Understanding Lake Data

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Why We're Here





Take Homes



- O Learn how to access your data
- O Lake worksheet protection or restoration
- O Specific project ideas
- We will stay after to help you access your lake data and fill in the worksheet if you want

Agenda

• Part 1: (~40 mins)

O How to find your data

OLake Monitoring

O How to understand what it means

Oldeas for analysis

• Questions on Part 1 (~10 mins)

Part 2: Lake Diagnostic Worksheet (~20 mins)
 Pass out worksheets and walk through them

Agenda

• Part 1: (~40 mins) O How to find your data OLake Monitoring O How to understand what it means Oldeas for analysis Questions on Part 1 (~10 mins) O Part 2: Lake Diagnostic Worksheet (~20 mins) OPass out worksheets and walk through them

We will stick around to help you look up your lake data and put it into the worksheet

Finding your data

• MPCA Database

- O CLMP Program
- O CLMP + Program
- SWCD or Watershed District
- O RMB Lab
- O Other Labs
- O RMB Database
- O Other options

| Individual Lake Data Summary | | | | | | | | |
|--|-------------|--|--|--|--|--|--|--|
| County MN Lake ID Lake Site Date Range | Data Source | | | | | | | |
| Otter Tail 56-0383-00 Dead 205 (Primary) 05-01-2008 - 09-30-2008 | RMB Lab | | | | | | | |

*2nd Source data was retrieved from MPCA STORET database and came from a source other than RMB Environmental Laboratories, Inc

| Historical Mean | | | | | | 24.4 | 9.4 | 11.6 | 49 | 52 | 41 | 47 |
|------------------|----------|------|------------|----------|-------------|---------|-----------|------------|-----------|-----------|----------------|----------|
| | | | | | | | | | | | | |
| Date | Time | Site | Sampler | Lab Code | Data Source | TP ug/L | ChIA ug/L | Secchi Ft. | TSI Phos. | TSI ChIAL | TSI Secchi Ft. | TSI Avg. |
| <u>5/19/2008</u> | 10:00 AM | 205 | Les Hansen | 75147 | RMB Lab | 13 | 8 | 13 | 41 | 51 | 40 | 44 |
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| Annual Me | an | | | | | 24.4 | 9.4 | 11.6 | 49 | 52 | 41 | 47 |













RMB Database



RMB Database



RMB Database

How are these data used?

- O Lake Management Plan
- O Cities
- O County
- O State (MPCA, DNR)
- O EPA

How are these data used?

- The MPCA, DNR, County, & EPA don't have the time, funding, or staff to collect all the data that you are collecting
- So if you weren't collecting it, no one would be

How are these data used?

\$\$ Million Dollar Decisions are Occurring at the State and County Levels Using Volunteer Data!

Understanding your data

Testing Parameters
Trophic State Index
Ecoregion Comparisons
Trend Analysis

Each Lake is Different

Each Lake is Different

Comparing Lakes

 Because each lake is different, it is difficult to compare lakes to each other

 It is best to compare your own lake to itself over time

Lake Monitoring

Water quality measurements (basic MPCA Assessments)

- Total Phosphorus
- Chlorophyll a
- Water clarity (secchi depth)

Phosphorus

• Limiting nutrient in lakes

- Means everything that plants and algae need to grow is available in excess (sunlight, warmth, water, nitrogen, etc.) except phosphorus
- Phosphorus is food for algae and plants
- Enters the lake from:
 - Agriculture Improperly maintained septic systems
 - Fertilizer

- Boat motors in shallow areas

- Manure

- Lake Sediment

Chlorophyll-a

- O The pigment that makes plants and algae green
- Measured in lakes to determine algal concentration
- Algae is important in lakes because it adds oxygen to the water as a by-product of photosynthesis.
- On the other hand, if there is too much algae in a lake it can produce a foul odor and be unpleasant for swimming.

Secchi Depth

- A measurement of water transparency
- Transparency is how deep sunlight can penetrate through the water
- Water transparency depends on the amount of particles in the water

Relationships

These three measurements are used to monitor Eutrophication in Lakes

Eutrophication

- Eutrophication is a natural process that a lake goes through over hundreds to thousands of years.
- Natural eutrophication is also sometimes referred to as lake aging.

Eutrophication

- Humans can speed up the process of eutrophication by adding excess nutrients and sediment quickly, where the lake will change trophic states in a matter of decades.
- This type of eutrophication is called cultural eutrophication because humans cause it.

Lake Eutrophication

Phosphorus Exports

Phosphorus Exports

- A measurement of overall lake productivity based on algae
- Converts values for phosphorus, chlorophyll-a and secchi depth into comparable numbers

$$TP = 27 \text{ ug/L} \longrightarrow 52$$

$$CHLA = 9 \text{ ug/L} \longrightarrow 52$$

$$Secchi = 5 \text{ ft} \longrightarrow 54$$

 Trophic states are defined divisions of a continuum in water quality.

- TSI of 0 = Secchi of 64 meters (greater even than Crater Lake and Lake Tahoe!)
- TSI of 100 = Secchi of only 6.4 cm (less than 3 inches- yuck !)
- An increase in TSI of 10 units corresponds to a halving of secchi depth and a doubling of phosphorus concentration.

| TSI | Trophic State |
|-------|-------------------|
| <30 | Oligotrophic |
| 30-40 | Oligo-Mesotrophic |
| 40-50 | Mesotrophic |
| 50-70 | Eutrophic |
| 70+ | Hypereutrophic |

Lake Trophic States

Oligotrophic

Mesotrophic

Eutrophic

Lake Trophic States

DISTRIBUTION OF FISH SPECIES ACROSS LAKE TROPHIC STATES

Minnesota Ecoregions

- Lakes and streams in the different parts of the state have different physical and chemical properties
- Ecoregions are a way to group similar conditions affecting lake type
- An ecoregion is a large expanse of land containing a geographically distinct collection of plants, animals, natural communities and environmental conditions

Minnesota Ecoregions

- The MPCA has developed a way to determine the "average range" of water quality expected for lakes in each ecoregion
- From 1985-1988, the MPCA evaluated the lake water quality for reference lakes
- The reference lakes are representative of the typical lakes within the ecoregion.
- The "average range" refers to the 25th 75th percentile range for data within each ecoregion.

Minnesota Ecoregions

| Parameter | Central Hardwood Forest | Northern Lakes & Forest |
|-------------------------|----------------------------|----------------------------|
| Total Phosphorus (ug/l) | 23 –50 | 14 - 27 |
| Chlorophyll-a (ug/l) | 5 – 22 | < 10 |
| Secchi Disk (ft) | 5 – 10.5 | 8 - 15 |

- A statistical way to see if your water quality is improving, staying the same, or declining
- Need 8-10 years of consecutive data with 4 or more data points each year from the same lake site
- The trend must have over a 90% probability to be considered a true trend.

You don't need to calculate your own trends!
 MPCA website trend analysis report
 RMB website trend analysis report

| Environmental Data App | | Θ – σ × | |
|--|---|---|---------------------|
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| Apps For quick access, place your bookmarks here on the bo | pokmarks bar. Import bookmarks now | Other bookmarks | |
| | Description Overall condition Clarity Recreation use | <u>^</u> | |
| | CAUTION 6000 6000 | | |
| | Clarity summary | | |
| | Suitable for swimming and wading, with good clarity and low algae levels throughout the open water sesson. | | |
| | Lake clarity trend | | |
| | These graphs show statistical changes in clarity over time at this site and across its watershed. For sites and watersheds with at least 8 years of data, the graphs include a trend line, which shows the direction of detected changes in clarity (increasing, decreasing, or no change). | | |
| | Trend analysis result: The matian transporting at this also from 1975 to 2006 increased by 0.65 feet per decide. Given the variability over these years, there is strong evidence of a long term thend. A pulsable range for the long term tend is between an increase of 0.54 and an increase of 0.54 kept per decide. | | MINNESOTA POLLUTION |
| | Weden for each year Delin lange for each year Trend los | | |
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Questions?

- Developed a lake diagnosis worksheet
- This follows my process when assessing a lake
- Tool that you can use to better understand your lake
- Prioritizes projects where you will get the most "bang for your buck" for your lake
- Grant ideas for projects on your lake
- Draft form work in progress
- O We hope to put it online this summer, interactive

• Three main areas of evaluation:

- Ecoregion comparison
- Trend analysis
- O Inlet presence/absence
- PROTECTION TRACK ∨S RESTORATION TRACK
- Project Ideas based on track

- Pass out lake worksheet
- Walk through it
- O We will stay after for anyone who wants to work through it
- We can look up your data online for you to put into your worksheet

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- Before you start with the worksheet, you need the annual water quality means for your lakes.
- You can get these from the MPCA or RMB website
 - Transparency (secchi depth)
 - Total Phosphorus
 - O Chlorophyll-a

O Part one: Ecoregion comparison

1. How do your lake's long-term means compare with the ecoregion ranges? Find your lake on the ecoregion map and then look at the ecoregion table below to compare to your means.

<u>Note</u>: The ecoregion ranges work for comparison on most lakes, but some lakes have special conditions that may affect how they compare to the ecoregion range. If your lake is located in the middle of a city or on the edge of one of the adjacent ecoregions, its best to get a professional's advice on comparing your lake to the ecoregion ranges.

| Ecoregion: | Red River Valley | Northern Minnesota Wetlands | Northern Lakes and Forests | North Central Hardwood Forests | Northern Glaciated Plains | Western Corn Belt Plains |
|----------------------------|---------------------|-----------------------------------|----------------------------------|---|---------------------------------|--------------------------------|
| Abbreviation: | RRV | NMW | NLF | NCHE | NGP | WCBP |
| Total phosphorus (ug/l) | 23 - 50 | 14 -27 | 14 -27 | 23 -50 | 130 -250 | 65 -150 |
| Chlorophyll a (ug/ | (1) 5 - 22 | <10 | <10 | 5 - 22 | 30 - 55 | 30 - 80 |
| Secchi Depth (ft) | 5.0 - 10.5 | 7.9-15.0 | 7.9 - 15.0 | 5.0 - 10.5 | 1.0 - 3.25 | 1.5 - 3.25 |

1a. If you don't have enough lake data to calculate means, then your recommendation is to collect a summer's worth of lake data (5 samples once a month between May and September). See page 6 for project ideas.

1b. If you have enough data for this comparison, circle the result below that corresponds to your data. Then proceed to page 2.

| Ecoregion range for Secchi: | within range | better than range | poorer than range |
|------------------------------------|--------------|-------------------|-------------------|
| Ecoregion range for phosphorus: | within range | better than range | poorer than range |
| Ecoregion range for chlorophyll-a: | within range | better than range | poorer than range |

- Part two: Trend analysis look up your trend on the MPCA or RMB website.
 - If you don't have 8-10 years of data, you can still complete the worksheet using your means from the data you have.

2. Does your lake show a water quality trend? To evaluate a trend, you must have 8-10 consecutive years of data from the same lake site with at least 4 data points per year.

Look up your trend results on the MPCA website: https://cf.pca.state.mn.us/water/watershedweb/wdip/index.cfm or the RMB Lab website: https://cf.pca.state.mn.us/water/watershedweb/wdip/index.cfm

My lake's trend results:

| Secchi | |
|---------------|--|
| Phosphorus | |
| Chlorophyll-a | |

| | Better than Ecoregion Range | Within Ecoregion Range | Poorer than Ecoregion Range |
|-----------------|--------------------------------|--------------------------|--------------------------------|
| Improving Trend | <i>PROTECTION TRACK</i> | <i>PROTECTION TRACK</i> | <i>PROTECTION TRACK</i> |
| | jump to question 3 | jump to question 3 | jump to question 3 |
| No Trend | <i>PROTECTION TRACK</i> | <i>PROTECTION TRACK</i> | <i>RESTORATION TRACK</i> |
| | jump to question 3 | jump to question 3 | jump to question 4 |
| Declining Trend | <i>RESTORATION TRACK</i> | <i>RESTORATION TRACK</i> | <i>RESTORATION TRACK</i> |
| | jump to question 4 | jump to question 4 | jump to question 4 |

O Part three: inlet evaluation

- No inlets
- O Major perennial inlet
- Minor intermittent inlet

• Worksheet results

- Project recommendations
- O Resources
- Grant opportunities

Conservation Easements

If your lake has areas of shoreline that are still undeveloped, now is a good time to be proactive and put those areas into permanent conservation easements. Even if current landowners do not plan on developing the shoreline, they could sell it to future owners that would develop it. A conservation easement is a permanent designation to make sure the land remains in a natural state, which is good for fish and wildlife habitat and for lake water quality.

To do:

 Look into establishing conservation easements on undeveloped shoreline parcels. See the Minnesota Land Trust website for more information: <u>http://www.mnland.org/</u>

Stewardship

- Stewardship is an attitude.
- It is the understanding that what we do on land and in the water affects the lake.
- It is recognition that lakes are vulnerable and that in order to make them thrive, citizens, both individually and collectively, must assume responsibility for their care.

"Never doubt that a small group of thoughtful, committed citizens can change the world. Indeed, it's the only thing that ever has." - Margaret Mead

Questions?

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