# From Self-help to Volunteer Monitoring to Citizen/Community Science

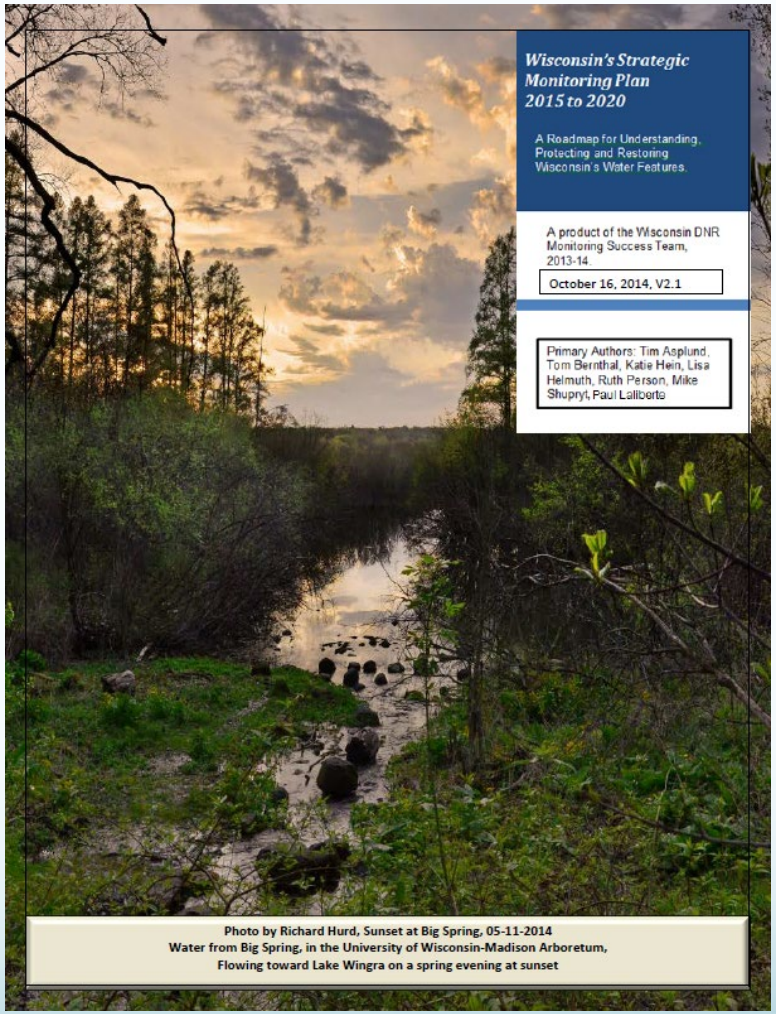
## Engaging the Public in Lake and Stream Assessment, Restoration and Protection in Wisconsin

Tim Asplund, Wisconsin Department of Natural Resources
Katy Bradford, UW-Madison Extension
Paul Skawinski, UW-Extension Lakes




# Wisconsin's Water Monitoring Strategy

- Monitoring Strategy Updated in 2021
- Priorities:
  - Targeted Watershed and Lake Assessment
  - Healthy Waters
  - Emphasis on climate change, biological indicators, emerging contaminants and AIS
- Strategy Integration
  - Does Monitoring Data Meet Program Needs?
  - Are we making a difference?



# Monitoring Strategy Vision – What are we trying to achieve?

- A **comprehensive** (water quality, biology, habitat, hydrology), **cross-media** (lakes, streams, rivers, wetlands), monitoring plan that is driven by **assessment and management needs**, adequately resourced (**staffed and funded**), and makes strategic use of **partners and volunteers.**

# Volunteers are Integral!

- All media (Lakes, streams, rivers, wetlands)
- All Tiers (baseline, stressor identification and assessment, evaluation and success stories)
- All Stressors (nutrients, habitat degradation, AIS, climate, water use)

# Goals and Objectives

- **Goal:** To help preserve and protect Wisconsin's over 15,000 lakes and 86,000 miles of rivers
- **Objectives:**
  - Educate Wisconsinites about water quality
  - Build a network of informed riparians and water users (empower them to take action to protect and improve natural resources)
  - Obtain (high quality) water resources data useful for DNR decision-making
  - Share data and knowledge

# Multiple Levels

- Level 1 – Educational
  - An introduction to monitoring basics
  - Better understand the connection between land use & water quality
- Level 2 – Status and trends
  - A more intensive monitoring experience
  - Must follow a specific schedule
  - Utilize DNR methodologies & databases
- Level 3 – Research projects
  - Unique opportunity to address a specific issue

# Wisconsin's Citizen Lake Monitoring Network

**Paul Skawinski**
**CLMN Statewide Educator**
**UW-Stevens Point / Extension Lakes**

# Quick Stats

- Began in **1986** with 113 lakes
- **1,000+** volunteers per year (clarity and chemistry monitoring)
- **No fees** charged to participate
- Over **200,000** water clarity measurements taken since 1986

# Program Structure

## WDNR

- Program Funding
- Database Management
- Data Analysis & Interpretation
- Volunteer Trainings

## Extension Lakes

- Statewide Support, Education, Training
- Promotion & Recruitment
- Material Development
- Data Interpretation

## Citizens

- Collect Data
- On-shore Processing
- Data Entry
- Ship Water Samples

# Recruitment and Retention

- Make expectations clear (videos are very helpful)
- Exciting recruitment tools produce excited volunteers

# Recruitment and Retention

- Broad communication and volunteer input (high priority)
- Webinars in off-season
- Recognition (not necessarily physical materials)


# Parameters Monitored

- Water clarity (Secchi)
- Temperature profile every 3 feet
- Chlorophyll-A
- Total phosphorus

} Water chemistry package

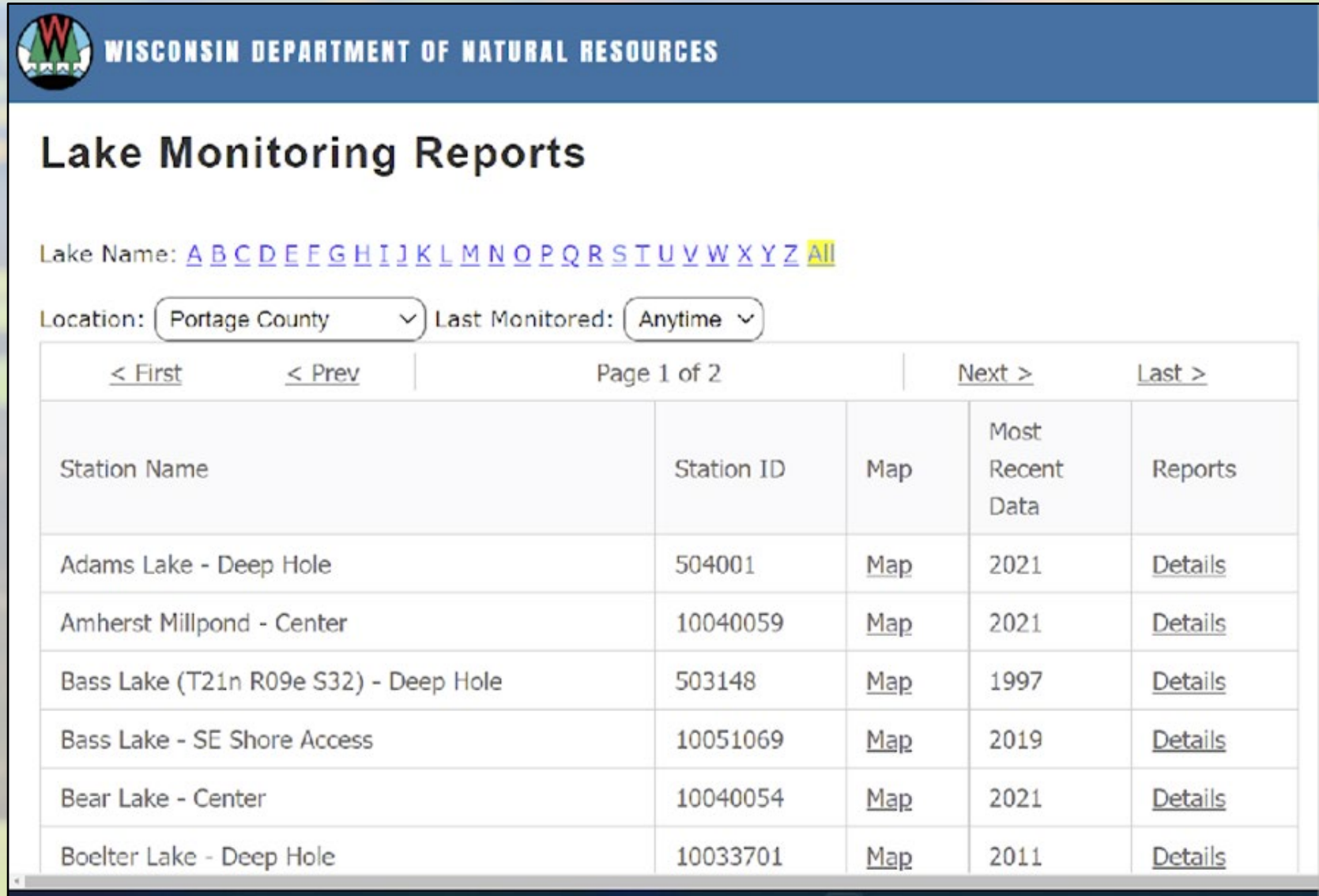
- Dissolved oxygen
- Aquatic invasive species (several options)
- Native aquatic plant monitoring (several options)
- Ice cover duration

# Lake Monitoring Reports

Generated/updated every 24hrs

Public-facing

Water sample analyses entered by SLOH staff



WISCONSIN DEPARTMENT OF NATURAL RESOURCES

## Lake Monitoring Reports

Lake Name: A B C D E F G H I J K L M N O P Q R S T U V W X Y Z All

Location: Portage County  Last Monitored: Anytime

< First  < Prev  Page 1 of 2  Next >  Last >

| Station Name | Station ID | Map | Most Recent Data | Reports |
|---|---|---|---|---|
| Adams Lake - Deep Hole | 504001 | Map | 2021 | Details |
| Amherst Millpond - Center | 10040059 | Map | 2021 | Details |
| Bass Lake (T21n R09e S32) - Deep Hole | 503148 | Map | 1997 | Details |
| Bass Lake - SE Shore Access | 10051069 | Map | 2019 | Details |
| Bear Lake - Center | 10040054 | Map | 2021 | Details |
| Boelter Lake - Deep Hole | 10033701 | Map | 2011 | Details |

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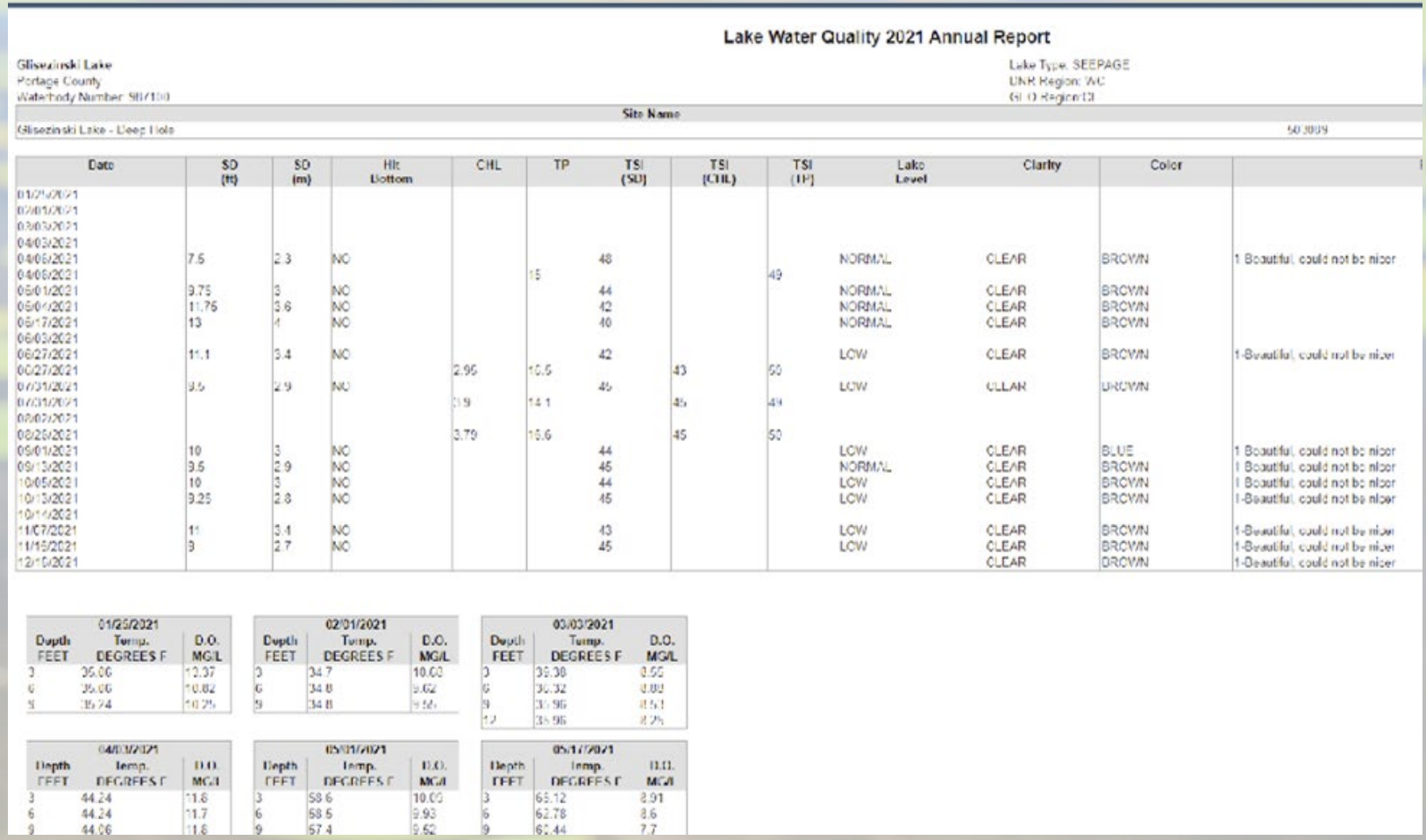


Lake Water Quality 2021 Annual Report

Glisezinski Lake
Portage County
Waterbody Number: [illegible]

Lake Type: SEEPAGE
[illegible]

Site Name

Glisezinski Lake - Deep Hole [illegible]

| Date | SD (ft) | SD (m) | Hit Bottom | CHL | TP | TSI (SD) | TSI (CHL) | TSI (TP) | Lake Level | Clarity | Color | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| [illegible] | | | | | | | | | | | | |
| [illegible] | | | | | | | | | | | | |
| [illegible] | | | | | | | | | | | | |
| 04/03/2021 | | | | | | | | | | | | |
| 04/06/2021 | 7.5 | 2.3 | NO | | | 48 | | | NORMAL | CLEAR | BROWN | 1 Beautiful, could not be nicer |
| 04/09/2021 | | | | | 15 | | | 49 | | | | |
| 05/01/2021 | 9.75 | 3 | NO | | | 44 | | | NORMAL | CLEAR | BROWN | |
| 05/04/2021 | 11.75 | 3.6 | NO | | | 42 | | | NORMAL | CLEAR | BROWN | |
| 05/17/2021 | 13 | 4 | NO | | | 40 | | | NORMAL | CLEAR | BROWN | |
| 06/03/2021 | | | | | | | | | | | | |
| 06/27/2021 | 11.1 | 3.4 | NO | | | 42 | | | LOW | CLEAR | BROWN | 1-Beautiful, could not be nicer |
| 06/27/2021 | | | | 2.95 | 10.5 | | 43 | 50 | | | | |
| 07/31/2021 | 9.5 | 2.9 | NO | | | 45 | | | LOW | CLEAR | UNKOWN | |
| 07/31/2021 | | | | 3.9 | 14.1 | | 45 | 49 | | | | |
| 08/07/2021 | | | | | | | | | | | | |
| 08/26/2021 | | | | 3.79 | 10.6 | | 45 | 50 | | | | |
| 09/01/2021 | 10 | 3 | NO | | | 44 | | | LOW | CLEAR | BLUE | 1 Beautiful, could not be nicer |
| 09/13/2021 | 9.5 | 2.9 | NO | | | 45 | | | NORMAL | CLEAR | BROWN | 1 Beautiful, could not be nicer |
| 10/05/2021 | 10 | 3 | NO | | | 44 | | | LOW | CLEAR | BROWN | 1 Beautiful, could not be nicer |
| 10/13/2021 | 9.25 | 2.8 | NO | | | 45 | | | LOW | CLEAR | BROWN | 1-Beautiful, could not be nicer |
| 10/14/2021 | | | | | | | | | | | | |
| 11/07/2021 | 11 | 3.4 | NO | | | 43 | | | LOW | CLEAR | BROWN | 1-Beautiful, could not be nicer |
| 11/15/2021 | 9 | 2.7 | NO | | | 45 | | | LOW | CLEAR | BROWN | 1-Beautiful, could not be nicer |
| 12/19/2021 | | | | | | | | | | CLEAR | BROWN | 1-Beautiful, could not be nicer |

01/25/2021

| Depth FEET | Temp. DEGREES F | D.O. MG/L |
|---|---|---|
| 3 | 35.06 | 12.37 |
| 6 | 35.06 | 10.82 |
| 9 | 35.24 | 10.25 |

02/01/2021

| Depth FEET | Temp. DEGREES F | D.O. MG/L |
|---|---|---|
| 3 | 34.7 | 10.60 |
| 6 | 34.8 | 9.62 |
| 9 | 34.8 | 9.56 |

03/03/2021

| Depth FEET | Temp. DEGREES F | D.O. MG/L |
|---|---|---|
| 3 | 36.38 | 8.66 |
| 6 | 36.32 | 8.62 |
| 9 | 36.96 | 8.51 |
| 12 | 36.96 | 8.25 |

04/03/2021

| Depth FEET | Temp. DEGREES F | D.O. MG/L |
|---|---|---|
| 3 | 44.24 | 11.8 |
| 6 | 44.24 | 11.7 |
| 9 | 44.06 | 11.6 |

05/01/2021

| Depth FEET | Temp. DEGREES F | D.O. MG/L |
|---|---|---|
| 3 | 58.6 | 10.05 |
| 6 | 58.5 | 9.93 |
| 9 | 57.4 | 9.62 |

05/17/2021

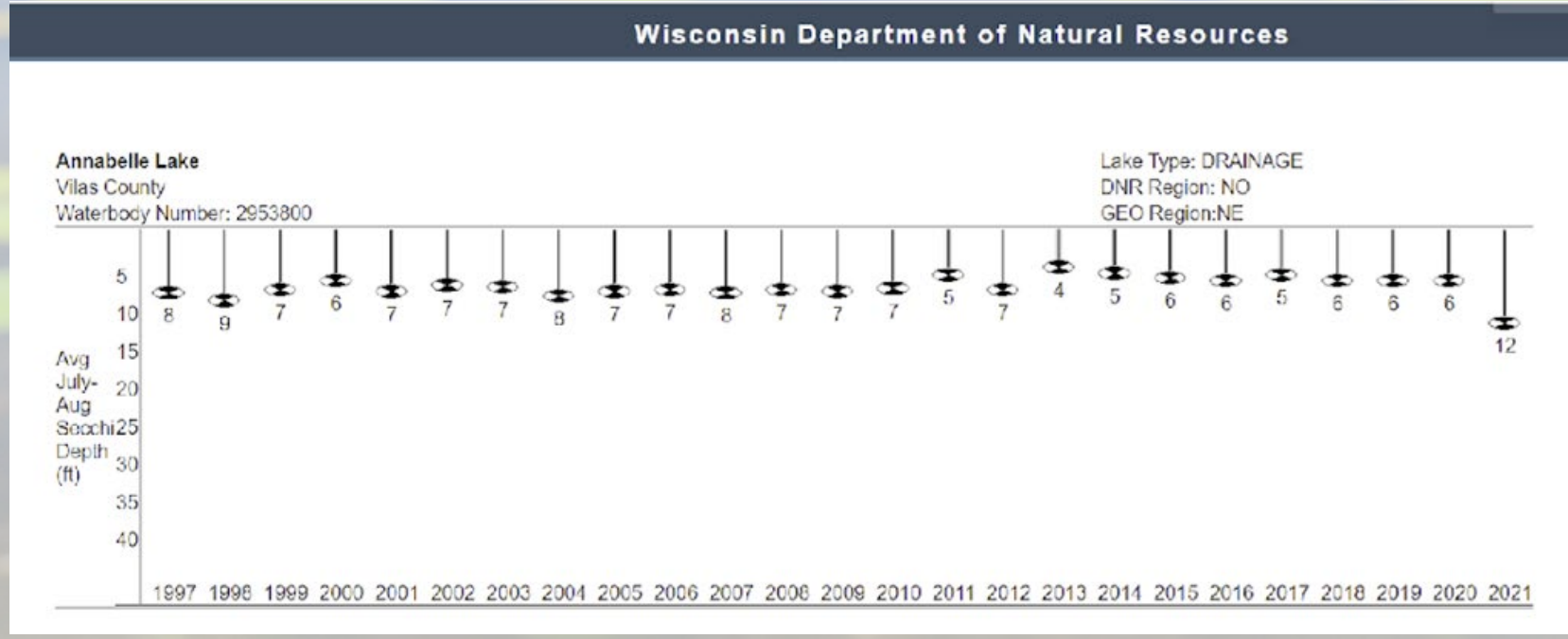
| Depth FEET | Temp. DEGREES F | D.O. MG/L |
|---|---|---|
| 3 | 65.12 | 8.91 |
| 6 | 62.78 | 8.6 |
| 9 | 62.44 | 7.7 |

# Lake Monitoring Reports

Generated/updated every 24hrs

Public-facing

Water sample analyses entered by SLOH staff



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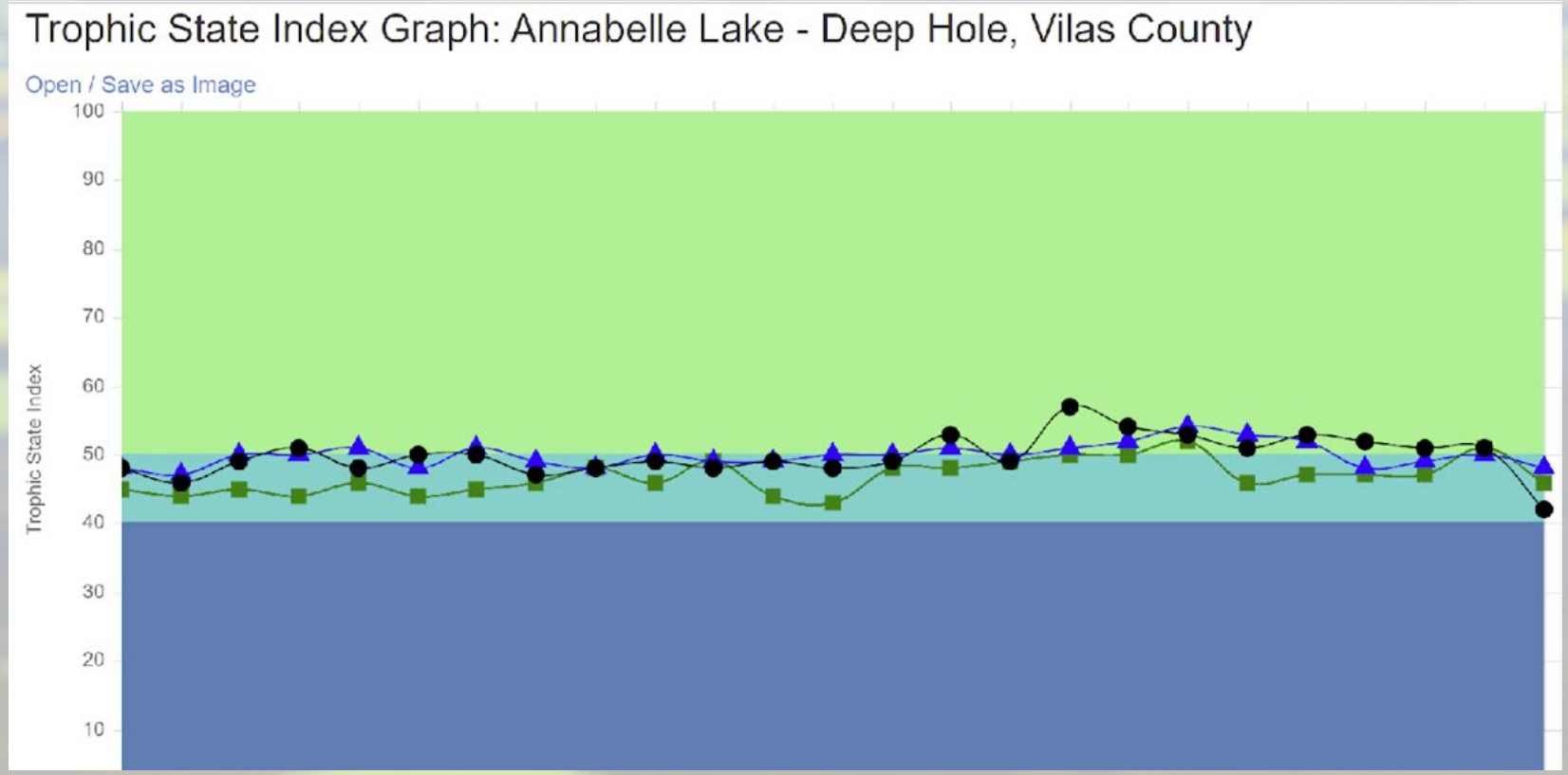
Water sample analyses entered by SLOH staff



# Data Use

- Lake associations/districts & local municipalities
- DNR lake biologists/lake consultants - lake management planning
- Water quality assessments and reporting
- Evaluation of changes in lake/shoreland management or use

# Deer Lake – Northwest Wisconsin

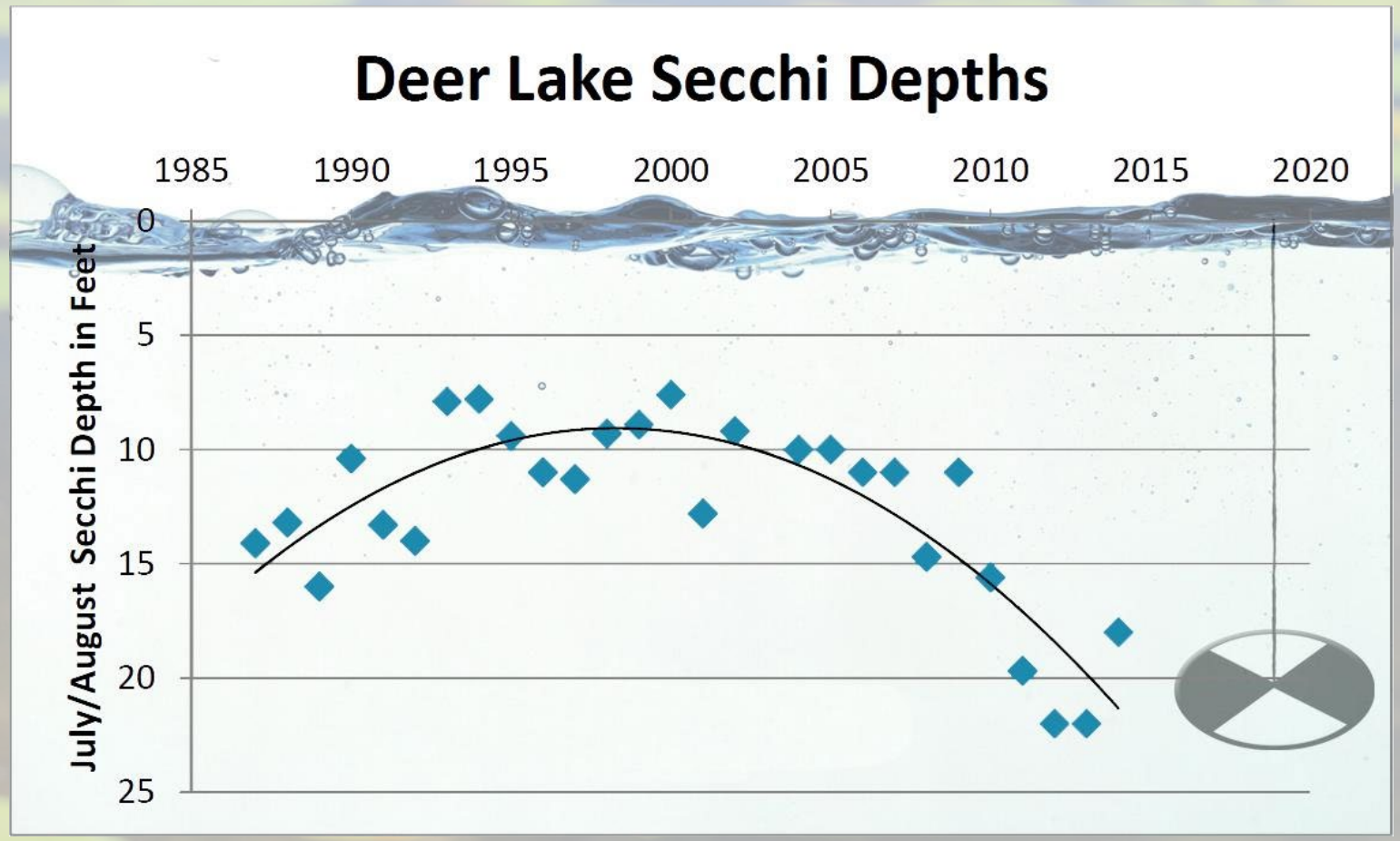
- Monitoring since 1987
- Negative trend in water clarity, positive trend in phosphorus
- DNR lake planning grant & watershed study
- Address stormwater runoff and sediment delivery from tributaries

# Monitoring to Action

- Purchased agricultural lands and converted to prairies
- Stabilized streambanks and gullies draining to Deer Lake
- Installed sedimentation basins
- Restored wetlands in the watershed

# Monitoring to Action

**53%** TP reduction!
(1996-2009)



# Water Action Volunteers:

## Wisconsin's volunteer stream monitoring program

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WAV WATER ACTION VOLUNTEERS

# WAV Volunteer Roles

**1 Baseline Monitoring Volunteers**

- Temperature
- Transparency
- Dissolved oxygen
- Stream flow
- Biotic Index (educational)
- Habitat Assessment (less common)

**2 Special Projects Monitoring Volunteers**

- Nutrients
- Continuous temperature
- Aquatic invasive species
- Other unique projects (e.g. road salt)

**3 Local WAV Coordinators**

- Coordination and training

# Onboarding Volunteers

1. Complete the *Online Introduction to WAV* course
2. Attend a 3-4 hour field training and get a free monitoring kit
3. Connect with a local WAV Coordinator for support
4. Get set up in the DNR SWIMS database to enter data

# Statewide Volunteers

**383** Active volunteers in SWIMS in 2021

Monitored in **44 of 72 counties** in 2021

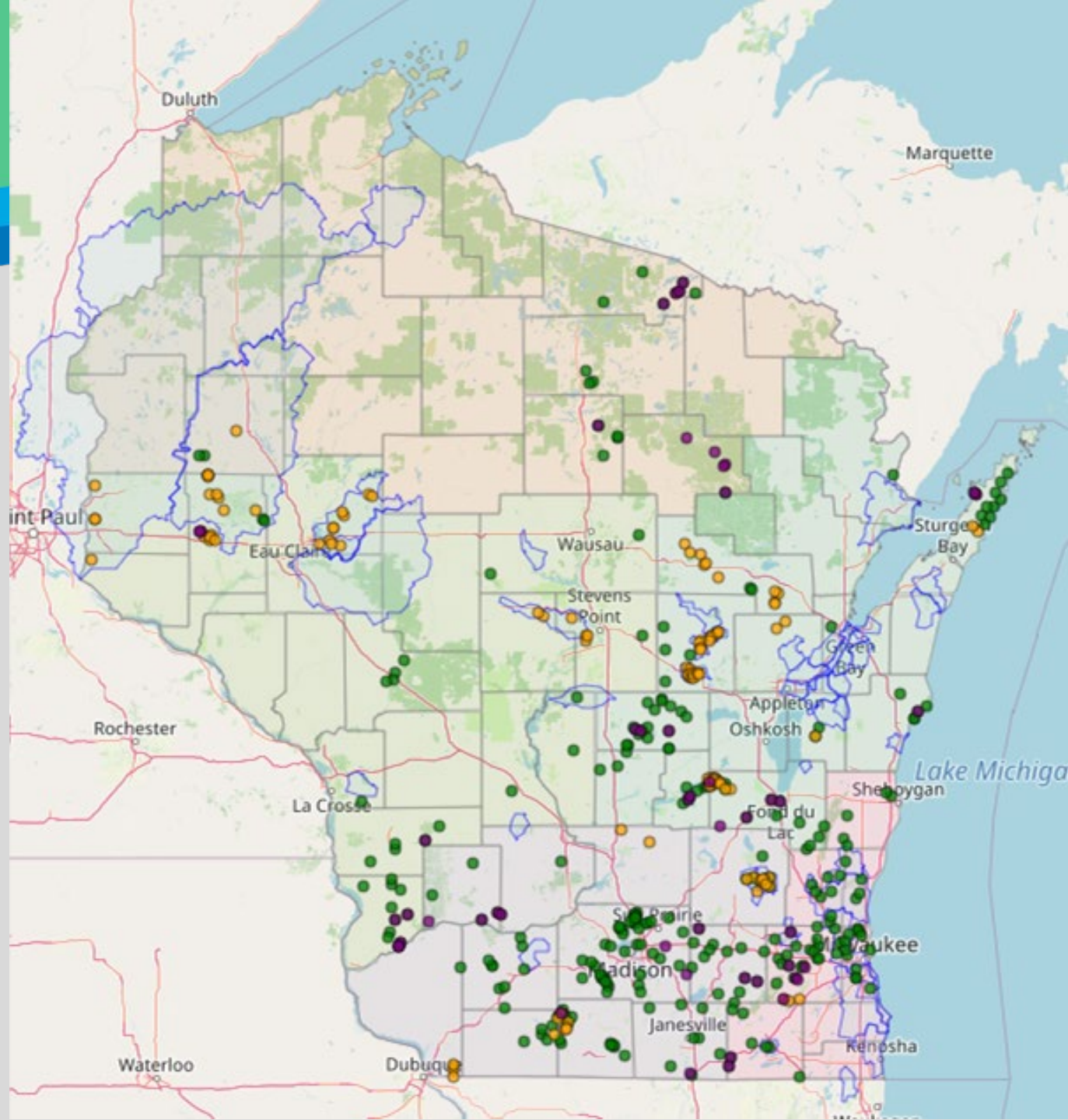
# Monitoring Sites

**279** Baseline monitoring sites

**111** Nutrient monitoring sites

**60+** Thermistors (temp loggers)

**Interactive site map:**
*https://wateractionvolunteers.org/data/wav-stream-monitoring-sites/*



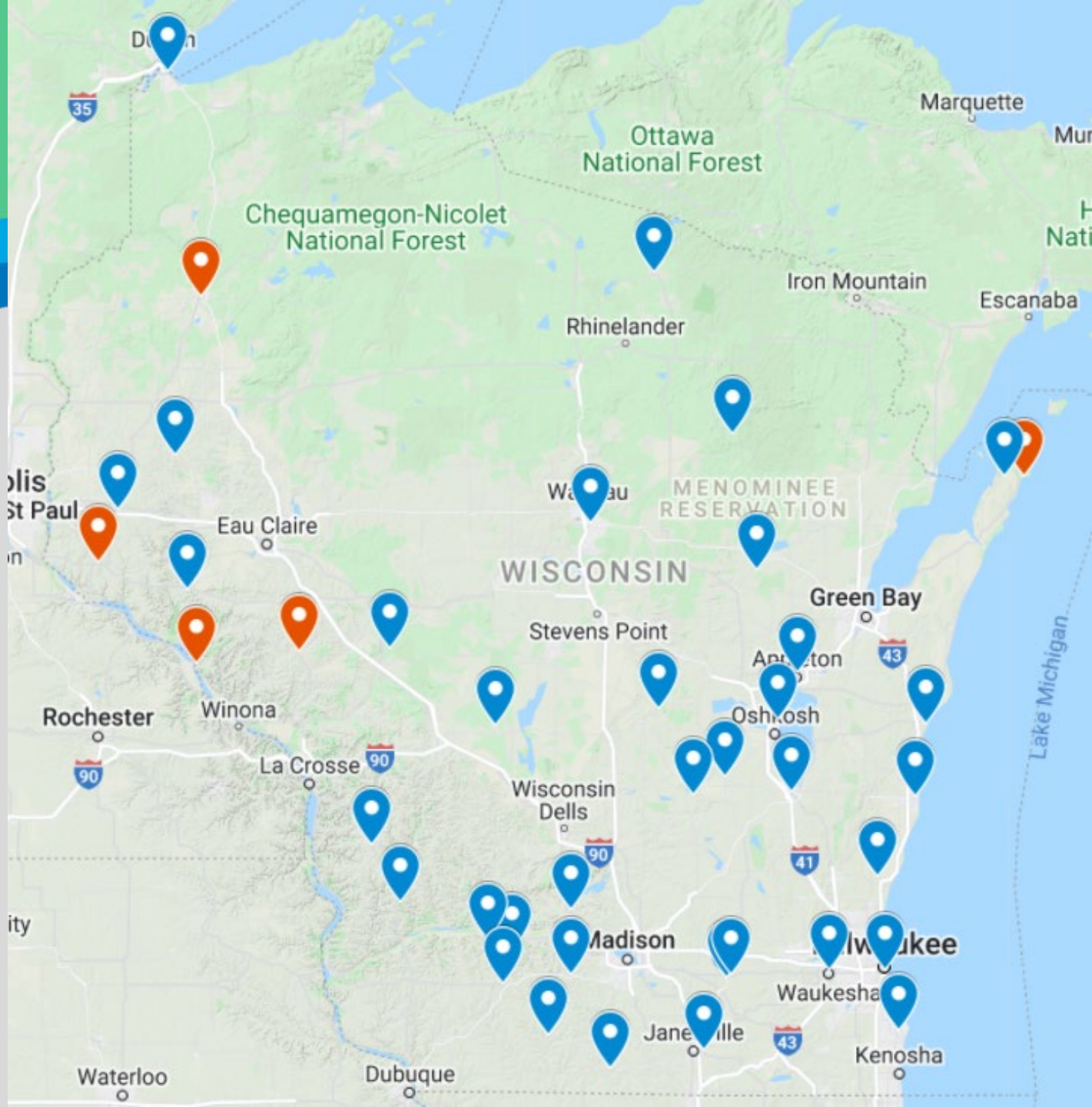
# 2022 WAV Coordinators

**40** Active WAV local coordinators

**56** Counties served

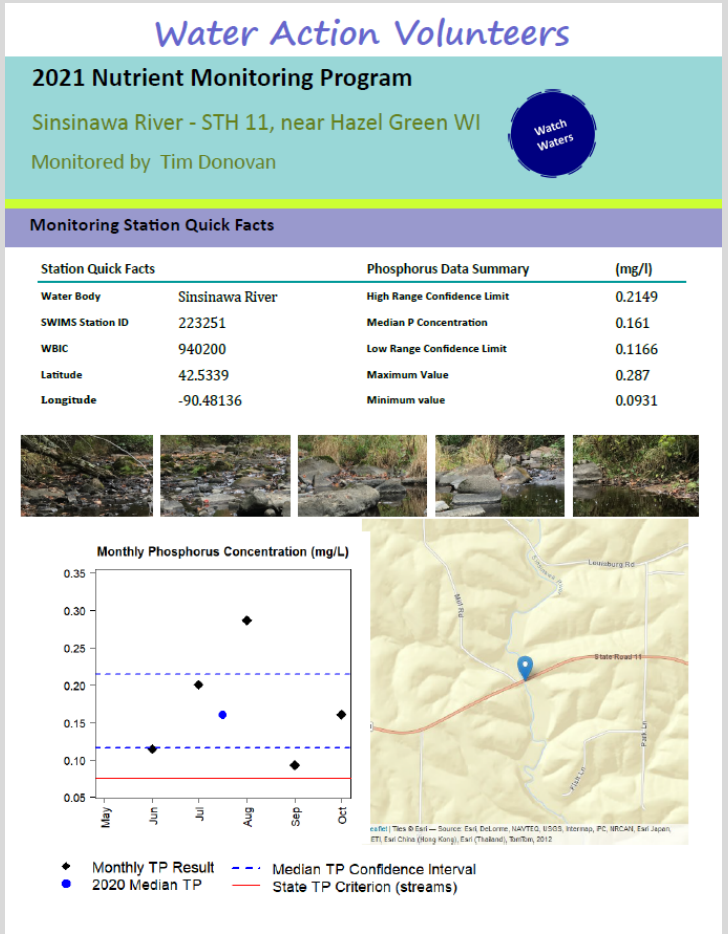
**4** New WAV coordinators so far

***New PDF resource:**
[2022 WAV Coordinators by County]



# Sharing Data with Volunteers

## Stream Site Reports



Water Action Volunteers

2021 Nutrient Monitoring Program

Sinsinawa River - STH 11, near Hazel Green WI

Monitored by Tim Donovan

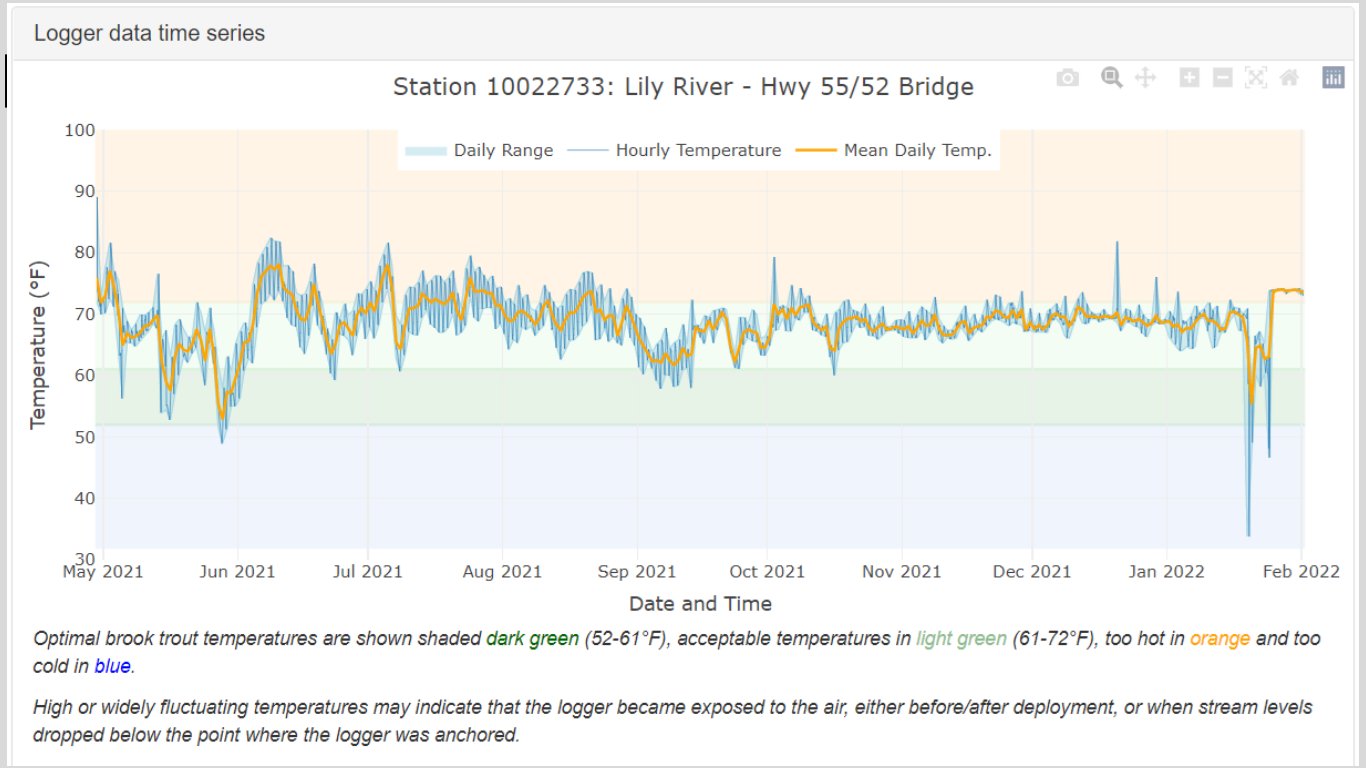
Watch Waters

Monitoring Station Quick Facts

| Station Quick Facts | | Phosphorus Data Summary | (mg/l) |
|---|---|---|---|
| Water Body | Sinsinawa River | High Range Confidence Limit | 0.2149 |
| SWIMS Station ID | 223251 | Median P Concentration | 0.161 |
| WBIC | 940200 | Low Range Confidence Limit | 0.1166 |
| Latitude | 42.5339 | Maximum Value | 0.287 |
| Longitude | -90.48136 | Minimum value | 0.0931 |



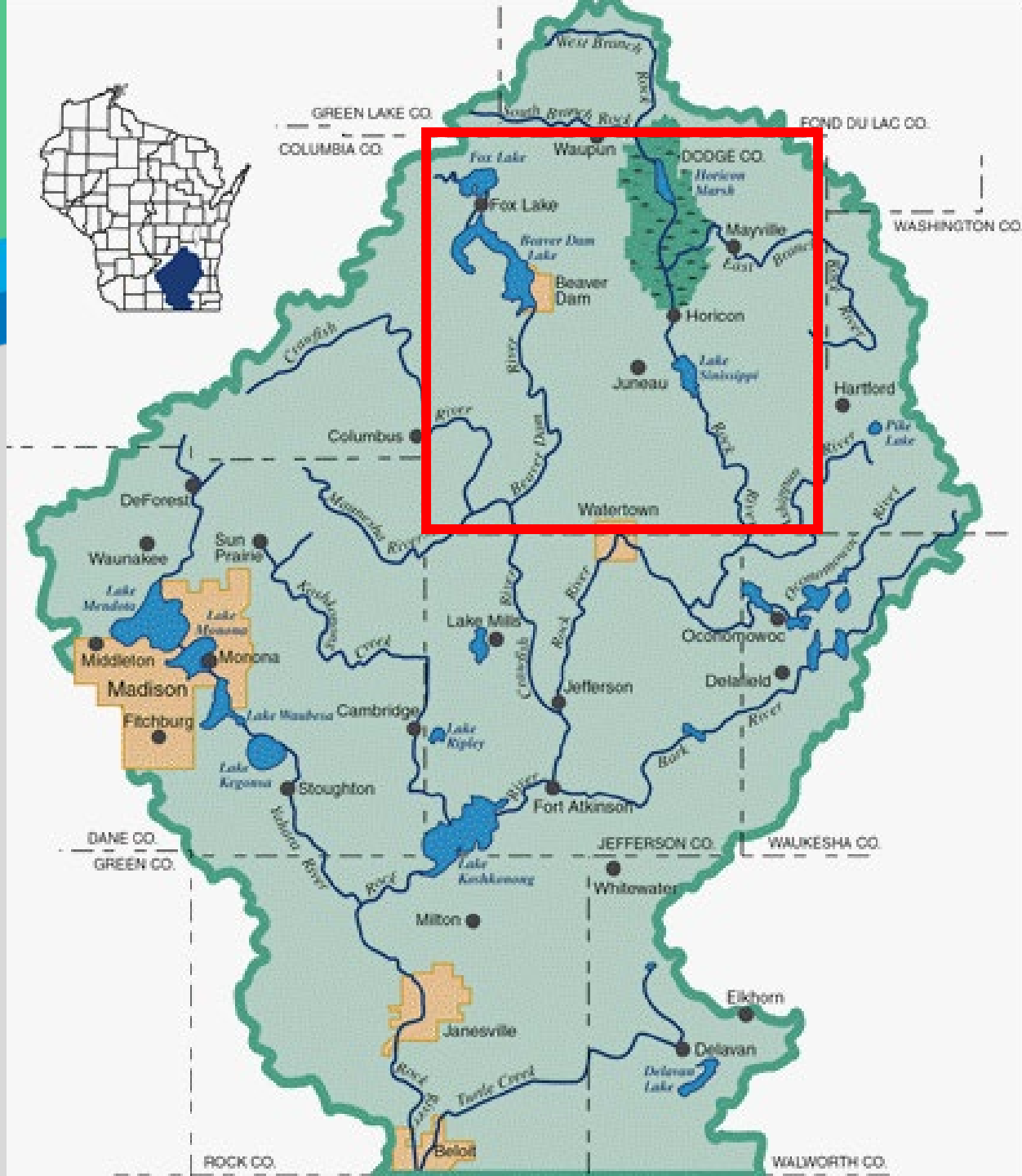
## R Shiny Data



# Data Use Example: Rock River Coalition

**Addie Schlussel**
Rock River Coalition
*Stream Monitoring and AIS Program Coordinator*
addie@rockrivercoalition.org

**Volunteers are collecting baseline data for three different Nine Key Element Watershed Plans in Dodge County**

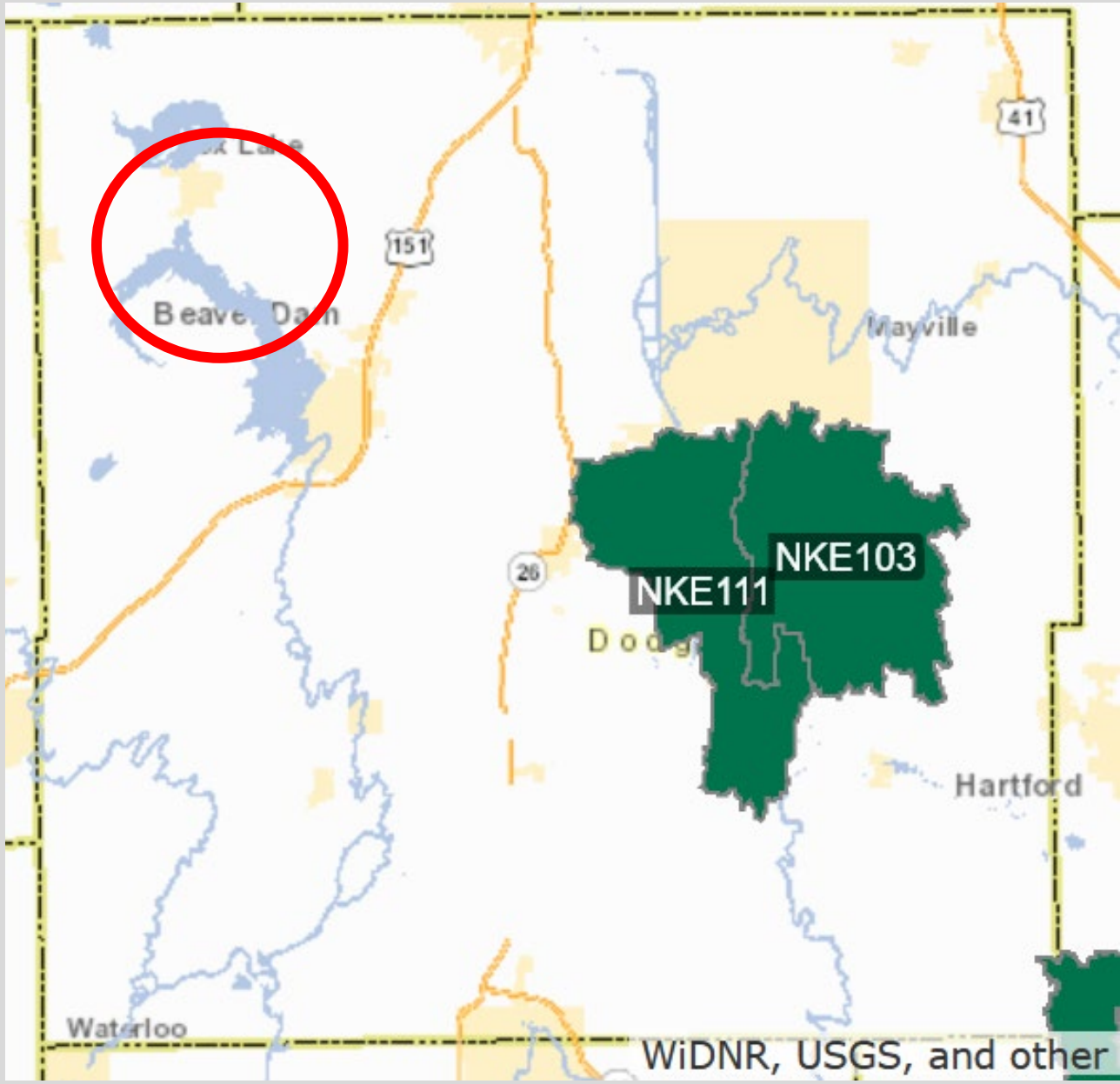


## Fox Lake 9KE Plan Development:

- Using targeting volunteer sampling to learn about the sources of phosphorus entering the lake.

  *How much phosphorus is coming from each of Fox Lake's major tributaries?*

- Existing data is nearly 20 years old



# Data Use Example: Friends of Stony Brook

Friends of Stony Brook

**www.friendsofstonybrook.org**

*"Recent efforts to assess the stream have indicated that water quality is sufficient for trout survival. Water Action Volunteers (WAV) monitoring protocols have documented an abundance of food in the form of macro invertebrates, and adequate water temperatures, clarity, and flow."*

- *Thermistors*
- *6 years of volunteer baseline monitoring*

**Email Us:**
wav@extension.wisc.edu

**Call us:**
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**Learn more and sign up for our monthly newsletter at:**
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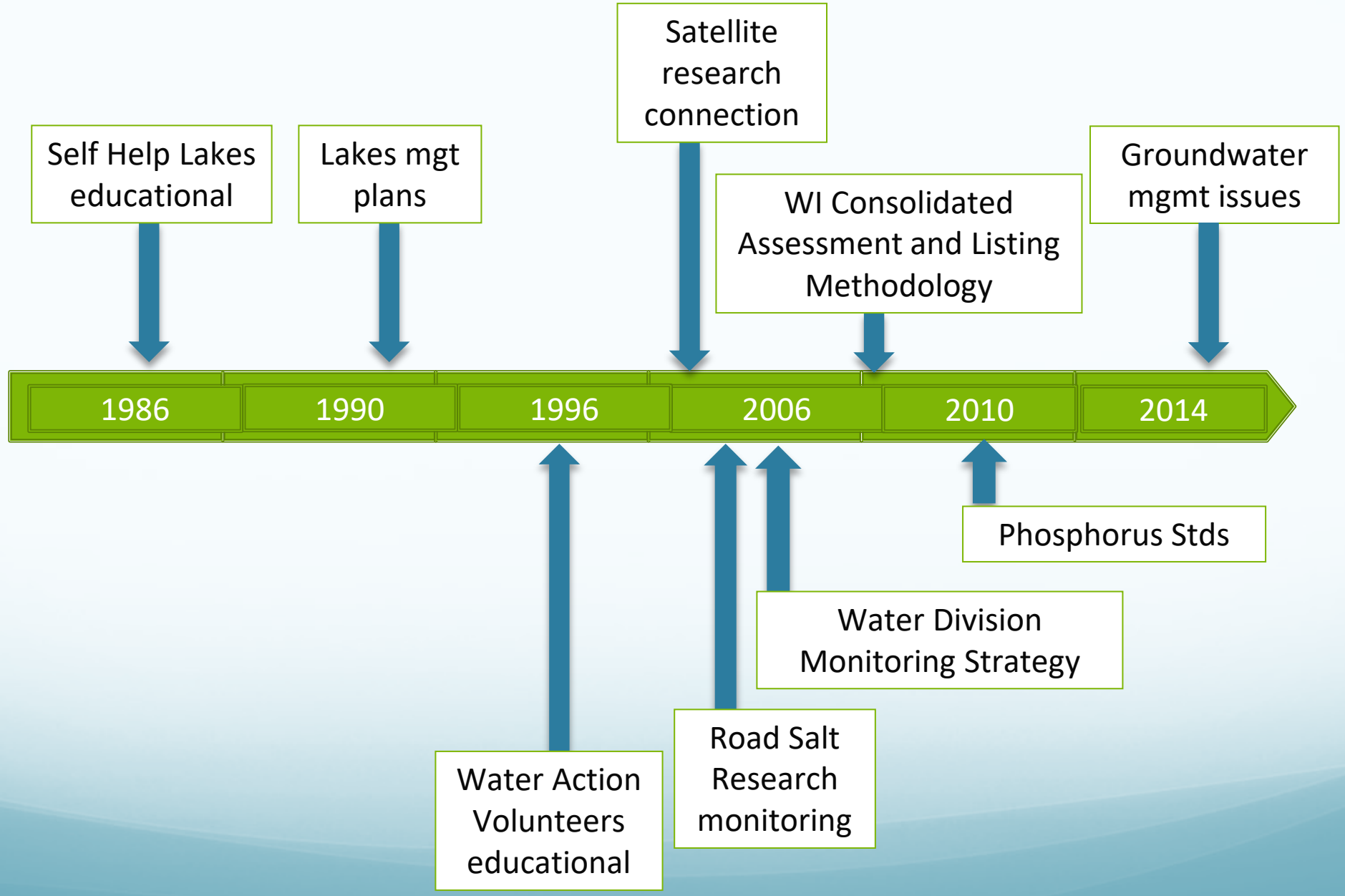
# Evolution of Volunteer Data Uses



# Volunteer Data Provides Answers:

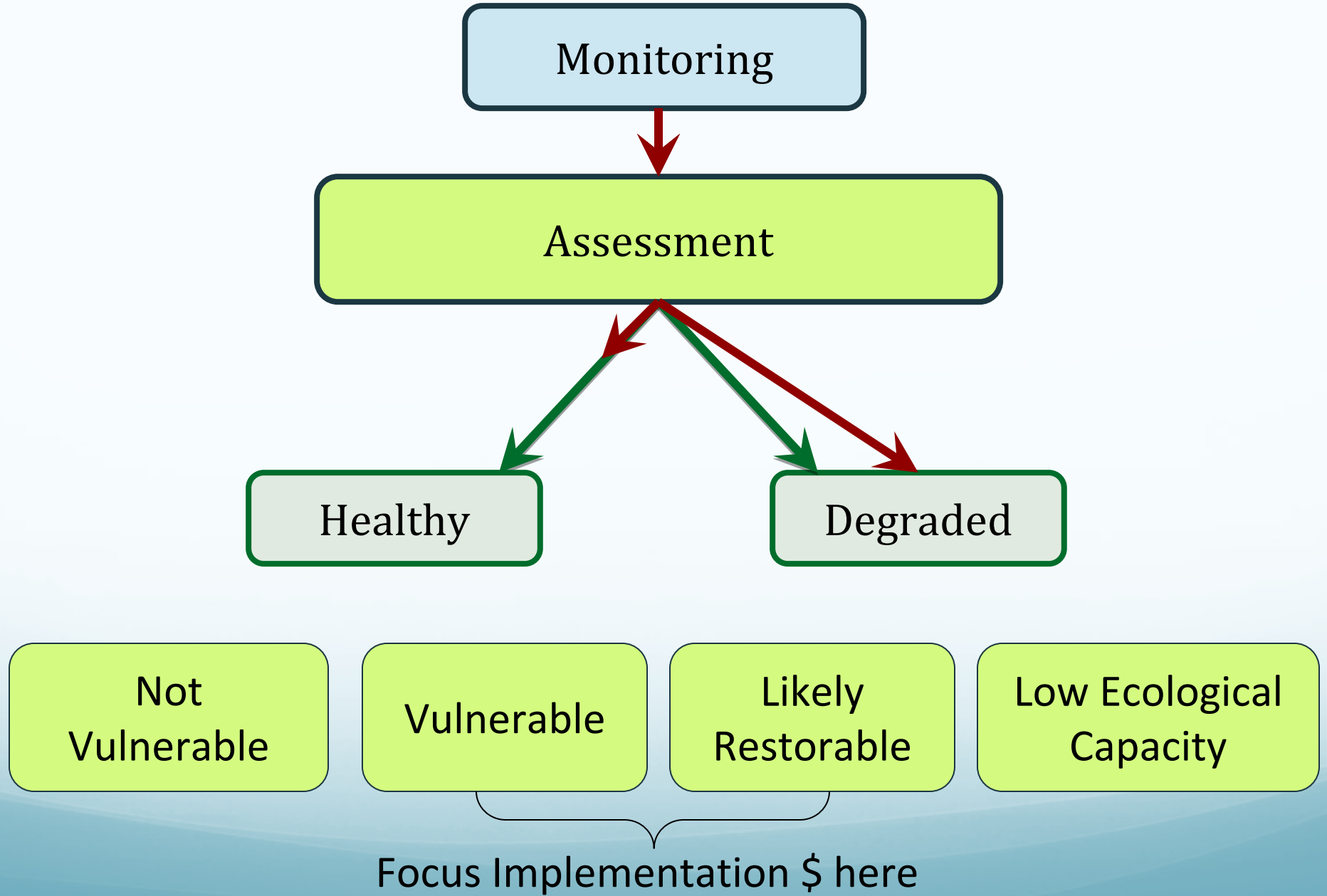
- Clean Water Act
  - How healthy are Wisconsin lakes and streams?
- Policy
  - What standards will provide good water quality?
- Management
  - How can we better manage our surface waters?
- Research
  - How are lakes and streams changing over time?

# Clean Water Act Goals





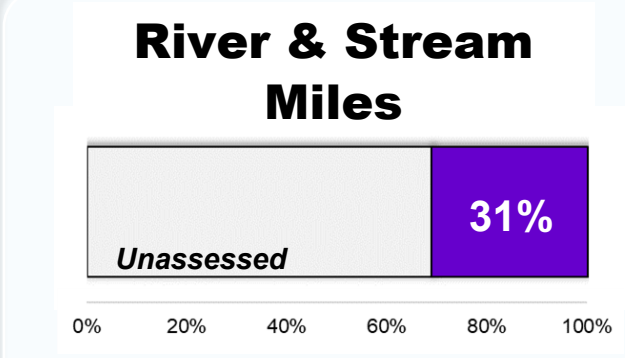

# Implementing the Clean Water Act

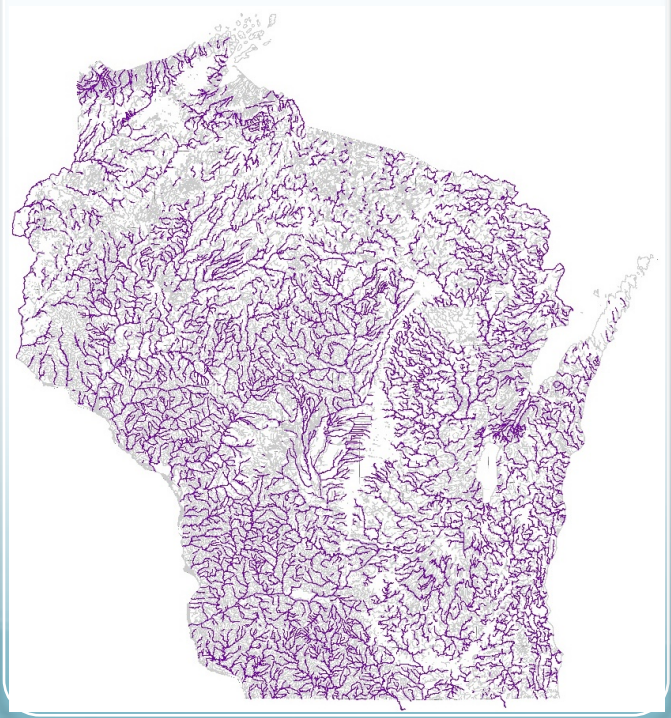


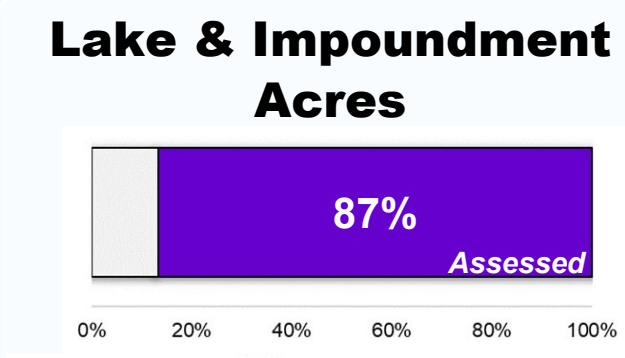
# Use of Volunteer Data for CWA Assessments

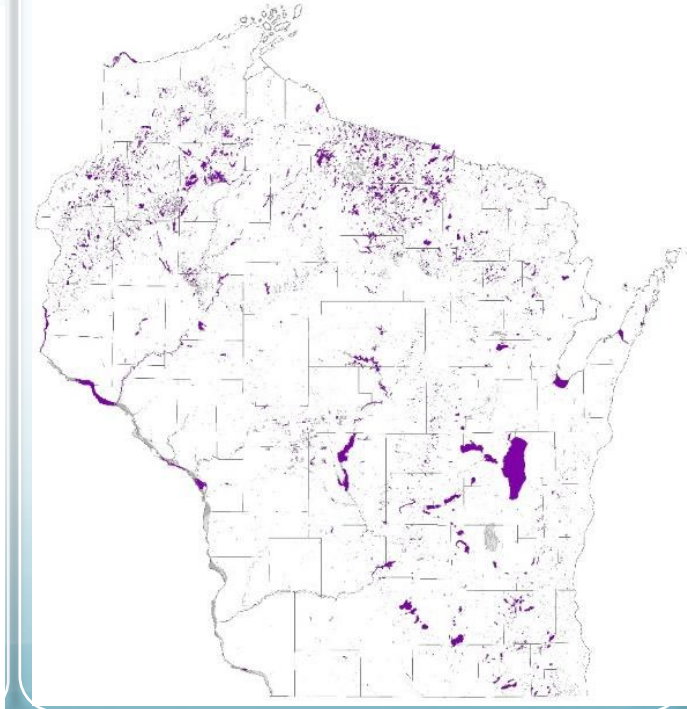

- WDNR data in SWIMS
  - Chemistry data collected by staff, CLMN and WAV volunteers, and grant recipients go to the State Lab of Hygiene (SLOH), which sends its data to the SWIMS database through the Laboratory Data Entry System (LDES).
- Public data
  - Public data were gathered and considered for use in assessments through an active data solicitation process – data must meet specified requirements

# 2022 Integrated Reporting

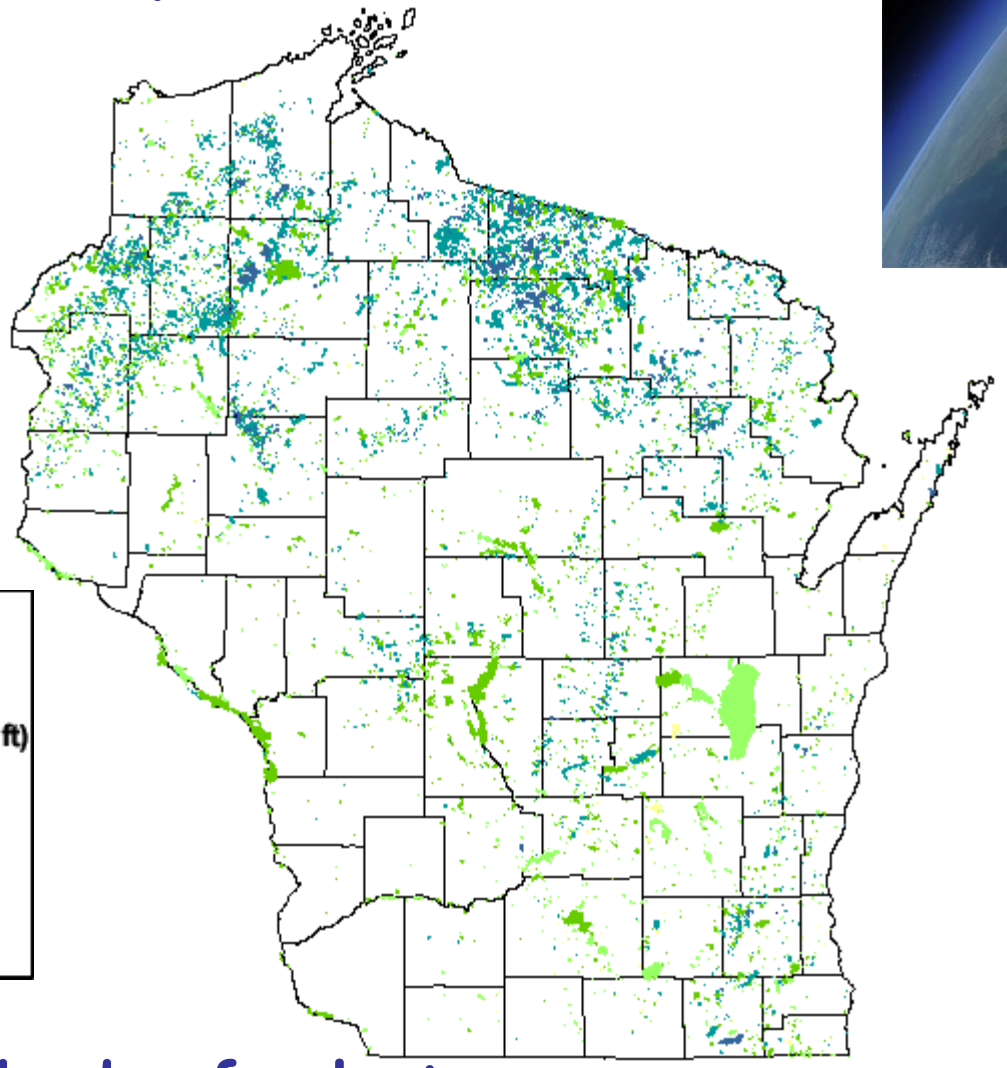




# Wisconsin Lake Clarity – Trophic State From Space

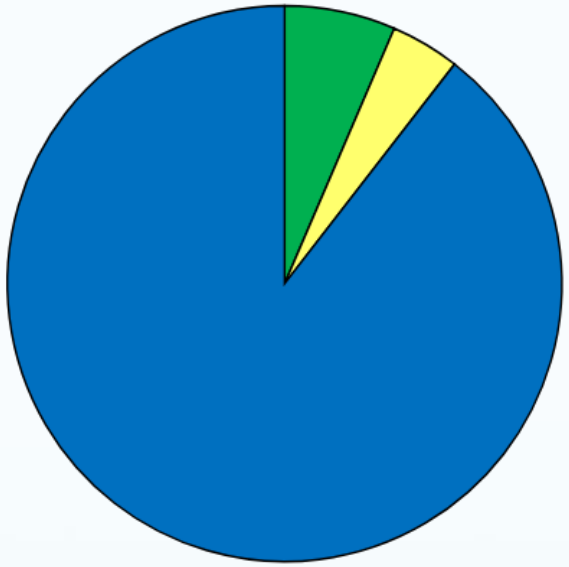


| Trophic State Index | Estimated Secchi Depth |
|---|---|
| > 80 | < 0.25 m (< 0.8 ft) |
| 70 to 80 | 0.25 - 0.5 m (0.8 - 1.6 ft) |
| 60 to 70 | 0.5 - 1 m (1.6 - 3.3 ft) |
| 50 to 60 | 1 - 2 m (3.3 - 6.6 ft) |
| 40 to 50 | 2 - 4 m (6.6 - 13.1 ft) |
| 30 to 40 | 4 - 8 m (13.1 - 26.2 ft) |
| < 30 | > 8 m (> 26.2 ft) |

Ground-truthed by hundreds of volunteers

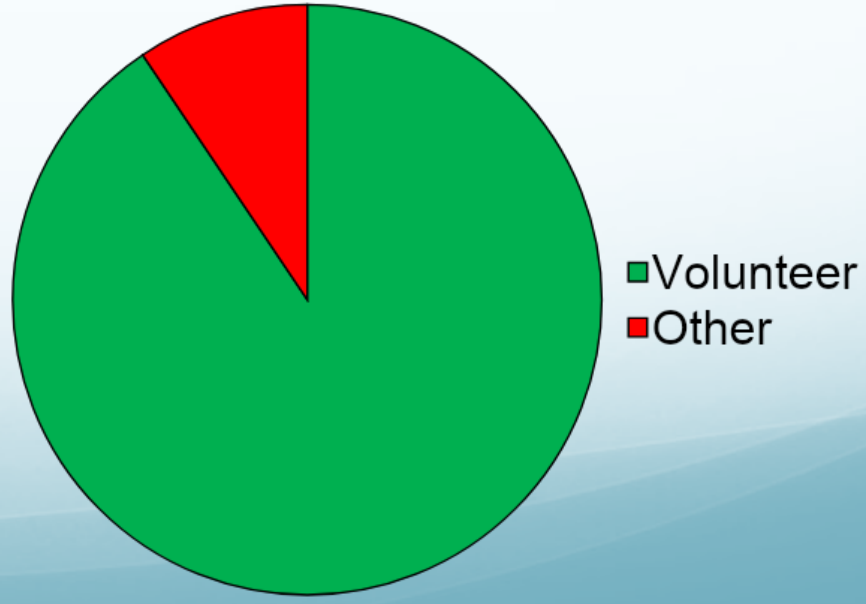
We generate annual estimates for >8000 lakes

# Volunteers collect majority of data for lakes




Secchi Depth


Chlorophyll a



# 2022 Integrated Reporting

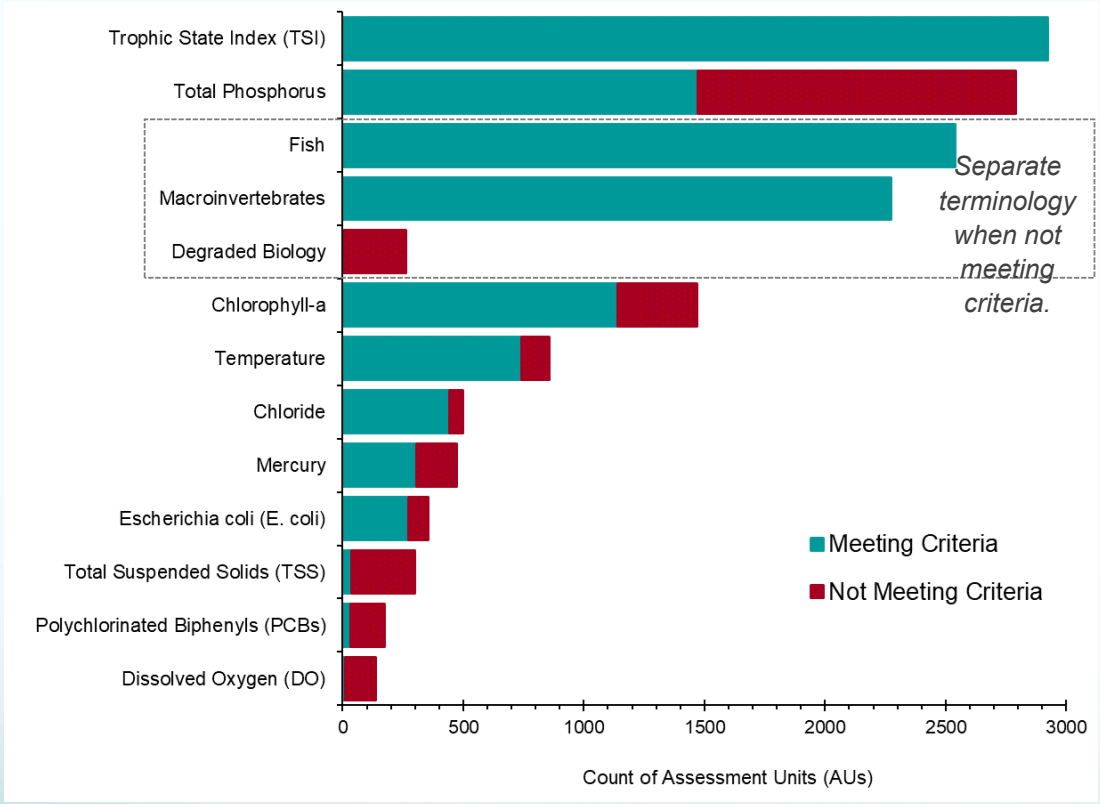



*Figure 2. The most assessed parameters by count of assessment units (AU); only showing those with more than 100 AUs.*

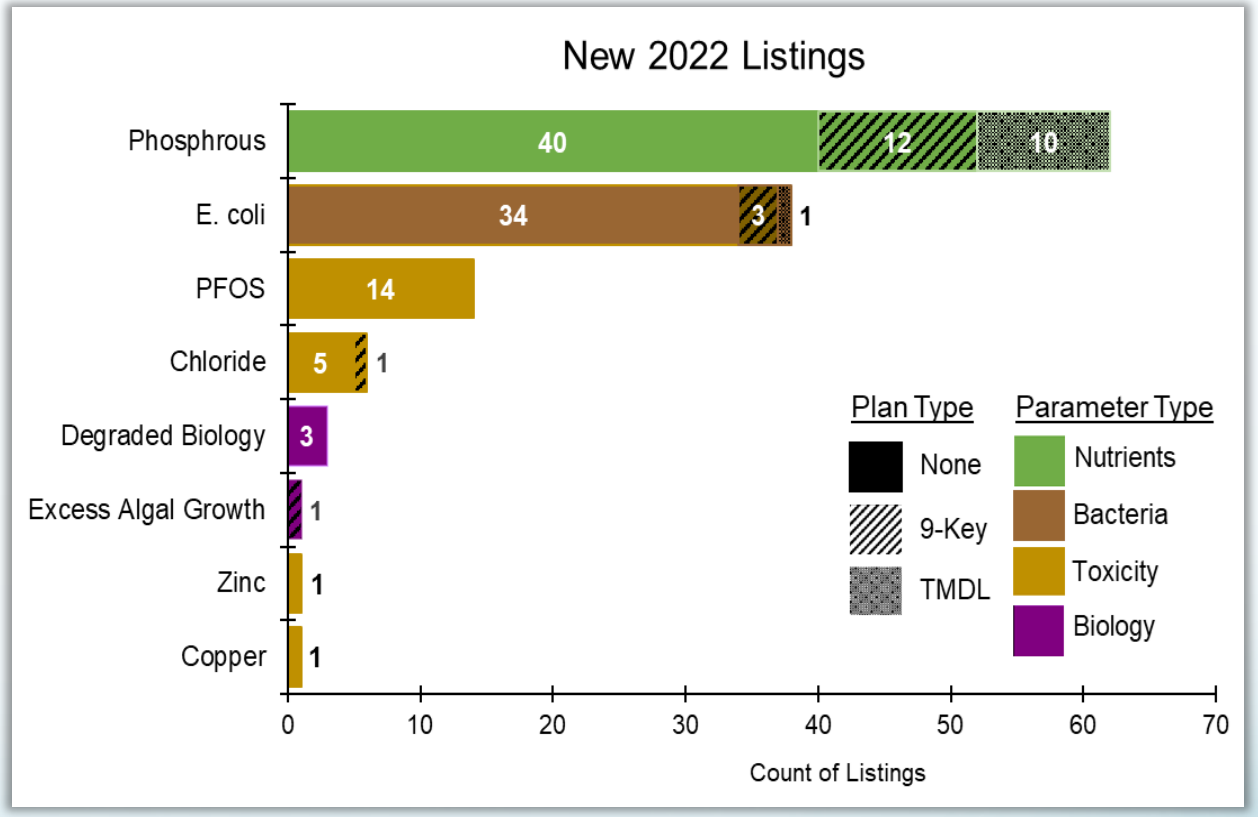



*Figure 10. Number of new listings by parameter with available plan type applied.*

# Lake Wissota Stewardship Project

- Led by Chippewa County Land Conservation & Forest Management Committee (LCFM) and the Lake Wissota Improvement & Protection Association (LWIPA).
- Monitoring data were collected by volunteers in the Water Action Volunteers (WAV) and Citizen Lake Monitoring Network (CLMN) programs
- Two 9-Key Element Watershed plans were created based on collected data
- The plans and data collection establish a baseline of current conditions for evaluation of future BMP effectiveness.

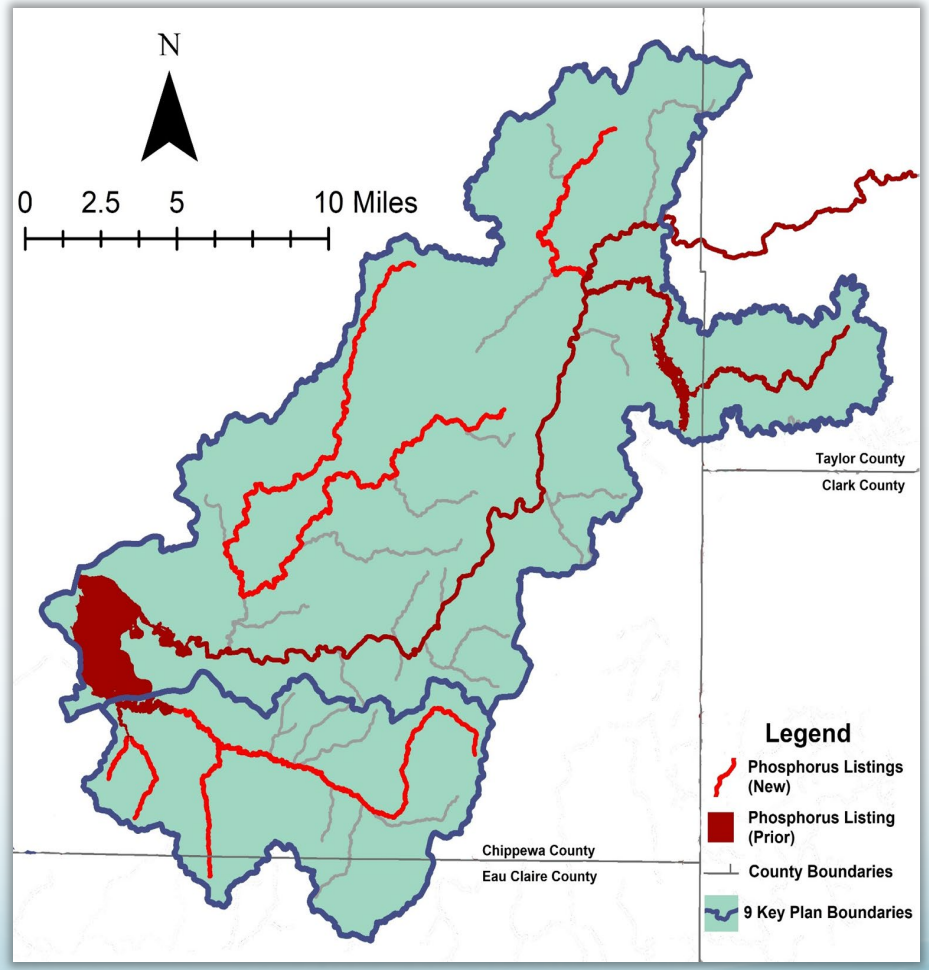
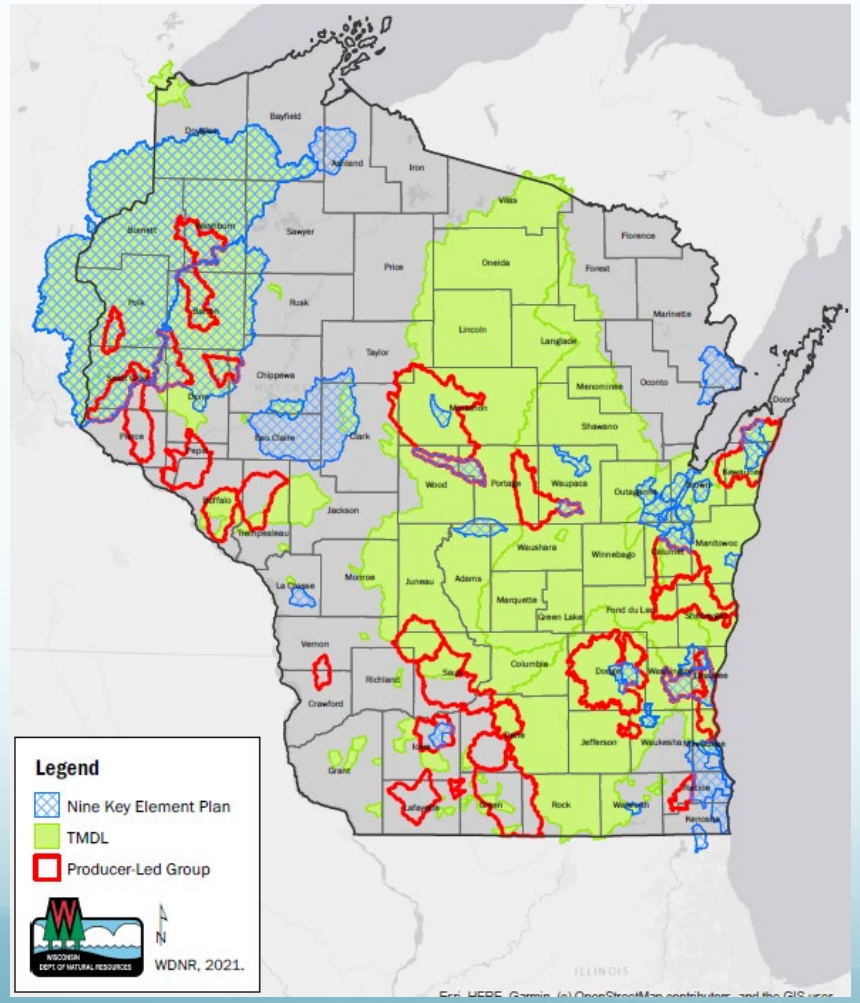
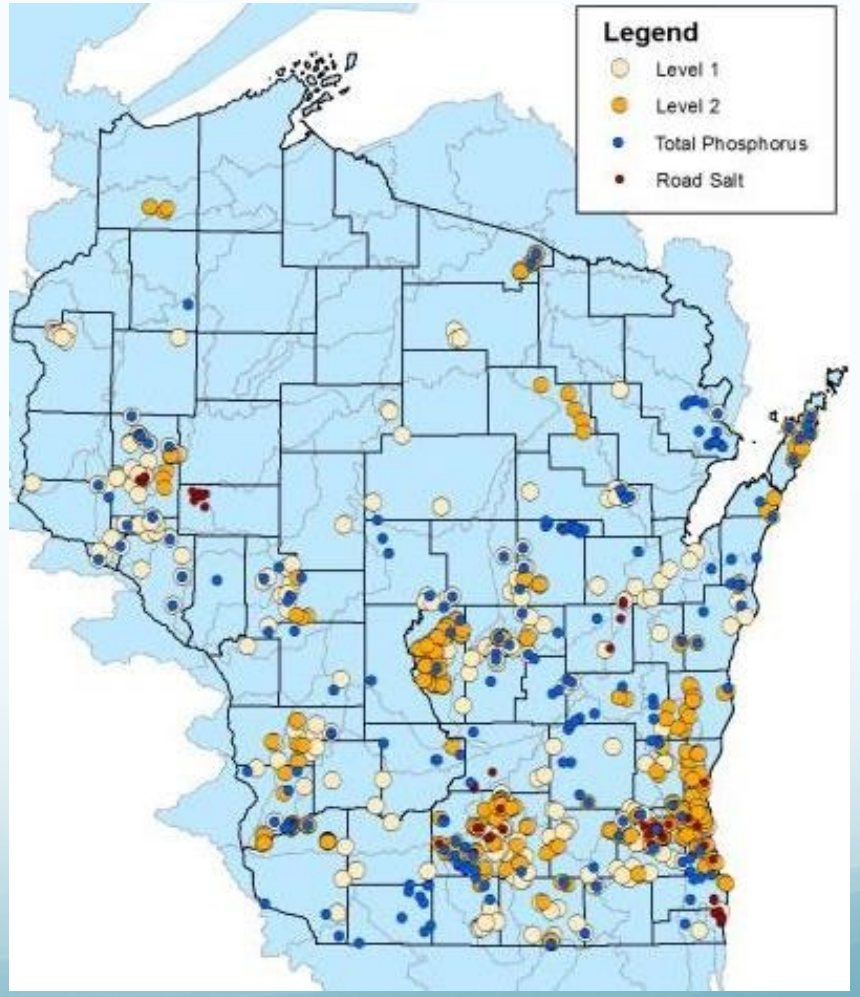



*Figure 11. Stream segments added for phosphorus in the Lake Wissota watershed.*

# Recruiting volunteers in 9KE and TMDL areas



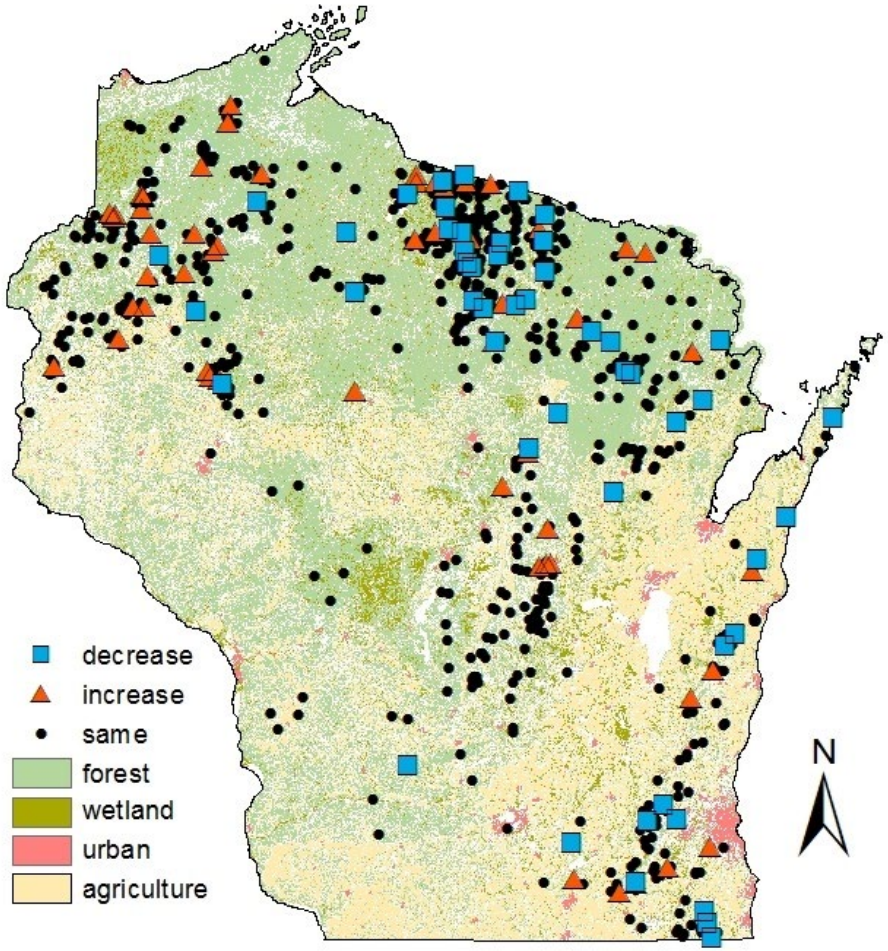
# Are we making a difference?

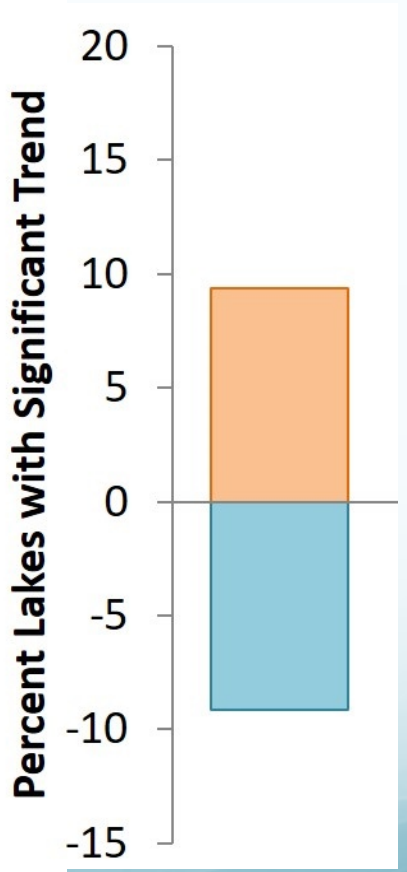
- Adaptive Management
- Nutrient Reduction Strategy
- Effectiveness of regulatory and implementation practices
- Slowing the spread of AIS
- Climate Adaptation

# Trends in Total Phosphorus

No significant phosphorus trend in most lakes.
Lakes with increasing or decreasing trends are dispersed across WI.

218,300 records
1,501 lakes
Data from 1968 - 2015
Up to 34 years of data on a single lake



# Volunteer Data Uses for Management

Key elements:

- Quality Assurance Project Plans for CLMN and WAV
- 10% QA checks
- Mandatory training for all volunteers
- EPA-approved methods
- Continued stable funding

# Volunteer Monitoring is Valuable

- Supports broader community networks in a short time period
- Generates credible data
  - Trophic status and lake clarity trends
  - Impaired waters listings – chloride and total phosphorus
  - Lake level and streamflow research
  - AIS early detection
- Results in outcomes that affect natural resource policies and civic engagement

# Partnerships Make it Happen!

- Wisconsin Department of Natural Resources and University of Wisconsin-Extension led
- Riparian landowners
- Non-profits
- School groups
- County staff
- Nature Centers
- Tribal partners
- Lake and watershed organizations
- University scientists
- Federal agencies

  (USGS, EPA, NRCS, etc)


Citizen Lake Monitoring Network Since 1986

Water Action Volunteers