



Investments

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Introduction

- ❑ **Shoreland Management Act of 1969**
 - ❑ Shoreland Development Standards; P&Z

- ❑ **Federal Clean Water Act of 1972**

- ❑ **Minnesota's Clean Water Legacy Act of 2008**
 - ❑ Funds for clean water, habitat, parks, & arts
 - ❑ \$110M/year for clean water (CWF account)
 - ❑ Clean Water Accountability Act of 2013 - *prioritize*

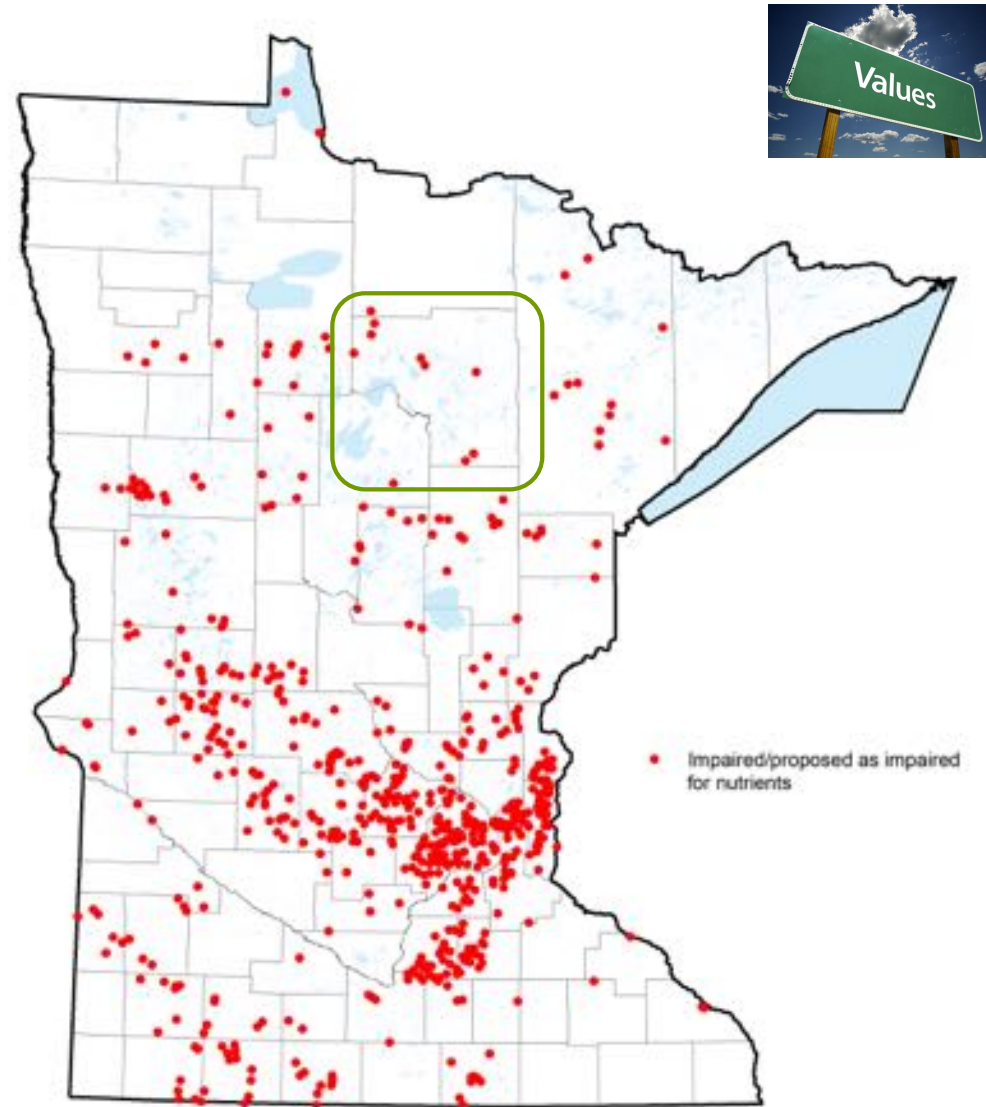
Why Prioritize?

- we have a lot of water and don't have resources to work everywhere



Focus on Impaired Lakes

- 80% spent on restoration projects for Impaired Waters
- > 600 Nutrient Impaired Lakes

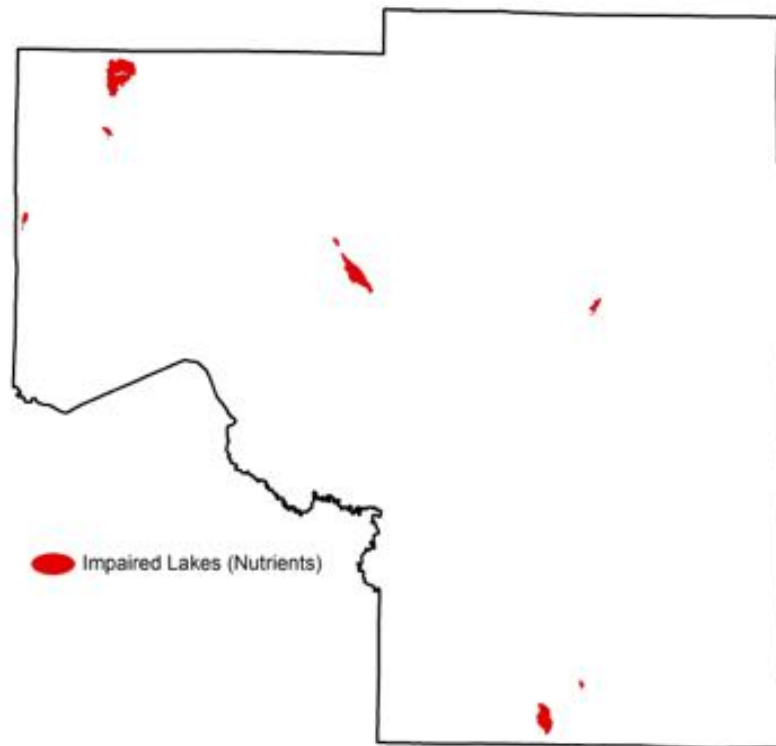


Impaired Lakes

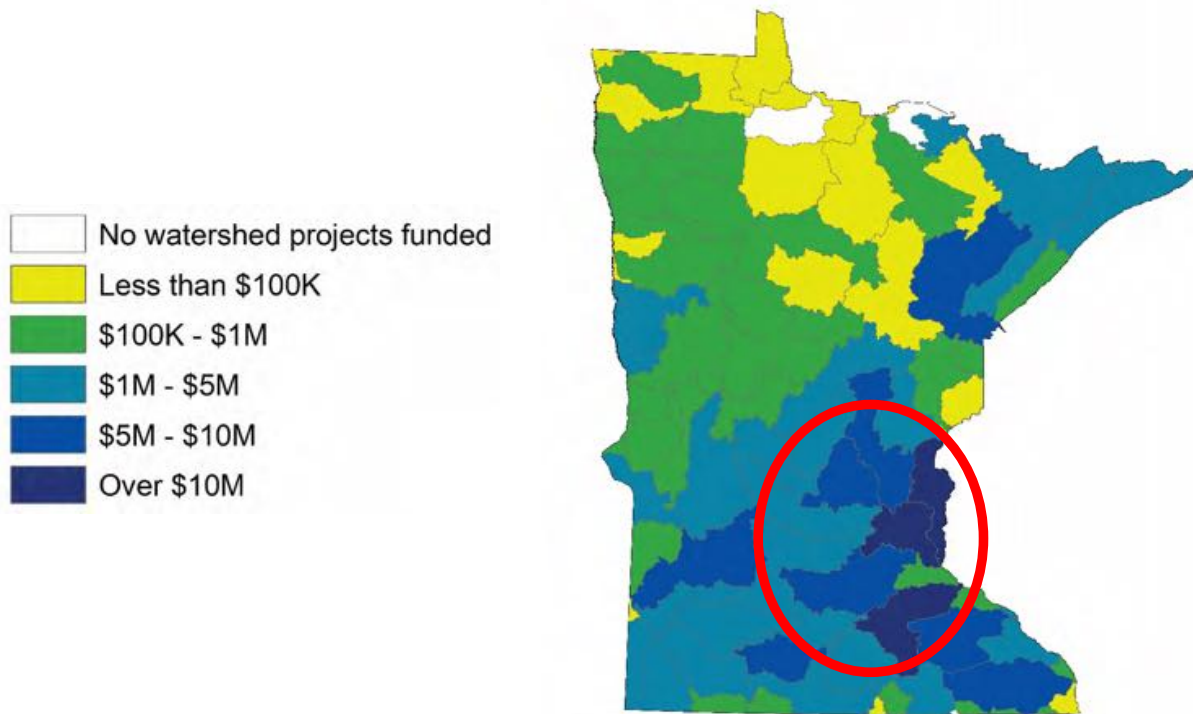
Itasca County

1251 Lakes

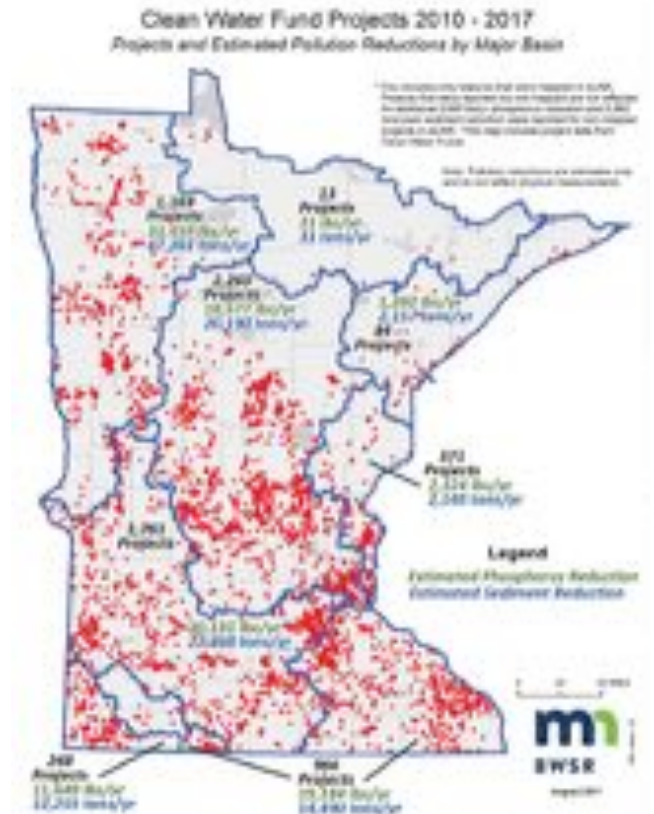
8 Impaired Lakes



Investment – Total FY 10-17 CWF Dollars by Watershed



*Protection/restoration
implementation activities*





What Lakes Should We Invest In?

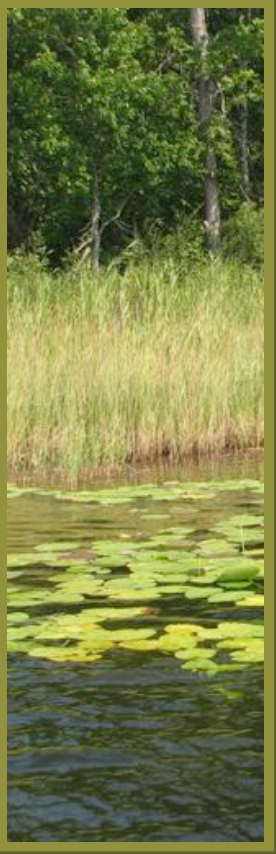


Pollution Control Agency | Department of Natural Resources | Board of Soil and Water Resources

Common Prioritization Approaches

- ❑ First Come (Impaired), First Served
- ❑ Squeaky Wheel
- ❑ Those with Resources get more Resources
- ❑ Number-based (economic, ecological, etc.)
- ❑ Various combinations

Avoid: Arbitrariness & Hidden value judgments

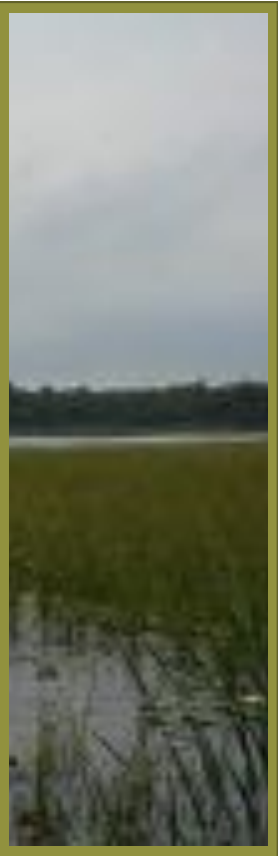


Lake Prioritization

❖ Different objectives:

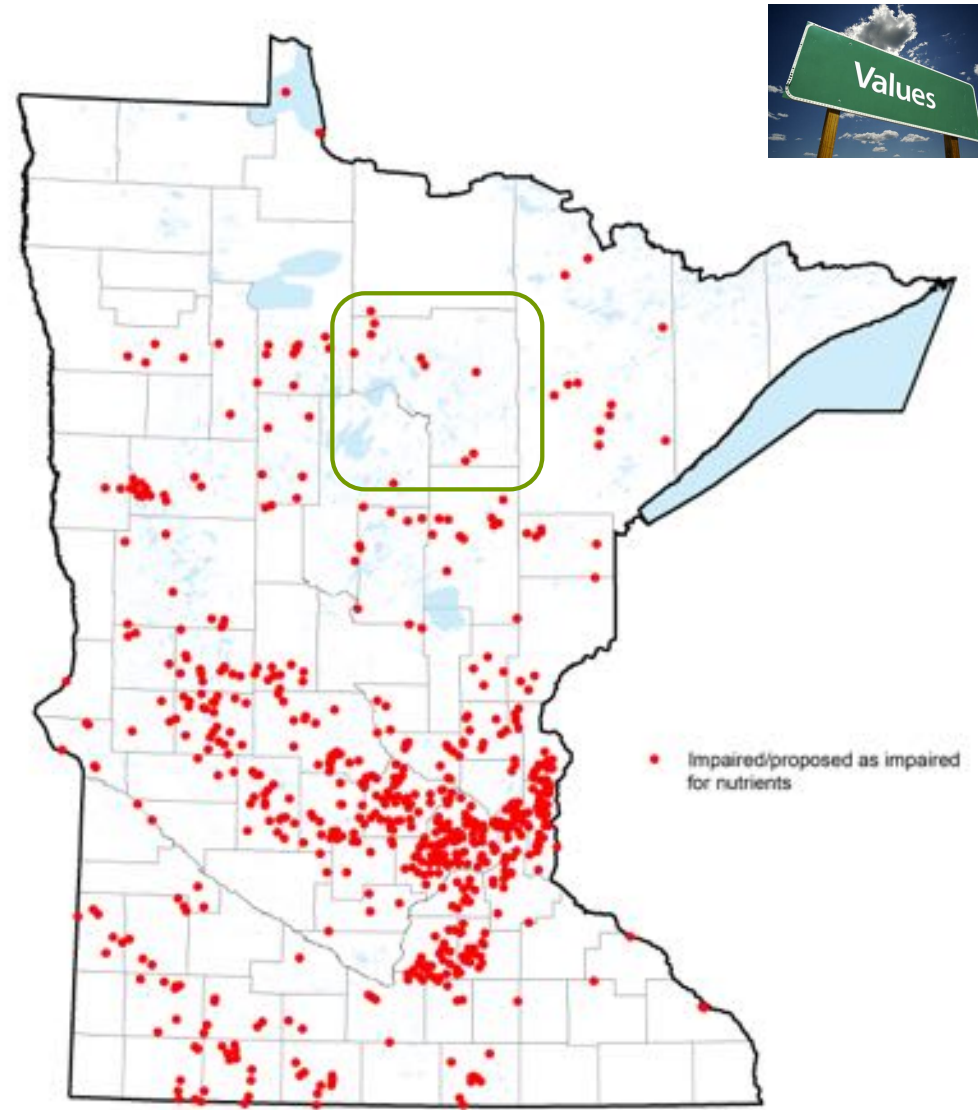
- *Focus on impaired lakes*
- *Focus on high-quality lakes at greatest risk of becoming degraded or further degraded*
- *Focus on lakes with high-quality biological communities*
- *Focus on high-value lakes that provide the greatest return on investment*

❖ Compare two different objectives



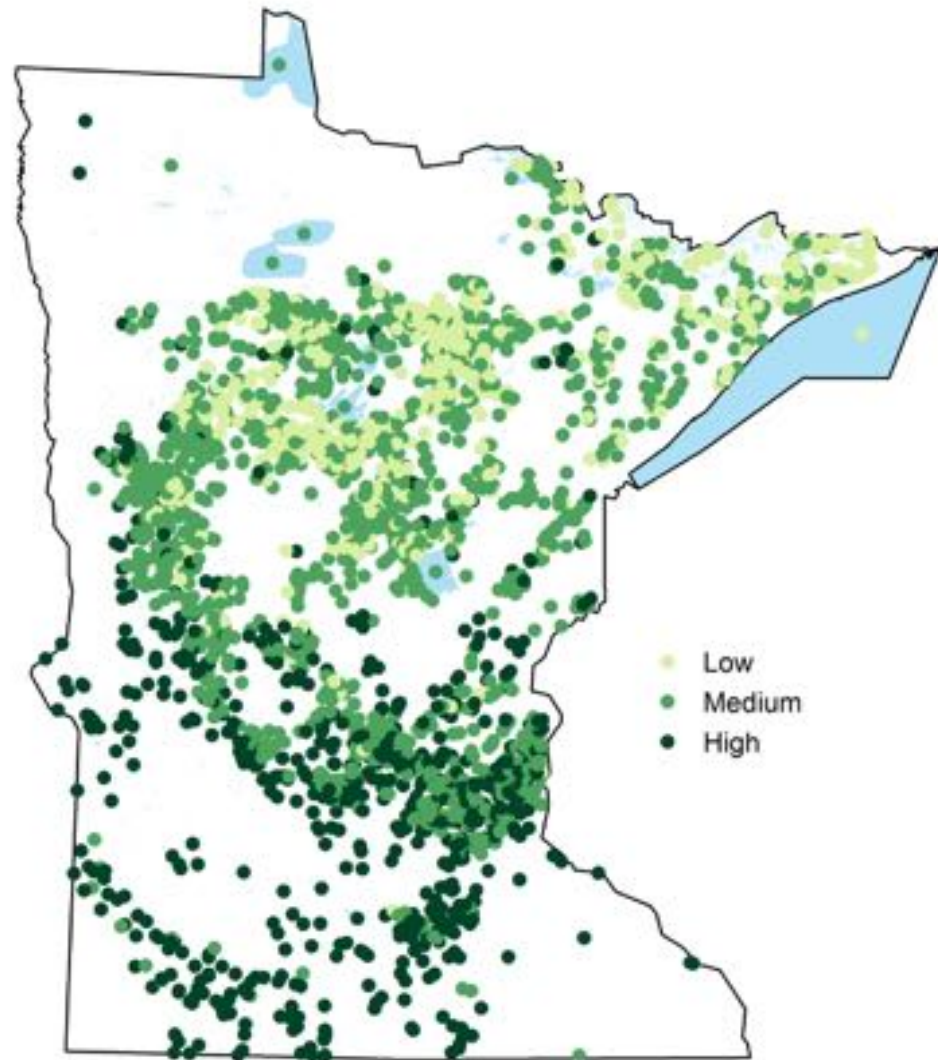
Focus on Impaired Lakes

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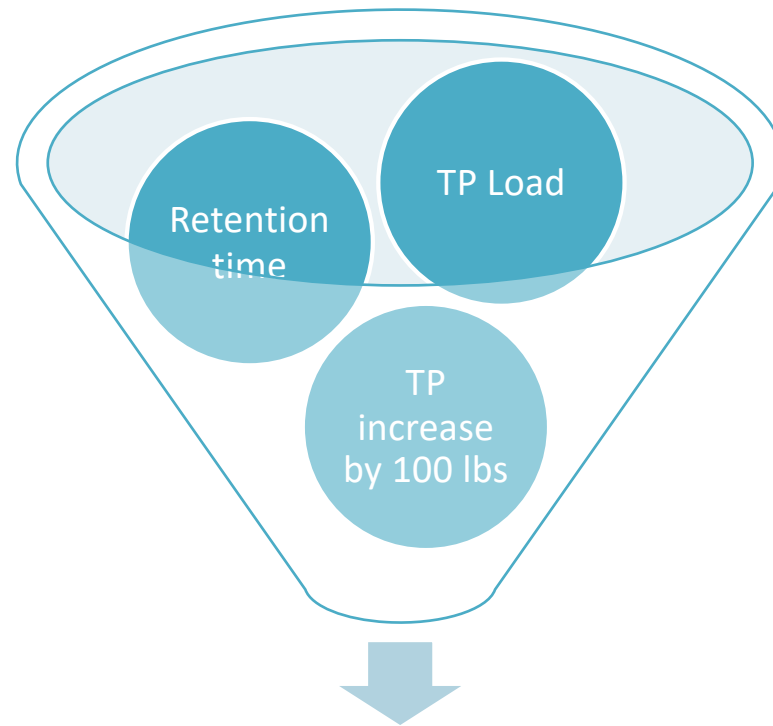


Mean TP

Average summer mean
total phosphorus ($\mu\text{g/L}$)



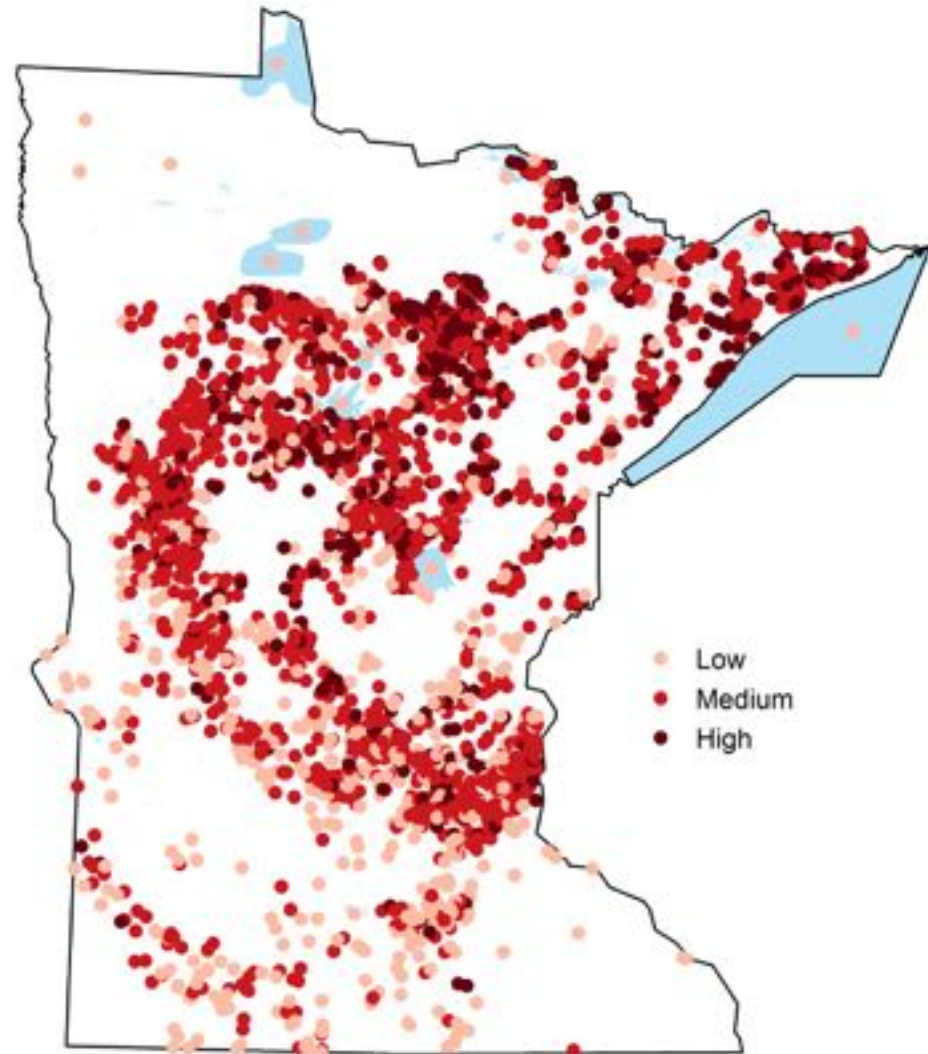
Lake's TP Sensitivity



Sensitivity = Loss in water transparency (inches)

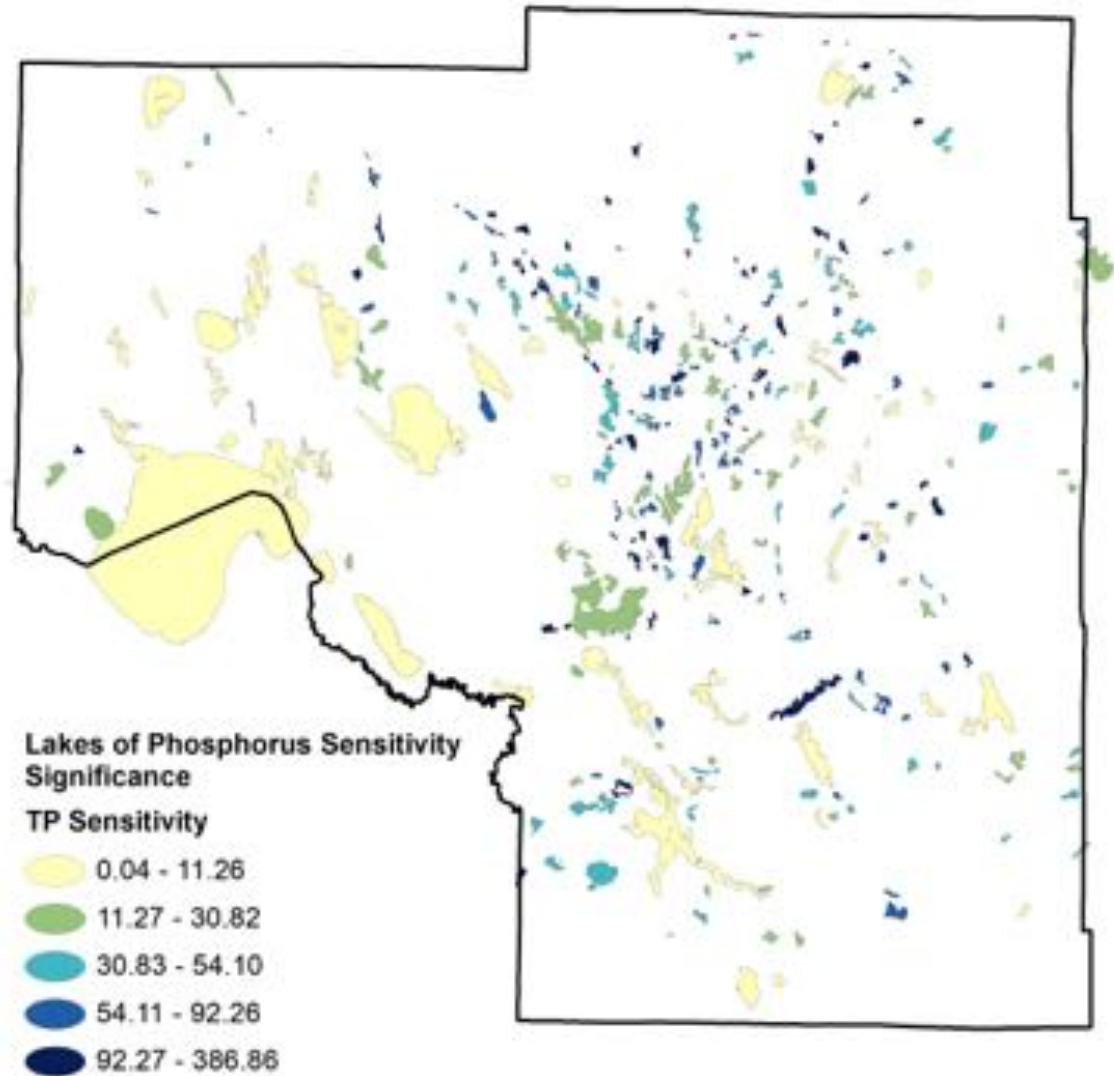
TP Sensitivity

Inches lost in water clarity
with an increase in 100 lbs
of phosphorus loading



TP Sensitivity

Inches lost in
water clarity
with +100
lbs TP

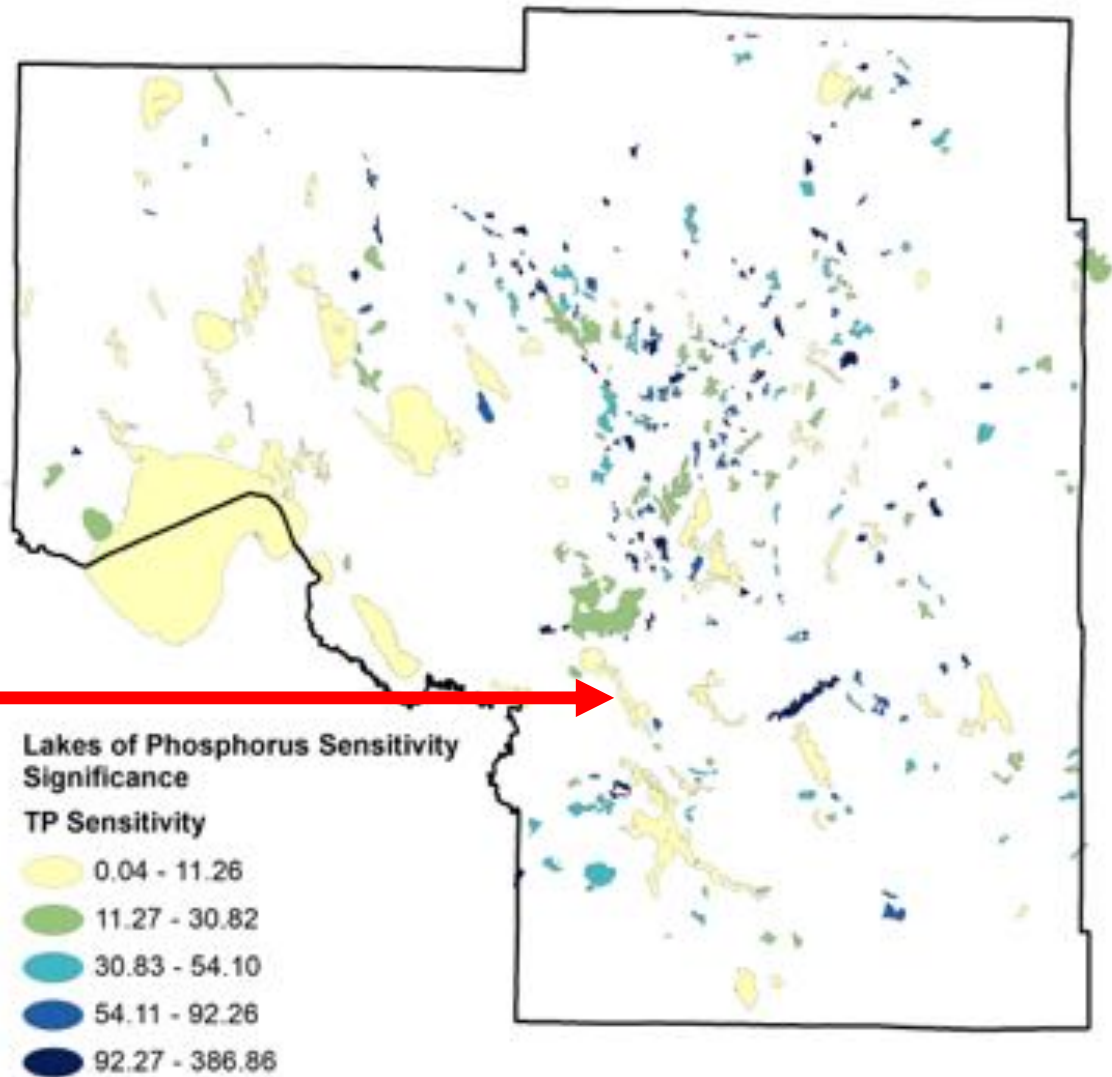


TP Sensitivity

Inches lost in
water clarity
with +100
lbs TP

Bass Lake

~1' of water clarity lost with 100lbs of P
~50 lb/year phosphorus reduction goal

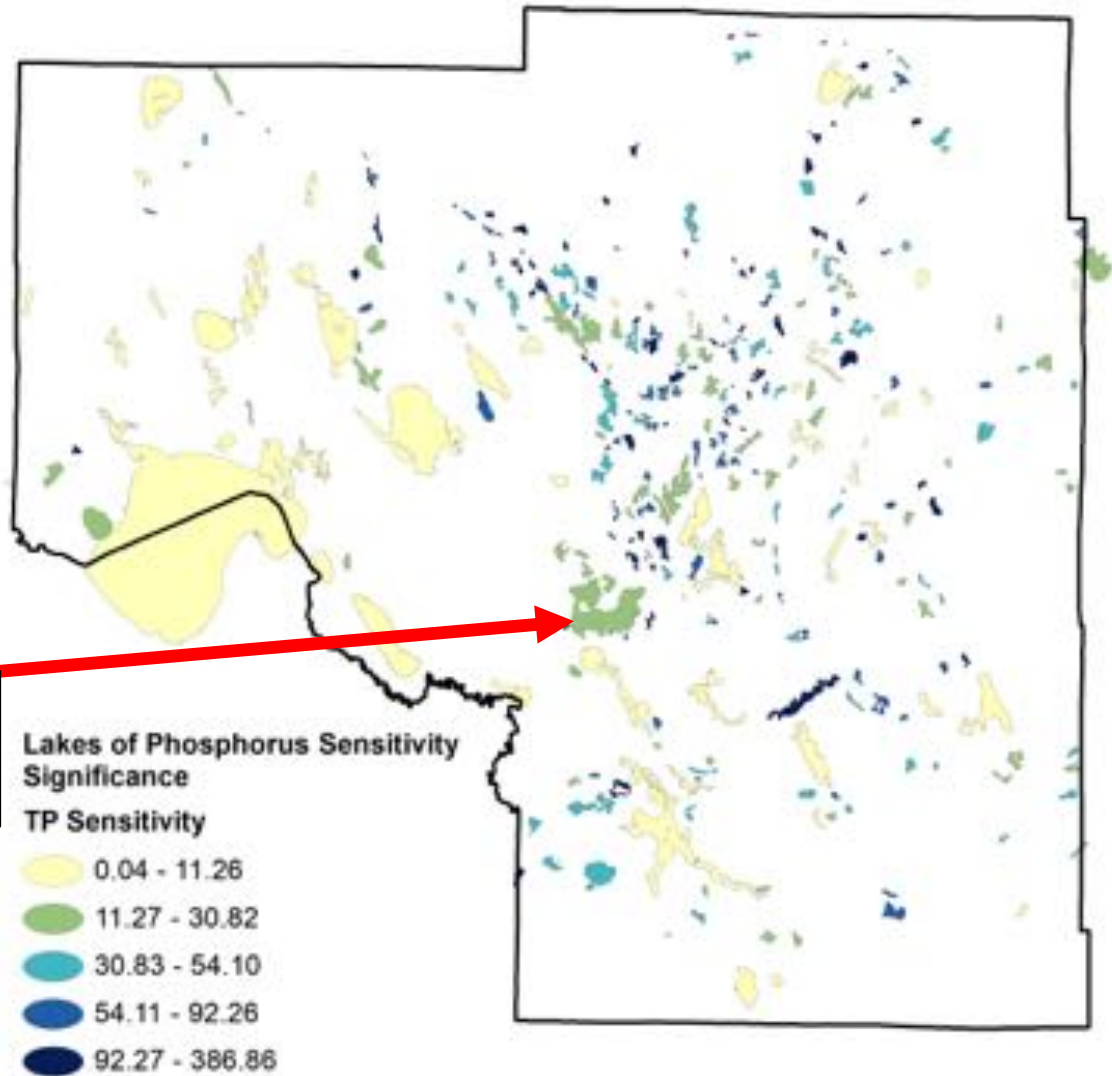


TP Sensitivity

Inches lost in
water clarity
with +100
lbs TP

Deer Lake

~2' of water clarity lost with 100lbs of P
~25 lb/year phosphorus reduction goal

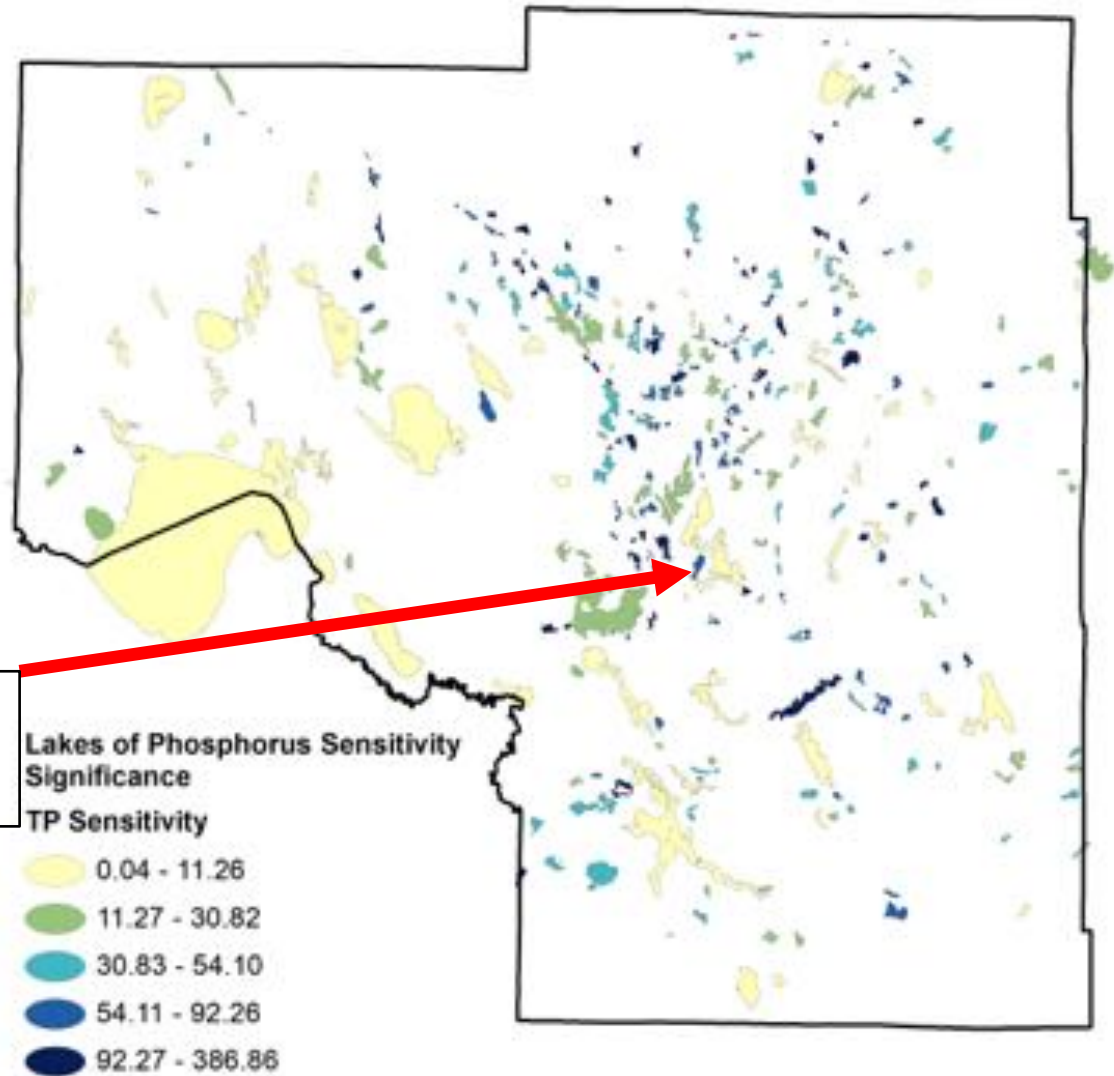


TP Sensitivity

Inches lost in
water clarity
with +100
lbs TP

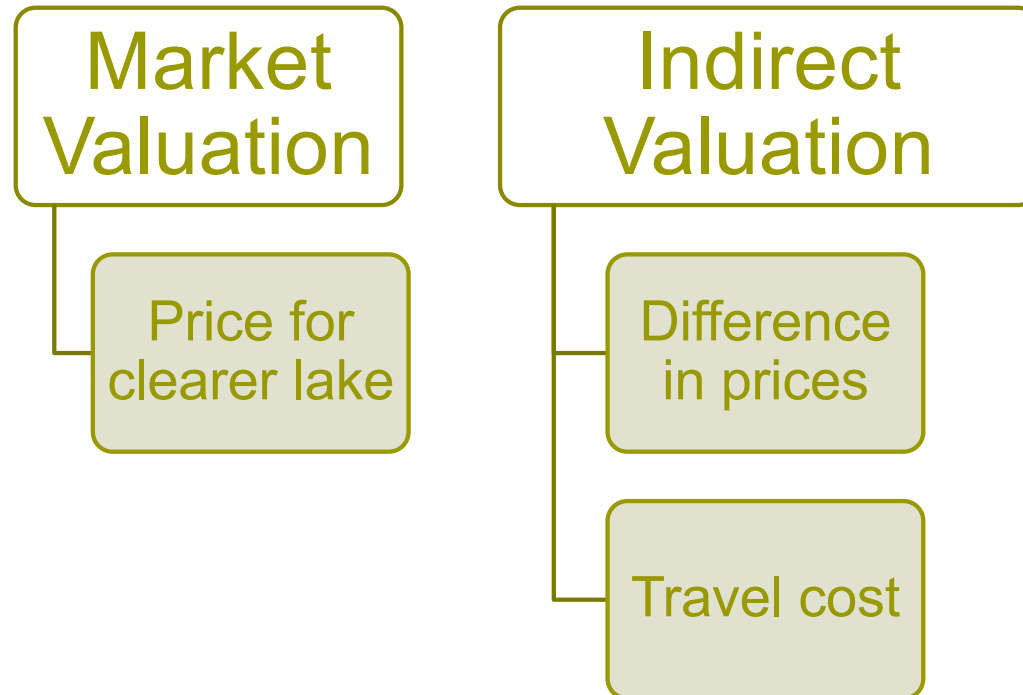
Bluewater Lake

~7-8' of water clarity lost with 100lbs of P
~4 lb/year phosphorus reduction goal



BCR (Economic Model)

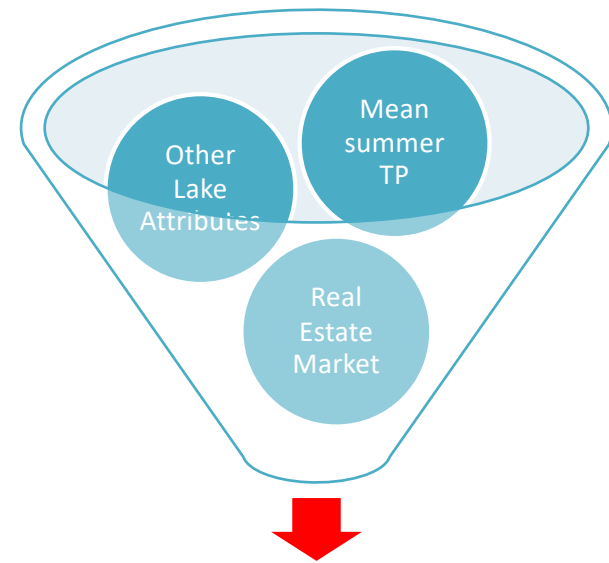
Benefits (B) = \$ VALUE



BCR

Predicted land values based on lake's mean TP (\$/shoreline ft)

- Land value was higher with lower TP
- Land value was higher with bigger and deeper lakes
- Real Estate Market



Land Value (\$/shoreline ft)

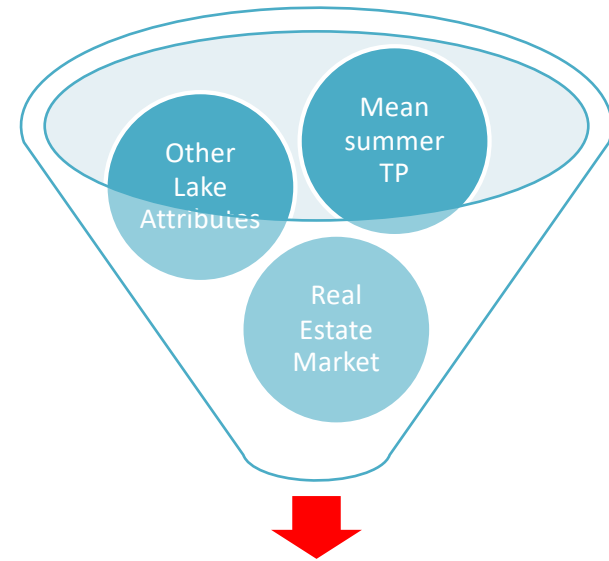


One Can Predict Benefits!

BCR

Predicted land values based on lake's mean TP (\$/shoreline ft)

- Land value was higher with lower TP
- Land value was higher with bigger and deeper lakes
- Real Estate Market



Land Value (\$/shoreline ft)





BCR


Benefits (B)

- Total land value increase for a lake with 5% P reduction

Cost (C)

- Ag – \$18/pound P
- Residential/Urban – \$21,000/pound P
- Forest – conservation easement 60% of land \$

BCR

- Multipliers – probability of feasibility (T) & willingness (W)
 - $BCR = B/C \times T \times W$
 - Higher the BCR → better the return on investment (ROI)
- 

Shoreline Value

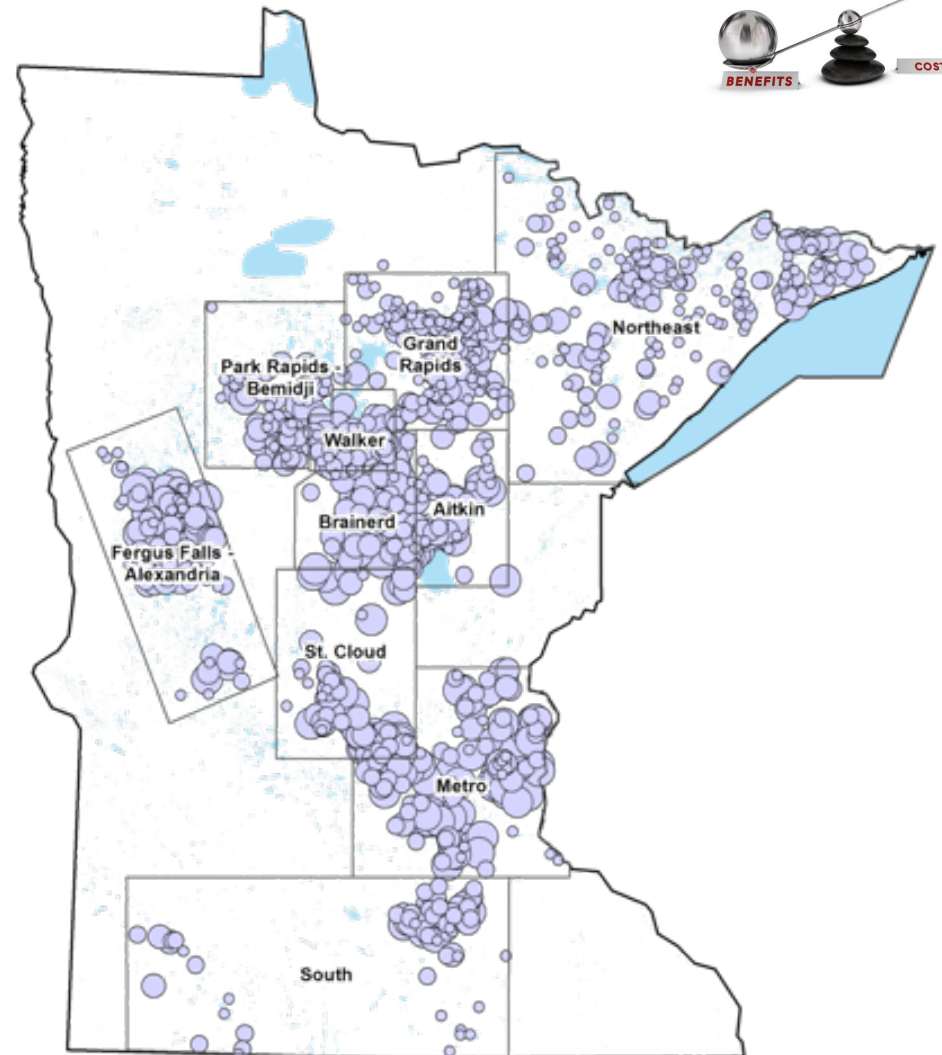
Mean lake shoreline value
Land value (\$/ft)

Brainerd

Median: \$800/ft (max \$3800/ft)

Walker

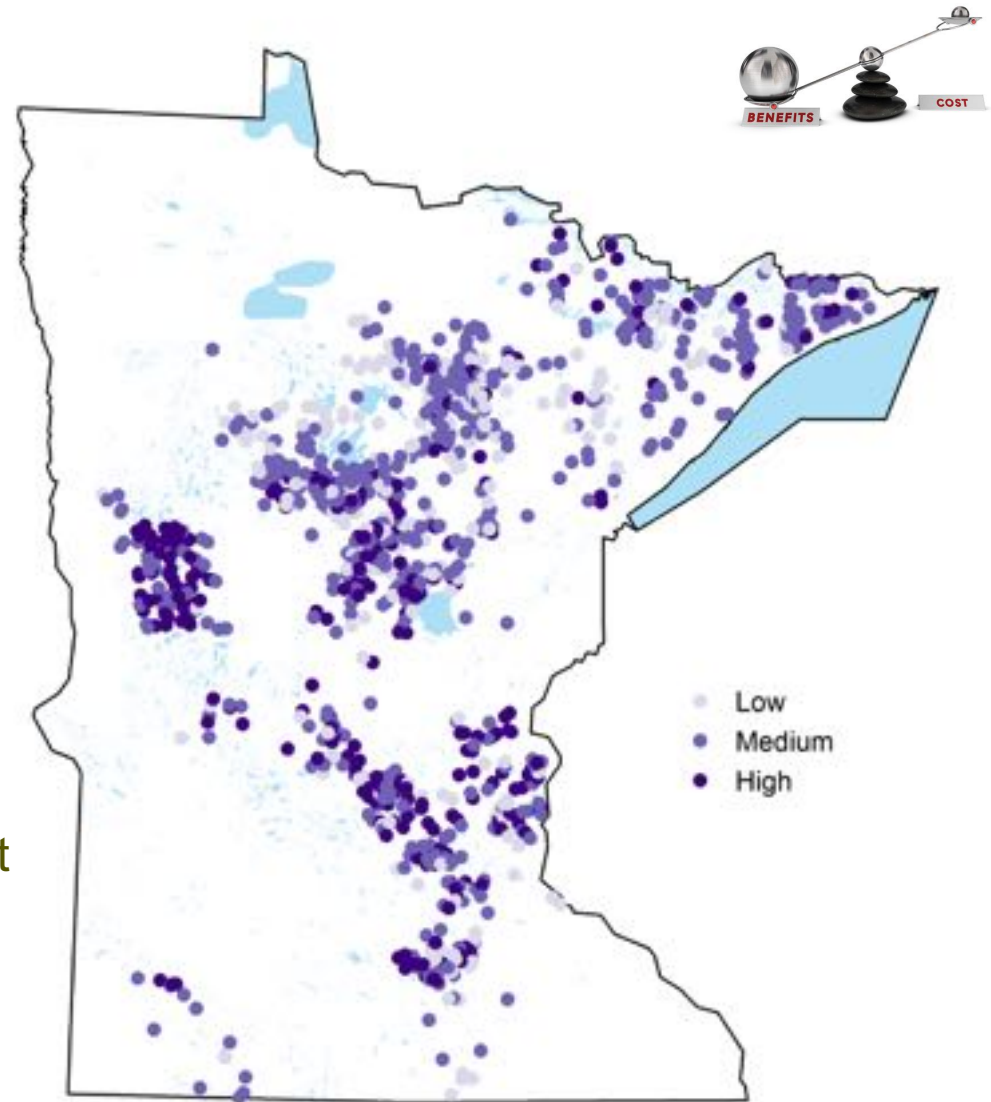
Median: \$500/ft (max \$1600/ft)



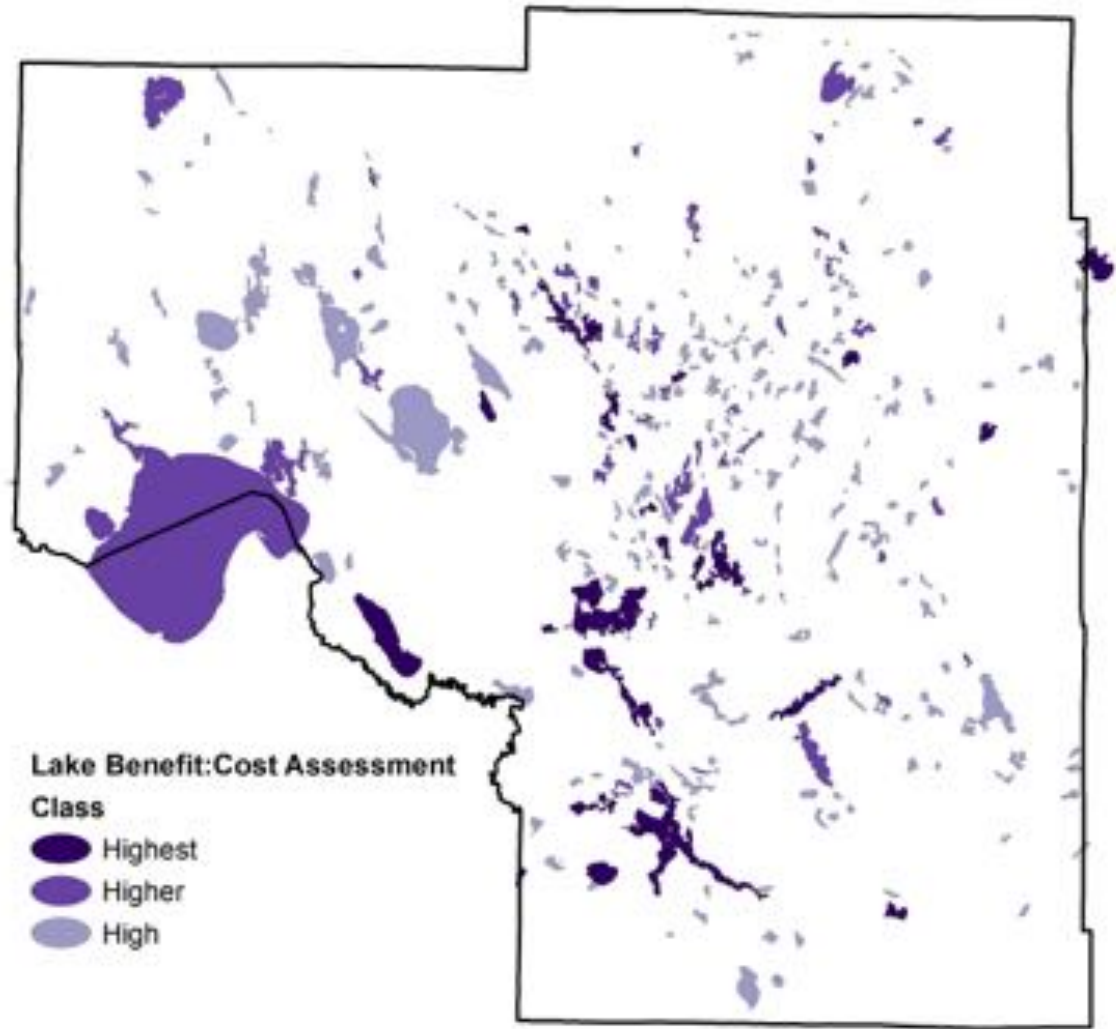
BCR

Benefit:cost ratio

- Benefits - Large lakes & urban lake benefits likely exceed \$1 million
- Costs - by land use:
 - Forest (cons. easement) = \$3/ft
 - Ag dominated watersheds = \$9/ft
 - Residential/Urban watersheds = \$17/ft



BCR



Lakes with high BCR

- Large lakes (>1000 acres)
- High land value lakes
- Lakes of Biological Significance
- Lakes highly vulnerable to additional phosphorus loading (TP Sensitivity)





Lakes with low BCR

Impaired Lakes → Higher Costs

- IF restoration focused on the top 100 BCR impaired lakes, THEN Cost = \$80 million & Benefit = \$34 million
- For the same \$80 million, selecting high BCR lakes without regard to impairment status:
 - 198 lakes (vs. 100)
 - Benefit = \$209 million (vs. \$34 million)

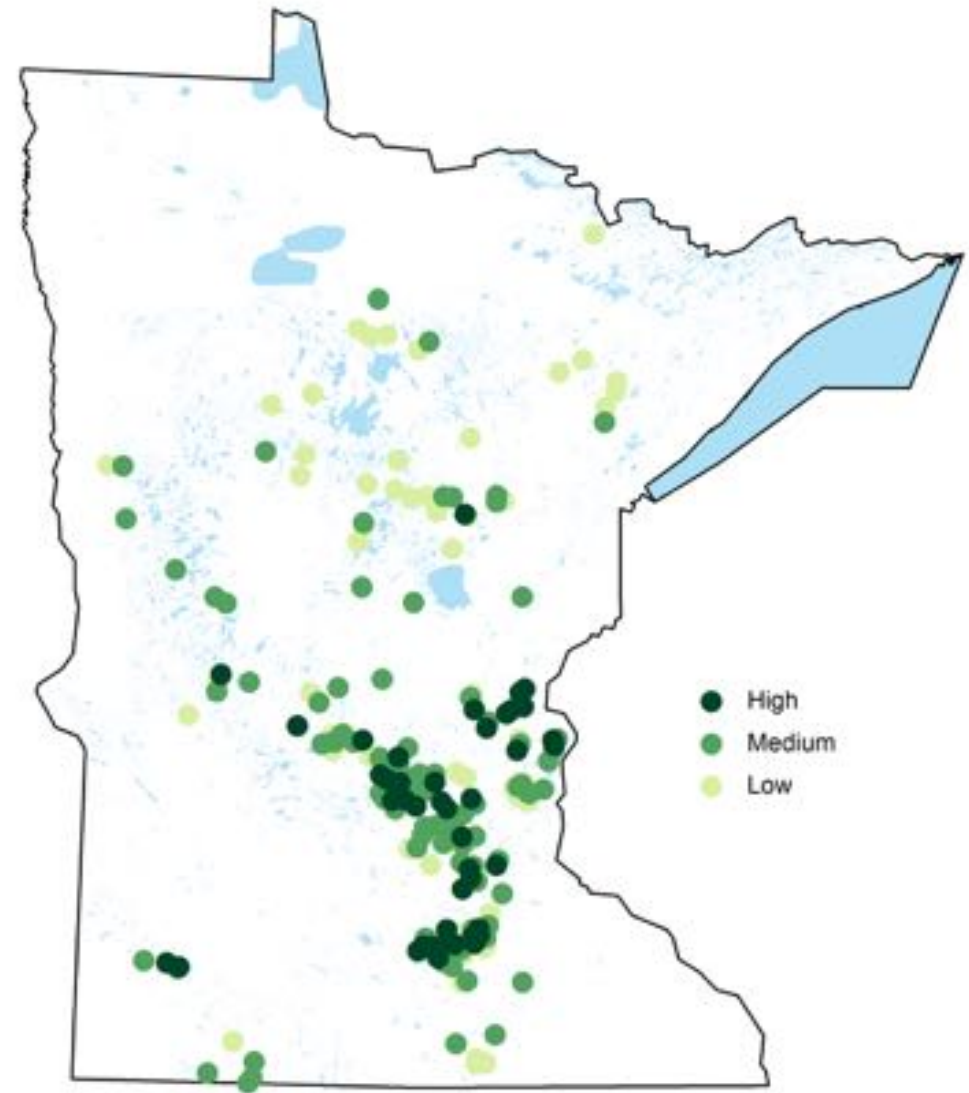
6X greater ROI if focused on high BCR lakes over focus on impaired lakes



Impaired Lakes

Top 100 BCR impaired lakes


**There are nutrient
impaired lakes with
high BCR!**





Which Lakes Would You Prioritize?

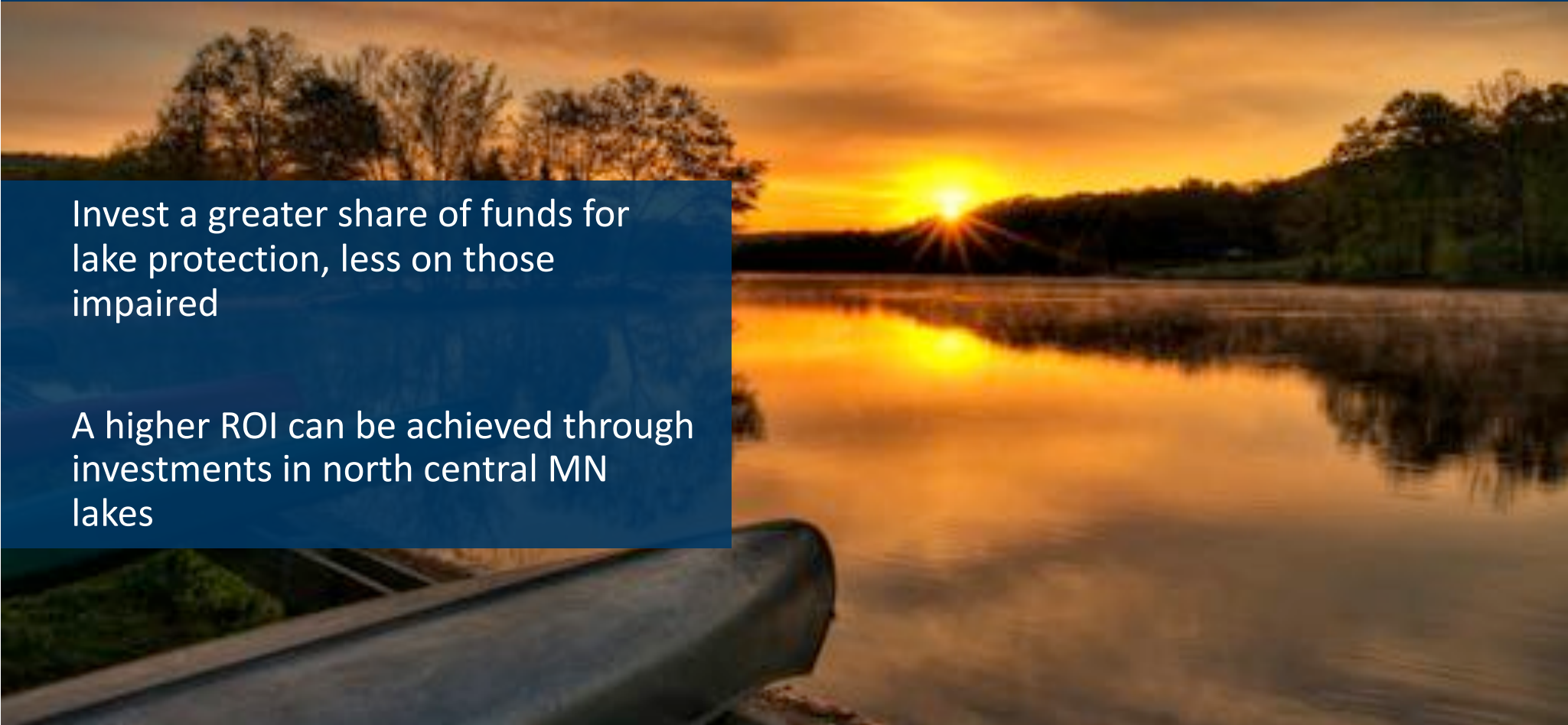
Think about giving higher priority to lakes that are:

- Large
 - Sensitive to Phosphorus loading
 - Protected with cost-effective strategies (forested shoreland)
 - In cities or highly developed
 - High value biological communities
- 

Summary

Invest a greater share of funds for lake protection, less on those impaired

A higher ROI can be achieved through investments in north central MN lakes



Nutrient Pollution & Erosion



Big Trout Lake

- Large lake (1400 acres)
- High land value (\$139m)
- High benefit (\$1.6m; 5% reduction in P [37 lbs])
- Moderate cost (\$0.6m)
- Assumed high technical feasibility, moderate probability of social & political willingness
- High BCR (1.2; high rank)



Big Trout Lake





Thank you. Questions?