GLTG: Great Lakes To Gulf Virtual Observatory

Marcus Slavenas (slavenas@illinois.edu)
Research Programmer, NCSA

October 26th, 2016 @
Illinois Water Conference
University of Illinois, Urbana, IL

National Center for Supercomputing Applications
University of Illinois at Urbana-Champaign

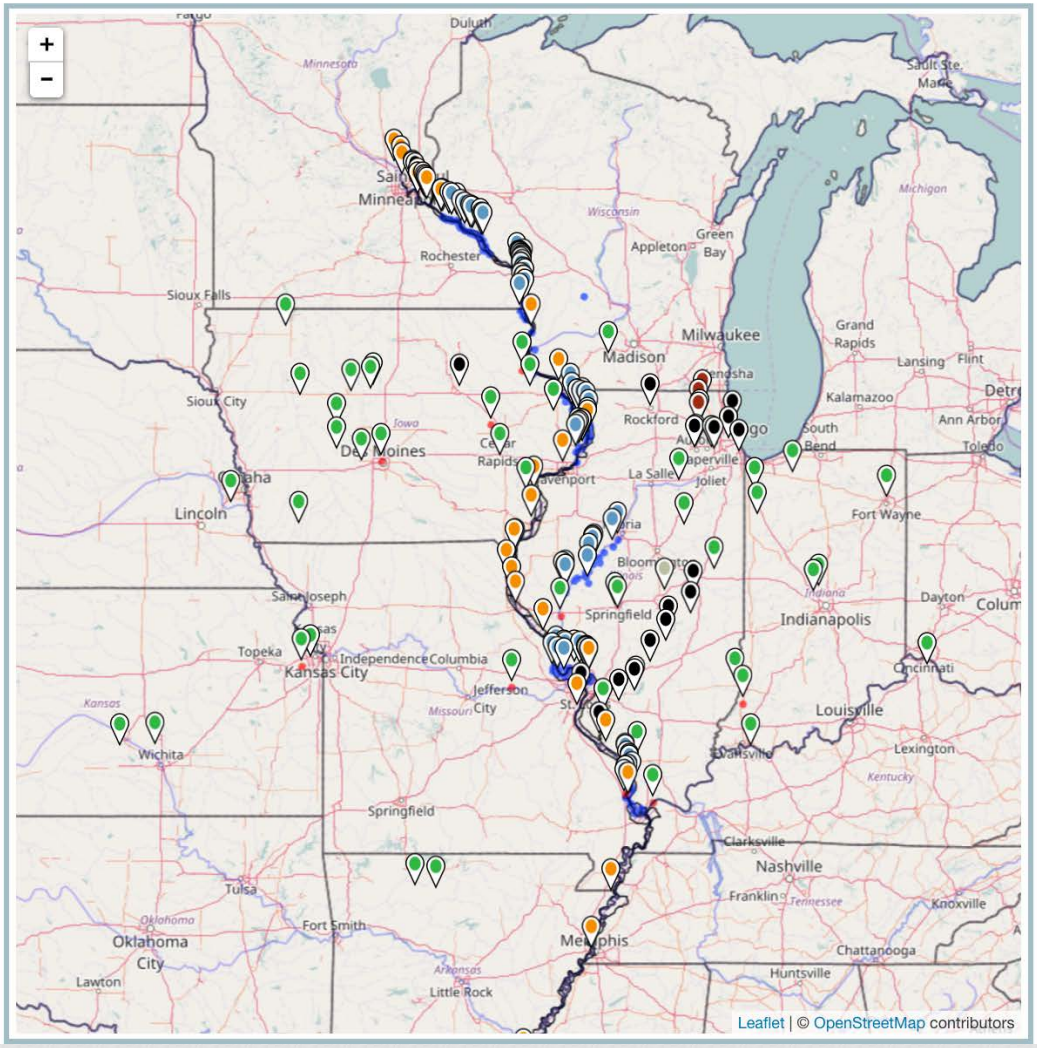
Great Lakes to Gulf
VIRTUAL OBSERVATORY

HOME | COMPARE | DOWNLOAD | ABOUT

Explore Layers

Explore Data by Source

- Epa Polutant Loading (EPA)
  - 0714
  - 0701
  - 0709
  - 0712
  - 0708
- Great Rivers Ecological Observation Network (GREON)
  - 0713
  - 0706
  - 0714
  - 0704
  - 0711
- Iepa Ambient Water Quality Monitoring Network (Awqmn) (IEPA)
  - 0714
- Fox River Study Group (ILLINOIS-EPA)
  - 0712
- National Oceanic and Atmospheric Administration (NOAA)
  - 0809
- Upper Mississippi River Restoration (UMRR LTRM)
  - 0708
  - 0713



LEWIS&CLARK COMMUNITY COLLEGE

The National Great Rivers Research & Education Center

NCSA

Sea Grant ILLINOIS · INDIANA

University of Illinois Department of Civil and Environmental Engineering

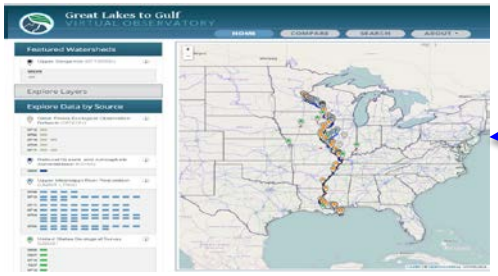
NCSA

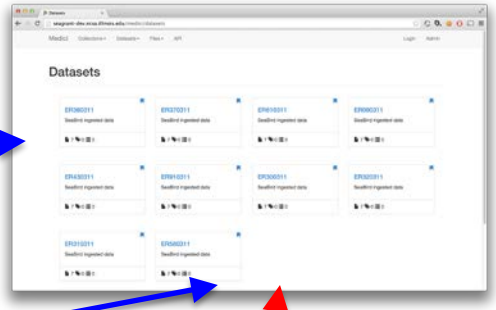
Scalable Data Management

Geodashboard

Clowder

Visualize
Search
Retrieve





Long Term
Archive

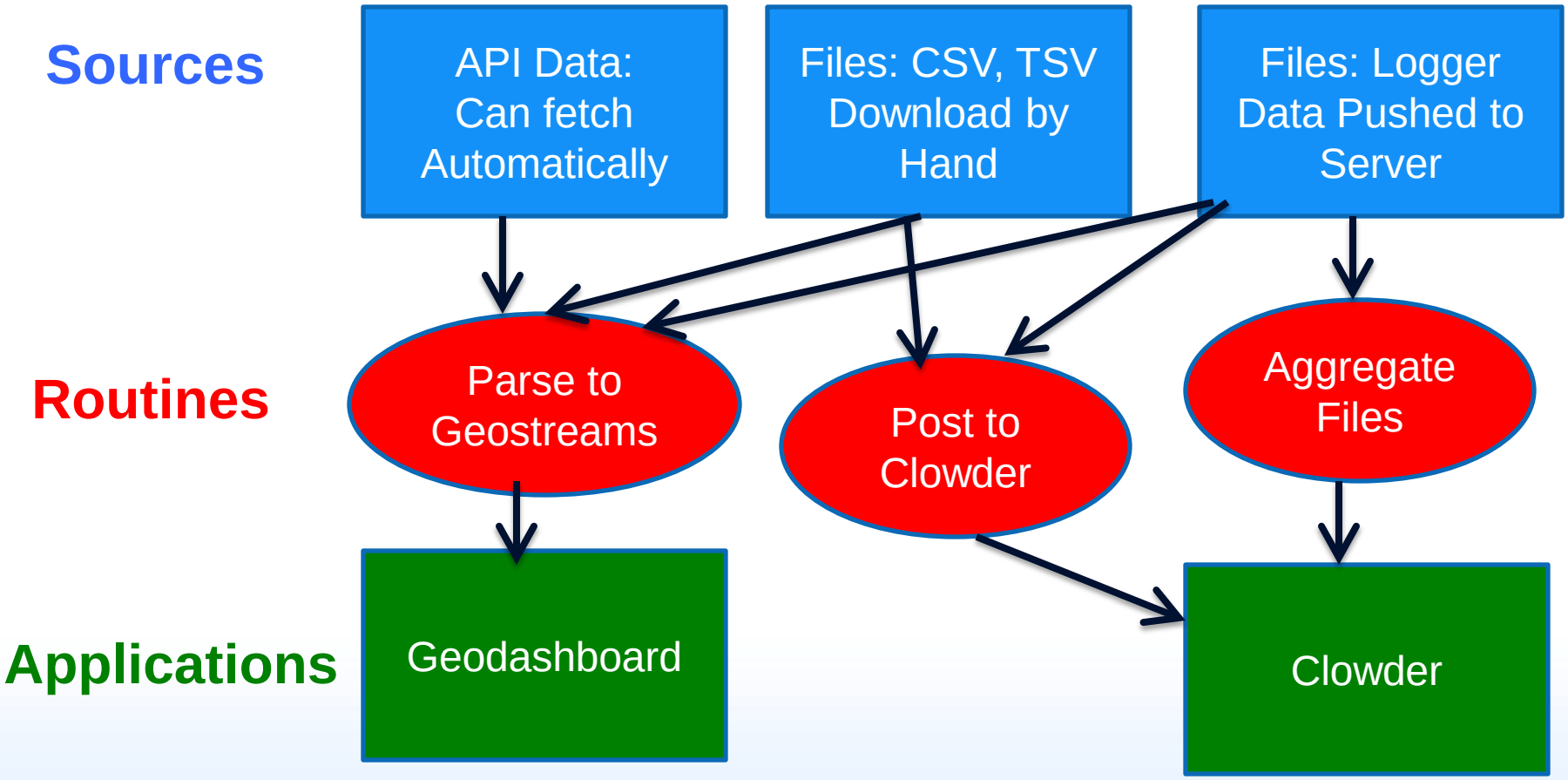
Geospatial
Cache

Geospatial
Database

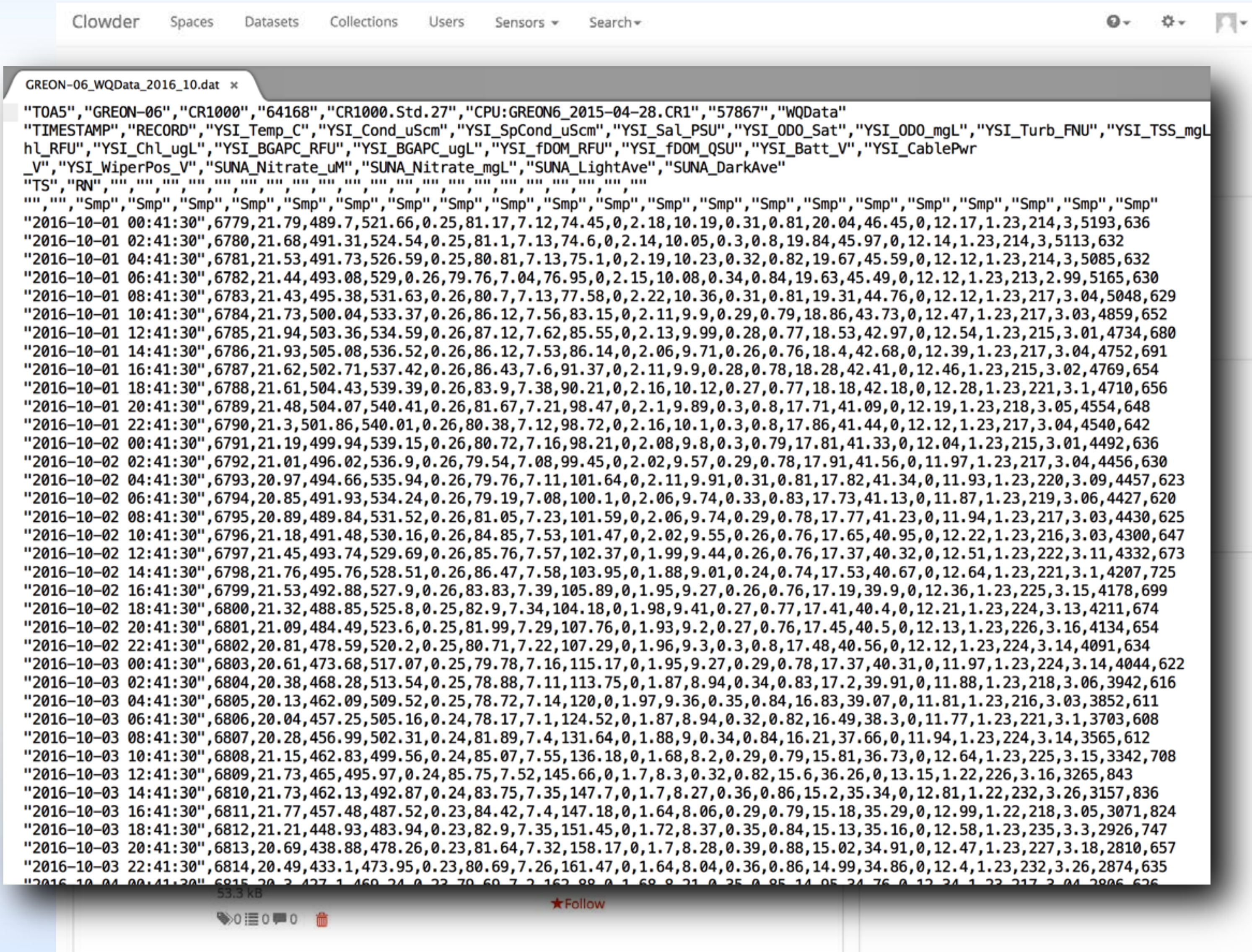
Long Term
Archive

Raw Data

Workflows


Sources
Routines
Applications
API Data: Can fetch Automatically
Files: CSV, TSV Download by Hand
Files: Logger Data Pushed to Server
Parse to Geostreams
Post to Clowder
Aggregate Files
Geodashboard
Clowder

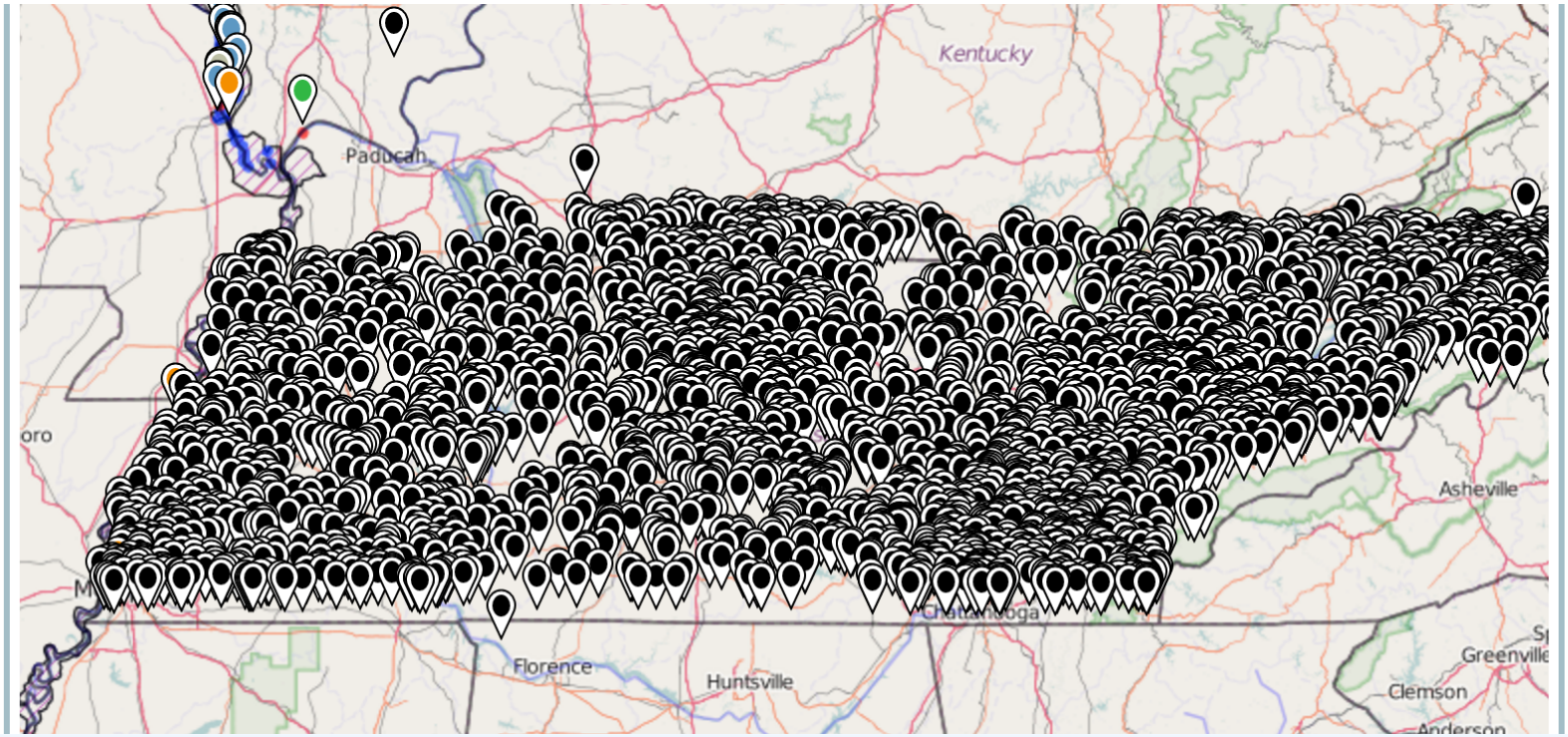
Clowder - Raw Files (or Aggregated)



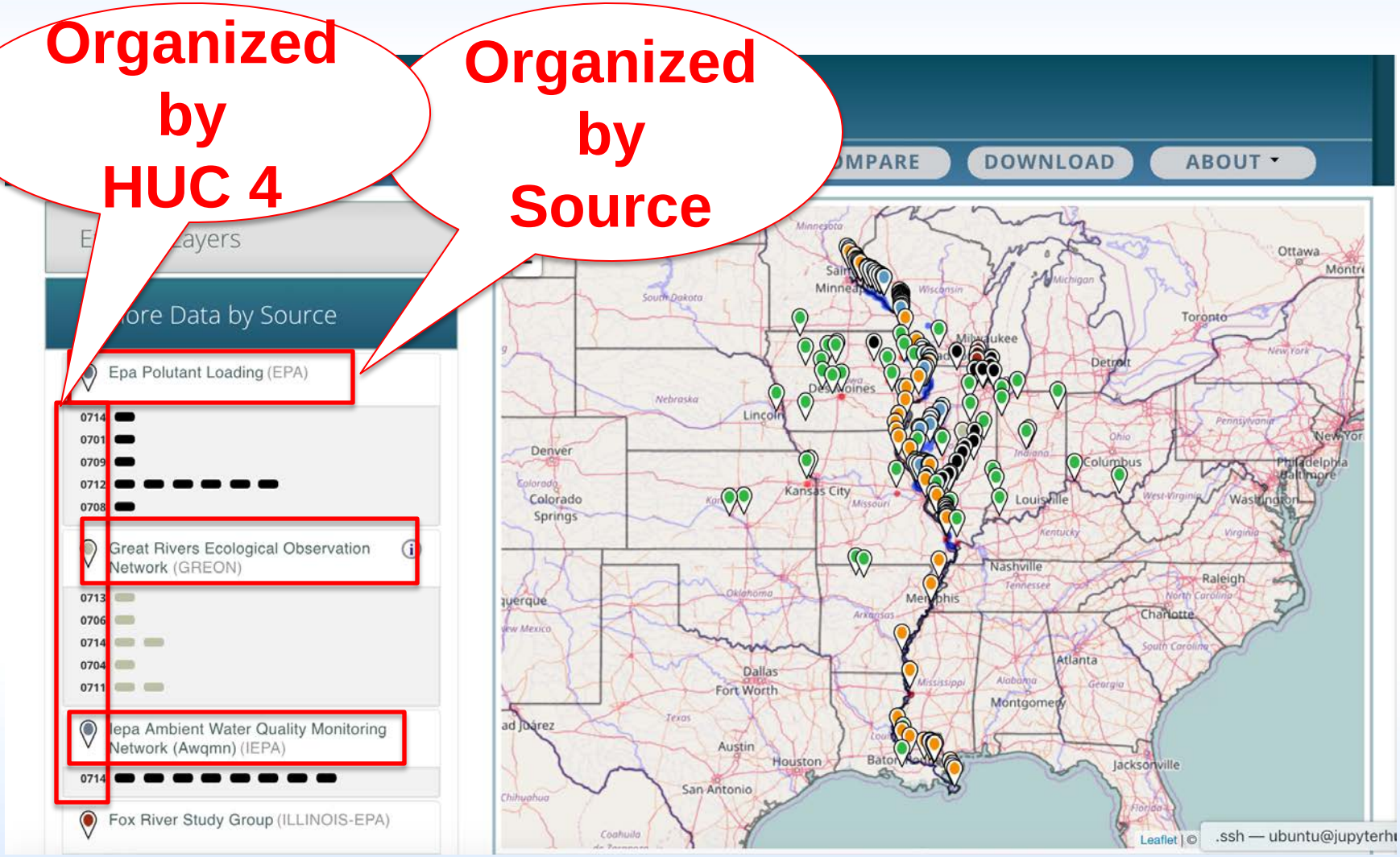
Data Sources

- GREON
- USGS
- IEPA
- Illinois Sierra Club
- EPA
- NOAA
- Upper Mississippi River Restoration
- Tennessee
- Water Quality Portal
  - Minnesota Pollution Control Agency
  - USGS
  - Wisconsin Department of Natural Resources
  - LDEQ/Watershed Planning Division (Louisiana)
  - IEPA

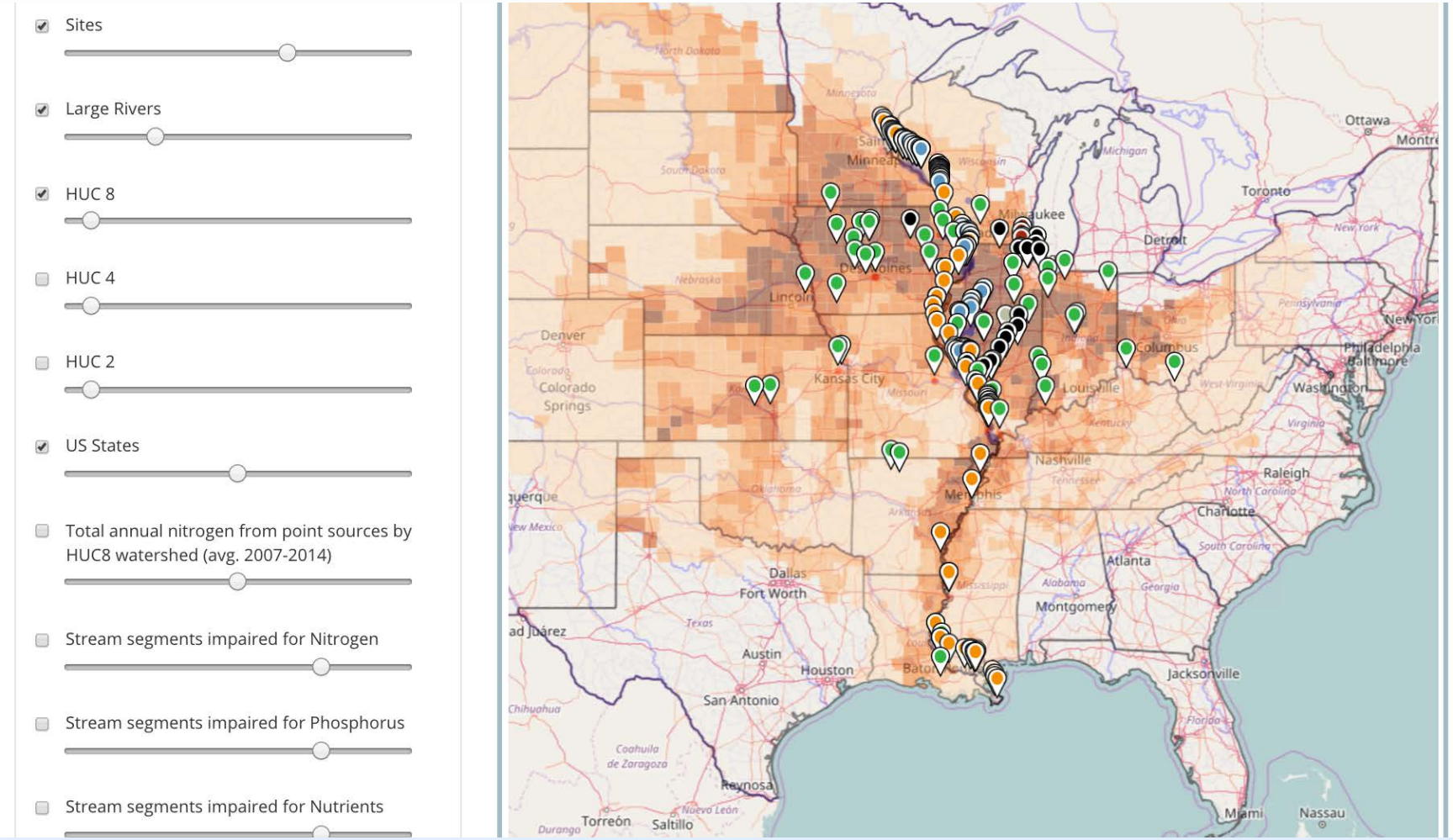
On Development Site
Scaling Up



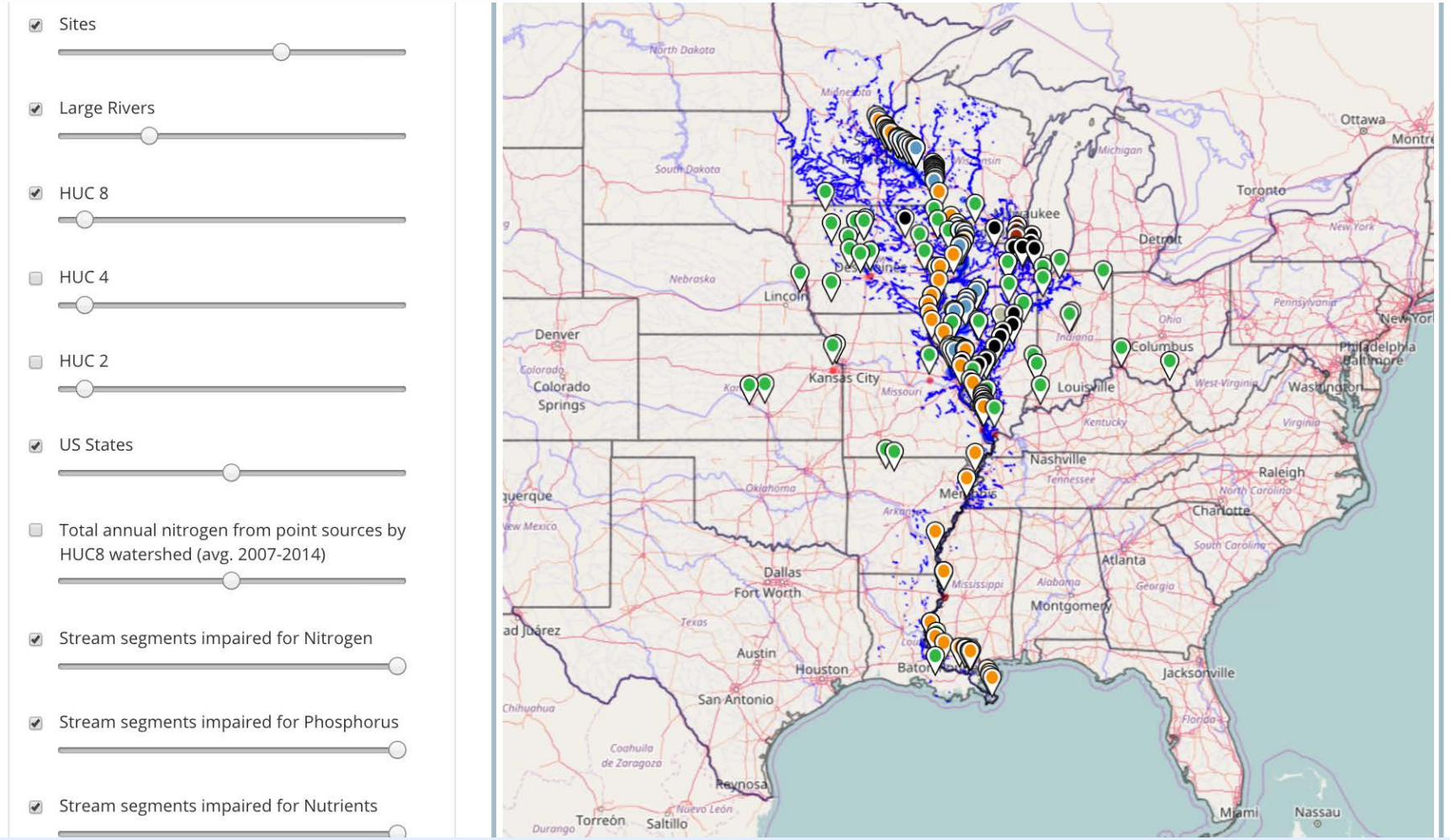
Geodashboard Homepage



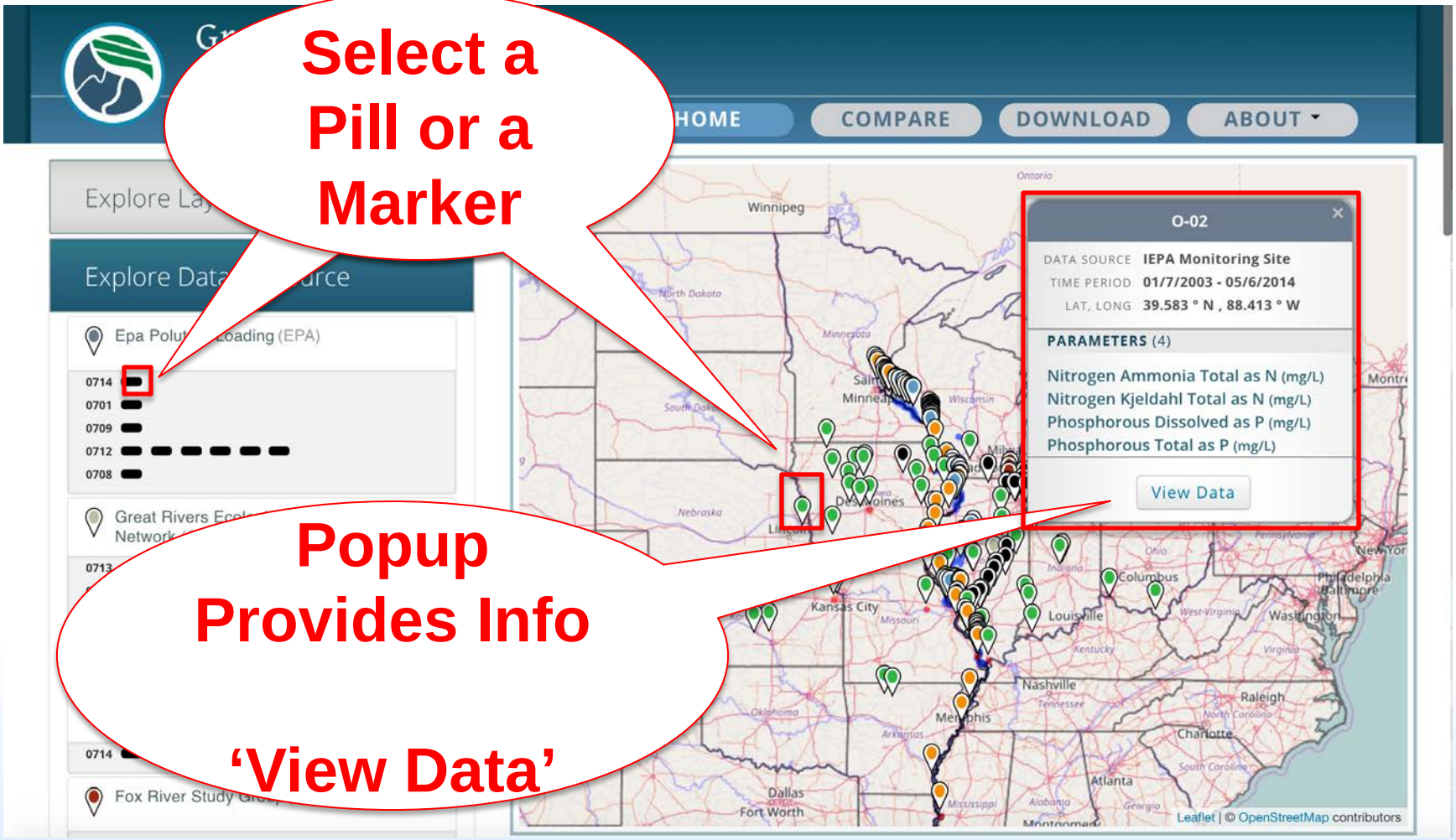
Shape Files: Average Annual Nitrogen Fertilizer Inputs for 1997 to 2006



Shape Files: Impaired Streams



Select a Pill or a Marker



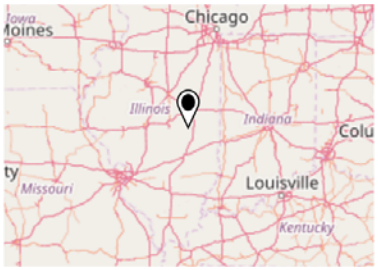
IEPA Sensor

Date Range 1/8/2003 - 5/6/2014
Averaged by season

Download Data

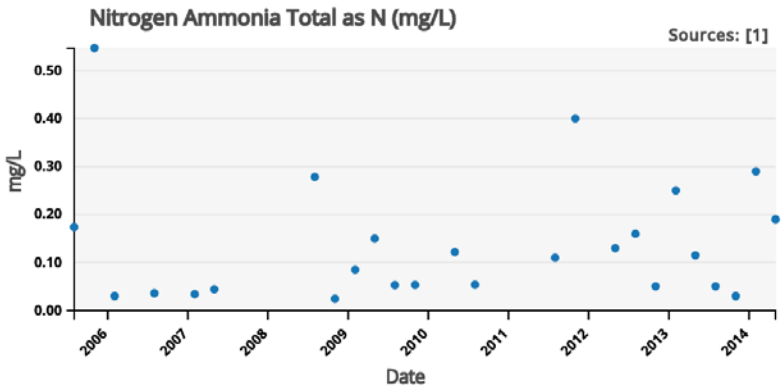
Selected Parameters

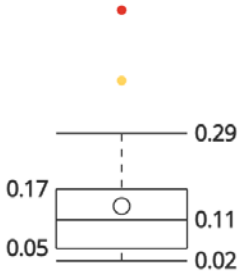
- Nitrogen Ammonia Total as N (mg/L)
- Nitrogen Kjeldahl Total as N (mg/L)
- Phosphorous Dissolved as P (mg/L)
- Phosphorous Total as P (mg/L)

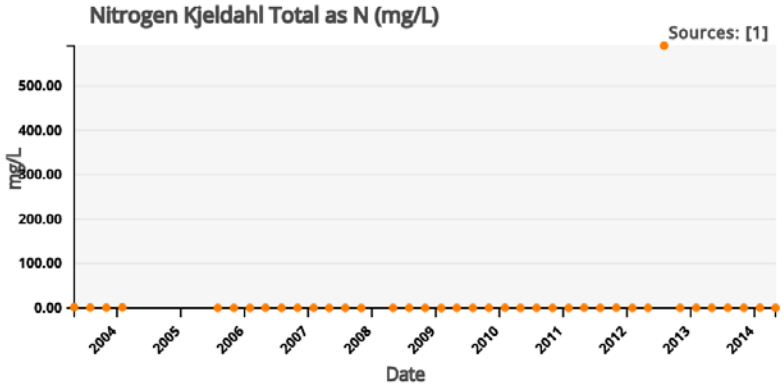


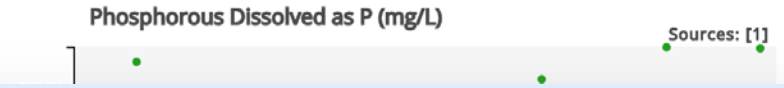
Time Series

Box and Whisker









USGS with Load and Cumulative Load

Calculations

Gap Filling

$$Slope = \frac{Value_{end} - Value_{start}}{Index_{end} - Index_{start}}$$

$$FilledValue_n = Index_n * Slope$$

Load Calculation

$$LoadingRate = Discharge \cdot NitrateLevel \cdot \left(28.3168 \frac{L}{ft^3}\right)$$

$$Load = LoadingRate \cdot 900s$$

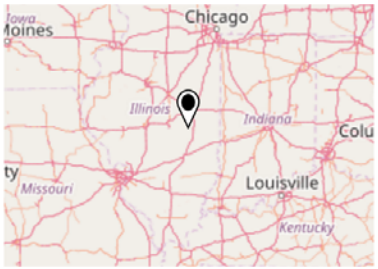
$$CumulativeLoad\left(t_{final}\right) = \sum_{t=1}^{t_{final}} Load\,(t)$$

Fox River – Sierra Club

View Mixed Sources?

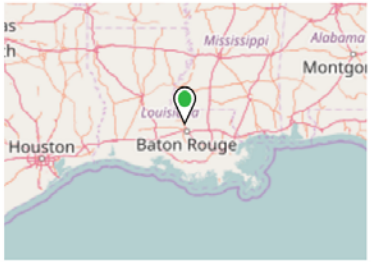
Selected Parameters

- Nitrogen Ammonia Total as N (mg/L)
- Nitrogen Kjeldahl Total as N (mg/L)
- Phosphorous Dissolved as P (mg/L)
- Phosphorous Total as P (mg/L)



Selected Parameters

- Nitrate Cumulative Load (Mg)
- Discharge (ft3/s)
- Dissolved Oxygen (mg/L)
- Nitrate Load (Mg)
- Nitrate as N (mg/L)
- Specific Conductance (uS/cm)
- Turbidity (FNU)
- Water Temperature (C)

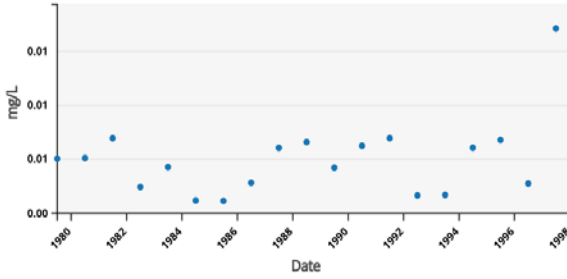


Selected Parameters

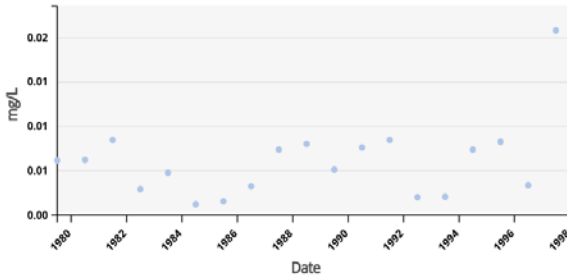
- Ammonia Unionized as N (mg/L)
- Ammonia Unionized Temp pH NH4 (mg/L)
- Nitrate Nitrite Total as N (mg/L)
- Nitrate Nitrogen Total as N (mg/L)
- Nitrite Nitrogen Total as N (mg/L)
- Nitrogen Ammonia Total as N (mg/L)
- Nitrogen Kjeldahl Total as N (mg/L)
- Nitrogen Kjehdahl Total Bottom Dep Dry Weight (Mg/kg)
- Nitrogen Organic Total as N (mg/L)
- Nitrogen Total as N (mg/L)
- Nitrogen Total as NO3 (mg/L)
- Phosphorous Dissolved as P (mg/L)
- Phosphorous in Total Orthophosphate as P (mg/L)
- Phosphorous Total as P (mg/L)
- Phosphorous Total Bottom Deposit Dry Weight (Mg/kg)

Time Series

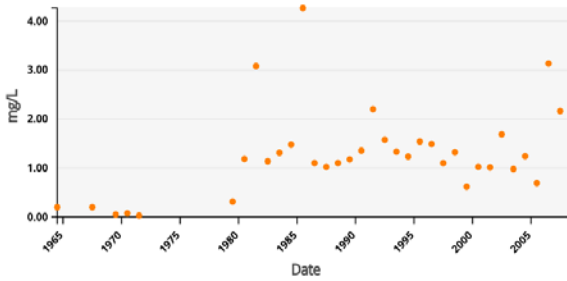
Ammonia Unionized as N (mg/L)



Ammonia Unionized Temp pH NH4 (mg/L)



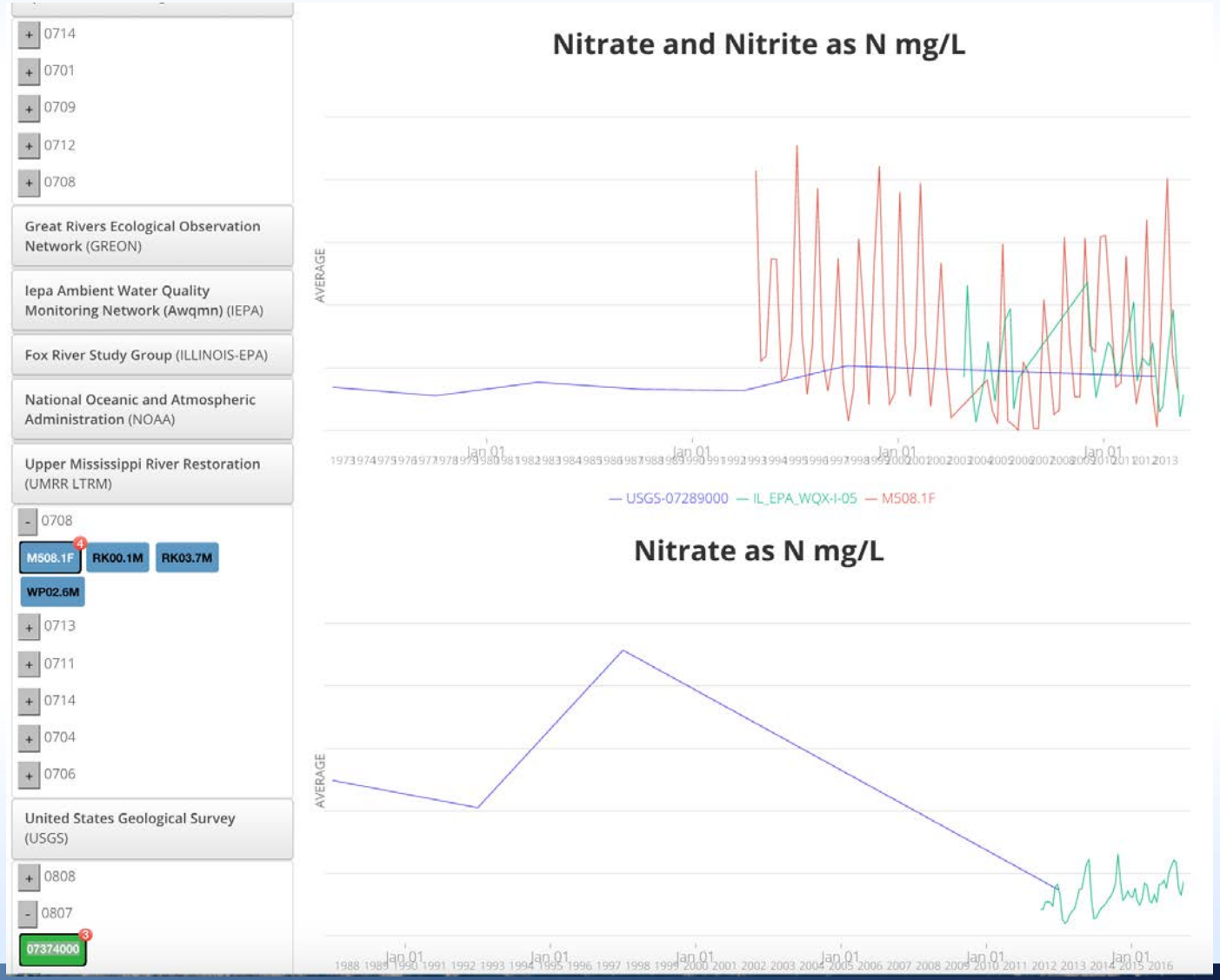
Nitrate Nitrite Total as N (mg/L)



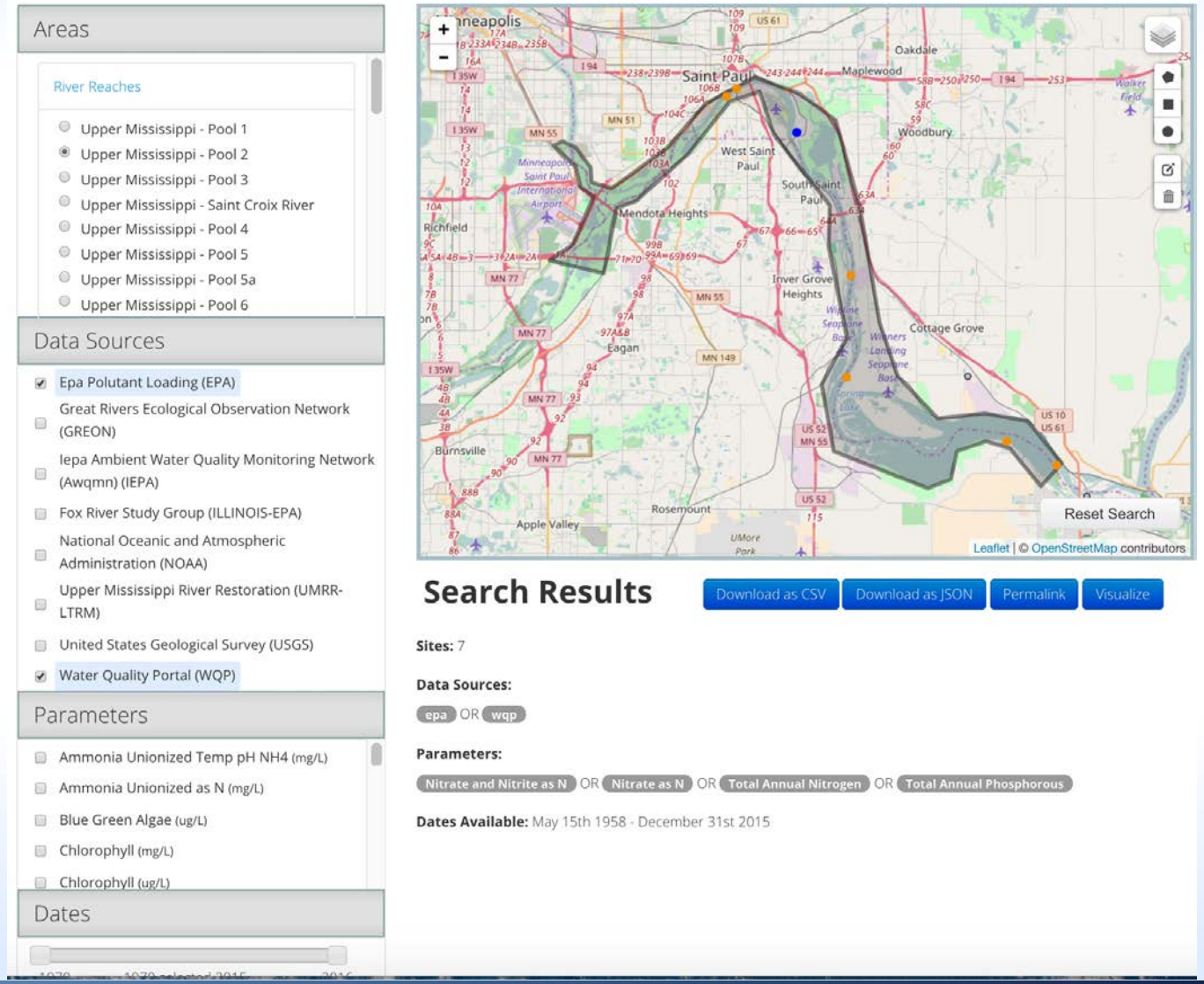
Nitrate Nitrogen Total as N (mg/L)

NCSA

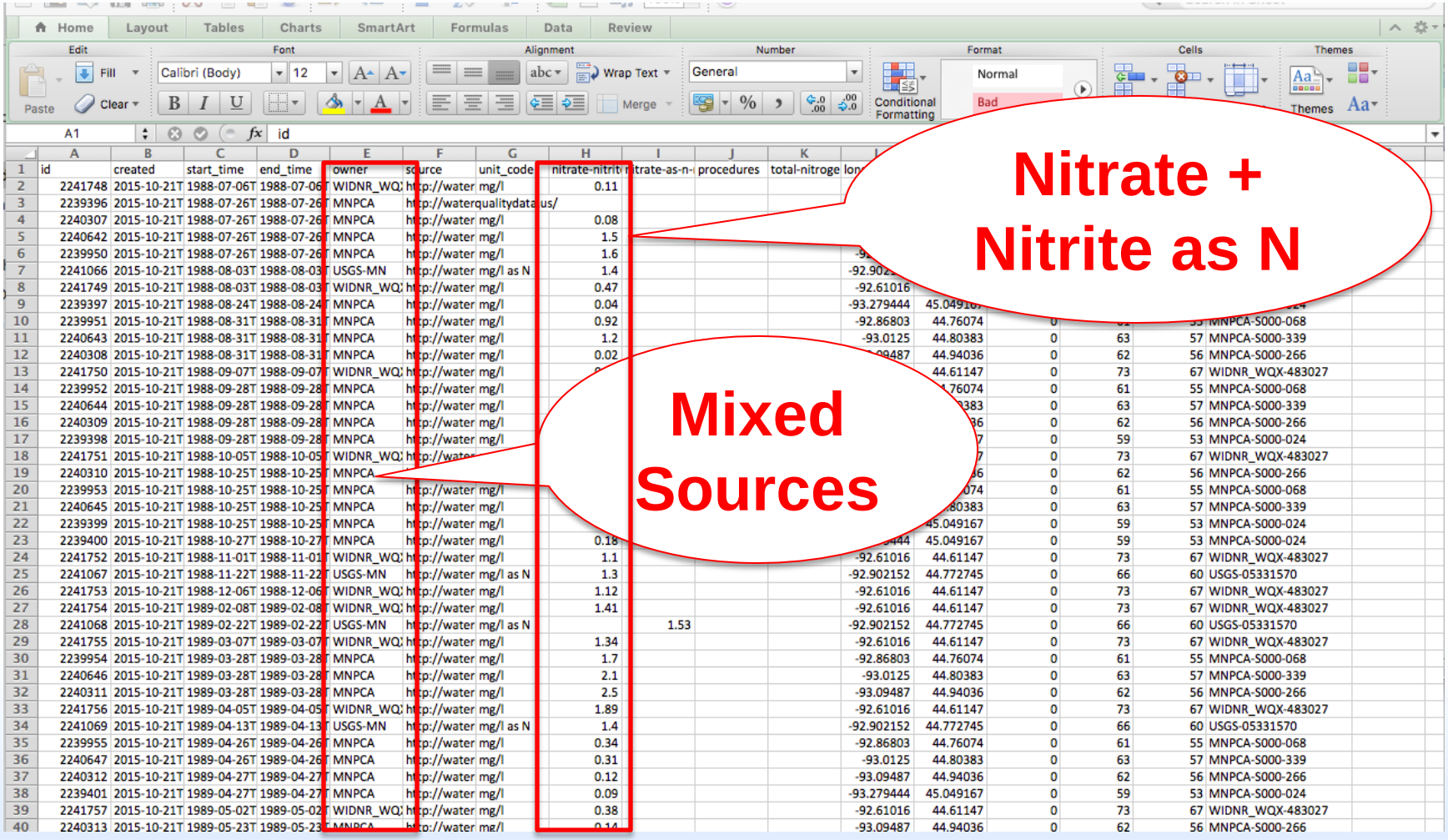
View Multiple Sensors and Data Types



Select by River Reaches or Watershed

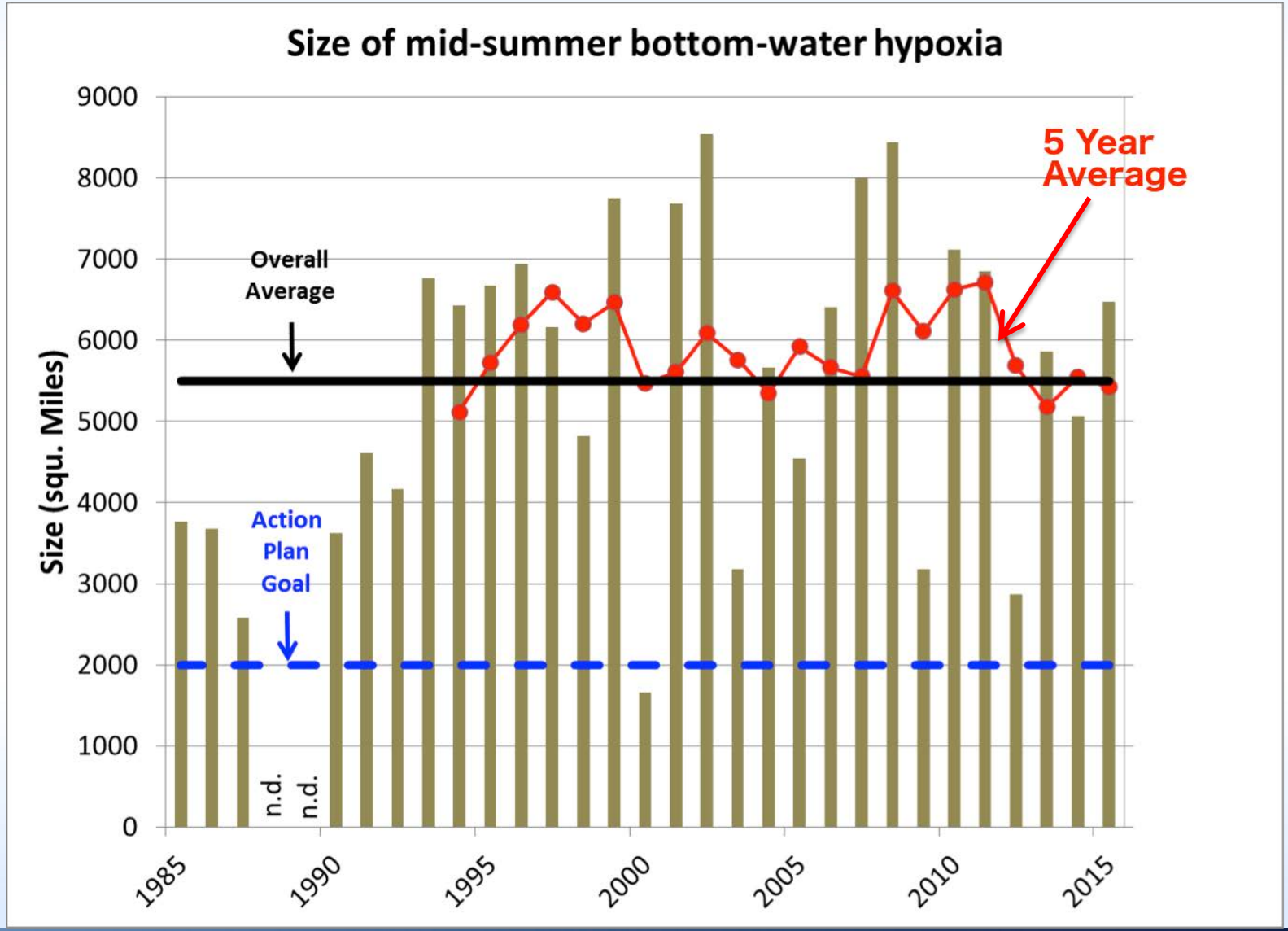


Mixed Data



	id	created	start_time	end_time	owner	source	unit_code	nitrate-nitrit	nitrate-as-n-	procedures	total-nitroge	lon					
2	2241748	2015-10-21T	1988-07-06T	1988-07-06	WIDNR_WQ	http://water	mg/l	0.11									
3	2239396	2015-10-21T	1988-07-26T	1988-07-26	MNPCA	http://waterqualitydata.us/											
4	2240307	2015-10-21T	1988-07-26T	1988-07-26	MNPCA	http://water	mg/l	0.08									
5	2240642	2015-10-21T	1988-07-26T	1988-07-26	MNPCA	http://water	mg/l	1.5									
6	2239950	2015-10-21T	1988-07-26T	1988-07-26	MNPCA	http://water	mg/l	1.6									
7	2241066	2015-10-21T	1988-08-03T	1988-08-03	USGS-MN	http://water	mg/l as N	1.4				-92.902					
8	2241749	2015-10-21T	1988-08-03T	1988-08-03	WIDNR_WQ	http://water	mg/l	0.47				-92.61016					
9	2239397	2015-10-21T	1988-08-24T	1988-08-24	MNPCA	http://water	mg/l	0.04				-93.279444	45.04916				
10	2239951	2015-10-21T	1988-08-31T	1988-08-31	MNPCA	http://water	mg/l	0.92				-92.86803	44.76074	0		53	MNPCA-S000-068
11	2240643	2015-10-21T	1988-08-31T	1988-08-31	MNPCA	http://water	mg/l	1.2				-93.0125	44.80383	0	63	57	MNPCA-S000-339
12	2240308	2015-10-21T	1988-08-31T	1988-08-31	MNPCA	http://water	mg/l	0.02				-93.09487	44.94036	0	62	56	MNPCA-S000-266
13	2241750	2015-10-21T	1988-09-07T	1988-09-07	WIDNR_WQ	http://water	mg/l						44.61147	0	73	67	WIDNR_WQX-483027
14	2239952	2015-10-21T	1988-09-28T	1988-09-28	MNPCA	http://water	mg/l						44.76074	0	61	55	MNPCA-S000-068
15	2240644	2015-10-21T	1988-09-28T	1988-09-28	MNPCA	http://water	mg/l						44.80383	0	63	57	MNPCA-S000-339
16	2240309	2015-10-21T	1988-09-28T	1988-09-28	MNPCA	http://water	mg/l						44.94036	0	62	56	MNPCA-S000-266
17	2239398	2015-10-21T	1988-09-28T	1988-09-28	MNPCA	http://water	mg/l						44.772745	0	59	53	MNPCA-S000-024
18	2241751	2015-10-21T	1988-10-05T	1988-10-05	WIDNR_WQ	http://water							44.61147	0	73	67	WIDNR_WQX-483027
19	2240310	2015-10-21T	1988-10-25T	1988-10-25	MNPCA								44.94036	0	62	56	MNPCA-S000-266
20	2239953	2015-10-21T	1988-10-25T	1988-10-25	MNPCA	http://water	mg/l						44.76074	0	61	55	MNPCA-S000-068
21	2240645	2015-10-21T	1988-10-25T	1988-10-25	MNPCA	http://water	mg/l						44.80383	0	63	57	MNPCA-S000-339
22	2239399	2015-10-21T	1988-10-25T	1988-10-25	MNPCA	http://water	mg/l						45.049167	0	59	53	MNPCA-S000-024
23	2239400	2015-10-21T	1988-10-27T	1988-10-27	MNPCA	http://water	mg/l	0.18					45.049167	0	59	53	MNPCA-S000-024
24	2241752	2015-10-21T	1988-11-01T	1988-11-01	WIDNR_WQ	http://water	mg/l	1.1				-92.61016	44.61147	0	73	67	WIDNR_WQX-483027
25	2241067	2015-10-21T	1988-11-22T	1988-11-22	USGS-MN	http://water	mg/l as N	1.3				-92.902152	44.772745	0	66	60	USGS-05331570
26	2241753	2015-10-21T	1988-12-06T	1988-12-06	WIDNR_WQ	http://water	mg/l	1.12				-92.61016	44.61147	0	73	67	WIDNR_WQX-483027
27	2241754	2015-10-21T	1989-02-08T	1989-02-08	WIDNR_WQ	http://water	mg/l	1.41				-92.61016	44.61147	0	73	67	WIDNR_WQX-483027
28	2241068	2015-10-21T	1989-02-22T	1989-02-22	USGS-MN	http://water	mg/l as N		1.53			-92.902152	44.772745	0	66	60	USGS-05331570
29	2241755	2015-10-21T	1989-03-07T	1989-03-07	WIDNR_WQ	http://water	mg/l	1.34				-92.61016	44.61147	0	73	67	WIDNR_WQX-483027
30	2239954	2015-10-21T	1989-03-28T	1989-03-28	MNPCA	http://water	mg/l	1.7				-92.86803	44.76074	0	61	55	MNPCA-S000-068
31	2240646	2015-10-21T	1989-03-28T	1989-03-28	MNPCA	http://water	mg/l	2.1				-93.0125	44.80383	0	63	57	MNPCA-S000-339
32	2240311	2015-10-21T	1989-03-28T	1989-03-28	MNPCA	http://water	mg/l	2.5				-93.09487	44.94036	0	62	56	MNPCA-S000-266
33	2241756	2015-10-21T	1989-04-05T	1989-04-05	WIDNR_WQ	http://water	mg/l	1.89				-92.61016	44.61147	0	73	67	WIDNR_WQX-483027
34	2241069	2015-10-21T	1989-04-13T	1989-04-13	USGS-MN	http://water	mg/l as N	1.4				-92.902152	44.772745	0	66	60	USGS-05331570
35	2239955	2015-10-21T	1989-04-26T	1989-04-26	MNPCA	http://water	mg/l	0.34				-92.86803	44.76074	0	61	55	MNPCA-S000-068
36	2240647	2015-10-21T	1989-04-26T	1989-04-26	MNPCA	http://water	mg/l	0.31				-93.0125	44.80383	0	63	57	MNPCA-S000-339
37	2240312	2015-10-21T	1989-04-27T	1989-04-27	MNPCA	http://water	mg/l	0.12				-93.09487	44.94036	0	62	56	MNPCA-S000-266
38	2239401	2015-10-21T	1989-04-27T	1989-04-27	MNPCA	http://water	mg/l	0.09				-93.279444	45.049167	0	59	53	MNPCA-S000-024
39	2241757	2015-10-21T	1989-05-02T	1989-05-02	WIDNR_WQ	http://water	mg/l	0.38				-92.61016	44.61147	0	73	67	WIDNR_WQX-483027
40	2240313	2015-10-21T	1989-05-23T	1989-05-23	MNPCA	http://water	mg/l	0.14				-93.09487	44.94036	0	62	56	MNPCA-S000-266

Hypoxic Zone - Trends



Great Lakes to Gulf (GLTG) Virtual Observatory

THANK YOU!!!

University of Illinois
Department of Civil and
Environmental Engineering

The
WALTON FAMILY
FOUNDATION

Sea Grant
ILLINOIS - INDIANA

LEWIS&CLARK
COMMUNITY COLLEGE

THE
McKNIGHT
FOUNDATION

NCSA