Illinois Nutrient Loss Reduction Strategy – EOF Practices

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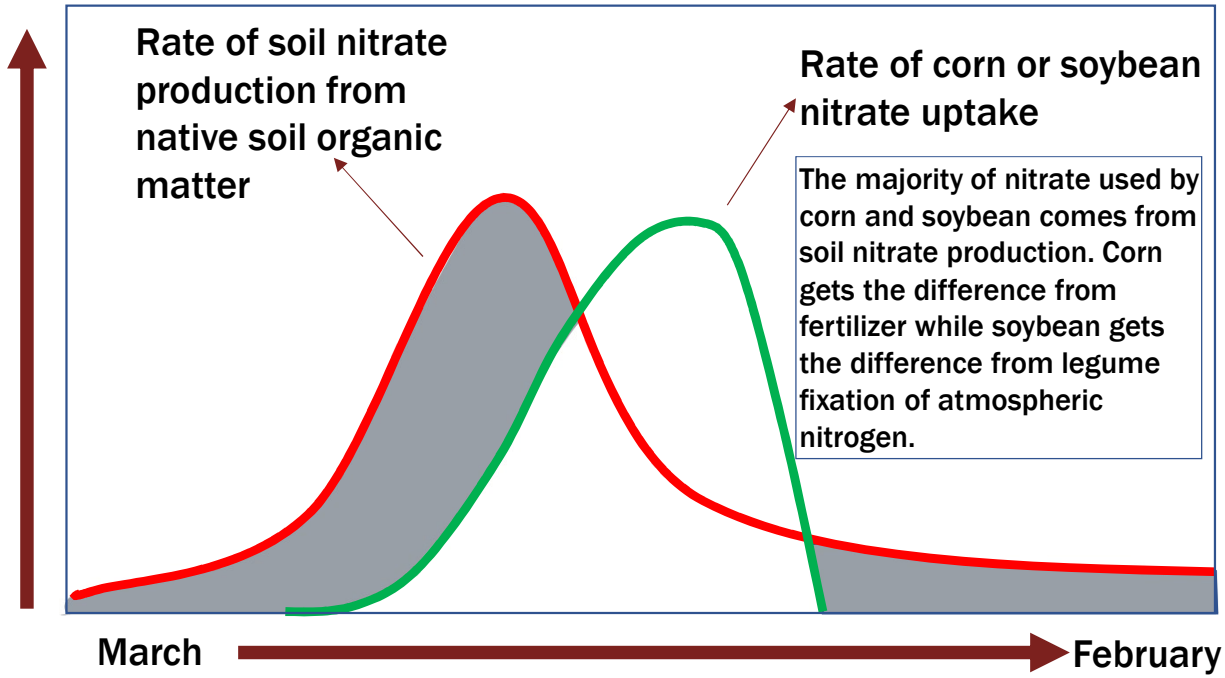
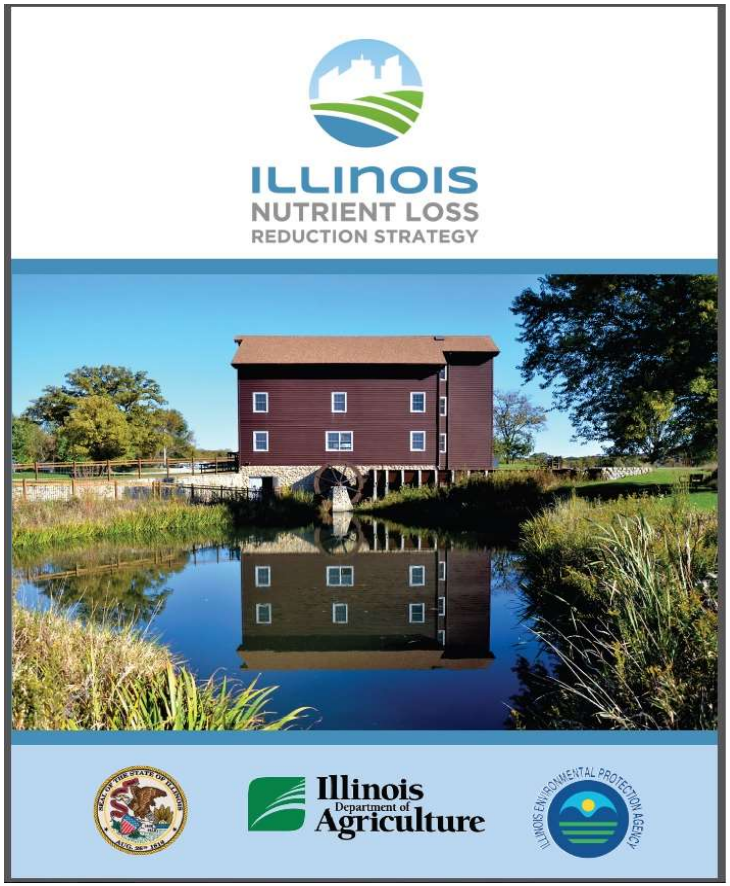
ADMC Diamond and Platinum Members



In the shaded areas, the soil produces nitrate, but there is no crop to use it. As a result, <u>some</u> nitrate is lost to waterways.

Slide developed by Dr. Mike Castellano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NUTRIENT LOSS
REDUCTION STRATEGY
Illinois
Department of
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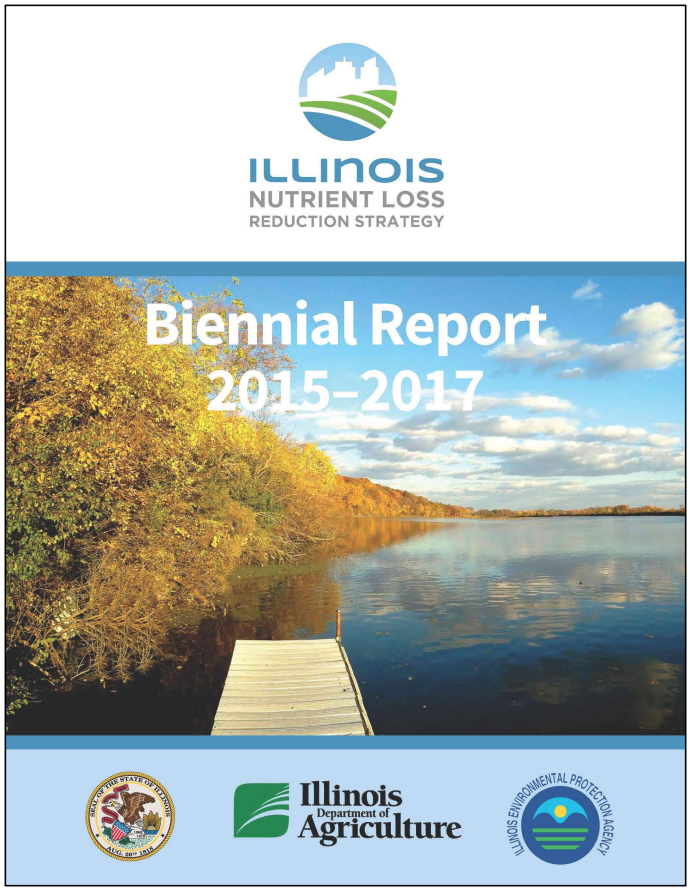
ILLINOIS ENVIRONMENTAL PROTECTION AGENCY


ILLINOIS
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Biennial Report
2015–2017
Illinois
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Principles of the 2008 Gulf Hypoxia Action Plan

- Voluntary, incentive-based, practical, and cost-effective actions
- Use existing programs
- Follow adaptive management strategies
- Identify funding needs and sources
- Identify opportunities & potential barriers to innovative and market-based solutions
- Provide measurable outcomes

Stoner memo provides NLRS framework

1. Prioritize watersheds
2. Set watershed load reduction goals
3. Ensure effectiveness of NPDES point source permits in priority watersheds
4. Address agricultural sources
5. Address stormwater/septic system sources
6. Establish accountability and verification measures
7. Annual reporting
8. Work plan and schedule for numeric criteria development

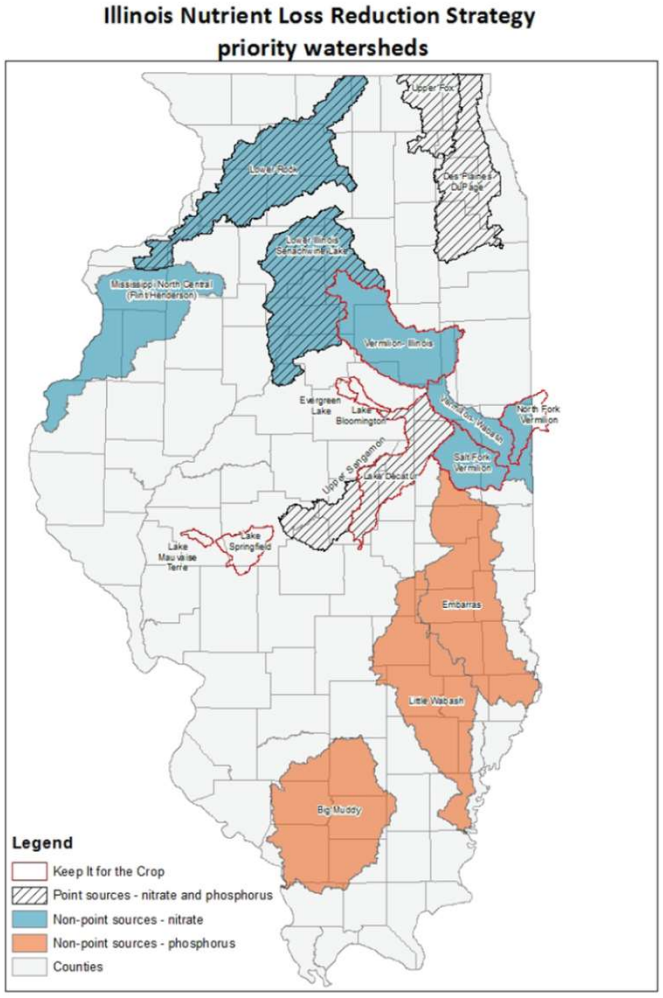


Figure 4.2. Priority watersheds for nutrient loss reduction.

Ranking criteria

- Nutrient loads, N & P considered separately
- % of watershed meeting designated uses
- Number of watershed plans within HUC 8

Goals and Milestones

Nutrients	Phase 1 Milestones	Target
Nitrate-Nitrogen	15% by 2025	45%
Total phosphorus	25% by 2025	45%

80% of Nitrate-N and 48% of Total P attributed to agricultural sources

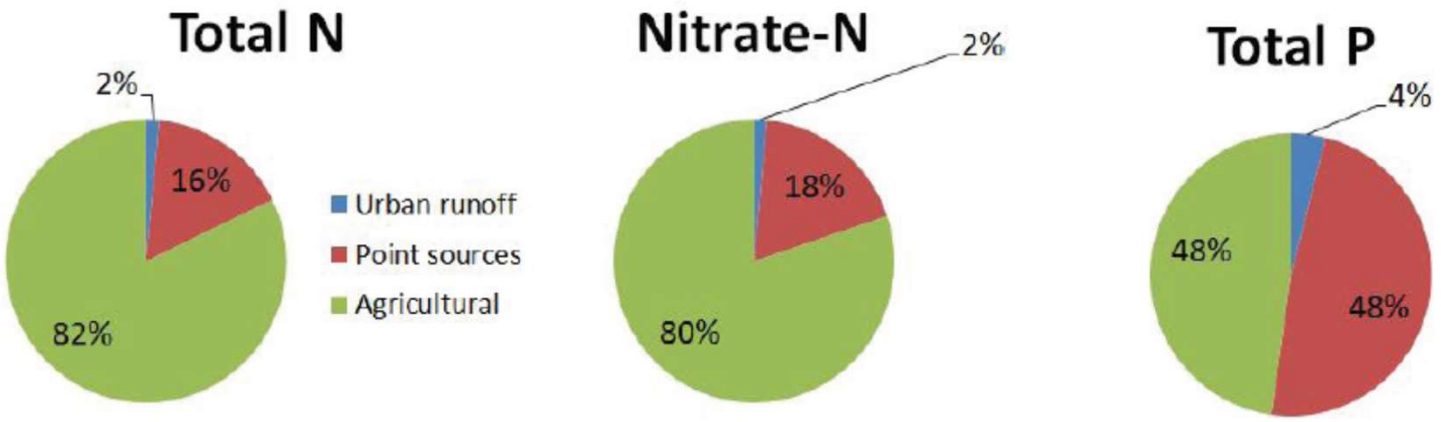
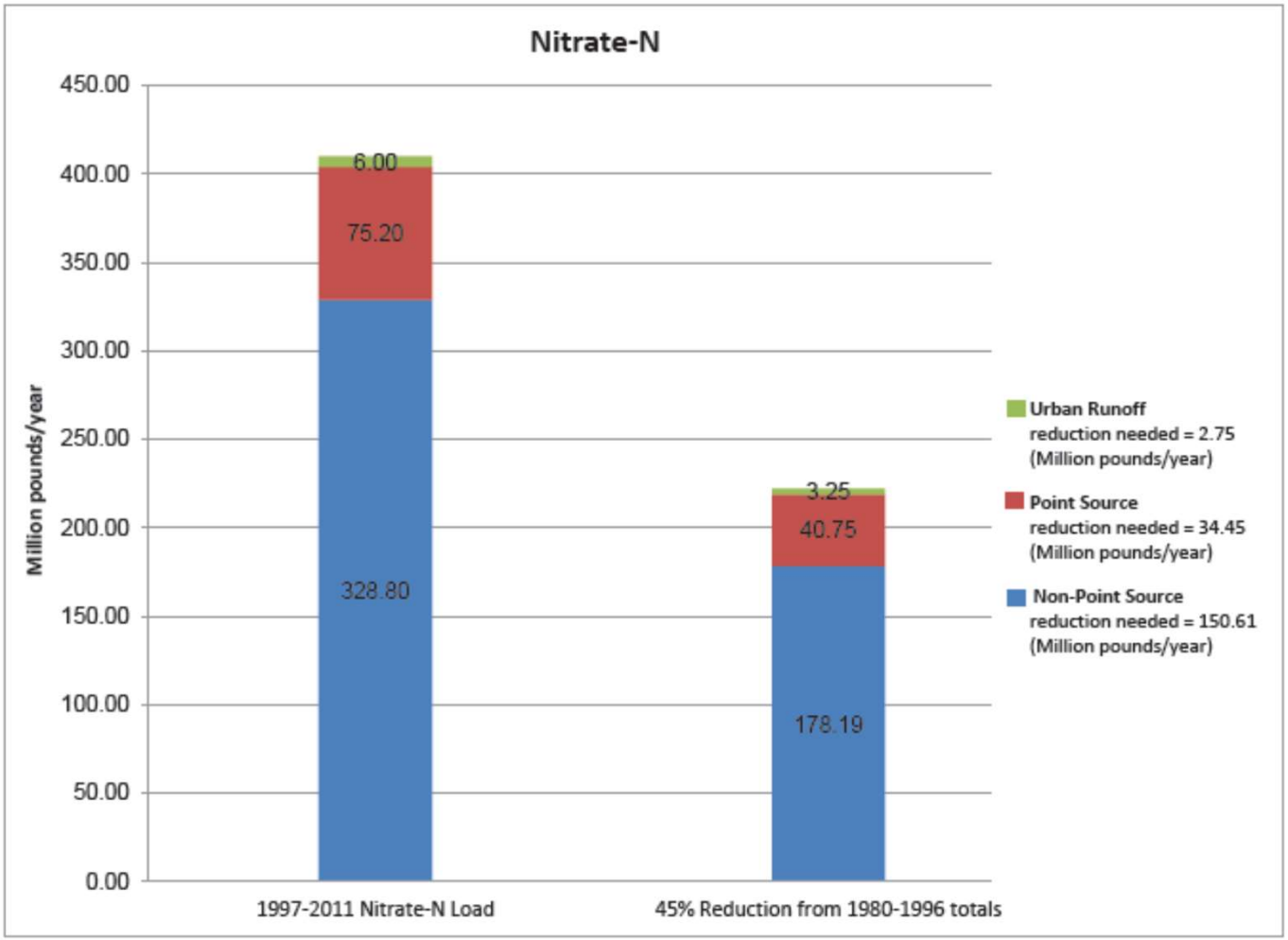
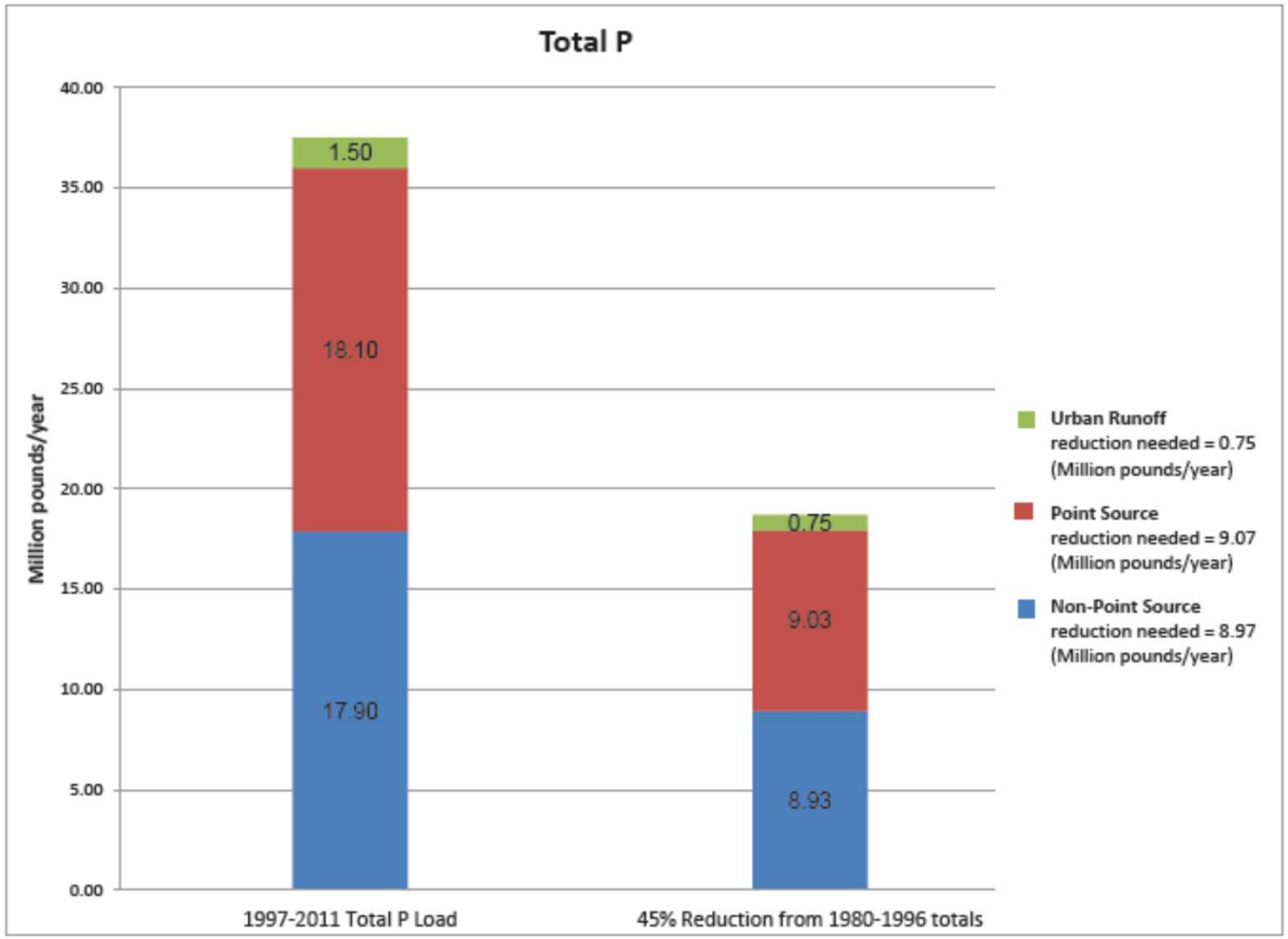


Figure 3.2. Nutrient sources in Illinois contributing to riverine nutrient export from the state.

Other states

	Illinois	**Iowa**
Total N	82%	92%
Total P	48%	80%


Nitrate-N
450.00
400.00
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Million pounds/year
6.00
75.20
328.80
3.25
40.75
178.19
1997-2011 Nitrate-N Load
45% Reduction from 1980-1996 totals
Urban Runoff
reduction needed = 2.75
(Million pounds/year)
Point Source
reduction needed = 34.45
(Million pounds/year)
Non-Point Source
reduction needed = 150.61
(Million pounds/year)


Total P
Million pounds/year
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
1.50
18.10
17.90
0.75
9.03
8.93
1997-2011 Total P Load
45% Reduction from 1980-1996 totals
Urban Runoff
reduction needed = 0.75
(Million pounds/year)
Point Source
reduction needed = 9.07
(Million pounds/year)
Non-Point Source
reduction needed = 8.97
(Million pounds/year)

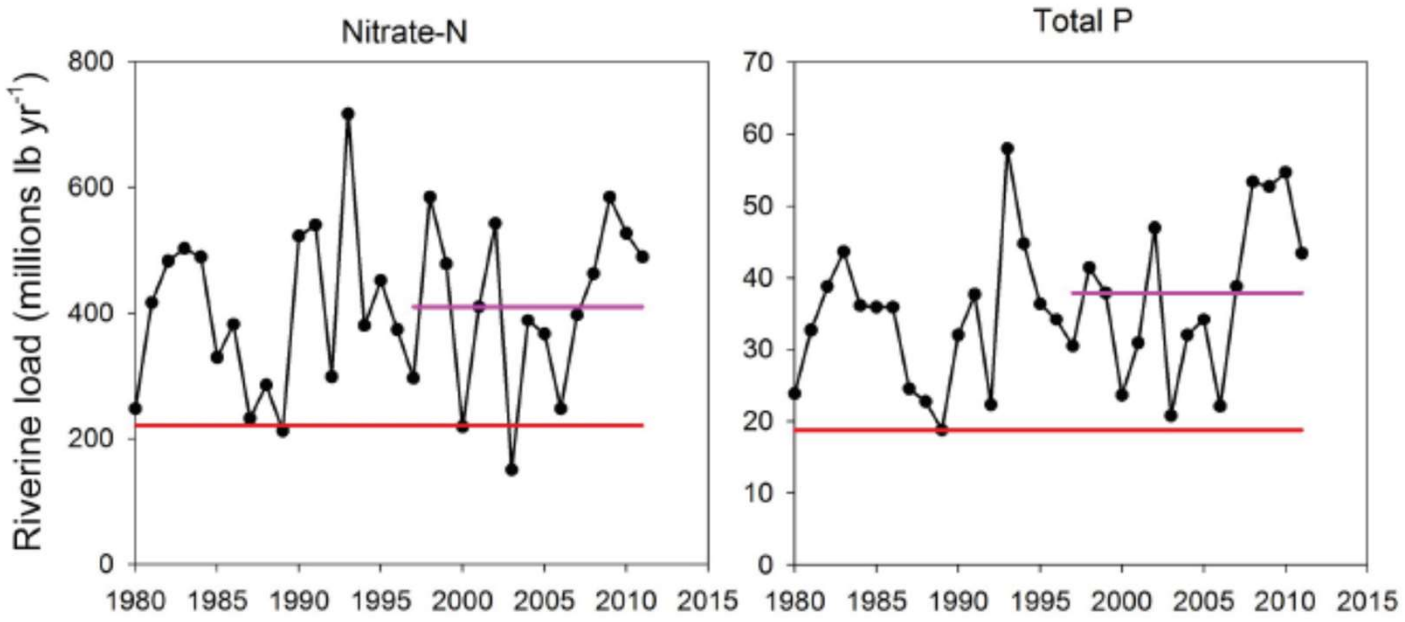


Figure 3.10. Riverine nitrate-nitrogen and total phosphorus loads for the 1980-2011 water years. Target load is shown in red, and the average load for the last 15 years is in purple.

INLRS Edge of Field Practices

Practice	Effectiveness	Efficiency	Scenario Impact
Bioreactors	25%	$2.21/lb of N	35 million pounds
Wetlands	50%	$4.05/lb of N	49 million pounds
Buffers	90%	$1.63/lb of N	36 million pounds

Bioreactors

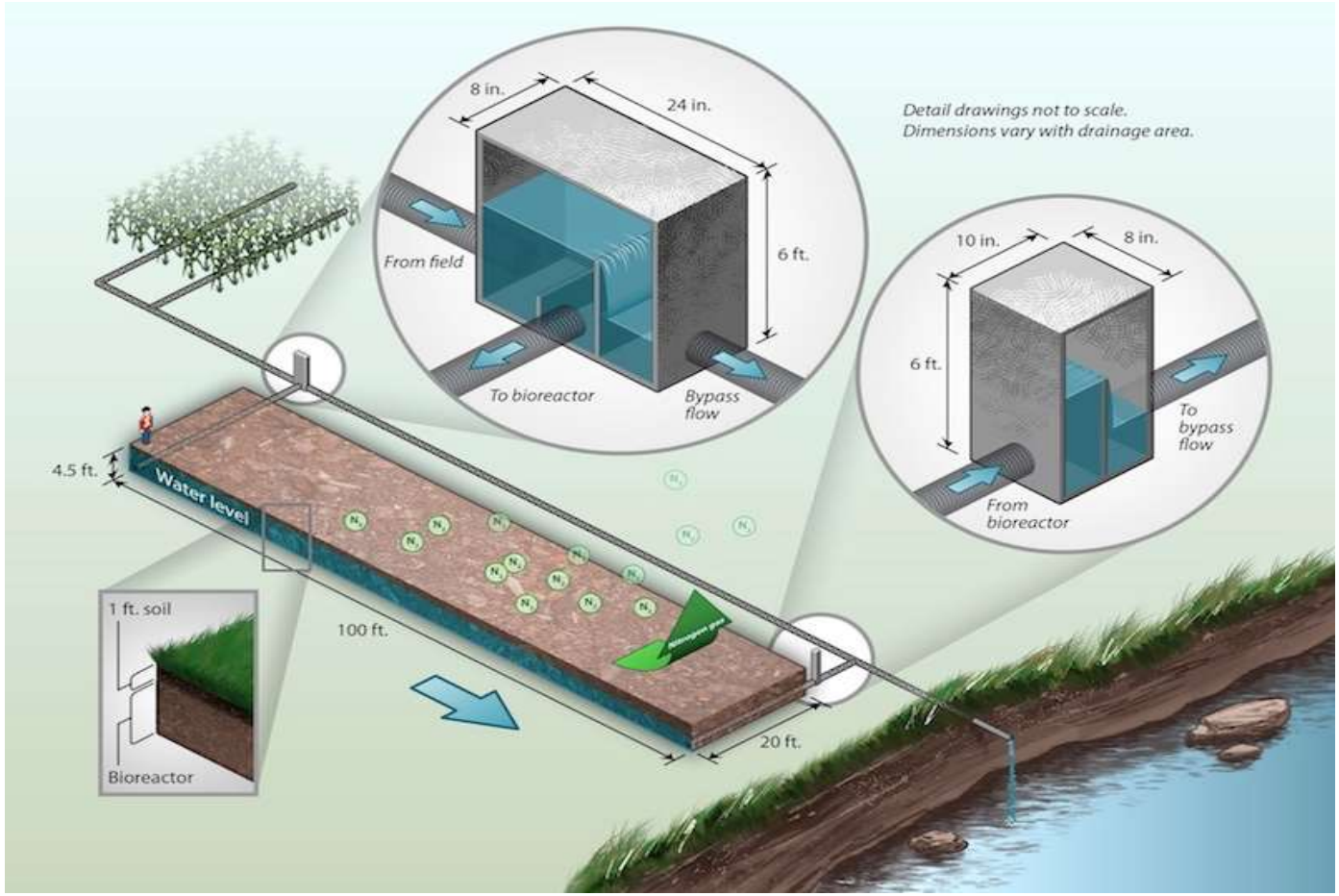


Illustration by John Peterson
Courtesy of Matt Helmers, ISU Extension

Placement

- 30 – 100 acre drainage areas
- 6 – 10” tile lines
- Bioreactors typically 100’ x 20’
- Starting to try larger systems

Approximately 20 bioreactors installed

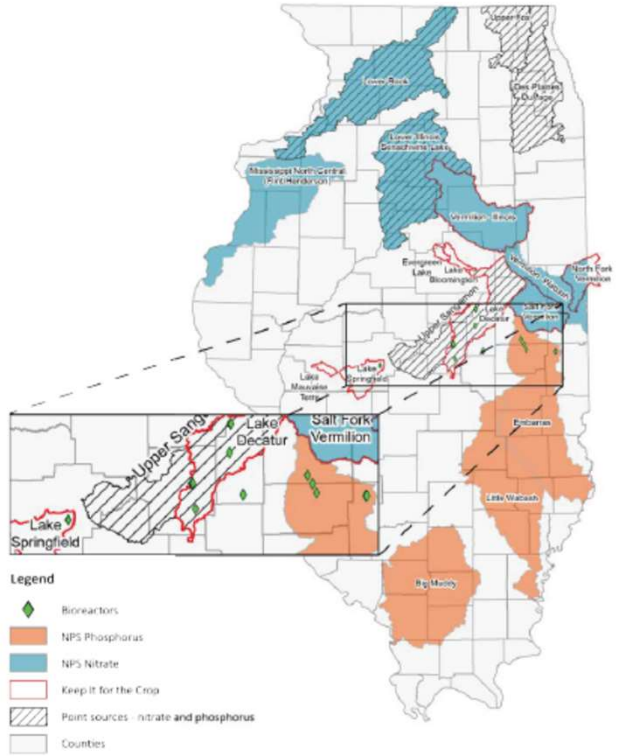


Figure 4.5. Woodchip bioreactor identified via University research and demonstration projects

Constructed Wetland

SMART wetland via The Wetlands Initiative

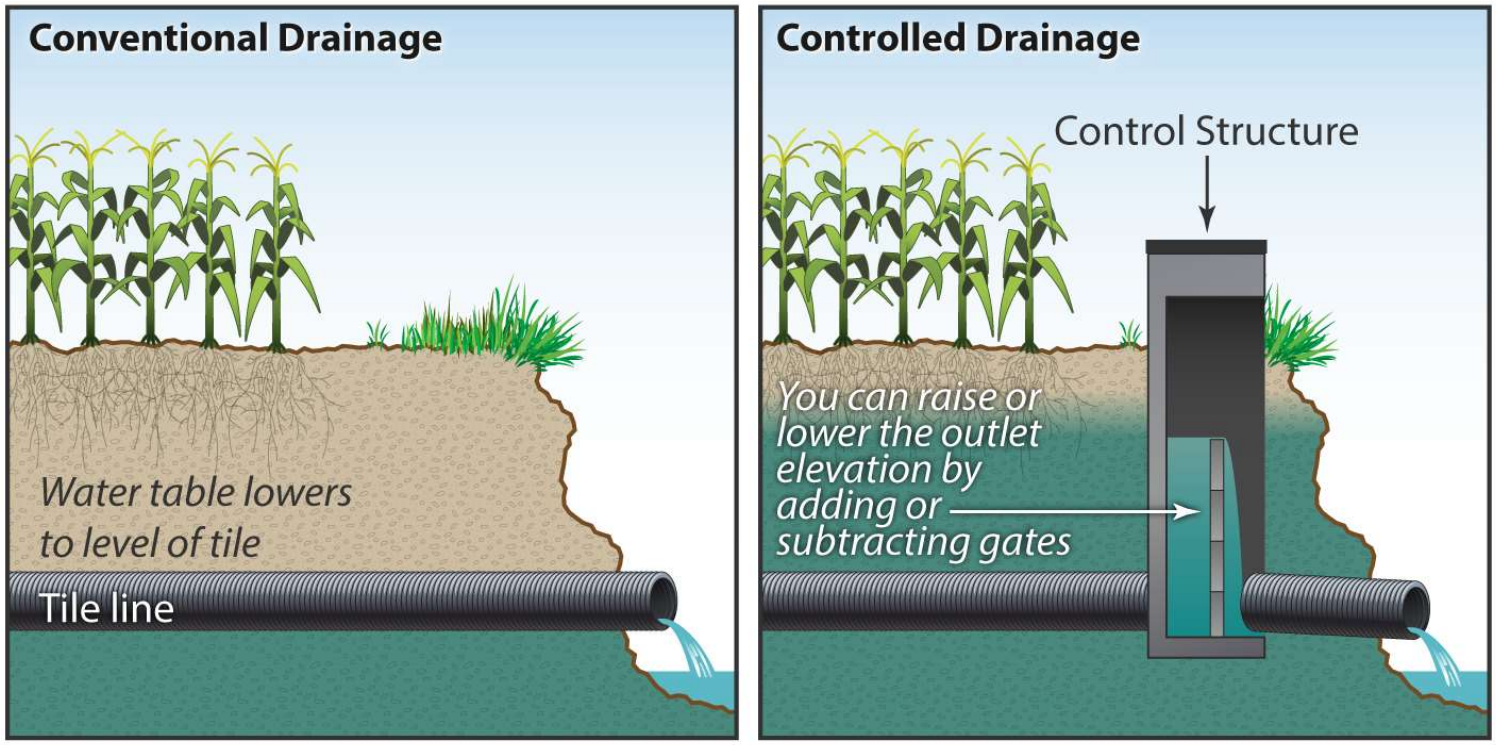
Footprint

- Not previously considered wetlands
- Out of 100 year flood plain
- 1-5% of the contributing drainage area
- >50% nitrate reductions

EOF Practices not included

Practice	Effectiveness	Efficiency	Impact
Shallow Drainage	32%		
Controlled Drainage	33%	$1.29	
Saturated Buffer	50%	$1.22	24 Million Pounds

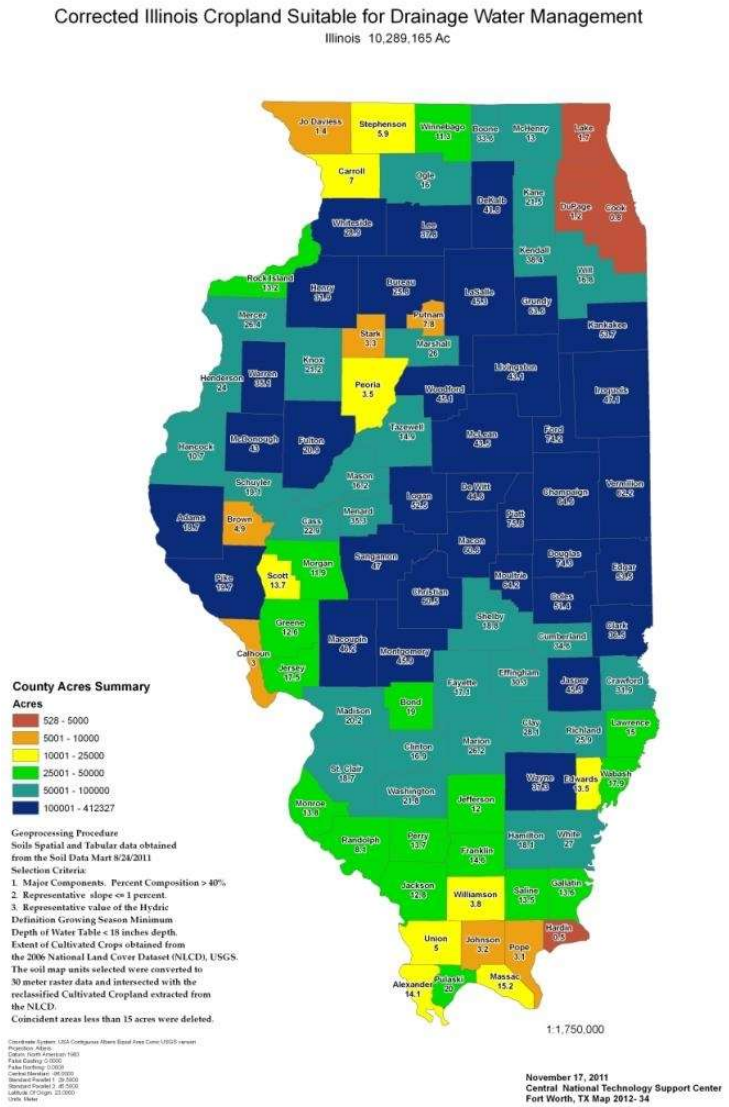
Drainage water management



Source: Christianson et al. (in press)

Drainage water management

- Over 10 million acres estimated to be suitable for DWM
- Up to 50% soluble P reduction
- 33% Nitrate-N reduction



Saturated buffers

Site Suitability

- 30 feet of perennial vegetation
- >1.2% soil organic matter
- No sand lenses or gravel layers
- Stable stream banks

ADMC Saturated Buffer Project

ADMC worked with FSA to monitor 7 Midwest sites from Oct. 2017 – Aug. 2018

- Site average nitrate concentration reductions ranged from **41% - 98%**

- Nitrate load reductions ranged from **10 – 194 pounds**

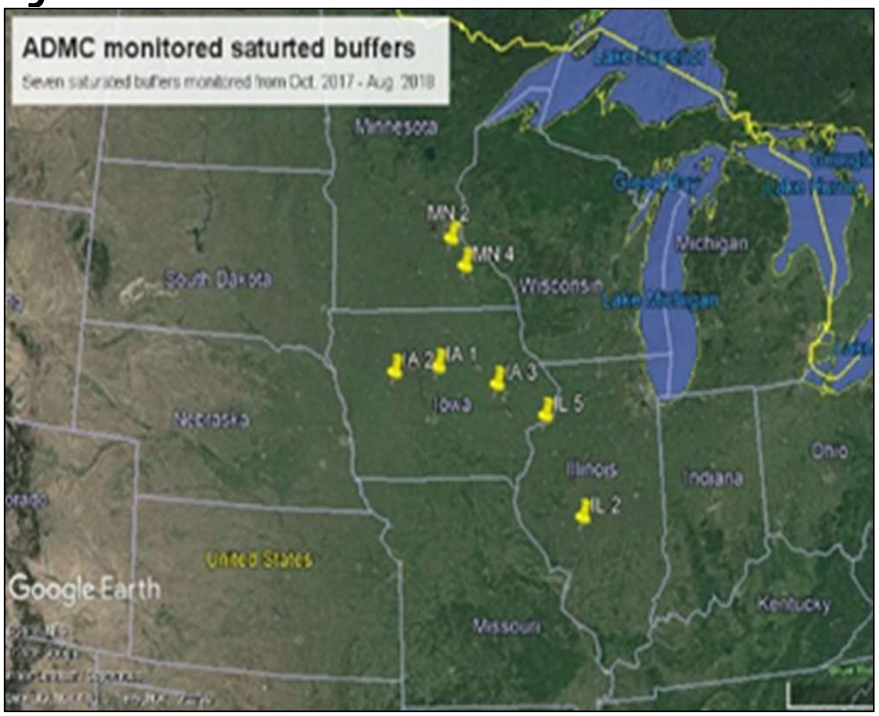


Figure 2 ADMC monitoring locations.

Costs

- $3,584 average installation cost
- $1.22/pound of N removed

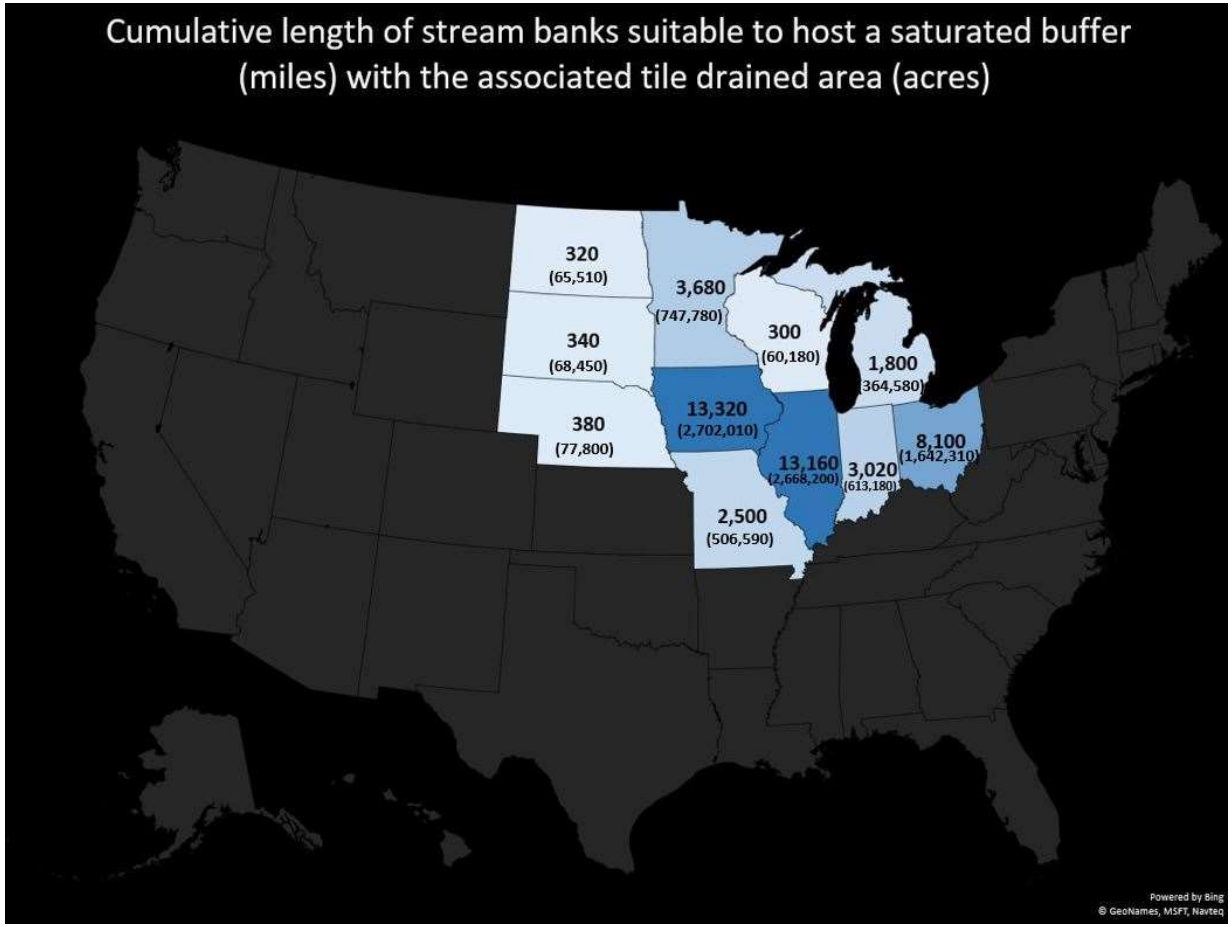
Scalability and Impact

University of Illinois, Urbana-Champaign developed a decision support tool to determine extent of feasible Midwest sites.

Stream length elimination steps

- Lengths identified as a major river or intermittent stream in the National Hydrography Dataset
- 330 ft around streams with soil organic matter >2.5%
- 980 ft zone around streams without poorly drained soils
- >50% of area within the 980 ft in corn or soybean production

Model Results



Impacts

- 9.5 million acres can be treated with a SB
- 22% of the estimated drained area
- 22,000 – 43,000 tons of N can be removed annually
- 5 – 10% overall N reduction from Midwest tile-drained lands

Saturated buffer potential in Illinois

Potential Sites	Acres Treated	Miles of saturated buffers	Miles of Stream
70,000 – 100,000	2,668,000	13,160	6,580

Impact of Illinois saturated buffers

Nitrates removed	Tile drained acres treated	N removed from tile drained areas
6,300 – 12,000 tons	28%	6 – 12%

Economic Impact

Average Installation Cost	Potential Work for Contractors
$3,600	$250,000,000 - $360,000,000

https://www2.illinois.gov/epa/topics/water-quality/watershed-management/excess-nutrients/Pages/nutrient-loss-reduction-strategy.aspx