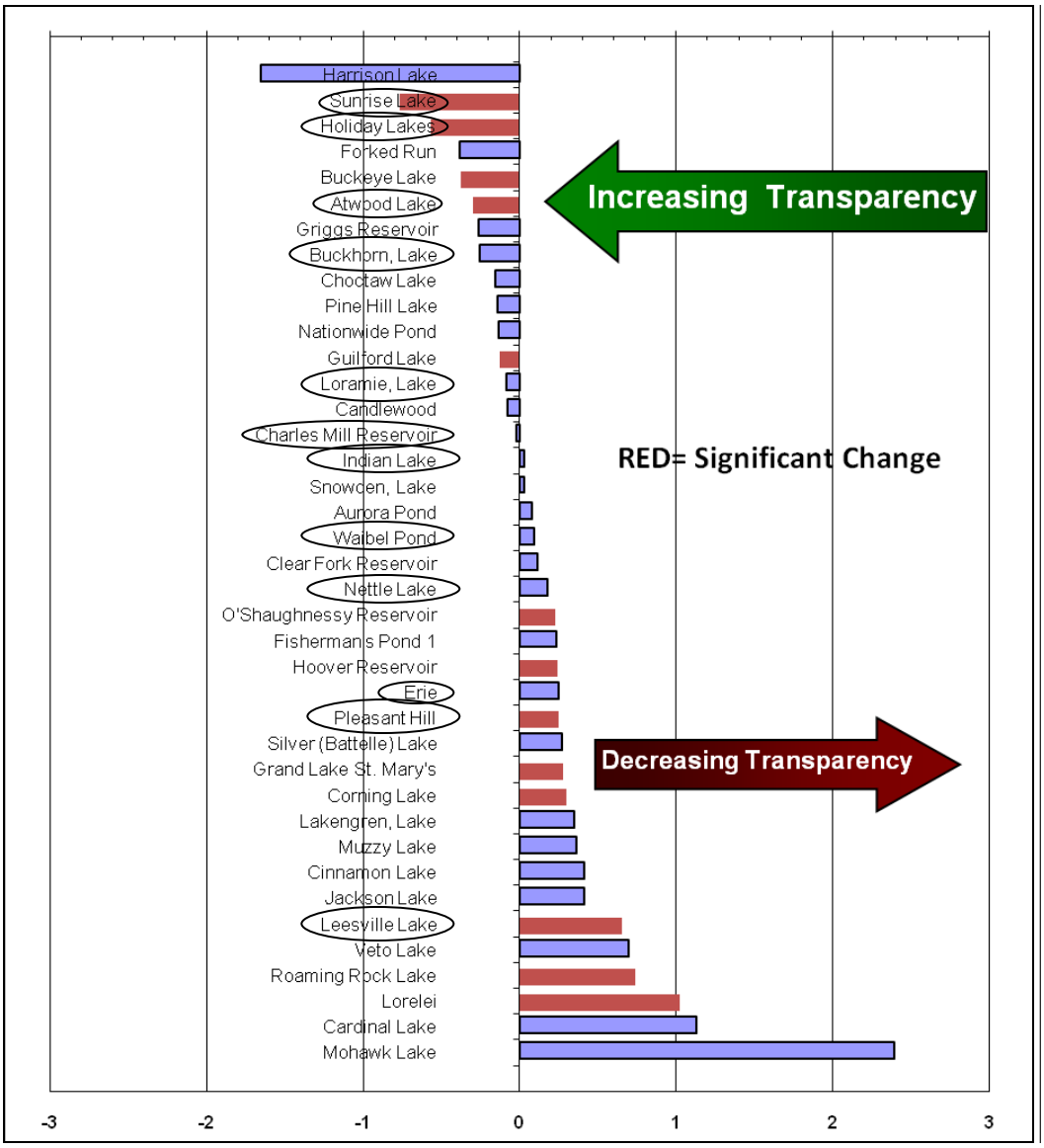

Figure 2:
Change in transparency as a percent per year in the Trophic State Index (TSI) value. A negative change is a trend towards a less eutrophic lake, while a positive change indicates a trend towards a more eutrophic lake. Lakes monitored in 2010 are shown within circles and statistically significant changes are indicated with red.

Furthermore, the greater the sample size, the more powerful the dataset. Seventeen volunteers (77%) turned in ten or more samples in 2010. When volunteers collect more than 10 samples in a given season, it allows for a more precise picture of the lake as better conclusions can be made using appropriate statistical analyses.

Our organization also truly appreciates the generous assistance given to CLAM by our sponsors. Grant funding from the **Muskingum Watershed Conservancy District** provided for the involvement of the Lake Keepers, along with support from the **Ohio Department of Natural Resources, Inland Fisheries Research Unit**.

CLAM is also supported in-kind from **Kent State University** and the **Ohio Environmental Protection Agency**. Partner collaborations enable OLMS to perform watershed protection education and continue to collect CLAM lake water quality information throughout Ohio!

Additional information on individual CLAM lakes can be found in the Lake Summary Reports at **www.eyesonthewater.org/olms** or request a Report by contacting:

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P.O. Box 463, Kent, OH 44240
330-466-5631
oleskiewicz@windstream.net

Include your name, address, phone number, and CLAM lake of interest.