

# A Lake Classification and Conservation Portfolio for Wisconsin

*Based on  
development  
of the*

*lake classification and conservation  
portfolio for MN, ND, and SD*

*2008-2009*



Kristen Blann  
Freshwater ecologist  
The Nature Conservancy

# The Nature Conservancy in Wisconsin



Nonprofit conservation organization

Since 1960, the Conservancy has protected more than 230,000 acres of critical land and water habitats in Wisconsin, including:

[Border Lakes Area](#) and [Catherine Wolter Wilderness Area](#)

[Caroline Lake](#) (North Central Wisconsin)

[Wild Rivers Legacy Forest](#) (Northeast Wisconsin)

[www.nature.org](http://www.nature.org)

# Why a lake portfolio?

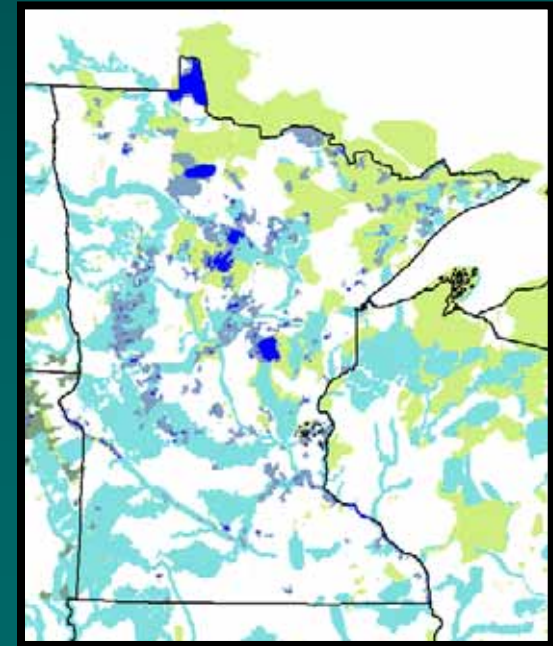


How to protect “the best of the best?”

TNC ecoregional plans...  
but these focused on terrestrial habitats, rivers, and watersheds



What about me?





# Lake Classification



What makes a lake a lake?

How many unique lake types are there?

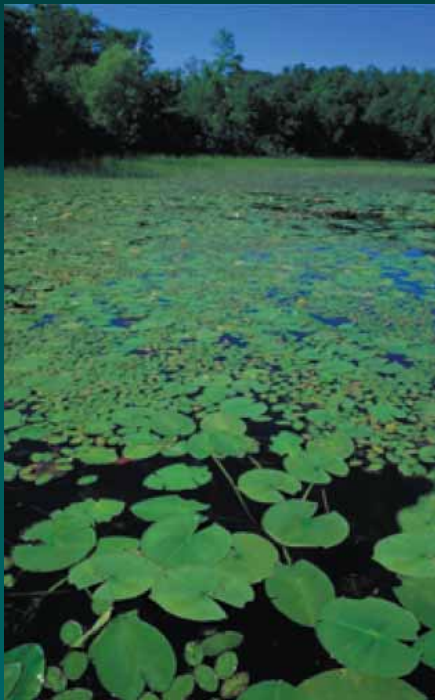
What do we need to protect?





# Step 1: Classification

*Which variables really matter ?*



From literature review & analysis:

Fish communities

Lake substrate & geology

Connectivity

Water chemistry

Aquatic plant communities

Drainage basin size &  
landscape position

- Depth
- Max
  - Mean
  - Average

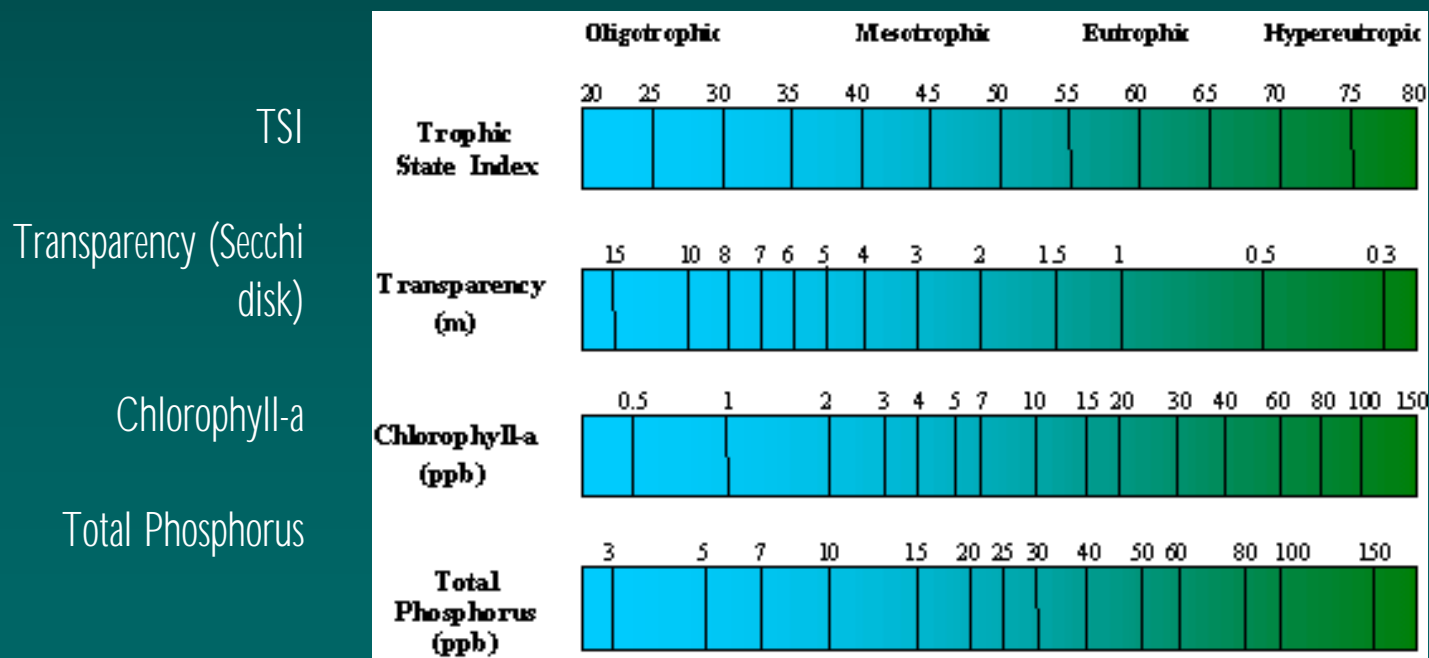
water quality

Watershed land use

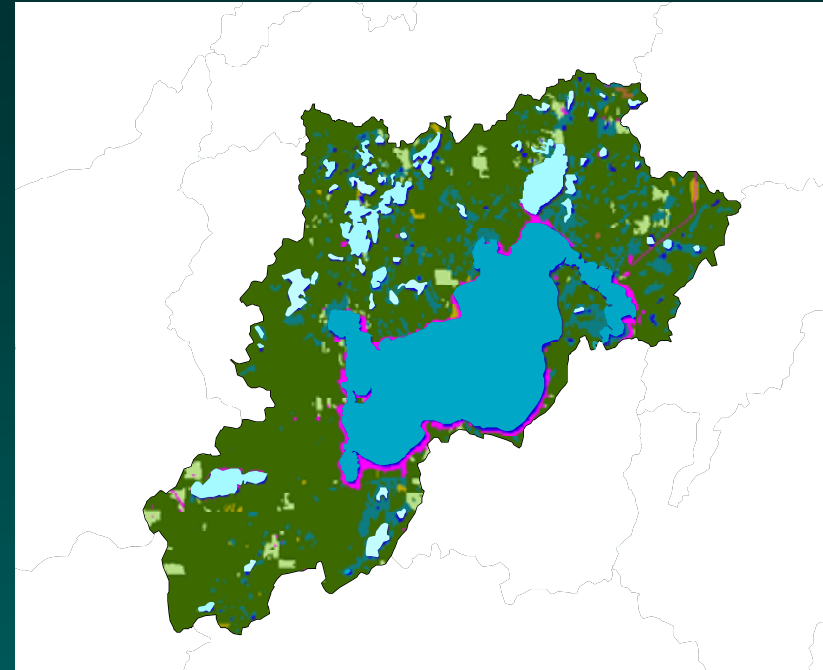
Lake Size

# What do we already know about lake classification?

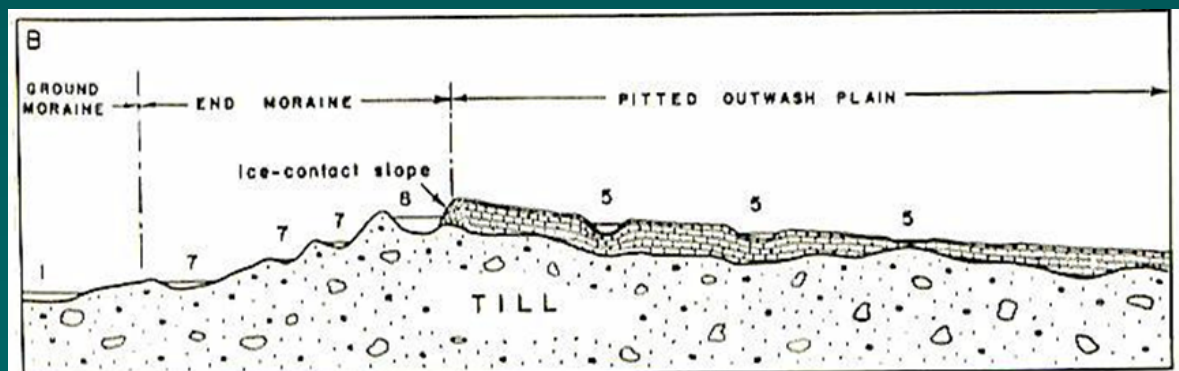
Oligotrophic    Mesotrophic    Eutrophic    Hypereutrophic



# A lake is influenced by its watershed



- Geologic origin and history
- Climate & runoff
- Geology and Soils
- Topography & position
- Land use & vegetation cover
- Impervious Surface



Diagrams showing origin of different kinds of glacial lakes. 1) basin formed by irregular deposition of till; 5) ice-block basins in outwash plain; 7) ice block basin in till; 8) ice block basin in till and outwash.



Biological communities (fish, aquatic plants) strongly respond to water quality, ecoregion, and lake morphology

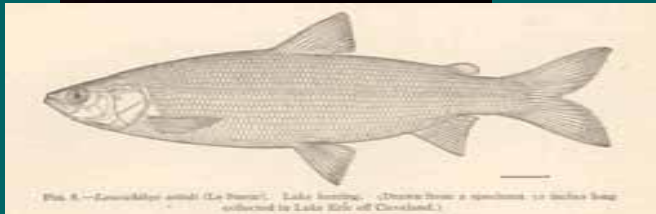
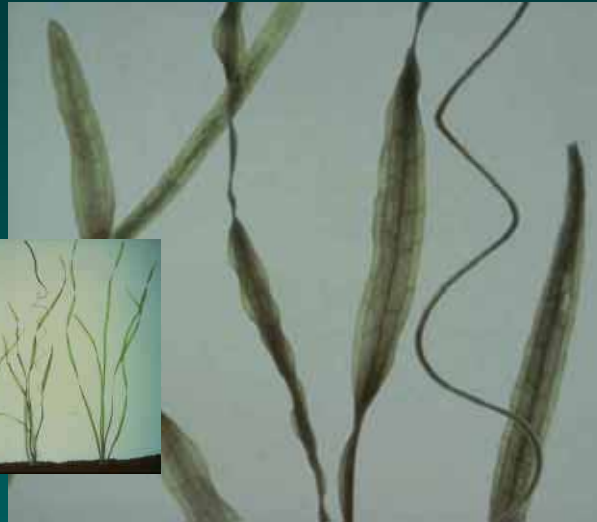


FIG. 8.—*Lepomis gibbosus* (L. Stead). Lake bass. (Drawn from a specimen in the fish collection of the U.S. Fish Commission.)

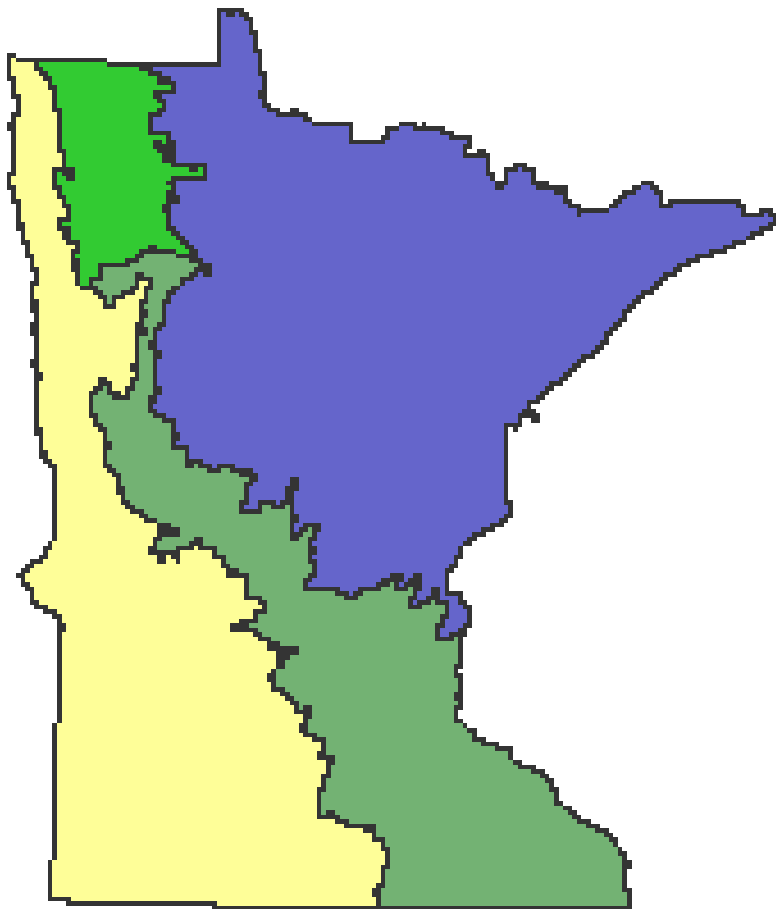
© MN DNR

© MN DNR

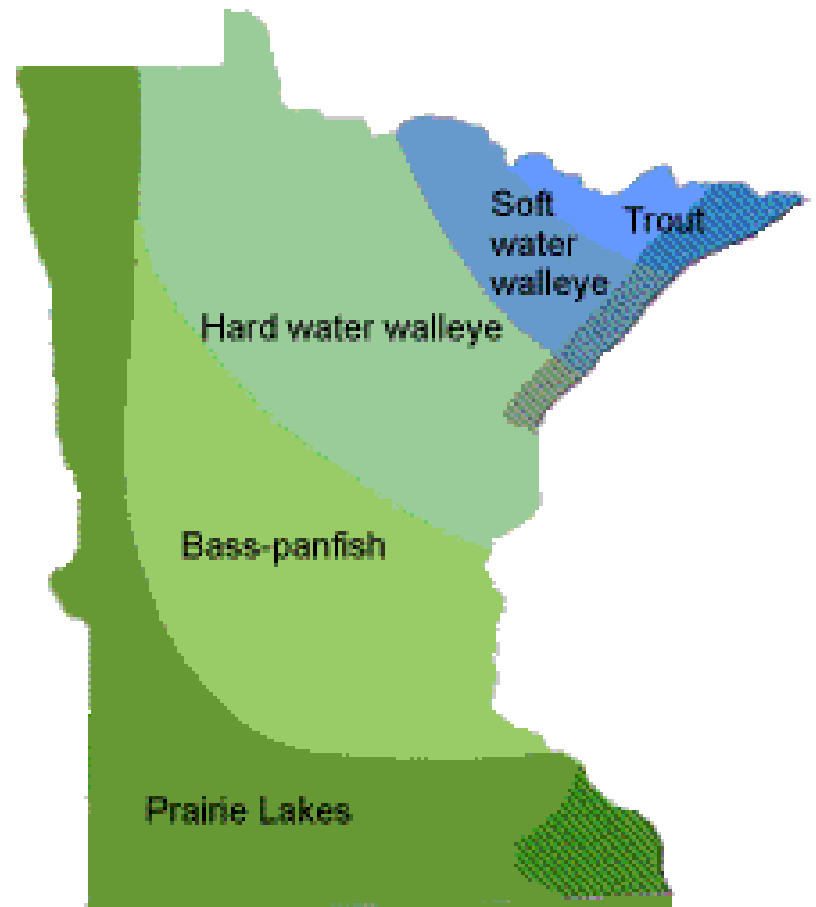


# Fish communities also relate strongly to ecoregion ...

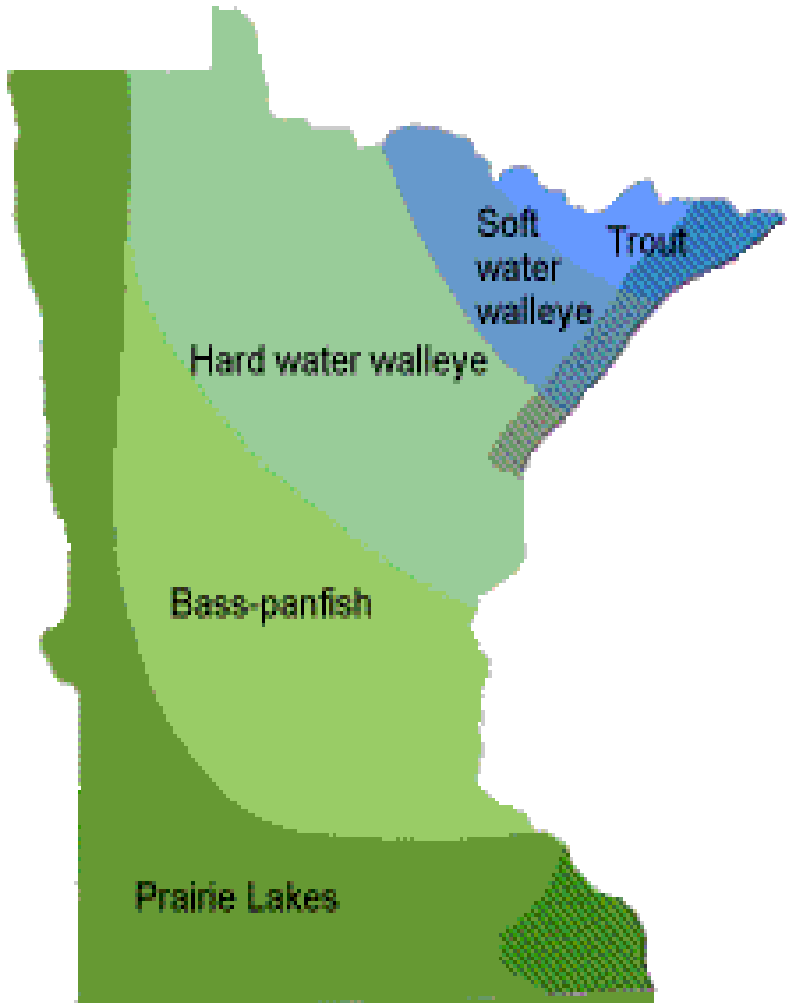
Minnesota's Ecoregions



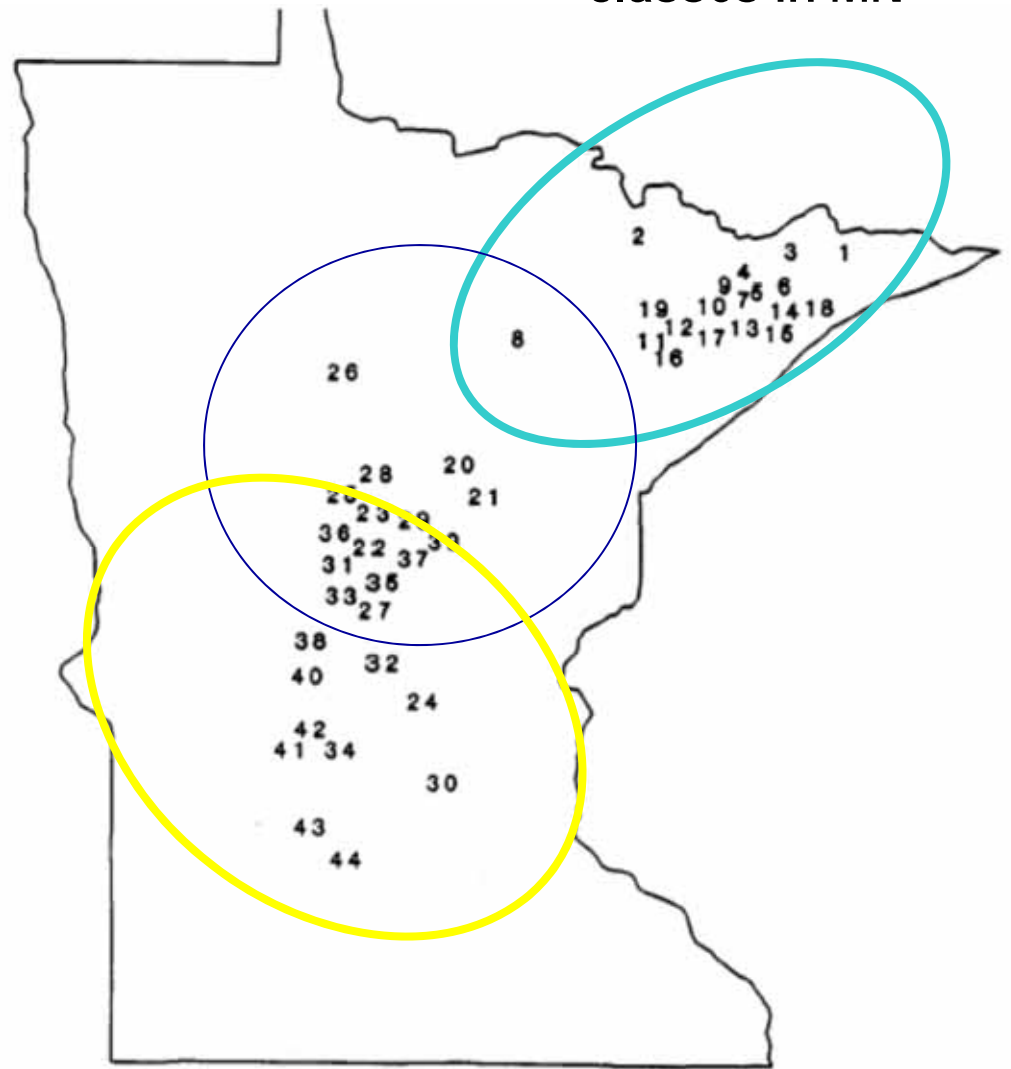
Ecological Types of Minnesota Waters



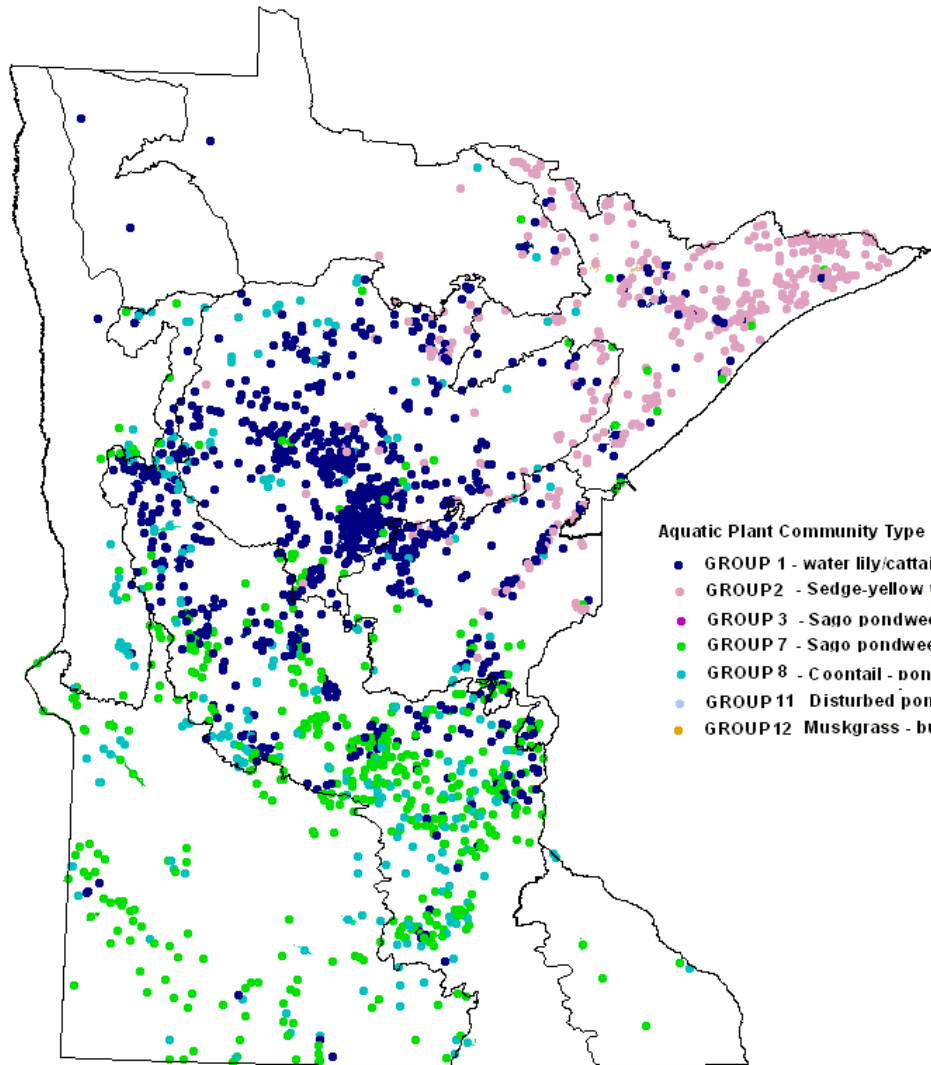
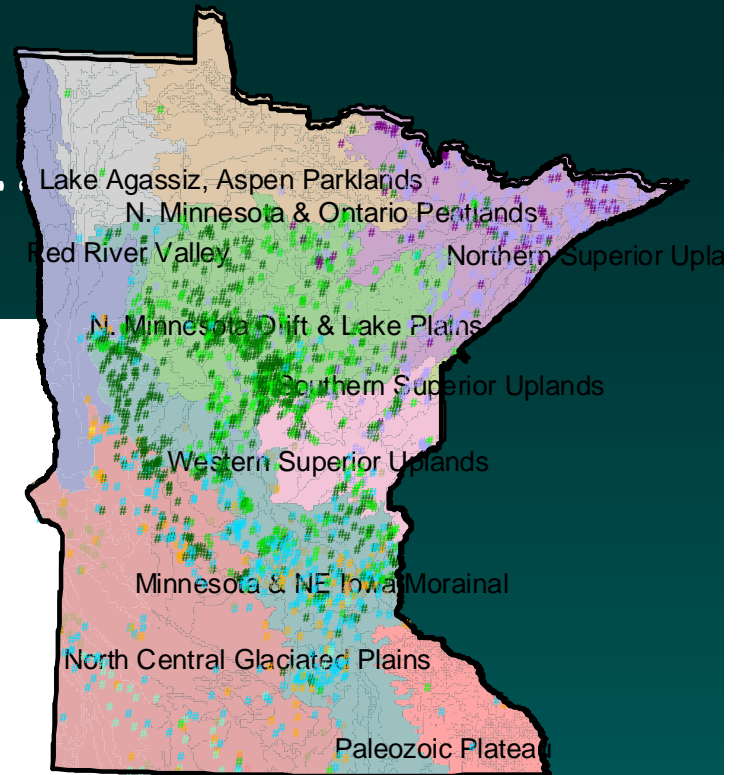
# Ecological Types of Minnesota Waters



# (3) Distribution of fisheries (Schupp) lake classes in MN



# So do Aquatic Plant Communities...



## Aquatic Plant Community Type

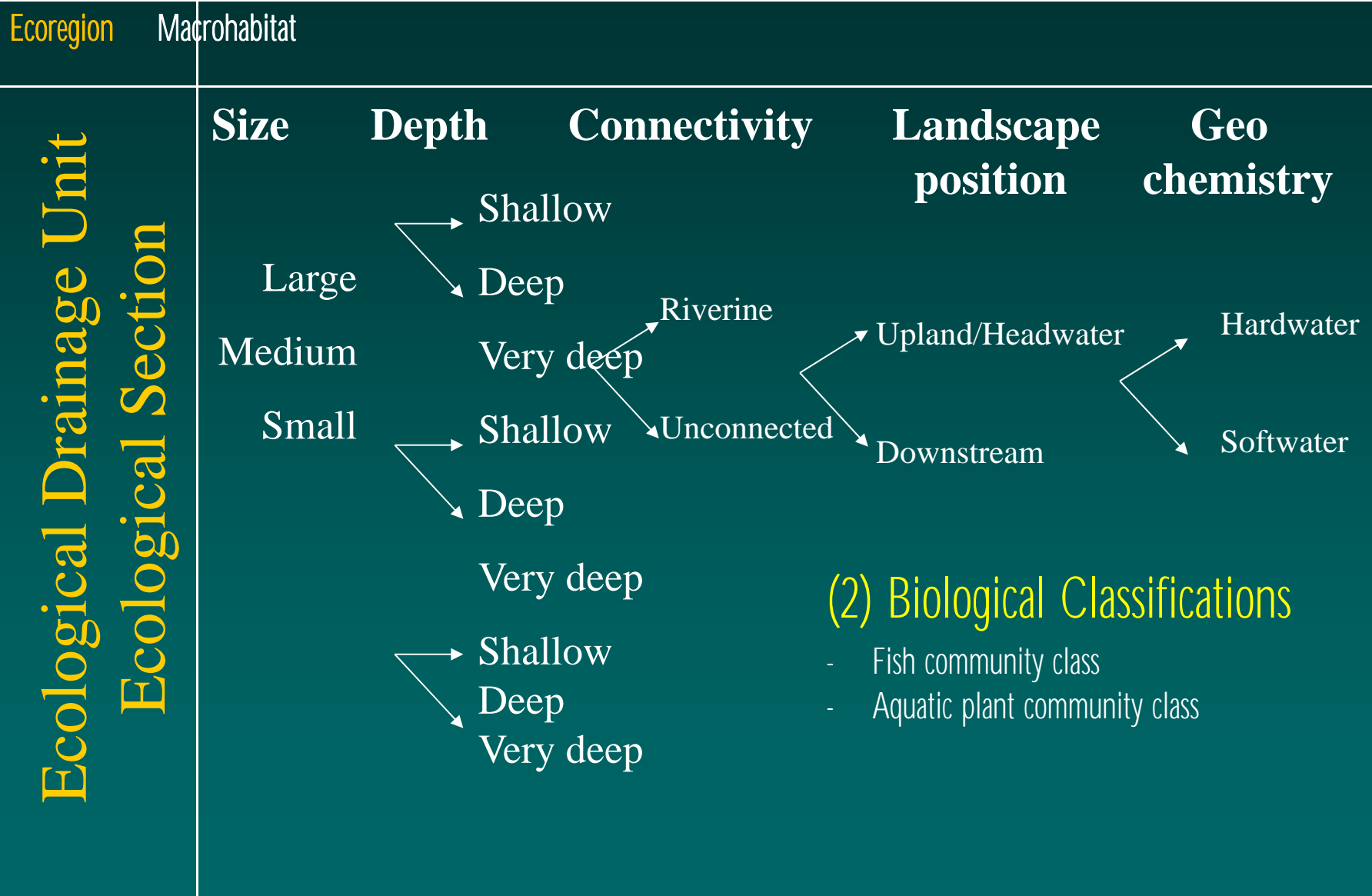
- GROUP 1 - water lily/cattail/muskgrass - sedge alkaline marsh
- GROUP 2 - Sedge-yellow water lily/iris
- GROUP 3 - Sago pondweed - hardstem bulrush - widgeon grass
- GROUP 7 - Sago pondweed - cattail - coontail - duckweed
- GROUP 8 - Coontail - pondweed - muskrass
- GROUP 11 - Disturbed pondweed - coontail - northern milfoil
- GROUP 12 - Muskgrass - bulrush - pondweed



Yellow water lily

# FINAL CLASSIFICATION

## (1) Hierarchical lake macrohabitat classification



## (2) Biological Classifications

- Fish community class
- Aquatic plant community class



# Step 2: Assessing Condition & Viability

## Condition:

Undeveloped land use, high public/conservation ownership, groundwater, water quality indicators and criteria, IBI, intolerant and sensitive taxa/species

**Threats** Threat indicators: exotic species, boat ramps, cropland and agriculture in the buffer, population growth and density, vulnerability to climate change

## Viability

High natural cover, low vulnerability based on connections & drainage position, depth, volume, watershed: lake ratio, lake class



# Step 3 Portfolio Priorities

Selected top 10% (Representativeness)  
*"The Best of the Best"*



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# Step 3 Portfolio Selection

Identified top 10% of each by:

Lake hydrogeomorphic types

Fish community classes

Aquatic plant community classes

Species (including SGCN)

Wild rice

Final based on multiple top 10% criteria



# Minnesota Lake Conservation Portfolio: Products

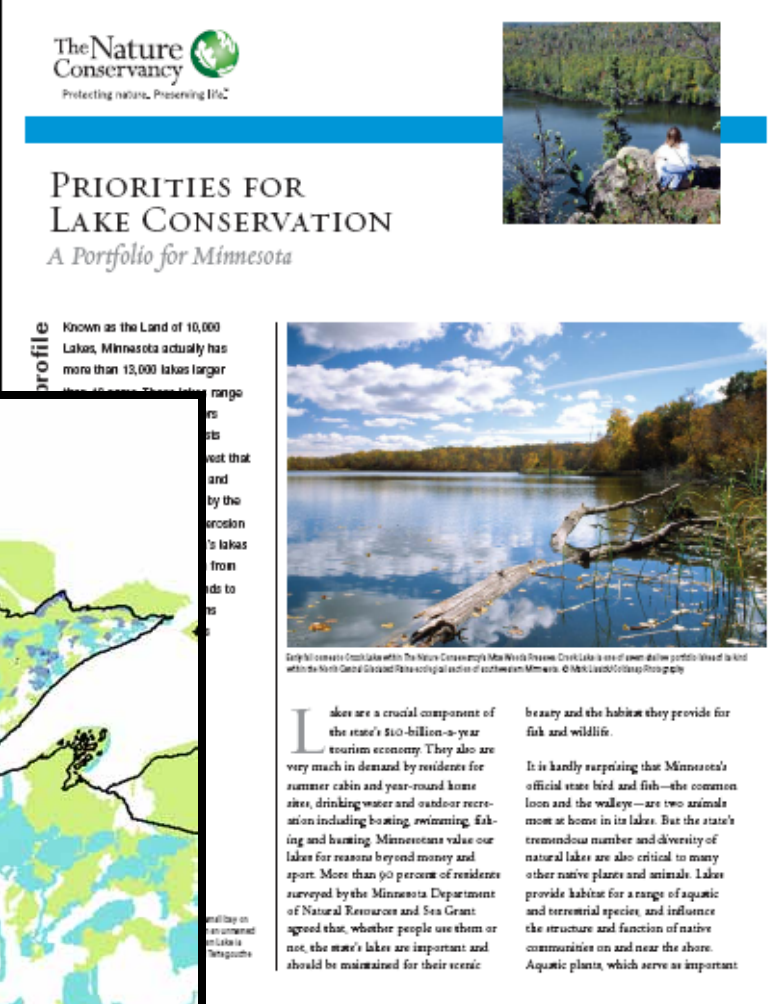
Report

Maps

Spatial Data

Fact Sheets

Fun Facts



The Nature Conservancy  
Protecting nature. Preserving life.

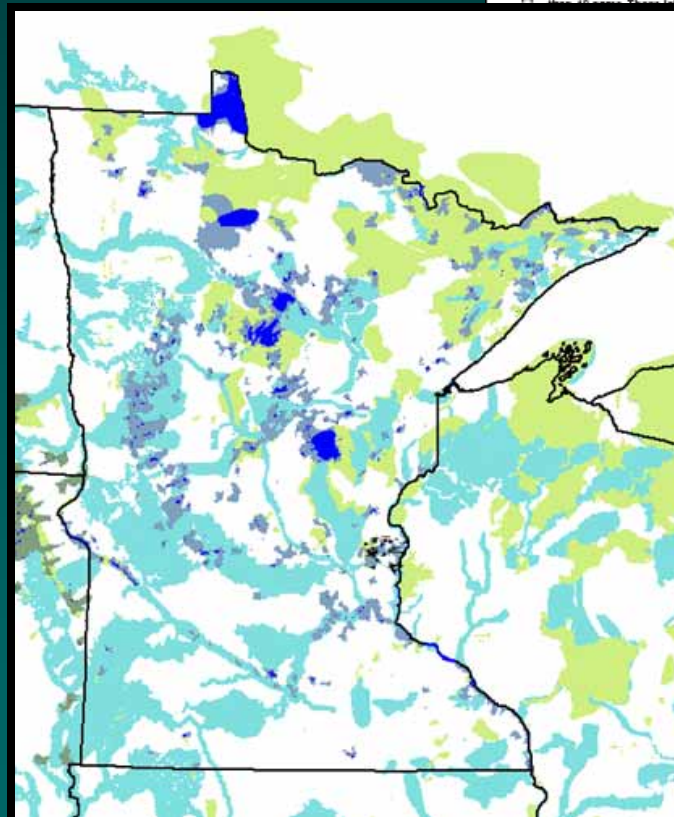
## PRIORITIES FOR LAKE CONSERVATION

*A Portfolio for Minnesota*

Known as the Land of 10,000 Lakes, Minnesota actually has more than 15,000 lakes larger than 10 acres. These lakes range in size from a few square feet to over 100 square miles. The largest are the 10 Great Lakes, and the smallest are the thousands of tiny ponds scattered throughout the state. The lakes are a vital part of Minnesota's natural heritage and provide many benefits to the state's economy and environment.

Lakes are a crucial component of the state's \$10-billion-a-year tourism economy. They also are very much in demand by residents for summer cabin and year-round home sites, drinking water and outdoor recreation including boating, swimming, fishing and hunting. Minnesotans value our lakes for reasons beyond money and sport. More than 90 percent of residents surveyed by the Minnesota Department of Natural Resources and Sea Grant agreed that, whether people use them or not, the state's lakes are important and should be maintained for their scenic beauty and the habitat they provide for fish and wildlife.

It is hardly surprising that Minnesota's official state bird and fish—the common loon and the walleye—are two animals most at home in its lakes. But the state's tremendous number and diversity of natural lakes also are critical to many other native plants and animals. Lakes provide habitat for a range of aquatic and terrestrial species, and influence the structure and function of native communities on and near the shore. Aquatic plants, which serve as important



<http://www.nature.org/wherewework/northamerica/states/minnesota/science/>



A scenic view of a lake. In the foreground, there are several large, round, green lily pads floating on the water. The water is clear, and the bottom of the lake is visible, showing some rocks and fallen leaves. In the middle ground, there is a dense forest of green trees. The sky is blue with many white, fluffy clouds. The text "Outcomes & Potential Uses" is overlaid in the center of the image.

# Outcomes & Potential Uses

# Applications - Conservation

- “Traditional” Tools & Strategies
  - Easements & Acquisition
  - Shoreland protection/restoration
  - Adaptive assessment & monitoring





## Implementing the Portfolio: Supporting partners in identifying & protecting critical lands & shoreland



Photo: Kristen Blann



Lake Alexander – ½ mile of shoreline as part of TNC Lake Alexander Preserve in central Minnesota + a recent 80 acre acquisition

Recent “assists” in central Minnesota

- **SNA acquisition** between Lake Alexander and Fishtrap Lake
- **Egg Lake** – 1446 feet of shoreline transferred to Cass County (thru TNC & anonymous donor) in February 2010
- **Sunfish Lake** project
- Twin Lakes project east of Camp Ripley

## Implementing the Portfolio: Watershed protection



Caroline Lake, Itasca County.



### Cont'd

MN Forest Legacy Partnership:

\$Millions for conservation easements on 1000s of acres  
in Itasca, Cass, Koochiching

- e.g. Pillsbury State Forest on Gull Lake, lots of small  
lakes

### Partnerships

- Wild rice protection, NW Itasca county portfolio  
lakes & basins
- BWSR CWF grant for Crow Wing  
County on Gull and Big Trout lakes
- Agate Lake/Lk Margaret grant app.

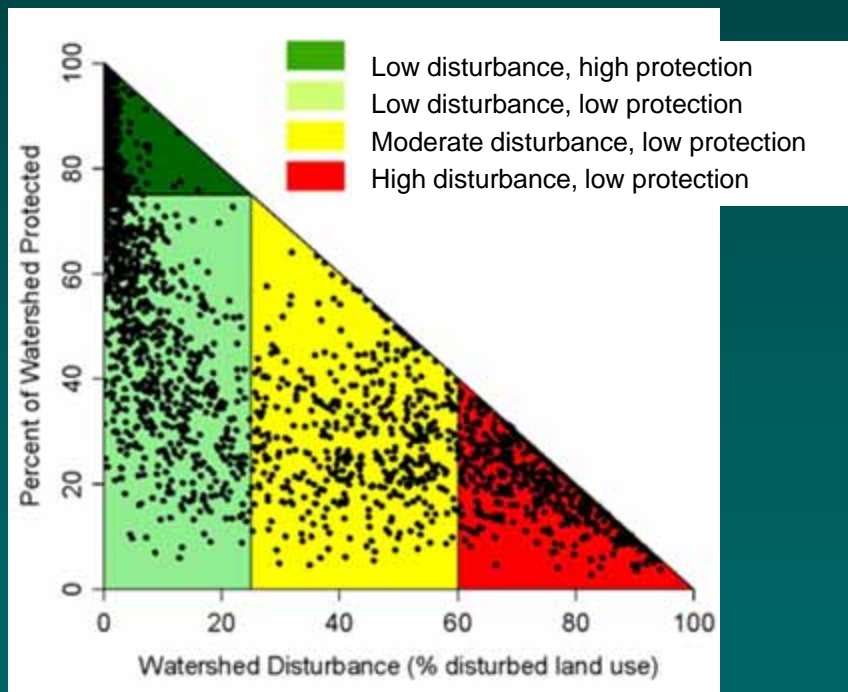


# Applications

- Setting goals and priorities
  - What should my lake look like?
  - What are ecologically appropriate / realistic goals?
  - “Protect” vs. “Enhance” vs. “Restore”

# Assessing condition and viability to inform priority lakes and strategies

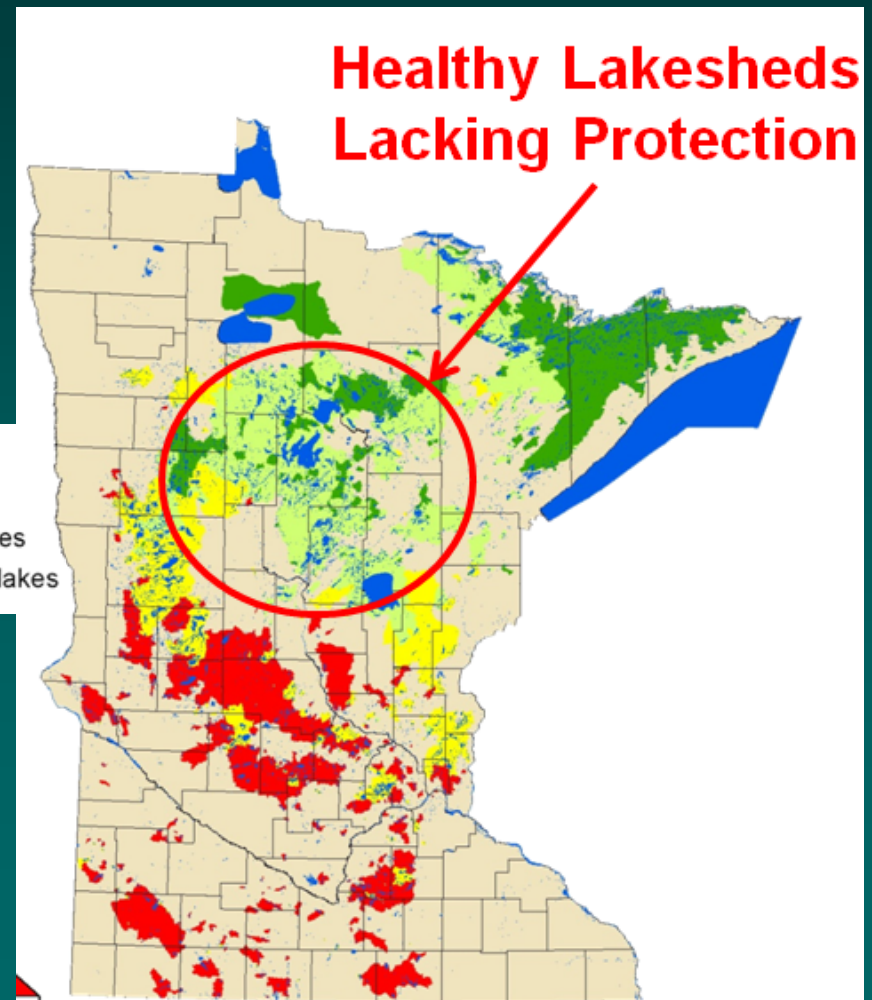
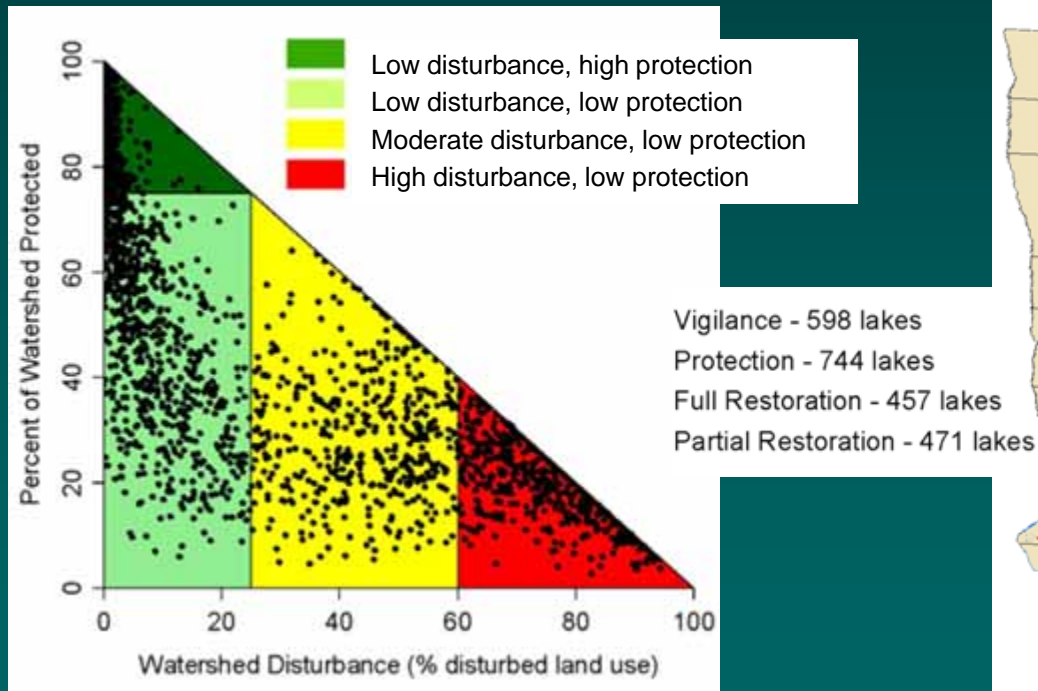
Example: Minnesota DNR's Lake Fish Habitat Strategic Plan



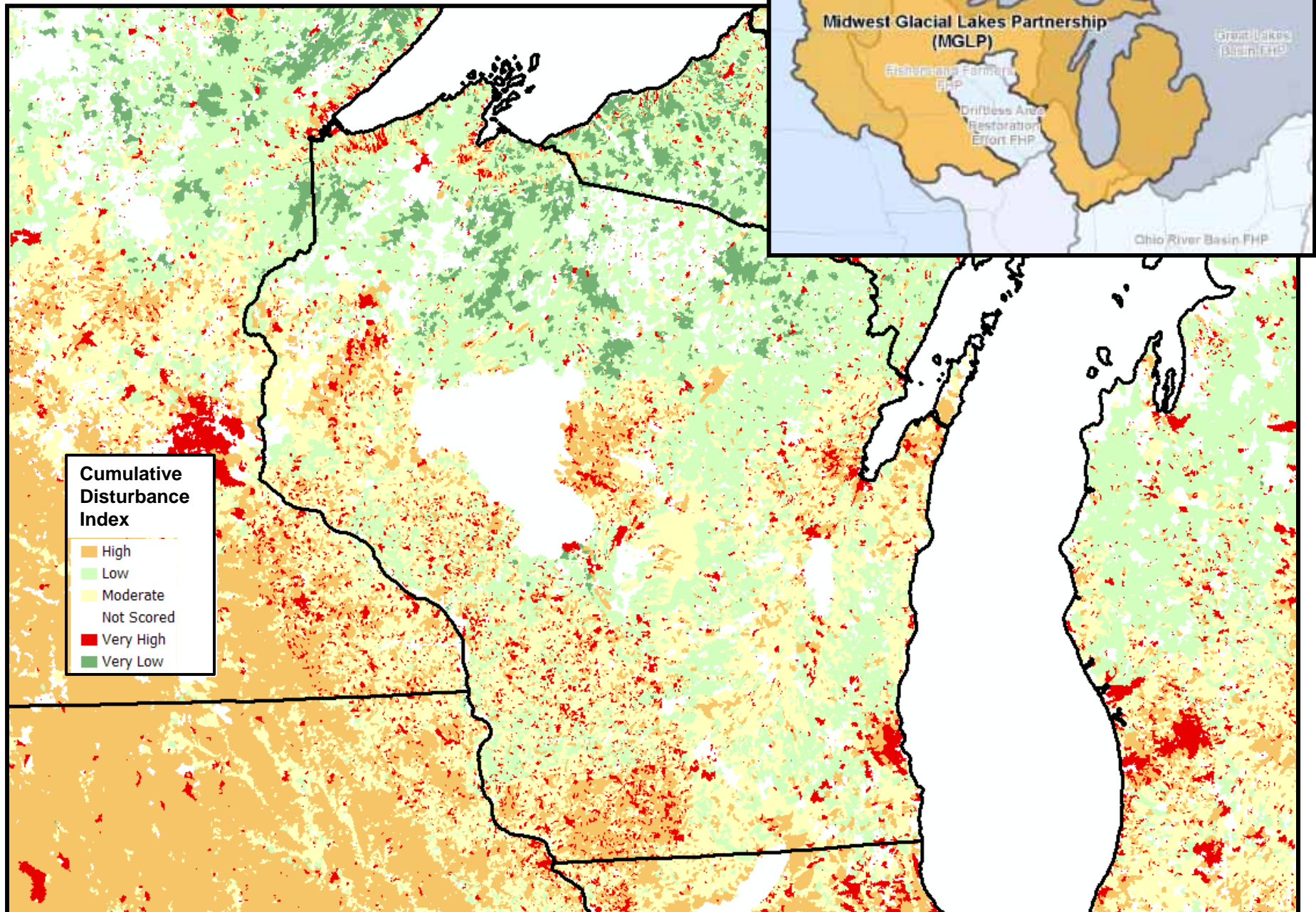
“Protect” vs.  
“Enhance” vs.  
“Restore”

# Assessing condition and viability to inform priority lakes and strategies

Example: Minnesota DNR's Lake Fish Habitat Strategic Plan



# NFHP Assessment





# Applications – Conservation

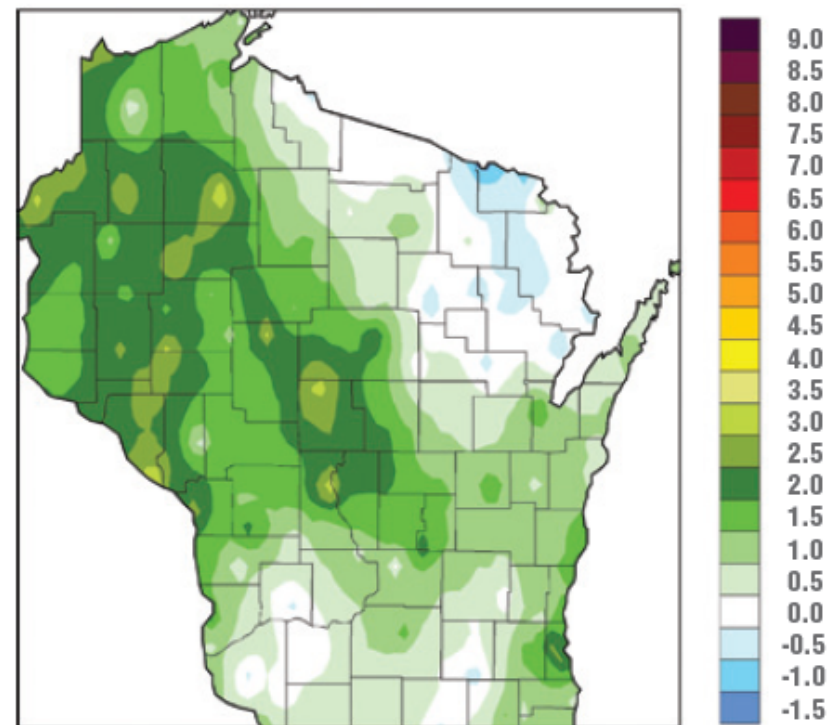
## Guide partnership work

- Water Quality restoration & improvement projects
- Lake protection priorities

Targeted education / outreach

Climate change vulnerability assessment and adaptation strategies

**CHANGE IN ANNUAL AVERAGE TEMPERATURE (°F)  
FROM 1950 TO 2006**





*We want your ideas and input!*

- What should be included in a lake classification and conservation portfolio for Wisconsin?
- How could this be useful to you ?
- Sign up to fill out a Survey Monkey survey for us:  
[kblann@tnc.org](mailto:kblann@tnc.org)

# Acknowledgments

Carrol Schaal, Water Quality, WI DNR

Wisconsin TNC

Darby Nelson, Author *For Love of Lakes*

Everyone who shared datasets and advice

Any Photographers whose photos appear brazenly unacknowledged in this presentation

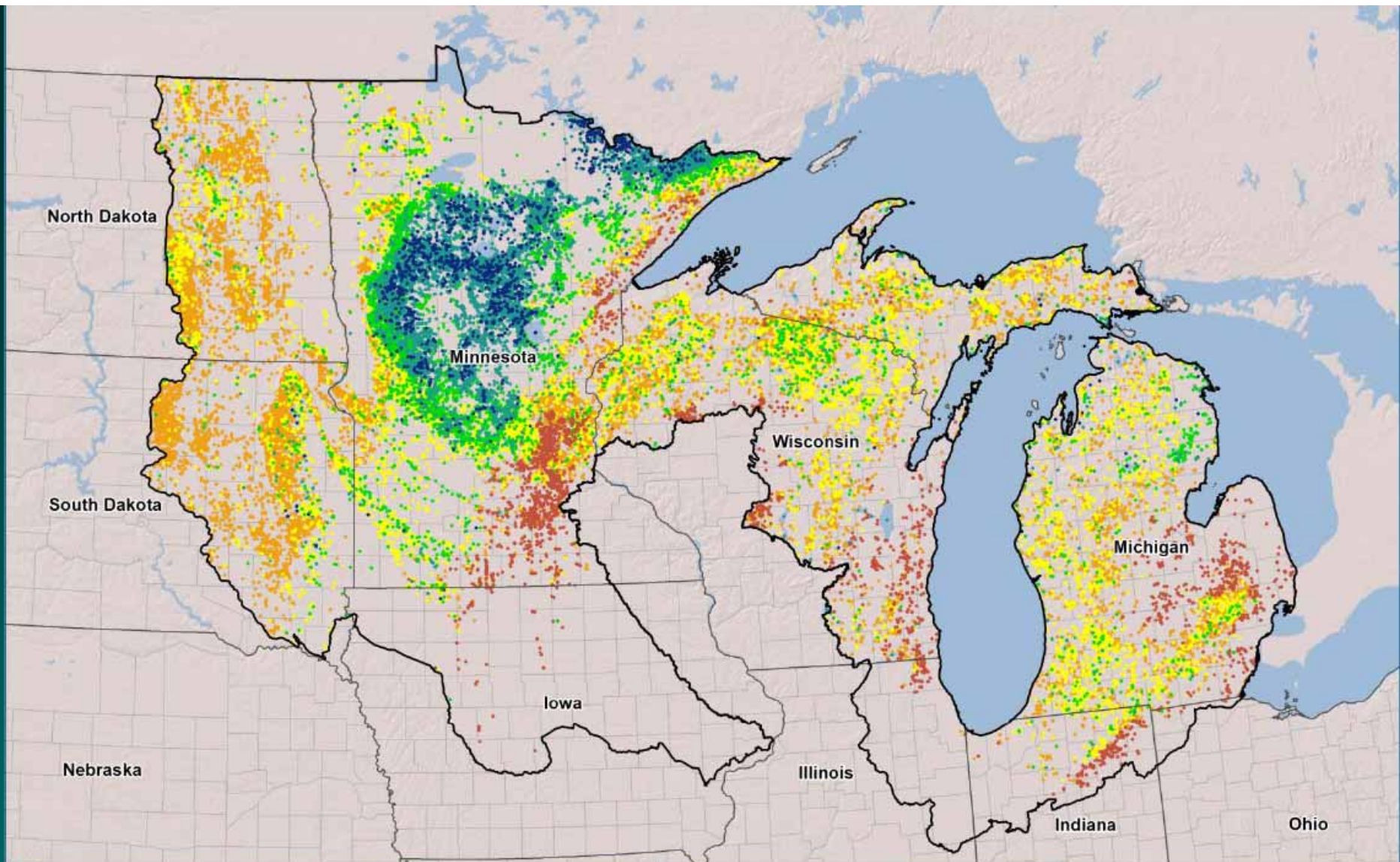
A serene landscape photograph of a lake at dawn or dusk. The sky is a soft gradient of pink and purple, with wispy clouds. The water is calm, reflecting the sky and the silhouetted trees on the left. A thick layer of mist or fog hangs over the water, partially obscuring the distant shoreline. The overall mood is peaceful and contemplative.

A lake is the landscape's most beautiful  
and expressive feature;

it is the earth's eye /  
Looking into which the beholder  
measures the depth of his own nature

Henry David Thoreau





Legend

**Cumulative Natural Quality Index (CNQI)**

- 0 - 19
- 20 - 29
- 30 - 38
- 39 - 50
- 51 - 63
- 64 - 100

⬮ MGLP Boundary



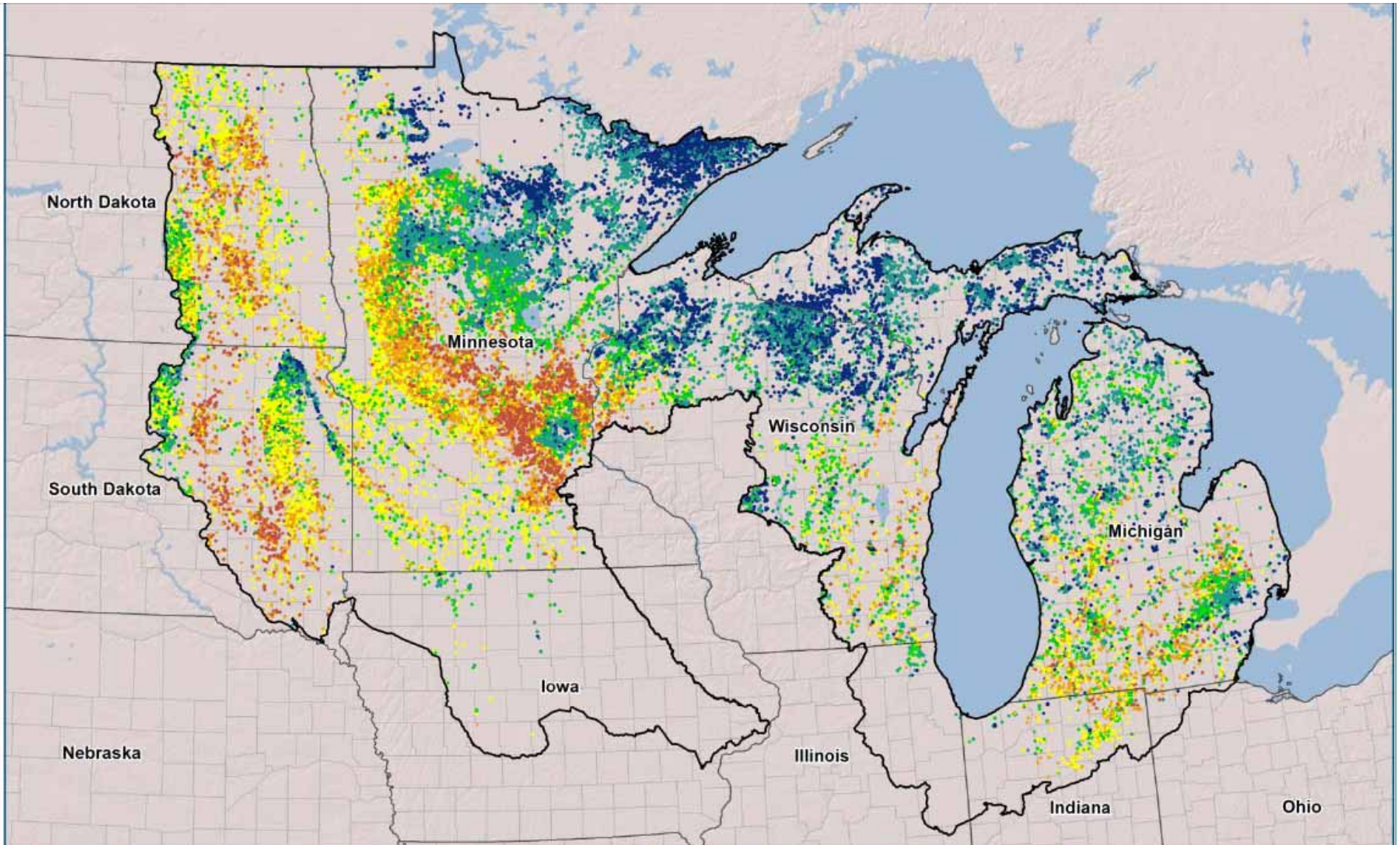
**Map Description:** Lake centroids symbolized by cumulative natural quality index (CNQI). Higher values indicate "better" natural conditions, for this model "better" corresponds to higher probability of presence for coldwater species.

**Midwest FHP Fish Habitat Assessment**

**Midwest Glacial Lakes FHP  
Coldwater Index Model  
Post-Modeling Results**

Map created by:  
Downstream Strategies  
Jason Clingerman  
Jan 17, 2012





### Cumulative Anthropogenic Stress Index

- Legend**
- 0 - 17
  - 18 - 27
  - 28 - 38
  - 39 - 49
  - 50 - 63
  - 64 - 100
- MGLP Boundary

0 25 50 100 Miles



**Map Description:** Lake centroids symbolized by cumulative anthropogenic stressor index (CASI). Higher values indicate more stress, in this instance more stress corresponds to higher total phosphorus values.

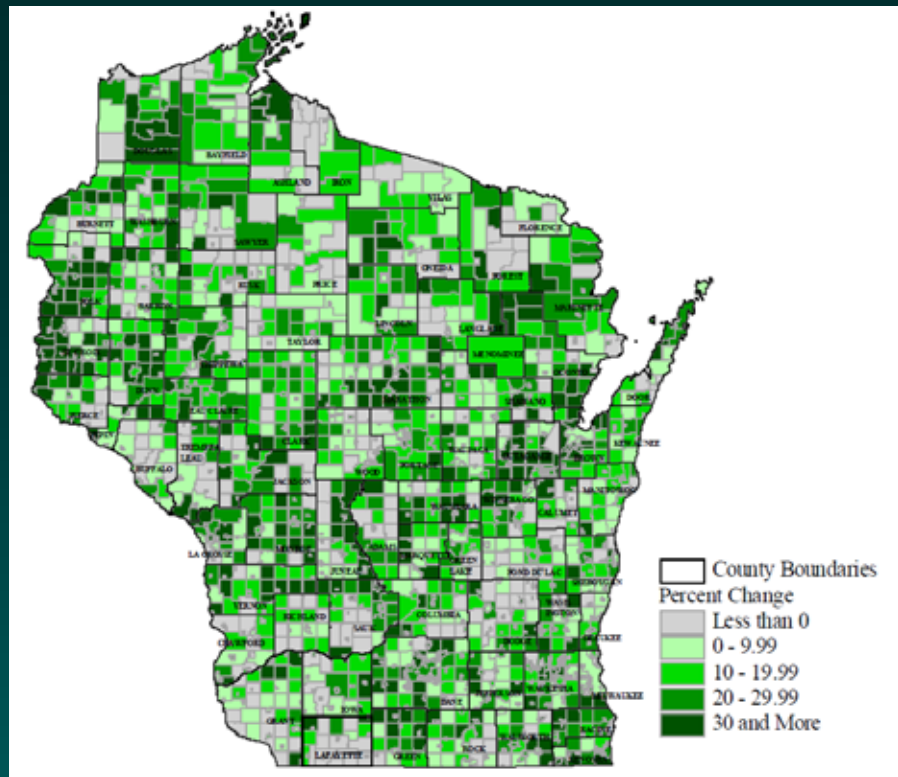
### Midwest FHP Fish Habitat Assessment

Midwest Glacial Lakes FHP  
Water Quality Model  
Post-Modelling Results

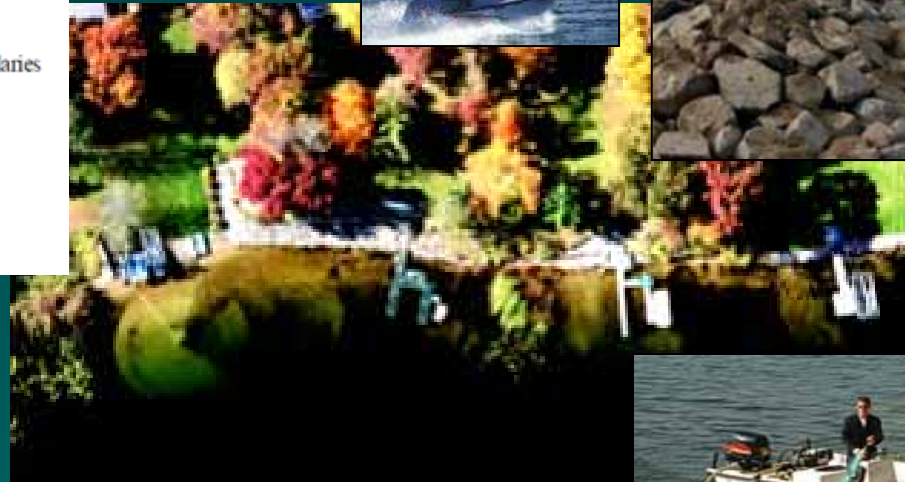
Map created by:  
Downstream Strategies  
Jason Clingerman  
Jan 20, 2012



## growing threats



- Development & shoreline alteration
- Aquatic plant removal & management
- Exotic Species
- Nutrient loading
- Water use / management
- Climate change



# Assessing condition and viability to inform priority lakes and strategies

