

# Stony Lake Volunteer Water Quality Testing Results for 2014

## ***2014 Results Consistent with long-term trends***

The lab results for Total Phosphorus and the Chlorophyll *a* tests, which were completed over the winter months, when combined with Secchi Disk Transparency readings and Dissolved Oxygen and Temperature Profiles indicate that the water quality for Stony Lake during the summer of 2014 is similar to the favorable results in recent years.

## ***History***

Volunteers at Stony Lake have participated in the Cooperative Lake Monitoring Program (CLMP) for over a decade, collecting samples and reporting observations and readings that are combined with the data from 238 other inland Michigan lakes. CLMP is a partnership of the Department of Environmental Quality, Michigan Lake & Stream Association, the Great Lakes Commission, the Huron River Watershed Council, and Michigan State University. The Stony Lake Property Owners Association pays the cost to be a part of the program, all of the funds are used by CLMP for testing equipment and laboratory materials.

### STONY LAKE VOLUNTEER LAKE MONITORING PROGRAM

| Test   | Volunteer Opportunities  |
|--|--|
| <b>Secchi Disk Transparency</b><br><i>Clarity depth is an indicator of the lake's trophic status.</i><br>Samples are taken at least once a week from early May through late September at two locations on Stony Lake.  | Ideally we would have one additional volunteer to share the load and provide a larger data pool.                               |
| <b>Total Phosphorus Concentration</b><br><i>Measure of a primary nutrient that stimulates plant growth.</i><br>Spring samples are taken between May 1 – 5, following lake turnover. Summer samples are taken between September 18 – 22. Samples taken at Deep Basin, the deepest point on Stony Lake. Samples are sent to lab at MSU for analysis. | Another volunteer is needed to share the load.   |
| <b>Chlorophyll <i>a</i> Concentration</b><br><i>Chlorophyll <i>a</i> is a component of most plant cells, the concentration is a measure of small plants such as algae.</i><br>Samples are taken five times from May through September at Deep Basin, the deepest point on Stony Lake. Samples are sent to lab at MSU for analysis.                 | Another volunteer is needed to learn the procedure to provide backup in future years.  |
| <b>Dissolved Oxygen and Temperature Profiles</b><br><i>Oxygen in the water is needed to sustain the fish population; temperature profile is related to nutrient release and mixing.</i><br>Samples are taken at least once every two weeks from early May through late September at two locations on Stony Lake.                                   | Another volunteer is needed to learn the procedure to provide backup in future years.  |
| <b>Exotic Aquatic Plant Watch</b><br><i>Identifying and mapping of invasive aquatic plants; assists in controlling and treatment process.</i><br>Survey conducted around perimeter of lake annually; results are logged on Google-maps.  | Additional volunteers are welcome; excellent opportunity to learn about the vegetation (both native and invasive) in the lake. |

## ***Want to get involved?***

Our current lake testing program takes about an hour mid-day once a week when we take Secchi disk readings and dissolved oxygen/temperature profiles. Once a month we sample for chlorophyll *a* which adds another hour. It would be great if you could make the commitment for the entire season and have access to a boat with an anchor. But if you're just interested, you're welcome to join in, learn what's involved, and serve as a back up.

The White River Watershed Partnership, with members knowledgeable in stream ecology, have asked if we would like to include Stony Creek, both above and below the Lake, in the spring and fall stream sampling they have been conducting in Oceana County. This is a great opportunity to learn more about our entire watershed.

If you are interested in getting involved, please contact John Stivers, [jhstivers@comcast.net](mailto:jhstivers@comcast.net).

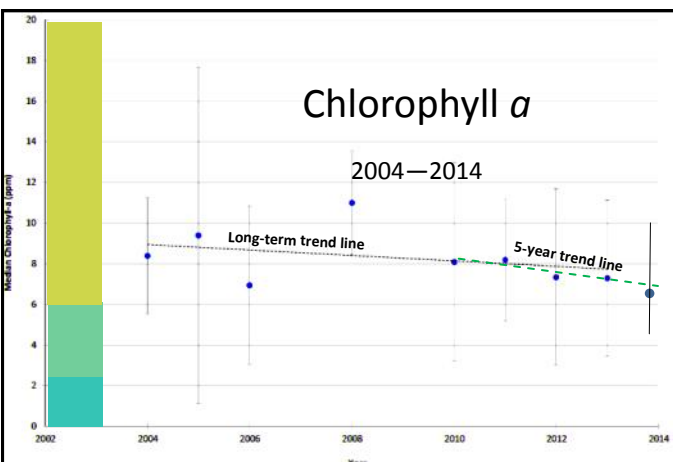
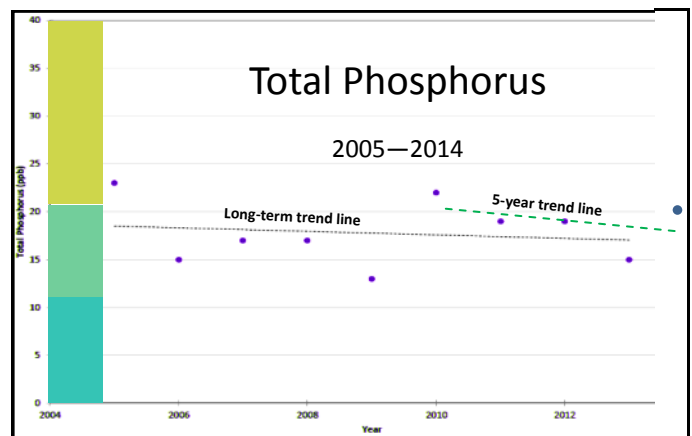
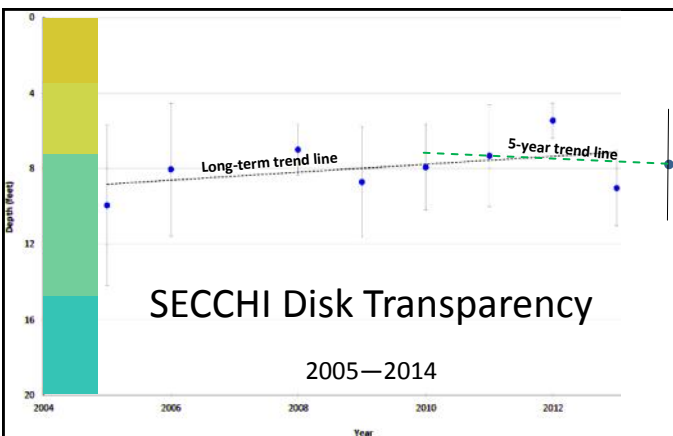
## Is Stony Lake getting older?

Lakes naturally increase in nutrients and sediment over time; human activities can also accelerate the productivity. The process is called **eutrophication**. It's often compared to human "aging" (maybe like for old folks, the lower the test results, the better). For lakes, their life stage is called the **trophic state**.

| Trophic State  | Oligotrophic<br><i>Young Lakes: deep, clear lakes with little aquatic plant growth.</i> | Mesotrophic<br><i>Middle Aged Lakes: between Oligotrophic and Eutrophic</i> | Eutrophic<br><i>Old Lakes: shallow, turbid with abundant aquatic plant growth</i> | Hypereutrophic<br><i>Very Old Lakes: highly productive; nuisance algae and weeds</i> |
|--|---|---|---|--|
| Secchi Depth (SD)<br>Annual Average                                      | > 15 ft   | 15 ft—7.5 ft  | 7.5 ft— 3 ft  | < 3 ft   |
| Total Phosphorus (TP)<br>Spring/Summer                                   | < 11 ppb  | 11 ppb—21 ppb   | 21 ppb—50 ppb   | > 50 ppb   |
| Chlorophyll <i>a</i> (CHL)<br>5 Sample Average                           | < 2.25 ppb  | 2.25 ppb—6.00 ppb   | 6.00 ppb—22 ppb   | > 22 ppb   |
| Carlson's Indices<br>TS <sub>SD</sub> TS <sub>TP</sub> TS <sub>CHL</sub> | <38   | 38 – 48   | 48 – 61   | >61  |

As the CLMP Annual Summary Report says, "the dividing lines between the trophic status categories are somewhat arbitrary ... and there is no broad agreement among lake scientists as to the precise point of change between each of these classifications." Limnologists (those lake scientists) generally look at seasonal averages of multiple tests; no one sample tells the tale. Because of variability in weather conditions, such as ice-out dates and summer water temperatures, having a long history of multiple tests is most instructive. We now have results dating back to 2004, which you can find on the MiCorp data exchange [www.micorps.net/data/view/search/](http://www.micorps.net/data/view/search/). That's also the repository for the data collected from the other lakes and streams all across the state.

## Stony Lake Test Results



Carlson's Indices for Stony Lake 2004—2014

| Year | TS <sub>SD</sub><br>(Secchi Disk) | TS <sub>TP</sub><br>(Total Phosphorus) | TS <sub>CHL</sub><br>(Chlorophyll <i>a</i> ) |
|------|-----------------------------------|--|--|
| 2014 | 47                                | 47                                     | 48   |
| 2013 | 45                                | 43                                     | 50   |
| 2012 | 53                                | 47                                     | 53   |
| 2011 | 48                                | 47                                     | 51   |
| 2010 | 48                                | 49                                     | 51   |
| 2009 | 46                                | 41                                     | 51   |
| 2008 | 49                                | 45                                     | 54   |
| 2007 | not reported                      | 45                                     | not reported                                 |
| 2006 | 48                                | 43                                     | 50   |
| 2005 | 44                                | 49                                     | 53   |
| 2004 | 47                                | 47                                     | 51   |

## Carlson's Trophic Status Indices

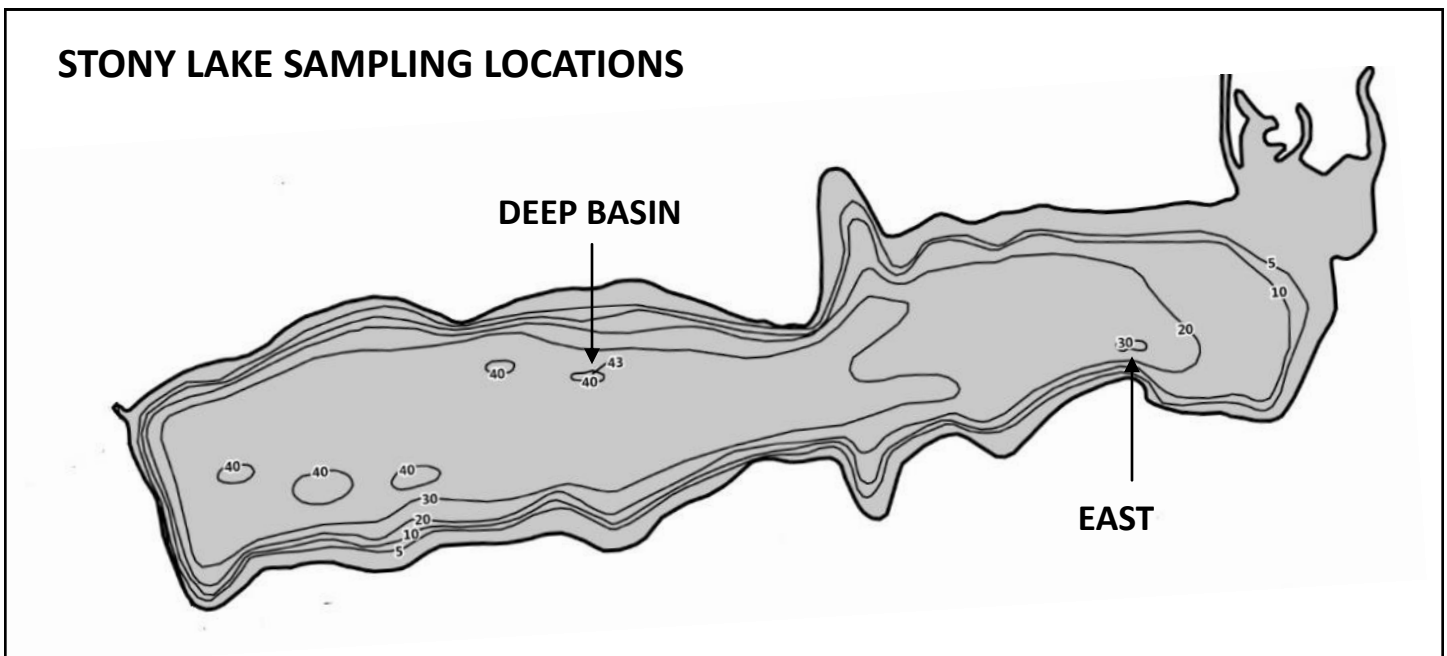
To make a more understandable evaluation of the data from different tests, those who study lakes use Carlson's Trophic Status Indices. For each of the three types of tests, the sample results for the year are averaged, then mathematically adjusted, making them a relatively comparable approximation of the "age" of our lake. When you look at the results (table at the lower right-hand corner of previous page), you see that there is considerable variability from year to year, even from test to test within the same year. A more detailed explanation of this topic is included in the CLMP Annual Summary Reports [www.micorps.net/lakereports.html](http://www.micorps.net/lakereports.html).

### Where on the lake are the samples taken?

As a general practice, the deepest points are used for testing. Depth is very important when taking Chlorophyll *a* samples, which are collected over a "water column" that is double the Secchi disk reading taken just before collecting the water. Similarly, using the deepest point gives the longest profiles for Dissolved Oxygen and Temperature readings.

On Stony Lake, the DEEP BASIN site is located off the shoreline of Camp Ao-Wa-Kiya. In 2012, with the objective to see how different conditions were, we began making some additional tests in the eastern portion of the lake as well.

The Secchi Disk Transparency readings for the two sites, though fluctuating in a similar pattern over the summer, were on average about 1.5 feet shallower (less transparent) at the EAST site. The lower clarity may be due to the difference in depth, nearness to the bank and vegetation, proximity to the inlet creeks, or wave action from the longer westerly-wind fetch.

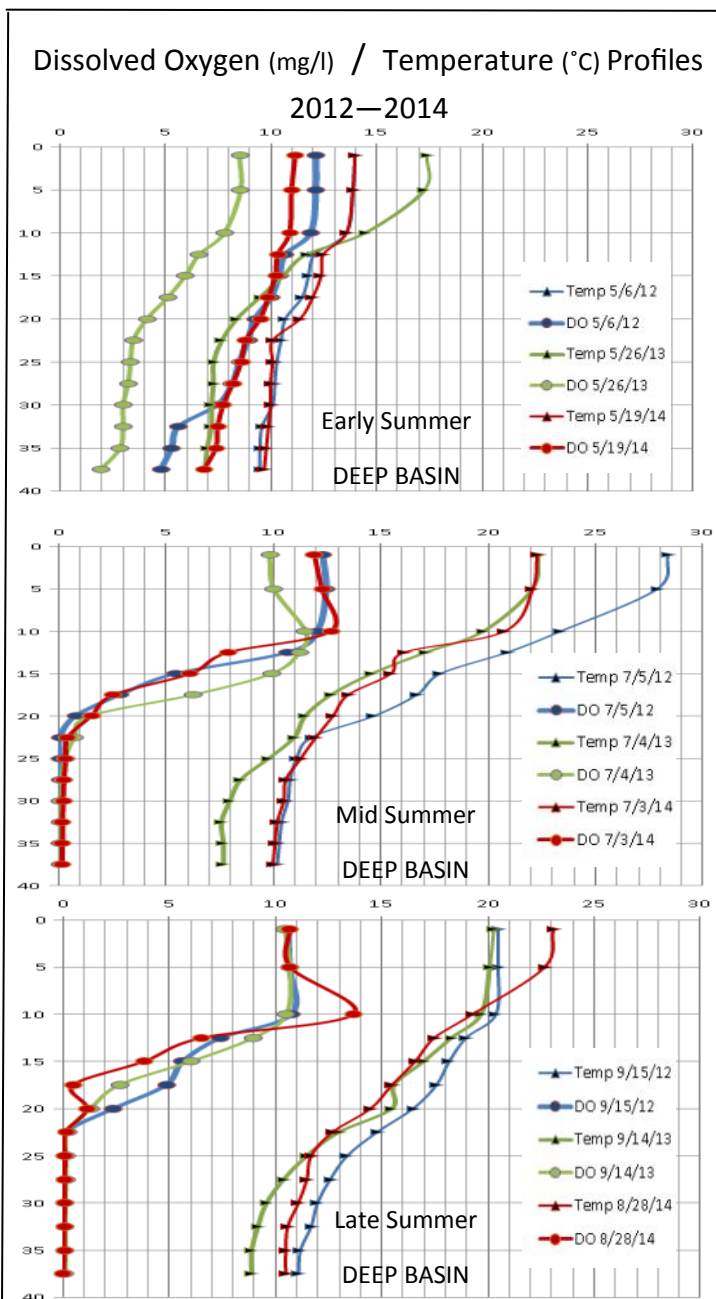
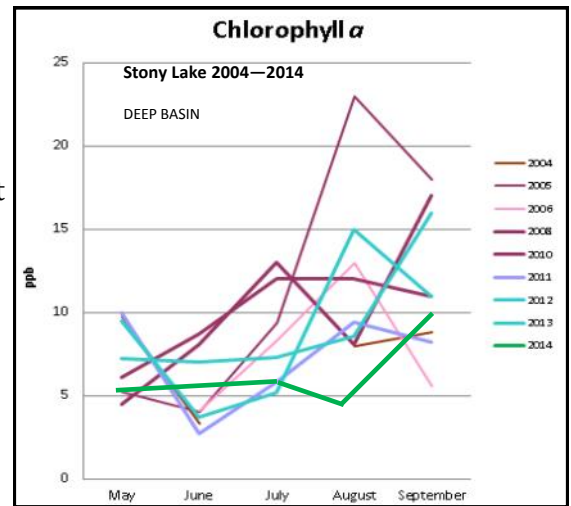


| Location   | Coordinates            | CLMP Field ID | Testing  |
|--|------------------------|---------------|--|
| "Deep Basin" (since 2004)<br>Located at the deepest point (~43 feet) off shore from Camp Ao-Wa-Kiya                      | N43.55983<br>W86.48547 | 640049        | Total Phosphorus<br>Chlorophyll <i>a</i><br>Secchi Disk Transparency<br>Dissolved Oxygen/Temperature |
| "East" (since 2012)<br>Located north of Hickey's Landing the deepest point (~30 feet) of the eastern portion of the lake | N45.56010<br>W86.47156 | 640345        | Secchi Disk Transparency<br>Dissolved Oxygen/Temperature   |

## What happens through the year?

Each summer since 2004, five Chlorophyll *a* samples have been taken, once a month, starting in mid-May. The test measures general density of all forms of algae in the lake. Like other forms of plant life, some algae is actually good, but too much results in large blooms that can be a nuisance. The 2014 averaged results were slightly lower than in previous years. As the graph to the right shows, there is considerable variation from month to month and from year to year.

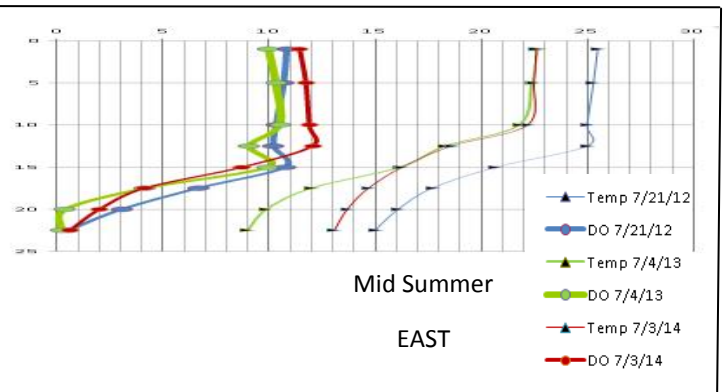
Following “ice-out” the lake “turns over.” This bottom-to-top mixing brings up much of the nutrients that have settled and decayed on the bottom. Because of this mixing, the spring Phosphorus sample can be taken near the surface and still be representative of the concentration in the entire lake. A fall sample is also taken. For 2014, both values and their average are within the range recorded over the last ten years.



The three charts to the left show profiles for Dissolved Oxygen and Temperature taken in the Deep Basin for early, mid and late summer over the last three years. Below is the chart for the mid-summer readings taken at the East sampling location. Because the numerical values for both DO and Temp are similar, they are charted together.

By mid-summer there is a clearly defined drop in oxygen levels beginning at about 10 feet. Below 20 feet, the oxygen level is nearly zero and the temperature is about 50°F. This characteristic profile continues through the end of summer.

The East values parallel those of the Deep Basin down



to its bottom depth, which is about the top of the “dead zone” that is mainly west of Green Point.

An informative explanation of lake “age,” seasonal aquatic activity, and why the sampling we are doing is useful to limnologists is available at the link below.

<http://www.micorps.net/documents/DO-TempFactsheet.pdf>

Prepared by CLMP volunteer John Stivers with sampling assistance from Tom Best.