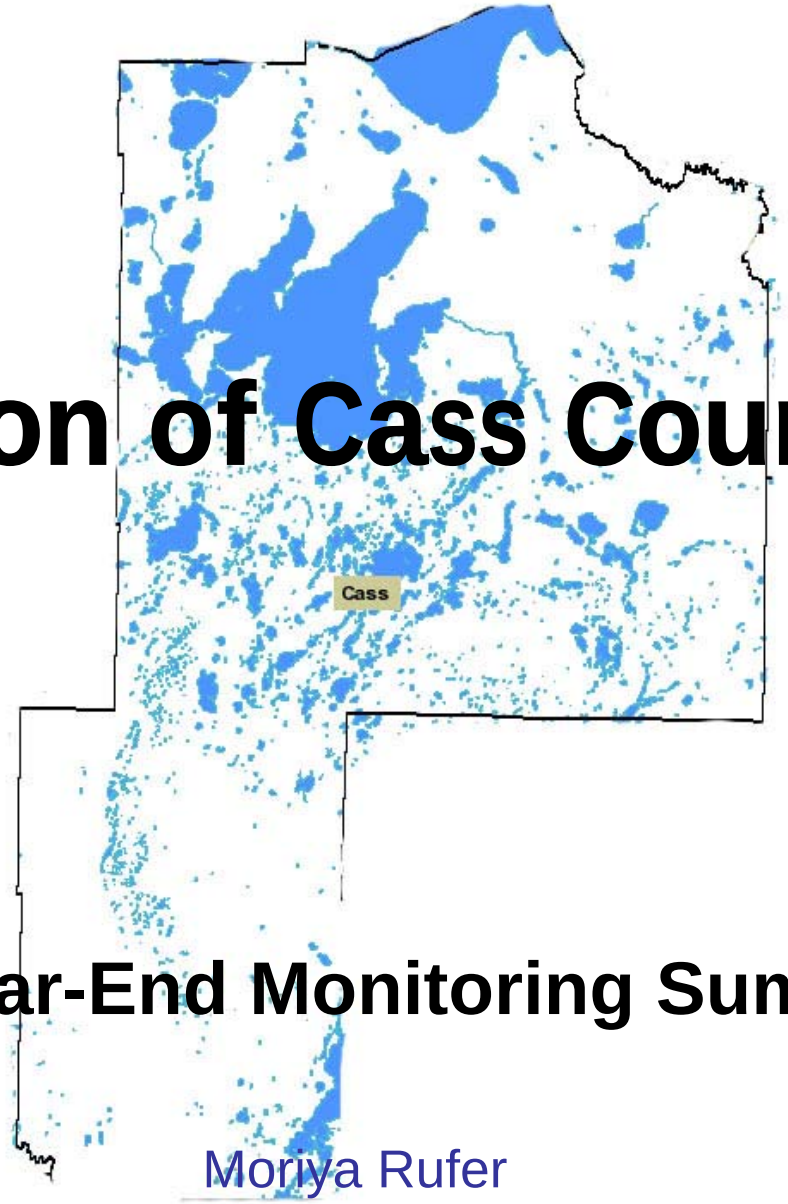


Association of Cass County Lakes

2007 Year-End Monitoring Summary

Moriya Rufer
Lakes Program Coordinator
RMB Environmental Laboratories, Inc

RMB Environmental Laboratories, Inc.

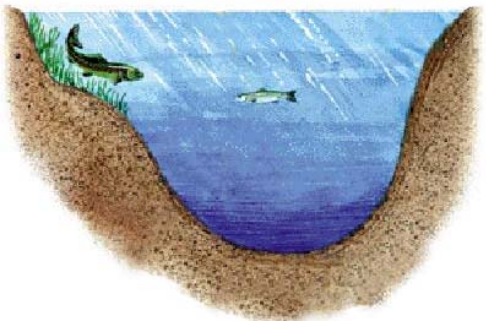
Lake Eutrophication

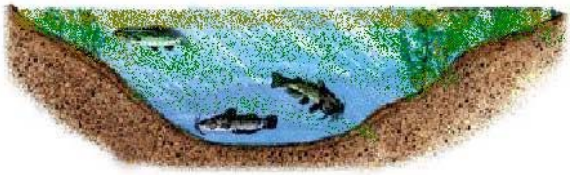
Oligotrophic

Eutrophic

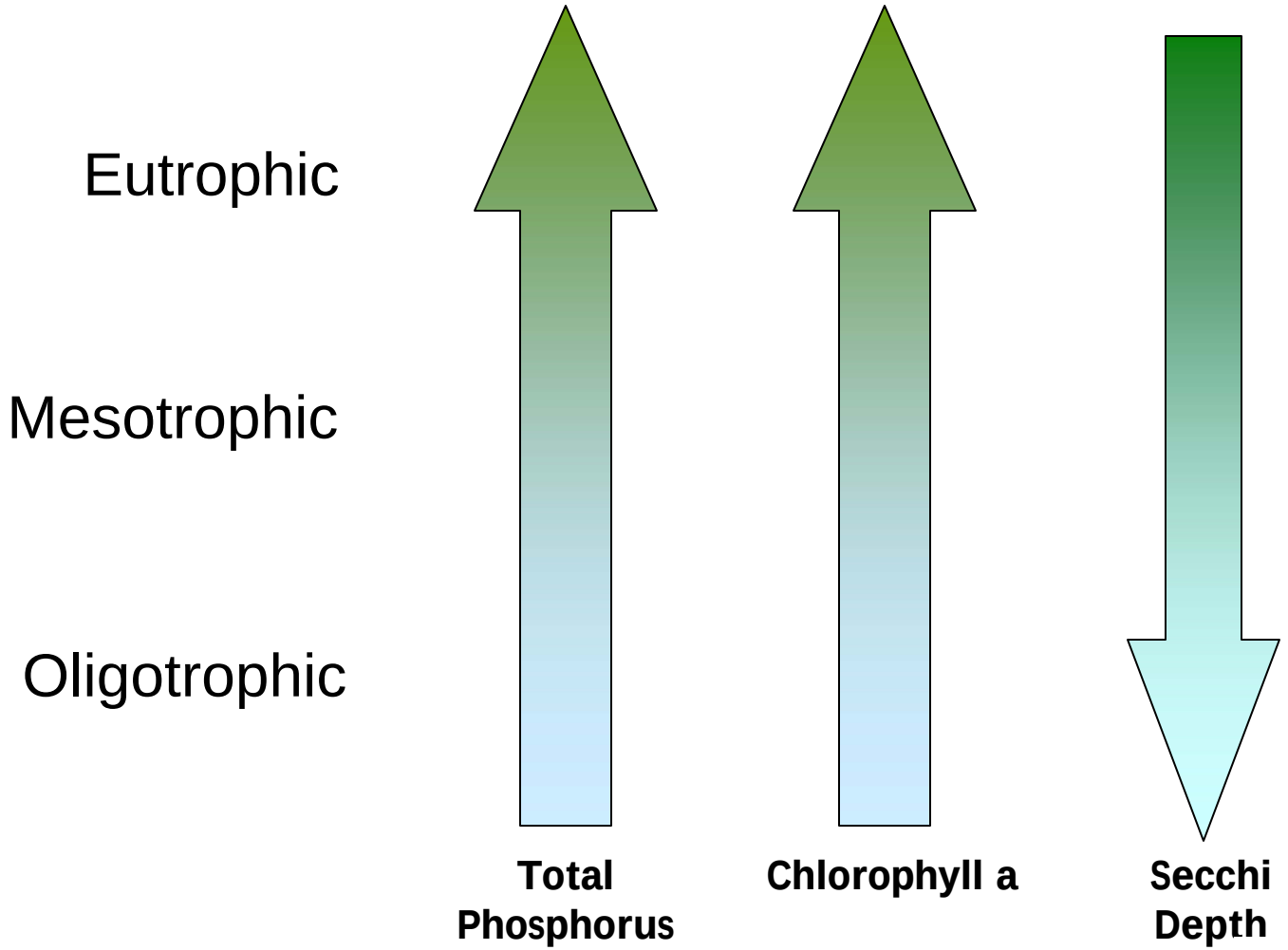
Lake Trout *(Salvalinus namaycush)*

Common Carp





Lake Trophic States



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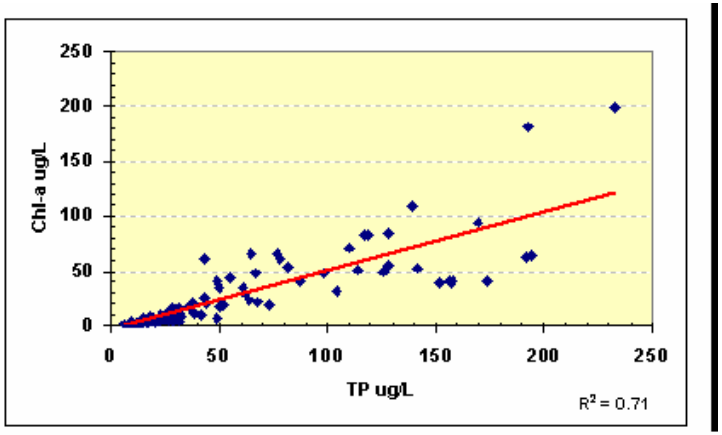
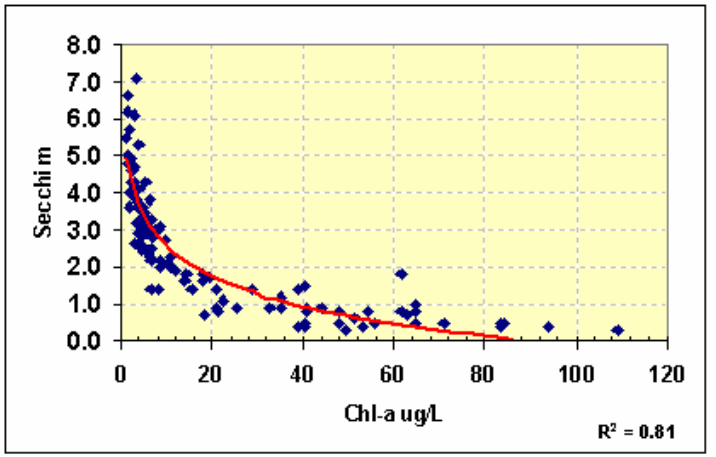
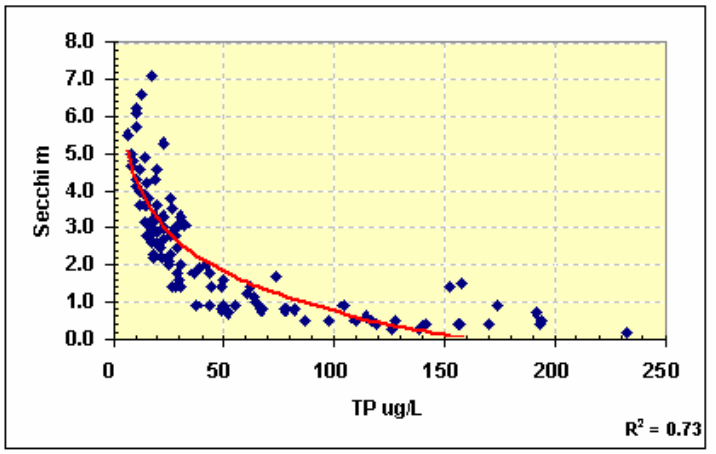
Relationships

- TP vs Chlorophyll-a
- Chlorophyll-a vs Secchi
- TP vs Secchi

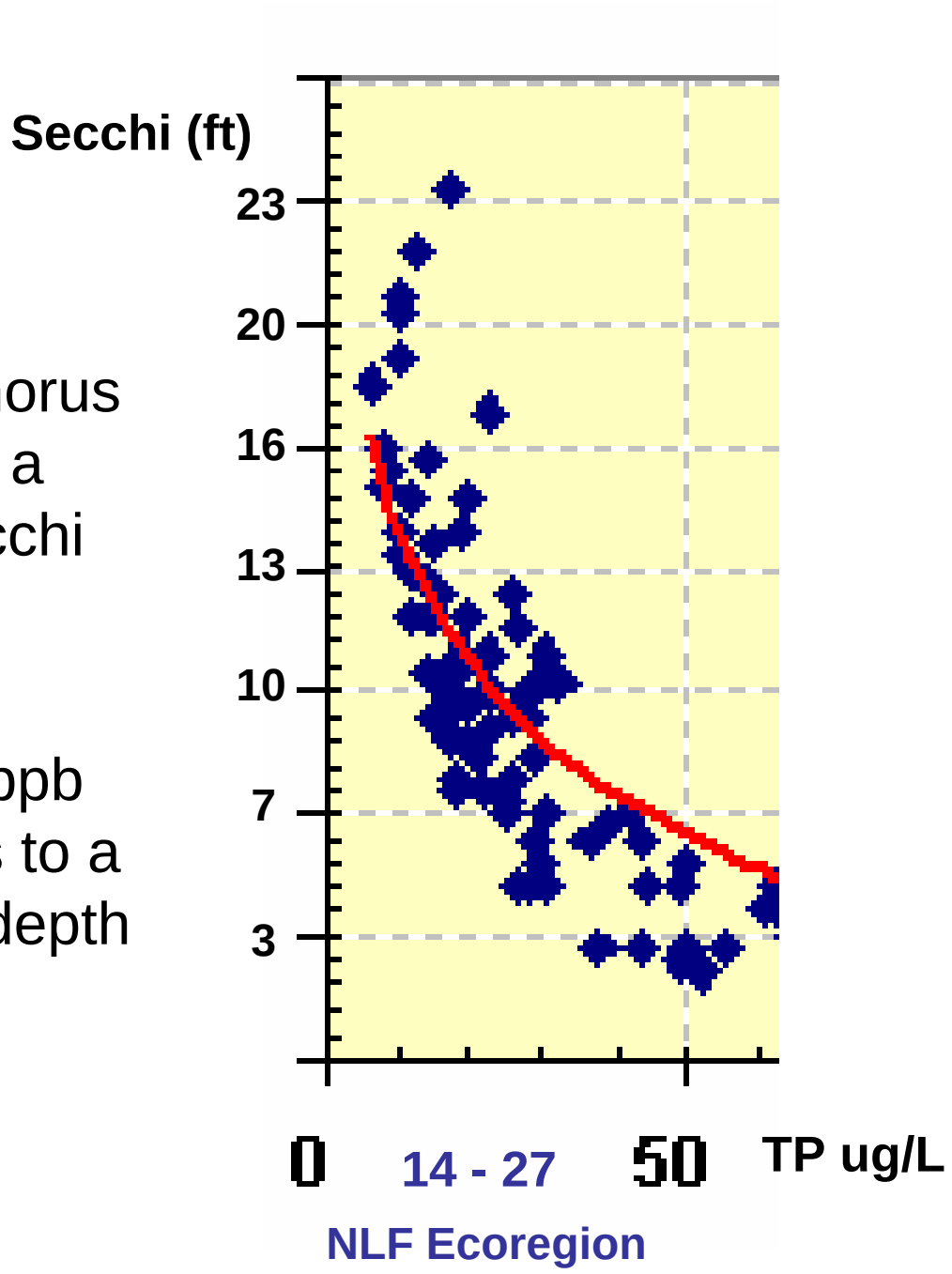






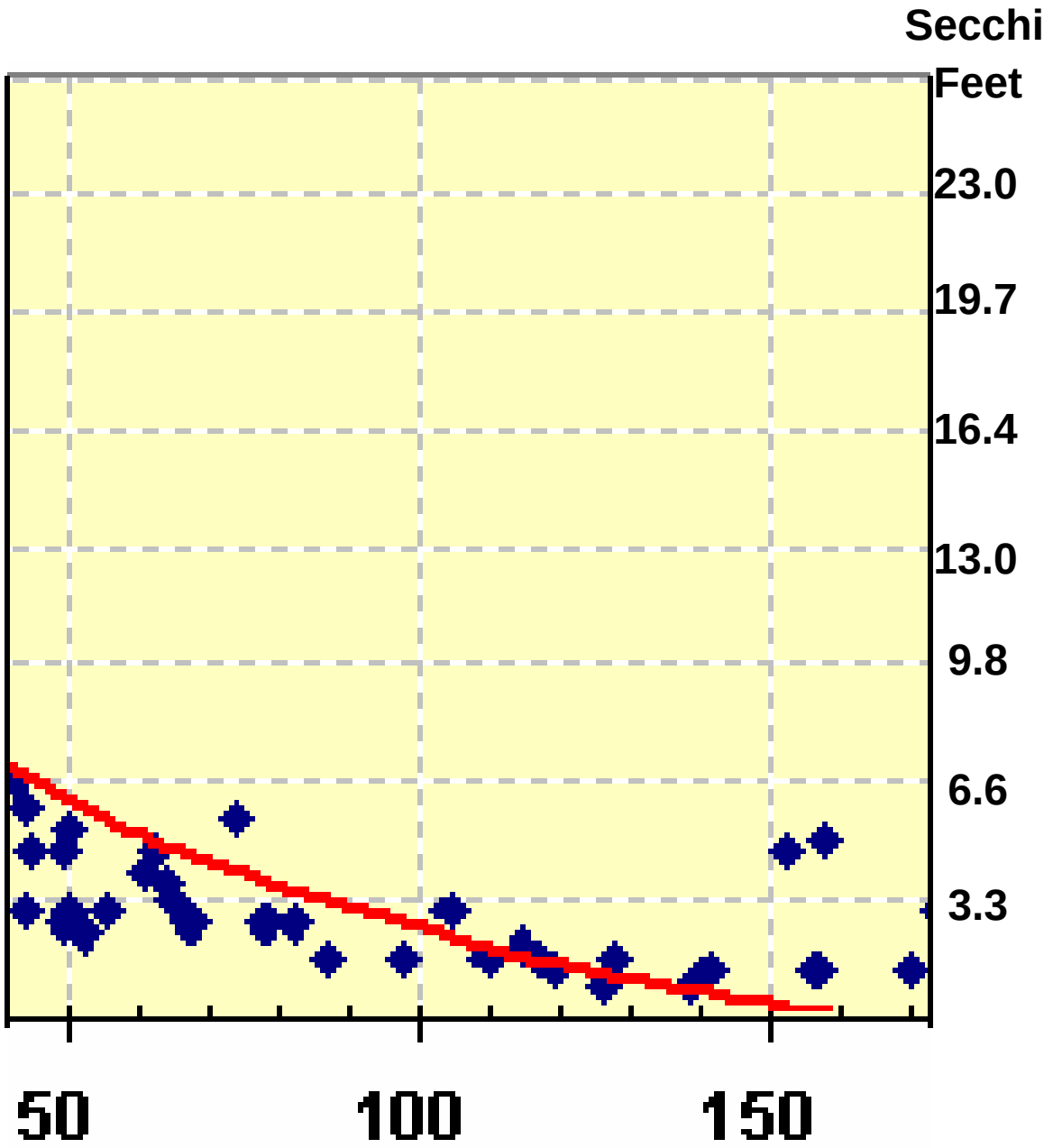
- In the your region, just a small increase in phosphorus concentration can cause a noticeable decline in Secchi depth

- An increase from 10-20 ppb phosphorus corresponds to a 3-foot decline in Secchi depth

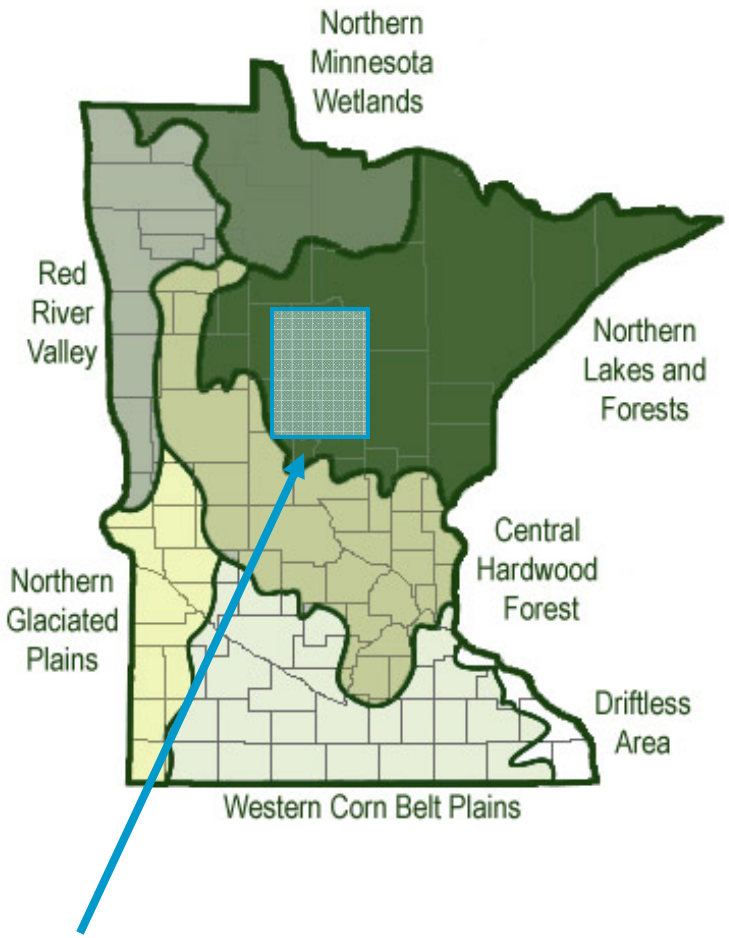


- In the southern lakes, a small increase in phosphorus does not cause such a noticeable decline in Secchi depth

- An increase from 90 to 100 ppb phosphorus corresponds to less than 1-foot decline in Secchi depth



MN Ecoregions



Parameter	Northern Lakes and Forests Ecoregion*
Total Phosphorus (ug/l)	14 –27
Chlorophyll-a Mean (ug/l)	<10
Secchi Disk (ft)	7.87 – 15.09

*Based on interquartile range (25th-75th percentile for Ecoregion Reference Lakes, MPCA)

Cass County is in the Northern Lakes and Forests Ecoregion

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Total Phosphorus

2007 Mean TP	ug/l = ppb
Thunder	8.5
Portage	8.8
Long 11-0142	9.8
Sand	10.6
Washburn-North	11.8
Blackwater	12
Island	12.4
Washburn-West	12.9
Stony	13
Ada	13.2
Mule	13.6

Lakes with LESS phosphorus than Ecoregion average (14-27 ug/l)

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2007 Mean TP	ug/l = ppb
Washburn-Birch	14.1
Washburn-East	15.9
Pleasant	17.2
Little Boy	17.2
Wabedo	17.5
Hattie 202	18.4
Hattie 201	18.8
Hattie 204	20.5
Hattie 203	20.6
Pine Mountain	22.8
Trillium 3901	23
Gull	23.2
Trillium 202	24.2
Hattie 205	24.5
Upper Gull	24.7
Swift	26

Total Phosphorus

Lakes WITHIN the phosphorus Ecoregion average (14-27 ug/l)

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Total Phosphorus

2007 Mean TP	ug/l = ppb
Blueberry	30
Boy 201	31
Boy 202	38

Lakes with MORE phosphorus than Ecoregion average (14-27 ug/l)

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Carlson's Trophic State Index

- A measurement of overall lake productivity.
- Converts values for phosphorus, chlorophyll-a and secchi depth into comparable numbers
- Average TSI can be thought of as the water quality of a lake taking into account phosphorus, chlorophyll-a and secchi depth.
- Trophic states are defined divisions of a continuum in water quality.

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Carlson's Trophic State Index

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

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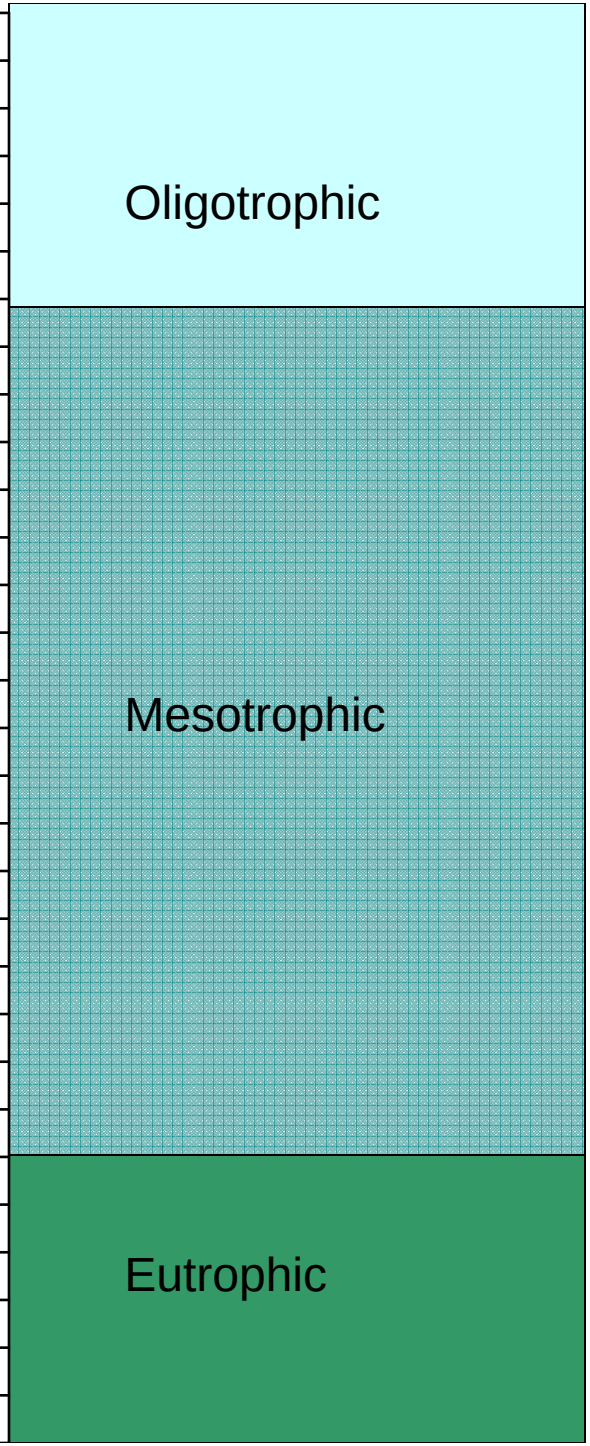
Mean TSI Rank

Portage	35
Sand	36
Long 11-0142	37
Island	38
Thunder	39
Stony	39
Blackwater	40
Washburn-North	41
Mule	41
Pleasant	41
Ada	42
Washburn-West	43
Washburn-Birch	43
Washburn-East	44
Little Boy	44
Wabedo	45
Hattie 202	45.9
Hattie 203	46.2
Hattie 204	46.6
Trillium 202	46.6
Hattie 201	46.8
Trillum 3901	47
Hattie 205	48.3
Pine Mountain	49
Gull	51
Swift	52
Boy 201	52
Upper Gull	52
Blueberry	53
Boy 202	56



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Trend Analysis

- Determining statistically if data shows improving or declining water quality over time
- Generally, it is best to have over 10 years of data with 4 or more measurements per year to be confident in an emerging trend
- Statistically, the probability that a trend is truly describing the water quality and not just a random trend is important
- % Significance means that there is an X% chance that the trend is real and not just random
- A probability over 90% is required by the MPCA to really be confident in the observed trend
- Available feature on our website

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Secchi Trends

- **Ada** 1976-2007 — no trend
- **Blackwater** 1988-2007 — increasing 90%
- **Gull** 1973-2007 — no trend
- **Little Boy** 1989-2007 — no trend
- **Long** (Main Basin) 1983-2007 — decreasing 95%
- **Mule** 1991-2007 — increasing 95%
- **Pleasant** 1975-2007 — increasing 99%
- **Portage** 1991-2007 — increasing 95%
- **Stony** 1994-2007 — no trend
- **Thunder** 1974-2007 — increasing 99%
- **Trillium** (3901) 1988-2007 — increasing 99.9%
- **Upper Gull** 1986-2007 — decreasing 95%
- **Wabedo** (SW Bay) 1994-2007 — no trend
- **Washburn** 1986-2007 — increasing 90%

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Data Quantity

- Cass County is deficient in chemical data for lakes
- You have a good base of Secchi data, chemical data is the next step
- Once you have 10 years of chemical data, you can evaluate phosphorus trends
- The MPCA wants to evaluate all lakes in the state and needs at least 10 data points of each phosphorus, chlorophyll-a and secchi disk to begin this process
- We send your data to STORET at the end of each year so that it is included in the state assessments

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New For Next Year

- Additional reporting features online
- Additional drop-off location at Longville or Remer?
- Currently, we are working with the EPA and MPCA to include historically stored data in STORET within our database management system
  - First time ability to query STORET data directly into pre-formatted reports and assessments

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New For Next Year

- This will allow you to query all data and generate various reports and statistical assessments from our website
- For those organizations that have historical data that is not currently stored in STORET, we are working with the MPCA to assist you in this process

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Additional Monitoring Ideas

- Complete a ground truthing study of your watershed
- Complete a shoreline inventory of your lake

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Additional Monitoring Ideas

- Take water samples monthly at stream inlets to your lake to determine where to focus phosphorus reductions
- Complete a mass balance study
  - Involves monitoring lake inlets and outlets and determining the net phosphorus staying in the lake. This data can then be fed into a model to see what will happen to your lake in the future.

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You can make a difference

- Thank you to all the volunteer monitors for taking the time and energy to collect water quality data

- Everyone benefits from clean lakes!
  - Recreational enjoyment
  - Great fishing
  - Lake property values

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