

GLTG: Great Lakes To Gulf Virtual Observatory

Marcus Slavenas (<u>slavenas@illinois.edu</u>) 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



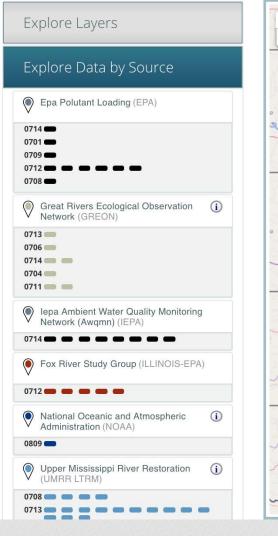


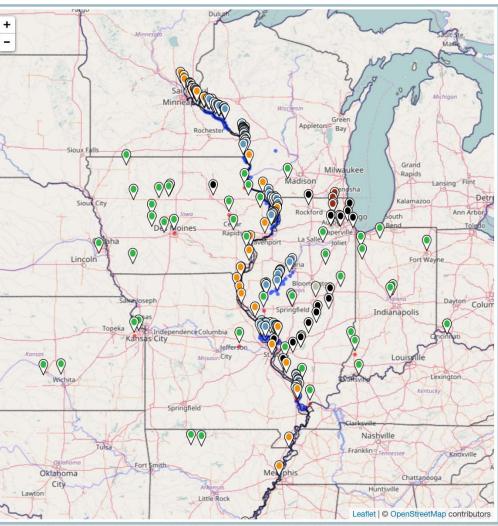
Great Lakes to Gulf

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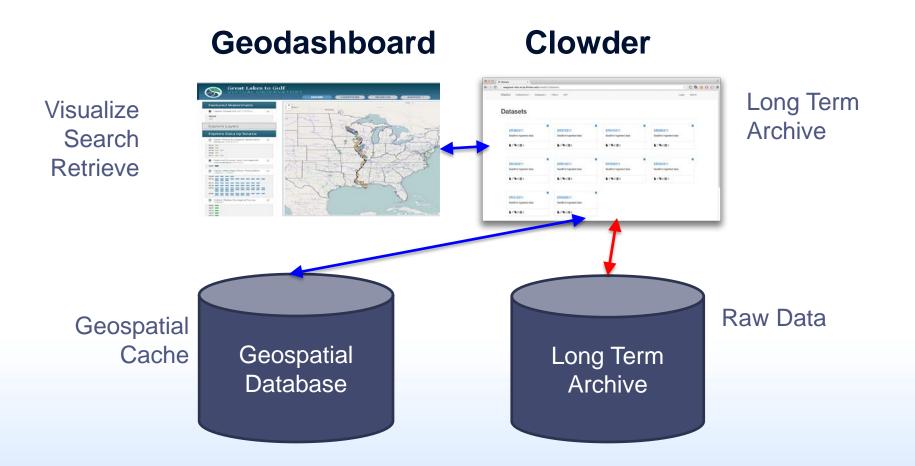


University of Illinois Department of Civil and Environmental Engineering



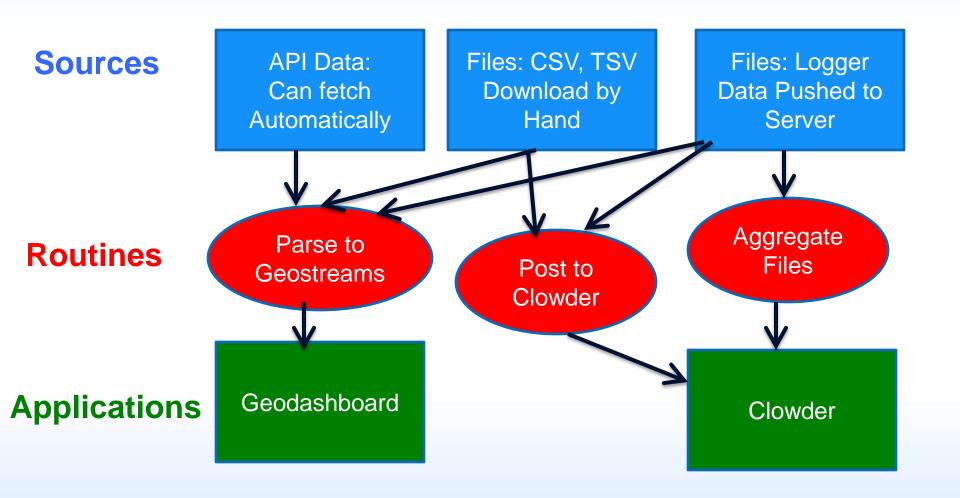


Scalable Data Management





Workflows





Clowder - Raw Files (or Aggregated)

Clowder Spaces Datasets Collections Users Sensors - Search-

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GREON-06_WQData_2016_10.dat ×

"TOA5","GREON-06","CR1000","64168","CR1000.Std.27","CPU:GREON6_2015-04-28.CR1","57867","WQData" "TIMESTAMP", "RECORD", "YSI Temp C", "YSI Cond uScm", "YSI SpCond uScm", "YSI Sal PSU", "YSI ODO Sat", "YSI ODO mal", "YSI Turb FNU", "YSI TSS mal hl_RFU","YSI_Chl_ugL","YSI_BGAPC_RFU","YSI_BGAPC_ugL","YSI_fDOM_RFU","YSI_fDOM_QSU","YSI_Batt_V","YSI_CablePwr "", "", "Smp", "Smp "2016-10-01 00:41:30",6779,21.79,489.7,521.66,0.25,81.17,7.12,74.45,0,2.18,10.19,0.31,0.81,20.04,46.45,0,12.17,1.23,214,3,5193,636 "2016-10-01 02:41:30",6780,21.68,491.31,524.54,0.25,81.1,7.13,74.6,0,2.14,10.05,0.3,0.8,19.84,45.97,0,12.14,1.23,214,3,5113,632 "2016-10-01 04:41:30",6781,21.53,491.73,526.59,0.25,80.81,7.13,75.1,0,2.19,10.23,0.32,0.82,19.67,45.59,0,12.12,1.23,214,3,5085,632 "2016-10-01 06:41:30",6782,21.44,493.08,529,0.26,79.76,7.04,76.95,0,2.15,10.08,0.34,0.84,19.63,45.49,0,12.12,1.23,213,2.99,5165,630 "2016-10-01 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16:41:30",6811,21.77,457.48,487.52,0.23,84.42,7.4,147.18,0,1.64,8.06,0.29,0.79,15.18,35.29,0,12.99,1.22,218,3.05,3071,824 "2016-10-03 18:41:30",6812,21.21,448.93,483.94,0.23,82.9,7.35,151.45,0,1.72,8.37,0.35,0.84,15.13,35.16,0,12.58,1.23,235,3.3,2926,747 "2016-10-03 20:41:30",6813,20.69,438.88,478.26,0.23,81.64,7.32,158.17,0,1.7,8.28,0.39,0.88,15.02,34.91,0,12.47,1.23,227,3.18,2810,657 "2016-10-03 22:41:30",6814,20.49,433.1,473.95,0.23,80.69,7.26,161.47,0,1.64,8.04,0.36,0.86,14.99,34.86,0,12.4,1.23,232,3.26,2874,635 1016 10 04 00.41.201 6015 00 2 407 1 460 24 0 22 70 60 7 2 162 00 0 1 60 0 21 0 25 0 05 14 05 24 76 0 12 24 1 22 217 2

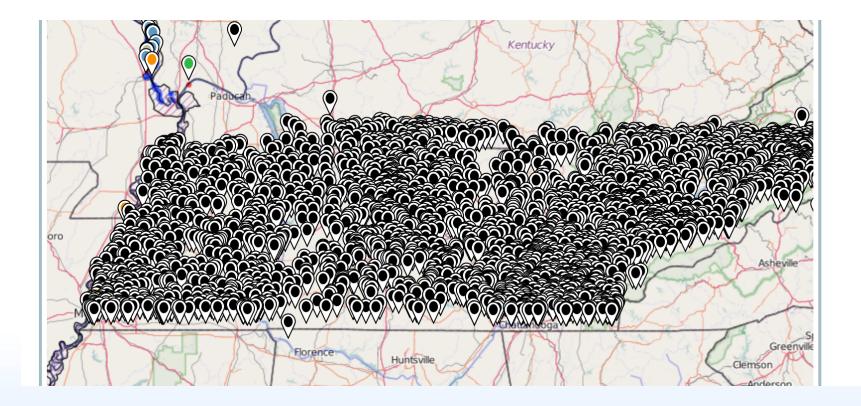




- GREON
- USGS
- IEPA
- Illinois Sierra Club
- EPA
- NOAA
- Upper Mississippi River Restoration
- Tennessee
- Water Quality Portal
 - Minnesota Pollution Control Agency
 - USGS
 - Wisconsin Department of Natural Resources
 - LDEQ/Watershed Planning Division (Louisiana)
 - IEPA

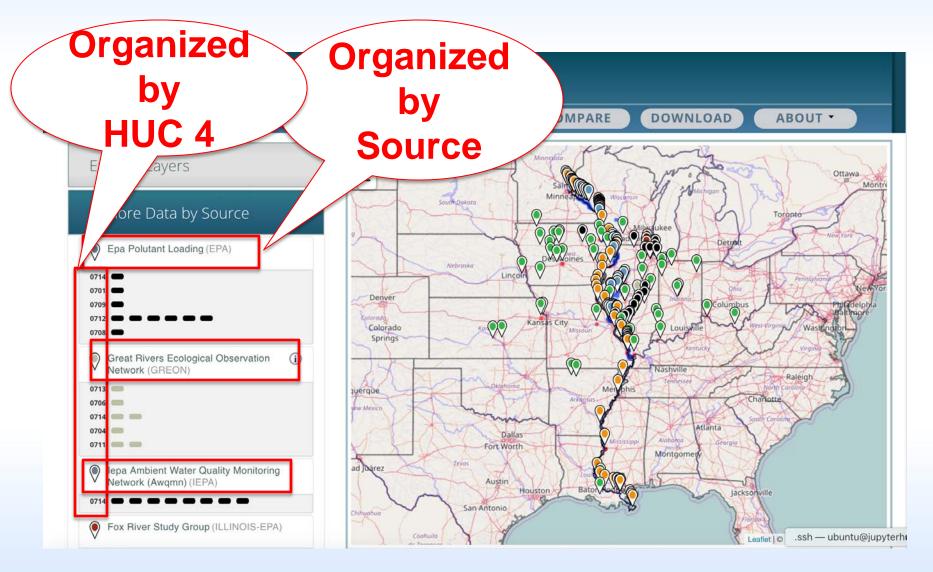


On Development Site Scaling Up



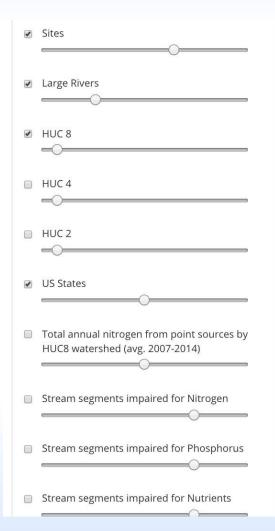


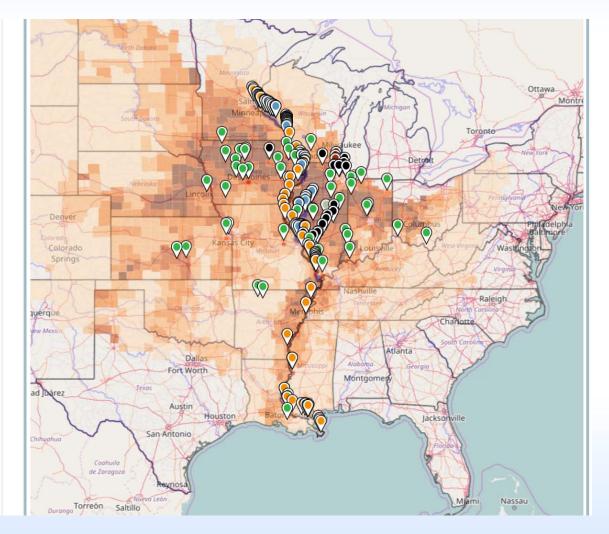
Geodashboard Homepage





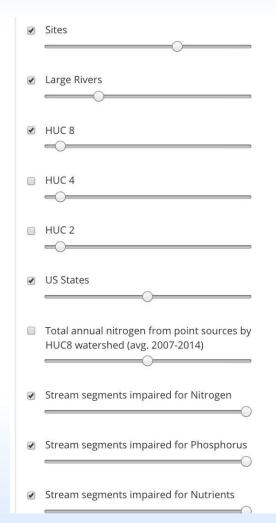
Shape Files: Average Annual Nitrogen Fertilizer Inputs for 1997 to 2006

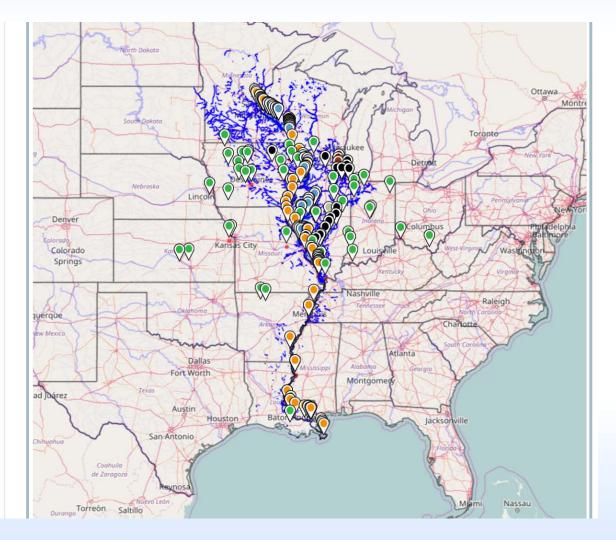






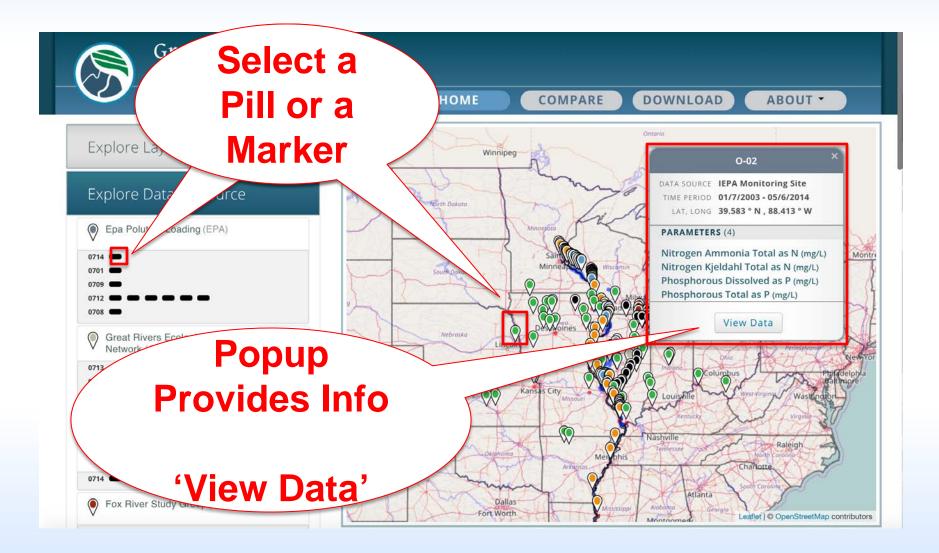
Shape Files: Impaired Streams





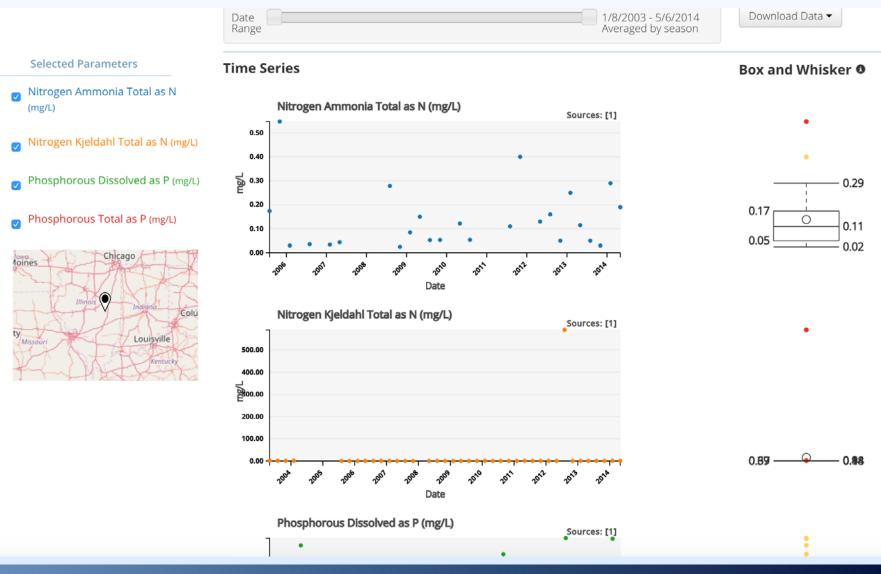


Select a Pill or a Marker





IEPA Sensor





USGS with Load and Cumulative Load





Calculations

Gap Filling

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

Load Calculation

 $FilledValue_n = Index_n * Slope$

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

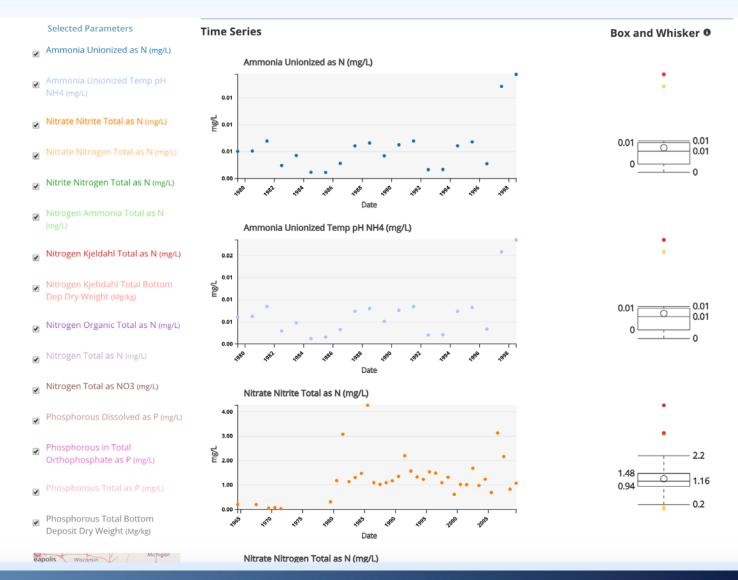
$$Load = LoadingRate \cdot 900s$$

$$t_{final}$$

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



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



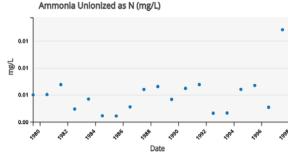
Selected Parameters

- 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)
- ☑ 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)

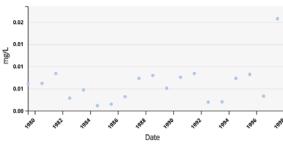
Wisconsin

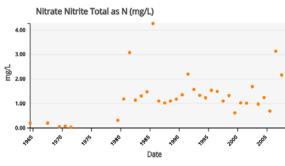
eapolis







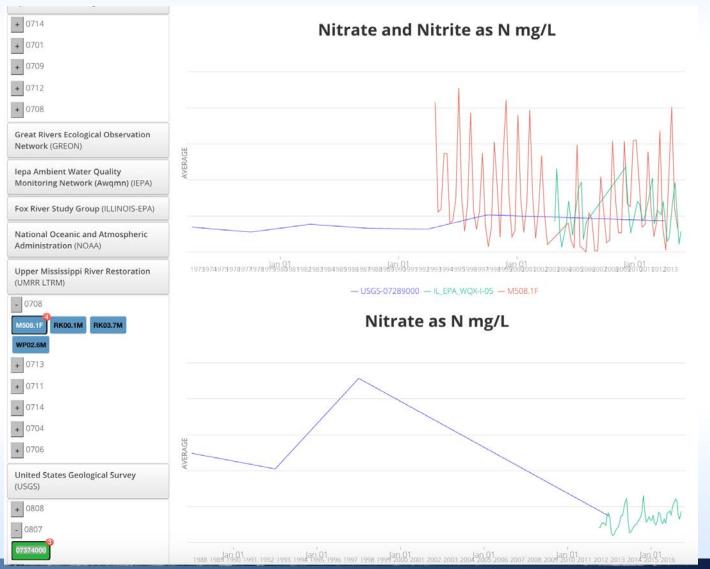




Nitrate Nitrogen Total as N (mg/L)



View Multiple Sensors and Data Types



NCSA

Select by River Reaches or Watershed

Areas

River Reaches

- Upper Mississippi Pool 1
- Upper Mississippi Pool 2
- Upper Mississippi Pool 3
- Upper Mississippi Saint Croix River
- Upper Mississippi Pool 4
- Upper Mississippi Pool 5
- Upper Mississippi Pool 5a
 Upper Mississippi Pool 6

Data Sources

Epa Polutant Loading (EPA)

Great Rivers Ecological Observation Network (GREON)

lepa Ambient Water Quality Monitoring Network (Awqmn) (IEPA)

Fox River Study Group (ILLINOIS-EPA)

National Oceanic and Atmospheric
 Administration (NOAA)

Upper Mississippi River Restoration (UMRR-LTRM)

United States Geological Survey (USGS)

✓ Water Quality Portal (WQP)

Parameters

Ammonia Unionized Temp pH NH4 (mg/L)

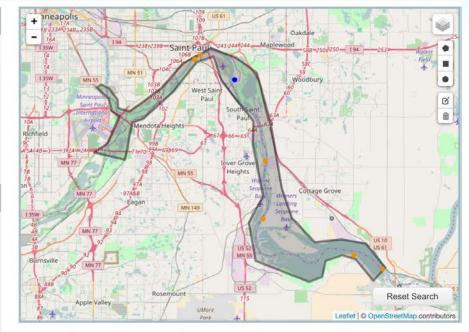
Ammonia Unionized as N (mg/L)

Blue Green Algae (ug/L)

Chlorophyll (mg/L)

Chlorophyll (ug/L)

Dates



Search Results



Sites: 7

Data Sources:

epa OR wqp

Parameters:

Nitrate and Nitrite as N OR Nitrate as N OR Total Annual Nitrogen OR Total Annual Phosphorous

Dates Available: May 15th 1958 - December 31st 2015

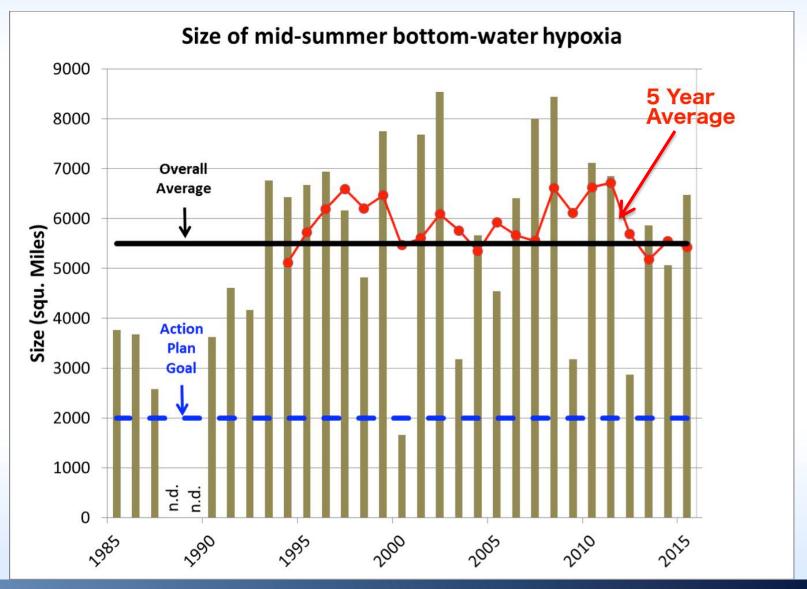


Mixed Data

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	41748 2015-10-21T			WIDNR WQ h		0.11	itrate-as	-n-i procedures total-introge			INIT			N
	39396 2015-10-21T				tp://waterqualityda				1					```
	40307 2015-10-21T				tp://water mg/l	0.08	-							
	40642 2015-10-21T				tp://water mg/l	1.5	\sim				.	1		
	39950 2015-10-21T	1988-07-26T	1988-07-26	MNPCA h	tp://water mg/l	1.6			-9			ТР	as N	
7 224	41066 2015-10-21T	1988-08-03T	1988-08-03	USGS-MN h	tp://water mg/l as N	N 1.4			-92.902					
	41749 2015-10-21T	1988-08-03T	1988-08-03	WIDNR_WQ h	tp://water mg/l	0.47			-92.61016					
	39397 2015-10-21T	1988-08-24T	1988-08-24	MNPCA h	tp://water mg/l	0.04			-93.279444	45.049107			-24	
	39951 2015-10-21T				tp://water mg/l	0.92			-92.86803	44.76074	0	~	55 MNPCA-S000-068	
	40643 2015-10-21T				tp://water mg/l	1.2			-93.0125		0	63	57 MNPCA-S000-339	
	40308 2015-10-21T	1988-08-31T	1988-08-31	MNPCA h	tp://water mg/l	0.02			09487	44.94036	0	62	56 MNPCA-S000-266	
	41750 2015-10-21T									44.61147	0	73	67 WIDNR_WQX-483027	,
	39952 2015-10-21T				tp://water mg/l					76074	0	61	55 MNPCA-S000-068	
	40644 2015-10-21T				tp://water mg/l			MIXOO		383	0	63	57 MNPCA-S000-339	
	40309 2015-10-21T				tp://water mg/l			Mixed		36	0	62	56 MNPCA-S000-266	
	39398 2015-10-21T				tp://water mg/l	4				7	0	59	53 MNPCA-S000-024	
	41751 2015-10-21T				tp://water					7	0	73	67 WIDNR_WQX-483027	,
	40310 2015-10-21T							<u> </u>		36	0	62	56 MNPCA-S000-266	
	39953 2015-10-21T				tp://water mg/l			ource	5	074	0	61	55 MNPCA-S000-068	
	40645 2015-10-21T				tp://water mg/l			00100		.80383	0	63	57 MNPCA-S000-339	
	39399 2015-10-21T				tp://water mg/l					45.049167	0	59	53 MNPCA-S000-024	
	39400 2015-10-21T				tp://water mg/l	0.18			5444	45.049167	0	59	53 MNPCA-S000-024	
	41752 2015-10-21T					1.1			-92.61016		0	73	67 WIDNR_WQX-483027	r
	41067 2015-10-21T				tp://water mg/l as N				-92.902152		0	66	60 USGS-05331570	
	41753 2015-10-21T					1.12			-92.61016		0	73	67 WIDNR_WQX-483027	
	41754 2015-10-21T					1.41		50	-92.61016		0	73 66	67 WIDNR_WQX-483027	
	41068 2015-10-21T 41755 2015-10-21T				tp://water mg/l as N	1.34	1.	53	-92.902152 -92.61016		0	73	60 USGS-05331570	,
	41755 2015-10-211 39954 2015-10-21T					1.34	-		-92.61016		0	73 61	67 WIDNR_WQX-483027 55 MNPCA-S000-068	
	40646 2015-10-21T				tp://water mg/l tp://water mg/l	2.1			-92.86803		0	63	57 MNPCA-S000-088	
	40848 2015-10-211 40311 2015-10-21T				tp://water mg/l	2.1			-93.09487	44.94036	0	62	56 MNPCA-S000-266	
	40311 2013-10-211 41756 2015-10-21T					1.89	-		-93.09487		0	73	67 WIDNR WQX-483027	,
	41758 2015-10-21T 41069 2015-10-21T				tp://water mg/l as N		-		-92.902152		0	66	60 USGS-05331570	
	39955 2015-10-21T				tp://water mg/l as r	0.34	-		-92.86803	44.76074	0	61	55 MNPCA-S000-068	
	40647 2015-10-21T				tp://water mg/l	0.34			-93.0125		0	63	57 MNPCA-S000-339	
	40312 2015-10-21T				tp://water mg/l	0.12	-		-93.09487	44.94036	0	62	56 MNPCA-S000-266	
	39401 2015-10-21T				tp://water mg/l	0.09	-		-93.279444		0	59	53 MNPCA-S000-024	
	41757 2015-10-21T					0.38			-92.61016		0	73	67 WIDNR WQX-483027	,
	40313 2015-10-21T				tp://water mg/l	0.30			-93.09487		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 MCKNIGHT FOUNDATION

