

Illinois Nutrient Loss Reduction Strategy

Nutrient Monitoring Council

10th Meeting, March 15, 2018, Springfield, IL



ILLINOIS
NUTRIENT LOSS
REDUCTION STRATEGY

Improving our water resources with
collaboration and innovation

Welcome/Housekeeping/Updates

- Important Stuff – bathrooms, lunch, other
- Member Introductions (current)
- NMC Member Loss and Replacement
- Trevor Sample – New Role at Illinois EPA
- NMC Member Updates to Share
 - Exciting news?
 - Boring news?



Nutrient Monitoring Council Members (3/15/18)

Illinois EPA

Gregg Good, Rick Cobb

Illinois State Water Survey

Laura Keefer

Aqua Illinois

Kevin Culver

~~**Illinois Natural History Survey**~~

~~Andrew Casper~~ (Need Replacement?)

Illinois Dept. of Natural Resources

Ann Holtrop

Univ. of IL – Dept. of Ag and Bio Eng.

Paul Davidson

Sierra Club

Cindy Skrukrud

MWRDGC

Justin Vick

Illinois Corn Growers Association

Laura Gentry

U.S. Army Corp of Engineers-Rock Island

~~Chuck Theiling~~ Nicole Manasco

U.S. Geological Survey

Kelly Warner

National Center for Supercomputing Apps

Jong Lee

Univ. of IL – Dept. of Nat. Res. & Bio. Studies

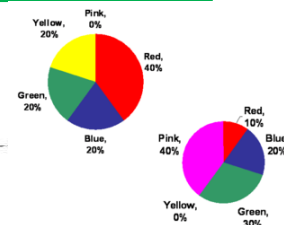
Greg McIsaac

NLRS Coordinator – Illinois EPA

Trevor Sample

NMC Charges *(Revised 10/26/15)*

1. Coordinate the development and implementation of monitoring activities (e.g., collection, analysis, assessment) that provide the information necessary to:
 - a. Generate estimations of 5-year running average loads of Nitrate-Nitrogen and Total Phosphorus leaving the state of Illinois compared to 1980-1996 baseline conditions; and
 - b. Generate estimations of Nitrate-Nitrogen and Total Phosphorus loads leaving selected NLRS identified priority watersheds compared to 1997-2011 baseline conditions; and
 - c. Identify Statewide and NLRS priority watershed trends in loading over time using NMC developed evaluation criteria.
2. Document local water quality outcomes in selected NLRS identified priority watersheds, or smaller watersheds nested within, where future nutrient reduction efforts are being implemented (e.g., increase in fish or aquatic invertebrate population counts or diversity, fewer documented water quality standards violations, fewer algal blooms or offensive conditions, decline in nutrient concentrations in groundwater).
3. Develop a prioritized list of nutrient monitoring activities and associated funding needed to accomplish the charges/goals in (1) and (2) above.



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September 6, 2017, NMC #9 Meeting

- Review of Meeting
- Minutes (review and approve)

“When Gregg
talks, people.....
um..... hey
peeps!!!”



Inaugural Nutrient Loss Reduction Strategy Conference

Gregg Good

- Conference Overview
- “Session C” Overview
- “Session C” Wrap-Up
- Discussion



Actual picture from the conference!

NLRS Conference Overview



- November 28-30, 2017
- Purpose:
 - To celebrate two years of NLRS progress and release of the First Biennial Report (August 2017)
 - Encourage communication and collaboration with ALL involved (e.g., Policy Working Group, Ag. Water Quality Partnership, NMC, Urban, etc.) as there was little opportunity for all prior to the conference.
- Day 1 Opening Plenary:
 - Katie Flahive – USEPA Gulf Hypoxia Task Force
 - Laura Christianson (U of I) – Illinois Science Assessment Comparison to Other States
 - Wes Burger (Miss. State U) – Illinois NLRS Comparison to Other States

NLRS Conference Overview (cont.)

- Day 2 Plenary Sessions
 - Session A: Policy Working Group: Perspectives on NLRS Implementation (Lauren Lurkins)
 - Session B: Tracking BMP Adoption (Trevor Sample)
 - Session C: Next Slide
 - Session D: Research Plenary (Brian Miller)



Session C: Monitoring Nutrient Loads and Water Resource Outcomes – Progress, Opportunities, and Challenges

Moderator: Gregg Good, IEPA



Who is the NMC and when were we formed?

- *“We are a group of 13 top notch, highly intelligent, extremely good looking, enthusiastic, and much-loved Illinois monitoring and research professionals.” (NMC 2015) 😊*
- 1st meeting - May 13, 2015.
- Illinois EPA is “Chair Extraordinaire.”



Session C: Monitoring Nutrient Loads and Water Resource Outcomes (Gregg Good)

- Gregg Good – Introduction to Session C and NMC
- Kelly Warner – Super Gage Network
- Paul Terrio – 1st Year Results (nutrients and sediment)
- Greg McIsaac – Assessing Long-Term Changes in Loads and Comparison of Different N Load Estimation Methods
- Jong Lee – Great Lakes to Gulf (NLRs Portal birth)
- Gregg Good – Monitoring Challenges for Estimating Nutrient Loads and Developing WQ Standards
- Panel Discussion – Take Questions, Hear Comments, Discuss Future Needs



Session C Awards Received



Session C Wrap Up For NLRs Policy Working Group: Monitoring Nutrient Loads and Water Resource Outcomes – Progress, Opportunities, and Challenges

Gregg Good, IEPA (11/30/17)



Discussion of Future Needs

- USGS Super Gage Network
 - 8 base sites (IEPA) and 1 added site at Joliet (MWRD)
 - Site on the Kankakee in Indiana
 - Need for a site on the Rock River in Wisconsin?
 - Need to keep the Super Gage Network going for an additional 5 years after 2020 - \$2,000,000+?
 - Is there an interest in outfitting all Super Gages with chlorophyll probes? If so, who has the funds?
- Who will do what Dr. Mark David and Dr. Greg McIsaac have been doing for us for free? (Charge: generating 5-year running average loads of N and P leaving the state compared to 1980-1996 baseline conditions, and estimations of N and P leaving priority watersheds compared to 1997-2011 baseline conditions)

Discussion of Future Needs

- Great Lakes to Gulf – Illinois NLRs Site Suggestions
 - What data sets to load into the observatory?
 - Recommendations on how to depict data?
 - Nutrient Monitoring Council members will be asked for their input.
- Documenting Water Quality Outcomes – a lot of the data are being collected at priority watersheds (e.g., chemical, physical, biological, loads), but pulling the data together and documenting results (good or bad) is a big endeavor.

Discussion of Future Needs

- WQ Standards Development Needs (e.g., benthic chlorophyll monitoring, user perception surveys, additional continuous D.O. monitoring, revised mIBI that isolates the effects of nutrients, sediment respiration/sediment oxygen demand, physical habitat improvement measurements)
- We gotta keep the ball rolling!

Discussion Time!



Thoughts on Those Needs?

Actionable Needs vs. Utopian Wants?

Other Needs?

“Gregg, just move on to the Next Presentation!”



New Collaboration with the University of Illinois Extension Trevor Sample

- NLRs Watershed Coordinators
- NLRs Science Team



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University of Illinois Extension Watershed Coordinators

- ▶ Illinois EPA is partnering with University of Illinois Extension to hire two watershed coordinators to work in priority watersheds for five years.
- ▶ Provide outreach and technical assistance
- ▶ Assist local stakeholders in:
 - ▶ Watershed Planning
 - ▶ Implementation of Watershed Plans
- ▶ Coordinate local initiatives, collaborate with other organizations.



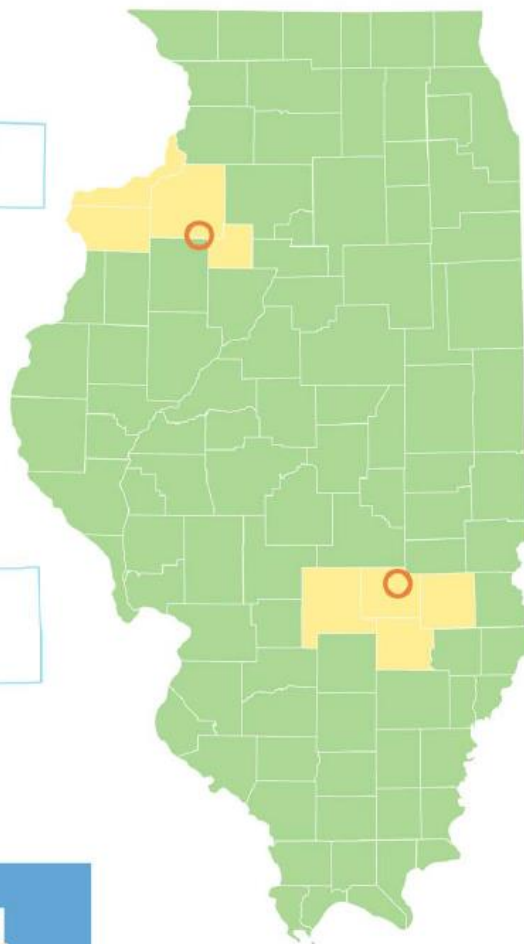
Galva, IL

Henry, Mercer, Rock Island,
and Stark Counties

Effingham, IL

Clay, Effingham, Fayette,
and Jasper Counties

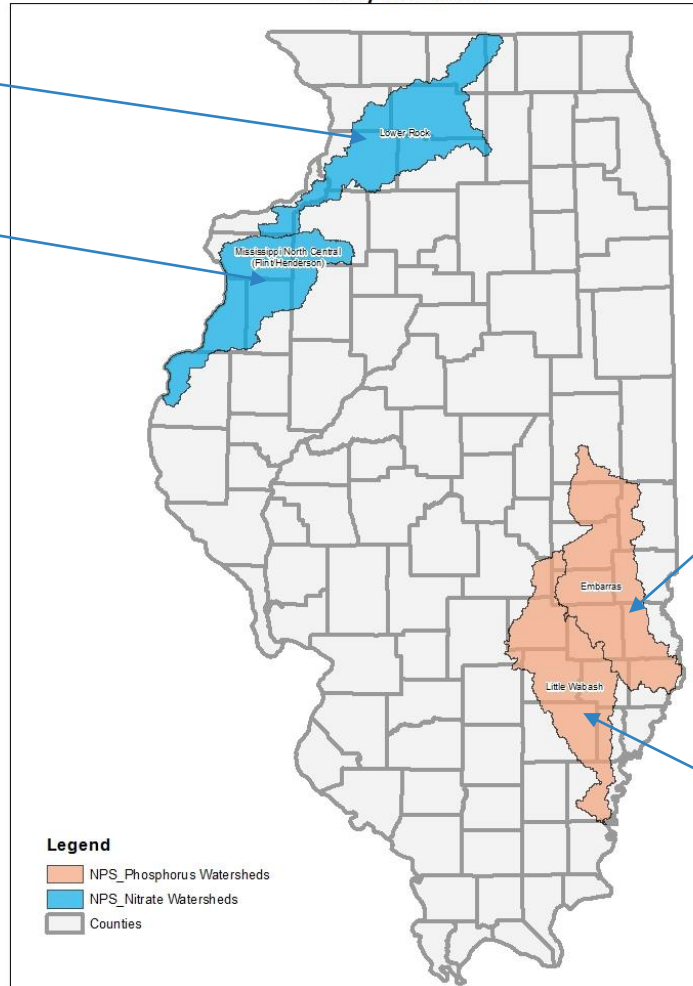
Location of
**Watershed
Coordinators**



Illinois Nutrient Loss Reduction Strategy
Watershed Coordinators
Priority Watersheds

Lower Rock River

Mississippi North Central
(Flint/Henderson)



Embarras River

Little Wabash River

University of Illinois Extension Watershed Coordinators

- ▶ Interviews for candidates were held in December 2017
- ▶ Chosen candidate for Effingham position accepted; Galva position declined.
- ▶ Position for Galva reposted.
- ▶ Interviews held March 2018.
- ▶ Effingham Watershed Coordinator to begin mid-April.
- ▶ Galva Watershed Coordinator to begin end of May.



University of Illinois Extension Watershed Coordinators

- ▶ **Project also includes funding for an Extension Water Quality Science Team.**
- ▶ Laura Christianson - Crop Science
- ▶ Jonathan Coppess - Ag Econ
- ▶ Paul Davidson - Ag and bio engineering
- ▶ Cameron Pittelkow - Crop Science
- ▶ Maria Villamil - Crop Science
- ▶ Suzanne Bissonnette (administrative) - Assistant Dean (IL Extension, director of ag and natural resources programs)
- ▶ *Reid Christianson - Crop Science*



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University of Illinois Extension Watershed Coordinators

- ▶ **Extension Water Quality Science Team will:**
- ▶ Provide technical support from research to Watershed Coordinator.
- ▶ Update conservation practice performance in NLRs updates.
- ▶ Approve of new conservation practices to be included in the NLRs.





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Trevor Sample
Illinois EPA
Watershed Management Section
217/782-3362
Trevor.Sample@Illinois.gov

QUESTION/DISCUSSION:

What future opportunities might there be for interaction, communication, collaboration, etc., between NLRS - Watershed Coordinators and the NLRS – Nutrient Monitoring Council?



NLRS Biennial Reports

First and Future

Gregg Good and Trevor Sample

Sometimes,
people don't notice the things
we do for them
until we stop doing them.



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July 2015



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What does the strategy call for?

The Illinois Nutrient Loss Reduction Strategy lays out a comprehensive suite of best management practices for reducing loads from wastewater treatment plants and urban and agricultural runoff. Recommended activities target the state's most critical watersheds and are based on the latest science and best-available technologies. Along with water quality standards currently being developed, these practices will help the state achieve its ultimate goal of reducing phosphorus and nitrate loads by 45 percent.

The strategy also calls for more collaboration among state and federal agencies, cities, non-profits, and technical experts.



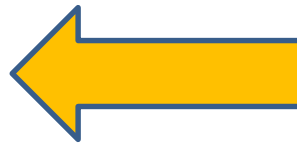
How was the Illinois Nutrient Loss Reduction Strategy developed?

The strategy was developed by a policy working group led by the Illinois Water Resources Center, the Illinois Environmental Protection Agency, and the Illinois Department of Agriculture. Group members included representatives from state and federal agencies, agriculture, and non-profit organizations as well as scientists and wastewater treatment professionals. By relying on the expertise of diverse stakeholders, the working group developed a cost-effective strategy that meets community and industry needs while still reducing the negative impacts of nutrient pollution on environmental and public health.



Key Strategy Components

1. Extends ongoing regulatory and voluntary efforts
2. Identifies priority watersheds for nutrient loss reduction efforts
3. Establishes the Nutrient Monitoring Council to coordinate water quality monitoring efforts by government agencies, universities, non-profits, and industry
4. Creates the Nutrient Science Advisory Committee to develop numeric nutrient criteria for Illinois waters



5. Forms the Agricultural Water Quality Partnership Forum to oversee outreach and education efforts
6. Establishes the Urban Stormwater Working Group to coordinate and improve stormwater programs and education
7. Lays out strategies for improving collaboration among government, non-profits, and industry
8. Defines a process for regular review and revision





Biennial Report 2015-2017

First Biennial Report: August 2017



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Chapter 7

Nutrient Monitoring Council

The Nutrient Monitoring Council (NMC) works to develop, coordinate, and implement monitoring activities to calculate annual nutrient loads leaving the state and to determine loading trends in priority watersheds identified in the Illinois Nutrient Loss Reduction Strategy (Illinois NLRs or the strategy). In this effort, NMC discussions include program design, data collection and methods, data analysis and assessment, quality assurance, reporting, and evaluation.

NMC is chaired by the Illinois Environmental Protection Agency (Illinois EPA) and has 13 members representing agencies, universities, and organizations involved in monitoring and assessing nutrient loads and their impacts. These include Aqua Illinois, the Illinois Corn Growers Association, Illinois Department of Natural Resources, Metropolitan Water Reclamation District of Greater Chicago, Sierra Club, U.S. Army Corps of Engineers, U.S. Geological Survey, and at the University of Illinois: Department of Agriculture and Biological Engineering; National Center for Supercomputing Applications; Illinois State Water Survey; and Illinois Natural History Survey.



What did we say?

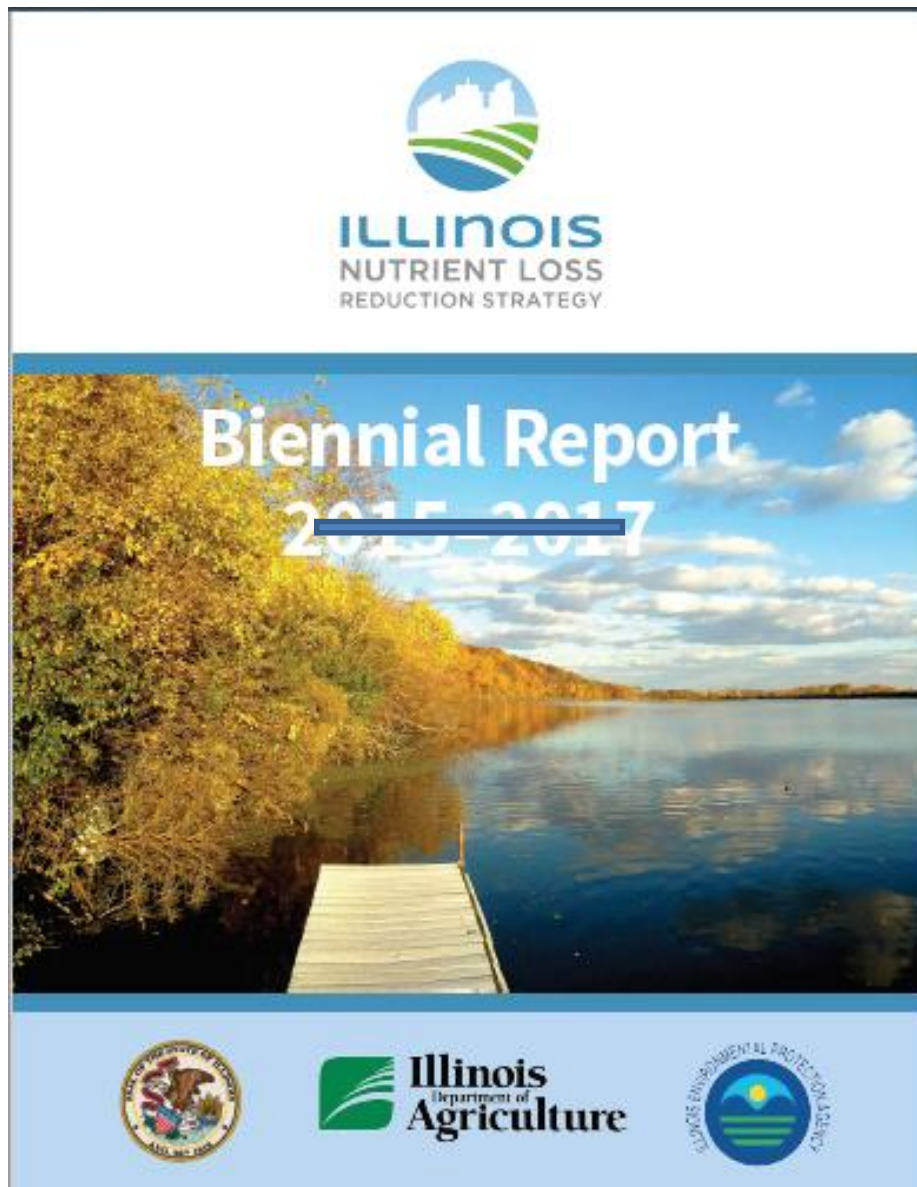
- *Goals*

- 5-year average loads of N and P compared to 1980-1996 baseline conditions.
- Estimates of N and P leaving selected priority watersheds compared to 1997-2011 baseline conditions.
- Trends over time.

- *Accomplishments*

- USGS 8-Station Super Gage Network.
- Additional Super Gage at Joliet.
- Identified nutrient monitoring throughout the state.
- Priority Watershed Nutrient Monitoring Plans



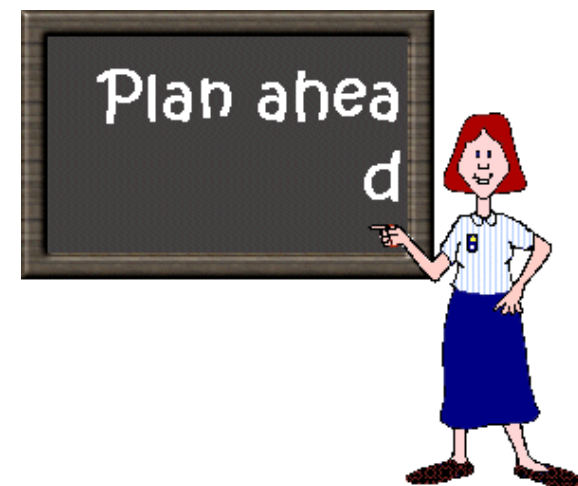


Second Biennial Report Due: Fall 2019

It's now: March 18'
Report Thru: Dec 18'
Report Due: August 19'

What's the Goal for the Next NMC Summary?

- Reiteration of NMC Charges
- NMC Activities Summary
- USGS Statewide Super Gage Annual Loadings Summaries?
- Mclsaac/David Statewide Summaries?
- Priority Watershed Loading Summaries?
- Trends?
- Other?



NUTRIENT AND SEDIMENT EXPORT FROM ILLINOIS—QUANTIFICATION THROUGH A CONTINUOUS LOADINGS NETWORK TO SUPPORT THE ILLINOIS STATEWIDE NUTRIENT LOSS REDUCTION STRATEGY

Preliminary
Results After
Approximately
One Year of
Monitoring

Paul Terrio,
U.S. Geological Survey





Provisional normalized annual load for nitrate, total phosphorus, and suspended sediment for each site that the data and (or) regression equations were provisionally adequate.

Normalized annual loads are computed from the period of data available data for each site. Normalized load values were derived from at least one year's worth of data during the period August 2015 through January 2017.

TBD; Insufficient data to determine the annual load or yield.

Stream name	<u>Nitrate</u>		<u>Total Phosphorus</u>		<u>Suspended Sediment</u>	
	Annual load (lb)	Annual yield (lb/acre)	Annual load (lb)	Annual yield (lb/acre)	Annual load (ton)	Annual yield (ton/acre)
Illinois River at Florence/Valley City	215,220,950	12.5	21,020,287	1.2	4,340,965	0.3
Embarras River at Lawrenceville	17,427,920	11.7	1,961,336	1.3	809,448	0.5
Big Muddy River at Murphysboro	2,339,032	1.7	1,310,602	0.9	279,837	0.2
Green River near Geneseo	11,614,829	18.1	338,962	0.5	162,462	0.3
Rock River near Joslin	83,426,545	13.7	TBD	TBD	TBD	TBD
Little Wabash River at Carmi	TBD	TBD	2,571,015	1.3	730,403	0.4
Kaskaskia River at New Athens	12,957,382	3.9	TBD	TBD	758,746	0.2
Vermilion River near Danville	TBD	TBD	TBD	TBD	TBD	TBD

 Indicates highest yield

 Indicates lowest yield

What's for Lunch?

Pie and Cheese of Course!



USGS Happenings and Updates

Kelly Warner

- USGS Reorganization
- USGS Video on Continuous Monitoring
- Super Gage Update
- USGS Mississippi River Basin Nutrient Story Map
- Congressional Briefing – Nutrients in the UMR Basin



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Great Lakes to Gulf Observatory

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

Jong Lee, Ph.D. jonglee1@illinois.edu

National Center for Supercomputing Applications

University of Illinois at Urbana-Champaign

@ Nutrient Monitoring Council, 03/15/2018



GLTG Overview

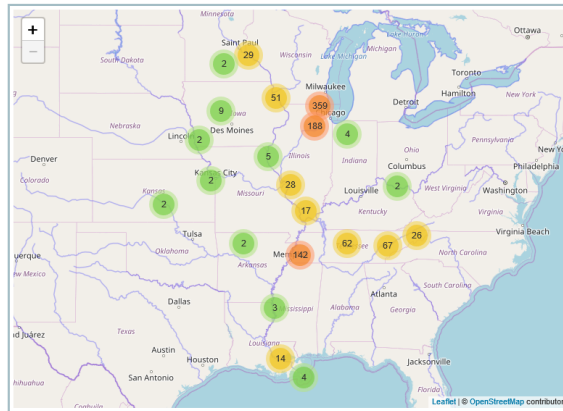


What is the Great Lakes to Gulf Virtual Observatory?

- The GLTG Observatory is a geospatial application that integrates water quality data from multiple sources to visualize nutrient pollution and water quality conditions in the Mississippi River watershed, and includes other information related to these conditions.
- The online interactive application provides users with tools to explore, analyze and compare water quality data from the Mississippi River and its tributaries.

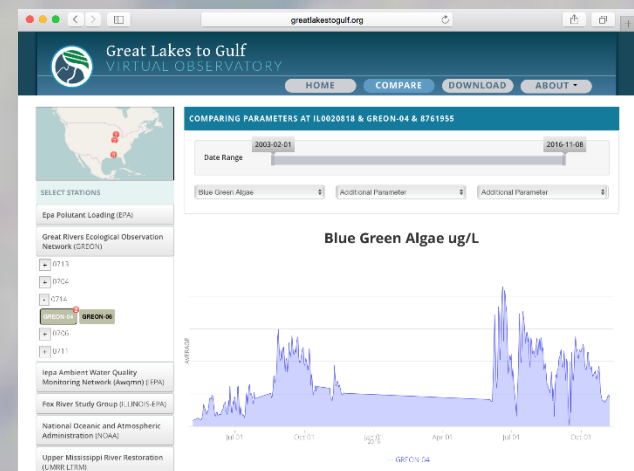
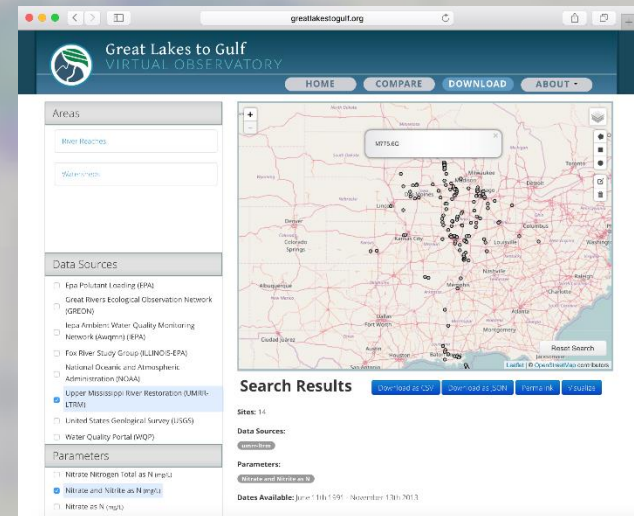


Featured Watersheds



This website was developed by NGRREC, Lewis & Clark Community College, University of Illinois National Center for Supercomputing Applications and the University of Illinois at Urbana-Champaign. © 2014 National Center for Supercomputing Applications.

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Configured for [GLGVO](#) version:1.8.3 build:302



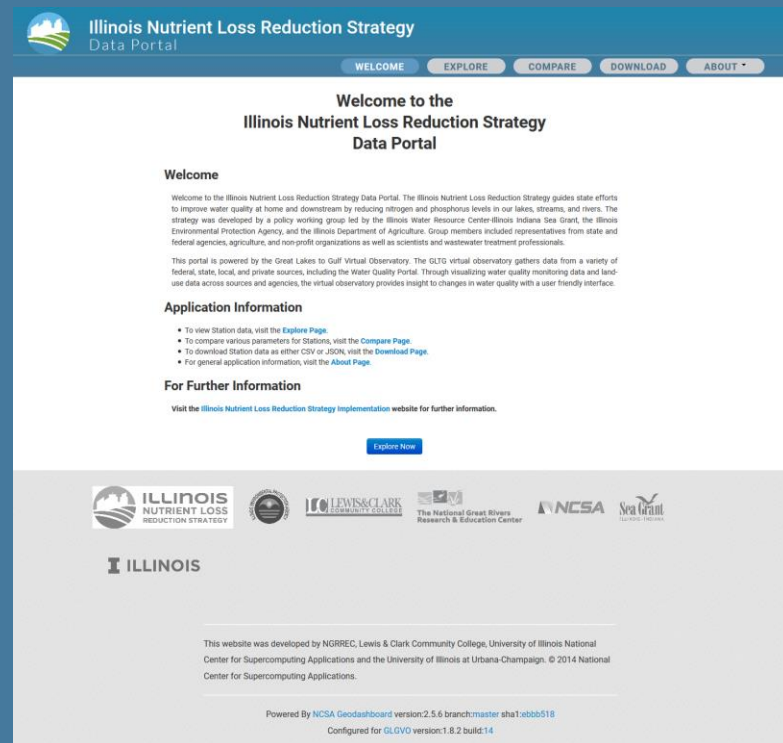


Illinois NLRs Data Portal



Development of IL NLRs Data Portal

- <https://ilnlrs.ncsa.illinois.edu>
- It will be <https://Illinois.greatlakestogulf.org>
- Based on GLTG application and data, IL NLRs data portal is under development working with IL EPA
- The portal is hosted at NCSA (GLTG resource)
- IL NLRs data portal will host the data for IL NLRs
- Initial data is from GLTG





Initial Data

- GREON
- IEPA Ambient Water Quality Monitoring Network
- Data from Fox River Study Group
- Data from Upper Mississippi River Restoration
- USGS
- USGS – Supergauges



Initial GIS Layers

- River network
- HUC2, 4, 8 boundaries
- US State boundaries
- Total annual nitrogen from point source by HUC8 (avg. 2007-2014)
- Avg. Annual Nitrogen Fertilizer Inputs for 1997 to 2006
- EPA impaired Stream Segments (303d, related to nutrients)



Explore Data



Illinois Nutrient Loss Reduction Strategy Data Portal

[WELCOME](#)[EXPLORE](#)[COMPARE](#)[DOWNLOAD](#)[ABOUT ▾](#)

Explore Layers

Explore Data by Source

▶ Station Legend

IEPA Ambient Water Quality Monitoring Network (ILLINOIS-EPA)



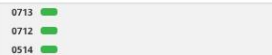
Fox River Study Group (SIERRA-CLUB)



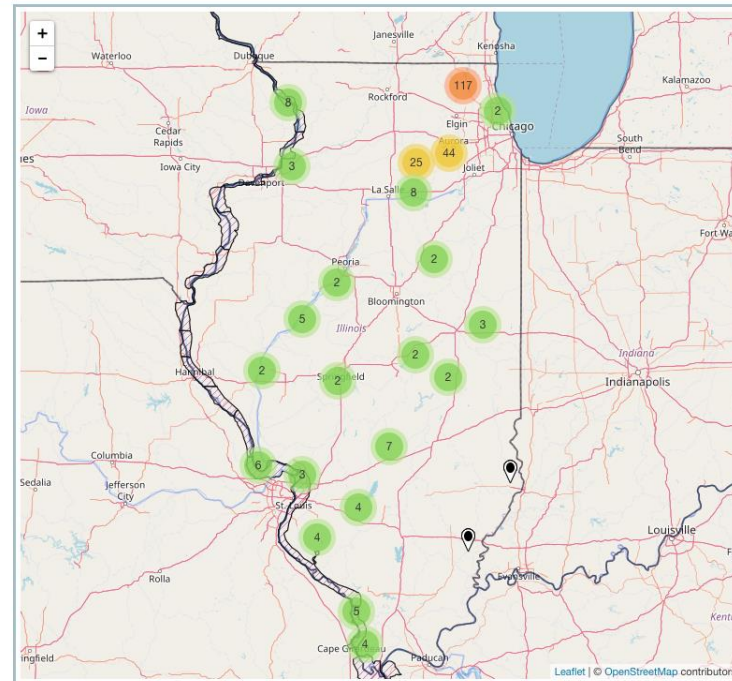
Upper Mississippi River Restoration (UMRR LTRM)



United States Geological Survey (USGS)

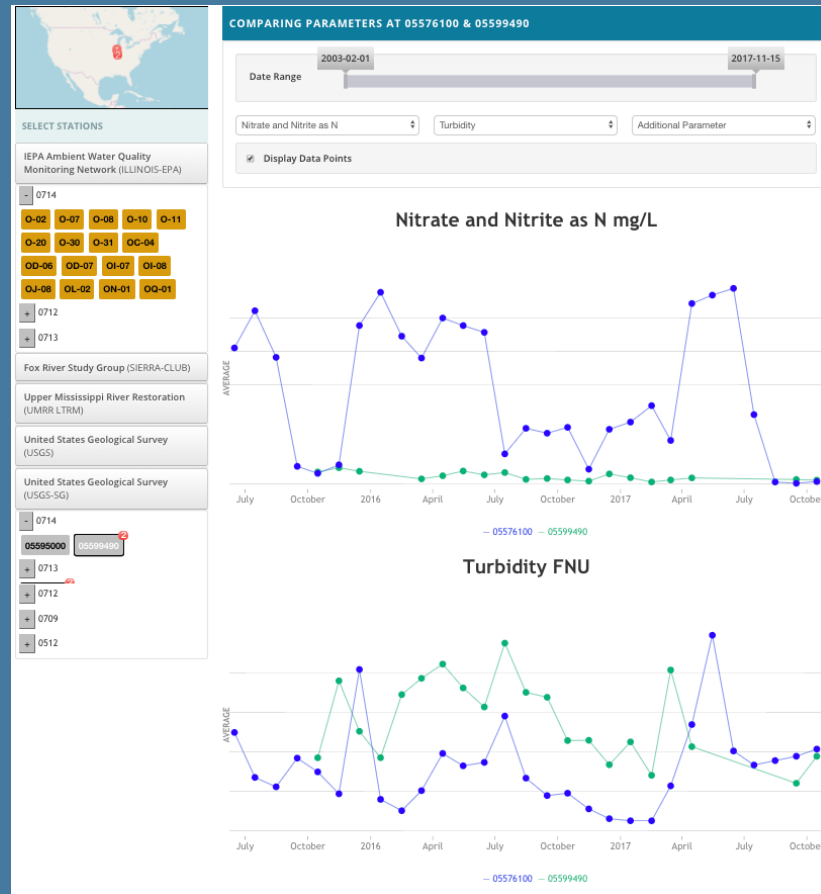


United States Geological Survey





Compare Data





Download Data

The logo shows a stylized green landscape with a white building silhouette.

Illinois Nutrient Loss Reduction Strategy Data Portal

WELCOMEEXPLORECOMPAREDOWNLOADEDABOUT

Locations

☐ Select All Available Locations

☐ Click to Draw Custom Location

☐ Watershed - Ohio

☐ Watershed - Upper Mississippi

☐ Upper Mississippi - Pool 13

☒ Upper Mississippi - Grand Tower to Ohio River

☐ Upper Mississippi - Pool 26

☐ Upper Mississippi - Pool 14

☐ Upper Mississippi - Pool 12

☐ Upper Mississippi - Lock & Dam 26 to Grand Tower

+

DOWNLOAD

PERMALINK

Sites: 7

A map of the Upper Mississippi River watershed, showing the river and surrounding land. The map includes a scale bar, a north arrow, and a legend. The river is highlighted in blue, and the surrounding land is shown in shades of green and brown. Several locations are marked with pins, and a blue circle with the number '2' is visible in the upper left corner of the map area.



Need Your Feedback

- GLTG team needs your feedback
 - Static contents (under About page or at Welcome page)
 - Parameters
 - User Interface
 - It may be needed to be reviewed in terms of feasibility of implementations
- Contact: jonglee1@Illinois.edu



How to Bring Your Data to the Portal

- Contact: jonglee1@Illinois.edu
- If you have web service and access specification,
 - GLTG team can harvest automatically and regularly from the web service
 - E.g. USGS, EPA STORET
- If you have static file such as Excel, CSV, etc.,
 - Please send the files to GLTG team - we will parse and load to the portal
 - E.g. Fox river data, UMRR data
- Regardless of how data is available,
 - GLTG team needs to understand the data specifications, metadata, parameter, units, etc.
 - It may requires cross-walk among similar parameters.

Legislative Initiatives Update

Gregg Good and Trevor Sample

- Representative Kind and Davis Bill – Potential UMR Funding
- Iowa Legislature Passage of NLRS Funding Bill
- NLRS Info Being Provided to the IL General Assembly and Public
- National Farm Bill
- Other?



Statewide Nutrient Load Estimates Minor Corrections

Dr. Greg McIsaac



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Minor Corrections to Statewide Nitrate-N and Total P Load Estimates

Gregory McIsaac, Associate Professor Emeritus
University of Illinois at Urbana Champaign

Adjunct Research Scientist
Agricultural Watershed Institute

Table 3.3. River systems, location and station number of discharge and water quality data, drainage area, and fraction of drainage area in Illinois used in estimating export of nitrogen and phosphorus by surface water from Illinois.

River system	Gage location	USGS station number	Drainage area (sq. mi)	Fraction in Illinois (percent)
Rock	Joslin	05446500	9,549	46
Rock	Rockton	05437500	6,362	
Green	Geneseo	05447500	1,003	100
Illinois	Valley City	05586100	26,743	93 → 8
Kaskaskia	Venedy Station	05594100	4,393	100 5
Big Muddy	Murphysboro	05599500	2,169	100
Little Wabash	Carmi	03381500	3,102	100
Embarras	Ste. Marie	03345500	1,516	100
Vermilion	Danville	03339000	1,290	100 → 92.6

corrected
values

Estimated Loads Leaving Illinois

In estimating the nutrient loads leaving Illinois we summed the loads from the major rivers except: 1) for the Rock River we used the difference between the load at Joslin and the load at Rockton; 2) for the Illinois River, we assumed the proportion of the load from Illinois was the same as the proportion of the area of the watershed within Illinois; 3) to account for the ungauged watershed area within Illinois, we multiplied this sum by the ratio of (Total area in Illinois/ sum of gauged river areas in Illinois)

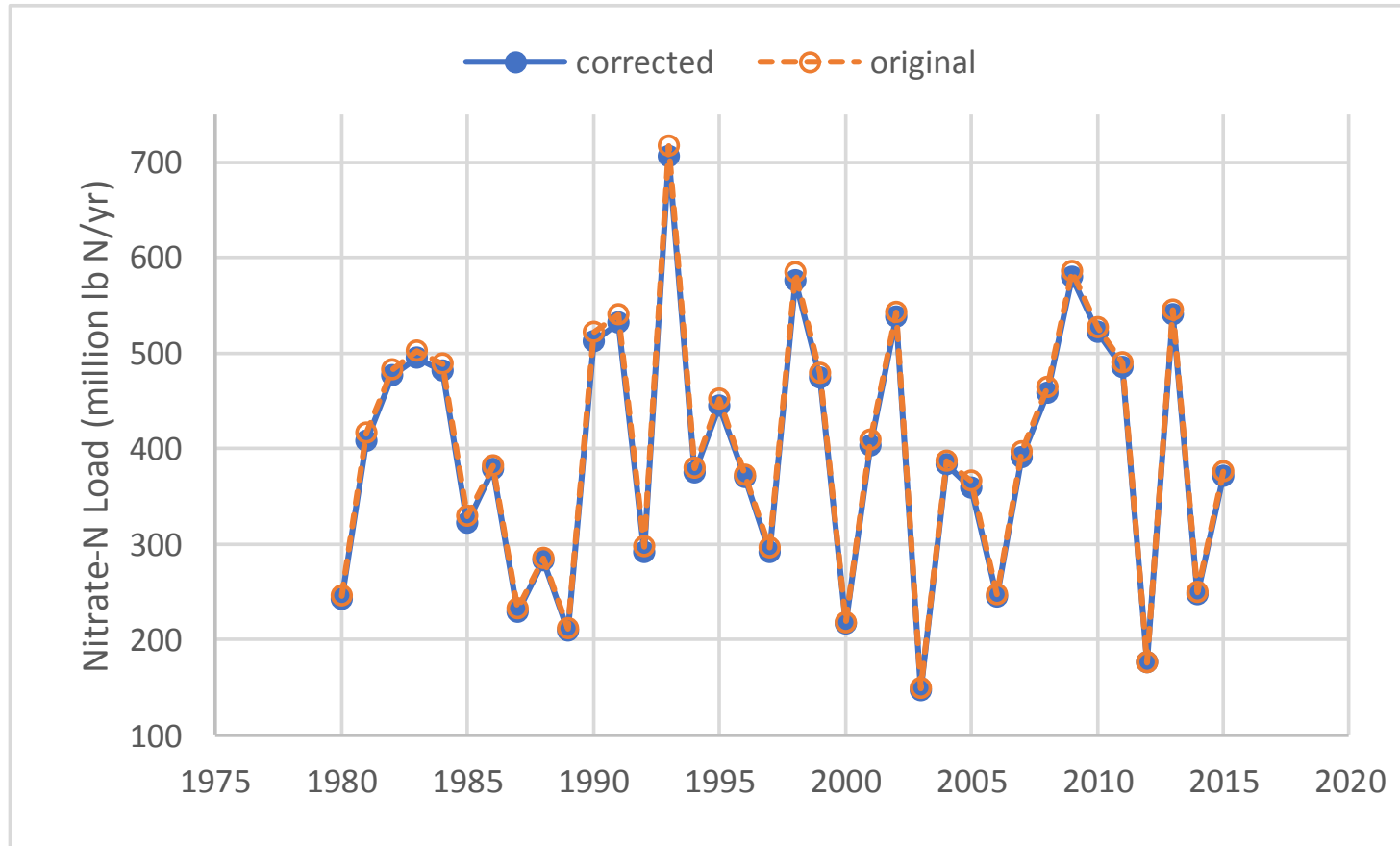
In both the NLRs and the Biennial Report, we multiplied the loads of the Illinois at Valley city by 0.93, but that should have been **0.85**. Similarly we should have multiplied the loads for the Vermilion at Danville by **0.926**. These corrections also need to be incorporated in the sum of gauged river area. Expressed as an equation:

Corrected Estimated Load Leaving IL =

$$[(\text{Rock at Joslin} - \text{Rock at Rockton}) + \text{Green at Geneseo} + \mathbf{0.85} * \text{Illinois at Valley City} + \text{Kaskaskia at Vendy Station} + \text{Big Muddy at Murphysboro} + \text{Little Wabash at Carmi} + \text{Embarass at St. Marie} + \mathbf{0.926} * \text{Vermilion at Danville}] * \text{Total Illinois Surface Area} / (\mathbf{\text{sum of gauged watershed area in Illinois}})$$

The terms shown in red were changed in the correction. These corrections reduced the Illinois portion of the loads. But it also reduced the sum of the gauged watershed areas in Illinois, which increased the ratio of total area to gauged area. The resulting changes to statewide loads were relatively small.

Original and Corrected Statewide Nitrate-N Loads



Original and Corrected Statewide Total P Loads

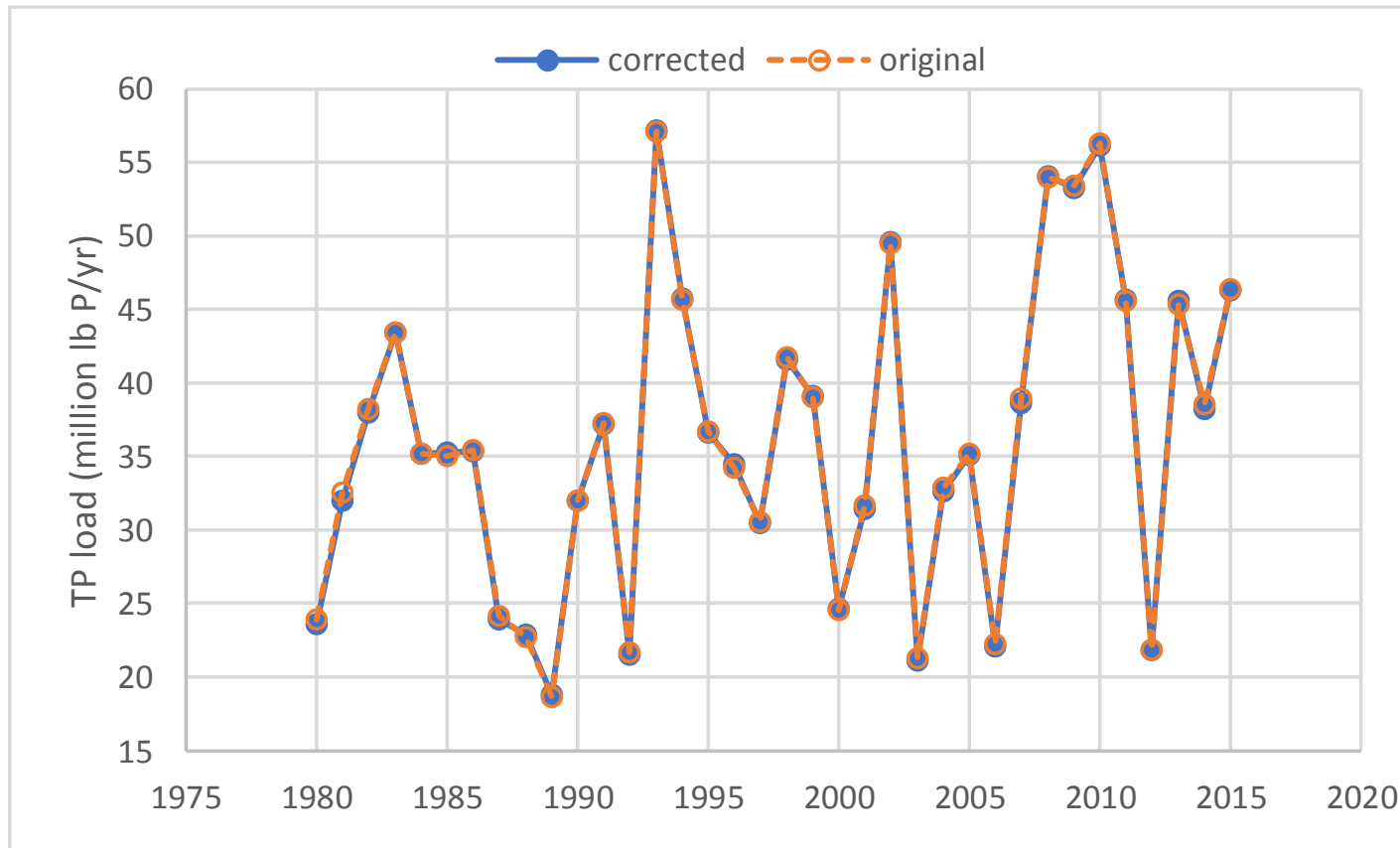


Table 3.4. Water, nitrate-nitrogen, total nitrogen, DRP, and total phosphorus loads for Illinois for 1980-1996 and 1997-2011, along with David and Gentry (2000) estimates as a comparison. Point source loads are also shown as well as point sources as a percent of the recent loads.

	Water	Nitrate-N	Total N	DRP	Total P
	10 ¹² ft ³ yr ⁻¹		million lb yr ⁻¹		
David and Gentry (2000)	1.6		538		31.3
1980-1996	1.7	404 → 397	527	15.4	34 → 33.9
1997-2011	1.72	410 → 404	536	18.5	37.5 → 37.4

These corrected Total P loads were calculated using 1980-2011 concentrations in WRTDS. When re-calculated using 1980-2015 concentrations, the 1980-96 load was 33.7 and the 1997-2011 load was 38.4, which are probably more accurate estimates, because load estimates with WRTDS are increasingly uncertain at the beginning and end of the data record. The availability of the 2012-15 data improved the 1997-2011 estimates.

Suggested edits to the Biennial Report page 9:

~~“Total~~ Estimated annual nitrate-nitrogen losses leaving Illinois ~~from the eight major rivers~~ in 2011–2015 were ~~10~~ 8 percent less than losses during the 1980 to 1996 baseline period (Figure 3.1). “

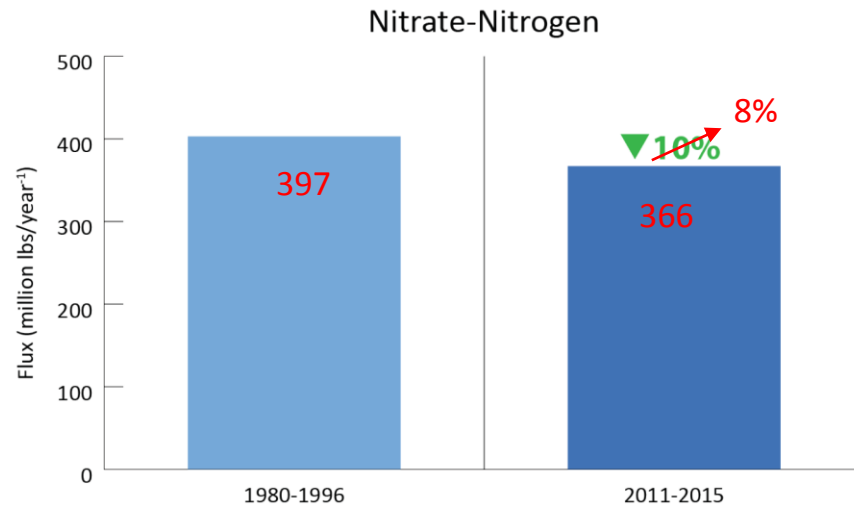
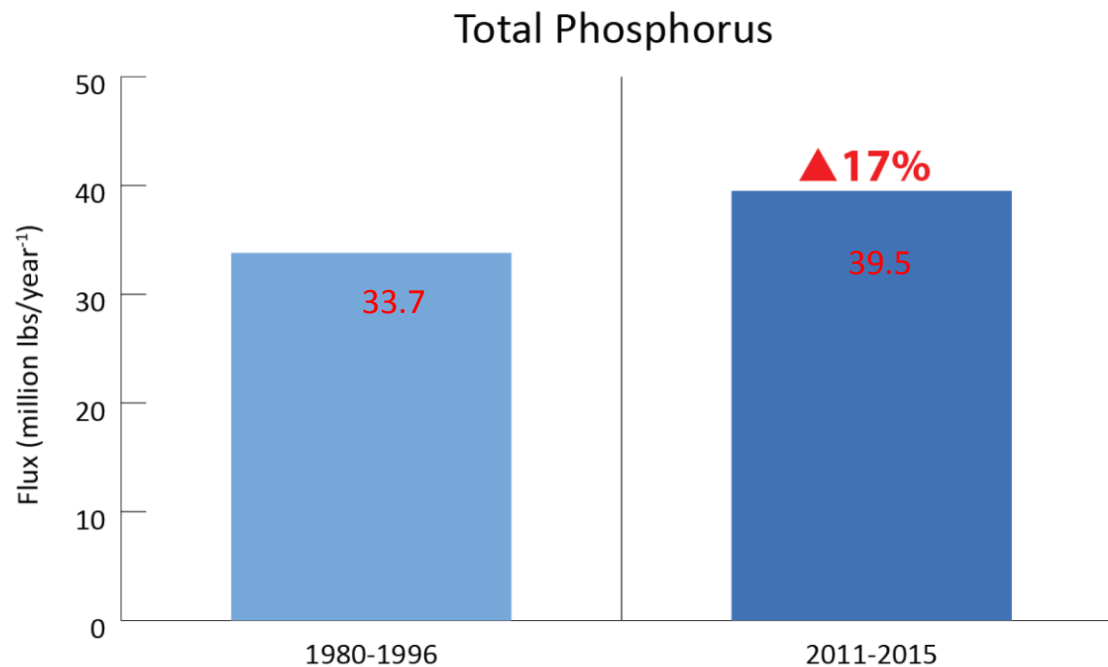


Figure 3.1. Comparison of nitrate-nitrogen flux in eight major Illinois rivers from 1980–1996 to 2011–2015

These losses are not the sum of the loads from the eight major rivers, but an estimate of the losses from the state as a whole based on losses from the eight major rivers.

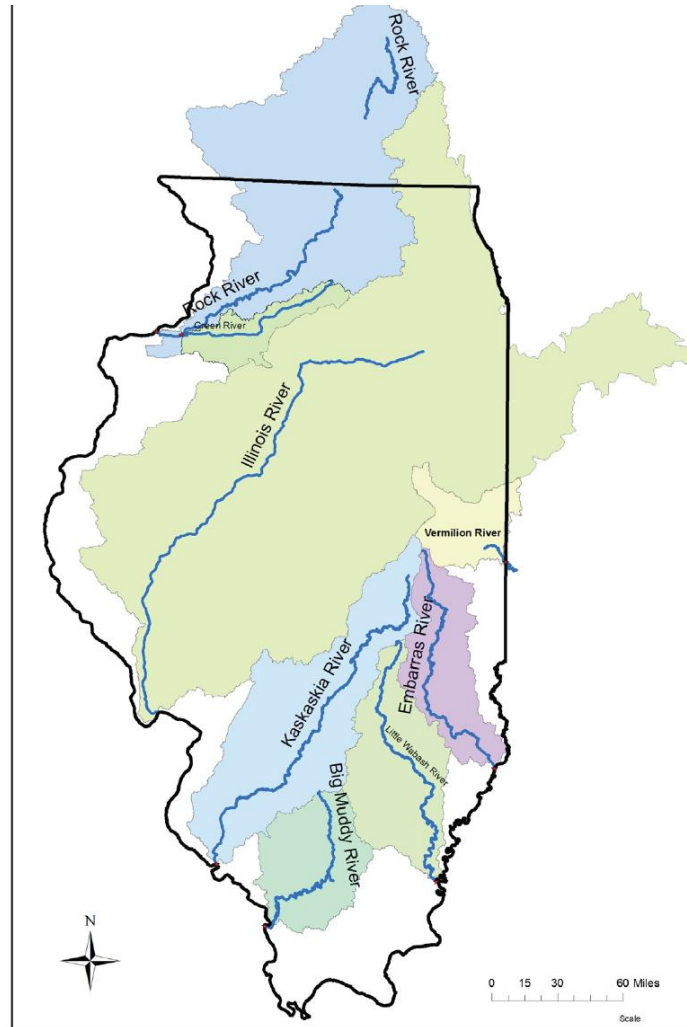


The estimated TP load for 1980-1996 changed slightly from the estimate appearing in the NLRS because the additional concentration and flow data (2011-2015) modifies the relationships that WRTDS uses to estimate loads.

Figure 3.2. Comparison of total phosphorus flux in 8 major Illinois rivers between 1980-1996 and 2011-2015

Additional Issues to Consider In the Future

- About 54% of the Rock River above Joslin is in Wisconsin. So we used the difference between loads at Joslin and Rockton to represent the Illinois portion of the Rock, but this leaves out about 1100 square miles in the Illinois portion of the Rock River basin above Rockton (mostly the Pecatonica River).
- For the state as a whole, we implicitly assume that the nutrient yields from the ungauged areas (~30% of the state) are equal to the average nutrient yield from the gauged areas. Nutrient yields from the ungauged areas might be better estimated by relationships of nutrient loads to watershed characteristics observed in the gauged areas (e.g. land use, slope, rainfall, etc.)



This figure does not show the gauge locations. Gauged area is less than the shaded areas.

Nitrate Monitoring in Groundwater in Havana, Illinois Kelly Warner Update



“Next Steps” Summary

(NMC March 15, 2018)



- Summarize today's action items
 - A.
 - B.
 - C.
- Future topics for the next meeting
- Other (TBD)

Next NMC Meetings

➤ *August 29, 2018*
(in Urbana)

➤ ????

➤ ????





Wait, she's
driving?
HELP!!!



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