Great Lakes to Gulf Virtual Observatory

- A Place to Deposit, Organize, and Integrate NLRS Data and Information

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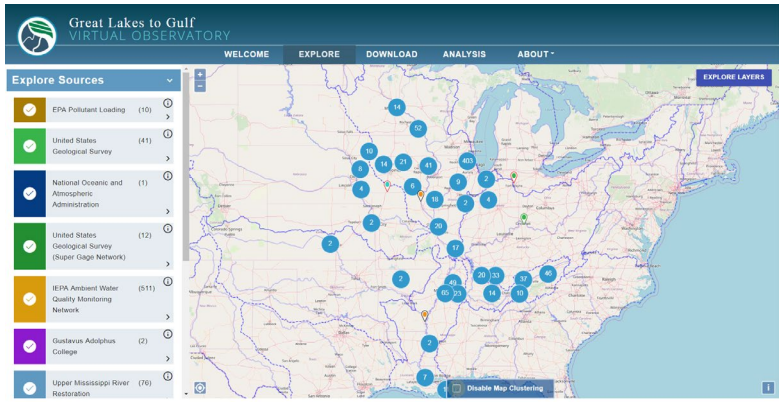
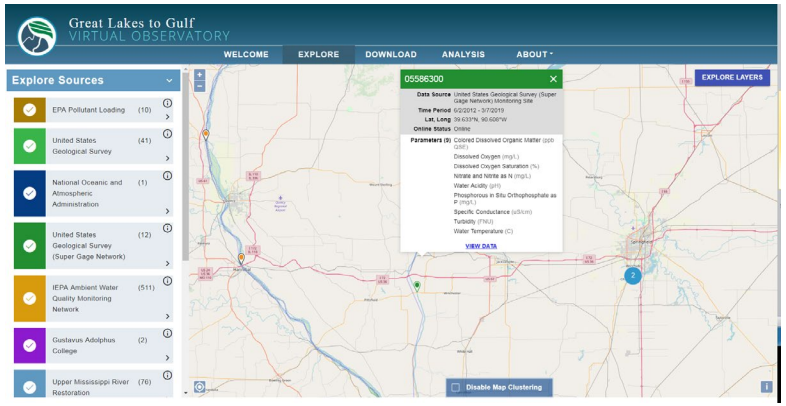
NCSA | National Center for Supercomputing Applications

What is the Great Lakes to Gulf Virtual Observatory?

- The GLTG Virtual Observatory is a web-based geospatial application that integrates water quality data and analytical tools from multiple sources allowing a user to visualize and understand nutrient pollution and water quality conditions in the Mississippi River watershed.
- The online interactive application provides users with tools to explore, analyze and compare water quality data from the Mississippi River and its tributaries.





The McKnight Foundation

The Walton Family Foundation

The National Great Rivers Research & Education Center

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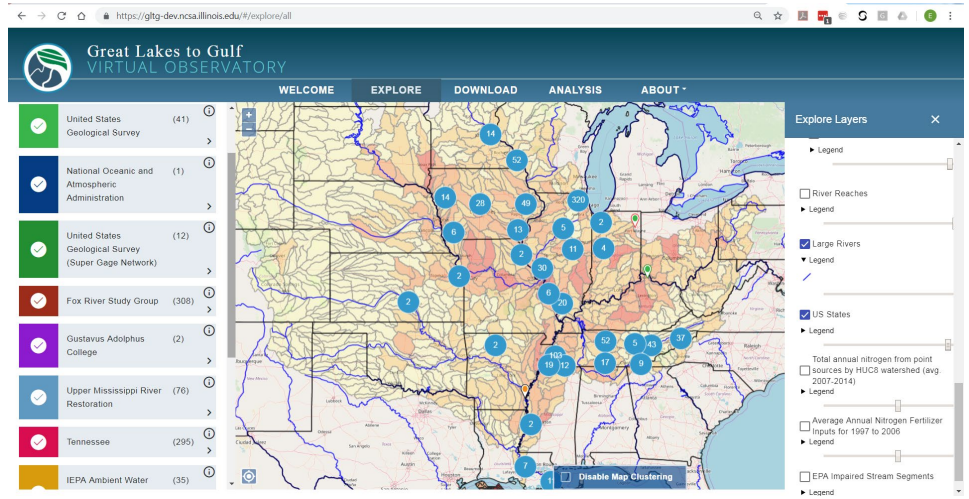
Data in GLTG

- GLTG Main Site
  - 1427 sites
    - 30,536,674 individual measurements (on current and growing)
    - 27,650,502 individual measurements (on 2/11/2019)
    - 26,418,123 individual measurements (on 9/10/2018)
  - 13 Data sources
  - 13 States
    - Illinois, Wisconsin, Minnesota, Arkansas, Kentucky, Nebraska, Kansas, Missouri, Louisiana, Mississippi, Iowa, Tennessee, Indiana
- IL NRLS Site
  - 393 sites from 9 sources and 12,228,339 datapoints (on current)

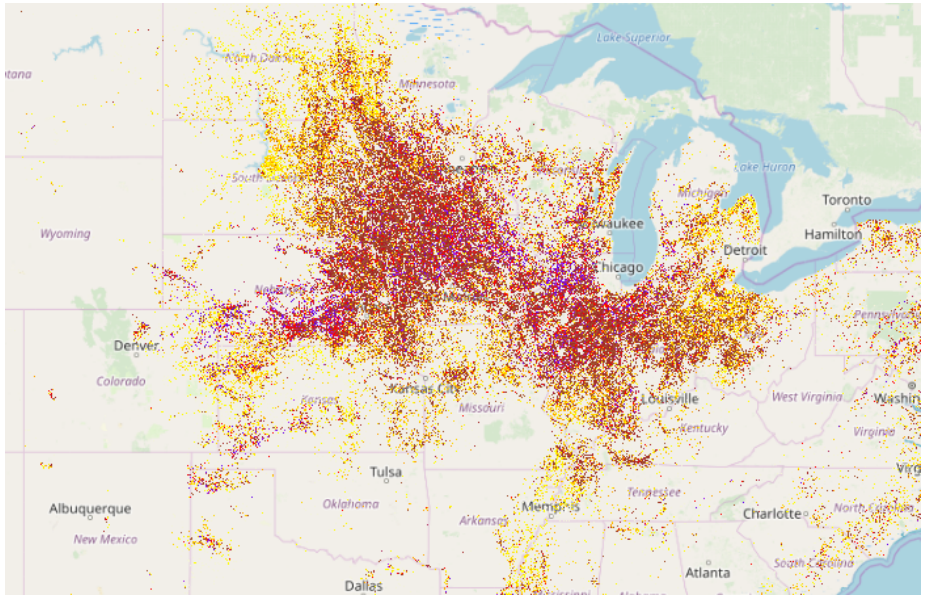
Selected Data Sources

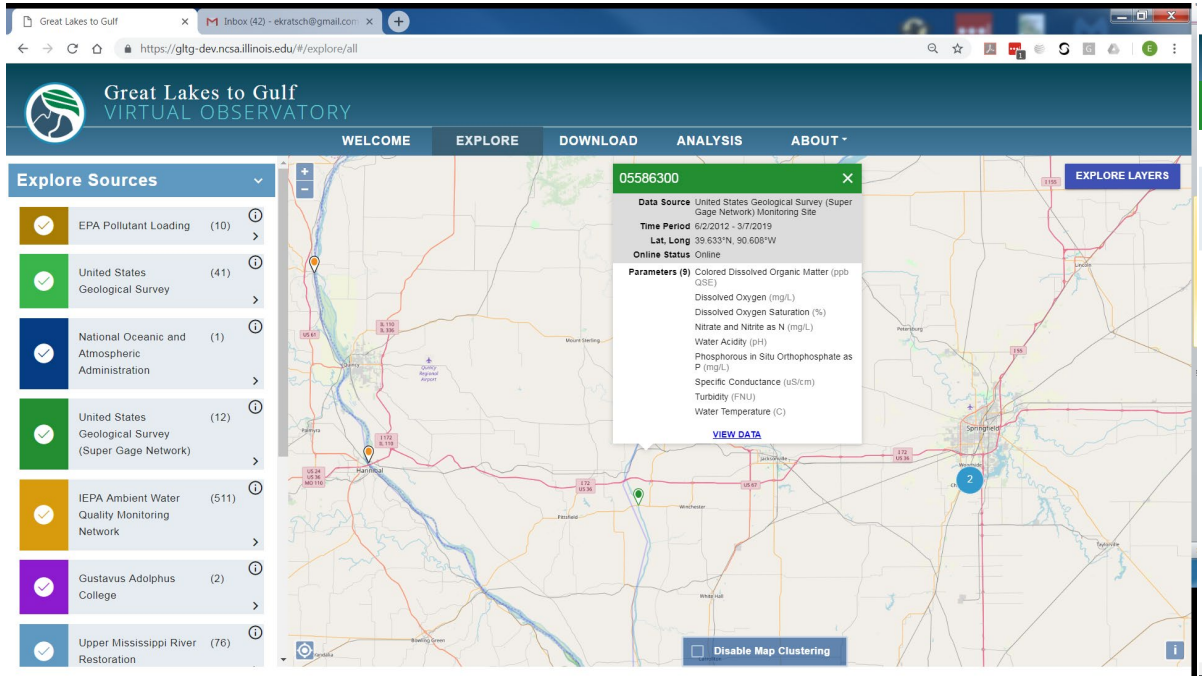
- US Geological Survey – NWIS
  - ‘Supergages’, ambient monitoring
- US Environmental Protection Agency –
  - STORET/WQX
- UMRR LTRM – Upper Mississippi River Restoration Long Term Resource Monitoring Program
- NGRREC – GREON (Great Rivers Ecological Observatory Network)
- Metropolitan Council, Minneapolis/St. Paul, MN
- Fox River (Illinois) Study Group
  - Latest data 3/28/2019
- Iowa Water Quality Information System / University of Iowa

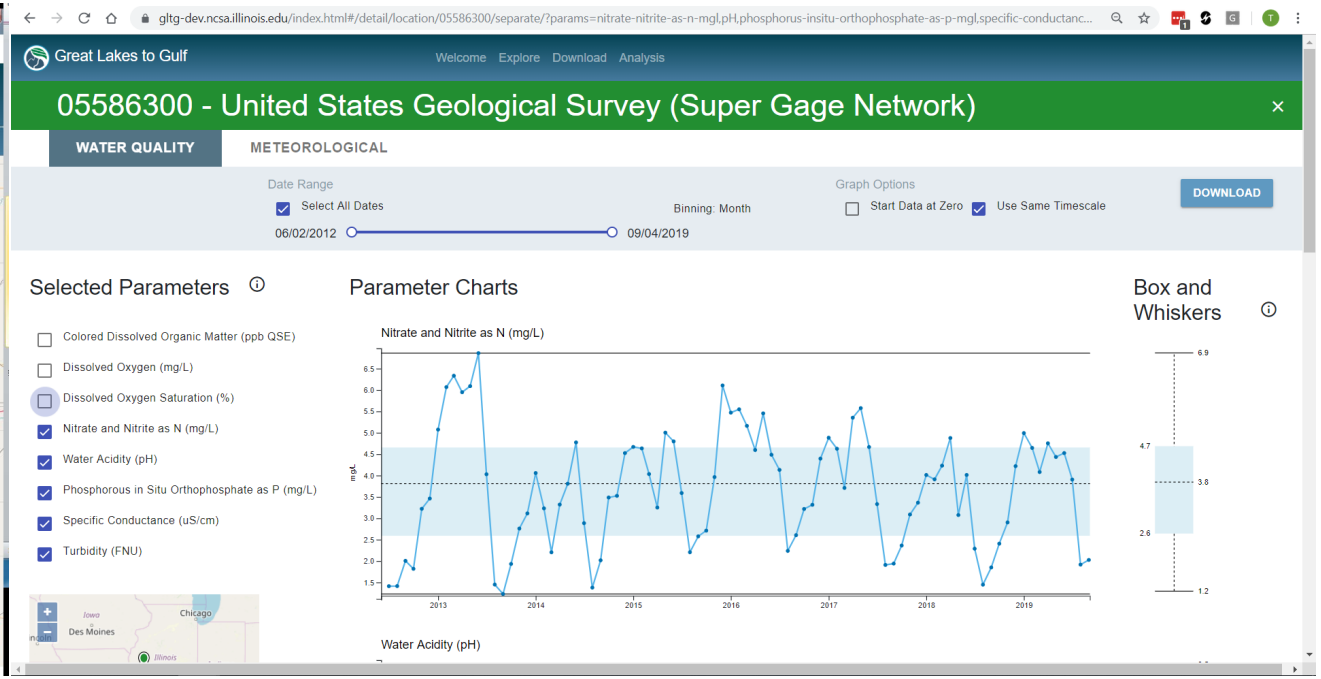


Geospatial Contextual Layers

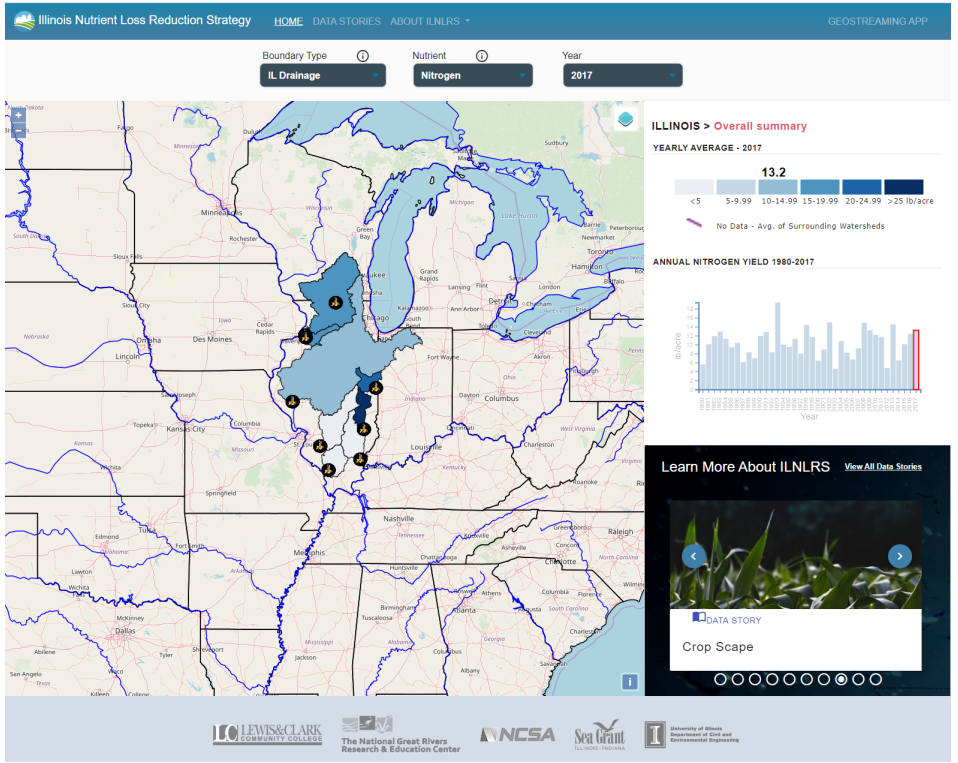
- SPARROW 2002 Model
- Hypoxia Extent from 2005 to 2017
- USDA CropScape Frequency layer
- NOAA Precipitation layer
- State EPA impaired waters layer
- Layers related to nutrient analysis for Illinois
  - Catchment
  - Point sources
  - Unmonitored area
  - Nutrient loading by HUC 8




Great Lakes to Gulf
VIRTUAL OBSERVATORY
WELCOME
EXPLORE
DOWNLOAD
ANALYSIS
ABOUT
Explore Sources
EPA Pollutant Loading (10)
United States Geological Survey (41)
National Oceanic and Atmospheric Administration (1)
United States Geological Survey (Super Gage Network) (12)
IEPA Ambient Water Quality Monitoring Network (511)
Gustavus Adolphus College (2)
Upper Mississippi River Restoration (76)
05586300
Data Source United States Geological Survey (Super Gage Network) Monitoring Site
Time Period 6/2/2012 - 3/7/2019
Lat, Long 39.633°N, 90.608°W
Online Status Online
Parameters (9) Colored Dissolved Organic Matter (ppb QSE)
Dissolved Oxygen (mg/L)
Dissolved Oxygen Saturation (%)
Nitrate and Nitrite as N (mg/L)
Water Acidity (pH)
Phosphorous in Situ Orthophosphate as P (mg/L)
Specific Conductance (uS/cm)
Turbidity (FNU)
Water Temperature (C)
VIEW DATA
EXPLORE LAYERS
Disable Map Clustering

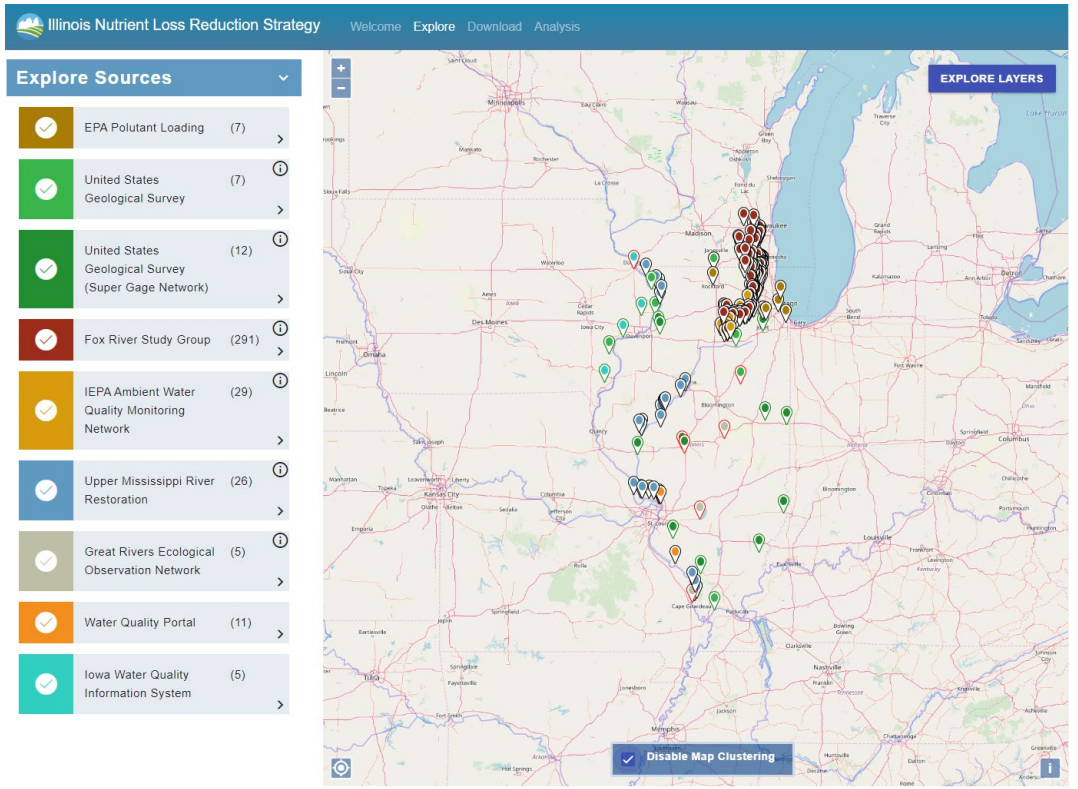

Great Lakes to Gulf
Welcome Explore Download Analysis
05586300 - United States Geological Survey (Super Gage Network)
WATER QUALITY
METEOROLOGICAL
Date Range
Select All Dates
06/02/2012
09/04/2019
Binning: Month
Graph Options
Start Data at Zero
Use Same Timescale
DOWNLOAD
Selected Parameters
Colored Dissolved Organic Matter (ppb QSE)
Dissolved Oxygen (mg/L)
Dissolved Oxygen Saturation (%)
Nitrate and Nitrite as N (mg/L)
Water Acidity (pH)
Phosphorous in Situ Orthophosphate as P (mg/L)
Specific Conductance (uS/cm)
Turbidity (FNU)
Parameter Charts
Nitrate and Nitrite as N (mg/L)
Box and Whiskers
Water Acidity (pH)

Illinois NLRS Data Portal



Development of IL NLRS Data Portal

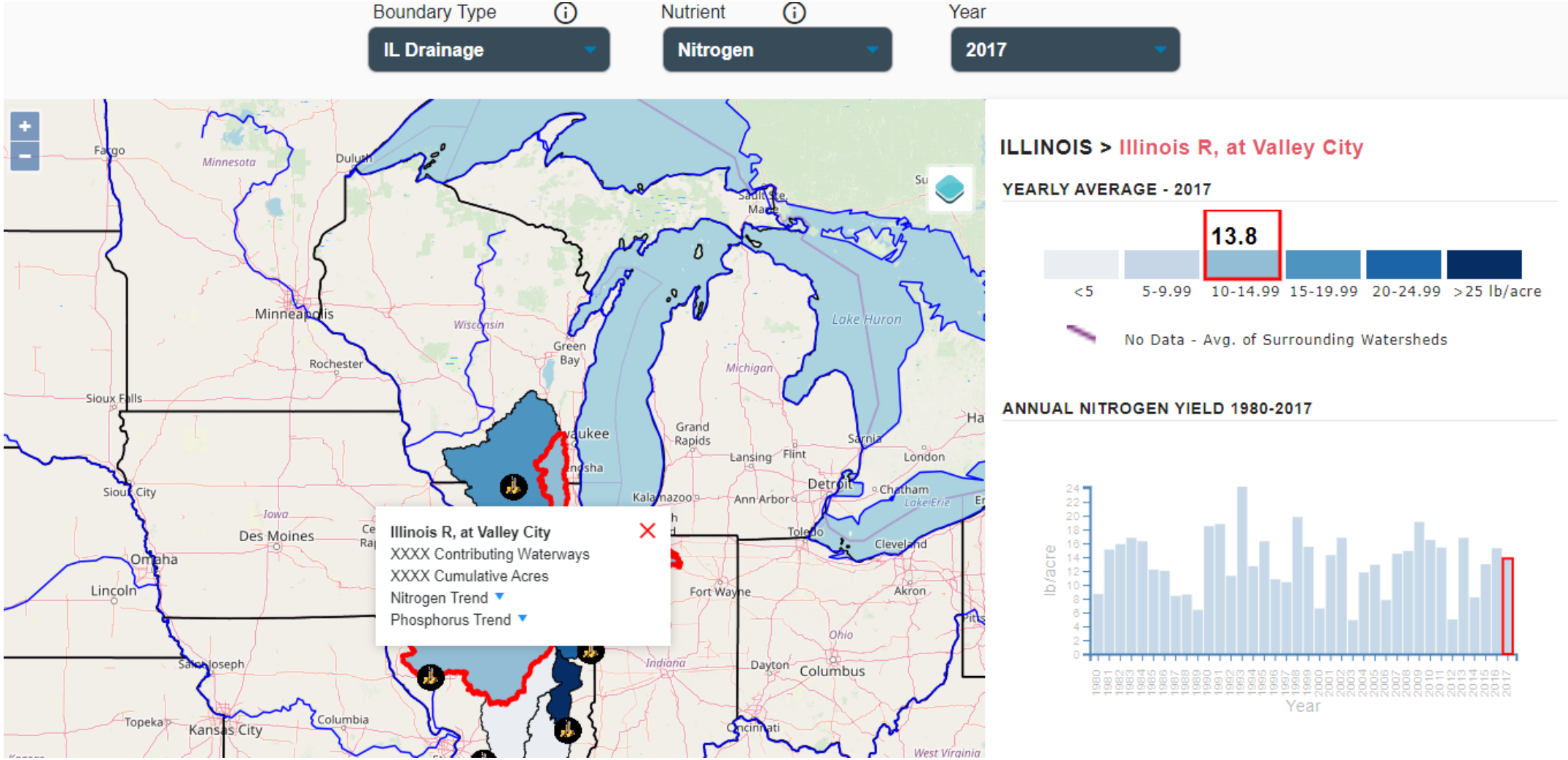
- Base on GLTG application and data, IL NLRS data portal has been developed working with IL EPA
- Initial data is from GLTG
- New version of IL NLRS has been deployed



What's New?

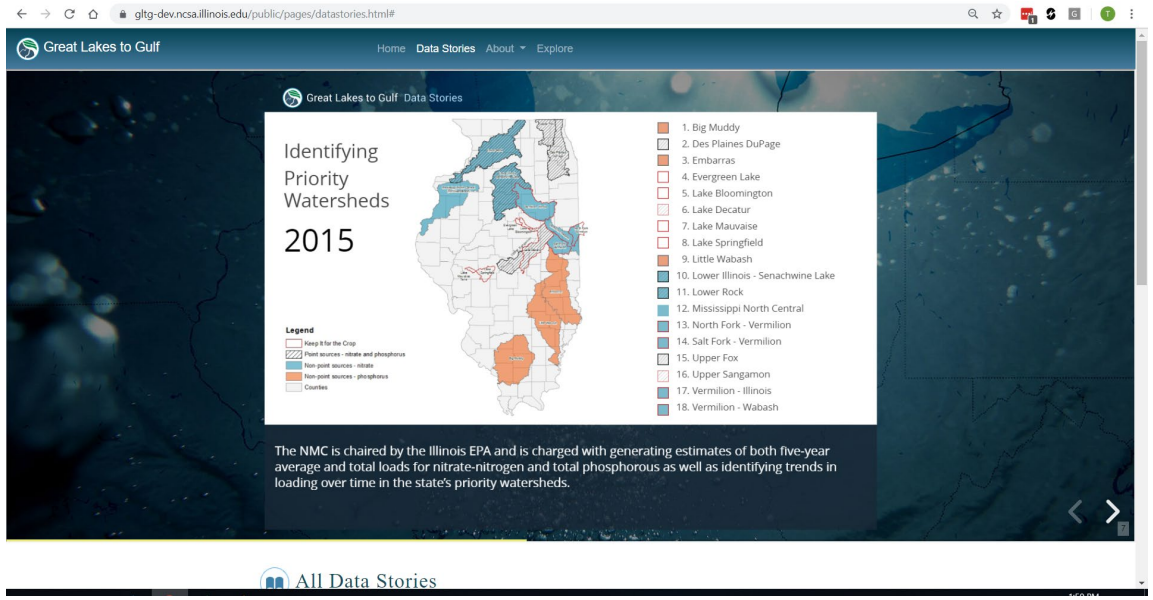
- Geostreaming Data Framework V3
- Developed through combining efforts of 4 projects
  - GLTG, Seagrant Great Lakes Monitoring, IML-CZO, TERRA-REF
- New Frontend (User Interface)
  - Complete rewrite using latest technologies
  - Improvements to user interface/interaction
- New Backend (Performance)
  - New binning methodology and database improvement
- Signup/Login for users
  - Track downloads
- Dashboard for IL NLRS data
- Story board

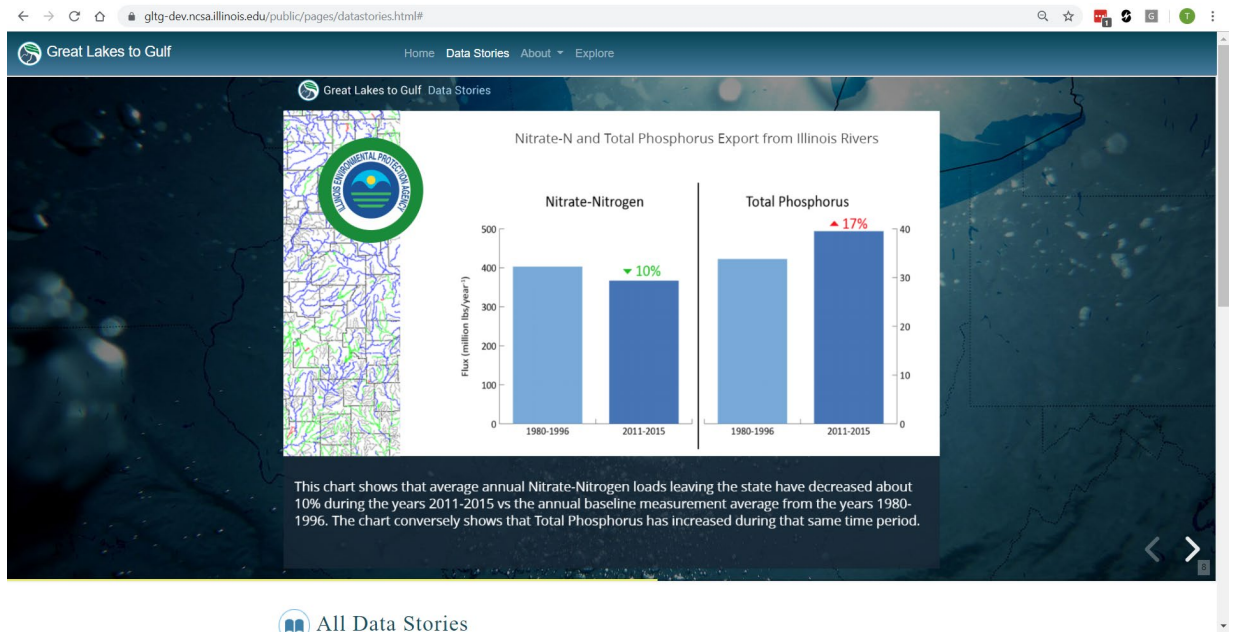
Dashboard


Boundary Type
IL Drainage
Nutrient
Nitrogen
Year
2017
Illinois R, at Valley City
XXXX Contributing Waterways
XXXX Cumulative Acres
Nitrogen Trend
Phosphorus Trend
ILLINOIS > Illinois R, at Valley City
YEARLY AVERAGE - 2017
13.8
<5
5-9.99
10-14.99
15-19.99
20-24.99
>25 lb/acre
No Data - Avg. of Surrounding Watersheds
ANNUAL NITROGEN YIELD 1980-2017
lb/acre
Year

Narrative / Storyboard

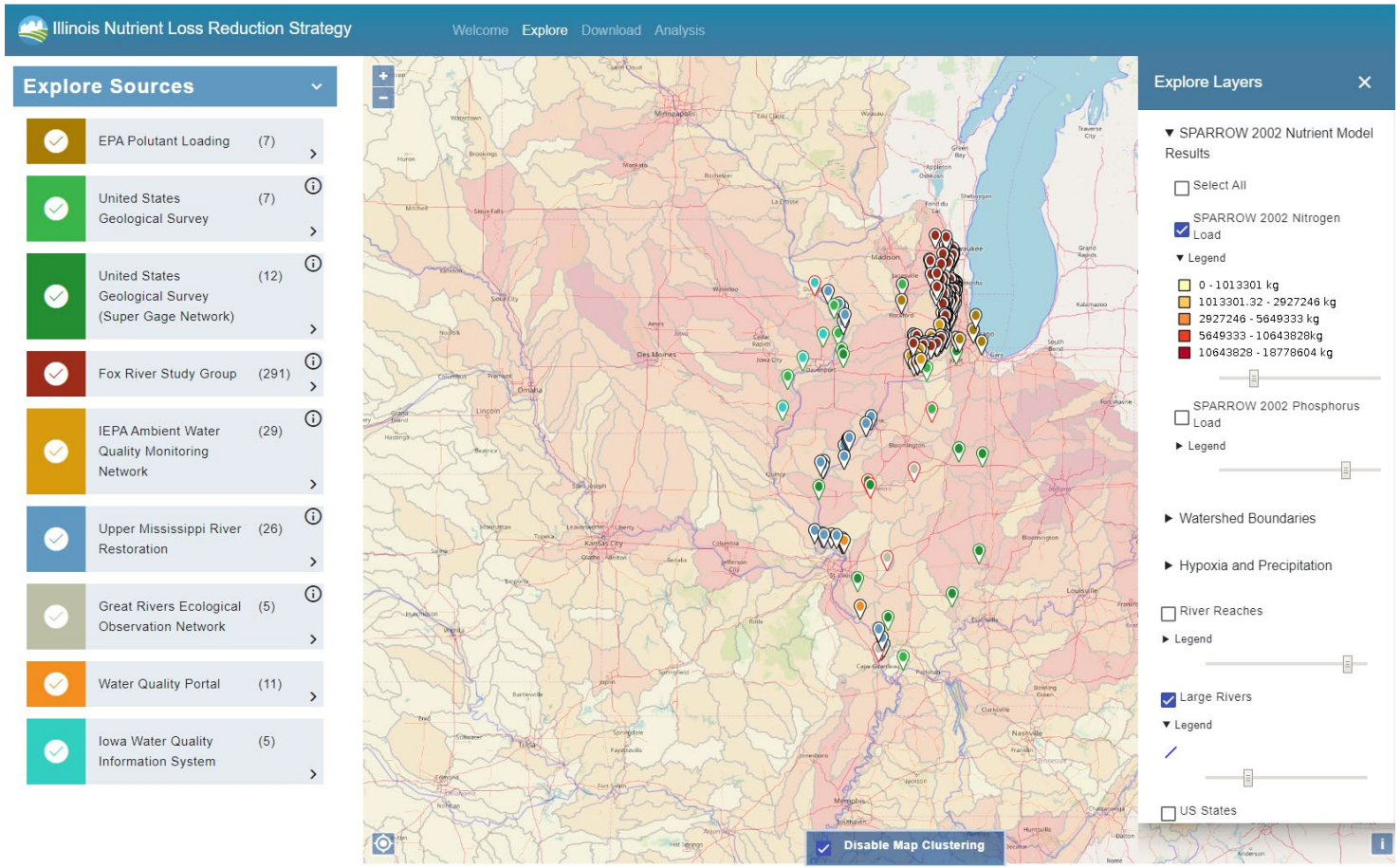
- Work with users / stakeholders to develop relevant stories
  - Easy to digest graphs, charts, summaries





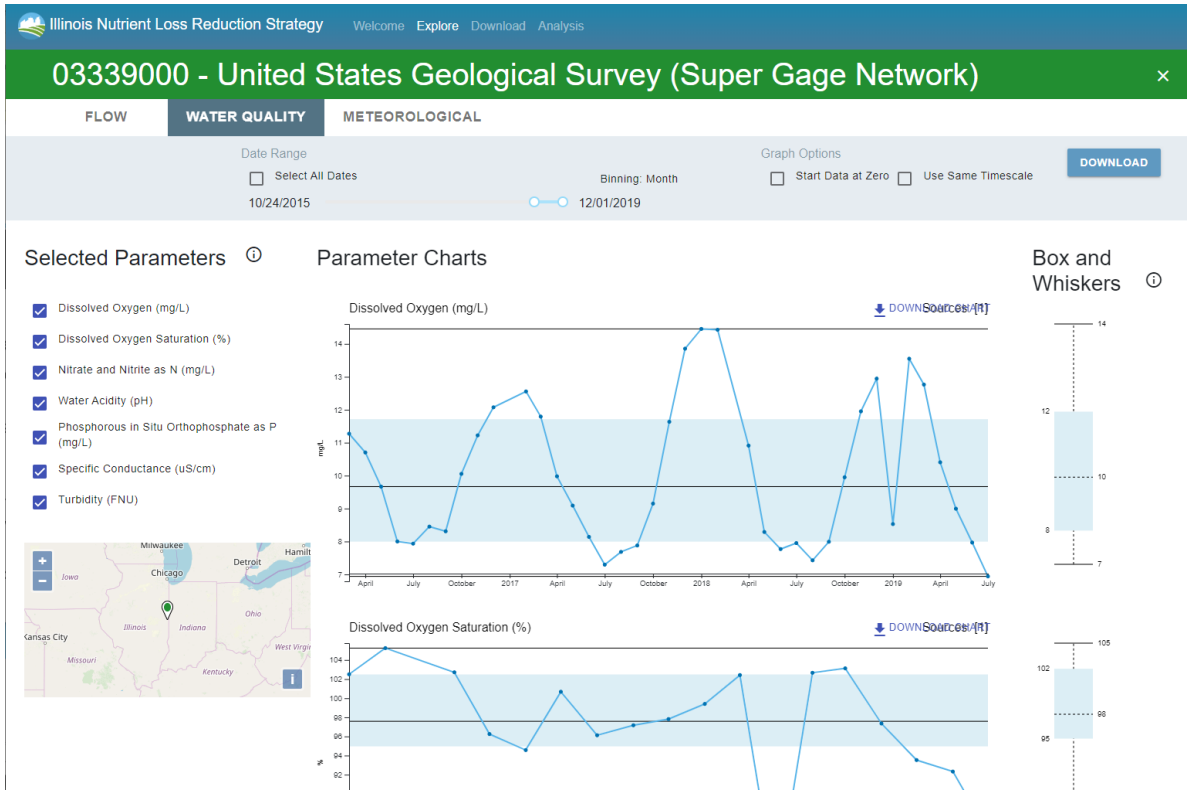
Explore Page

- New User Interface design
  - Separate panes for data sources and Geospatial layers
- Map clustering option
- Turn on/off data sources



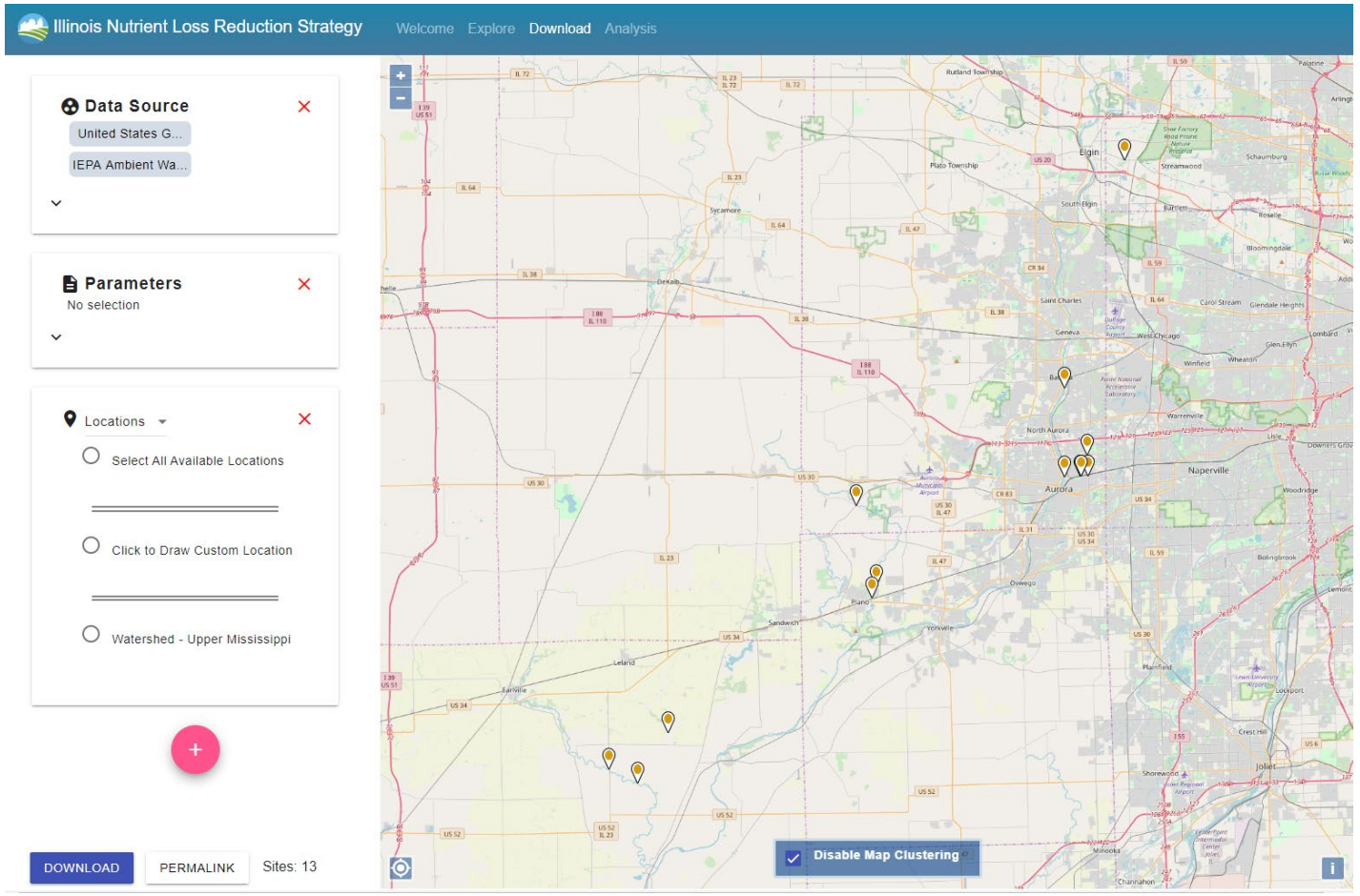
Detail Page

- New and improved User Interface design
- Performance improvement for smart binning
- Categories for parameters
- Charts
  - Box plots shows on the charts; highlight outliers
- Graph options
  - Start data at Zero
  - Use same time scale
    - It will sync all charts with same time range/scale
- Date Range
  - Select all dates: option to show all dates quickly

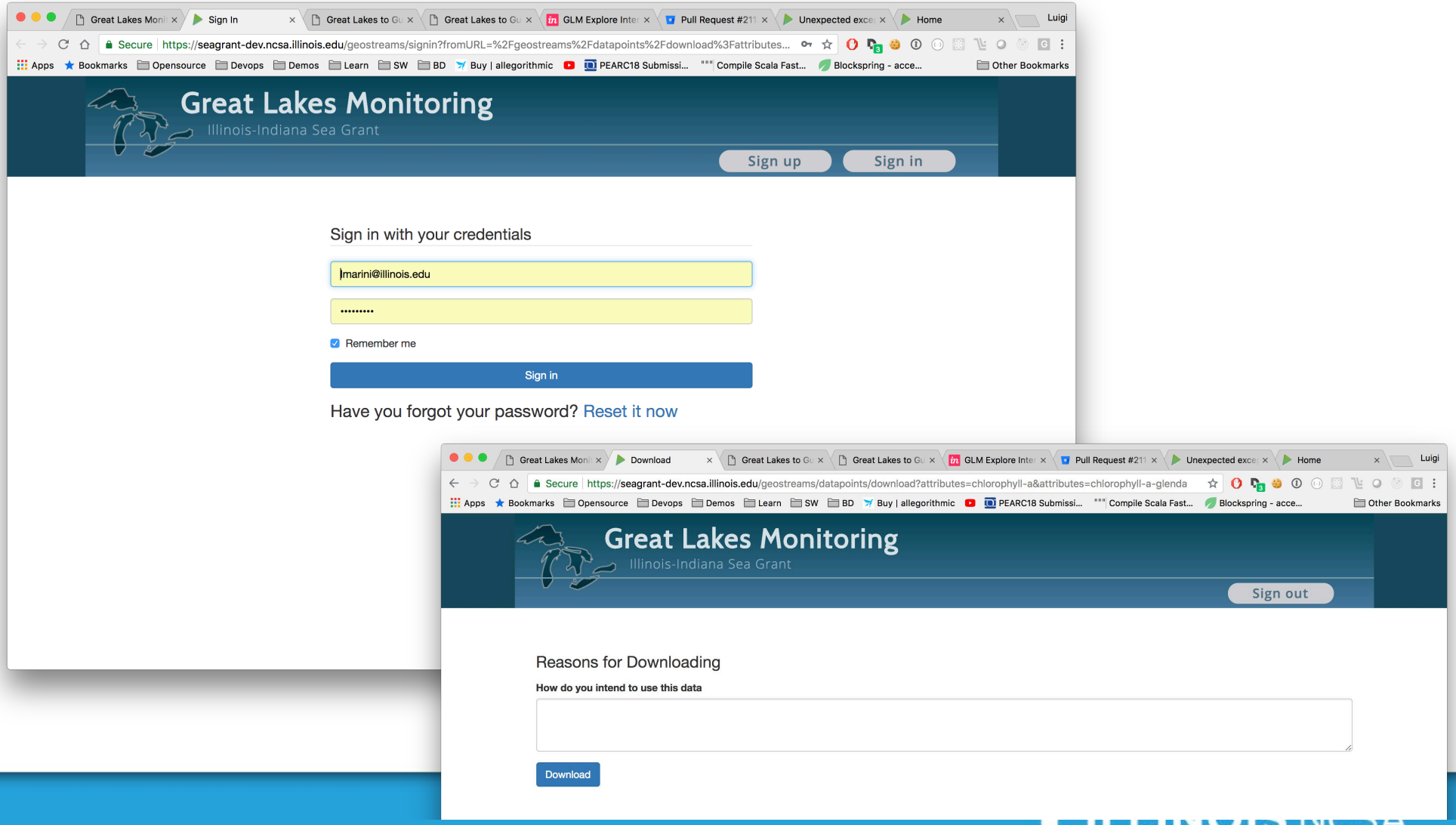


Download Page

- Easy search and on-the-fly update on search
- Main search criteria
  - Data Source
  - Parameter
  - Location
  - Time
  - Online



V3 - User Login / Track Downloads (In Progress)



Collaboration with IL - NLRS

- Collaborating with Illinois Nutrient Loss Reduction Strategy (by IEPA)
- Geospatial data support for analyses on N/P changes over time with Prof. Greg McIsaac
  - Catchment analysis of monitoring stations (# stations)
  - Identifying point sources related to certain monitoring stations
  - Identifying unmonitored area in Illinois (with point sources)
  - Generating/visualizing the N/P loads by HUC 8
  - Those geospatial layers will be GLTG contextual layers

Question & Comments?

- https://illinois.greatlakestogulf.org/