COOPERATIVE LAKES MONITORING PROGRAM
TRAINING FOR
Dissolved Oxygen and Temperature

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Dissolved Oxygen and Temperature

What does this data tell you:

- Does my lake stratify (separate into layers in the summer)?
- Is oxygen present at the bottom of my lake?
- At what depths will I find fish in my lake?
- What is my lake’s trophic status?

Lake Temperature/Density Zones

- Warm upper zone; light and nutrients
- Metalimnion: rapid decrease in temperature and increase in water density
- Cold bottom zone; low oxygen

http://rmbel.info/wp-content/uploads/2013/04/Lake_layers_summer.jpg
How Does Wind Affect the Lake

Temperature Profiles
Lake Temperatures During the Seasons

Annual Pattern of Mixing from Young, M. (2004). Thermal Stratification in Lakes. Baylor College of Medicine, Center For Educational Outreach.

Temperature Profiles - Seasonally
Dissolved Oxygen Profiles - Seasonally

Lotus Lake, Oakland County

<table>
<thead>
<tr>
<th>Dissolved Oxygen and Temperature Profile</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="https://www.fondriest.com/environmental-measurements/parameters/water-quality/dissolved-oxygen/" alt="Graph" /></td>
<td><strong>Average TSI</strong></td>
</tr>
<tr>
<td></td>
<td>Lotus Lake</td>
</tr>
<tr>
<td></td>
<td>All Lakes</td>
</tr>
</tbody>
</table>

With an average TSI score of 35 based on 2017 Secchi transparency, chlorophyll-a, and summer total phosphorus data, this lake is rated as an oligotrophic lake.

The lake keeps some dissolved oxygen in the bottom waters through mid-summer, but by late summer the lake has stratified and the bottom water is devoid of oxygen.

There is too little data to assess long term trends. OLMP recommends eight years of consistent monitoring in order to develop a strong data baseline.
Lake Independence, Marquette Co.

### Summary

<table>
<thead>
<tr>
<th></th>
<th>2017</th>
<th>2012-2016</th>
<th>1977-2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake Independence</td>
<td>43</td>
<td>42</td>
<td>28</td>
</tr>
<tr>
<td>All CLMP Lakes</td>
<td>40</td>
<td>40</td>
<td>43</td>
</tr>
</tbody>
</table>

With a TSI score of 43 based on 2017 summer total phosphorus data, this lake is rated as a mesotrophic lake.

Due to its low depth, the lake is able to maintain dissolved oxygen throughout the water column for the entire summer.

There is too little data to assess long term trends. CLMP recommends eight years of consistent monitoring in order to develop a strong data baseline. Using historical records data, it is clear that nutrient levels have dropped in the lake since the 1970s, however.

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Higgins Lake, Roscommon County

### Summary

<table>
<thead>
<tr>
<th></th>
<th>2017</th>
<th>2012-2016</th>
<th>1977-2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higgins Lake (basin)</td>
<td>29</td>
<td>29</td>
<td>29</td>
</tr>
<tr>
<td>All CLMP Lakes</td>
<td>40</td>
<td>40</td>
<td>43</td>
</tr>
</tbody>
</table>

With an average TSI score of 20 based on 2017 chlorophyll-a and summer total phosphorus data, this lake is rated as an oligotrophic lake.

The low level of nutrients in the lake results in dissolved oxygen being available throughout the water column for the entire summer.

Long term trends indicate that the monitored parameters have changed very little since monitoring began, except for transparency which has significantly improved since the 1970s.
How Does the DO Program Work?

- You may get matched with 2-3 other groups to share a DO meter. We leave the sharing logistics to you.

- Some lake groups purchase their own meter; if interested talk to us so you know which type to get.

- How often to measure? Your goal should be twice a month May-September, as evenly divided as you can.

DO/Temperature Equipment Kit

- Oxygen Meter (550A or Pro-20)
- DO probe/cable (various lengths)
- Probe electrolyte solution bottle
- Probe membrane cap (in film canister)
- Quick-start calibration card
- Equipment storage box
- Spare batteries
DO Meter Probe

plastic guard

membrane cap

thermistor

Probe of Each Meter

550A

Pro20
Prepare for Sampling

- Turn on your meter and calibrate it
- Pack up your equipment
- Check for your data forms
- Bring boating safety equipment and a friend for data recording
- Calm and dry weather conditions
Proceed to Sampling Location

- Anchor just upwind of deep basin and drift back over deepest spot, as with other parameters
- Check for actual basin depth with depth finder or weighted line
- Take the measurements and fill out the data form!
**CAUTION: Remember to switch to mg/l mode before making oxygen measurements.**

<table>
<thead>
<tr>
<th>Depth (ft.)</th>
<th>Temp (°C)</th>
<th>DO (mg/l)</th>
<th>Depth (ft.)</th>
<th>Temp (°C)</th>
<th>DO (mg/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td>37%</td>
<td>5</td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>10</td>
<td></td>
<td>42%</td>
<td>15</td>
<td></td>
<td>45</td>
</tr>
<tr>
<td>17½</td>
<td></td>
<td>50</td>
<td>20</td>
<td></td>
<td>55</td>
</tr>
<tr>
<td>22½</td>
<td></td>
<td>60</td>
<td>25</td>
<td></td>
<td>65</td>
</tr>
<tr>
<td>27½</td>
<td></td>
<td>70</td>
<td>30</td>
<td></td>
<td>75</td>
</tr>
<tr>
<td>32½</td>
<td></td>
<td>80</td>
<td>35</td>
<td></td>
<td>80</td>
</tr>
</tbody>
</table>

*Note: Take 1st measurement 2½-5 ft. above bottom sediments of the lake.*

Graphing: If you want to graph your data, you can print the graph from this website:

Thompsonville (Crystal Mountain) area is 794 feet.
Taking a measurement

- Move probe with slight jiggling motion
- The DO reading will drift—judge the nearest mg/l.
- Go to the next depth
- Stop about 3 feet above sediment to protect probe

Data Entry and Data Turn in

DATA ENTRY
Check ONE box:

☐ A volunteer has entered the field notes into the MiCorps Data Exchange (before October 30)
  Volunteer Name __________________________ Date entered ____________

☐ The field notes have not been entered into the MiCorps Data Exchange.

DATA SHEET TURN IN
No matter what box you check above, please do the following:
Make a copy for your records, and mail data form(s) by October 30 to:
MLSA, P.O. Box 303, Long Lake, MI 48743

End of the year- returning the meters

☐ Please return the meter directly to Marcy Knoll Wilmes (EGLE-Lansing), or to an EGLE District Office.

☐ Contact me at (517) 342-4348 or knollm@michigan.gov to arrange the drop-off

☐ Please be sure to have the meter returned by the end of October

☐ Upon returning it, just have the calibration chamber sponge damp-no pooled water in the chamber, please.
Calibration Step by Step

Pro20

Pro20 Calibration

Turn On the Meter

Panel When On – Let Meter Stabilize for 5 Minutes

Push Calibrate Button – Hold 3 Seconds
Pro20 Calibration

Screen Will Show “Calibrating %DO”

If the Meter Calibrated Properly, Screen Will Show “Calibration Successful”

If the Meter Does Not Show Previous Screen, Allow More Time to Stabilize and Retry Calibration

550A Calibration

Turn On the Meter

Panel When On – Let Meter Stabilize for 10 Minutes

To Calibrate – Push the Up and Down Buttons at the Same Time
550A Calibration

"CAL" Will Appear on the Screen, Hit Enter

Adjust the Elevation Based on Your Location Using the Up and Down Arrow Keys and Hit Enter (9 would be appropriate for an area of 900 ft in elevation)

The Percent Air Saturation Needs to Display 93-103%. If it is, Press Enter. If Over or Under, turn the Meter Off and On and Allow it to Re-Stabilize

The Salinity Should Always Read 0.0 Since We Only Sample Freshwater. Hit Enter.

The Display Will Show % Saturation, Hit the Mode Button to Show mg/L

Display Screen Showing mg/L. Your Dissolved Oxygen Readings Should be Recorded in mg/L
Let’s Calibrate our Meters

- We’ll separate by DO meter type
  - 550A
  - Pro20
- Follow along using laminated calibration card

Take a practice measurement!

- Set the meter on mg/L
- Try it out in a bucket lake
- Remember to use a slight jigging motion.
- Fill out an evaluation and leave when you are ready!