

A Lake Classification and Conservation Portfolio for Wisconsin



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John Wagner, Wisconsin**

The Nature Conservancy in Wisconsin



www.nature.org

Acknowledgments

**Carroll Schaal, Wisconsin DNR Lakes Partnership Team
Matt Diebel, Alison Mikulyuk, Gretchen Hansen
Dennis Wiese, Scott Van Egeren, Paul Cunningham,
Jennifer Filbert, Kristi Minahan, Matt Rehwald, Andrew
Rypel, Lori Tate, Amy Steffen, Susan Tesarik and the
Wisconsin Lakes Partnership**

Why a lake portfolio?



How to identify and protect “the best of the best?”

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



What about me?



Minnesota vs Wisconsin



Minnesota vs Wisconsin – top 20 lake names

	WI	MN
Mud Lake	127	184
Bass Lake	72	68
Long Lake	66	106
Spring Lake	48	40
Twin Lakes	44	40
Round Lake	43	62
Lost Lake	42	25
Perch Lake	35	24
Pine Lake	33	23
Deer Lake	30	19

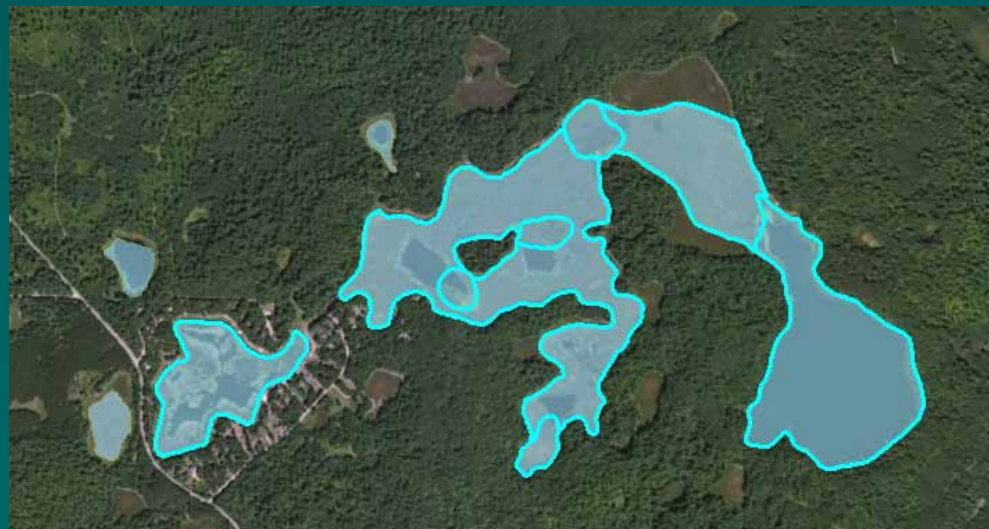
	WI	MN
Silver Lake	28	25
Horseshoe Lake	27	54
Beaver Lake	23	19
Pickeral Lake	23	24
Bear Lake	22	19
Clear Lake	22	35
Crystal Lake	22	15
Rice Lake	22	76
Cranberry Lake	21	21
Island Lake	20	38



What makes a lake a lake?

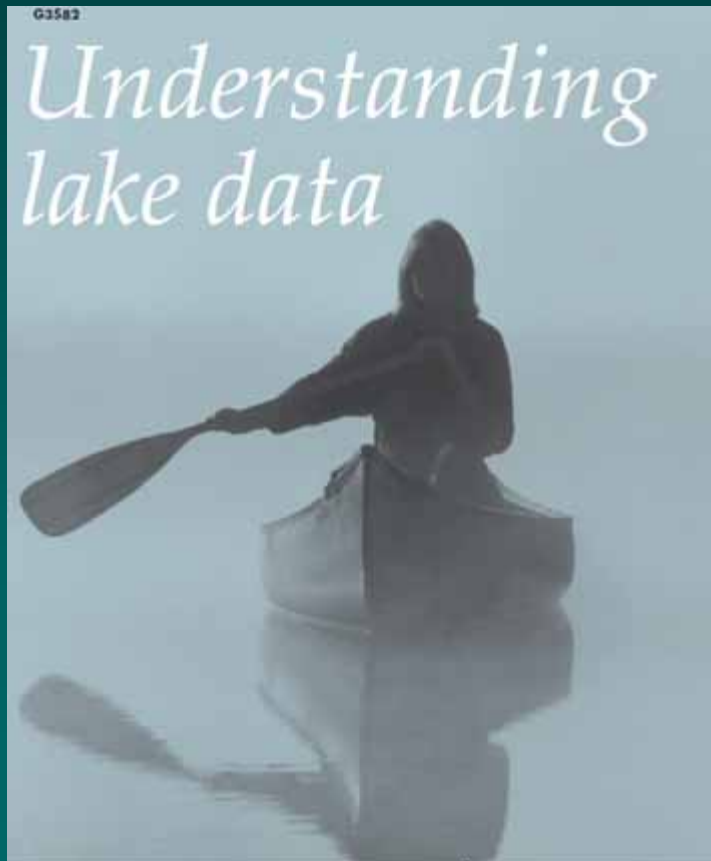
How many unique lake types are there?

How can we protect the best of the best?



Step 1: Classification

Which variables make a lake what it is?



Lake substrate & geology

Connectivity

Lake Size & Depth

Littoral area / shoreline

Drainage basin size

Landscape position & hydrology

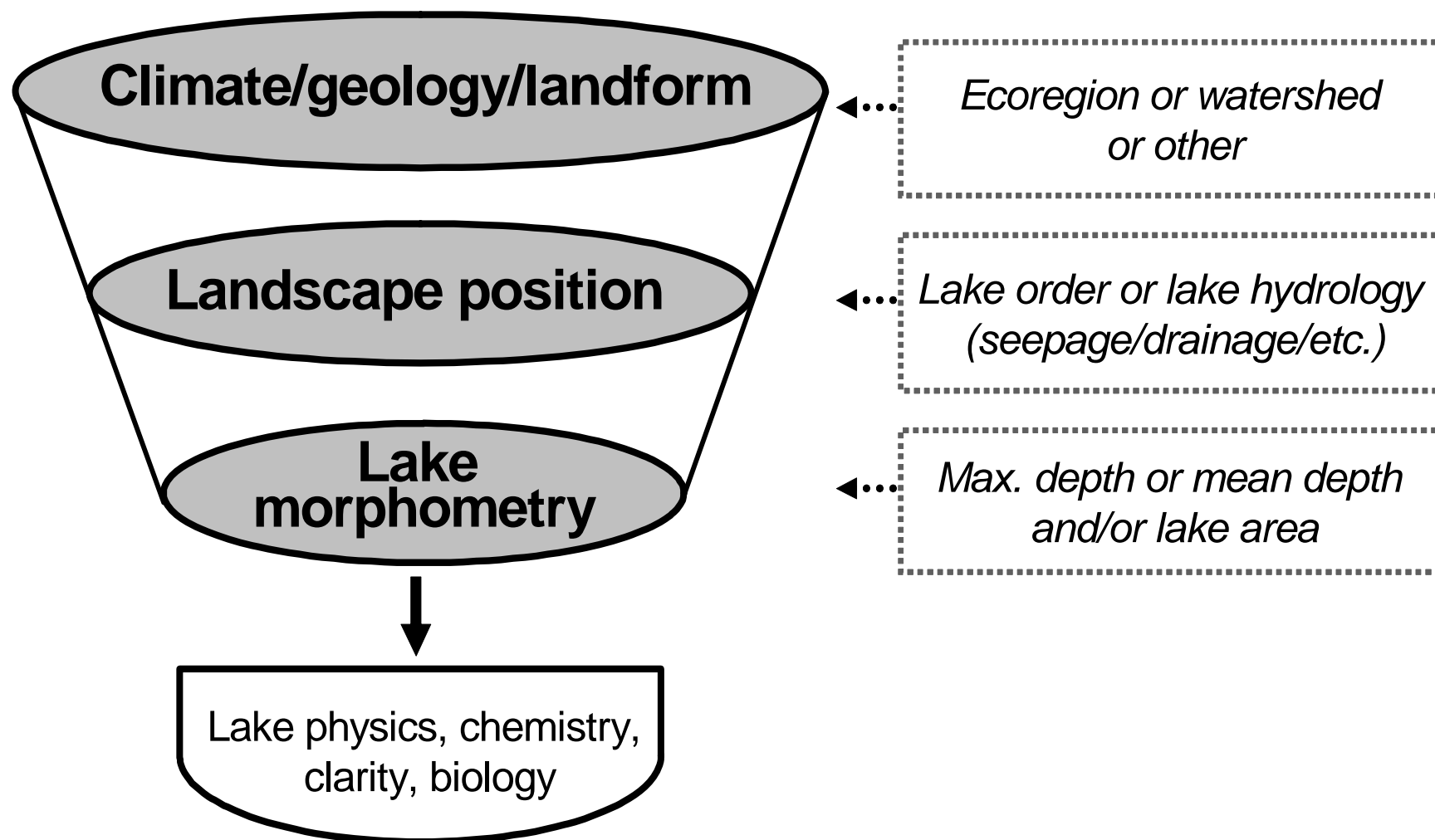
Watershed

/shoreland land use

Fish & Aquatic plant communities

Water chemistry
water quality

Hydrogeomorphic Lake Classification (HGLC)



Conceptual model for EPA national lake classification framework.

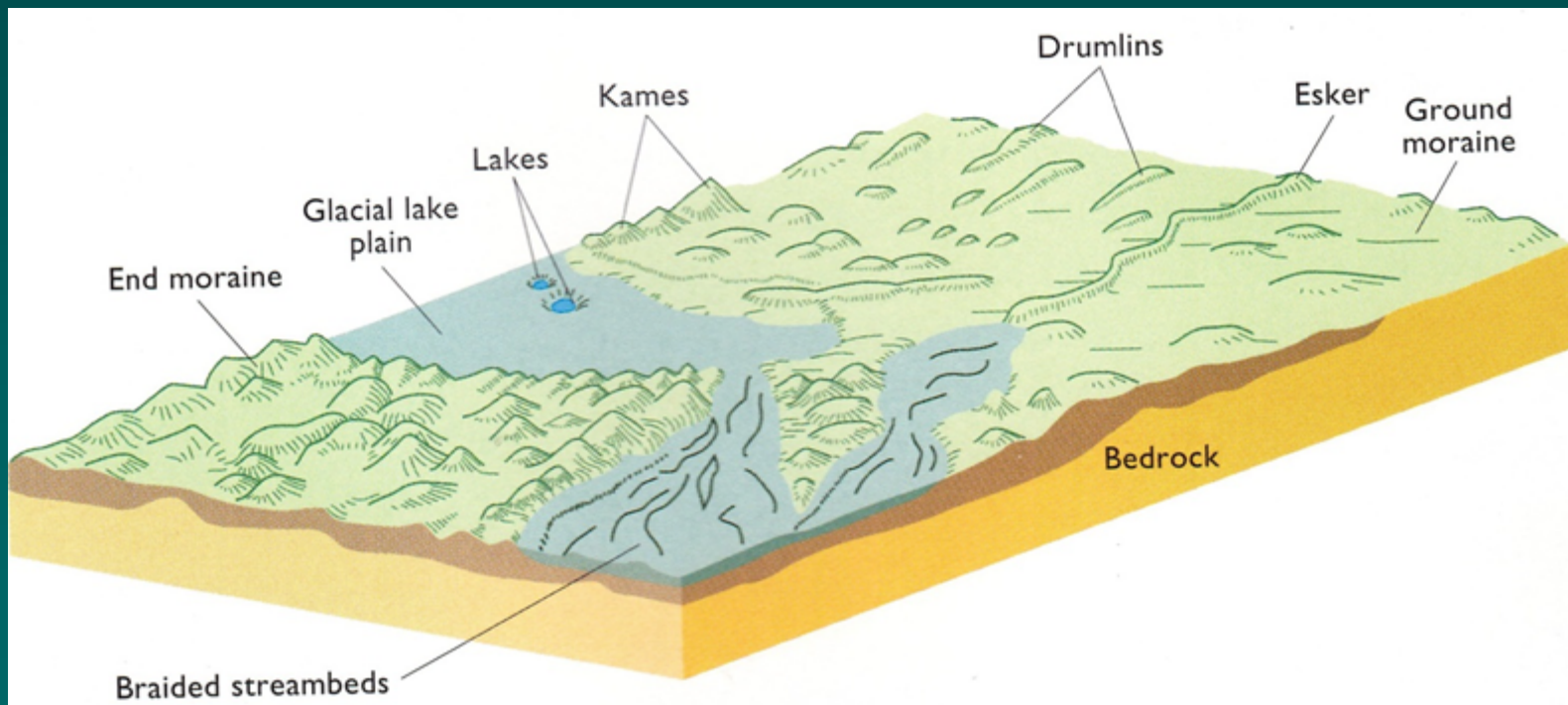
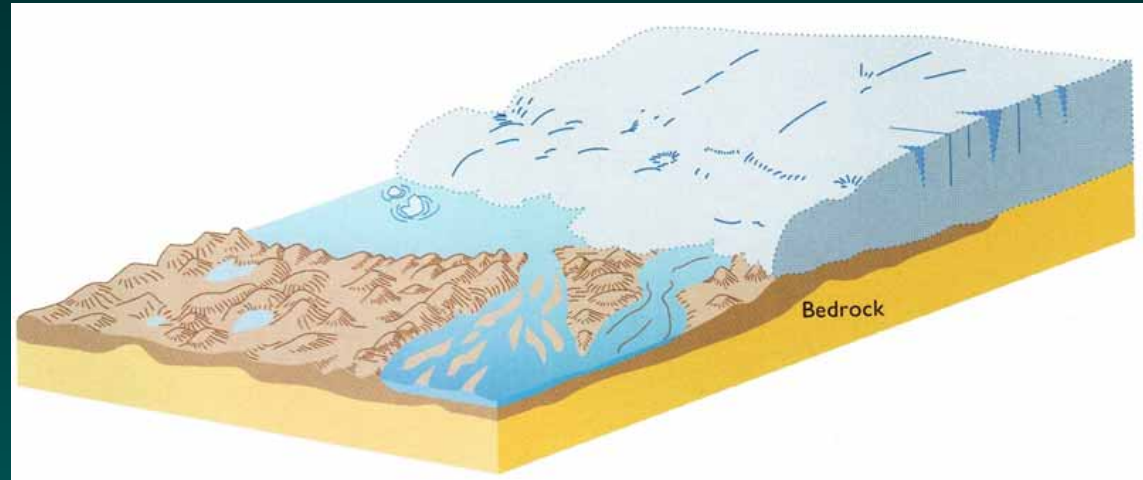
Glaciers

shaped the landscape
that we see today.

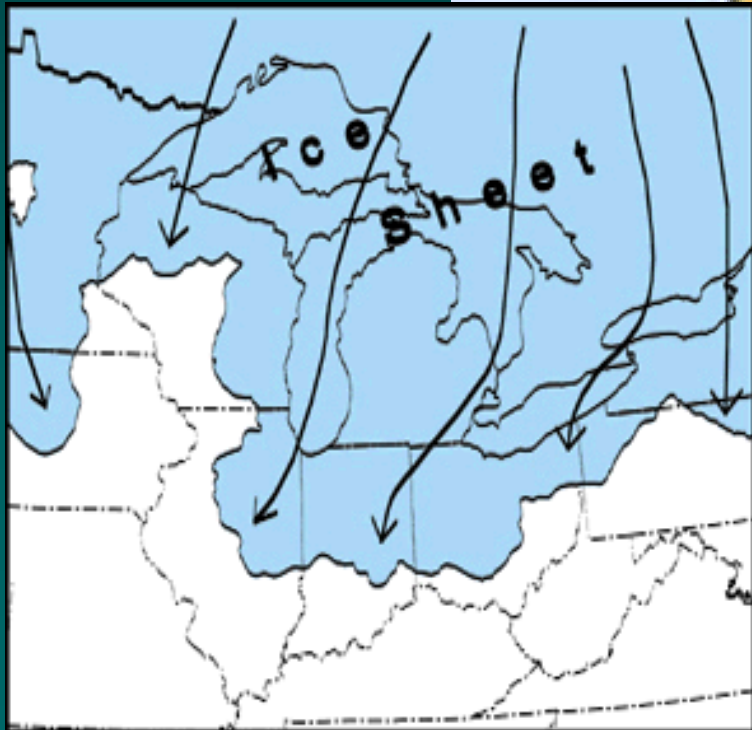


Climate/landform/geology

Lake Formation after Glacial Retreat

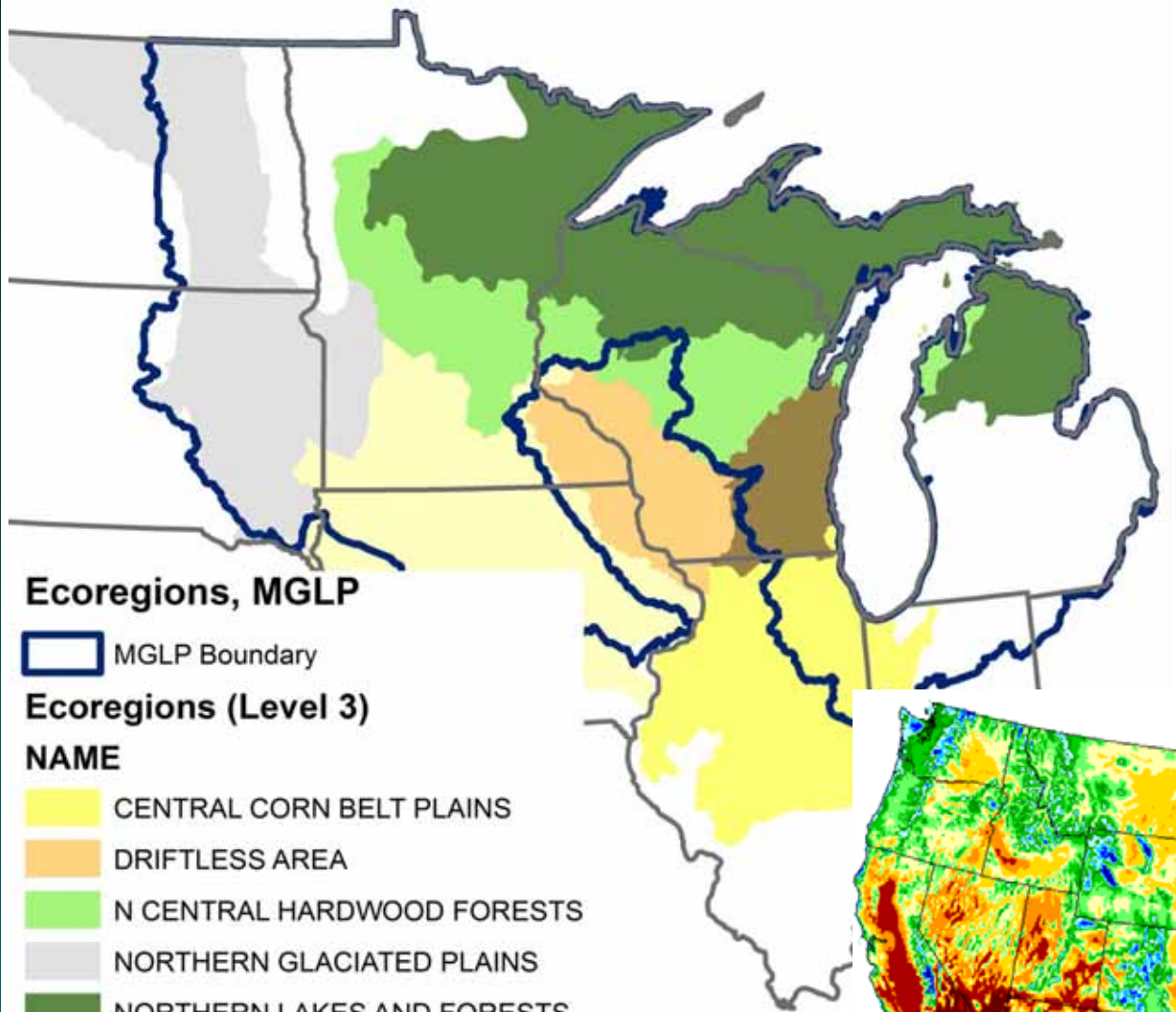


Glaciers



Ecoregion & Climate

PRISM 1961-1990
July Mean Maximum
Temperature, US



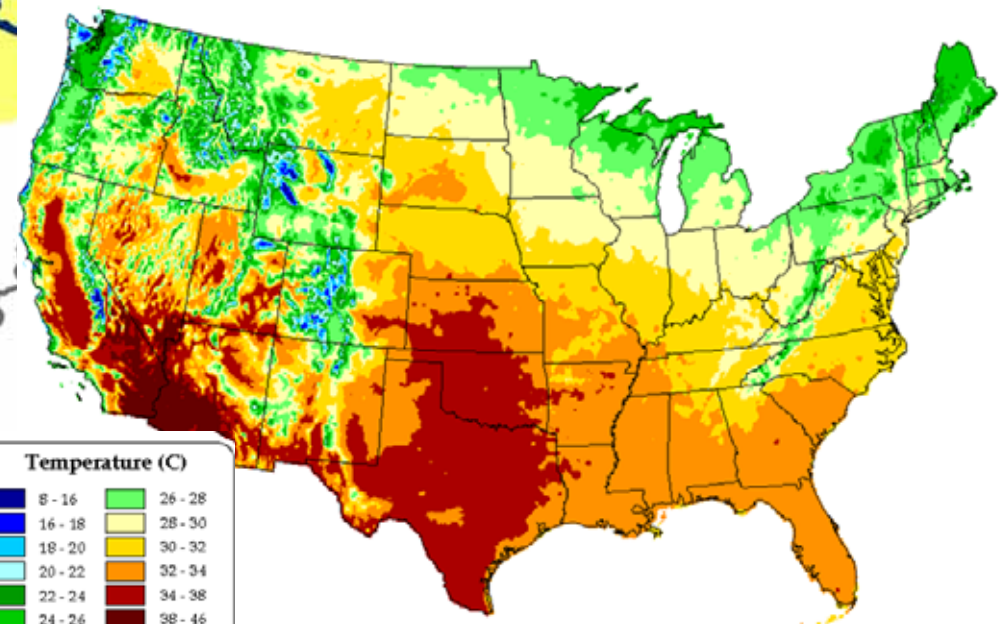
Ecoregions, MGLP

 MGLP Boundary













Ecoregions (Level 3)

NAME

-  CENTRAL CORN BELT PLAINS
-  DRIFTLESS AREA
-  N CENTRAL HARDWOOD FORESTS
-  NORTHERN GLACIATED PLAINS
-  NORTHERN LAKES AND FORESTS
-  SE WISCONSIN TILL PLAINS
-  WESTERN CORN BELT PLAINS



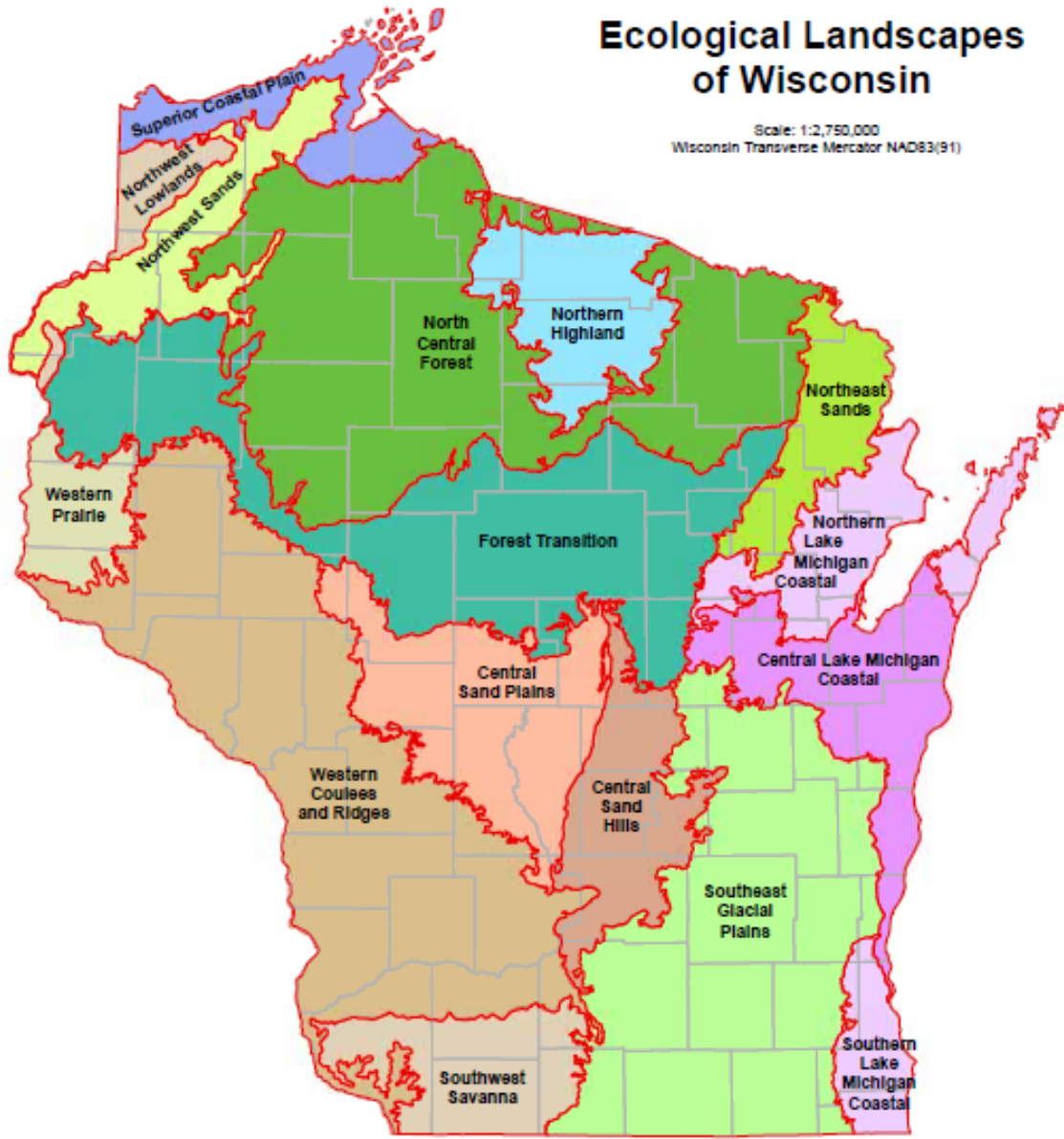
Temperature (C)

- | | |
|--|---|
|  8 - 16 |  26 - 28 |
|  16 - 18 |  28 - 30 |
|  18 - 20 |  30 - 32 |
|  20 - 22 |  32 - 34 |
|  22 - 24 |  34 - 38 |
|  24 - 26 |  38 - 46 |

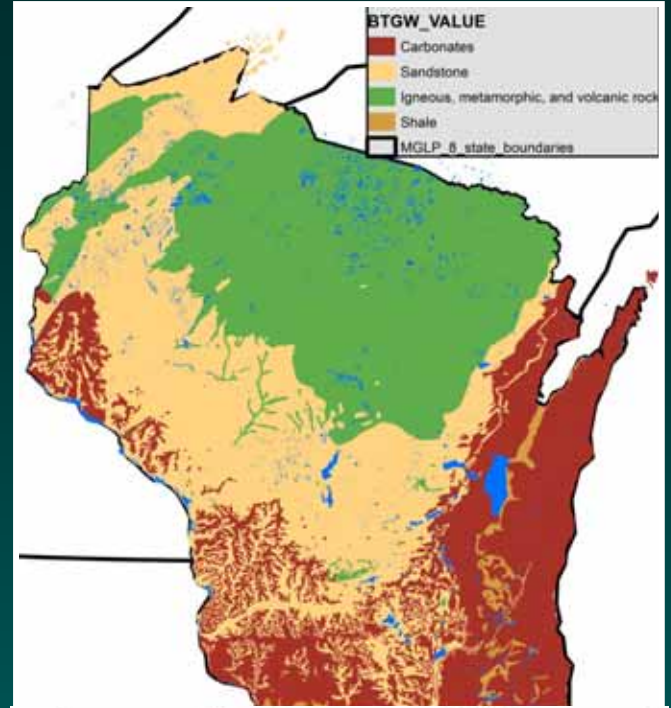
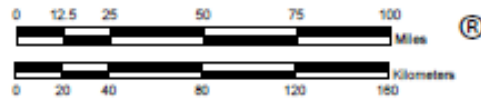
Map created: December 2000

Ecological Landscapes of Wisconsin

Scale: 1:2,750,000
 Wisconsin Transverse Mercator NAD83(91)

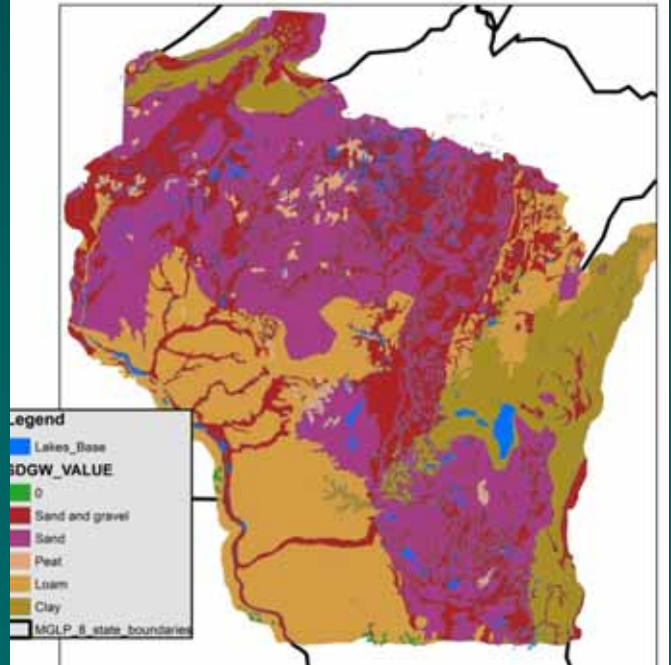


Ecological Landscapes
 County Boundaries



BTGW_VALUE

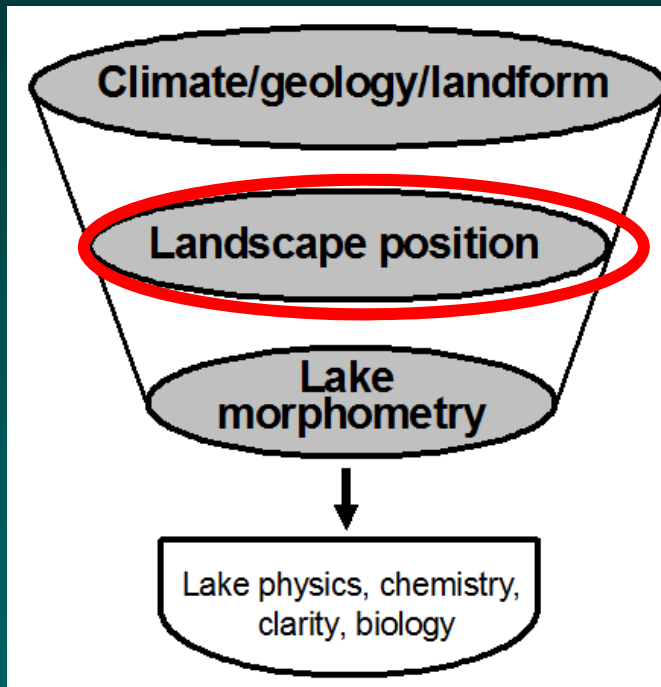
- Carbonates
- Sandstone
- Igneous, metamorphic, and volcanic rock
- Shale
- MGLP 8 state boundaries



Legend

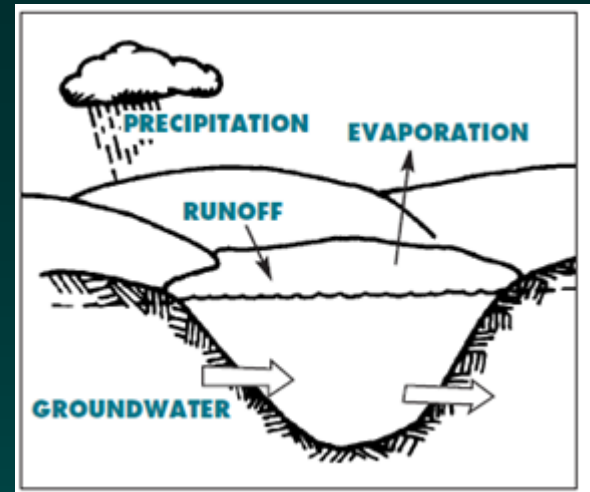
- Lakes_Base
- SOGW_VALUE**
- 0
- Sand and gravel
- Sand
- Peat
- Loam
- Clay
- MGLP 8 state boundaries

Landscape position and hydrology

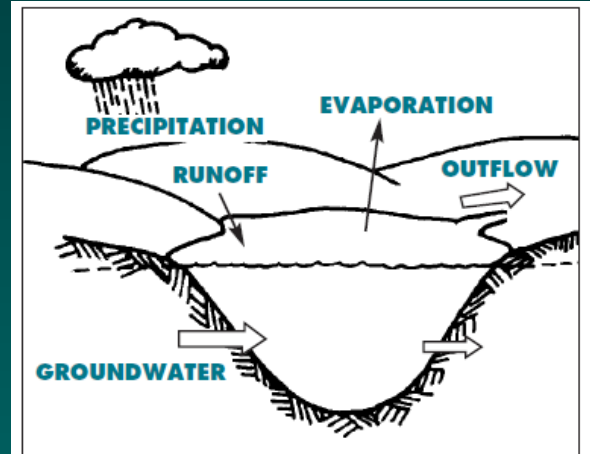


Higher (upstream)

Seepage

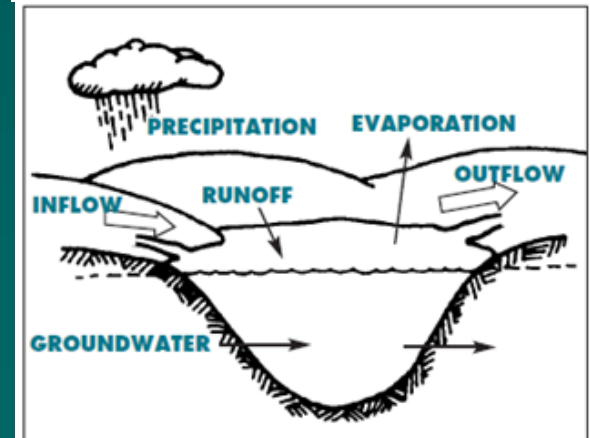


Drained

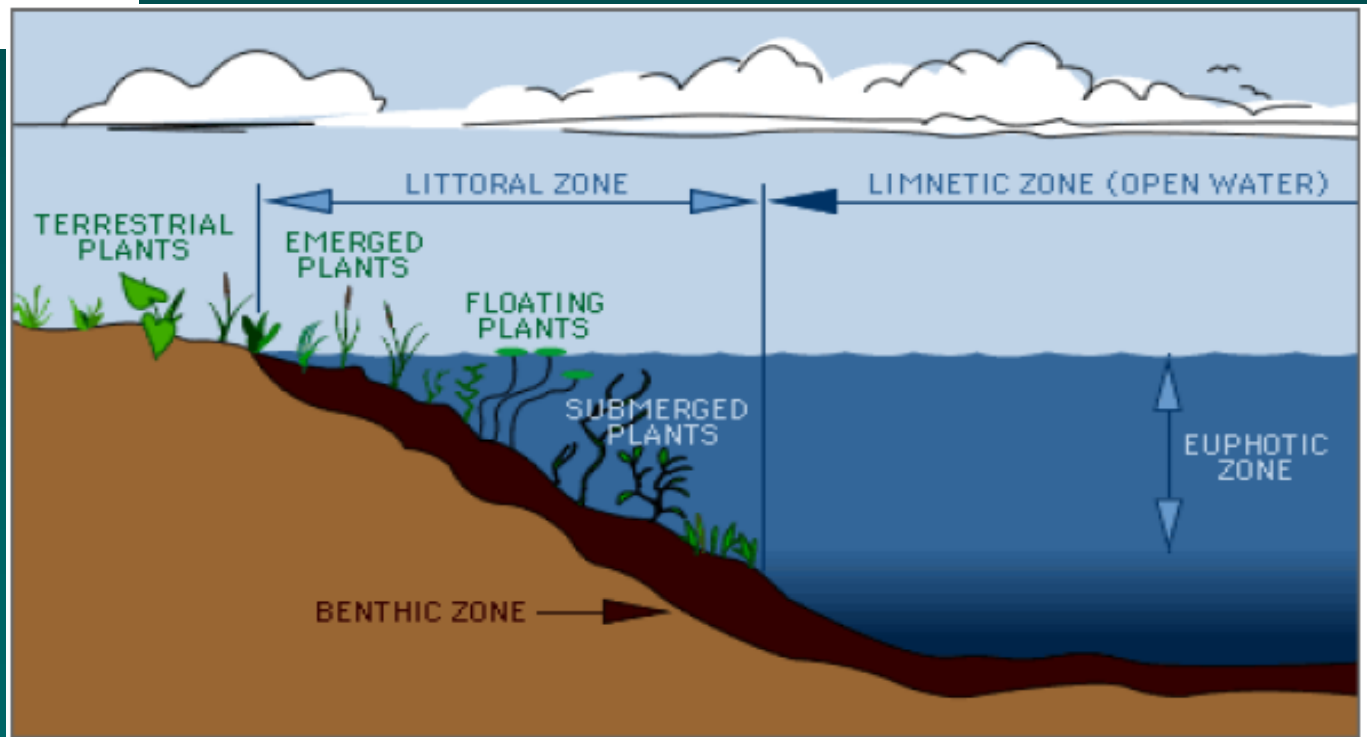
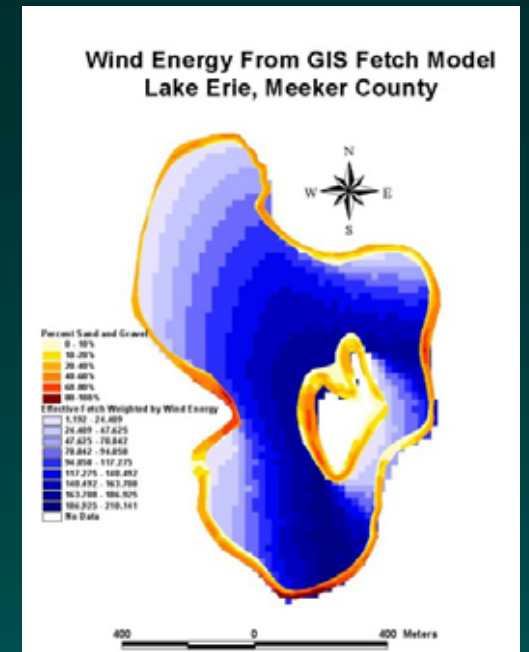
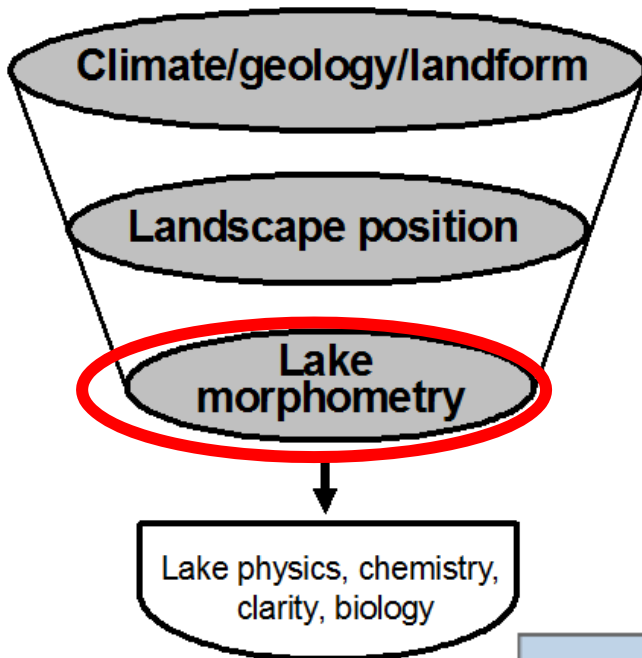


Lower (downstream)

Drainage



Diagrams from *Understanding Lake Data*



What we did

Assembled lake and spatial data from a variety of sources (mostly WI DNR)

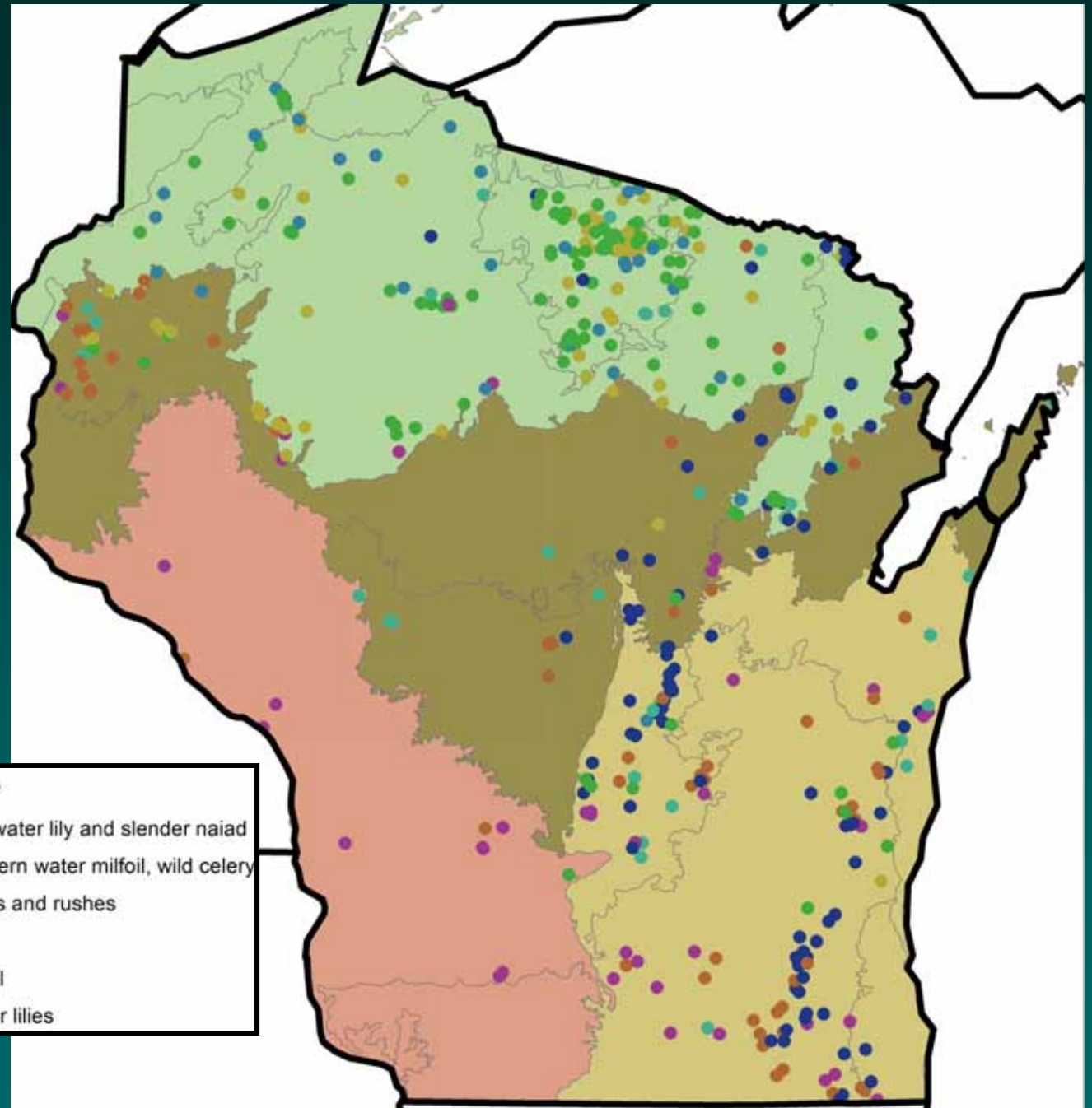
Dataset	Source
Wisconsin lake data	WI DNR
Water quality data	SWIS / WDNR
Aquatic plant data	WI DNR
Fish CPE data	“”
Natural heritage data	“”
Spatial data	various

HYDROGEOMORPHIC CLASSIFICATION

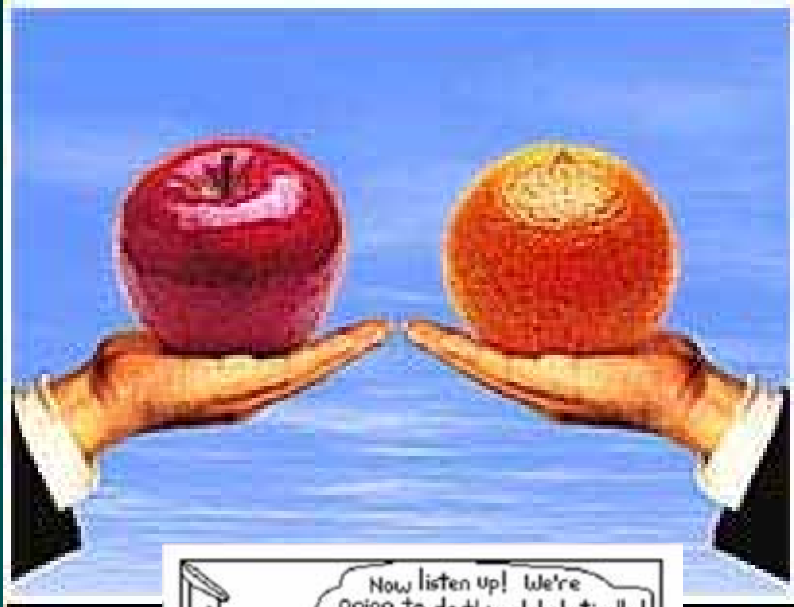
(hierarchical geology, setting and morphology)

Ecoregion	Morphology				
Ecological Land Type Names EcoLandName (17) Ecological Drainage Units EDU (10) Omernik Level 3 Ecoregion (5) TNC ecoregion (4)	Size	Depth	Connectivity / landscape pos	Drainage Type	Geo chem
	Large Medium Small Very Small	Deep Shallow/ non-stratifying	Riverine / flowage Unconnected	Drainage Drained Seepage Spring	Hardwater Softwater

Fish and Aquatic Plants



Ranking & Portfolio Selection



Step 2: Assessing Quality, Condition & Viability

→ Use HWI + biological data

Step 3: Ranking

→ Rank lake scores, stratified by lake class

Step 4: Portfolio selection

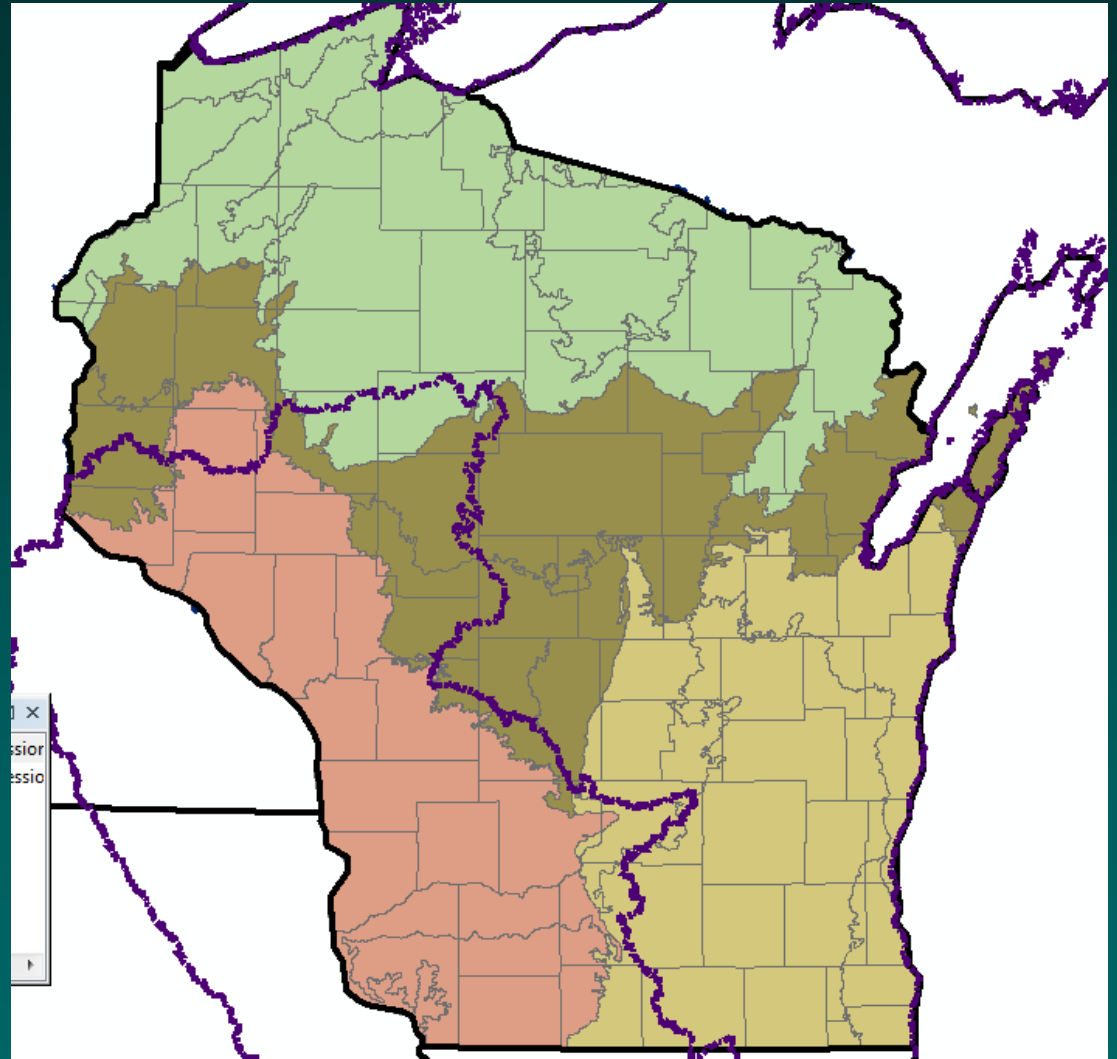
→ Determine representation goals, and select based on highest ranks for multiple criteria



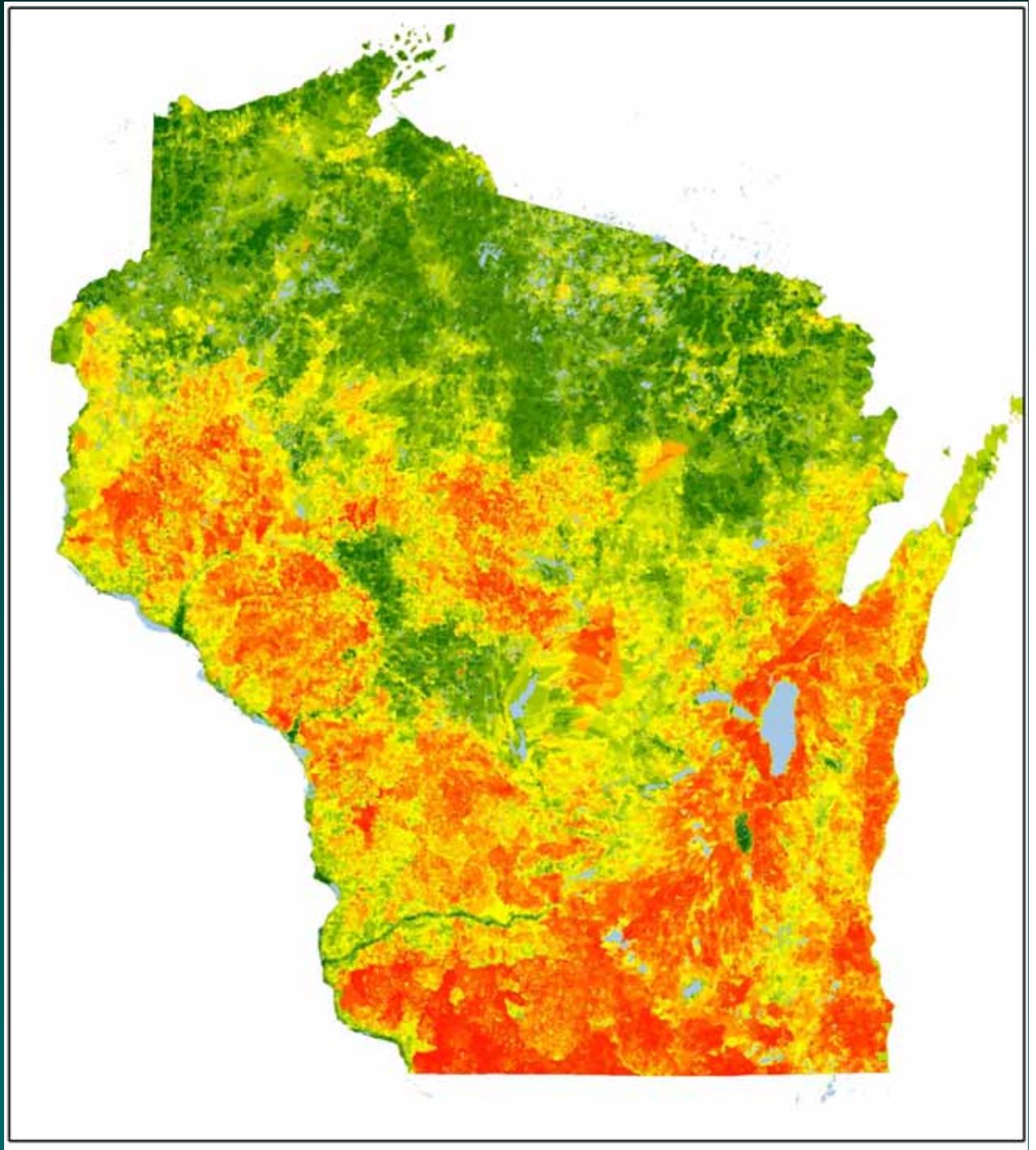
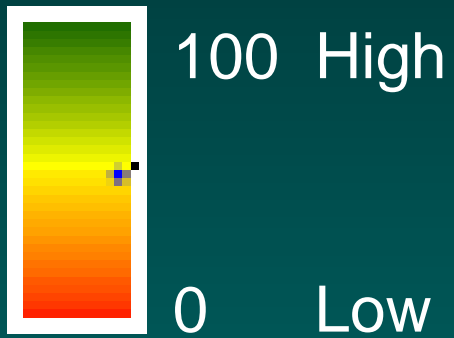
Final portfolio rankings stratified mainly on 4 lake size classes in 4 ecoregions:

In addition, top lakes by:

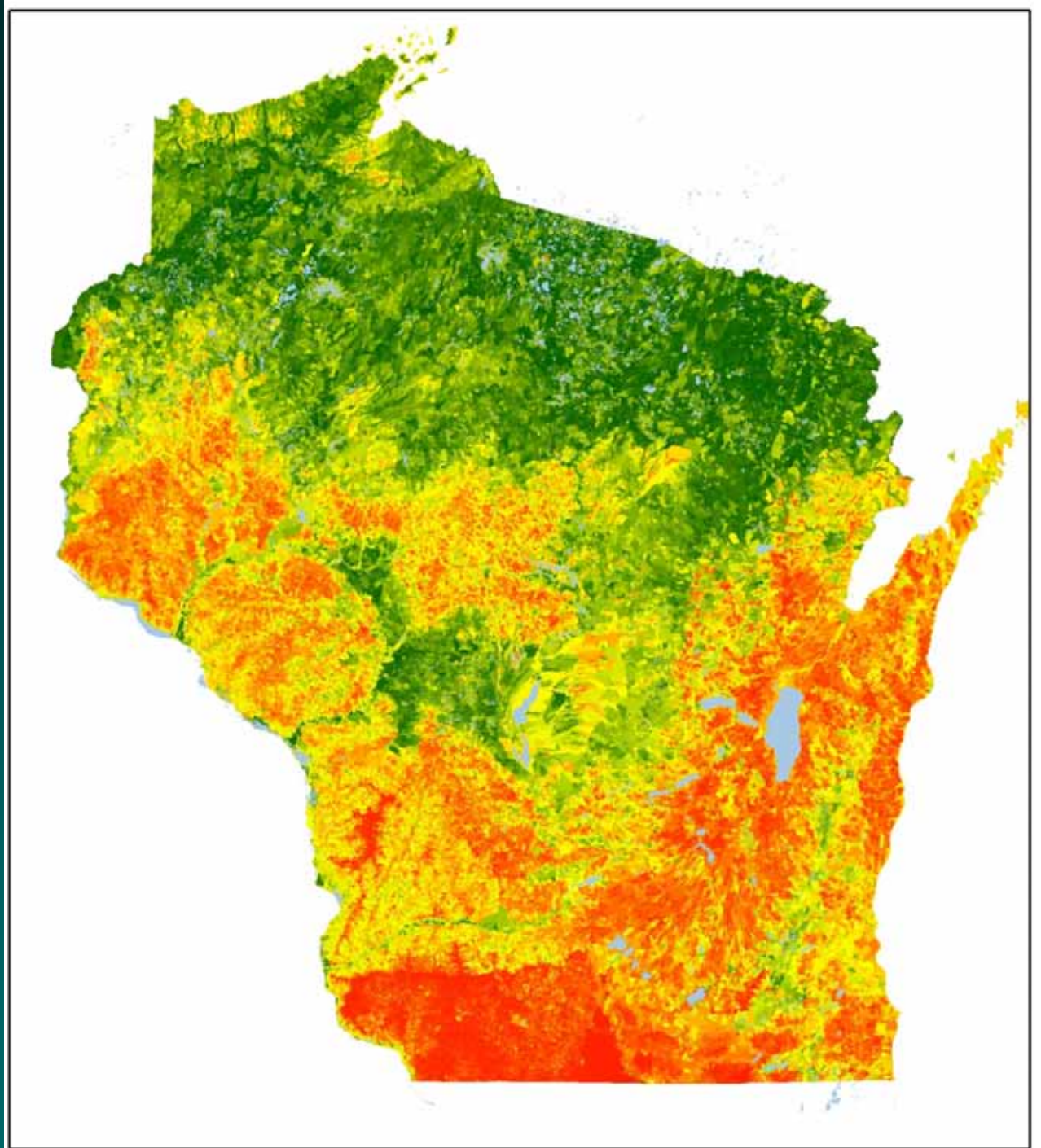
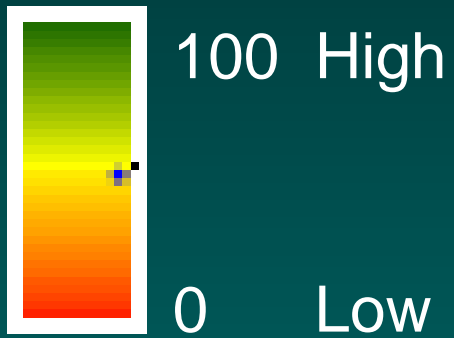
- County
- DNR watershed management units



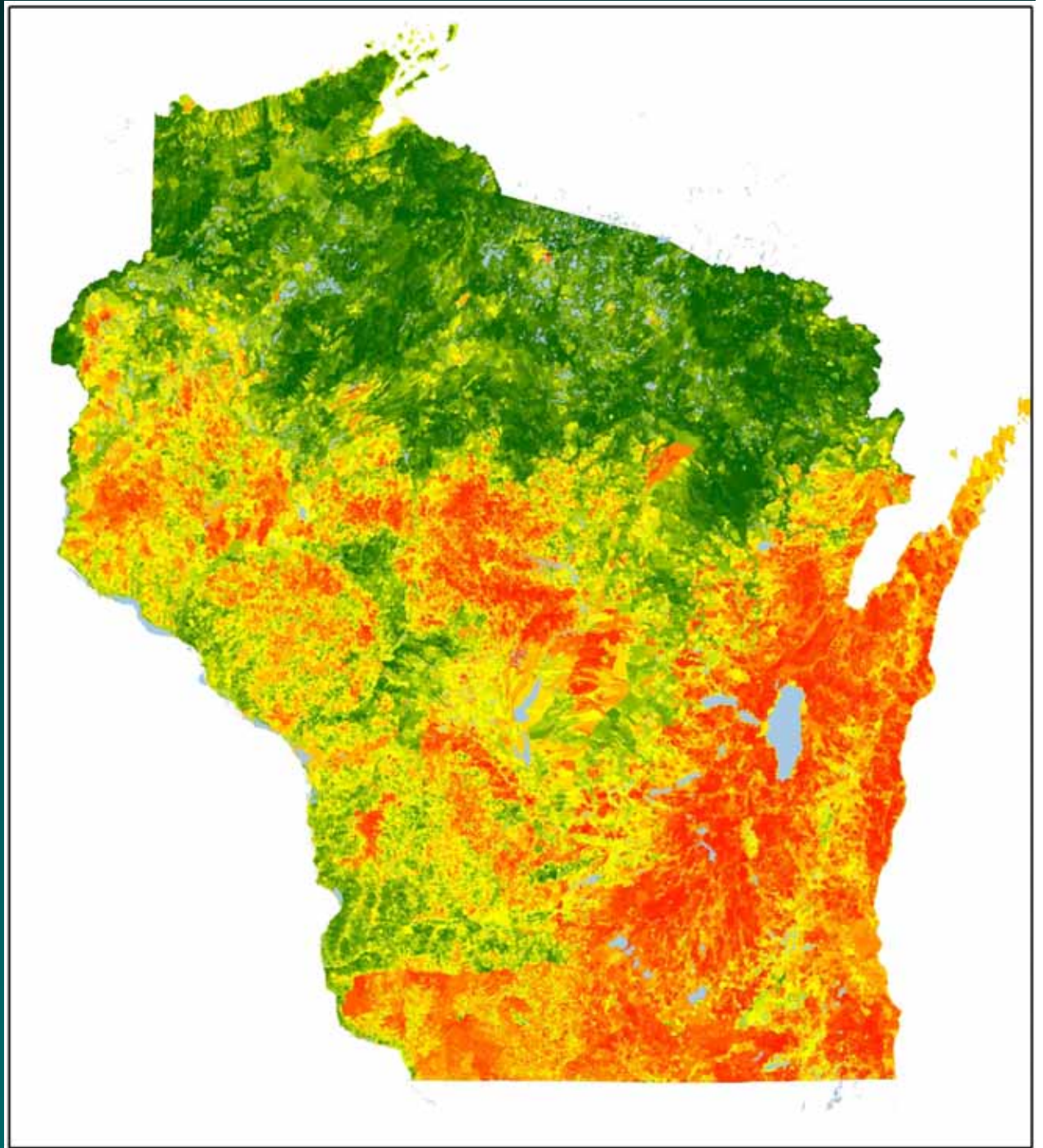
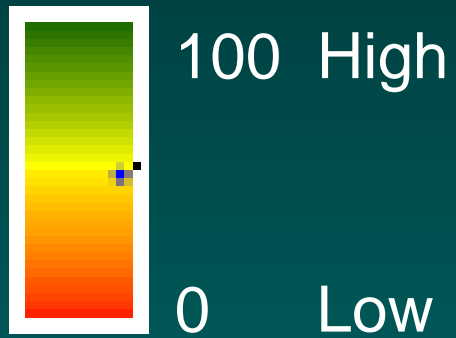
Wisconsin Healthy Watershed Landscape Condition Index



Wisconsin Healthy Watershed Water Quality Sub-index



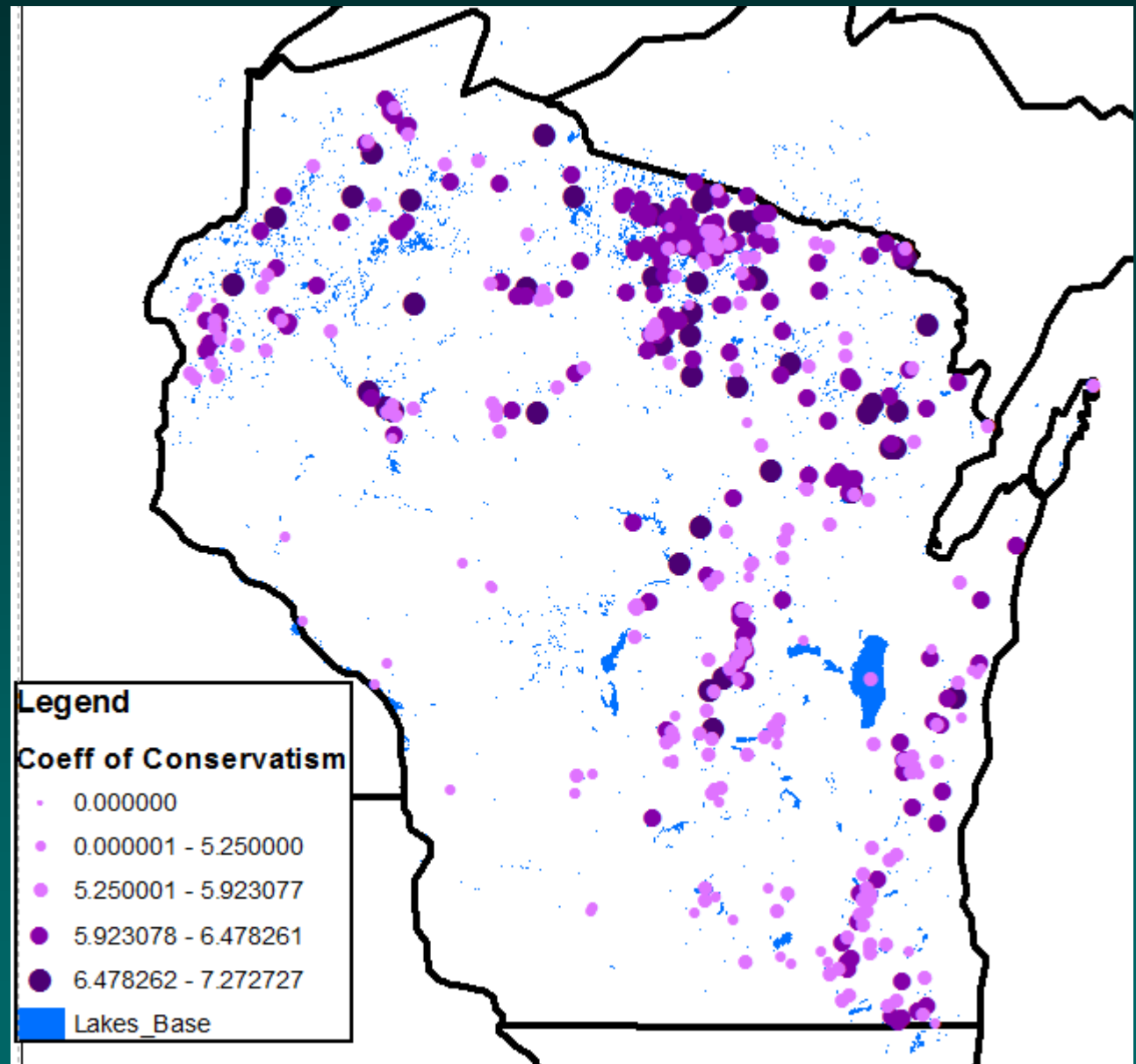
Wisconsin Healthy Watershed Aquatic Ecosystem Health Index



Aquatic Plants

Species presence/absence by lake: **N=418**

- Species richness
- Mean “coefficient of conservatism” for species present



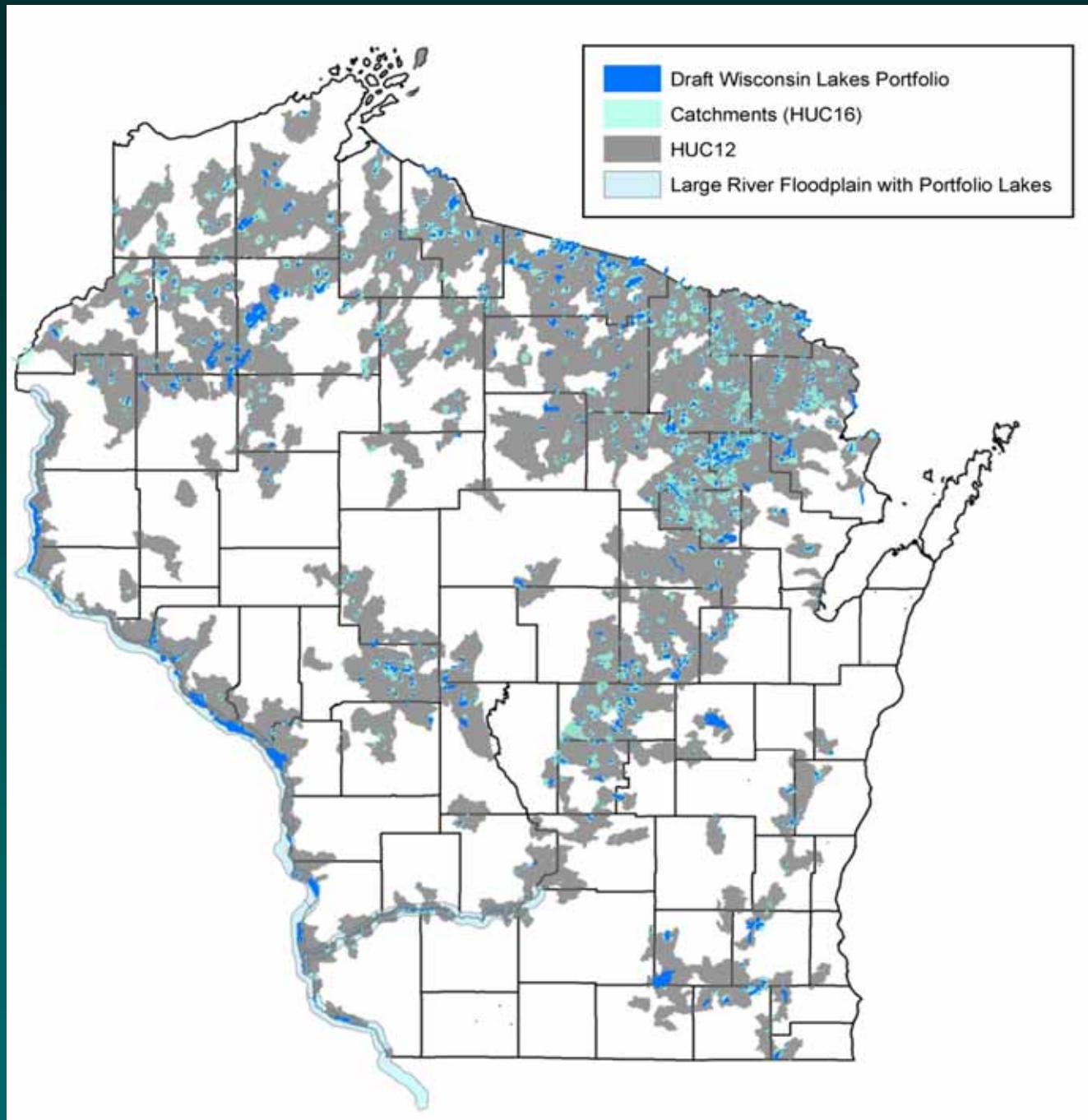
Provisional “portfolio”:

~2000 lakes

+

**portfolio lake
catchments &
watersheds**

**+ high quality
riverine /
flowage
systems**





Products & Potential Uses

What do Users Want to Know?



Photo: Kristen Blann



Basic information about my lake

Where is my lake? What **should** it look like?

How does my lake compare to other lakes?

How is the water quality on my lake?

How healthy/threatened is my lake?

What are the sources of threats or impairments to my lake?

What can be done to make things better?

Who is doing what (on my lake)? Who do I contact?

Surface Water Data Viewer

Explore Water Waters Lakes Watersheds Basins Impaired Waters Projects Documents

Mud Lake, Middle and South Branches Embarrass Rive Watershed (WR11)

Mud Lake (193800)

Size 70 Acres
Natural Community Shallow Seepage
Year Last Monitored 2013
General Condition Fair

[Return to Search](#)

[Go to Watershed](#)



Overview Conditions Goals Monitoring & Projects Ecosystem Challenges Fish & Habitat Photo Gallery Map Gallery

Condition

Wisconsin has over 84,000 miles of streams, 15,000 lakes and millions of acres of wetlands. Assessing the condition of this vast amount of water is challenging. The state's water quality monitoring program uses a tiered approach to analyze compliance with Clean Water Act fishable, swimmable standards. The narrative summary of water condition will be posted here when one is available. See also 'monitoring' and 'projects'.

Reports

- [Mud Lake, Marathon County - Aquatic Plant Sampling Map \(40 mpts\)](#)
- [Mud Lake, Marathon County - Garmin Text File](#)
- [Lake Bathymetry Map for Mud Lake](#)



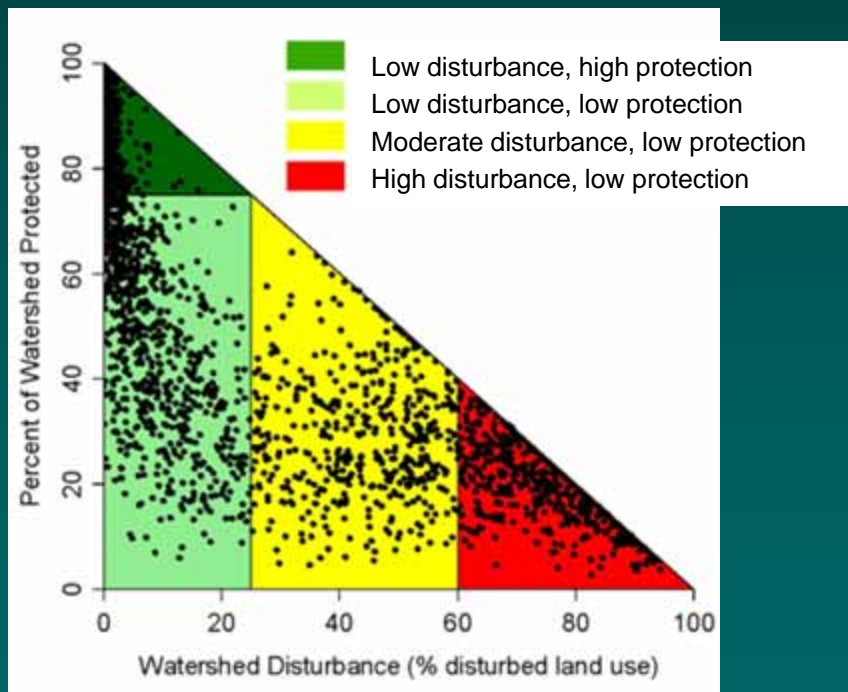
WI DNR SWV "About the water"

What can this project add

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

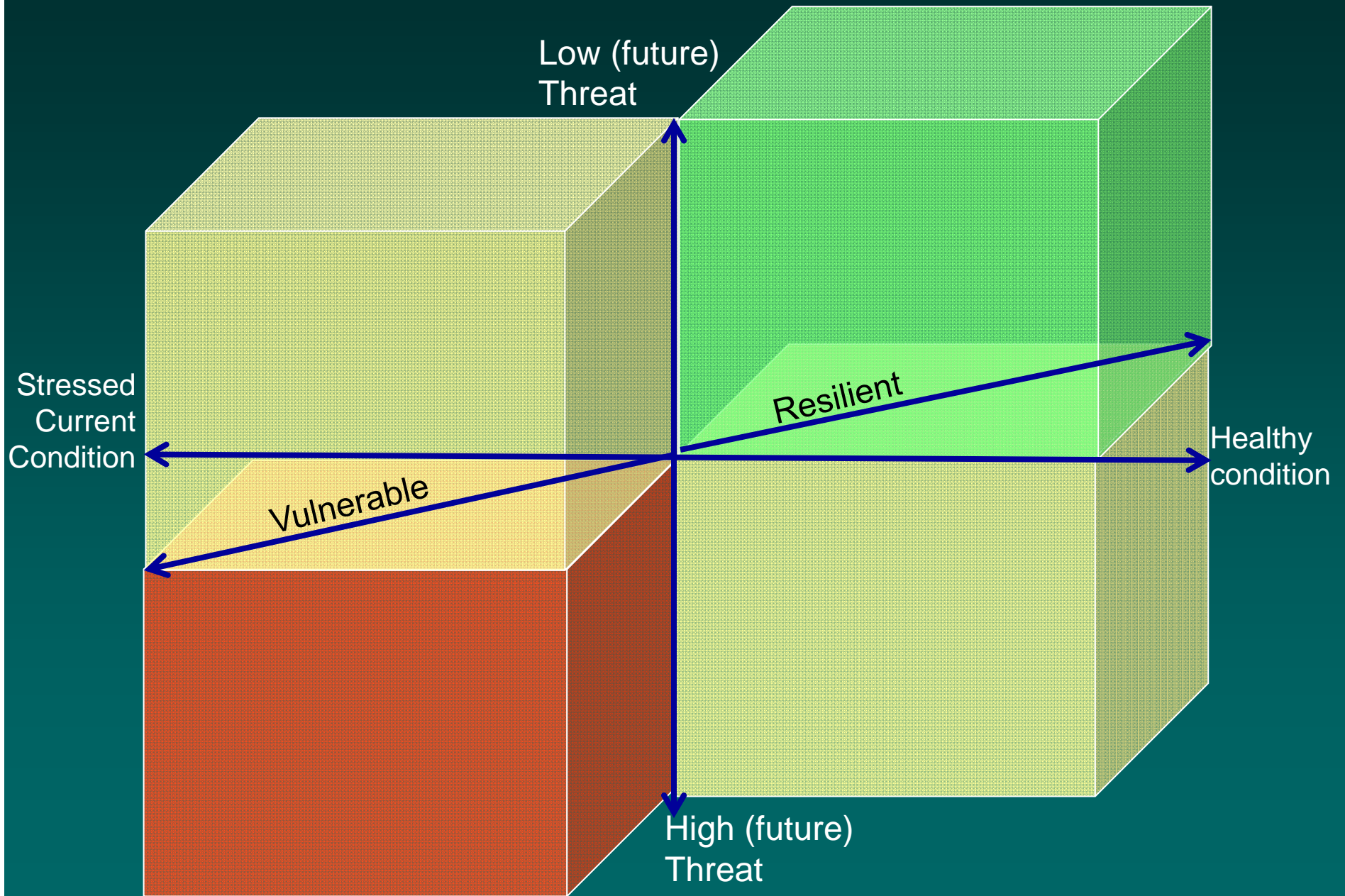
Assessing condition and viability to inform priority lakes and strategies

Example: Minnesota DNR's Lake Fish Habitat Strategic Plan



“Protect” (vigilance) vs.
“Protect” (active) vs.
“Enhance” vs.
“Restore”

Strategy development - broadly



Example #1

Lower & Upper Buckatabon Lakes

Vilas County

Wisconsin River drainage

Large (both > 250 acres),
connected drainage lakes

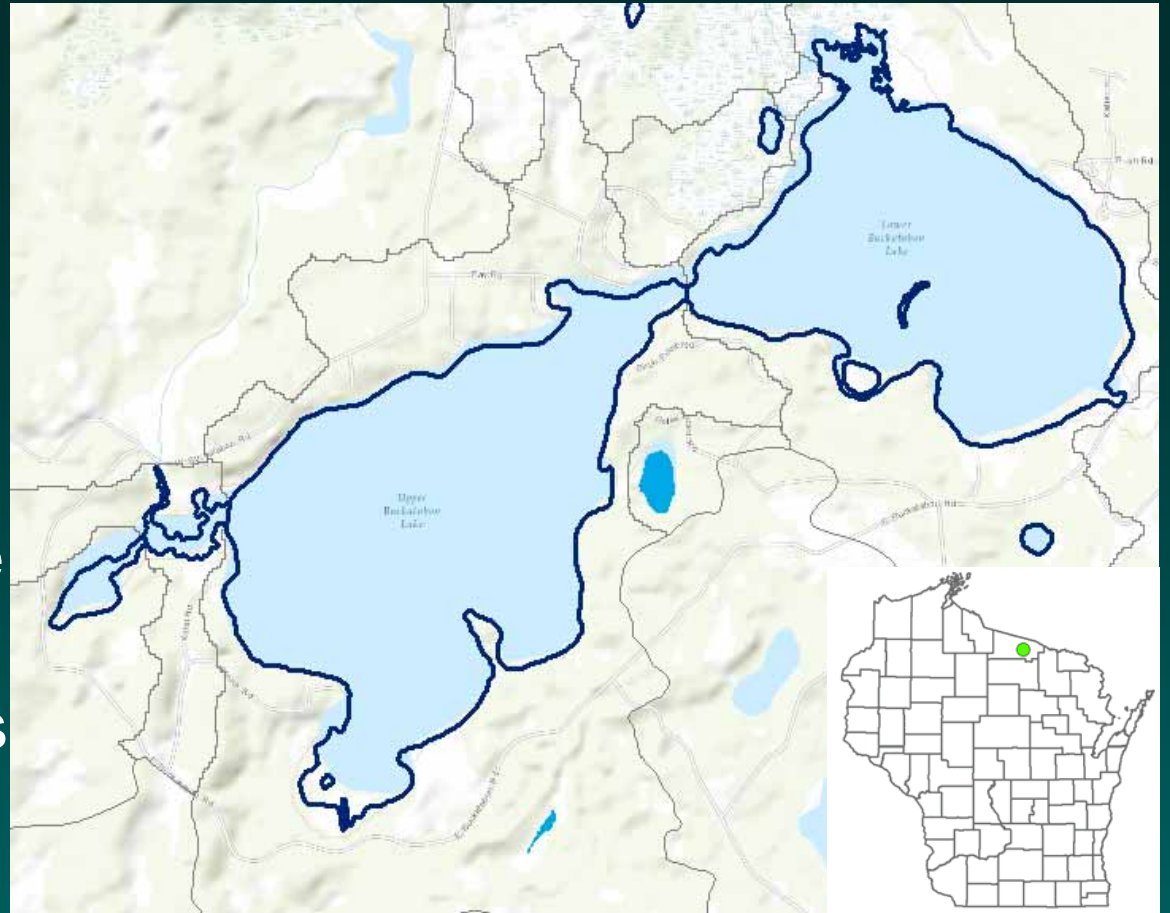
Condition: **Good**

Threat: **Low**

Vulnerability: **Low**

Strategies:

Educaton, vigilance, protection



Example #2

Lake Huron, Waushara County

Seepage, 40 ac

Condition: **Good**

Threat: **High**

Vulnerability: **High**

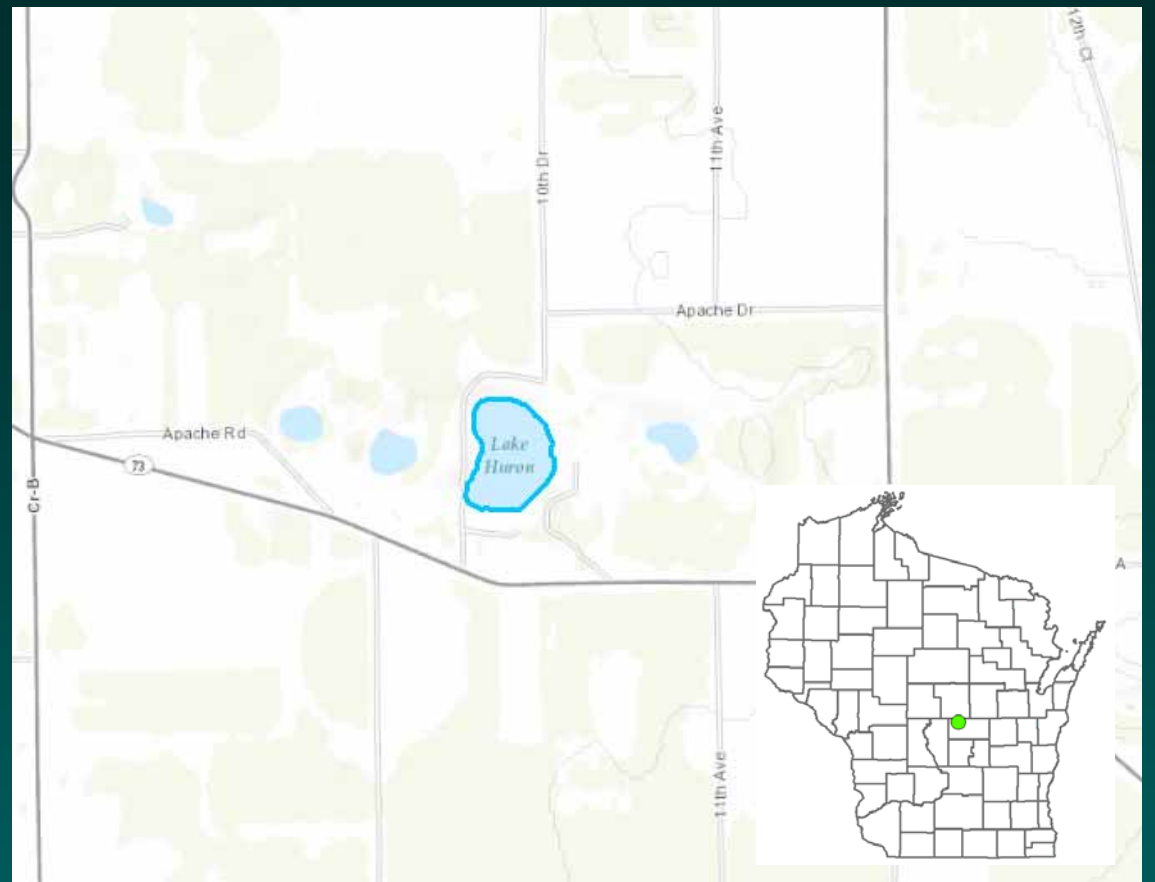
Strategies:

Monitor

Focused protection

Targeted BMP's for ag

Watershed planning, addressing ag and development



Example #3

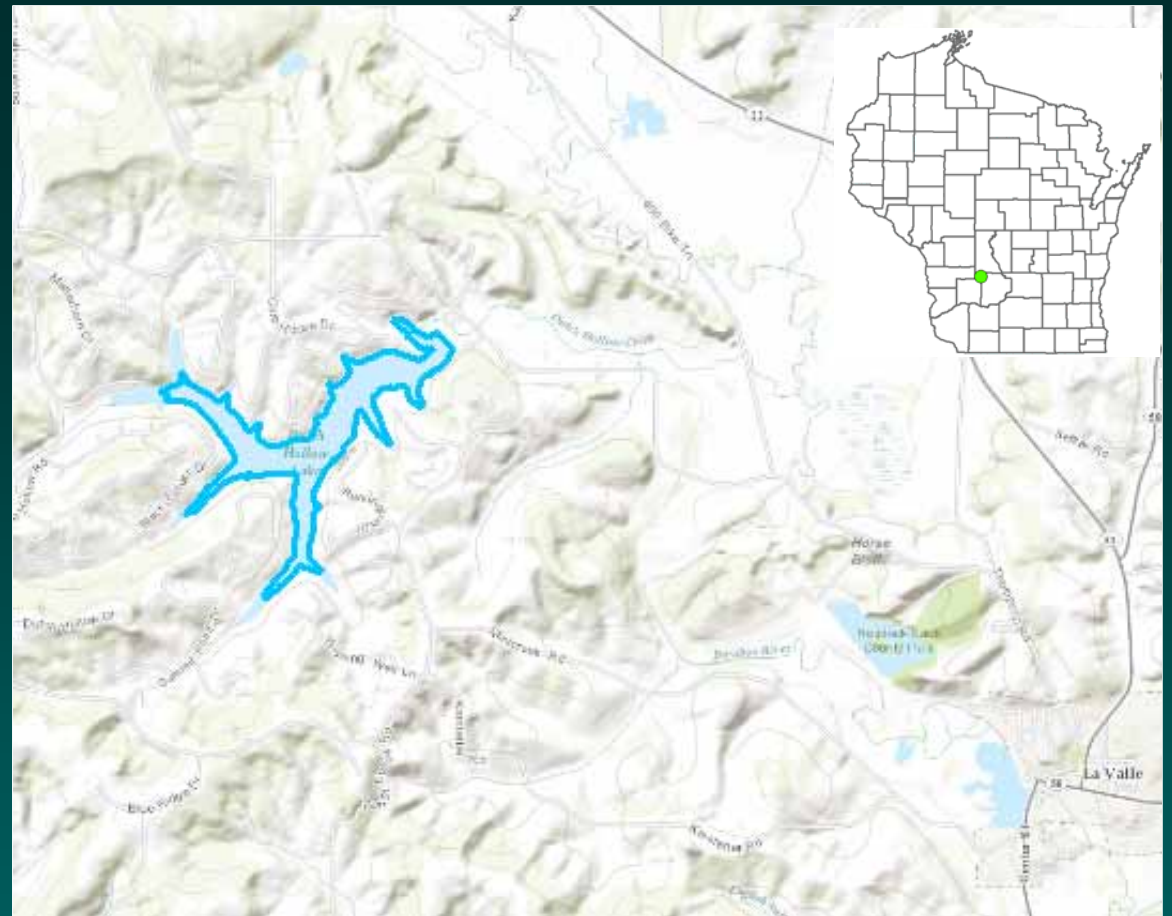
Dutch Hollow Lake

*Seepage, 136 ac
Richland County*

Condition: **Moderate**
Threat: **Moderate**
Vulnerability: **Moderate**

Strategies:

Lake plan, watershed plan, BMP's upstream



Next Steps

- Complete analyses, ranking & portfolio
- Report, presentation, and fact sheets
- *Sign up or email kblann@tnc.org to be notified*

Acknowledgments

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Aquatic plant data	WI DNR
Fish CPE data	“”
Natural heritage data	“”
Spatial data	various

10 most common lake classes:

Ecoregion	Class	Count
Northern	VS (< 5 acres), shallow, unconnected lakes	3329
	Small (5-25 ac), shallow, unconnected lakes	1709
Transition	VS (< 5 acres), shallow, unconnected lakes	970
	Small (5-25 ac), shallow, unconnected lakes	933
Northern	VS (< 5 acres), shallow, connected lakes	832
		781

Source Datasets (cont'd)

Fish – obtained from Fisheries

Limited to lake surveys that sampled for “ALL FISH”

CPE data for n=1061 WBICs

match to n=1027 WBICs from the n= 18,295 HYDROIDS / 17,608
WBICS

Qualitative abundance classes for sport fish from ROW dataset

n= 4926 that match to the n= 18,295 / 17,608

ISSUE: 98 WBICs with no matching WBIC in spatial lake dataset.

Species of Greatest

Conservation Need –

Count of species tracked by natural

Heritage database, count by taxa

Conservation Targets



© Ken Carmichael / Animals Animals

Conservation Targets

