THE 2015 SECCHI DIP-IN REPORT

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North American Lake Management Society
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Photo by Bob Kirschner
Thank you to the North American Lake Management Society for supporting the Secchi Dip-In.

Thank you to the 2015 and 2016 Secchi Dip-In committee members:

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SECCHI DIP-IN PROGRAM DESCRIPTION

The Secchi Dip-In is a program of the North American Lake Management Society (NALMS). The purpose of the Society is to foster the management and protection of lakes and reservoirs for today and tomorrow.

The Secchi Dip-In began in 1994 to demonstrate that volunteers can provide accurate, consistent information on the waters of North America. What began as a pilot study with six Midwest states (Indiana, Illinois, Wisconsin, Michigan, Ohio, and Minnesota) expanded to 37 states and 2 provinces of Canada by 1995. In 2015, Dr. Bob Carlson transferred the operation of the Secchi Dip-In to NALMS. In the 21 years Dr. Bob Carlson led the Secchi Dip-In, the database accumulated more than 41,000 records on more than 7,000 individual waterbodies.

The Dip-In is an ongoing program using trained volunteers to gather long-term water clarity data in the summer of every year. Secchi Dip-In participants include trained monitoring volunteers and individuals who are interested in citizen science and enthusiastic about lakes. We encourage anyone interested in understanding the ecology of their lake or watershed to get involved with the Secchi Dip-In.

Mission statement

To involve citizen scientists in monitoring the water quality of North America’s lakes and their watersheds

What we do

- Organize an annual data-gathering event during Lakes Appreciation month for North American lakes, reservoirs, and other waterbodies
- Provide educational materials and training for anyone engaged in managing lakes and their watersheds
- Maintain long-term transparency monitoring data for use in research on aquatic systems and the discovery of trends
- Prepare annual reports analyzing Secchi Dip-In data and make data available for all interested stakeholders
- Promote public awareness and stewardship of lakes and watersheds
- Recognize the importance of volunteers in the gathering of environmental data
THE SECCHI DISK

The Secchi disk is utilized by volunteers to take transparency measurements on their waterbodies. The Secchi disk is named after Father Pietro Angel Secchi (1818-1878) who was the scientific adviser to the Pope. The most common Secchi disk is a 20 cm with alternating black and white quadrants. The disk is lowered into a waterbody until it can no longer be seen (Figure 1). The depth of disappearance is a Secchi depth, a measure of the transparency of the water. This basic tool is one of the oldest and most robust used by limnologists.

Figure 1: Secchi disk measurements range in depth depending on how turbid or clear a lake is. Image from https://www.pca.state.mn.us/water/citizen-lake-monitoring-program.

MATERIALS AND METHODS

Measuring water clarity

Volunteers take water transparency measurements using their own materials, often supplied by an affiliated volunteer monitoring program. The Secchi disk is the most frequently used tool to measure water clarity. Secchi disks may vary in size and color (white, black, black and white), so volunteers are asked to designate the type of Secchi disk used to measure transparency. Those that monitor streams or estuaries generally use a turbidity tube, turbidity meter or a black disk.

A typical turbidity tube is made of plastic measuring 2 feet in length and 1 ½ inches in diameter. To measure the water clarity, the tube is filled with water then water is released by the stopper. Looking into the tube, the depth is measured (in centimeters) at the point in which the Secchi symbol, located at the bottom of the tube, becomes visible (Figure 2; Sovell, 2015).
The turbidity meter is an electronic device that measures turbidity, which is the amount of cloudiness in water caused by particles recorded in Nephelometric Turbidity Units (NTU). A LaMotte turbidity column also measures turbidity recorded in Jackson Turbidity Units (JTU). With either NTU or JTU measurements, a 1 is clear water and a 100 is extremely cloudy water. A sample of water is collected and turbidity is measured by the respective device and unit of measure (Figure 3; Carlson, 2015).

The black disk is generally used to obtain a transparency measurement horizontally. The advantages of the black disk are that it can be used in shallow waters, lighting conditions are independent of measurement, and it can be used in moving water (Carlson, 2015). The measurement process is similar to using a Secchi disk vertically. The device consists of a sealed viewing tube and stick with a black disk. The black disk is pulled away horizontally from the tube until it is no longer visible (Figure 4; Steel and Neuhasuer, 2015).
Additional water parameters- temperature, dissolved oxygen and pH

Volunteers most frequently submit Secchi measurements but have the option to submit additional information. Those details include temperature of the surface and bottom of the waterbody, dissolved oxygen (DO) and pH.

The temperature of water impacts many of the biologic and physical properties of aquatic systems. Understanding the temperature of a waterbody at different depths indicates how well mixed the water column is. In fact, temperature is the basis of the thermal classification system described by Carlson and Simpson (1996). If a lake is stratified or layered, then warmer, less dense waters lie at the surface and colder, denser waters at the bottom of the lake. Temperature also impacts where aquatic organisms live in a lake.

Dissolved oxygen (DO) is an important factor impacting aquatic organisms and nutrient recycling within aquatic systems (Holdren et al., 2001). These concentrations define where aquatic life can survive within a lake ecosystem. Conditions at the bottom of the lake generally have lower DO concentrations and may not support aquatic life. Towards the surface there are typically higher DO concentrations, which better support a habitat for fish and plant communities.

The pH is a measure of hydrogen ion concentration in water with low values describing acid conditions and high alkaline conditions. The pH in lakes generally ranges from 5.5-9.0 and there are plant and animals adapted to these levels. Changes in pH, particularly in early life stages, can rapidly change fish and plant communities (Holdren et al., 2001).

Data entry

The Secchi Dip-In website is where volunteers can learn about lakes and submit their water data. The process involves creating an account, adding background information about the waterbody (e.g. lake name, latitude and longitude, etc.) to the database, and entering the water quality parameters obtained. Volunteers also have the option to submit a physical copy by mail (Appendix A).
Through a collaboration with the US Environmental Protection Agency, the North American Lake Management Society invited members to test the Global Lake Ecological Observatory Network (GLEON) Lake Observer mobile app during the 2015 Secchi Dip-in. The app enables citizen scientists to submit water quality data using their smart devices and was successfully tested by volunteer monitoring programs in Indiana and Rhode Island.

**Lake classification**

Trophic state is a classification system defining the level of productivity in a lake. Lakes are classified into four main types based on TSI calculations (Figure 5). Oligotrophic lakes are associated with high transparency and low plant productivity (Holdren et al., 2001). Mesotrophic lakes indicate a medium range of productivity. Eutrophic lakes are associated with low transparency and high productivity. Finally, hypereutrophic lakes are associated with low transparency and extremely high productivity.

**Carlson’s trophic state index (TSI)**

Carlson’s TSI is a numeric method of classifying the trophic state of lakes using Secchi depth, chlorophyll-a, total phosphorous and total nitrogen. Individually or together the factors indicate whether a lake is oligotrophic, mesotrophic, eutrophic, or hypereutrophic (Carlson, 1977). For our purposes, we focused on Secchi disk measurements and utilized the TSI Secchi depth equation (Figure 6). In the long-term, the trophic state index can be used to determine how a lake’s trophic status is changing over time.

![Figure 5: The relationship between trophic state and lake classification (Clark, 2015).](image)
### CARLSON’S TROPHIC STATE INDEX

<table>
<thead>
<tr>
<th>Trophic State Index</th>
<th>Oligotrophic</th>
<th>Mesotrophic</th>
<th>Eutrophic</th>
<th>Hypereutrophic</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>20</td>
<td>25</td>
<td>30</td>
<td>36</td>
</tr>
<tr>
<td>Sacchi Disk (feet)</td>
<td>50</td>
<td>30</td>
<td>26</td>
<td>20</td>
</tr>
<tr>
<td>Chlorophyll-a (μg/L or PFD)</td>
<td>0.5</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Total Phosphorus (μg/L or PFD)</td>
<td>3</td>
<td>5</td>
<td>7</td>
<td>10</td>
</tr>
</tbody>
</table>

Figure 6: Carlson’s Trophic State Index, the most widely used index (Carlson, 1977)

### Factors affecting lake transparency

Transparency is affected by the water color, algal abundance, and non-algal suspended sediments (Holdren et al., 2001). As suspended sediments or algal abundance increases, transparency decreases. Decaying plant matter can stain the color of the water. Algae, small green aquatic plants, are abundant depending on plant nutrients, especially phosphorus and nitrogen. Transparency can be affected by the amount of plant nutrients coming into the lake from sources such as sewage treatment plants, septic tanks, and lawn and agricultural fertilizer. Suspended sediments often come from sources such as resuspension from the lake bottom, construction sites, agricultural fields and urban runoff.

### VOLUNTEER RECRUITMENT

Volunteers are an essential component of the Secchi Dip-In program. They have been the sole contributors to the Secchi Dip-In database since 1994. Volunteers were recruited in the past by mail solicitation with contact information provided by volunteer monitoring programs. Volunteers were asked to fill out a questionnaire and return postage was provided. Other publicity for the Dip-In was provided by Kent State University through new press releases. Outreach eventually became solely electronic (Carlson and Lee, 1994). For the 2015 Dip-In volunteers were notified by email and advertisements on the NALMS and Secchi Dip-In website leading up until July, the month selected for the Secchi Dip-In’s data collections. In addition, the volunteer monitoring listserv has served as a resource to communicate with the volunteer monitoring community.
Program Participation

The Secchi Dip-In received funding from various partner organizations when it began in 1994. After funding ceased in 2001, the Secchi Dip-In experienced a decreasing trend in volunteer participation (Figure 7). As a program of NALMS, the Secchi Dip-In hopes to reverse this trend and thus far between 2014 and 2015, this has been the case.

![Secchi Dip-In Participation](image)

**Figure 7:** The number of annual data entries to the Secchi Dip-In database (1994 - 2015)

TRANSPARENCY RESULTS AND DISCUSSION

Spatial distribution of Secchi Dip-In participation

The 2015 Dip-In attracted a range of participants across the US and Canada (Figure 8). However, the sample size for each state or province varies from 2 to as many as 171. This was considered during the data analysis process (Table 1).
Table 1: Descriptive statistics of 2015 Secchi measurements by state. British Columbia (BC) and Ontario (ON) represent provinces in Canada.

<table>
<thead>
<tr>
<th>State</th>
<th>Observations</th>
<th>Mean (meters)</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL</td>
<td>3</td>
<td>1.47</td>
<td>0.60</td>
<td>3.01</td>
<td>1.79</td>
</tr>
<tr>
<td>AR</td>
<td>38</td>
<td>2.69</td>
<td>0.50</td>
<td>5.00</td>
<td>1.26</td>
</tr>
<tr>
<td>BC</td>
<td>48</td>
<td>6.85</td>
<td>1.24</td>
<td>22.00</td>
<td>26.94</td>
</tr>
<tr>
<td>CA</td>
<td>16</td>
<td>6.85</td>
<td>0.62</td>
<td>2.50</td>
<td>0.24</td>
</tr>
<tr>
<td>CO</td>
<td>10</td>
<td>1.34</td>
<td>0.76</td>
<td>6.30</td>
<td>3.21</td>
</tr>
<tr>
<td>FL</td>
<td>33</td>
<td>1.95</td>
<td>0.20</td>
<td>5.33</td>
<td>0.89</td>
</tr>
<tr>
<td>GA</td>
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<td>0.07</td>
</tr>
<tr>
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<td>0.20</td>
<td>1.24</td>
<td>0.23</td>
</tr>
<tr>
<td>IL</td>
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<td>0.43</td>
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<td>0.81</td>
</tr>
<tr>
<td>IN</td>
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<td>2.11</td>
<td>0.43</td>
<td>6.46</td>
<td>1.81</td>
</tr>
<tr>
<td>MA</td>
<td>13</td>
<td>2.16</td>
<td>0.40</td>
<td>4.50</td>
<td>1.46</td>
</tr>
<tr>
<td>ME</td>
<td>5</td>
<td>4.67</td>
<td>2.50</td>
<td>7.70</td>
<td>5.98</td>
</tr>
<tr>
<td>MI</td>
<td>25</td>
<td>4.24</td>
<td>1.68</td>
<td>7.93</td>
<td>3.66</td>
</tr>
<tr>
<td>MN</td>
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<td>3.59</td>
<td>0.22</td>
<td>19.36</td>
<td>5.43</td>
</tr>
<tr>
<td>MO</td>
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<td>1.09</td>
<td>1.50</td>
<td>0.08</td>
</tr>
<tr>
<td>MT</td>
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<td>12.00</td>
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</tr>
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<td>NJ</td>
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<td>2.13</td>
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<td>1.51</td>
</tr>
<tr>
<td>NY</td>
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<td>11.00</td>
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</tr>
<tr>
<td>OH</td>
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<td>0.84</td>
<td>1.60</td>
<td>0.07</td>
</tr>
<tr>
<td>OK</td>
<td>71</td>
<td>0.74</td>
<td>0.08</td>
<td>1.90</td>
<td>0.14</td>
</tr>
<tr>
<td>ON</td>
<td>12</td>
<td>4.74</td>
<td>2.50</td>
<td>6.00</td>
<td>1.29</td>
</tr>
<tr>
<td>PA</td>
<td>36</td>
<td>1.55</td>
<td>0.40</td>
<td>4.30</td>
<td>0.54</td>
</tr>
<tr>
<td>RI</td>
<td>7</td>
<td>1.97</td>
<td>0.40</td>
<td>6.45</td>
<td>4.58</td>
</tr>
<tr>
<td>TX</td>
<td>5</td>
<td>1.09</td>
<td>1.04</td>
<td>1.15</td>
<td>0.001</td>
</tr>
<tr>
<td>UT</td>
<td>14</td>
<td>4.39</td>
<td>0.27</td>
<td>8.25</td>
<td>10.55</td>
</tr>
<tr>
<td>VA</td>
<td>21</td>
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<td>0.30</td>
<td>2.42</td>
<td>0.32</td>
</tr>
<tr>
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<td>7.60</td>
<td>8.33</td>
</tr>
<tr>
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<td>3.18</td>
<td>0.69</td>
<td>8.75</td>
<td>4.08</td>
</tr>
</tbody>
</table>
Average Secchi measurements were highest in Canada, the Northeast, and a few of the upper Midwest states. The lowest values were consistently in the Southeast and West/Southwest area. The Midwest states displayed a mixture of lower to middle range Secchi measurements (Figure 9).

Figure 9: Average Secchi measurements displayed by state

Comparing TSI results

The National Lakes Assessment (NLA) was completed in 2007 by the USEPA in order to provide a comprehensive survey of the nation’s lakes. Figure 10 provides a basis for comparison with 2015 Secchi Dip-In results. As indicated by the Carlson TSI lower transparency measurements reveal more eutrophic conditions and higher transparency measurements indicate more oligotrophic conditions (Figure 11; Carlson, 1977). Comparing the NLA data to the Dip-in’s state trophic conditions, the results were consistent with the nine ecoregions. The Pacific Northwest and Northeast regions had predominately oligotrophic conditions and the Southwestern and Southeast regions had more eutrophic lake conditions. A closer geographic equivalent is to compare the National Lakes Assessment results with lake classifications by US region (Figure 12). However, regional TSI conditions do not match as closely as they do with state lake classifications. This is likely because not all states are represented in regional values and regions varied in sample size.
Figure 10: Chlorophyll-a trophic state conditions across nine ecoregions (Level III). The pie chart represent the percentage of lakes types found in each ecoregion. From the 2007 National Lakes Assessment [http://www.epa.gov/sites/production/files/2013-11/documents/nla_newlowres_fullrpt.pdf](http://www.epa.gov/sites/production/files/2013-11/documents/nla_newlowres_fullrpt.pdf)

Figure 11: Lake classifications by state. Mean values were used to calculate the TSI for Secchi depth.
SURVEY RESULTS

A survey was conducted at the end of August 2015 to gather feedback from both Secchi Dip-In volunteers and NALMS affiliates. The survey was created on SurveyMonkey and consisted of 14 questions with a combination of multiple choice and questions requesting feedback (Appendix B). Over 200 individuals participated in the survey. Volunteers were asked whether they had participated in the 2015 Dip-In, their reasons for participating or not participating, and what changes they would like to see for future Dip-Ins.

Volunteers were asked which volunteer monitoring program they affiliate themselves. This gave us an idea of the types of programs submitting to the Secchi Dip-In, which are primarily volunteer monitoring programs (69%). When asked if future Dip-Ins should incorporate individual monitors, 75% voted in favor of including both individuals and volunteer monitoring programs. Finally, volunteers were asked the likelihood of using a mobile smart phone app for data entry. The majority of respondents were not interested, however 34% said they would be likely to use the app and can be recruited for the 2016 Dip-In.
LESSONS LEARNED AND FUTURE GOALS

Outreach campaign

NALMS took over the Secchi Dip-In officially in March 2015 and a Secchi Dip-In intern was not hired until June 2015. These circumstances did not allow enough time to adequately advertise the 2015 Dip-In.

For the 2016 Dip-In, we intend to diversify our outreach campaign. That is, to focus additional recruitment efforts on monitoring programs not currently affiliated with the Secchi Dip-In. The Secchi Dip-In is also eager to expand citizen science across the United States and increase monitoring in waterbodies not currently being monitored. Individual outreach will focus on lake and homeowner associations, water focused environmental groups, and outdoor groups through email and social media outlets. Outreach will occur in higher frequency during the spring season.

Database Upgrade

A general consensus from the survey was that volunteers found the website data entry to be difficult. We are aware of the status of the data entry process and are making plans to address these issues. In the short term NALMS will make basic updates to the data entry process to make it more streamlined. In the long term, NALMS is working to forge partnerships to make a database upgrade. This would involve geographic functionality and easier access to datasets.

Lake Observer App

The Lake Observer app was successfully tested by two volunteer monitoring programs: URI Watershed Watch in Rhode Island and the Clean Lakes Program (CLP) in Indiana. The lessons learned include launching and advertising the app further in advance of the summer sampling season. Successes in Indiana were in part from the Secchi Dip-In intern who promoted the app during side-by-side trainings with the CLP. The 2015 Lake Observer app beta test received 127 Secchi depth observations from 11 users, comprising of 14% of all 2015 Secchi observations (Borre, 2015). For the 2016 Dip-In, the app will be updated and available for a wider audience. Outreach efforts for the 2016 Dip-In will encourage the usage of the app.

Citizen Science Day

In the last few years, the White House has recognized the need for citizen science to ‘…address societal and scientific challenges’ (Kahlil and Wilkinson, 2015). The White House has deemed April 16, 2016 as Citizen Science day, and the Secchi Dip-In will host an event in celebration. Getting involved with the White House has helped forge new relationships with citizen science programs and we will continue to utilize this outlet in the future.
Future Annual Reports

Future Dip-In reports will include long-term trends and any significant changes over time. The Secchi Dip-In database was prepared to be migrated to the STOrage and RETrieval and Water Quality eXchange (STORET and WQX), a database operated by the US Environmental Protection Agency that allows for the submission and sharing of water quality monitoring data. Due to time constraints, only 2015 data was analyzed for the 2015 Dip-In report.

CONCLUSIONS

The data analyzed provided a snapshot of lake conditions using only 2015 data. Due to the range of entries submitted across North America, average Secchi disk measurements were better represented at the state level rather than regional level. This was confirmed by comparing the chlorophyll-a trophic index in the 2007 National Lakes Assessment report.

The Secchi Dip-In has water quality parameters dating back to the early 1980’s. Therein lies a resource for interested stakeholders and many possibilities for data analysis. The 2011 report ‘Assessing the Needs of Volunteer Water Monitoring Programs’ highlighted that funding stability and quantity are the top two program concerns (Green et al., 2011). In the midst of underfunded state volunteer monitoring programs, the Secchi Dip-In has served as a place for volunteers to continue submitting their data. With the support of NALMS, the Secchi Dip-In expects to continue as a long-standing citizen science monitoring program.

The volunteers contributing data to the Secchi Dip-In program provide valuable information about waterbodies nation-wide. The consistency of volunteers allows for long-term data and the ability to see trends. Presently, the Secchi Dip-In has seen a decreasing trend in volunteer participation. Recently absorbed by the North American Lake Management Society, we hope to reverse the trend, grow and revitalize the program, and contribute to the expansion and recognition of citizen science.

Thank you to all the volunteers who have participated in the Secchi Dip-In. You all are the key to the success of this program.
LITERATURE CITED


Appendix A:

Secchi Dip-In mail in forms

The Secchi Dip-In Entry Form

Please review the data at our website (http://www.nwqup.org) and keep this form on hand. If you have any computer access, read the form to the Secchi Dip-In address given at the end of this form.

Person Taking Reading:

Last Name ___________________________________________ First Name: ___________________________ Telephone Number ___________________________________________ E-mail Address: ___________________________ Year Monitoring Program Name (if applicable): ___________________________________________

Please enter the following information on your waterbody:

Waterbody Name: ___________________________________________
State/Province: ___________________________
County/Region: ___________________________________________
Zip/Postal Code of waterbody nearest form to this: ___________________________
Latitude of Site: ___________________________ Degree ___________ Minute ___________ Second ___________
Longitude of Site: ___________________________ Degree ___________ Minute ___________ Second ___________
Please include map sectors of the waterbody and any if you don’t have the map coordinates.

Waterbody Type:  ○ Natural Lake/Pool/Drain  ○ Reservoir (Lake)  ○ Reservoir (River)  ○ Other waterbody type ___________________________
Size (Lakes or Reservoirs Only)  ○ Less than 10 Acres  ○ 10-20 Acres  ○ 20-100 Acres  ○ 100-500 Acres  ○ 500 Acres or More
Actual Size (Hectores) ___________________________  ○ Acres  ○ Hectores  ○ Depth at Site (Hectores) ___________________________  ○ ft.  ○ Meters

Please enter the transparency measurement below:
Date of Reading: ___________________________ Month: ___________________________ Day: ___________________________ Year: ___________________________
Time of Observation: ___________________________ AM.  ○ PM. (To the nearest 10 minutes)
Site Name or Site Number (As Used in Your Normal Program Monitoring): ___________________________
Weather:  ○ Sunny  ○ Partly Cloudy  ○ Overcast  ○ Rain
The reading was taken from a:  ○ Boat  ○ Dock  ○ Bridge  ○ Other ___________________________

Reading:

Secchi Disk Turbidity Tube

Turbidity Tube: ___________________________________________

Vertical Block Disk: ___________________________________________

Reading: ___________________________________________

My Reading is measured to:  ○ Feet  ○ Inches  ○ Meters  ○ Centimeters  ○ Yards  ○ Yards  ○ Feet

It is very important that you add the Unit of Measurement (Feet, Inches, Meters, etc.) so that we can accurately estimate transparency.

Please answer the following if you used a Secchi Disk:
Was the disk resting on the bottom?  ○ Yes  ○ No
Did you use a tripod?  ○ Yes  ○ No
If yes is it an open top or is it closed?  ○ Open  ○ Closed
Did you use a container to hold the disk?  ○ Yes  ○ No
Did you use the disk on the Drained water body?  ○ Yes  ○ No
Did you use the disk on the Other side of the body?  ○ Yes  ○ No

Please answer the following if you used a Turbidity Tube:
Length of tube: ___________________________________________
Was the bottom of the tube visible when filled?  ○ Yes  ○ No

What is the general water quality of your waterbody?  ○ Beautiful  ○ Poor  ○ No Change
Was the quality measured at a specific location?  ○ No  ○ Yes

Has the quality changed in the past 5 years?  ○ Better  ○ Worse  ○ No Change

Please enter other variables you measured here:

Water Quality: ___________________________________________

Other Measurements: ___________________________________________

What is the general water quality of your waterbody?  ○ Beautiful  ○ Poor  ○ No Change
Was the quality measured at a specific location?  ○ No  ○ Yes

Has the quality changed in the past 5 years?  ○ Better  ○ Worse  ○ No Change

□ Degrees F  ○ Degrees C

□ Degrees F  ○ Degrees C

□ Degrees F  ○ Degrees C
What factors (if any) negatively affect the general water quality at your site?

<table>
<thead>
<tr>
<th>Problem</th>
<th>I Don't Know</th>
<th>Beautifully Caused No Problems</th>
<th>Causes Minor Problems</th>
<th>Causes Major/Use Impairment</th>
<th>Causes Substantial Use Impairment</th>
<th>Causes Your Water Totoy Impaired</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age/Scums</td>
<td></td>
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<tr>
<td>Aquatic Weeds (Seaweed)</td>
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<tr>
<td>Tumidness (from sediments and erosion)</td>
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<tr>
<td>Boating/Bathing (Gas, Gunk, Safety, Noise)</td>
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<tr>
<td>Poor Fishing</td>
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<tr>
<td>Personal Watercraft (we sink)</td>
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<tr>
<td>Bacteria</td>
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<tr>
<td>Don't Know</td>
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<tr>
<td>Filling-In</td>
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<tr>
<td>Trash and Litter</td>
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<tr>
<td>Pest Wildlife: Mice, Rodents, Cheese, Ducks, etc.</td>
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<tr>
<td>Noise: Non-Boating neighbors, traffic, etc.</td>
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<tr>
<td>Swimmer's foot</td>
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<tr>
<td>Too Many Boaters and Regulators</td>
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<tr>
<td>Other</td>
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</tbody>
</table>

**Dig-In Instructions**

- **Measure transparency on any day during the Dig-In period.** Please do not go out if it is raining. If there is abnormally high boat traffic, it is not safe to be at risk. A clear, calm day is best.
- **Go to the site or sites where you normally measure transparency.** Follow your normal monitoring procedures.
- **Enter the dates on our website (http://www.sechslapadip.org).** Carefully and completely record your findings on this form. We may not be able to use your information unless the blanks are filled in correctly.
- **Please be sure to add your telethon number and email address in case we have questions about your answers.**
- **It is very important to know where your sampling site is.** If you supplied this information in the past, you do not have to add it again.
- **Be sure to mark the type of transparency device you use.** Whether it is a Secchi disk, a turbidity tube, a shaded vertical column, a turbidimeter, or a vertical black tube. It is especially important that you enter the mean (from, at, nearest, between, etc.) of where the transparency reading was measured.
- **If you have participated in the past, please participate again so that we can compare trends in transparency.**
- **Do you have any questions?** Look at our website (http://www.sechslapadip.org). E-mail us at sechslapadip@seahorse.org or write us at: The Sechslapadip, PO Box 6415, Madison, WI 53706.
Appendix B:

Secchi Dip-In Survey Responses

Secchi Dip-In Volunteer Questionnaire

Q5 Do you currently participate in a volunteer monitoring program besides the Secchi Dip-In?

<table>
<thead>
<tr>
<th>Answer Choice</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>142</td>
</tr>
<tr>
<td>No</td>
<td>53</td>
</tr>
<tr>
<td>Total</td>
<td>205</td>
</tr>
</tbody>
</table>

Secchi Dip-In Volunteer Questionnaire

Q7 Do you think the Secchi Dip-In should focus its efforts on individuals for monitoring or continue to work through existing volunteer monitoring programs?

<table>
<thead>
<tr>
<th>Answer Choice</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individuals</td>
<td>10</td>
</tr>
<tr>
<td>Monitoring Programs</td>
<td>30</td>
</tr>
<tr>
<td>Both</td>
<td>145</td>
</tr>
<tr>
<td>Total</td>
<td>194</td>
</tr>
</tbody>
</table>
Q9 Why do you participate in the Secchi Dip-In? (Check all that apply)

- Already part of a volunteer...
- Environmental education
- Lake stewardship
- Member of lake association...
- Want to compare with...
- Want to compare to...
- It’s easy
- It’s fun
- Already on the lake, so why...
- Part of event agenda, lake...
- I love data

Q13 How likely would you be to use a smart phone app to enter Secchi readings and other water quality parameters?

- Likely
- Unlikely
- Don’t know

<table>
<thead>
<tr>
<th>Answer Choices</th>
<th>Responses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Likely</td>
<td>33.67%</td>
</tr>
<tr>
<td>Unlikely</td>
<td>50.33%</td>
</tr>
<tr>
<td>Don’t know</td>
<td>16.00%</td>
</tr>
<tr>
<td>Total</td>
<td>139</td>
</tr>
</tbody>
</table>