

Illinois Nutrient Loss Reduction Strategy
Annual Partnership Conference
January 25, 2024

Great Lakes to Gulf Virtual Observatory: Infrastructure, Data Layers, and Dashboards



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What Is the Great Lakes to Gulf Virtual Observatory?

Geospatial Application

An interactive tool that integrates water quality data and analytical tools from multiple trusted sources such as USGS, NOAA, EPA, National Water Quality Monitoring Council and others.

Visualization Map

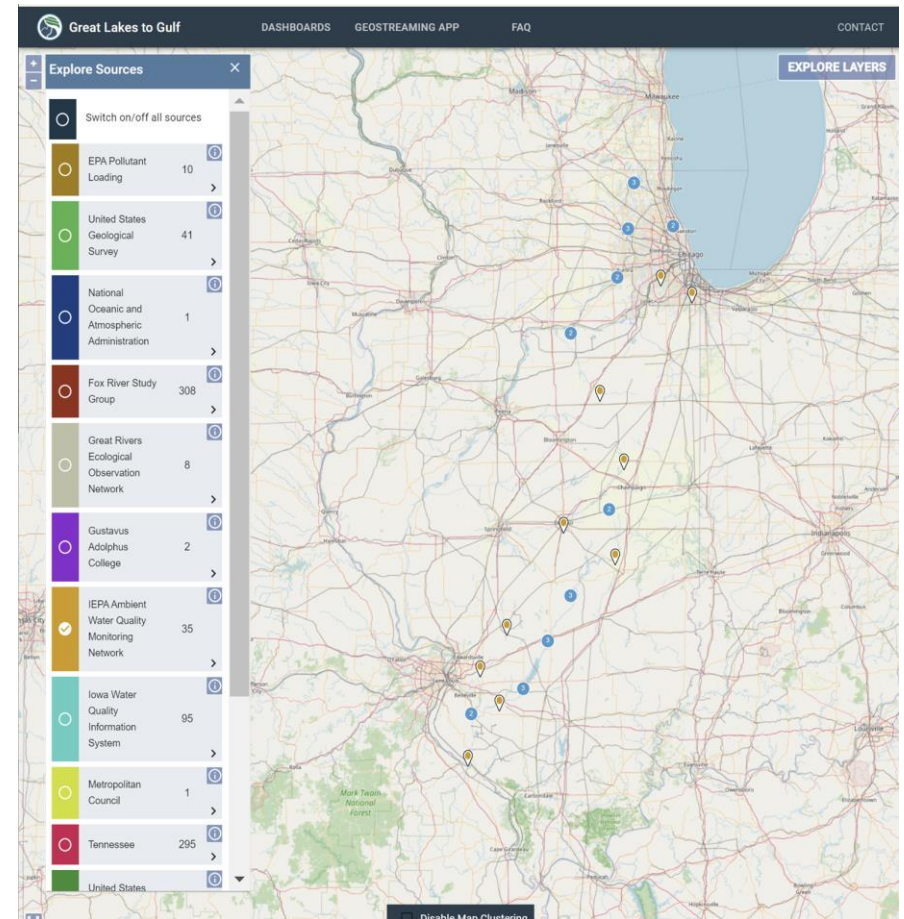
GLTG has map layers that show what is happening across the Mississippi River Basin, allowing researchers and decision makers to better understand nutrient pollution and its causes.

Data Exploration

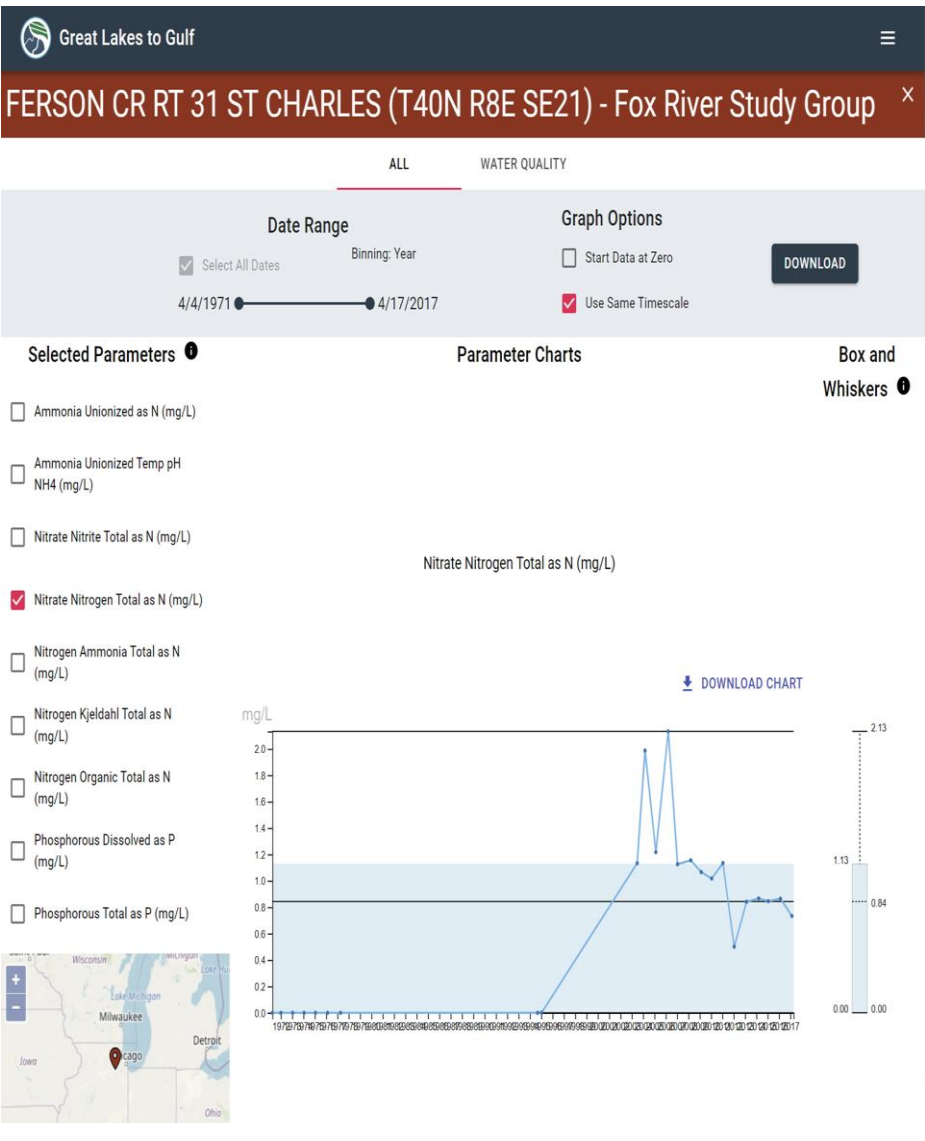
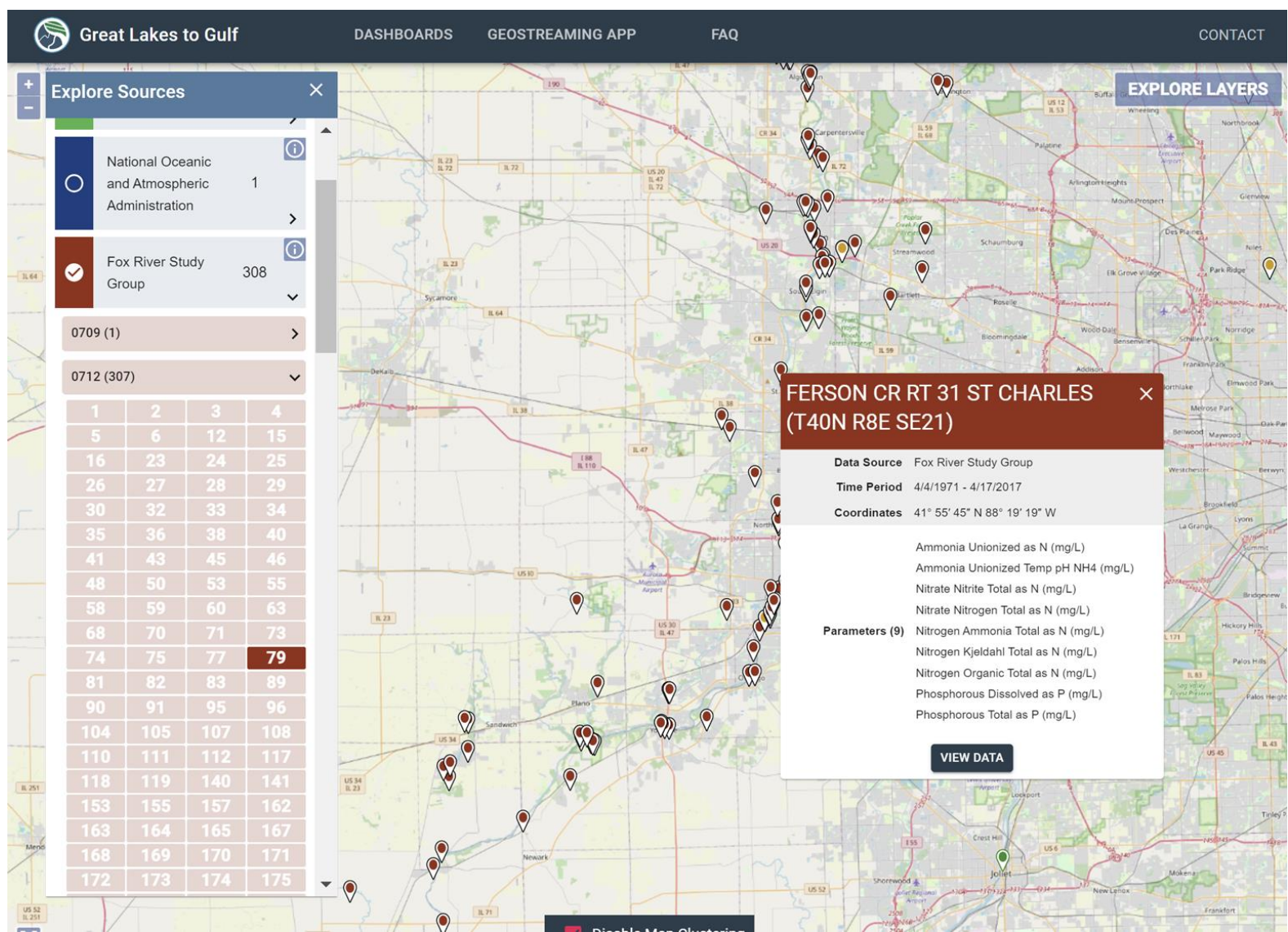
Currently, GLTGSM includes sites with five or more years of discreet nutrient data in the main stem of the Mississippi River watershed along with nutrient data for selected small watersheds (HUC-8 or smaller) in all the mainstem states.

Data Sources

- **IEPA Ambient Water Quality Monitoring Network**
- EPA Pollutant Loading
- US Geological Survey – NWIS ‘Super Gages’, ambient monitoring
- US EPA and State WQ Agencies –Water Quality Portal
- National Oceanic and Atmospheric Administration (NOAA)
- UMRR LTRM – Upper Mississippi River Restoration Long Term Resource Monitoring Program
- NGRREC – GREON (Great Rivers Ecological Observatory Network)
- Metropolitan Council, Minneapolis/St. Paul, MN
- Fox River (Illinois) Study Group
- Iowa Water Quality Information System / University of Iowa
- Gustavus Adolphus College
- Tennessee Nutrient Data
- Upper Mississippi River Restoration

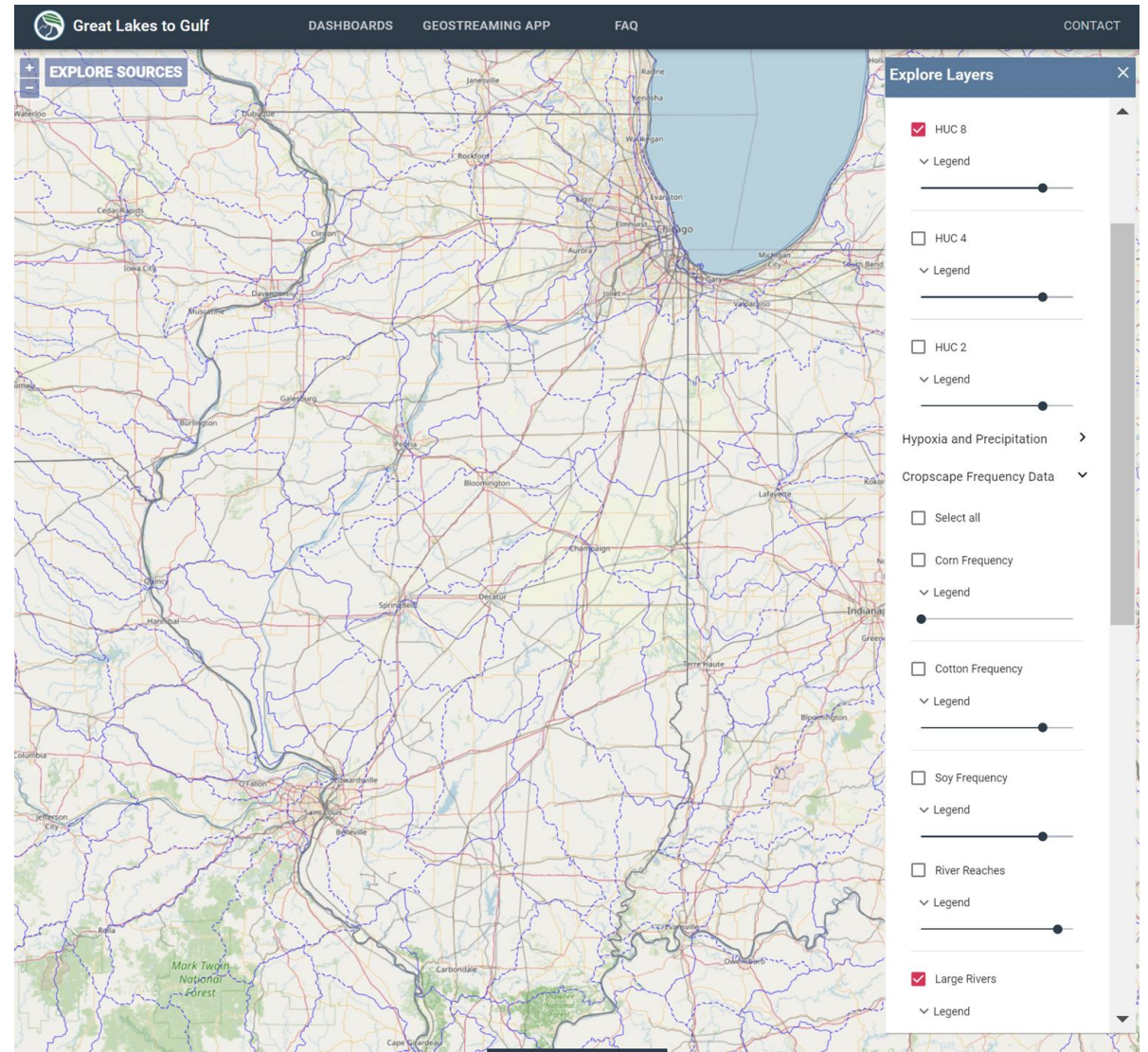


Sources Example: Fox River Study Group



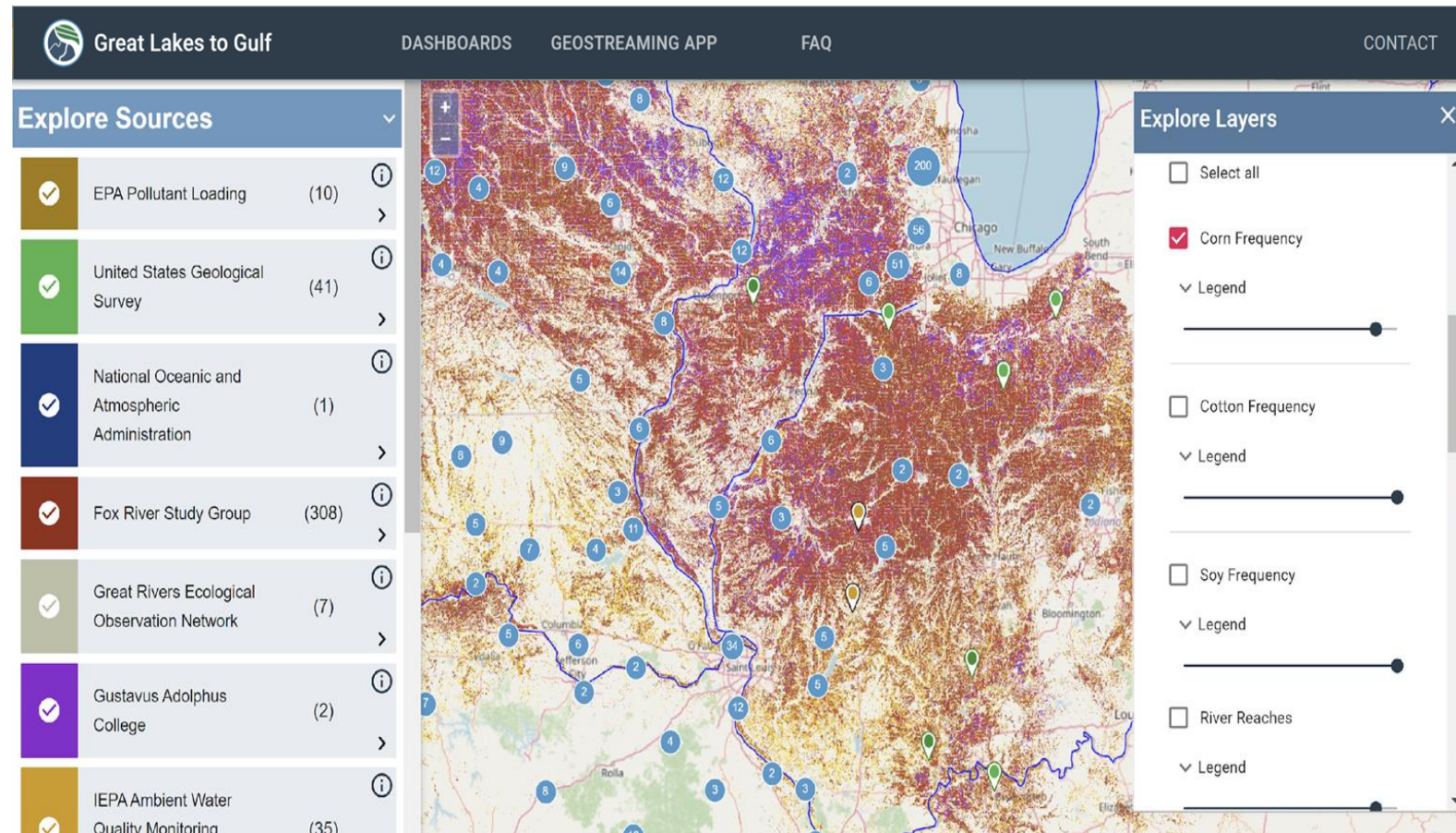
Geospatial Contextual Layers

- SPARROW 2002 and 2012 Models
- Hypoxia extent 2005- 2021
- State legislative district – lower and upper chamber layers
- Congressional district layer
- Watershed boundaries
- River reaches layer and large river layer



More Geospatial Layers

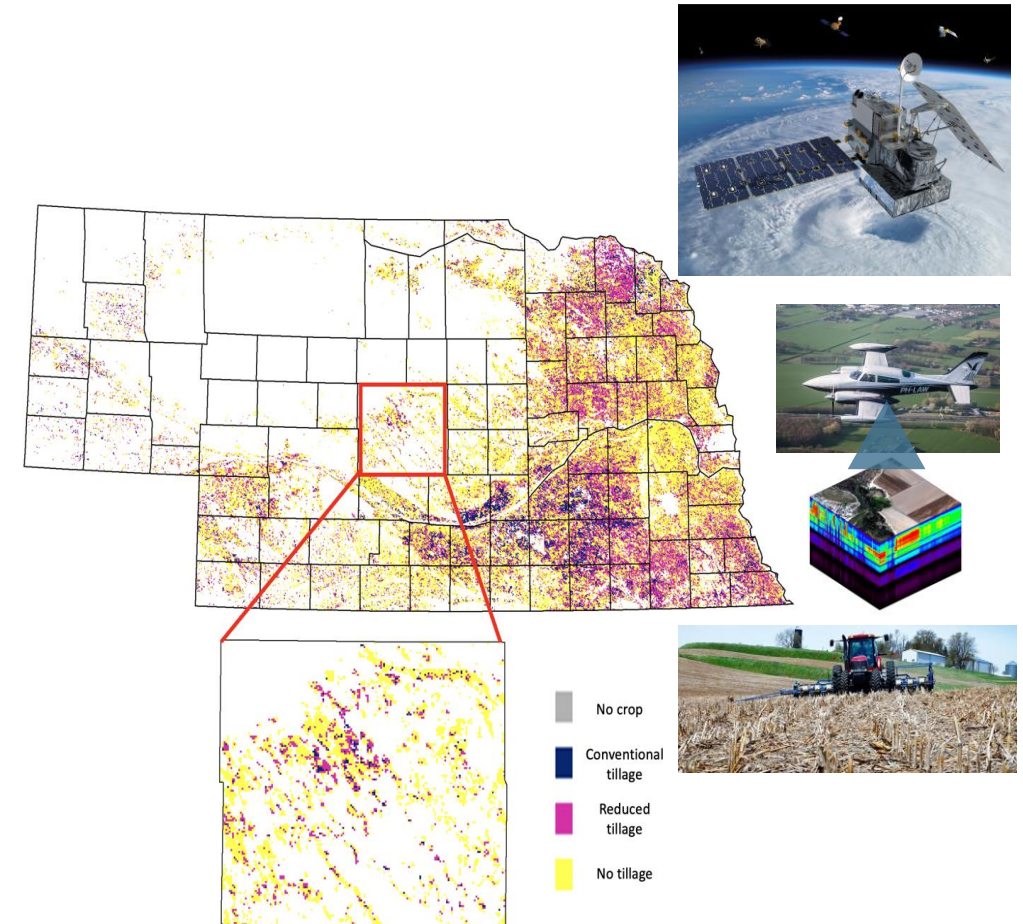
- USDA CropScape frequency layer
- NOAA precipitation layer
- State impaired waters layer
- Total annual Nitrogen from point sources by HUC8 (average from 2008 to 2014) layer
- Average annual Nitrogen fertilizer inputs for 1997 to 2006 layer



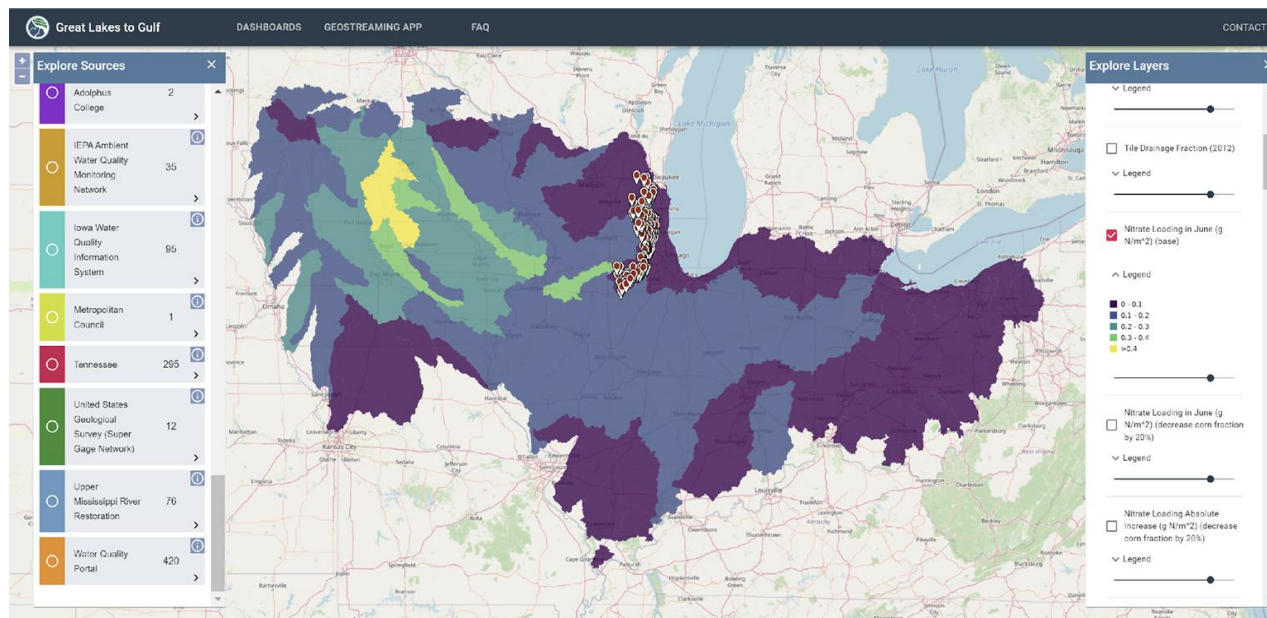
Remote Sensing and Water Quality

Working with Dr. Kaiyu Guan, University of Illinois:

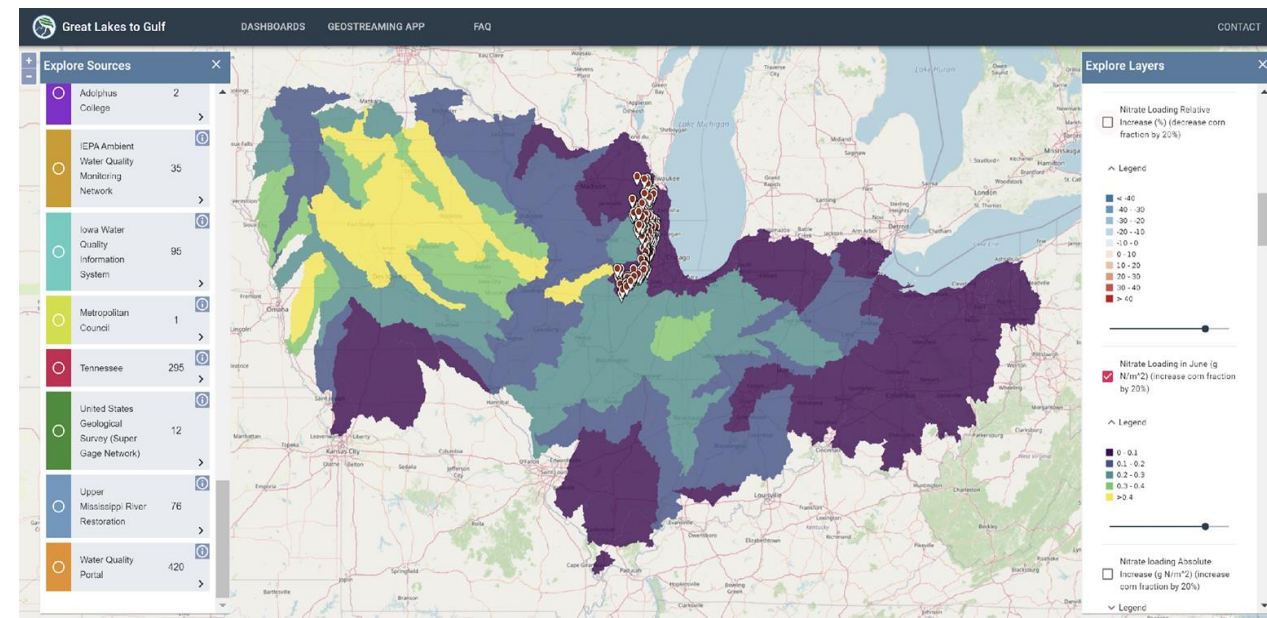
- Long-term, high resolution remotely sensed data for cover crops, tillage practices, and planting/harvesting
- Specifically, the impact of corn fraction and tile drainage on nitrogen concentration
- Developed algorithms to track cover crop adoption at the field scale in real time
- Allows for visualization of “What If” scenarios/Hindcasting
- Policy implications as annual practices (e.g., cover crops) require annual funding compared to structural practices that last longer.



Explore Layers: HUC8 Nitrate Loading Predictions



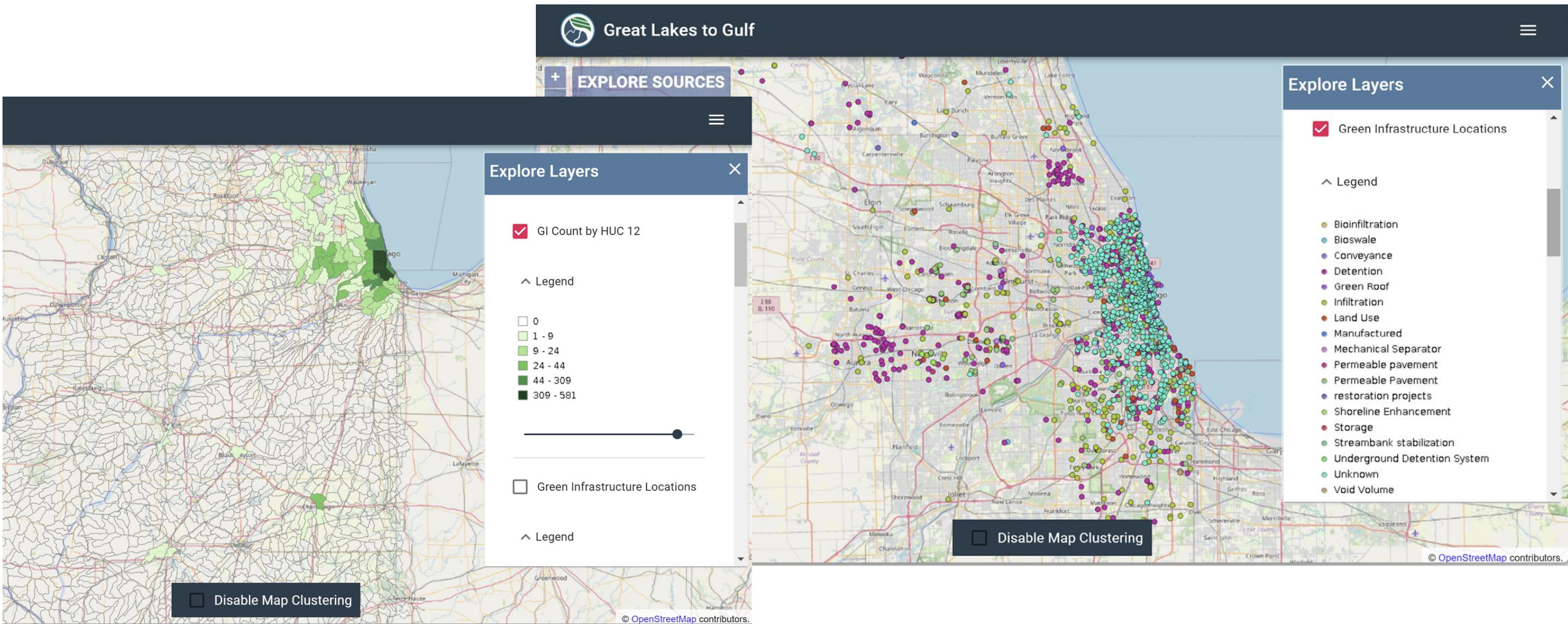
Nitrate loading in June (base)



Nitrate loading in June (increase the corn fraction by 20%)

Ma, Z., Guan, K., Peng, B., Sivapalan, M., Li, L., Pan, M., Zhou, W., Warner, R., & Zhang, J. (2023). Agricultural nitrate export patterns shaped by crop rotation and tile drainage. *Water Research*, 229, 119468.
<https://doi.org/10.1016/J.WATRES.2022.119468>

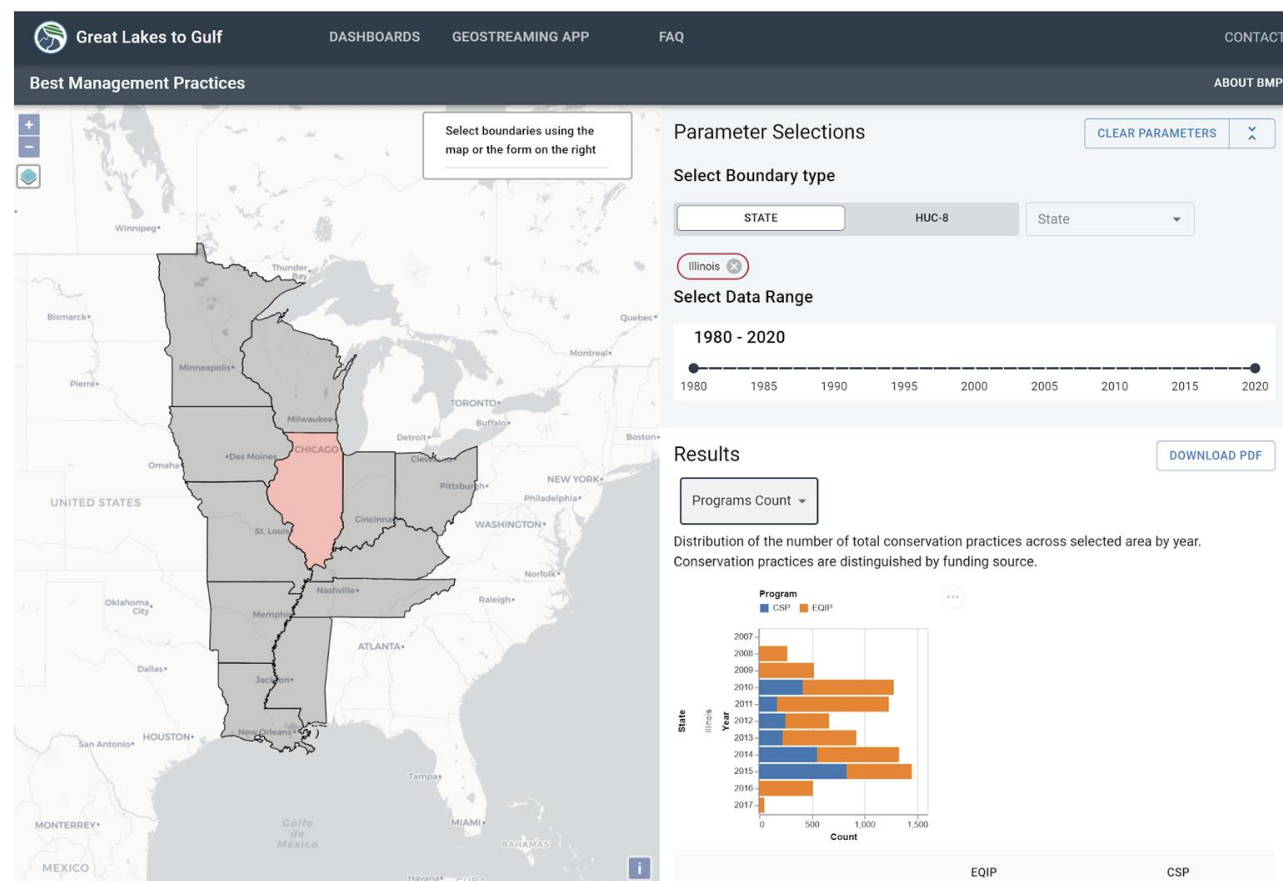
Green Infrastructure Layer



Agricultural Conservation Practices Dashboard

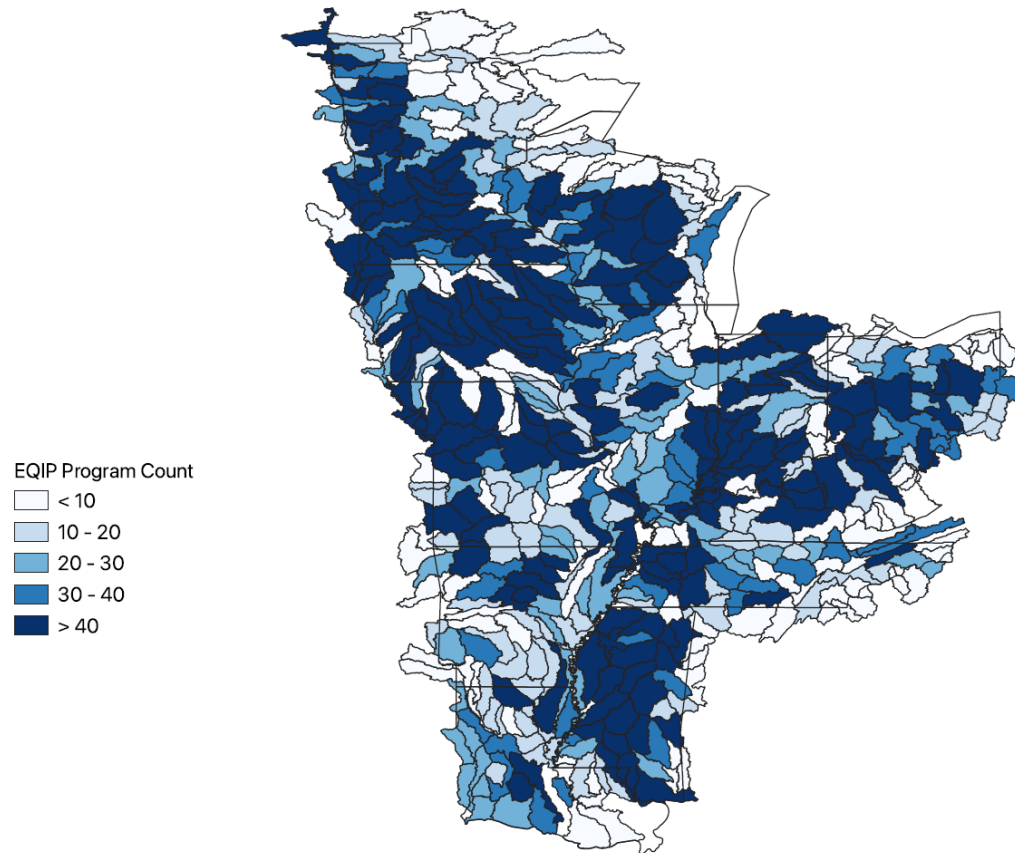
Working with Dr. Reid Christianson: Minnesota Dept. of Agriculture

- Inventory of nonpoint source agricultural practices in the 12 MRB mainstem states: EQIP, CSP, EPA 319
- Historically, coupling nutrient movement lag times with annual variations in rainfall and changes in rainfall patterns makes a simple assessment of water quality an incomplete measure.
- Adding an estimate of mitigation efforts, through tracking conservation practices, allows us to extrapolate the costs to meet water quality goals and provides a weather-independent assessment of efforts.

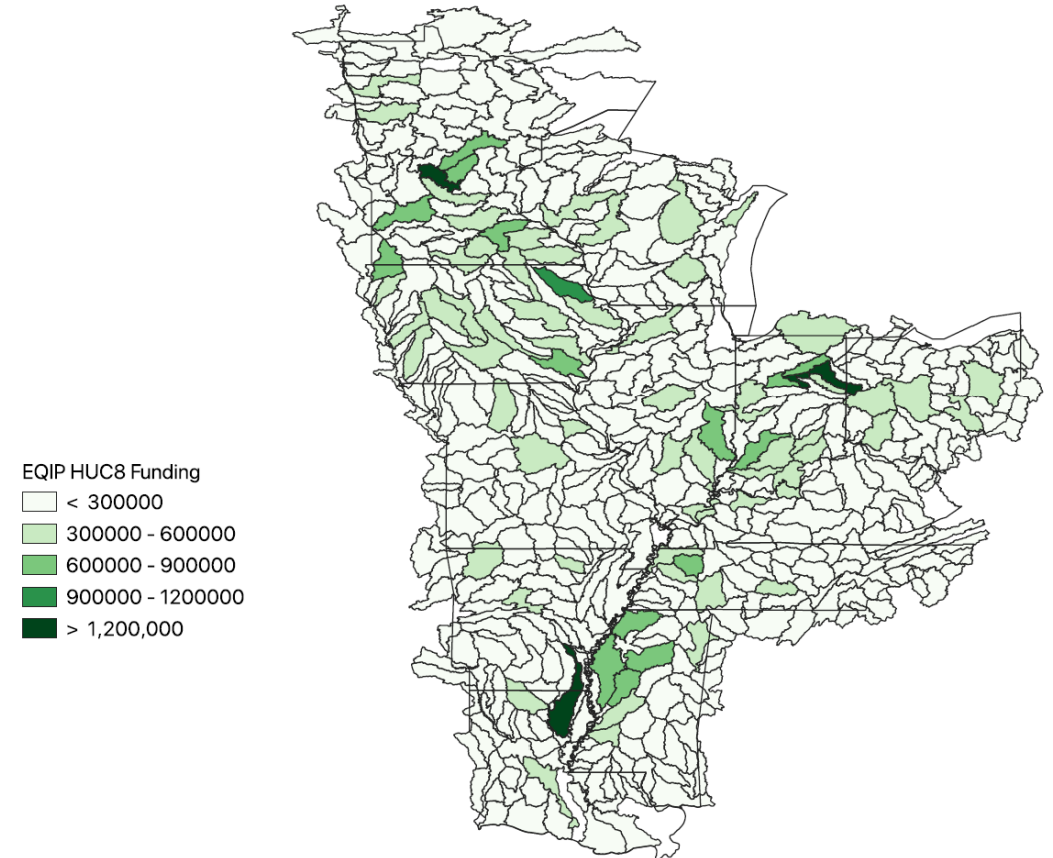


Agricultural Conservation Practices

OF EQIP Funded programs by HUC8



EQIP Funding by HUC8



State Data Portals

State Portals

Review data and trends specific to individual states. Current states available: Illinois, Arkansas, Iowa. More to come!

ILLINOIS

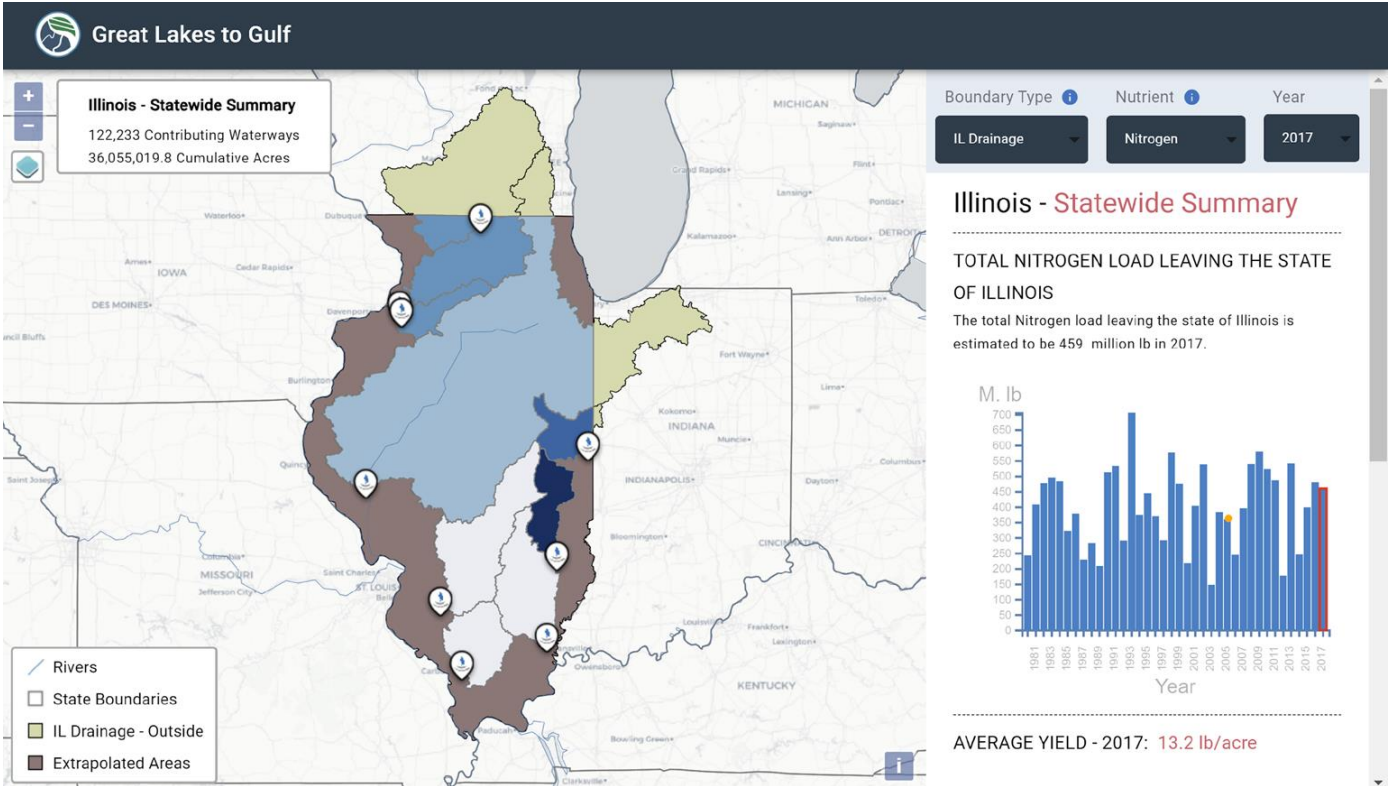
IOWA

ARKANSAS

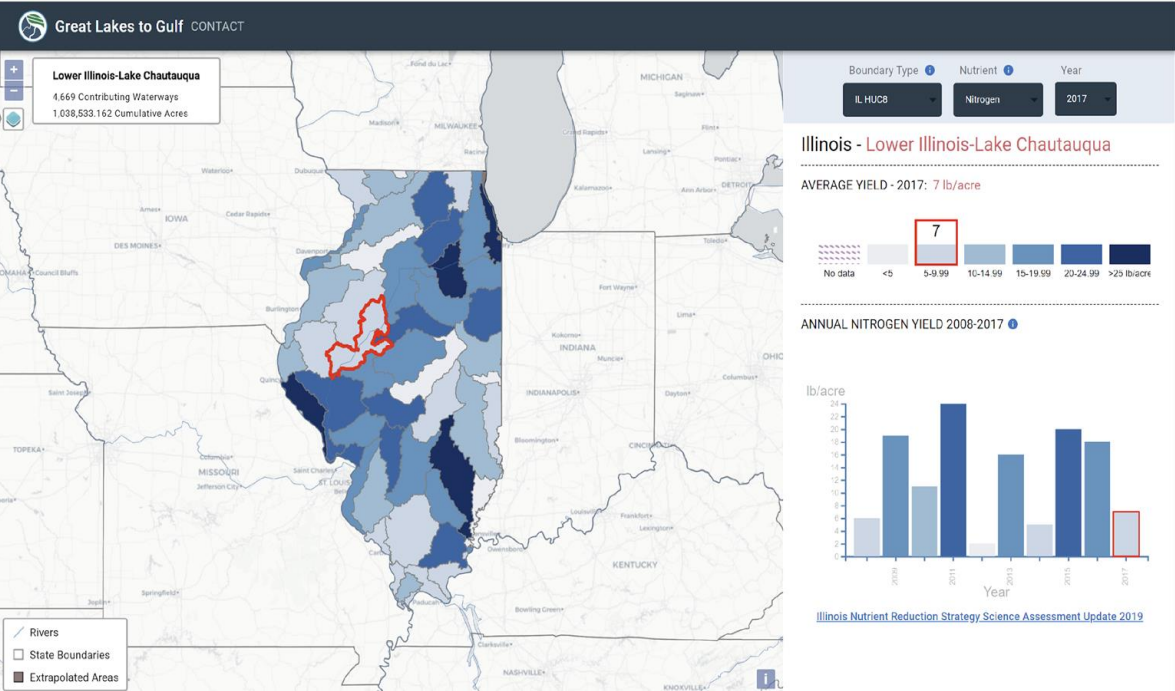
INDIANA

MISSOURI

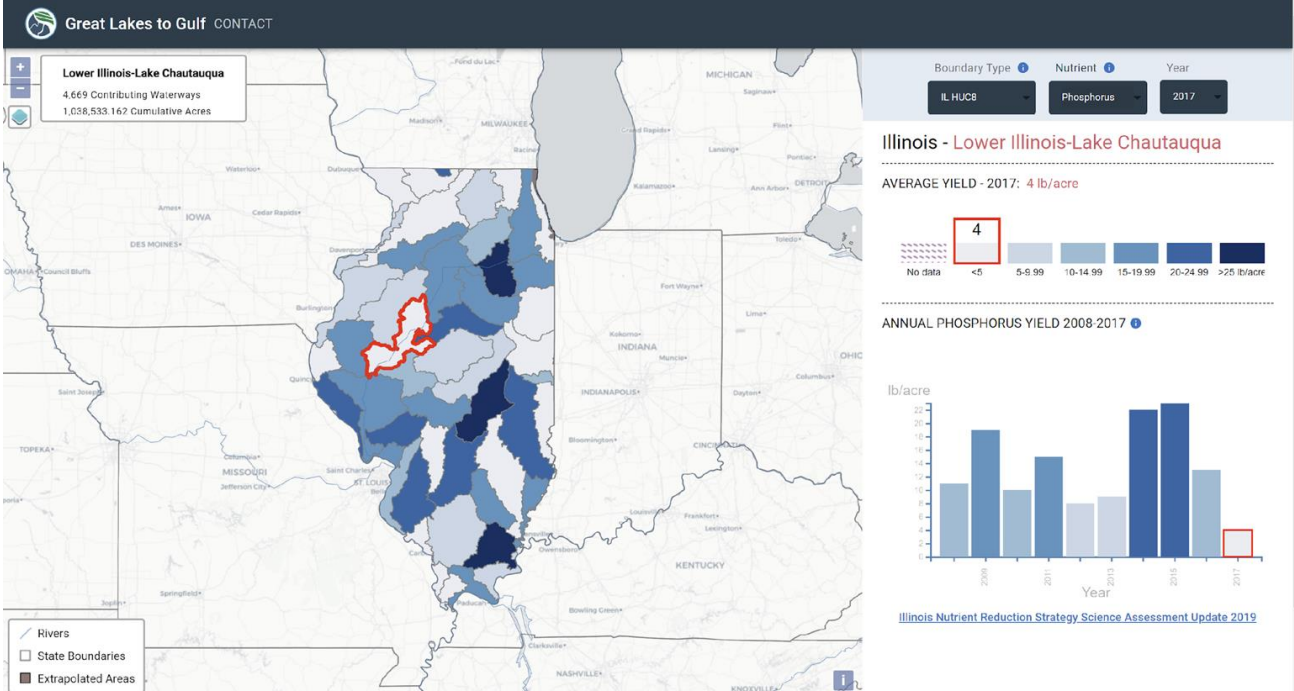
TENNESSEE



Illinois Data Portal



Nitrogen



Phosphorus

Why a Separate Nutrient Trends Dashboard?

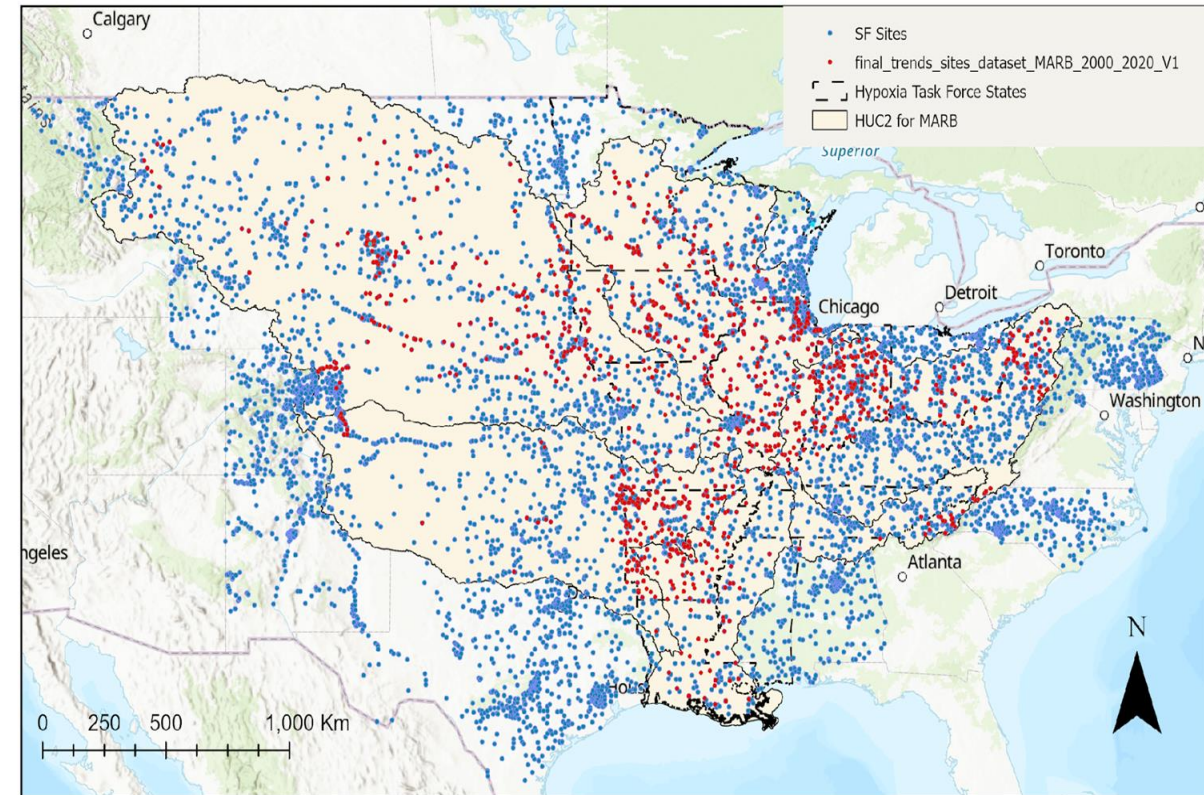
- Different groups (federal agencies, states, non-profits) working within the Mississippi River Basin have different ways of presenting water quality information and calculating nutrient trends.
- Selecting a network of existing long-term water quality monitoring stations (found in the Water Quality Portal <https://www.waterqualitydata.us/>) as trend sites and using a **unified analysis method** can help evaluate progress on nutrient reduction within the Mississippi River Basin and simplify the exploration of nutrient trends across states and watersheds.



Mississippi River Nutrient Trends Analysis

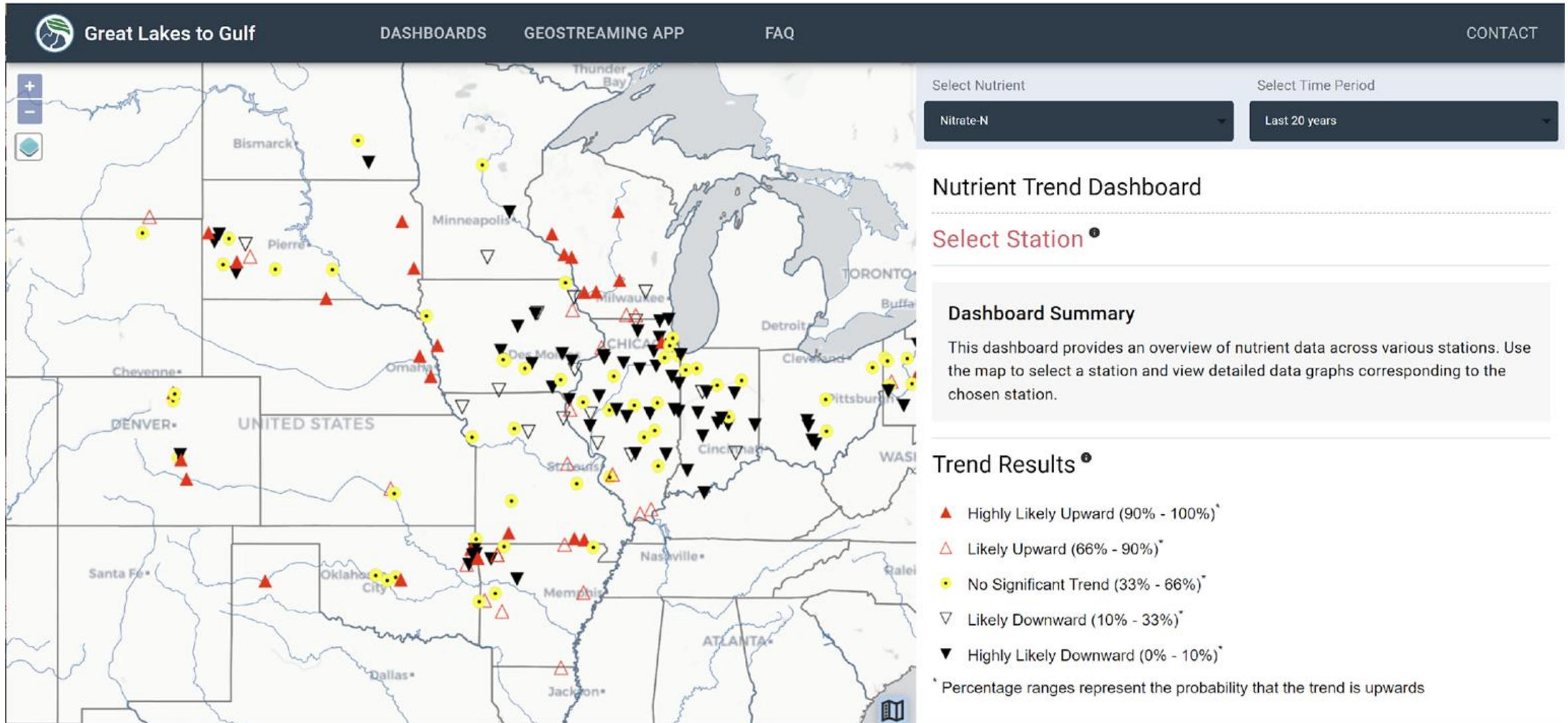
- Selected a network of existing long-term water quality monitoring stations as trends sites; data found in the Water Quality Portal <https://www.waterqualitydata.us/> from USGS, EPA, and state, federal, tribal, and local agencies.
- Harmonized data to create a consistent and quality-controlled dataset unifying parameter names, units, type of measurement, etc.
- Flow data from USGS National Water Information System (NWIS).
- Used a unified analysis method (WRTDS) to explore nutrient trends across states and watersheds.
- Used the longest consistent record available; we can use 1990-2020 but get more stations for trends with 2000-2020).

Water Quality (WQ) and Streamflow (SF) sites used in preliminary matching.

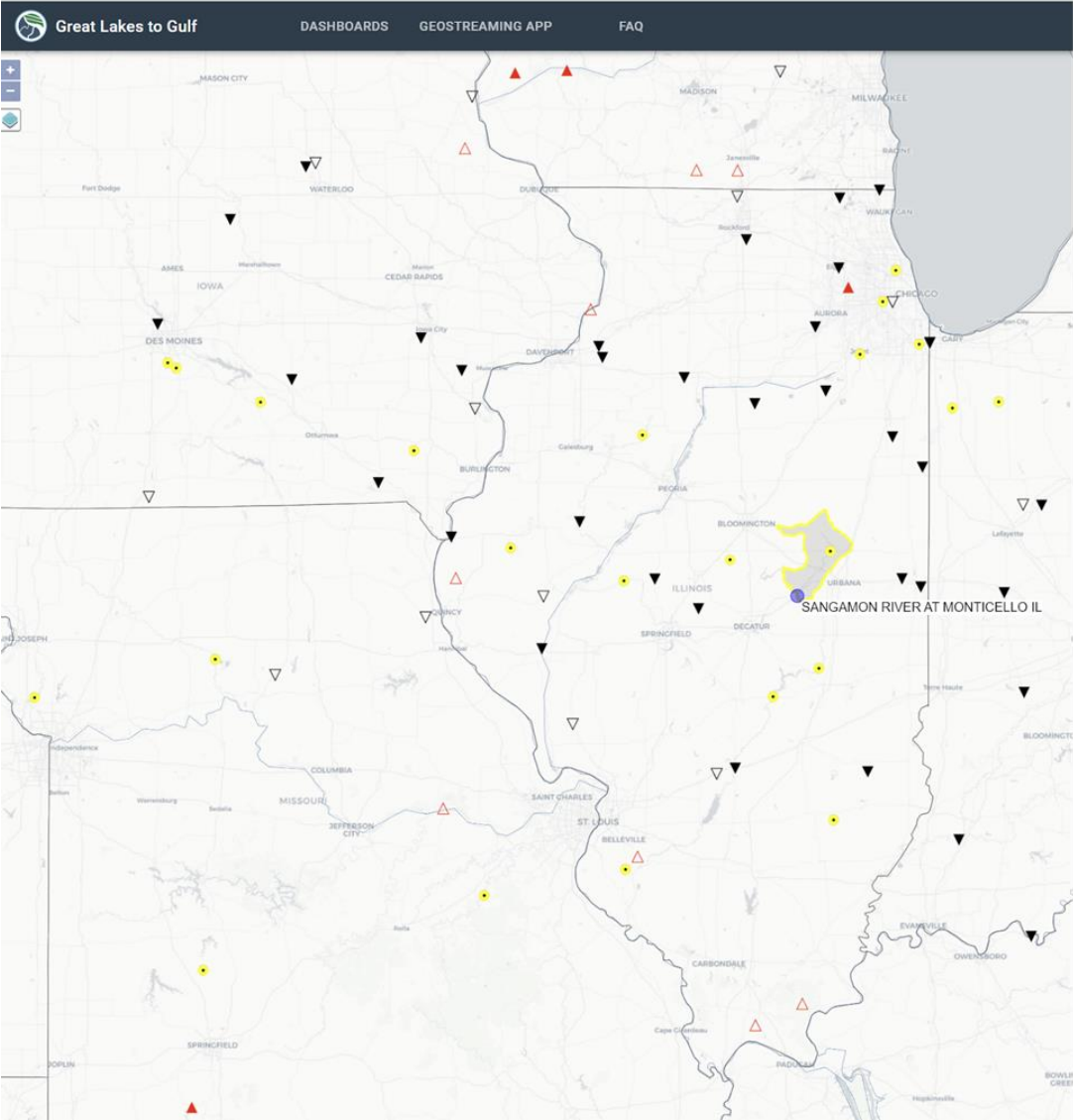


Nutrient Trends Dashboard

COMING SOON



Nutrient Trends Dashboard



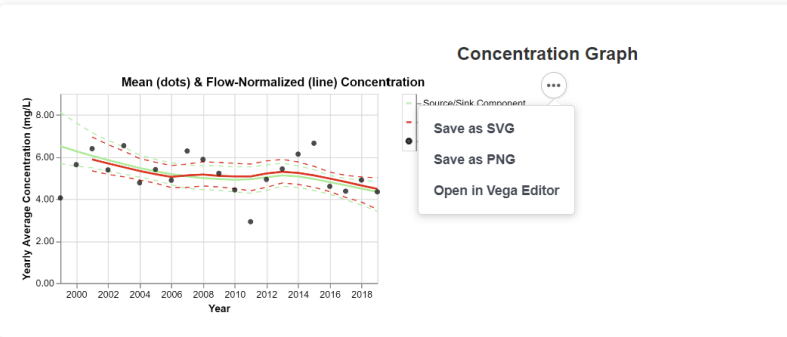
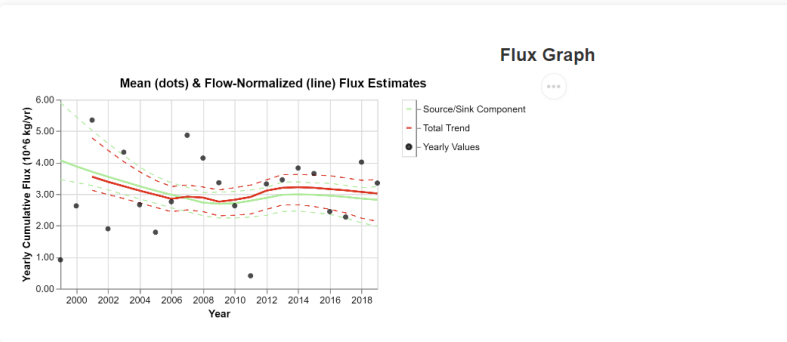
Select Nutrient
Nitrate-N

Select Time Period
Last 20 years

Nutrient Trend Dashboard

Water Quality Station Name:

Sangamon River



Total Trend: Flow-Normalized Non-Stationary Streamflow with 90% Confidence Interval

Source/Sink Component: Flow-Normalized Stationary Streamflow with 90% Confidence Interval

Flow Component: Total Trend - Source/Sink Component

Telling the Story: Story Boards and Blog Posts


 Great Lakes to Gulf

Below, please find our archive of storyboards providing historical context on nutrient pollution and the Great Lakes to Gulf project. Our team is at work developing additional resources to launch in late 2022 and 2023 - check back at greatlakesgulf.org for updates.

All Data Stories



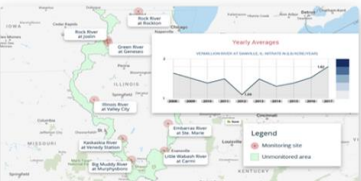
Evaluating Nitrogen and Phosphorus Loads in Mississippi



Illinois Nutrient-Loss Reduction Strategy



What Are Layers and Why Do They Matter?




Tracking Trends with GLTG

Illinois Nutrient-Loss Reduction Strategy

Great Lakes to Gulf Data Stories

about
IL NLR
Illinois Nutrient Loss Reduction Strategy

Illinois Nutrient Loss Reduction Strategy---IL NLR---guides state efforts to improve water quality by reducing nitrogen and phosphorus levels in our lakes, streams, and rivers.

 Great Lakes to Gulf

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GLTG News



Register Now: Internet of Water Coalition Webinar Series

Sep 25,2023

From agricultural conservation practices, to green infrastructure, to nitrate loading trends, there's a wealth of information at your fingertips when you.....

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Preliminary SF-WQ matching pairs (291 matching pairs)



Figure 1. Water Quality (WQ) and Streamflow (SF) sites used in preliminary matching.

Figure 2. WQ sites with a matching SF site.

GLTG Presents at the SWCS Conference 2023

Aug 21,2023

Dr. Ellen Gilinsky, NGRREC Senior Water Policy and Science Advisor, gave a talk on GLTG Trends Work at the Soil and Water Conservation Society (SWCS) Ann.....

[LEARN MORE](#)



Your Peek into State Water Quality Data Portals: First Up...Illinois

May 15,2023

We get it. The state data portals can feel a little daunting for the first-time user. So, in the next few posts we're going to give you an overview of ho.....

[LEARN MORE](#)

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QUESTIONS FOR YOU

1. How can GLTG be tailored to help present IL NLRs efforts?
2. What other data would you like to see?