ILLINOIS NUTRIENT LOSS REDUCTION: CURRENT ACTIVITIES, FUTURE DIRECTIONS

Illinois Lake Management Association
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Two water quality issues related to nutrients:

- Impacts to Illinois rivers, lakes, streams
- Contribution to Gulf of Mexico Hypoxia:
  - 20% of N that reaches Gulf
  - 11% of P that reaches Gulf
- Illinois Nutrient Loss Reduction Strategy designed to address local WQ and Gulf Hypoxia

Mississippi River Gulf of Mexico Watershed Nutrient Task Force

- Task Force began in late 1990s
- Integrated Assessment
- 2001 Action Plan – *30% reduction target*
- Reassessment / USEPA Science Advisory Panel
- 2008 Action Plan – *45% reduction target*

Mississippi River Gulf of Mexico Watershed Nutrient Task Force

Goals

- *Coastal Goal* – reduce the five-year running average areal extend of the Gulf of Mexico hypoxic zone to less than 5,000 sq. kilometers by the year 2015
- *Within Basin Goal* – restore and protect the waters of the 31 states and tribal lands within the Mississippi/Atchafalaya River Basin
- *Quality of Life Goal* – improve the communities and economic conditions across the Mississippi/Atchafalaya River Basin

Mississippi River Gulf of Mexico Watershed Nutrient Task Force

Principals

- Encourage actions that are *voluntary, incentive-based, practical, and cost-effective*;
- Utilize *existing programs*, including existing state and federal regulatory mechanisms;
- Follow adaptive management;
- Identify additional funding needs and sources during the annual agency budget processes;
- Identify opportunities for, and potential barriers to, innovative and market-based solutions; and
- Provide measurable outcomes as outlined below in the three goals and eleven actions.

March 16, 2011 "Stoner" Memo

- Provided framework for state nutrient (loss) reductions through 8 recommended elements:
  1. Watershed prioritization
  2. Watershed load reduction goals
  3. Effectiveness of point source permitting
  4. Agricultural practice targeting
  5. Storm water and septic systems
  6. Accountability and verification measures
  7. Annual public reporting
  8. N and P criteria development

Illinois Nutrient Loss Reduction Strategy

Policy work group made up of various stakeholders including

- Wastewater treatment works representatives
- Environmental advocate organizations
- Agricultural organizations
- State & federal government representatives
- University of Illinois researchers

Met monthly over a 12-month period beginning in the summer of 2013

Illinois Nutrient Loss Reduction Strategy

Science Assessment – Dr. Mark David, et al.

- Describes current conditions
- Identifies critical watersheds
- Identifies agricultural practices and nutrient losses by major land resource area (MLRA)
- Lists possible point source reductions with resulting cost estimates
- Outlines possible non-point source nutrient losses with cost estimates
- Lists statewide scenarios with associated costs
- Conclusions

Illinois Nutrient Loss Reduction Strategy

Three subcommittees with representatives from numerous interest groups –

- Agricultural non-point sources
- Urban point source
- Urban non-point sources

- Met various times to draft specific strategy chapters

Illinois Nutrient Loss Reduction Strategy

Goals and Milestones

Milestones

- Nitrate-nitrogen 15% by 2025
- Phosphorus 25% by 2025

HYPOXIA GOAL - 45% reduction in the annual loading of nitrate-nitrogen and phosphorus compared to 1980-1996 (baseline conditions)

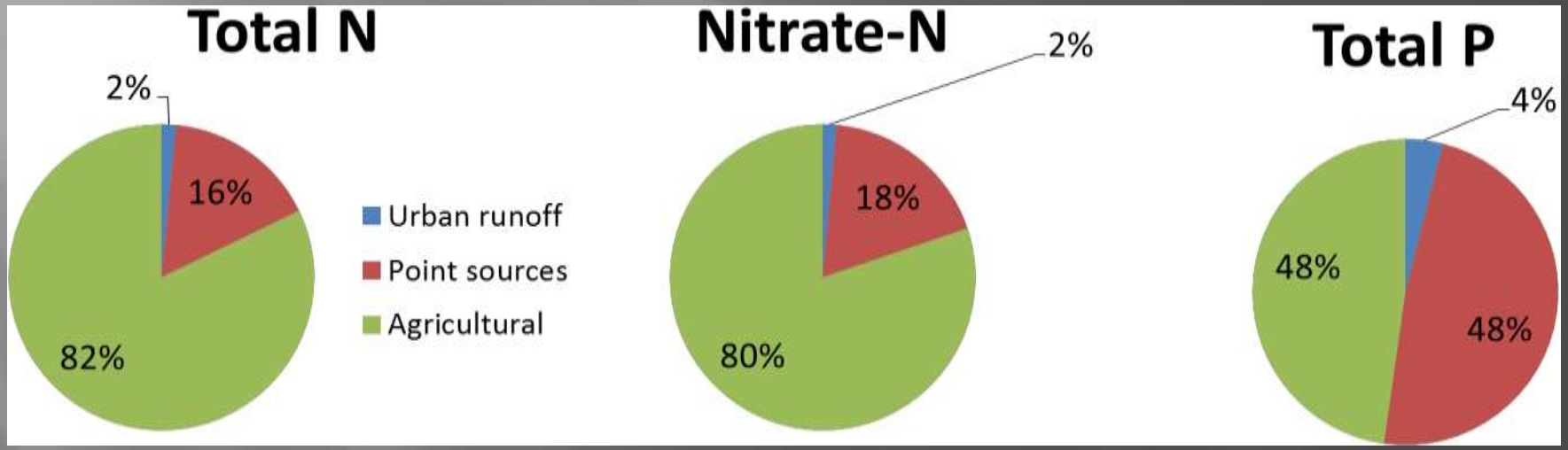
Local WQ Goals – Established by TMDL and/or watershed specific study

Science Assessment to Support An Illinois Nutrient Loss Reduction Strategy

Mark David, Greg McIsaac, George Czapar, Gary Schnitkey, Corey Mitchell

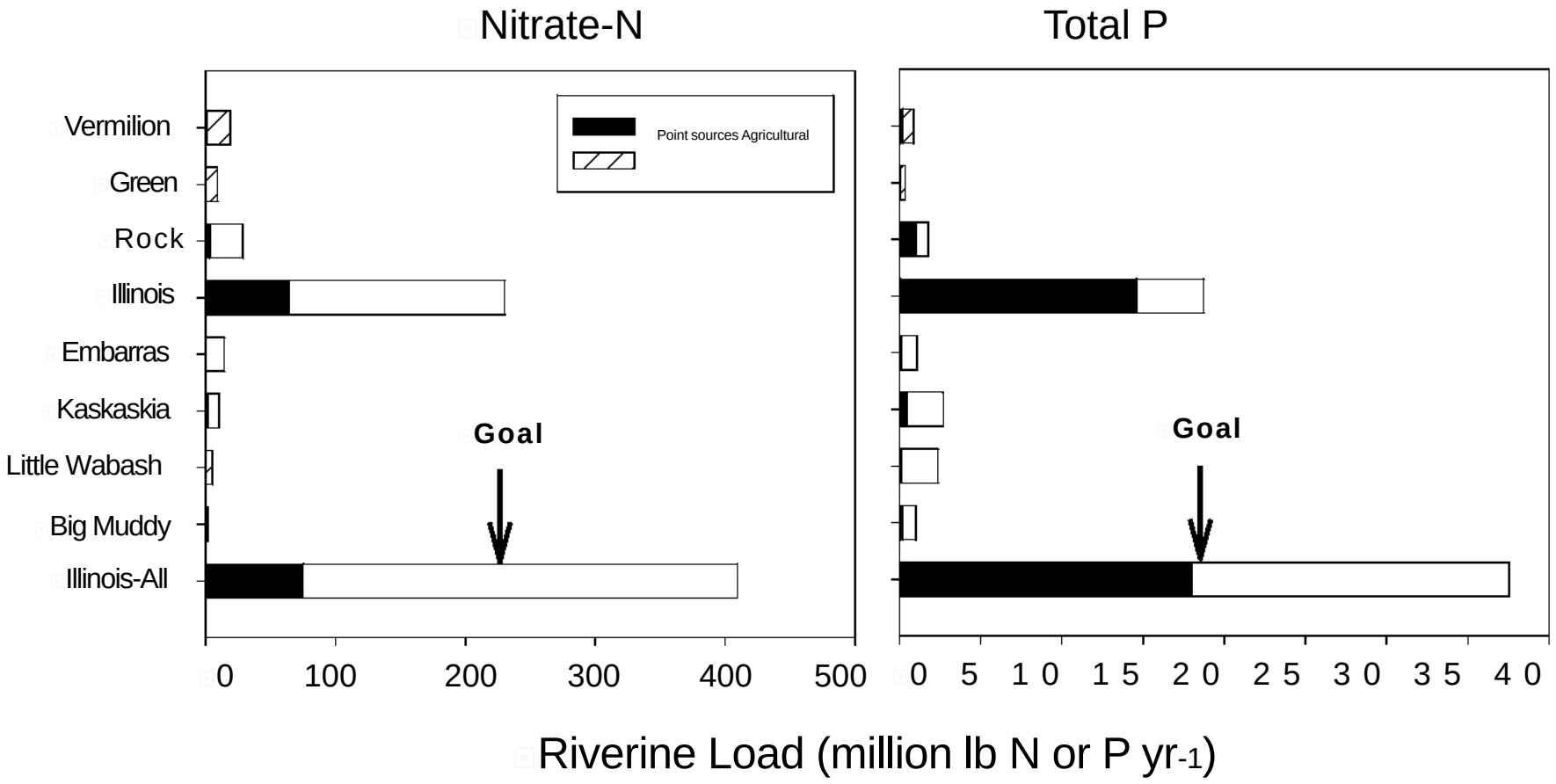
University of Illinois at Urbana-Champaign

Illinois Nutrient Sources

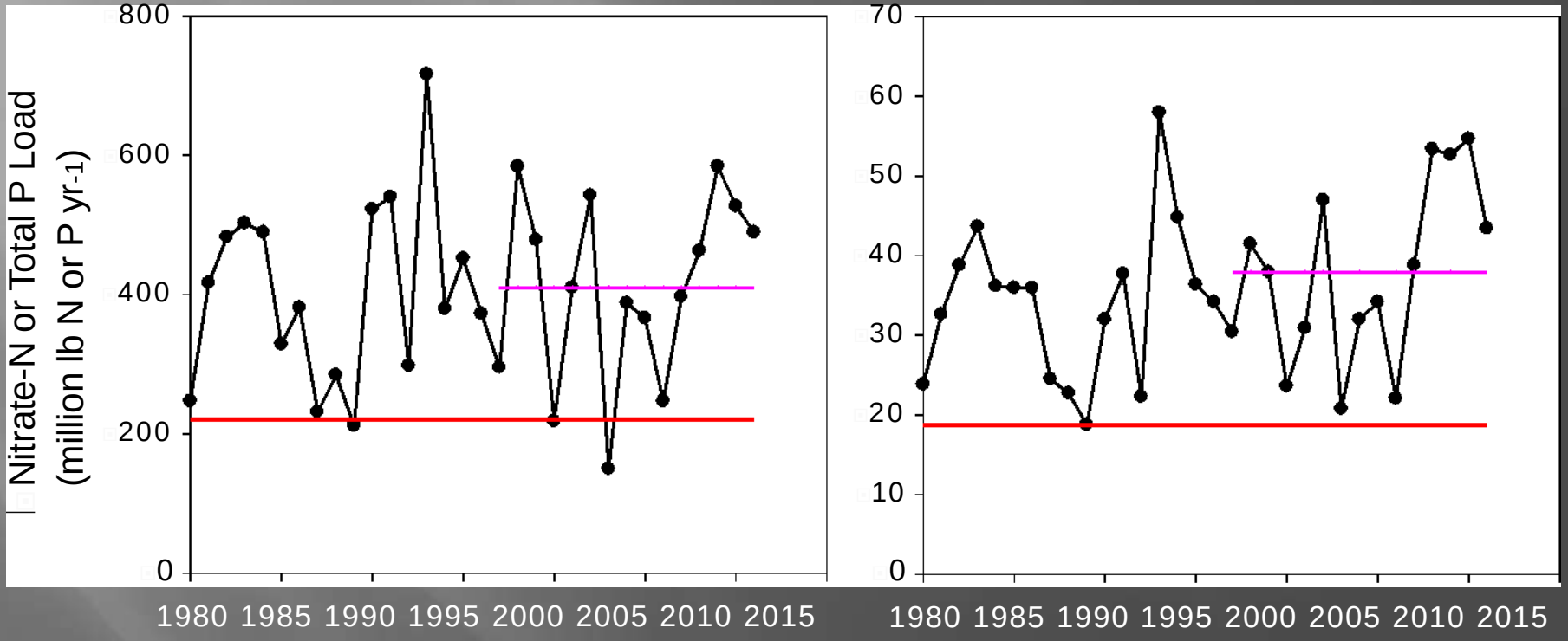


Point and agricultural sources

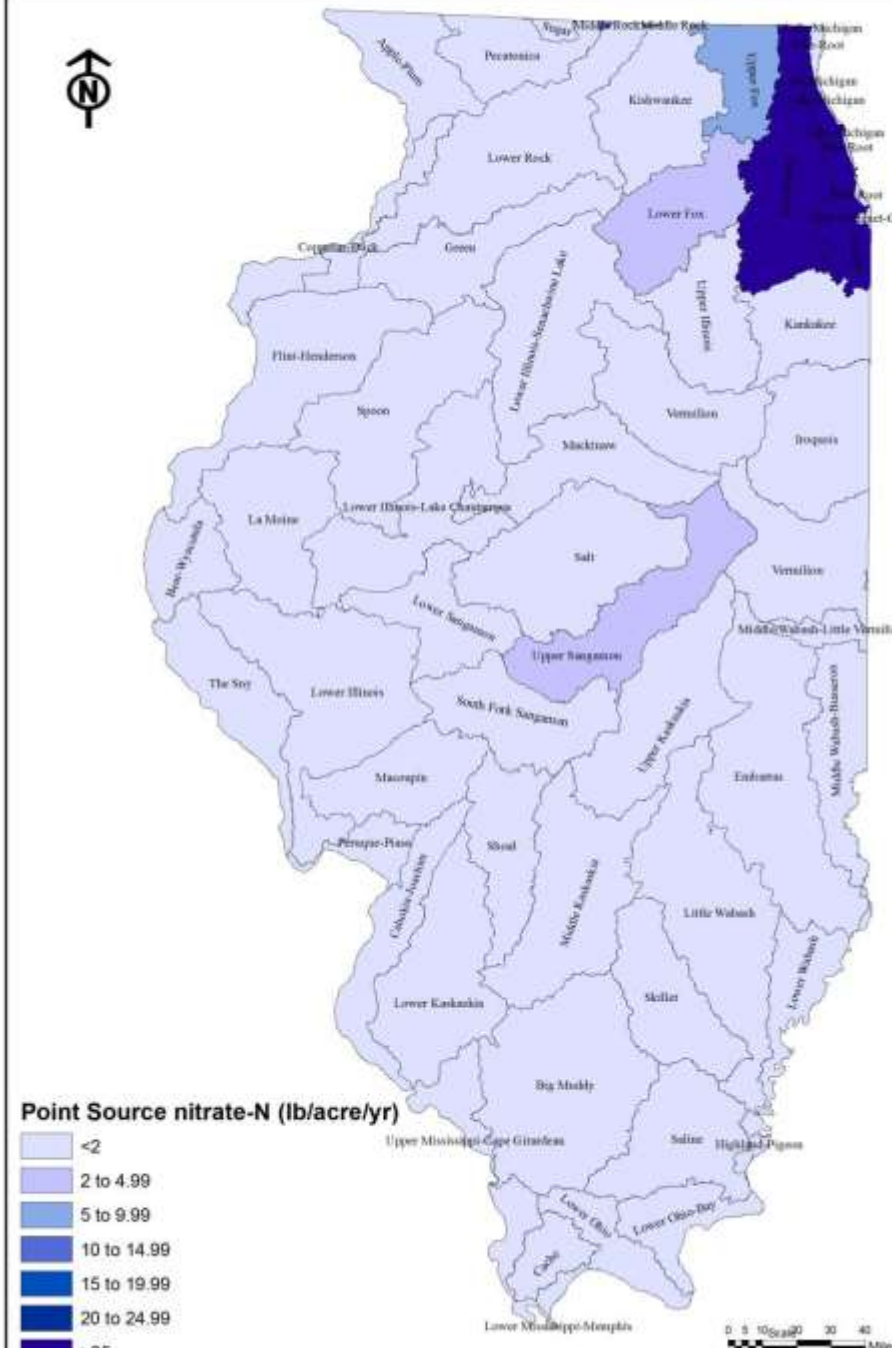
(1997-2011)



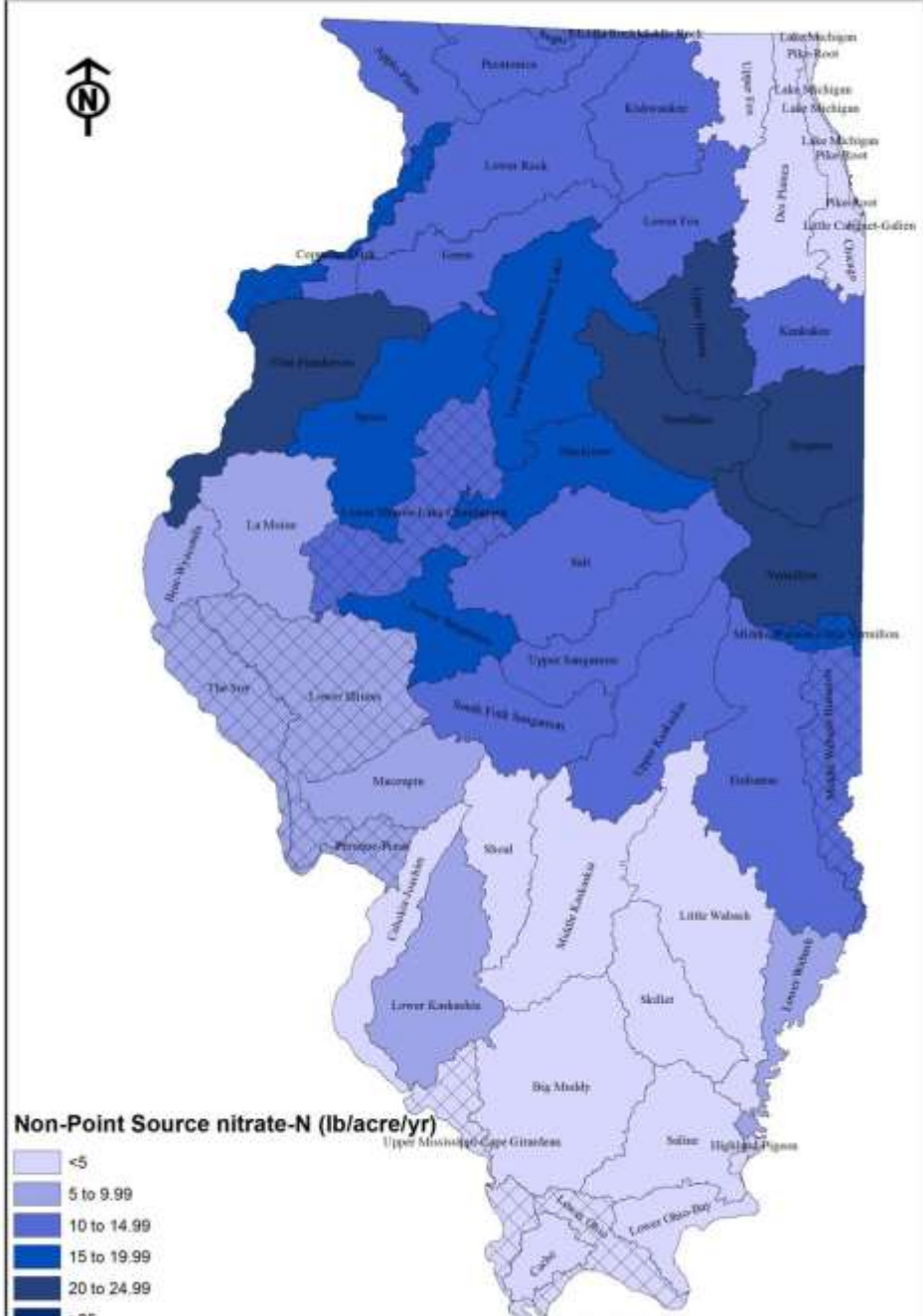
Nitrate-N & Total P Targets



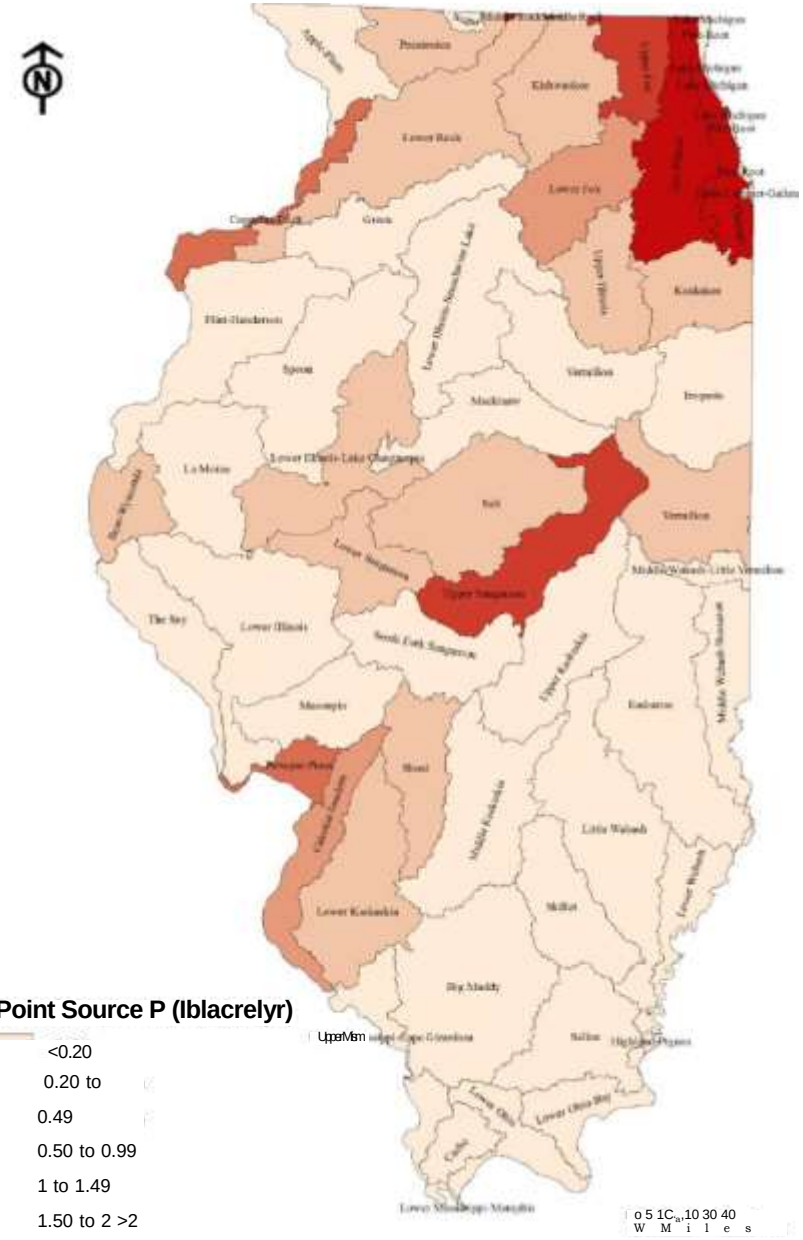
HUC8 Point Source nitrate-N Yields



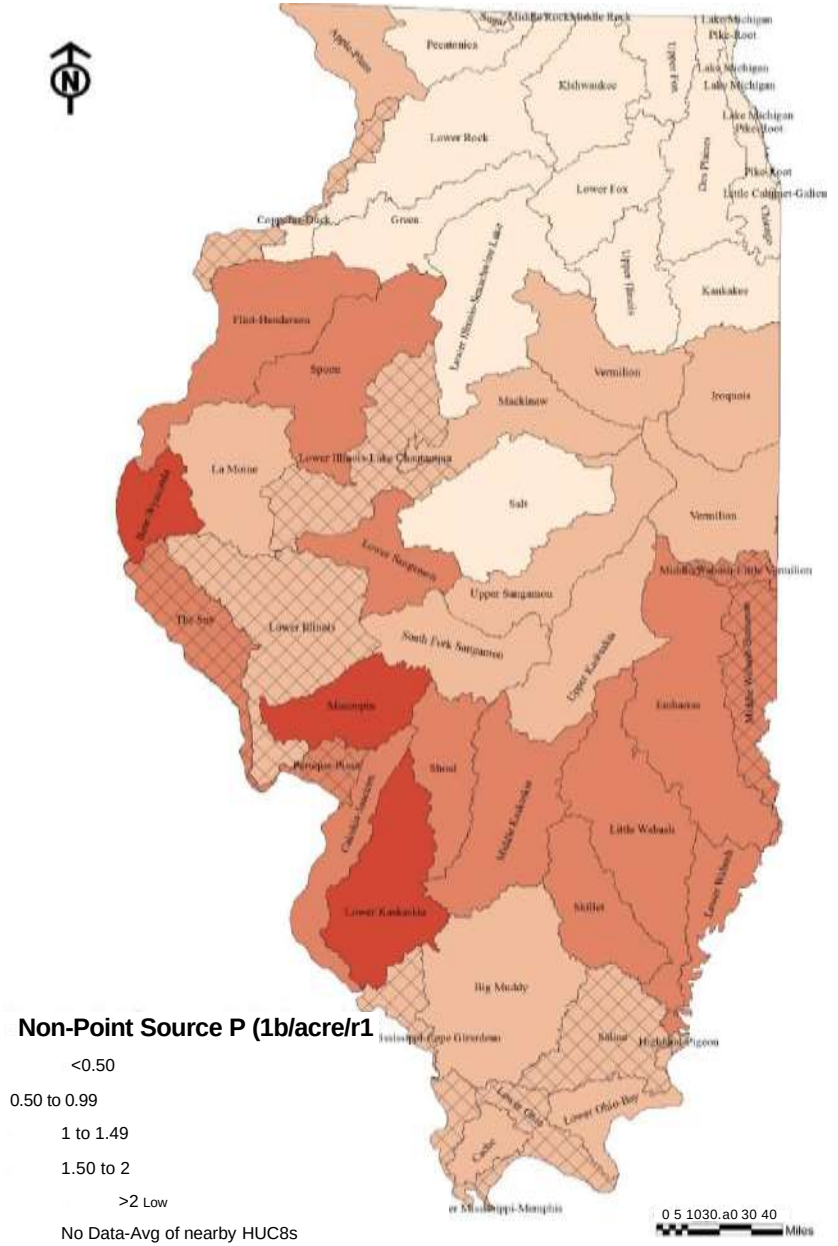
HUC8 Non-Point Source nitrate-N Yields



HUC8 Point Source P Yields



HUC8 Non-Point Source P Yields



Example Statewide Results for N

	Practice/Scenario	Nitrate-N reduction per acre (%)	Nitrate-N reduced (million lb N)	Nitrate-N Reduction % (from baseline)	Cost ($/lb N removed)
	Baseline			410	
In-field	Reducing N rate from background to the MRTN (10% of acres)	10	2.3	0.6	-4.25
	Nitrification inhibitor with all fall applied fertilizer on tile-drained corn acres	10	4.3	1.0	2.33
	Split (50%) fall and spring (50%) on tile-drained corn acres	7.5 to 10	13	3.1	6.22
	Fall to spring on tile-drained corn acres	15 to 20	26	6.4	3.17
	Cover crops on all corn/soybean tile-drained acres	30	84	20.5	3.21
	Cover crops on all corn/soybean non-tiled acres	30	33	7.9	11.02
Edge-of-field	Bioreactors on 50% of tile-drained land	40	56	13.6	1.38
	Wetlands on 25% of tile-drained land	40	28	6.8	5.06
	Buffers on all applicable crop land (reduction only for water that interacts with active area)	90	36	8.7	1.63
Land use change	Perennial/energy crops equal to pasture/hay acreage from 1987	90	10	2.6	9.34
	Perennial/energy crops on 10% of tile-drained land	90	25	6.1	3.18
Point source	Point source reduction to 10 mg nitrate-N/L		14	3.4	3.30
	Point source reduction in N due to biological nutrient removal for P		8	1.8	

Example Statewide Results for P

	Practice/Scenario	Total P reduction per acre (%)	Total P reduced (million lb P)	Total P Reduction % (from baseline)	Cost ($/lb P removed)
	Baseline		37.5		
In-Field	Convert 1.8 million acres of conventional till eroding >T to reduced, mulch or no-till	50	1.8	5.0	-16.60
	P rate reduction on fields with soil test P Above the recommended maintenance level	7	1.9	5.0	-48.75
	Cover crops on all corn/soybean acres	30	4.8	12.8	130.40
	Cover crops on 1.6 million acres eroding >T currently in reduced, mulch or no-till	50	1.9	5.0	24.50
Edge-of-field	Wetlands on 25% of tile-drained land	0	0	0.0	
	Buffers on all applicable crop land	25-50	4.8	12.9	11.97
Land use change	Perennial/energy crops equal to pasture/hay acreage from 1987	90	0.9	2.5	102.30
	Perennial/energy crops on 1.6 million acres>T currently in reduced, mulch or no-till	90	3.5	9.0	40.40
	Perennial/energy crops on 10% of tile-drained land	50	0.3	0.8	250.07
Point source	Point source reduction to 1.0 mg total P/L (majors only)		8.3	22.1	13.71

Example Statewide N & P Scenarios

Name	Combined Practices and/or Scenarios	Nitrate-N (% reduction)	Total P (% reduction)	Cost of Reduction ($/lb)	Annualized Costs (million $/year)
NP1	MRTN, fall to spring, bioreactors 50%, wetlands 25%, no P fert. on 12.5 million ac above STP maintenance, reduced till on 1.8 million ac conv. till eroding > T, buffers on all applicable lands, point source to 1.0 mg TP/L and 10 mg nitrate-N/L	35	45	**	383
NP2	MRTN, fall to spring, bioreactors 50%, no P fert. on 12.5 million ac above STP maintenance, reduced till on 1.8 million ac conv. till eroding > T, cover crops on all CS, point source to 1.0 mg TP/L and 10 mg nitrate-N/L	45	45	**	810
NP3	MRTN, fall to spring, bioreactors 15%, no P fert. on 12.5 million ac above STP maintenance, reduced till on 1.8 million ac conv. till eroding > T, cover crops on 87.5% of CS, buffers on all applicable lands, perennial crops on 1.6 million ac >T, and 0.9 million additional ac.	45	45	**	791
NP4	MRTN, fall to spring N, bioreactors 35%, no P fert. on 12.5 million ac above STP maintenance, reduced till on 1.8 million ac conv. till eroding > T, buffers on 80% of all applicable land	20	20	**	48
NP5	MRTN, fall to spring N, bioreactors 30%, wetlands 15%, no P fert. on 12.5 million ac above STP maintenance, reduced till on 1.8 million ac conv. till eroding > T, point source to 1.0 mg TP/L and 10 mg nitrate-N/L on 45% of discharge	20	20	**	66
NP6	MRTN, fall to spring N, no P fert. on 12.5 million ac above STP maintenance, reduced till on 1.8 million ac conv. till eroding > T, cover crops on 1.6 million ac eroding >T and 40% of all other CS	24	20	**	244

Conclusions

- no simple solution, or one method to achieve goals
- will take a range of point and non point source reductions to meet targets
- initial focus could be:
- – point source P reductions ($114 million per year)
  – tile-drained nitrate reductions by agriculture (range of costs)
- strategy will get us started

Current Activities – Agricultural Sources

Many programs available to promote and fund conservation practices that prevent nutrient loss

- Section 319
- CREP
- Partners for Conservation Cost Share
- Streambank Stabilization and Restoration
- EQIP
- CSP
- Easements
- MRBI
- RCPP
- Driftless Landscape Conservation Initiative
- Illinois Buffer Partnership
- Clean Water Initiative
- National Water Quality Initiative

Current Activities – Agricultural Sources

Illinois Agriculture is leading efforts to fund research, outreach and on-farm demonstration of effective practices.

- Nutrient Research and Education Council
- Keep It for the Crop
  - N-Watch
  - Nitrogen management systems
  - On-Farm nitrogen rate trials
  - N-Calc (MRTN calculator)
- Cover Crop Training Initiative

Future Directions – Agricultural NPS

In order to make progress on nutrient loss reduction, widespread implementation of effective practices needed.

- Farmers select and apply the most appropriate and beneficial practices from options:
  - Fertilizer application
  - Cover crops
  - Edge-of-field (bioreactors, wetlands, water/sediment control basins, buffers, grassed waterways)

Future Directions – Agricultural NPS

- Expanded outreach and education on nutrient loss & available tools by public, private sector, academic and non-profits – watershed scale, crop advisors, farm managers
- Ag Water Quality Partnership Forum
  - Strengthen connections between industry initiatives, continuing education for CCAs, etc. to help producers evaluate/select BMPs
  - Steer education initiatives/assign responsibility
  - Coordinate/align funding
  - Identify future implementation steps

Current Activities – Point Sources

- Effluent limits in NPDES permits
  - Total P limit of 1 mg/L for new/expanding wastewater treatment plants
  - Total P limit of 1 mg/L for discharges into or upstream of a lake
  - Total P limits and/or total N goals – anti-degradation
  - Voluntary acceptance of permit limits
  - Contribution to violation of narrative standards

Current Activities – Point Sources

- As a result, 36% of major municipal dischargers have P limits – 70% of regulated discharge from major municipals
- Permit limits for Metropolitan Water Reclamation District of Greater Chicago will achieve 33% of the point source load reduction goal for phosphorus – Gulf of Mexico hypoxia

Current Activities – Point Sources

- Watershed planning efforts help with local impairments as well as reduce loads leaving the State.
- Fox River
  - "placeholder" phosphorus limit
  - Phosphorus removal feasibility report – 1 mg/L and 0.5 mg/L
  - Fox River Implementation Plan
  - Allocation of phosphorus loads will drive future permit limits

Current Activities – Point Sources

- Watershed Planning
  - Upper DesPlaines
    - 1 mg/L P permit limit to start
    - Optimization of current equipment
    - Develop watershed implementation plan
  - DuPage River/Salt Creek
    - Focusing on habitat restoration to improve biology
    - Nutrient-related permit conditions under discussion

Future Directions – Point Sources

- Nutrient Loss Reduction Feasibility Plan
  - Focus on majors in priority watersheds
  - Favor biological nutrient removal
- Review data and identify additional strategies
  - Nitrate-nitrogen
  - Industrial discharges
- Expand reduction planning efforts to additional watersheds to address local water quality problems

Urban Stormwater

- Current Activities
  - Municipal separate storm sewer systems (MS4) permits
  - Funding of structural/non-structural practices
    - Section 319
    - Illinois Green Infrastructure Grants
    - Clean Water Initiative
- Future Directions
  - Strengthen IEPA stormwater program/provide more technical and financial assistance from BMPs, green infrastructure, planning
  - Post-development stormwater performance standard
  - Urban Stormwater Working Group

Water Quality Standards for Nutrients

- Revision of offensive conditions narrative standard
- Protection for low-phosphorus streams
- Numeric nutrient criteria
  - Nutrient Science Advisory Committee
  - Guide development of criteria by reviewing all available data, studies, methodologies and existing/proposed state standards

Showing Progress

- Track environmental outcomes and implementation activities
- Monitoring programs – local water quality/nutrient loads
  - Statewide Nutrient Export Loadings Network
- Implementation
  - NPDES
  - 319
  - Soil Conservation Transect Surveys
  - Natural Resources Inventory
  - NRCS Annual Report
  - Ag Industry Voluntary Reporting

Statewide Nutrient Export Loading Network

Public Information on Progress

- Biennial Condition of Illinois Waters 305(b) Report – Nutrient Section
- Biennial report on nutrient loss reduction implementation

Next Steps

- Draft NLRS released for public review/comment on November 24, 2014 – January 24, 2015
- www.epa.state.il.us/water/nutrient/nlrs.html
- Comments will be posted on website soon
- Illinois EPA & IDOA review/incorporate comments
- Hope to finalize by April 1, 2015