

Nitrate and Phosphate— *A Loaded Question* in Illinois

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Today 8:27 AM

Lizzy Warner

LW Debate night!

Today 11:17 AM

Giving a talk on monitoring in Peoria.

Lizzy Warner

A presentation on monitoring, huh? That should be exciting for you considering how much you love monitoring me and Andrew.

Imagine what I could have learned if I had continuously monitored your moves!!!!

Lizzy Warner

LW Ugh... 🙄



iMessage





(Brent Dykes, Customer Analytics for Adobe)

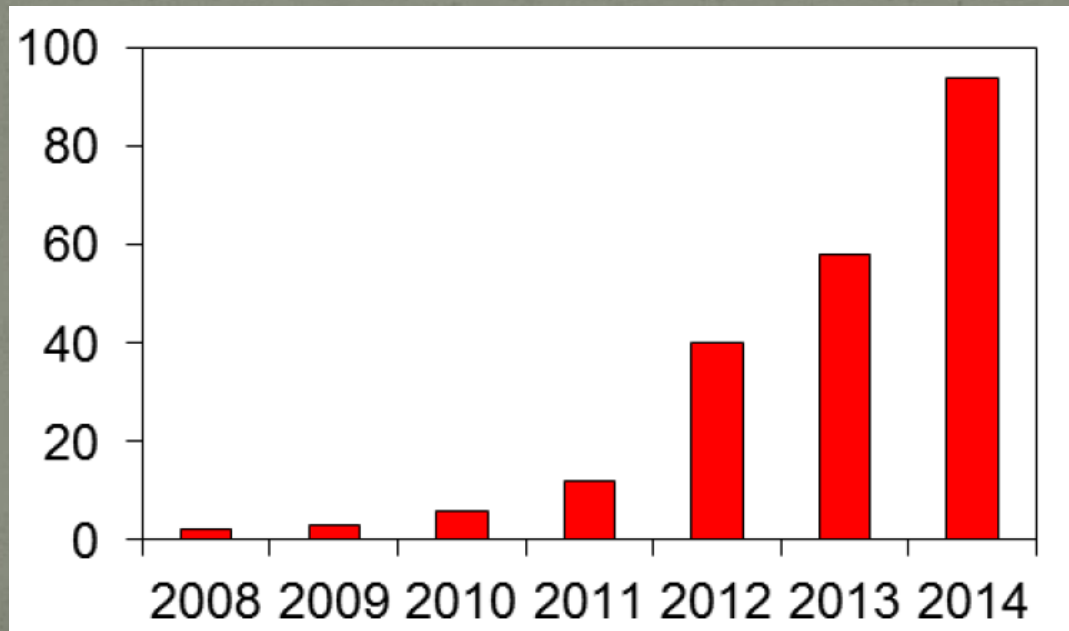
Data itself has no meaning, but becomes **information** when it is interpreted.

New technology is allowing for better understanding

- What changed?
- Why is it important?
- What are we doing?



USGS Continuous Nitrate Sites

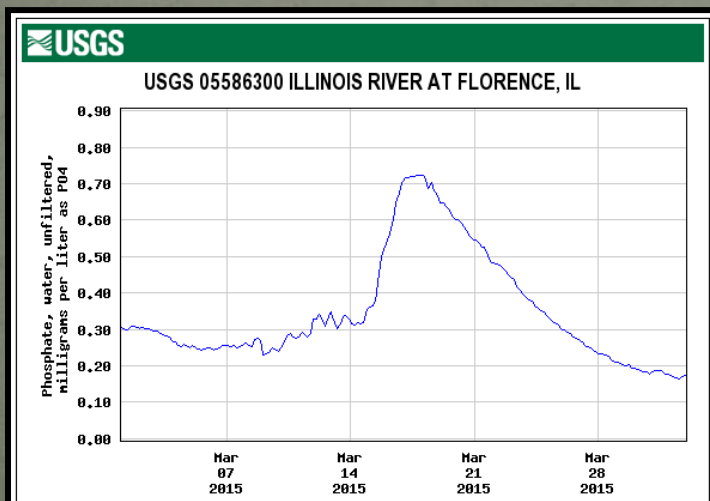


(B. Pellerin and others, in press)

Real-time Continuous Data Collection



- Streamflow
- Turbidity
- SpC, DO, Temp, pH
- Nitrate
- Orthophosphate



<http://waterdata.usgs.gov/il/nwis/qw>

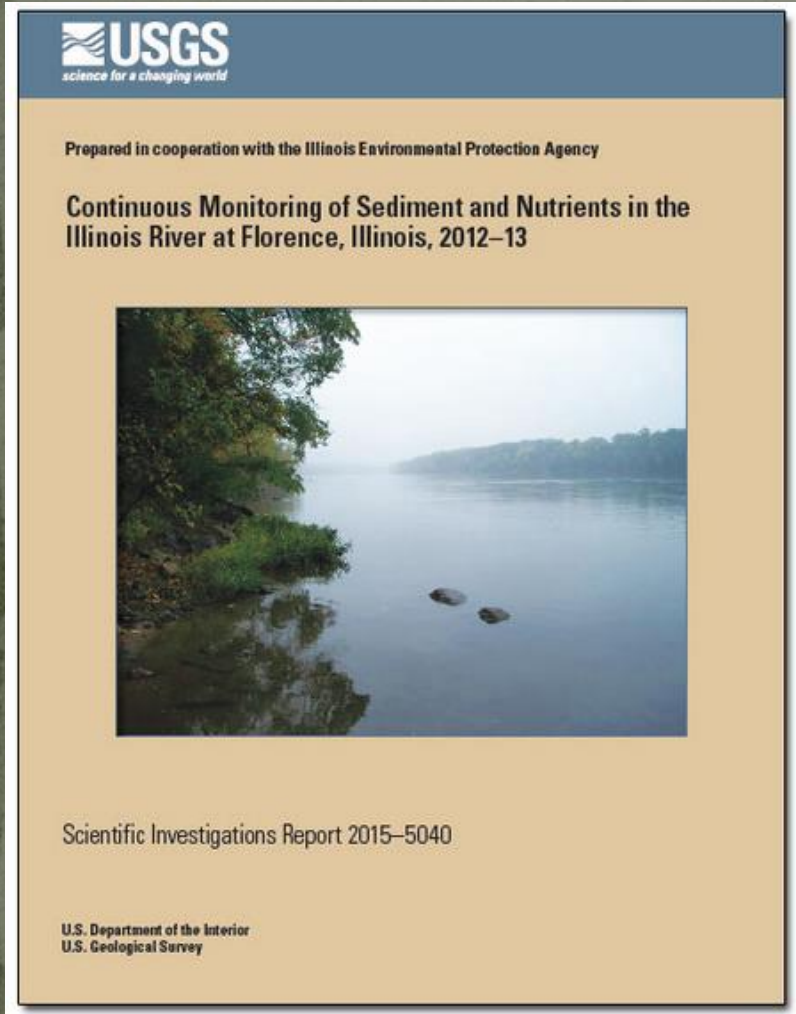
“Super gage”

A USGS gage with real-time, continuous measurements of streamflow, physiochemical parameters (pH, SpC, T, turbidity, and DO), at least one chemical constituent, and representative stream sample collection for laboratory analysis and quality assurance

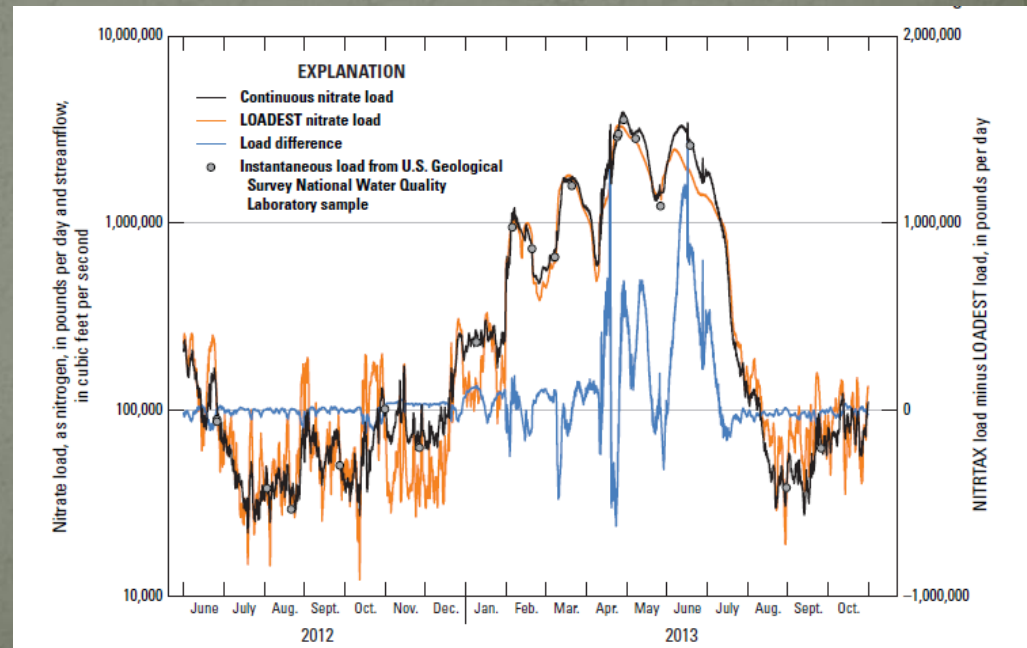
~Suggested definition USGS MWR Science Chiefs



USGS Continuous Nutrients in Illinois River



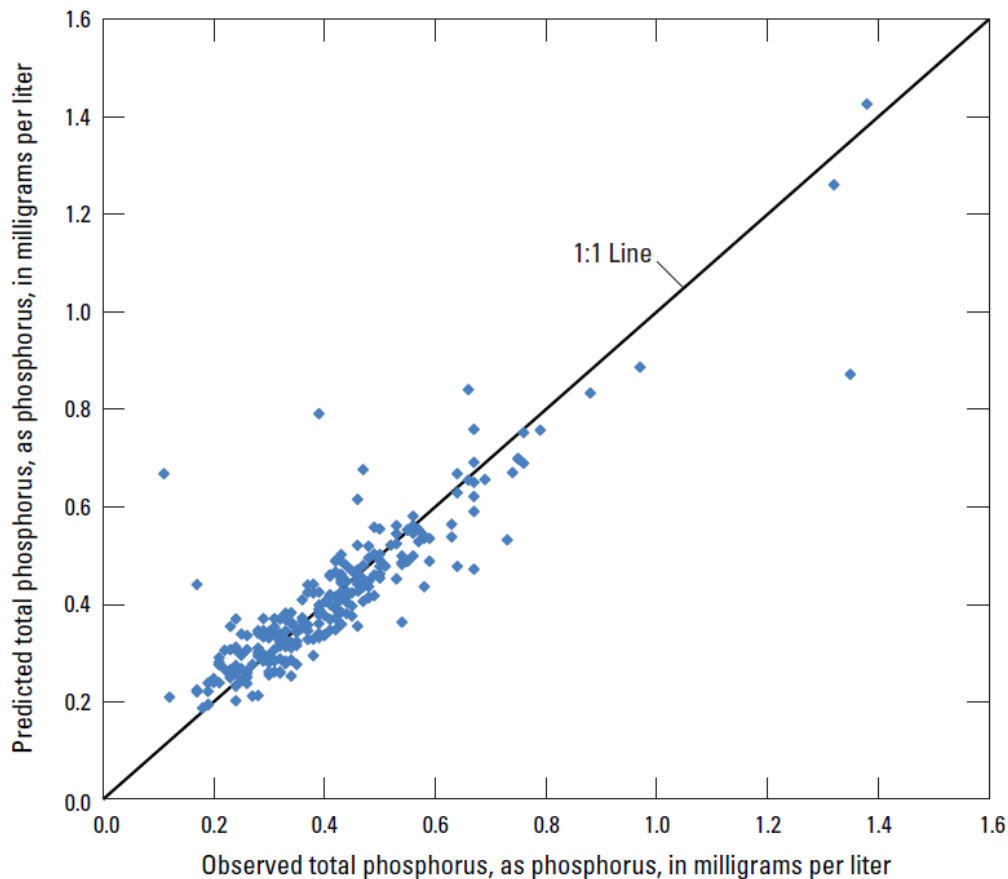
Terrio, P.J., Straub, T.D., Domanski, M.M., and Siudyla, N.A., 2015, Continuous monitoring of sediment and nutrients in the Illinois River at Florence, Illinois, 2012-13: U.S. Geological Survey Scientific Investigations Report 2015-5040, 61 p., <http://dx.doi.org/10.3133/sir20155040>.



Total Phosphorus Illinois River at Florence

- Continuous orthophosphate and turbidity are monitored
- Suspended sediment is estimated from turbidity
- Orthophosphate and suspended sediment are used to estimate total phosphorus

(from Terrio and others, 2015)



Illinois River at Florence model

$$\text{Total Phosphorus} = 0.0816 + 1.1 (\text{dissolved orthophosphorus}) + 0.00063 (\text{suspended sediment})$$

$$R^2 = 0.802$$

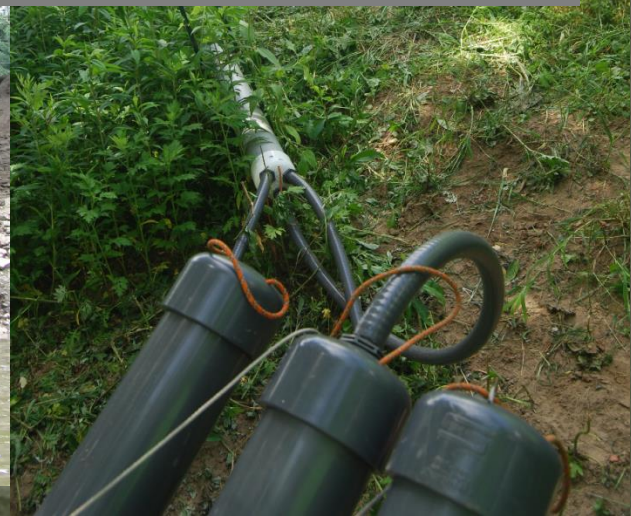
Value of continuous nutrient monitoring?

For nitrate, the continuous data record yielded a cumulative nitrate load approximately 8.3 percent larger than the LOADEST-derived load.

Terrio, P.J., Straub, T.D., Domanski, M.M., and Siudyla, N.A., 2015, Continuous monitoring of sediment and nutrients in the Illinois River at Florence, Illinois, 2012–13: U.S. Geological Survey Scientific Investigations Report 2015–5040, 61 p., <http://dx.doi.org/10.3133/sir20155040>.



How do we use these capabilities to inform the Nutrient Reduction Loss Strategy stakeholders?





ILLINOIS
NUTRIENT LOSS
REDUCTION STRATEGY



Illinois
Department of
Agriculture

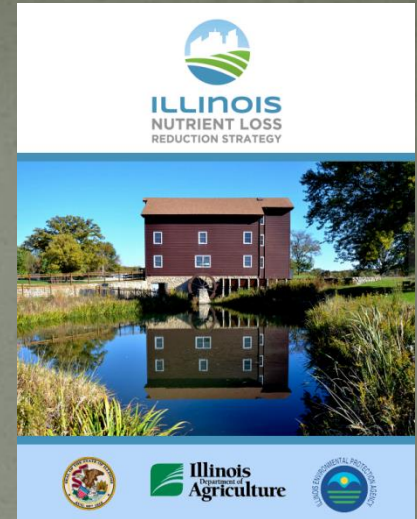


The objective of a real-time continuous monitoring network is to determine baseline nutrient and sediment loading (nitrate, phosphorus, and sediment), seasonal loadings, and storm-event loadings over time.

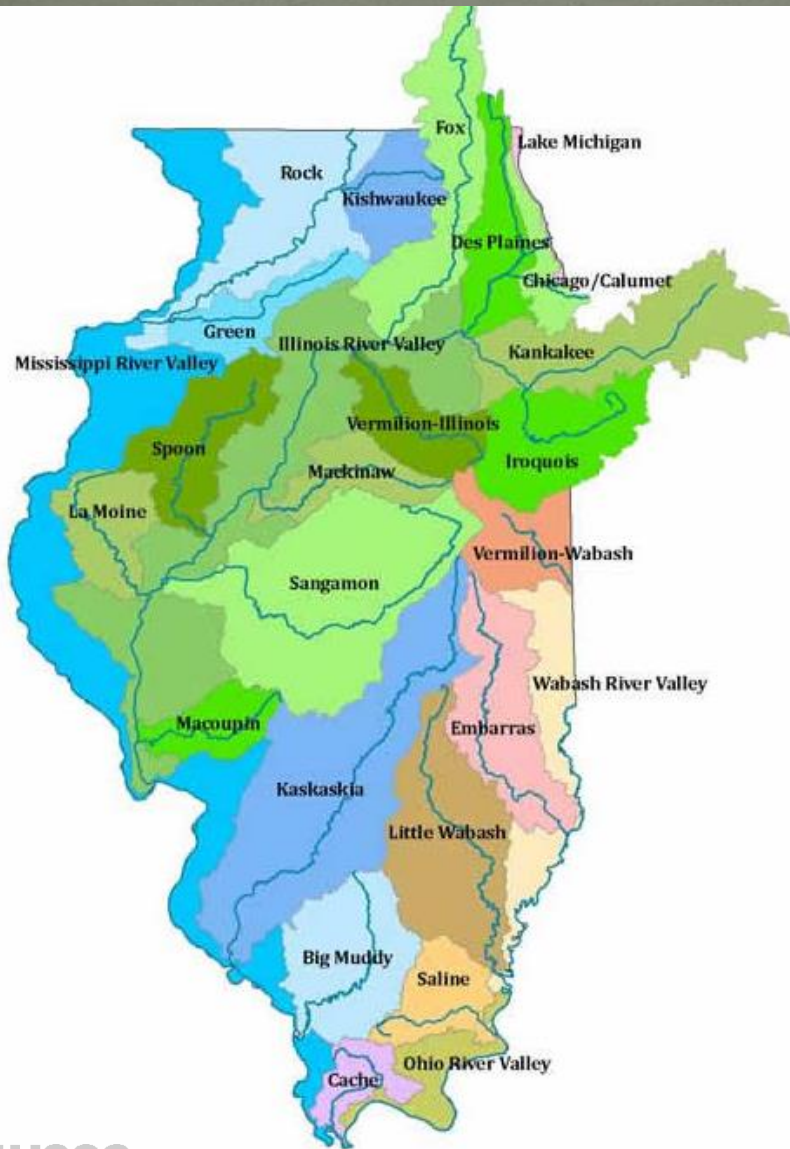
Are nutrient loads and concentrations decreasing?

Prioritization

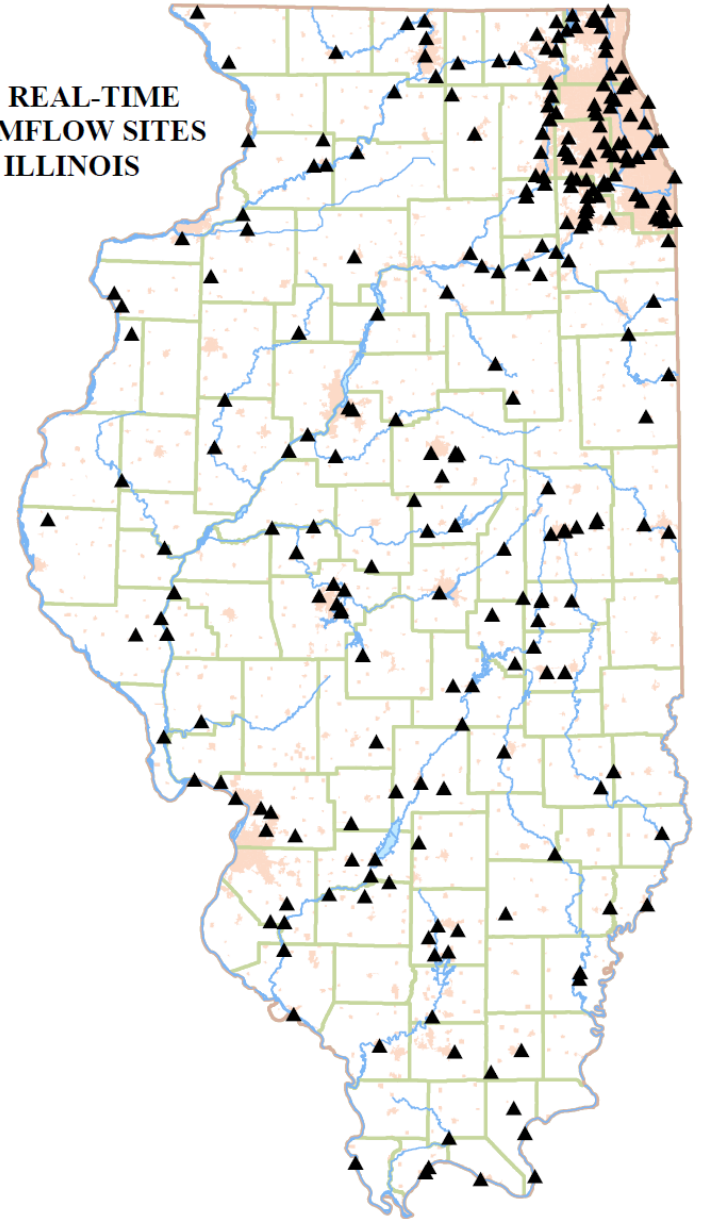
- Basins covering largest area of the State
- Current USGS gaging station
- Current IEPA Ambient site
- Historical data



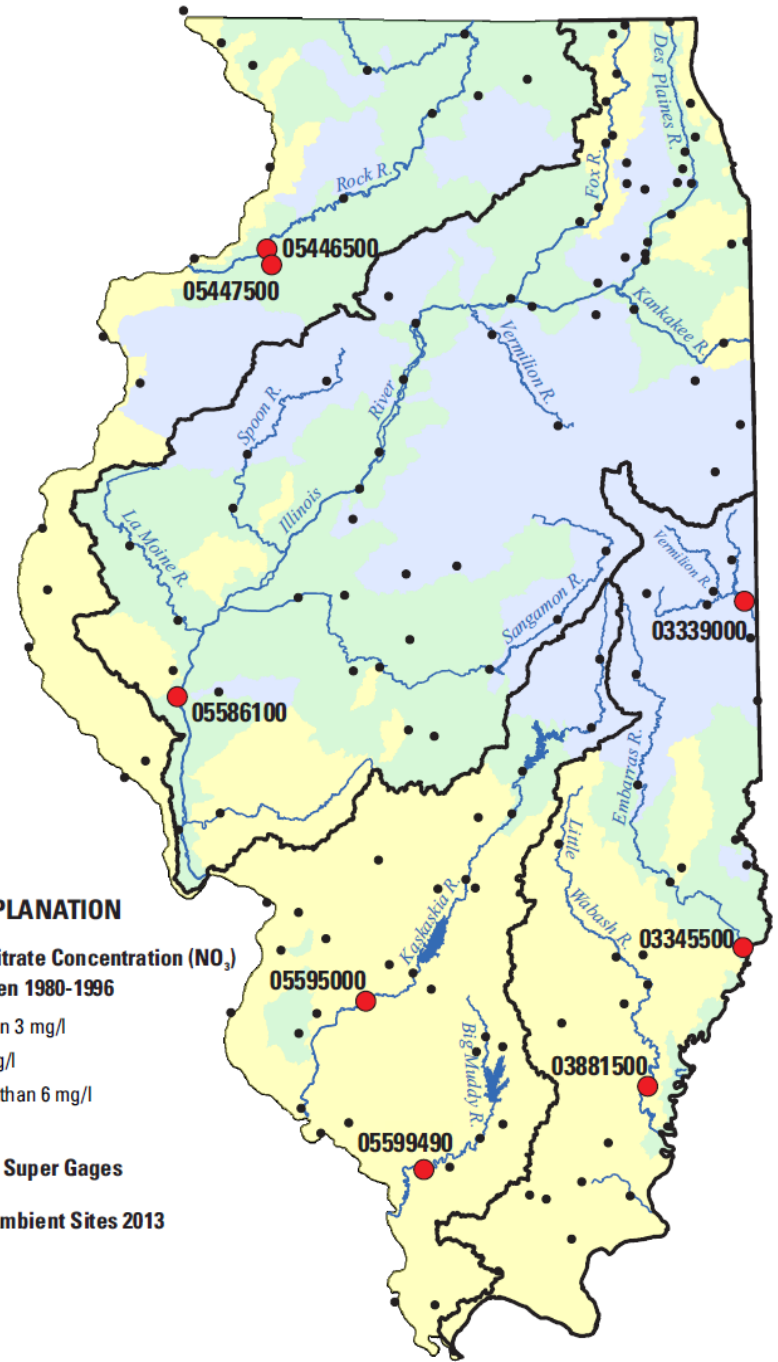
Large basin and USGS gaging station



USGS REAL-TIME STREAMFLOW SITES IN ILLINOIS



Stream Name	Location	Station Drainage Area in Illinois only, in mi ²	Mean Nitrate+ nitrite mg/l
Rock River	Joslin	3,973	3.6
Green River	Geneseo	1,000	4.1
Illinois River	Florence	22,651	4.3
Kaskaskia River	New Athens	5,189	0.89
Big Muddy River	Murphysboro	2,168	0.35
Vermilion River	Danville	1,199	6.9
Embarras River	Lawrenceville	2,348	4.6
Little Wabash River	Carmi	3,102	0.9



EXPLANATION

Mean Nitrate Concentration (NO₃) between 1980-1996

- Less than 3 mg/l
- 3 to 6 mg/l
- Greater than 6 mg/l

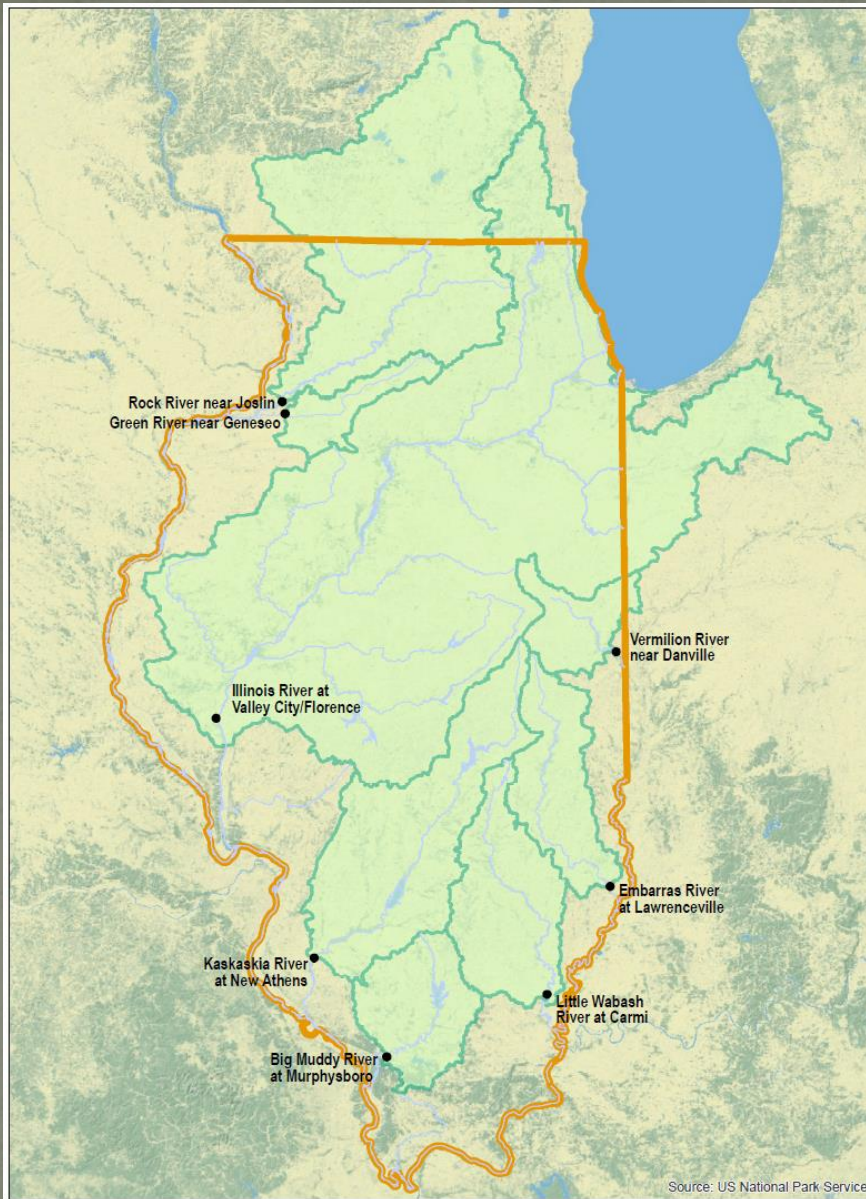
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Nutrient Super Gages

Active Ambient Sites 2013

Nutrient Super Gages

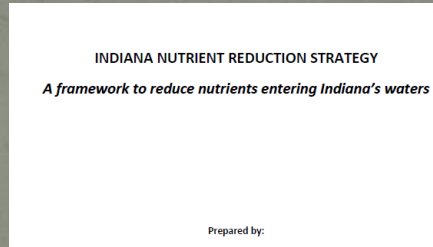
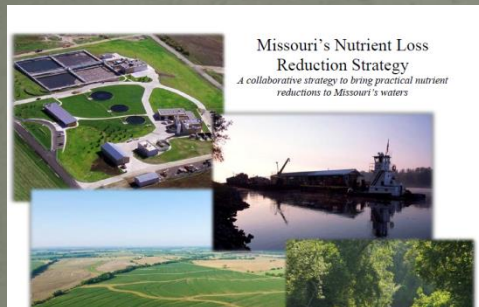
Basins cover almost 75% of the land area in the State



ILLINOIS
NUTRIENT LOSS
REDUCTION STRATEGY

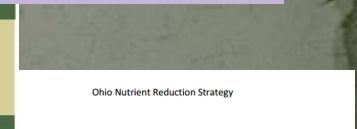
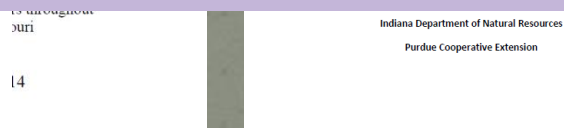
ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

Illinois will have data that is consistently collected and analyzed



Hypoxia Task Force plan requires State development of nutrient reduction
Are nutrient loads and concentrations decreasing?

Wisconsin's Nutrient Reduction Strategy



Kentucky nutrient management str

IOWA NUTRIENT REDUCTION STRATEGY
A science and technology-based framework to assess and reduce nutrients to Iowa waters and the Gulf of Mexico

November 2013



Prepared by:
Iowa Department of Agriculture and Land Stewardship
Iowa Department of Natural Resources
Iowa State University College of Agriculture and Life Sciences

Updated September 2014



Kentucky Division of Water

March 2014

Ohio Nutrient Reduction Strategy

Prepared by
Ohio EPA, Division of Surface Water
with contributions from
Ohio Department of Agriculture, Livestock Environmental Permitting Program
Ohio Department of Natural Resources, Division of Soil and Water Resources

This approach is proposed for other areas across the Midwest



Questions?

Data available:
<http://waterdata.usgs.gov/il/nwis/qw>

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