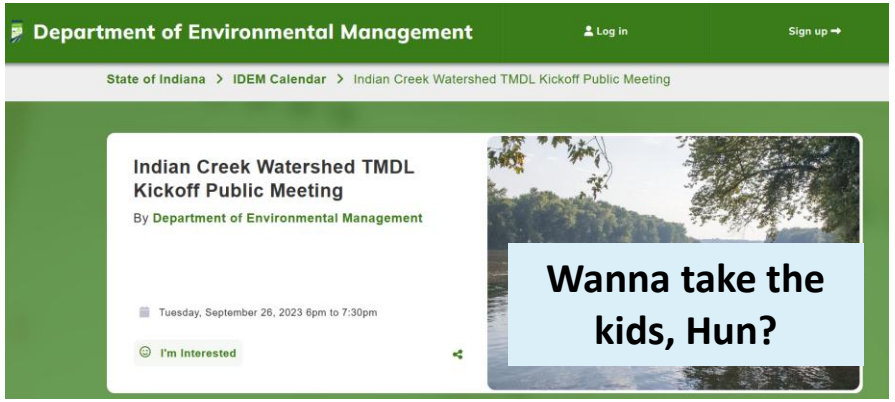
Making Water Talk

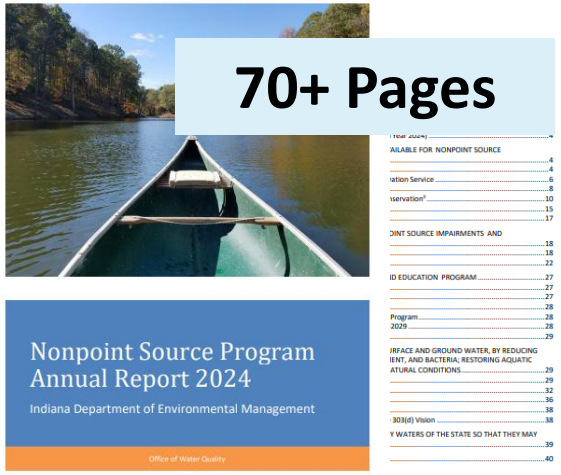
Creative, Technical, and Interactive Tools for Public Engagement

ACWA Annual Meeting
August 13, 2025

Caleb Rennaker
Indiana Department of Environmental Management

Communication Challenges





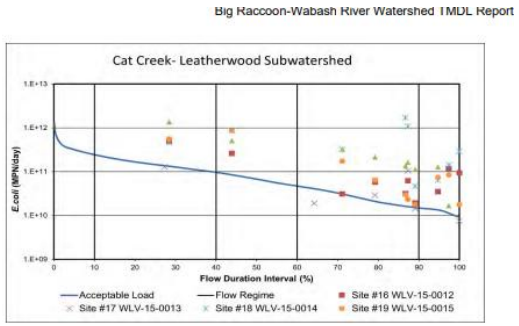
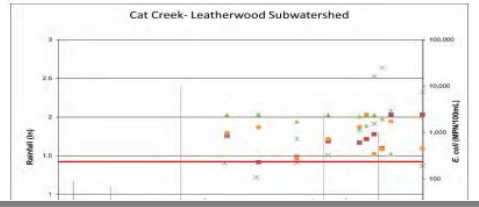


Figure 41: *E. coli* Load Duration Curve for Cat Creek Subwatershed



IDEM's 2024 Integrated Water Monitoring and Assessment Report Submittal, Including the 2024 303(d) List of Impaired Waters

- Indiana's 2024 Integrated Water Monitoring and Assessment Report to the U.S. EPA [PDF]
  - Appendix A: Integrated Report Tables [PDF]
  - Appendix B: Integrated Report Figures [PDF]
  - Appendix C: Metadata and Definitions [PDF]
  - Appendix D: Status of Category 4 Waters [PDF]
  - Appendix E: IDEM's Priority Ranking and 2024–2026 Schedule for Total M
  - Appendix F: IDEM's 305(b)/303(d) Monitoring, Assessment, Reporting, ar
  - Appendix G: IDEM's 2024 Consolidated Assessment and Listing Methodology [PDF]
  - Appendix H: Comprehensive Aquatic Life Use and Recreational Use Assessments [PDF]
  - Appendix I: Trend and Trophic Status of Indiana's Lakes
  - Appendix J: IDEM's Notice of Comment Period for the 2024 Draft 303(d) List [PDF]
  - Appendix K: IDEM's Responses to Comments on the Indiana Draft 2024 303(d) List of Impaired Waterbodies and Consolidated Assessment and Listing Methodology (CALM) [PDF]
    - U.S. EPA Comment File [XLS]
  - Appendix L: Listing Tables Including Indiana's Finalized 303(d) List of Impaired Waters (Category 5) for 2024 [XLS]
  - Appendix M: Indiana's 2024 Consolidated List (Categories 1–5) [XLS]

400+ Pages

TMDL *E. coli* Allocations (MPN/day)

Allocation Category Duration Interval (%)	High Flows 5%	Moist Conditions 25%	Mid-Range Flows 50%	Dry Conditions 75%	Low Flows 95%
LA	3.10E+11	1.44E+11	7.00E+10	2.72E+10	1.30E+10
WLA (Total)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MOS (10%)	3.64E+10	1.70E+10	8.24E+09	3.20E+09	1.53E+09
Future Growth (5%)	1.82E+10	8.49E+09	4.12E+09	1.60E+09	7.64E+08
Upstream Drainage Input	8.94E+12				3.75E+11
TMDL = LA+WLA+MOS	9.30E+12				3.90E+11

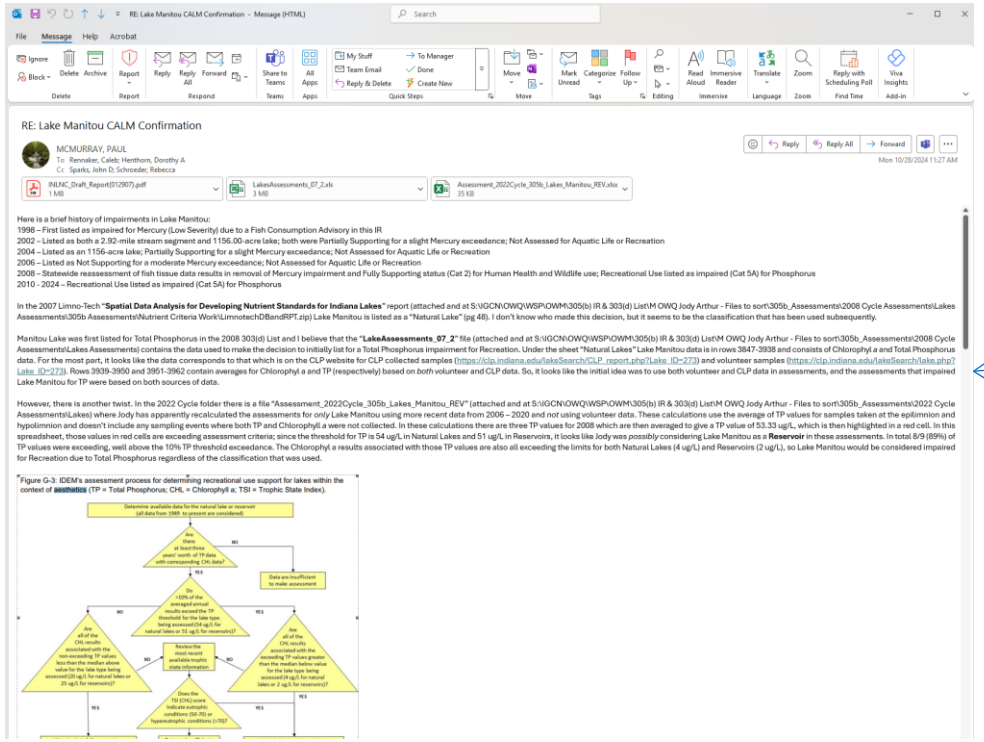
Allocation Category Duration Interval (%)	High Flows 5%				Low Flows 95%
LA	87.11	40.60	19.71	7.65	3.66
WLA (Total)	0.00	0.00	0.00	0.00	0.00
MOS (10%)	10.25	4.78	2.32	0.90	0.43
Future Growth (5%)	5.12	2.39	1.16	0.45	0.22
Upstream Drainage Input	2,515.09	1,172.10	569.12	220.88	105.54
TMDL = LA+WLA+MOS	2,617.58	1,219.86	592.31	229.88	109.84

Very Technical

Communication Challenges

How Do We Communicate as Scientists/Regulators

Question: For assessments, is this considered a natural lake or a reservoir?


RE: Lake Manitou CALM Confirmation

MCMURRAY, PAUL

Here is a brief history of impairments in Lake Manitou:
1998 – First listed as impaired for Mercury (Low Severity) due to a Fish Consumption Advisory in this IR
2002 – Listed as both a 2.92-mile stream segment and 1156.00-acre lake; both were Partially Supporting for a slight Mercury exceedance; Not Assessed for Aquatic Life or Recreation
2004 – Listed as an 1156-acre lake; Partially Supporting for a slight Mercury exceedance; Not Assessed for Aquatic Life or Recreation
2006 – Listed as Not Supporting for a moderate Mercury exceedance; Not Assessed for Aquatic Life or Recreation
2008 – Statewide reassessment of fish tissue data results in removal of Mercury impairment and Fully Supporting status (Cat 2) for Human Health and Wildlife use; Recreational Use listed as impaired (Cat 5A) for Phosphorus
2010 - 2024 – Recreational Use listed as impaired (Cat 5A) for Phosphorus

In the 2007 Limno-Tech "**Spatial Data Analysis for Developing Nutrient Standards for Indiana Lakes**" report (attached and at S:\IGCN\OWQ\WSP\OWM\305(b) IR & 303(d) List\M OWQ Jody Arthur - Files to sort\305b_Assessments\2008 Cycle Assessments\Lakes Assessments\305b Assessments\Nutrient Criteria Work\LimnotechDBandRPT.zip) Lake Manitou is listed as a "Natural Lake" (pg 48). I don't know who made this decision, but it seems to be the classification that has been used subsequently.

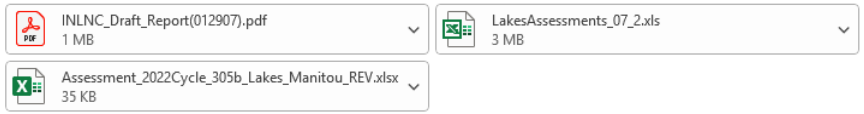
Manitou Lake was first listed for Total Phosphorus in the 2008 303(d) List and I believe that the "**LakeAssessments_07_2**" file (attached and at S:\IGCN\OWQ\WSP\OWM\305(b) IR & 303(d) List\M OWQ Jody Arthur - Files to sort\305b_Assessments\2008 Cycle Assessments\Lakes Assessments) contains the data used to make the decision to initially list for a Total Phosphorus impairment for Recreation. Under the sheet "Natural Lakes" Lake Manitou data is in rows 3847-3938 and consists of Chlorophyll *a* and Total Phosphorus data. For the most part, it looks like the data corresponds to that which is on the CLP website for CLP collected samples (https://clp.indiana.edu/lakeSearch/CLP_report.php?Lake_ID=273) and volunteer samples (https://clp.indiana.edu/lakeSearch/lake.php?Lake_ID=273). Rows 3939-3950 and 3951-3962 contain averages for Chlorophyll *a* and TP (respectively) based on *both* volunteer and CLP data. So, it looks like the initial idea was to use both volunteer and CLP data in assessments, and the assessments that impaired Lake Manitou for TP were based on both sources of data.

However, there is another twist. In the 2022 Cycle folder there is a file "Assessment_2022Cycle_305b_Lakes_Manitou_REV" (attached and at S:\IGCN\OWQ\WSP\OWM\305(b) IR & 303(d) List\M OWQ Jody Arthur - Files to sort\305b_Assessments\2022 Cycle Assessments\Lakes) where Jody has apparently recalculated the assessments for *only* Lake Manitou using more recent data from 2006 – 2020 and *not* using volunteer data. These calculations use the average of TP values for samples taken at the epilimnion and hypolimnion and doesn't include any sampling events where both TP and Chlorophyll *a* were not collected. In these calculations there are three TP values for 2008 which are then averaged to give a TP value of 53.33 ug/L, which is then highlighted in a red cell. In this spreadsheet, those values in red cells are exceeding assessment criteria; since the threshold for TP is 54 ug/L in Natural Lakes and 51 ug/L in Reservoirs, it looks like Jody was *possibly* considering Lake Manitou as a **Reservoir** in these assessments. In total 8/9 (89%) of TP values were exceeding, well above the 10% TP threshold exceedance. The Chlorophyl *a* results associated with those TP values are also all exceeding the limits for both Natural Lakes (4 ug/L) and Reservoirs (2 ug/L), so Lake Manitou would be considered impaired for Recreation due to Total Phosphorus regardless of the classification that was used.

Figure G-3: IDEM's assessment process for determining recreational use support for lakes within the context of aesthetics (TP = Total Phosphorus; CHL = Chlorophyll a; TSI = Trophic State Index).

Answer:

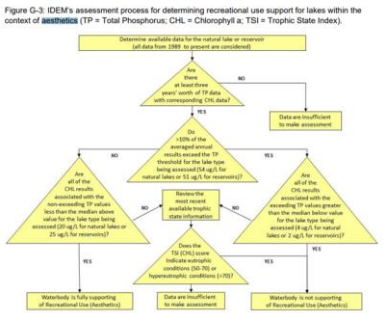
Reports/Spreadsheets



Technical Jargon

However, there is another twist. In the 2022 Cycle folder there is a file "Assessment_2022Cycle_305b_Lakes_Manitou_REV" (attached and at S:\IGCN\OWQ\WSP\OWM\305(b) IR & 303(d) List\M OWQ Jody Arthur - Files to sort\305b_Assessments\2022 Cycle Assessments\Lakes) where Jody has apparently recalculated the assessments for *only* Lake Manitou using more recent data from 2006 – 2020 and *not* using volunteer data. These calculations use the average of TP values for samples taken at the epilimnion and hypolimnion and doesn't include any sampling events where both TP and Chlorophyll *a* were not collected. In these calculations there are three TP values for 2008 which are then averaged to give a TP value of 53.33 ug/L, which is then highlighted in a red cell. In this spreadsheet, those values in red cells are exceeding assessment criteria; since the threshold for TP is 54 ug/L in Natural Lakes and 51 ug/L in Reservoirs, it looks like Jody was *possibly* considering Lake Manitou as a **Reservoir** in these assessments. In total 8/9 (89%) of TP values were exceeding, well above the 10% TP threshold exceedance. The Chlorophyl a results associated with those TP values are also all exceeding the limits for both Natural Lakes (4 ug/L) and Reservoirs (2 ug/L), so Lake Manitou would be considered impaired for Recreation due to Total Phosphorus regardless of the classification that was used.

Complex Charts/Tables



How Can We Improve Our Communication Strategies

Tools for Every Skill Level

We are constantly limited by staff resources and those staff are limited by their skills and abilities

We need to match skills with the right tools

Tool/Strategy	Technical Need	Creativity Need
Artificial Intelligence (AI)	Low	Medium
GIS Based Tools	Medium to High	Low
GIS Based Story Telling Tools	Medium	Medium

Using Artificial Intelligence

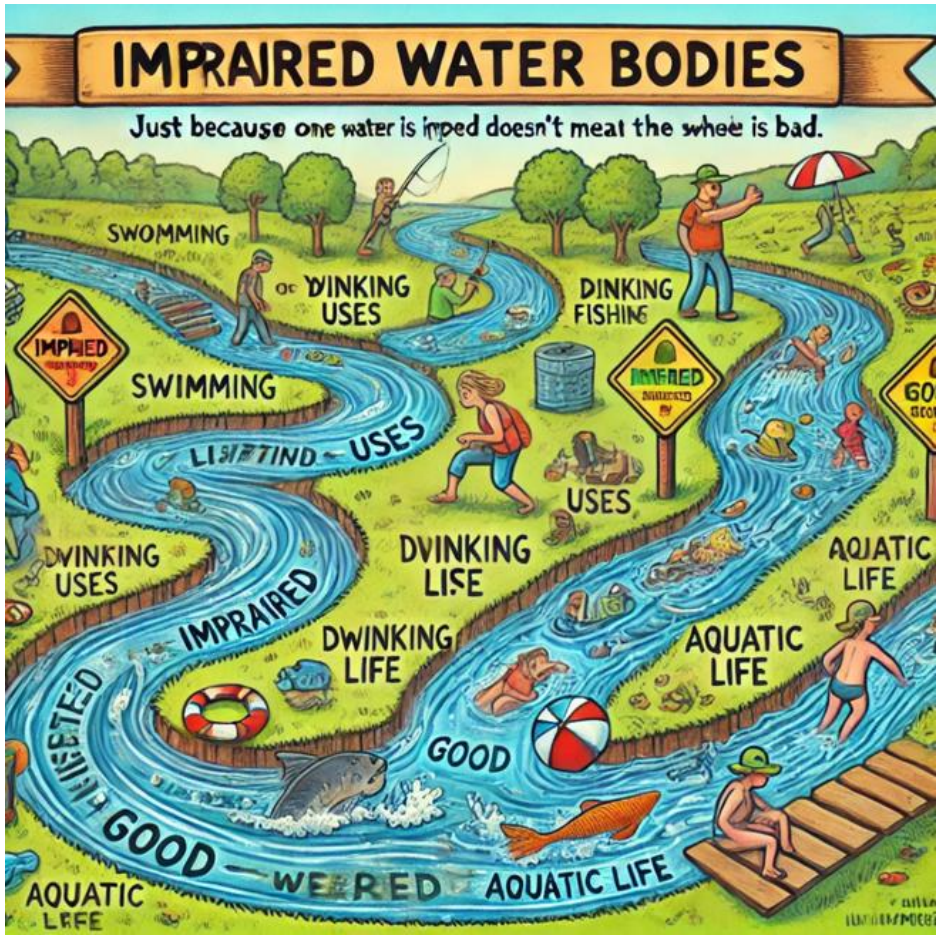
Great for staff who are creative without needing to be highly technical

Great for:

- Developing custom graphics
- Drafting narratives
- Creative feedback
- Readily available tools
  - *ChatGPT, MS Copilot, Claude, etc.*

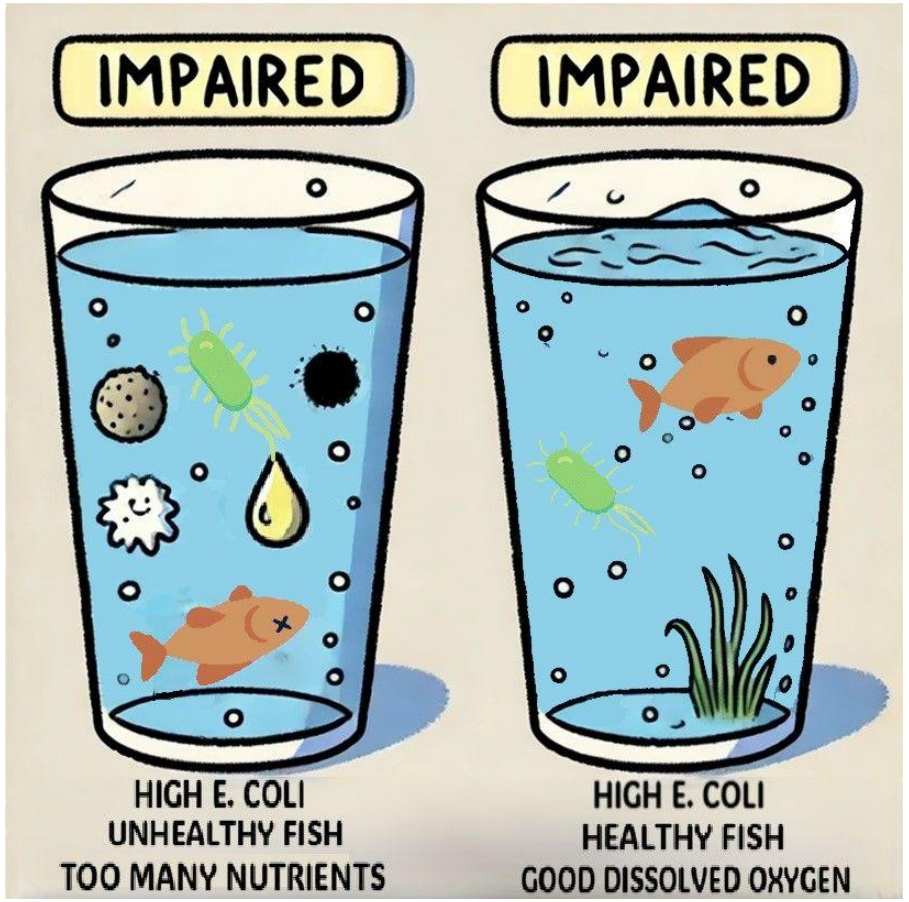
Potential Shortfalls:

- Graphic Components
- Robotic Narratives
- Best With Clear Directives


IMPRAIRED WATER BODIES
Just because one water is imped doesn't meat the whee is bad.
SWOMMING
DINKING USES
DINKING FISHING
SWIMMING
USES
DVINKING USES
IMPRAIRED
DVINKING LIFE
AQUATIC LIFE
DWINKING LIFE
AQUATIC LIFE
GOOD
GOOD
AQUATIC LIFE
AQUATIC LIFE


TMDL
TOTAL MAXIMUM DAILY LOAD
STAY WITHIN LIMITS!
STAY LUDGET
POLLUTION
STAY WITHIN LIMITS!
POLLUTION LUDGET!

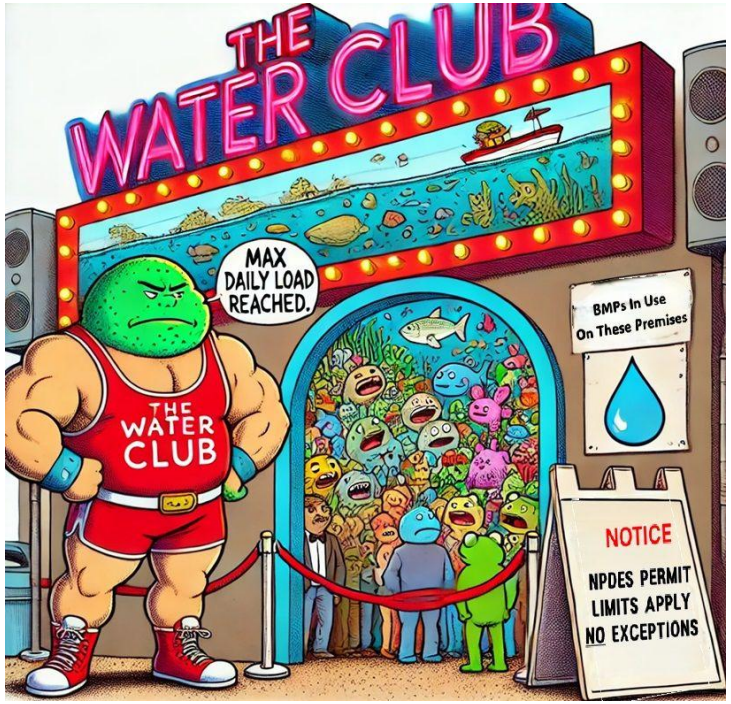

IMPRAIRED
IMPRAIRED
IMPRAIRED
IMPRAIRED
FUGLE · FOAM
POLLUTENT · FOAM
MURDANESS, · OLDANESY
OIL SHEEN · ALGAGE
IMBO


IMPAIRED
IMPAIRED
HIGH E. COLI
UNHEALTHY FISH
TOO MANY NUTRIENTS
HIGH E. COLI
HEALTHY FISH
GOOD DISSOLVED OXYGEN

Only Limited By Your Own Creativity

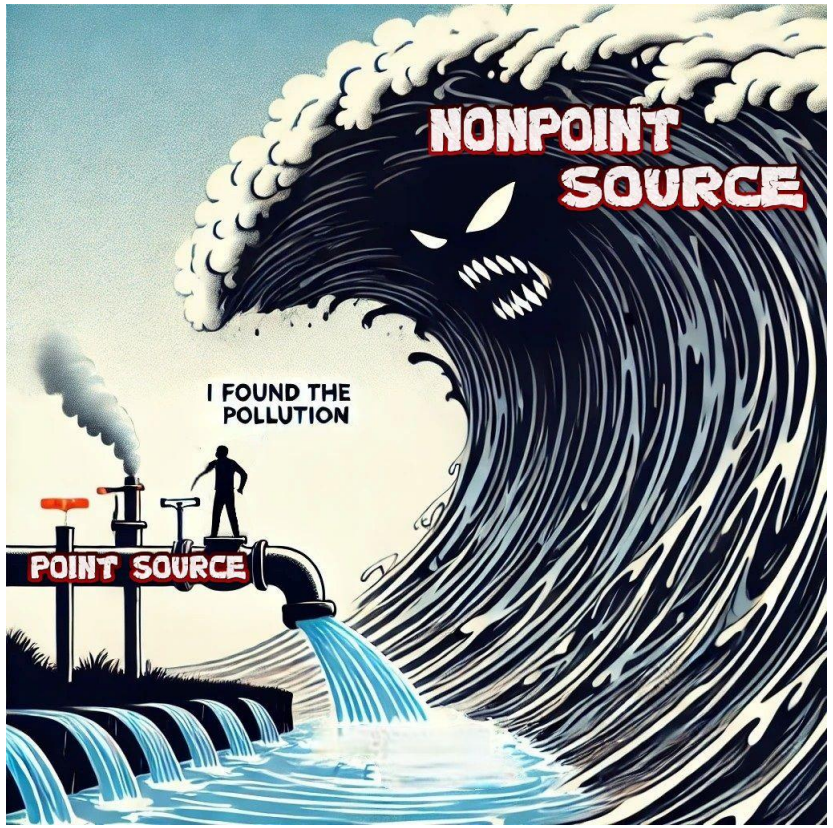
Industrial Stormwater

Construction Stormwater

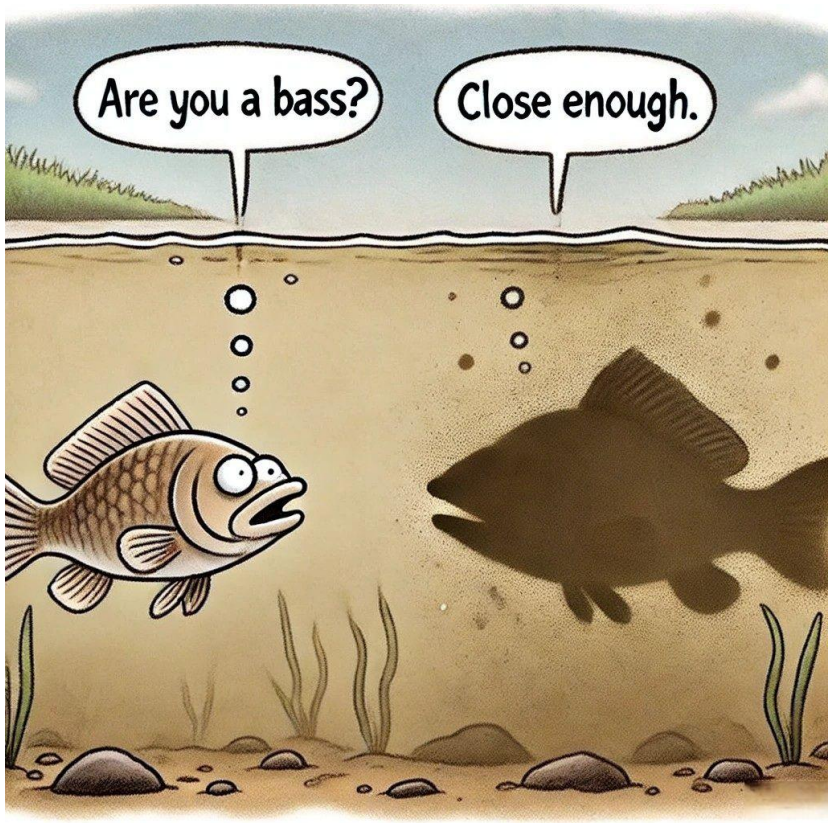


Total Maximum Daily Loads

Only Limited By Your Own Creativity



NPS Pollution Magnitude



Fish Hybridization & Visibility

Context for Indiana Water

Using GIS Based Tools

Better suited for med/high technical skills with lower creative needs

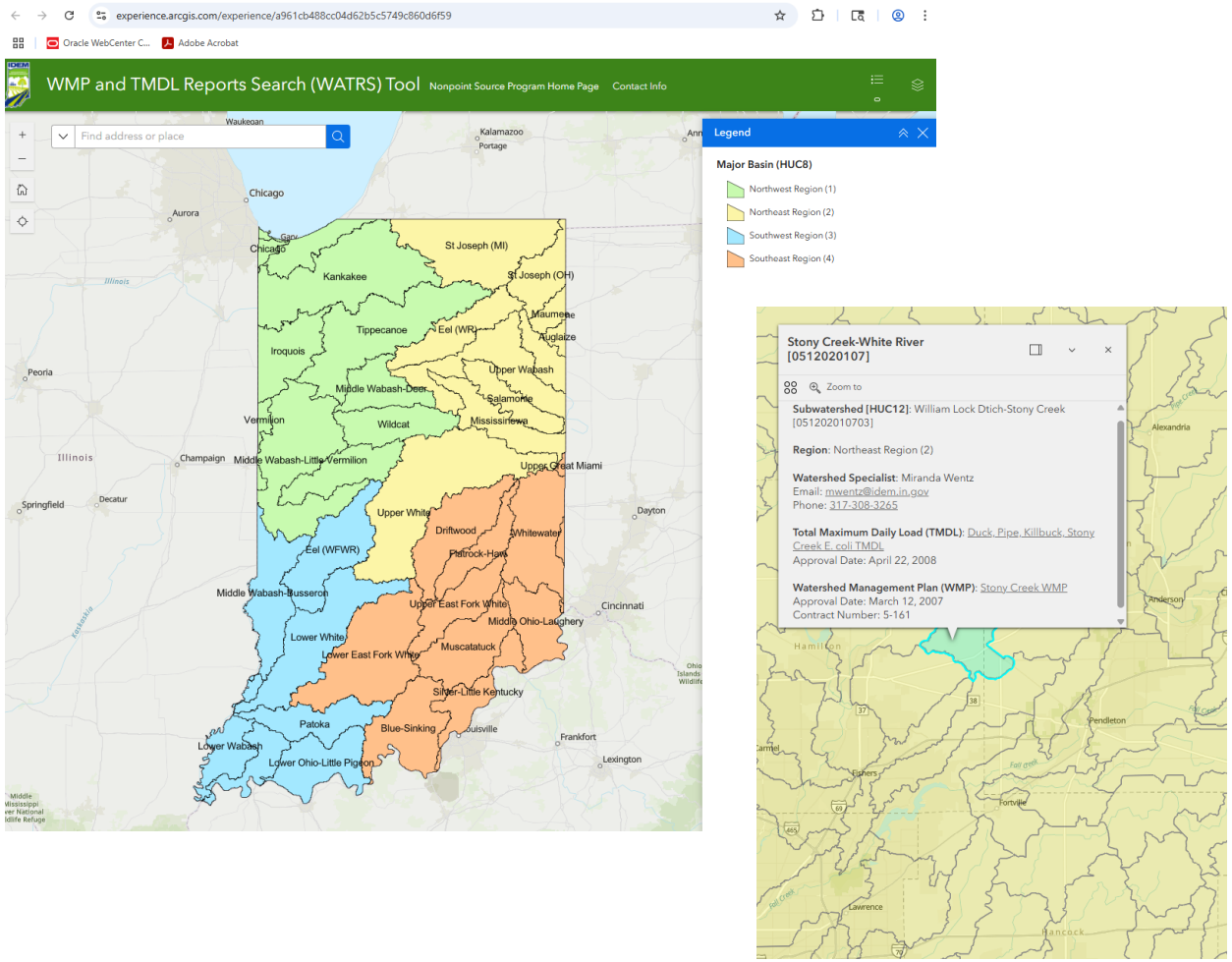
Great for:

- Spatial communication
- Interactivity
- Communicating complex information

Potential Shortfalls:

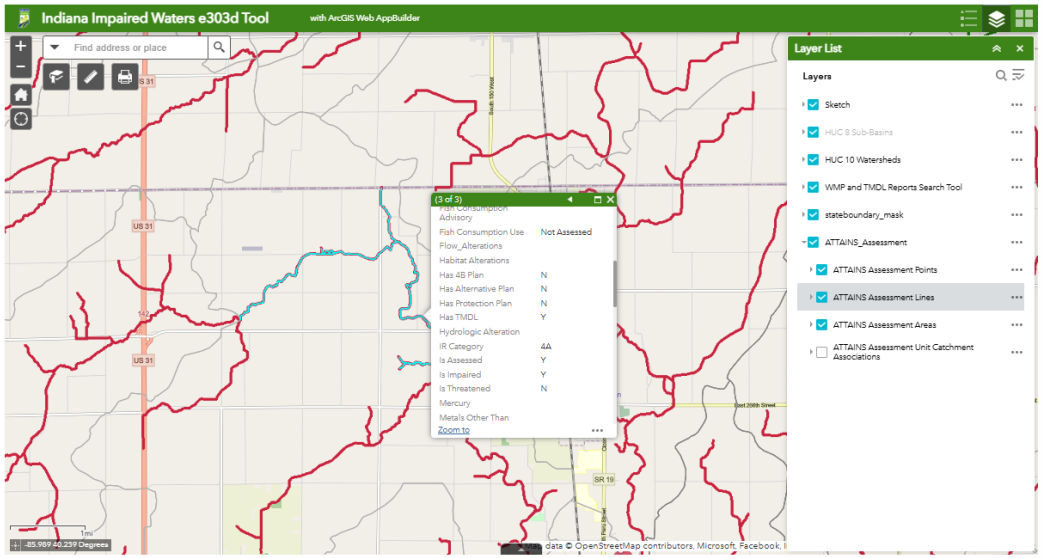
- Technical maintenance
- Ability to host, software
- Functionality for the public

WATRS Tool

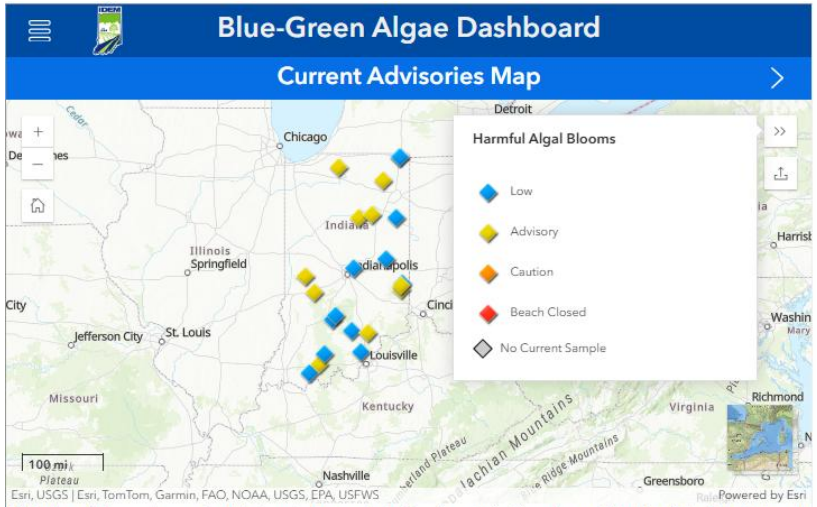


Indiana e303(d) Tool

Online e303d Tool



Cyanobacteria Dashboard for Indiana Lakes



Disclaimer: This map does not include beach closures due to *E. coli* contamination, please visit Indiana State Park Alerts and BeachAlert Map for *E. coli* closures. Harmful algal blooms may be present in waterbodies and not on this map. Please use discretion when swimming in Indiana waters and view our Identify Harmful Algal Blooms page.

What do the Diamonds Mean:

Blue: Low Risk for blue-green algae
- Don't drink the water. Shower with soap after being in the lake.
- Cell count and toxin concentrations are below thresholds.
- The beach will be sampled monthly.

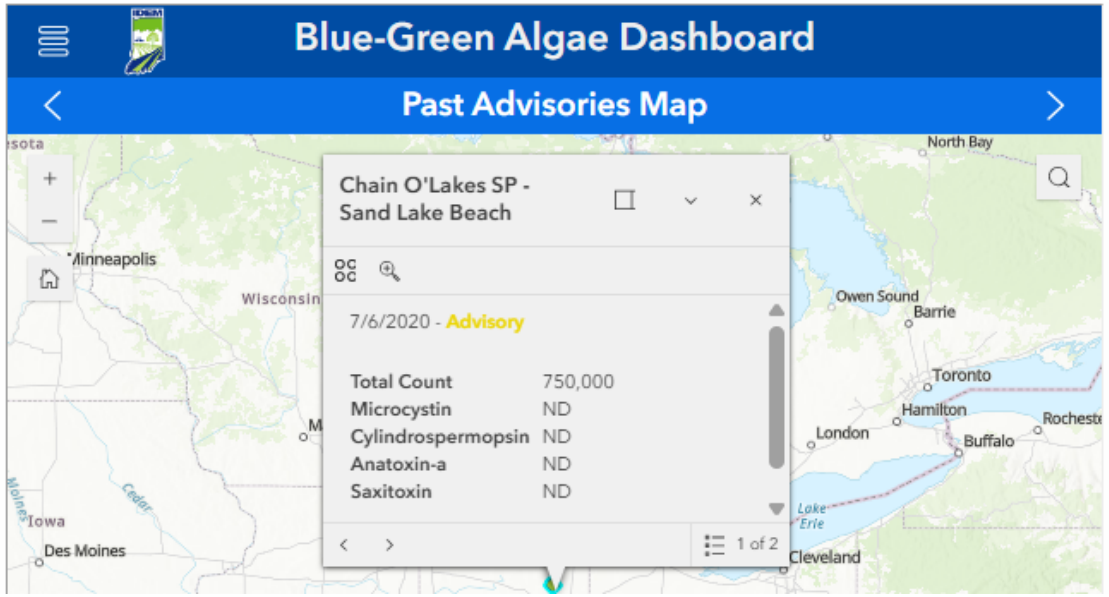
Yellow: Advisory for blue-green algae
- Swimming and boating permitted. In addition to cautions above, avoid contact with algae. Do not use lake water for cooking or bathing. Do not allow pets to swim in or drink water where algae are present.
- Cell count is above 100,000 cells/ml and toxin concentrations are below thresholds.
- The beach will be sampled biweekly.

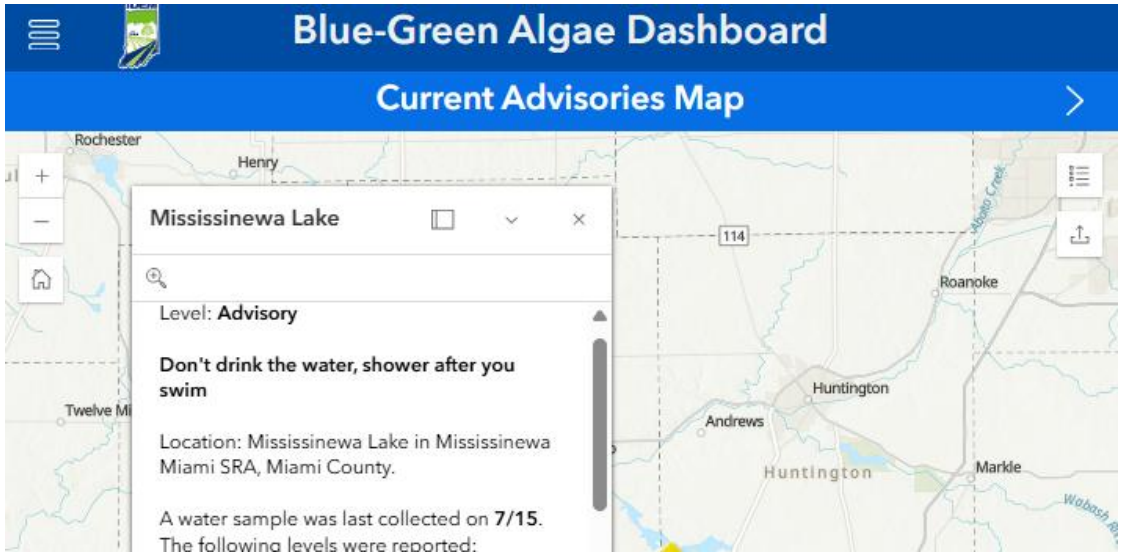
Orange: Caution for high levels of blue-green algal toxins
- Swimming and wading are not recommended.
- Toxin concentrations are above thresholds.
- The beach will be sampled weekly.

Red: NO SWIMMING due to high levels of blue-green algal toxins
- Toxin concentrations are elevated above thresholds.
- The beach will be sampled weekly.

Toxin Exposure Thresholds				
Exposure Reference Values (µg/L)	Microcystin	Cylindrospermopsin	Anatoxin-a	Saxitoxin
Human Recreation Advisory	8	6	8	0.8
Dog Recreation Advisory	0.4	0.5	–	–
Dog Recreation Prohibited	0.8	1.0	0.4	0.05

Note: Dogs are not permitted to swim at Indiana State Park beaches except for the dog park lake at Fort Harrison State Park. The dog park lake is tested by IDEM, and the dog recreation thresholds will apply.





Using GIS Story Based Tools

Good for those with medium levels of creativity and technical skills

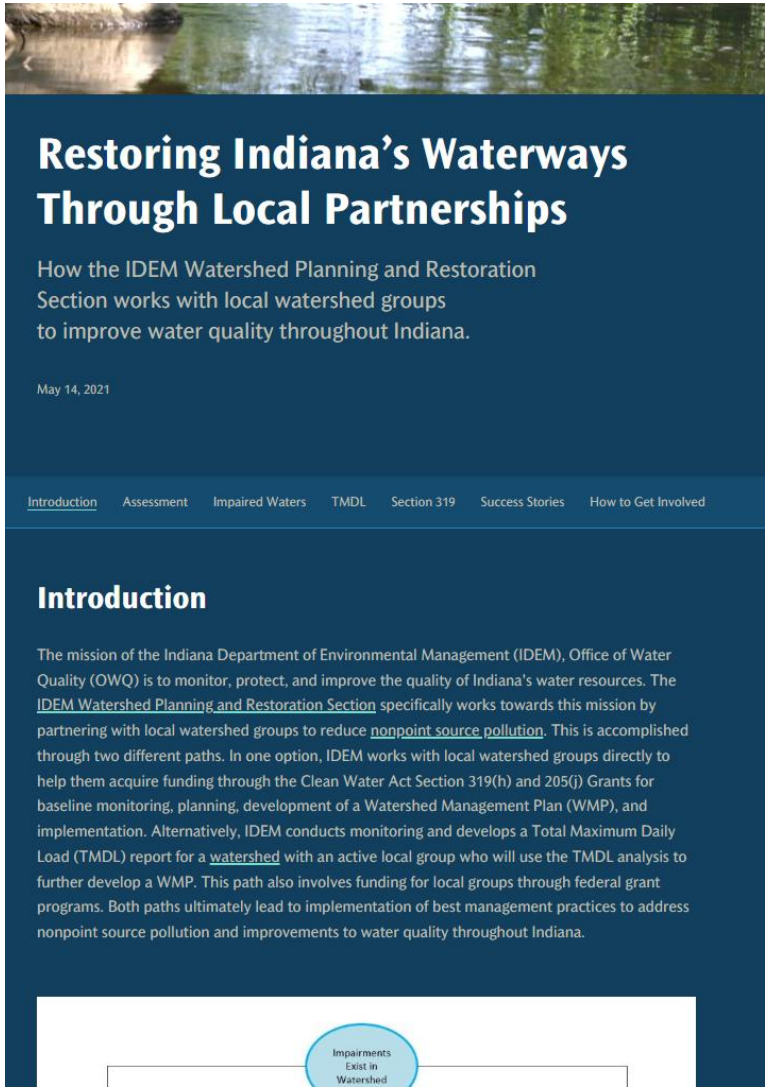
Great for:

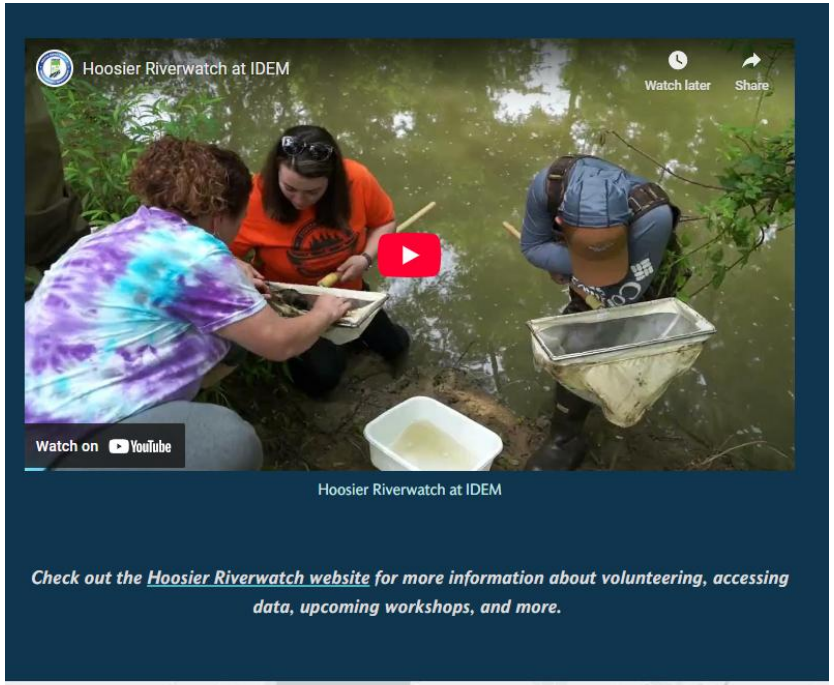
- Communicating a more involved story or concept
- Interactivity
- Highlighting accomplishments and programs

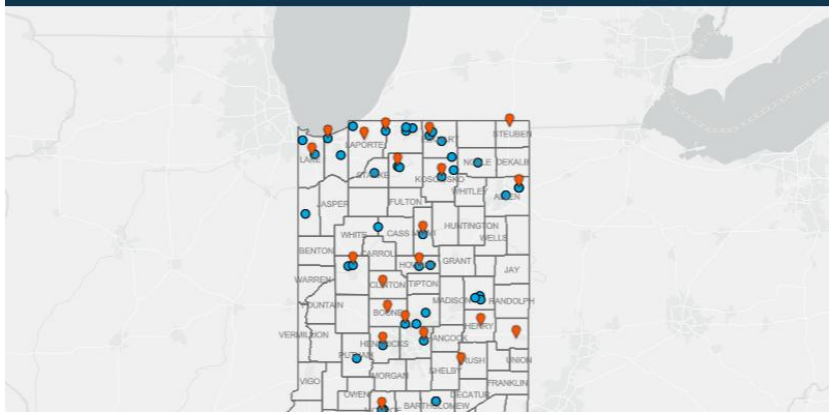
Potential Shortfalls:

- Technical maintenance
- Ability to host, Software
- Traditional methods for sharing/reporting

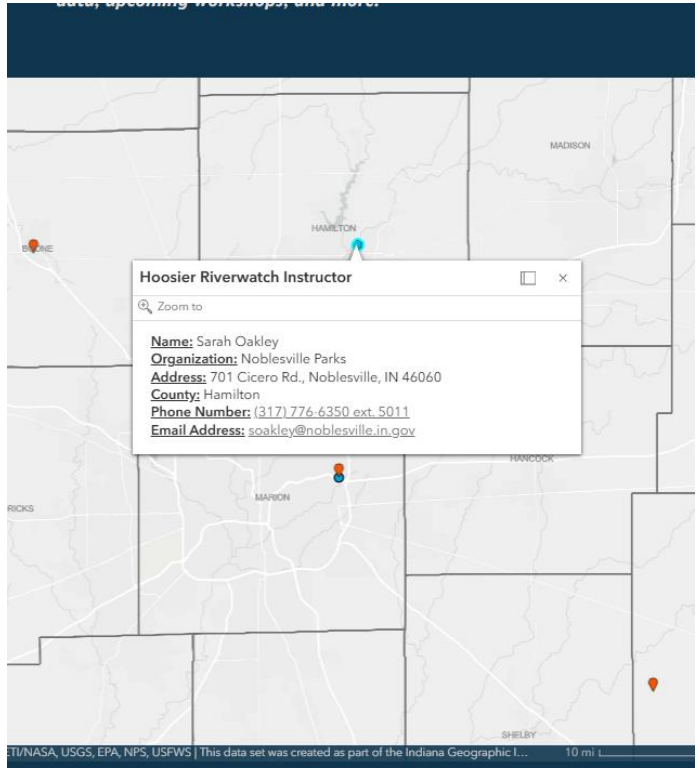
GIS Story Based Tools



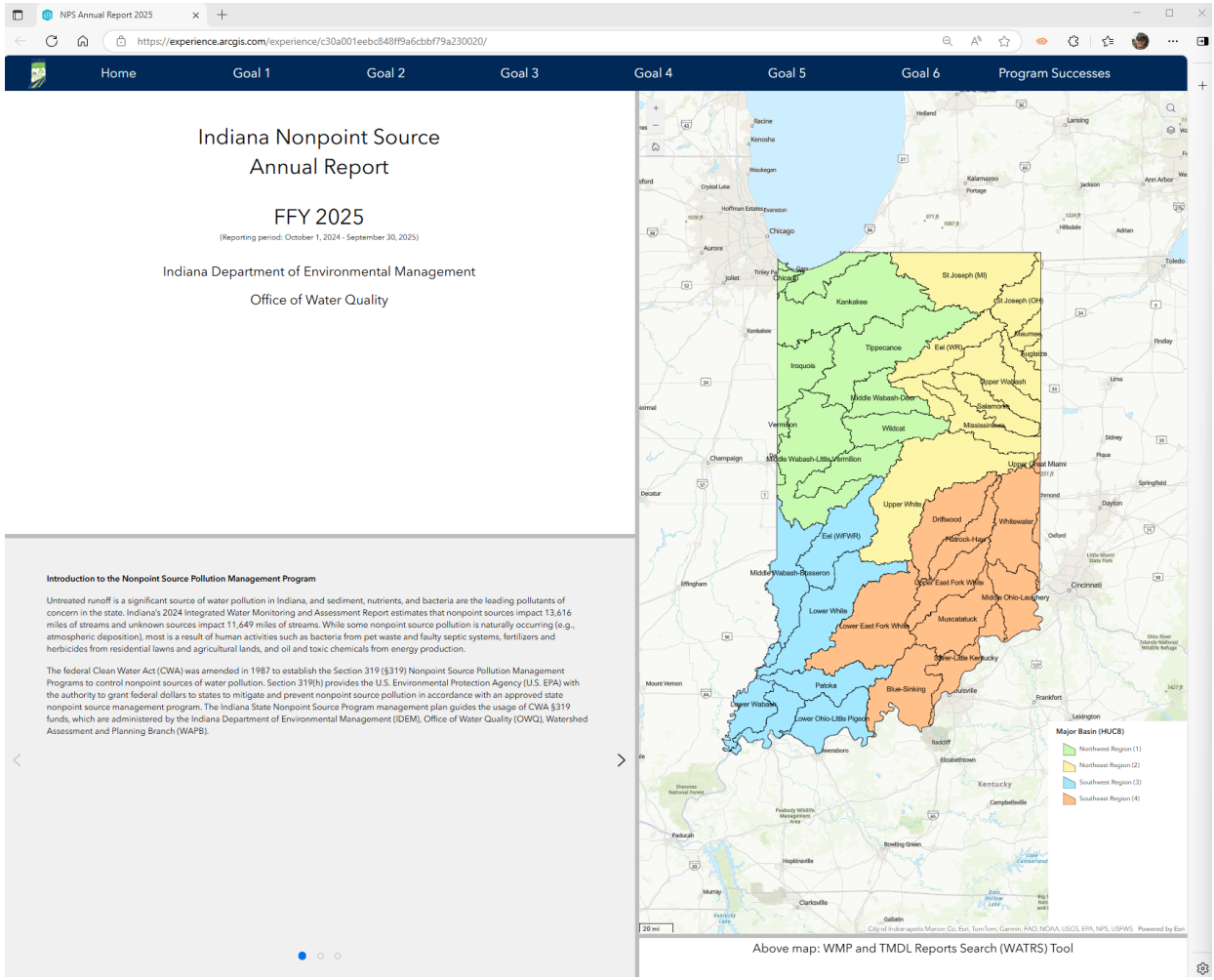




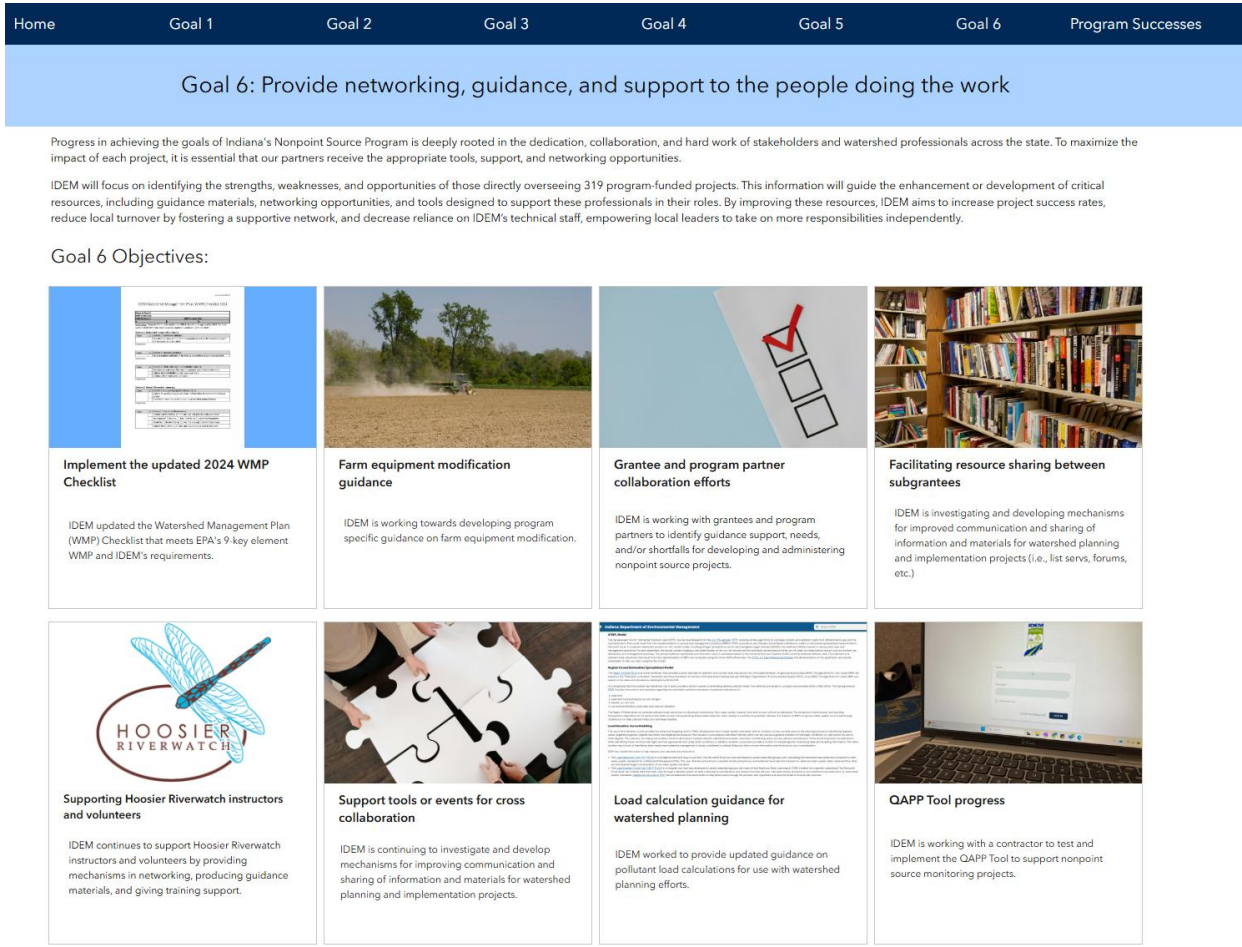
[Water Quality Program Partnerships Story Map]



Replacing Traditional Reports as Interactive Tools



Above map: WMP and TMDL Reports Search (WATRS) Tool



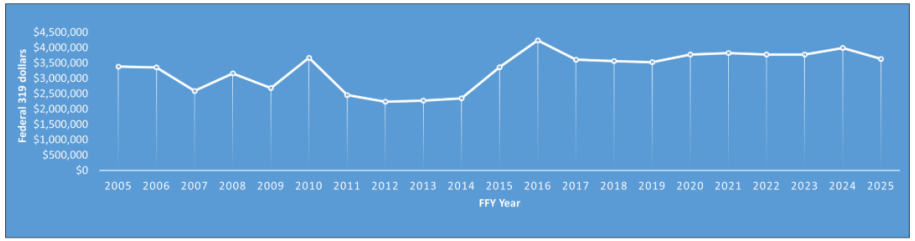
Goal 4: Improve Indiana's water quality by reducing nonpoint source pollution and restoring aquatic habitats

The heart of Indiana's Nonpoint Source Program is its effort to restore waterbodies impaired by NPS pollution. A primary focus of the NPS program is to help improve conditions so that the state's water quality goals of "swimmable" and "fishable" are met. The Watershed Planning and Restoration Section (WPRS), which houses the Nonpoint Source Program, administers two federal pass-through grant programs aimed at improving water quality in the state: the CWA §319(h) and §205(j) programs. Section 319(h) funding is predominantly used for the development and implementation of comprehensive watershed management plans (WMPs) that guide efforts to restore water quality in impaired waterways. Section 205(j) funding is used for the development of comprehensive WMPs along with monitoring projects to better assess water quality in Indiana. This has resulted in measurable improvements, especially in terms of estimated pollutant load reductions. The WPRS also administers the TMDL program and the 303(d) Vision, and efforts are underway to revisit and integrate both the Nonpoint Source and TMDL program priorities. More information about the §319 and §205(j) grant programs and the TMDL program may be found on IDEM's website.

Section 319(h) Grant Program

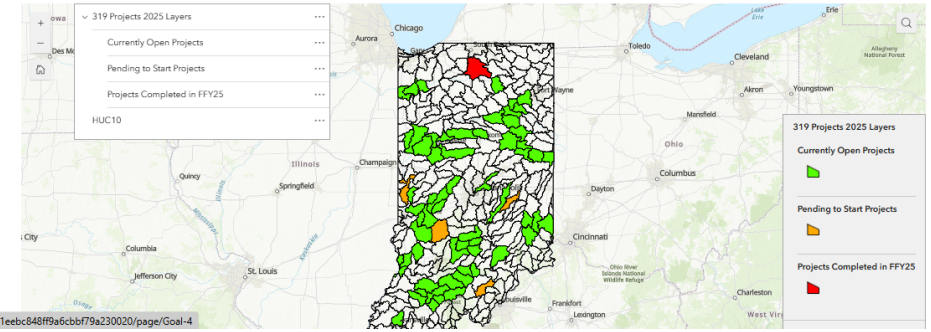
The §319 Grant Program is a major resource for reducing nonpoint source pollution in Indiana. In FY 2025 Indiana anticipates receiving $3,632,445 in §319 funds that will be used for Nonpoint Source Program support (technical staff and administration) and nonpoint source pollution projects. Each year, IDEM solicits applications for projects that will reduce nonpoint source pollution in Indiana's surface waters. Projects are selected based on their ability to make measurable improvements in water quality and to protect water quality designated uses (i.e., recreation, aquatic life, and public water supply). The infographic below shows the total 319 funding received by Indiana from the past 20 years.

Detailed information on the Section 319 policy, grant funding priority categories, and the application process, can be found on the IDEM NPS website at https://www.in.gov/idem/nps/progress-evaluation/319205j-grant-application-instructions/.



319(h) Open, Completed, and Pending projects during FFY 2025.

(Click on the map below for more information about these projects)



gis.com/experience/c30a001eebc848ff9a6cbbf79a230020/page/Goal-4

Home | Goal 1 | Goal 2 | Goal 3 | Goal 4 | Goal 5 | Goal 6 | Program Successes

Best Management Practices and Pollutant Load Reductions

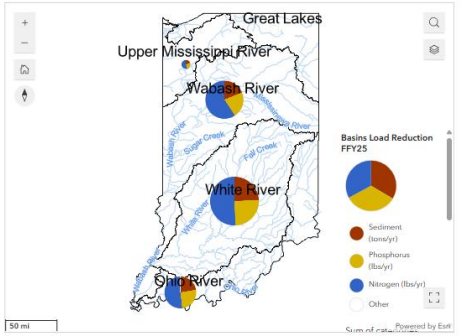
Best Management Practice	Approximate Number of BMPs installed in the calendar year					
	2020	2021	2022	2023	2024	2025
Cover Crops (Acres)	30,566	17,706	14,268	15,012	16,161	26
Fencing (Feet)	30,516	29,518	16,767	22,494	13,134	5,865
Grassed Waterways (Acres)	1,360	4,395	2	5,188	557	0
Heavy Use Area Protection (Sq Feet)	138,350	102,084	83,503	61,717	33,564	13,788
Native Planting (Acres)	0	38,450	0	0	0	0
Nutrient Management (Acres)	306	7,046	5,289	4,690	16,087	253
Pasture and Hay Planting (Acres)	730	299	166	505	213	33
Rain Barrels (Number)	7	3	0	2	0	0
Rain Gardens (Acres)	810	1,181	0	1,170	0	0
Residue Mgt, No-Till Strip Till (Acres)	4,438	557	291	2,105	23,775	1,176
Streambank Protection (Feet)	3,592	2,265	1,536	1,424	1,896	328
Tree/Shrub Establishment (Acres)	397	239	59	100	93	0
Watering Facilities (Number)	17	20	7	14	13	4

319(h) funded Best Management Practices in Indiana

In the Federal Fiscal Year 2025, watershed groups spent approximately $1,200,000 in cost-share to install BMPs in critical areas of Indiana's watersheds. The table to the left lists some of the BMPs implemented in the last six calendar years based on date a from IDEM's Project Tracking database. The 2025 data is currently in progress and will have finalized data by the next Annual Report.

Load Reductions in FFY 2025 by Basin

The map to the right shows the achieved load reductions that occurred during Federal Fiscal Year 2025 from projects using 319(h) funding. These are summarized for the following five major basins: Great Lakes, Upper Mississippi River, Wabash River, White River, and Ohio River. Reported reductions include a total of 111,690 pounds of nitrogen, 51,000 pounds of phosphorus, and 45,900 tons of sediment load in Federal Fiscal Year 2025, contributing to healthier waterways across the state. These reductions reflect the cumulative impact of various conservation and water management practices aimed at reducing runoff and improving stream quality.

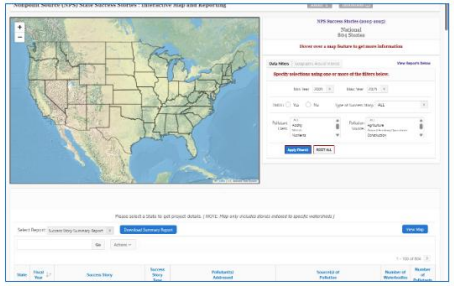


Nonpoint Source Success Stories

IDEM reports success stories to EPA as a primary measure of success towards improving water quality in Indiana. This federal fiscal year, Indiana is excited to report that twelve (12) success stories were submitted to EPA.

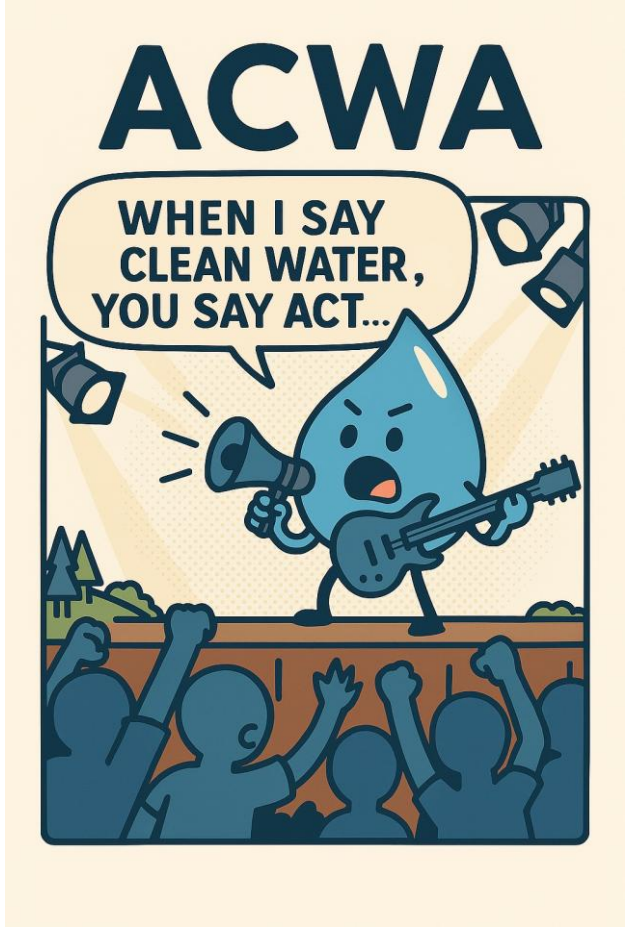
IDEM works side by side with numerous locally led watershed groups to help improve water quality. IDEM Clean Water Act grants and funds from a variety of innovative partnerships have helped clean up our rivers and streams by increasing education, developing effective water quality improvement plans, and helping individual landowners manage their land in ways that benefit our waterways. Over time, these projects have led to measurable improvements in water quality in our rivers, streams, and lakes.

Open the Success Story Mapper and click on Indiana



Final Takeaway Question

What's one tool you could try this year to make your water message clearer?



Contact Information

Caleb Rennaker
Chief, Watershed Planning & Restoration Section
Office of Water Quality
Indiana Department
of Environmental Management

(317) 308-3119

Email:
crennake@idem.IN.gov

www.linkedin.com/in/caleb-rennaker-2a321191