

Farmer-led Efforts to Improve Water Quality

Sean McMahon, Iowa Agriculture Water Alliance (IAWA)
Fluid Fertilizer Foundation
December 11, 2019

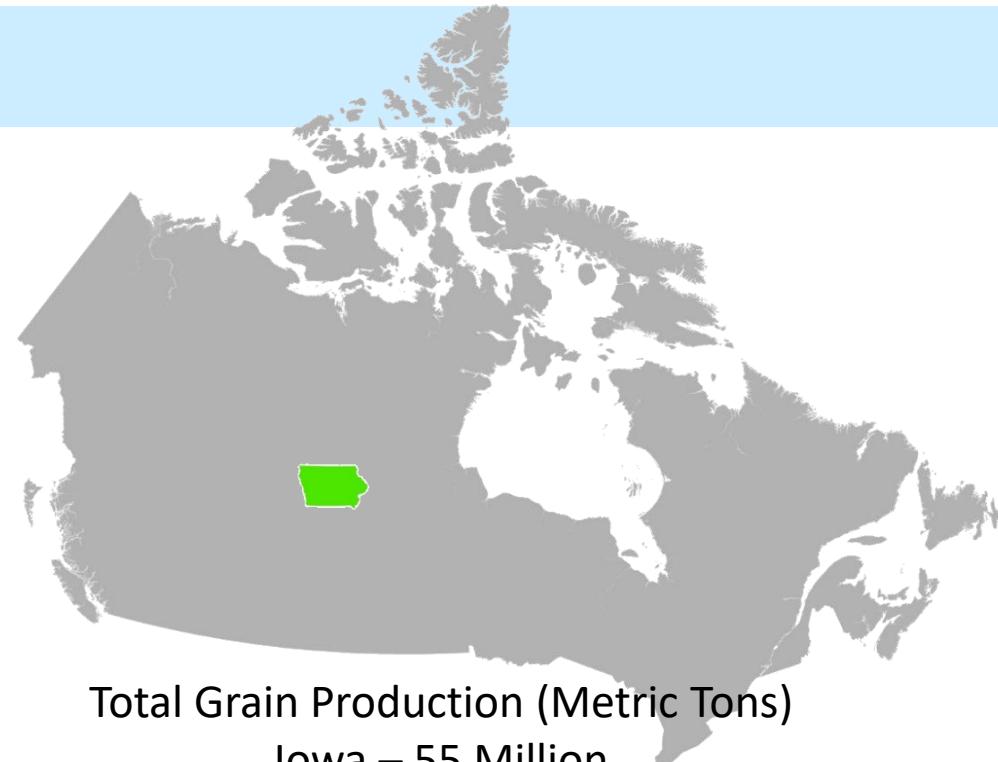
Iowa Agriculture Water Alliance

- Mission
 - Increase the pace and scale of farmer-led efforts to improve water quality
- Founding organizations
 - Iowa Corn Growers Association
 - Iowa Pork Producers Association
 - Iowa Soybean Association



Iowa Water Quality Initiative

IOWA DEPARTMENT OF AGRICULTURE & LAND STEWARDSHIP



Total Grain Production (Metric Tons)

Iowa – 55 Million

Canada – 45 Million

3

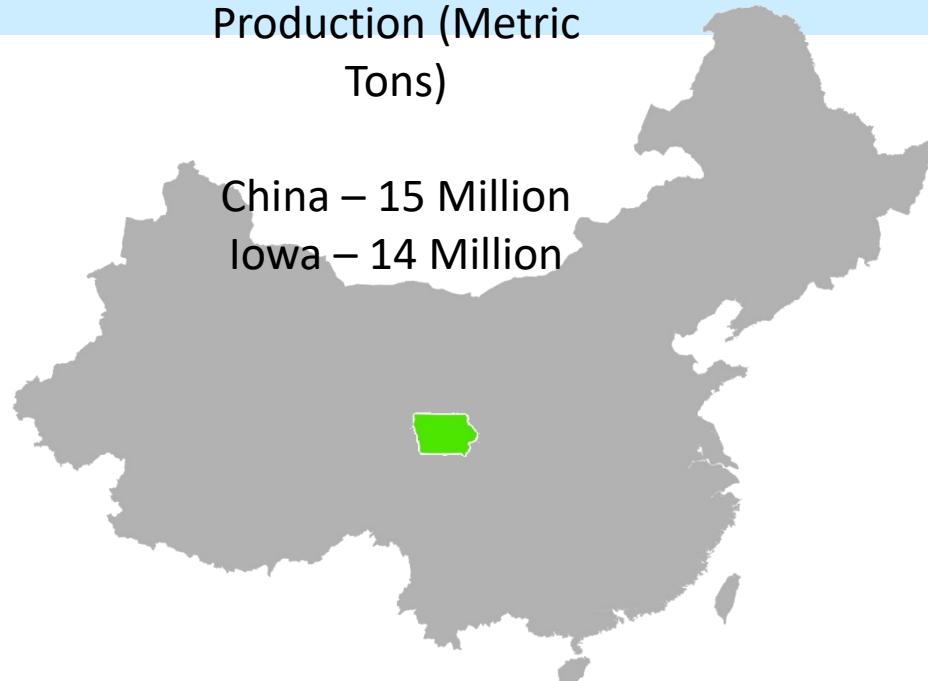
Iowa Water Quality Initiative

IOWA DEPARTMENT OF AGRICULTURE & LAND STEWARDSHIP



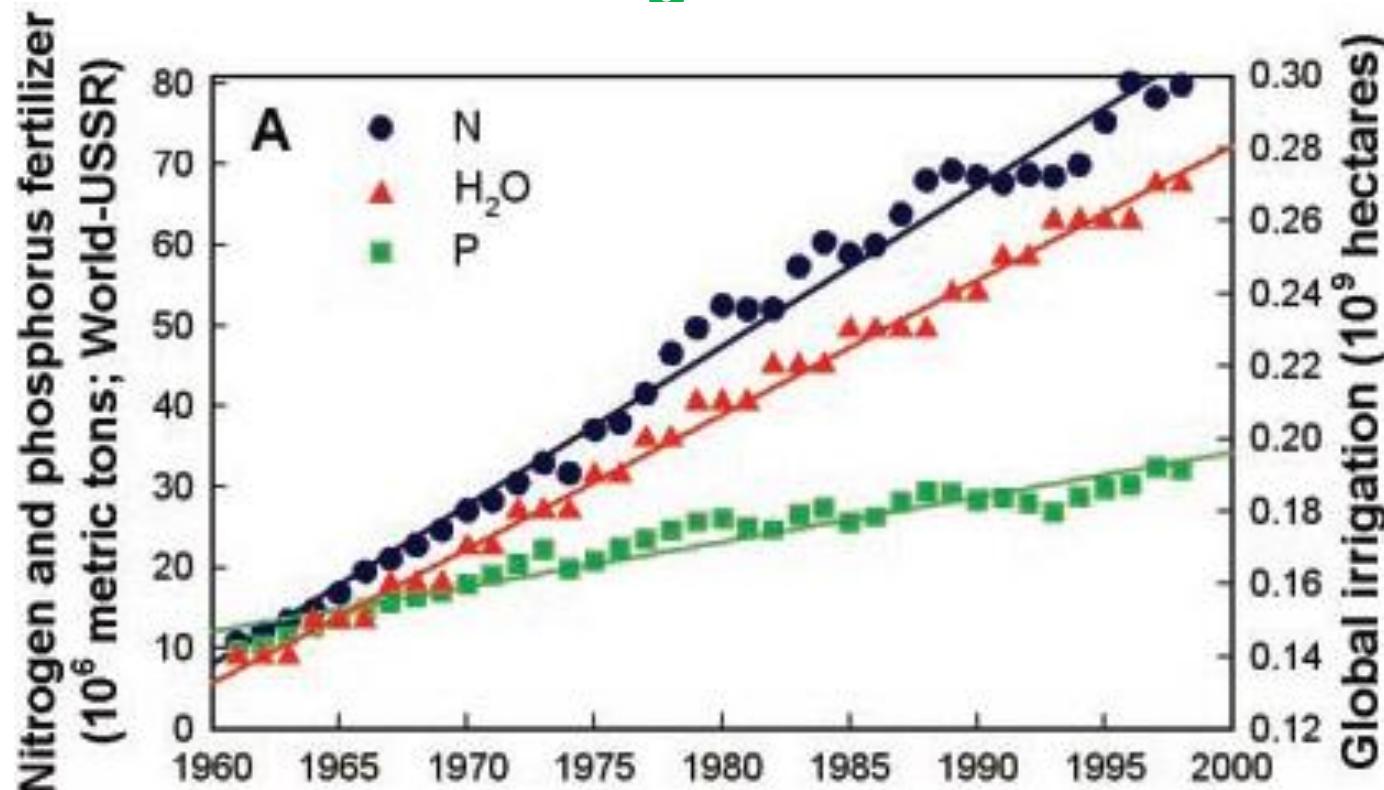
Total Soybean
Production (Metric
Tons)

China – 15 Million
Iowa – 14 Million

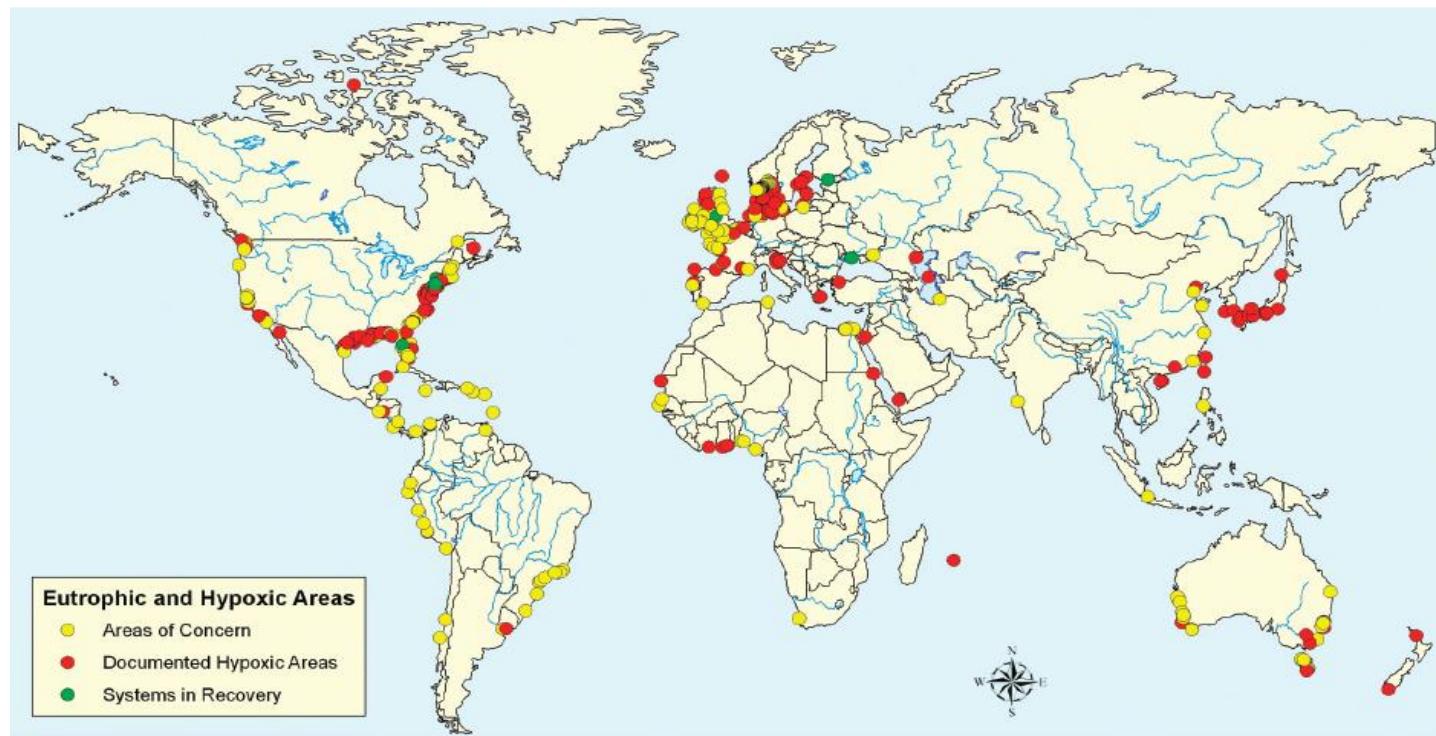


4

Global Nitrogen, Phosphorus and Irrigation Use

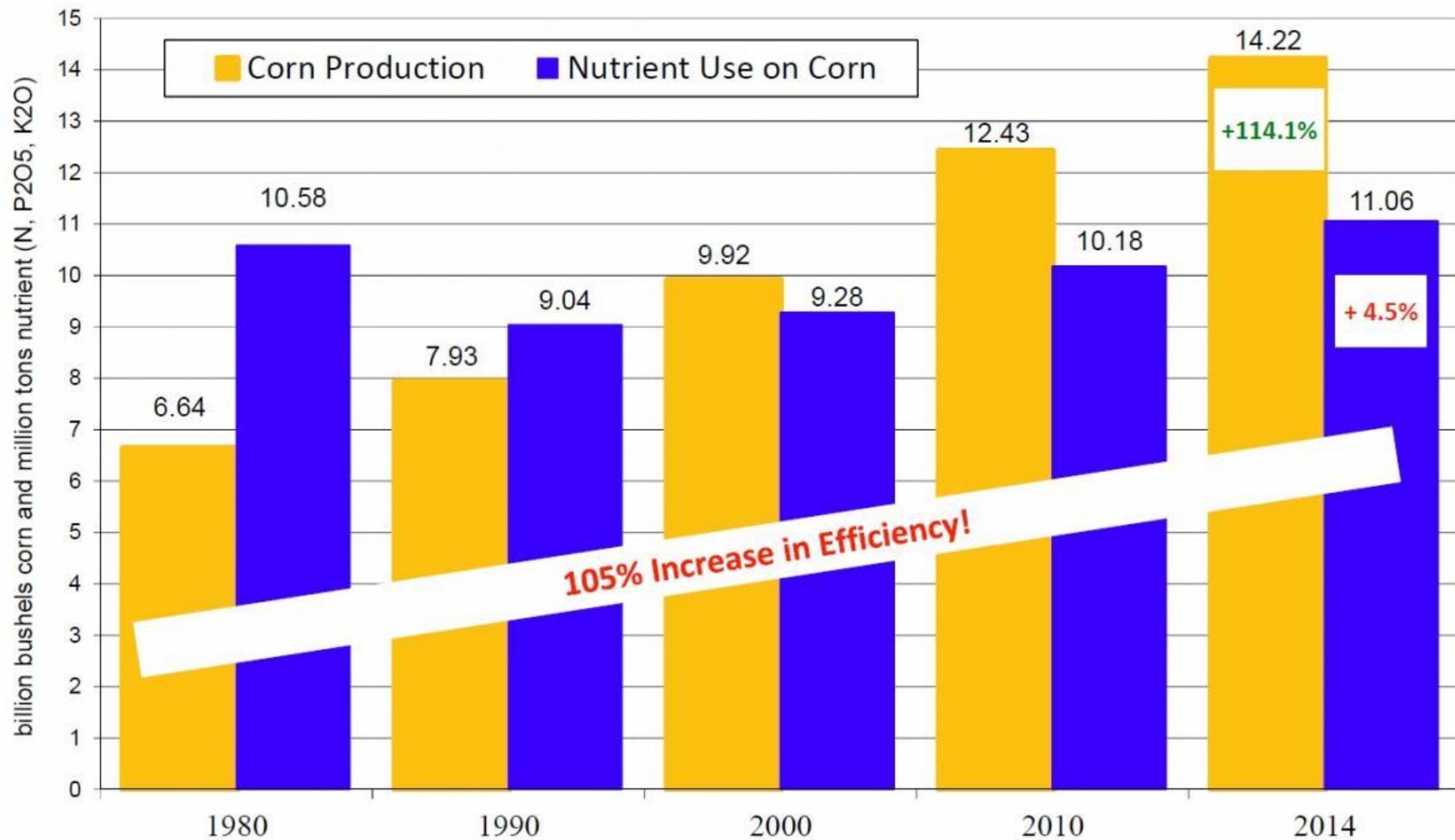


Hypoxic Zones of the World



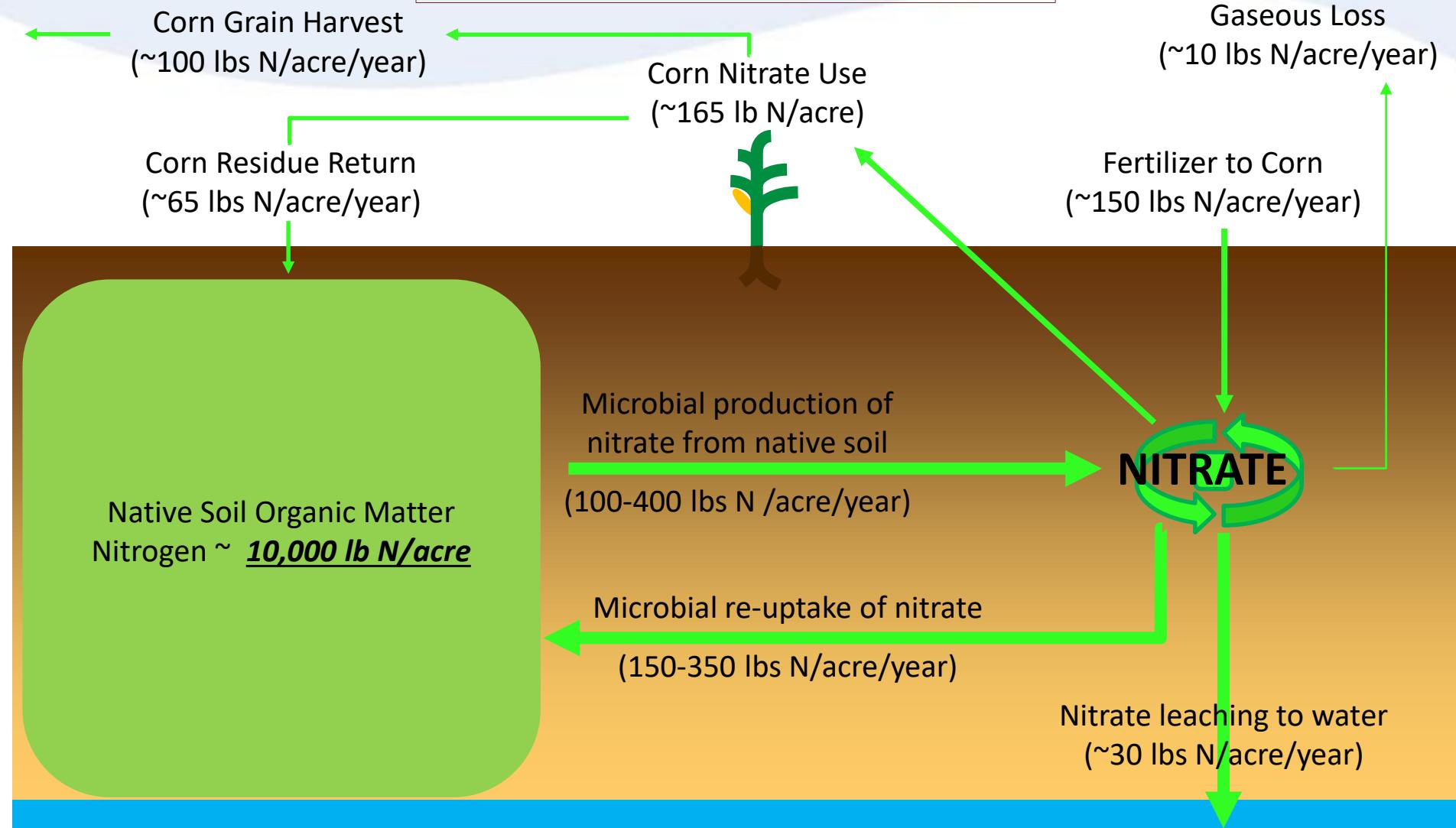
Major known eutrophic and hypoxic areas. Reprinted from Selman et al

U.S. Corn Production and Nutrient Use on Corn

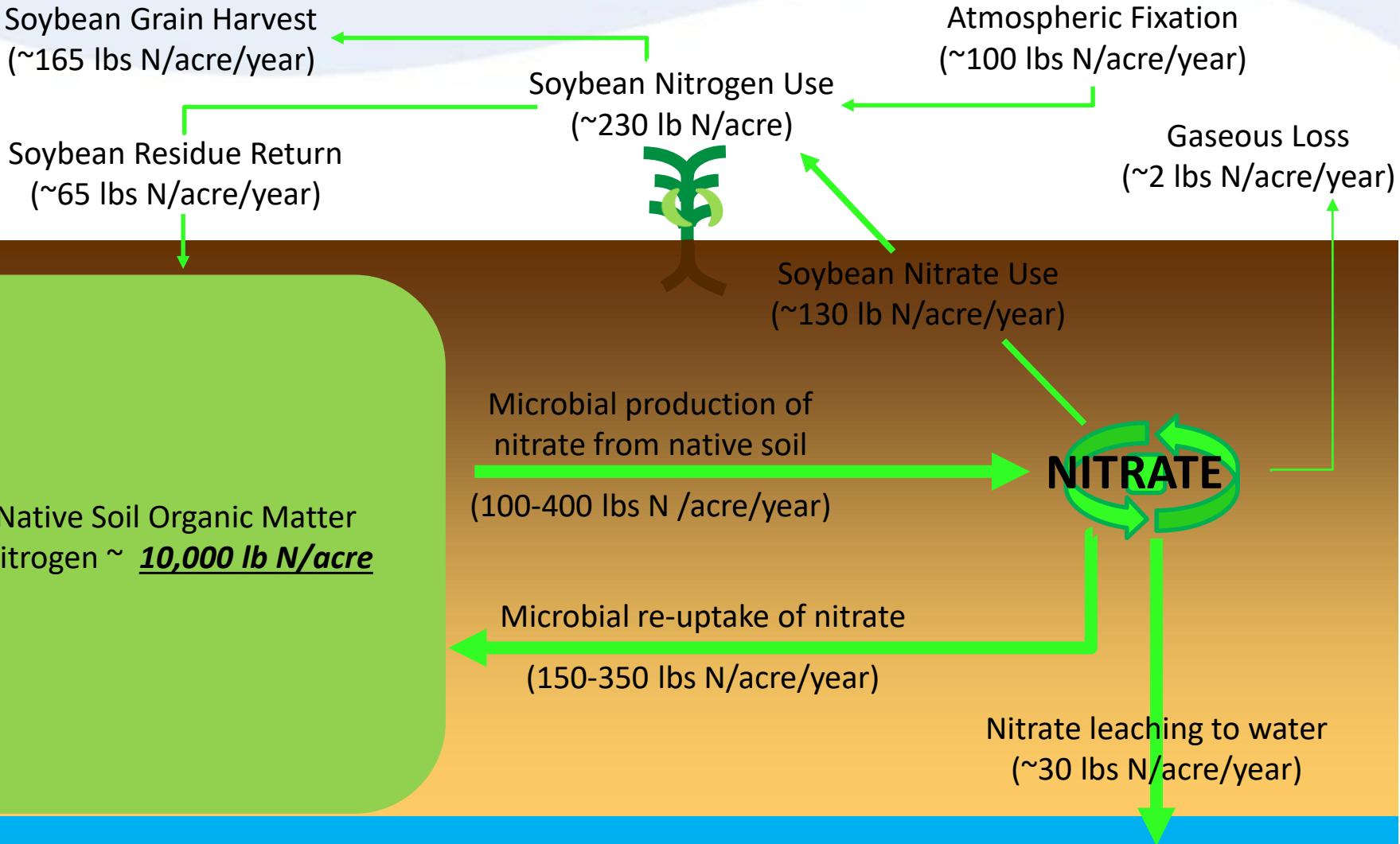


Source: Computed by The Fertilizer Institute from data reported by NASS, USDA.

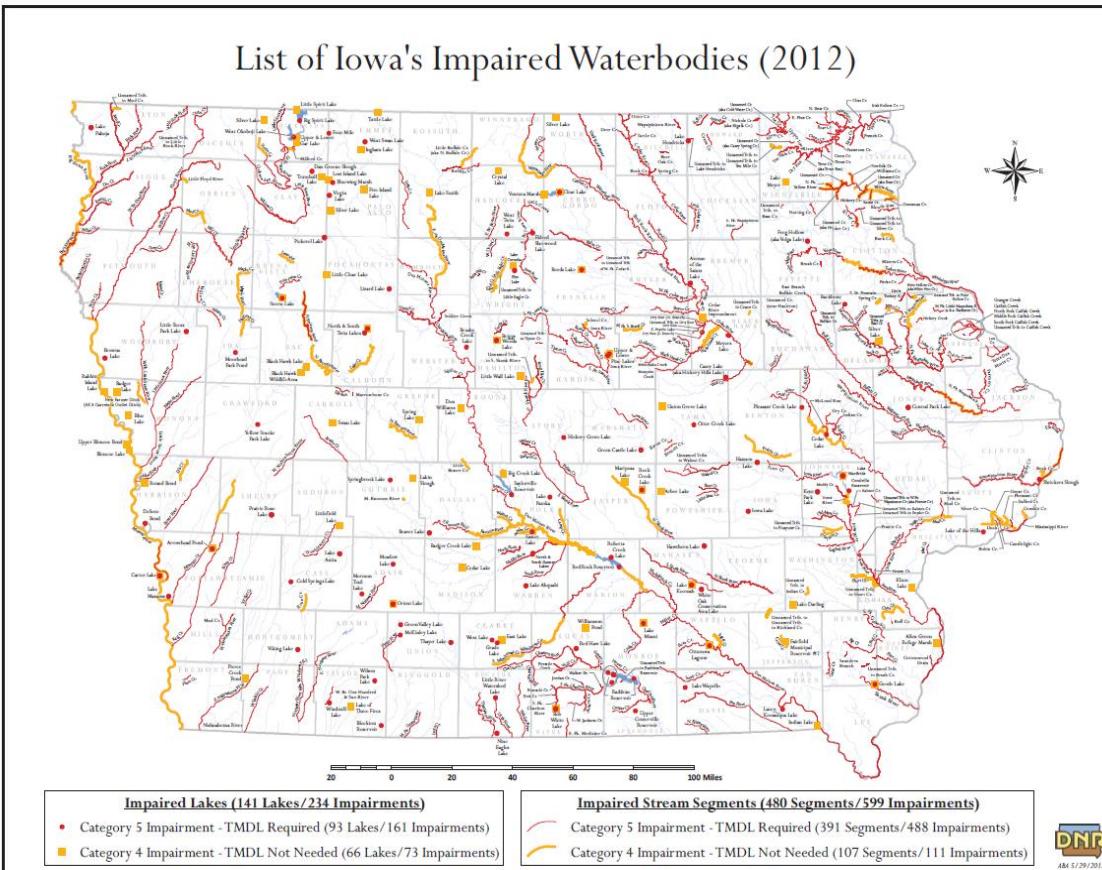
Corn Nitrogen Cycling & Budget



Soybean Nitrogen Cycling & Budget



Iowa Water Challenges and Opportunities

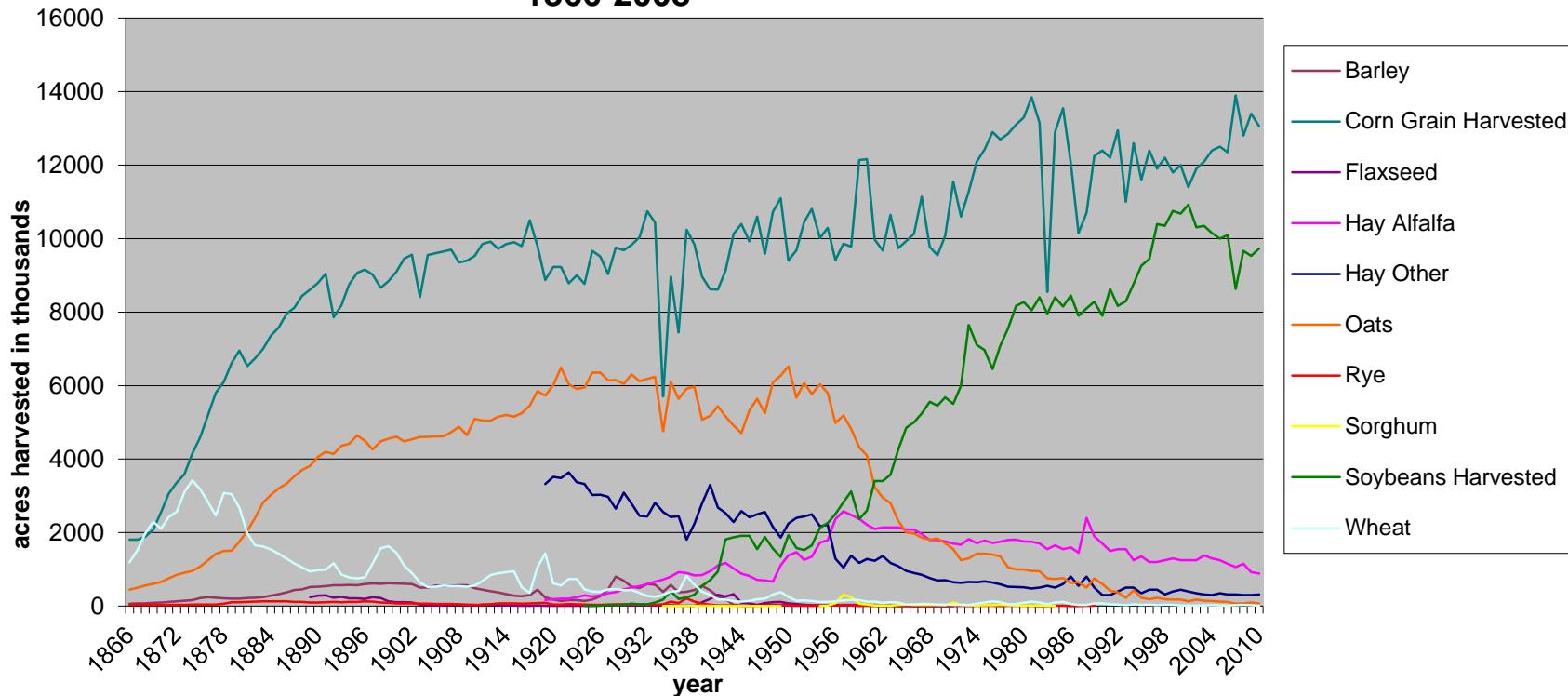


PLANNING FOR
**WATER
QUALITY**

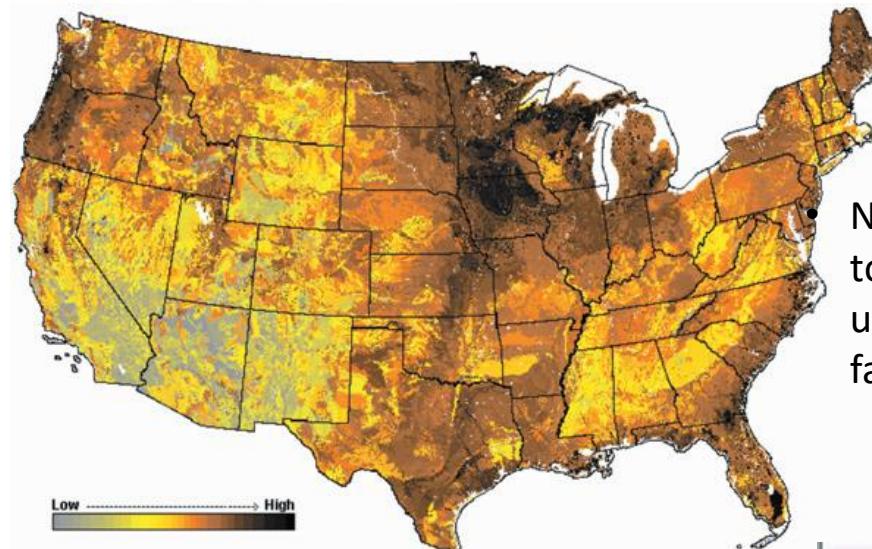
JULY 2012
**IOWA'S
NONPOINT SOURCE
MANAGEMENT PLAN**
clean water
fresh water supply
life's basic necessity
DNR

Changes in Land Use

**Corn, Hay, Small Grains, & Soybeans Harvested Trends
1866-2008**

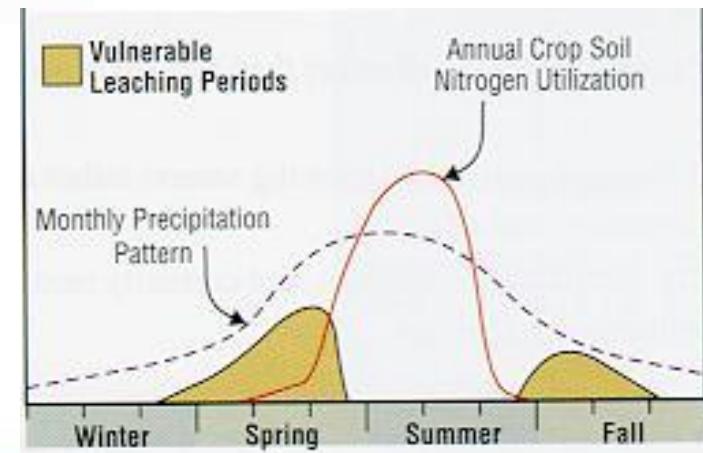


Soils Vulnerable to Leaching



Nutrient content of water has more to do with historic changes in land use and hydrology than inputs by farmers.

Current major cropping system leaves soil vulnerable to erosion and nutrient leaching, especially in Spring and Fall.



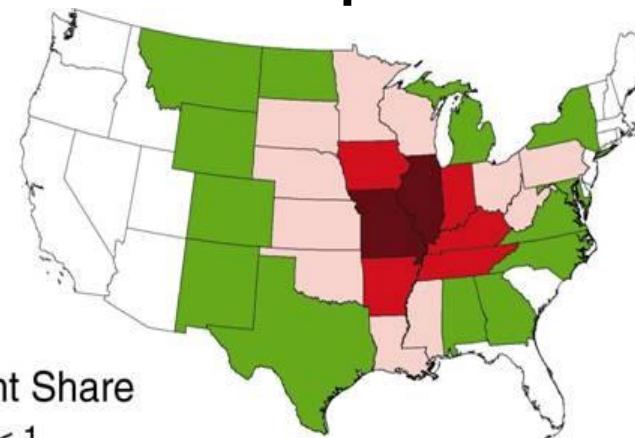
NUTRIENT DELIVERY TO THE GULF OF MEXICO

State shares of the total annual nutrient flux

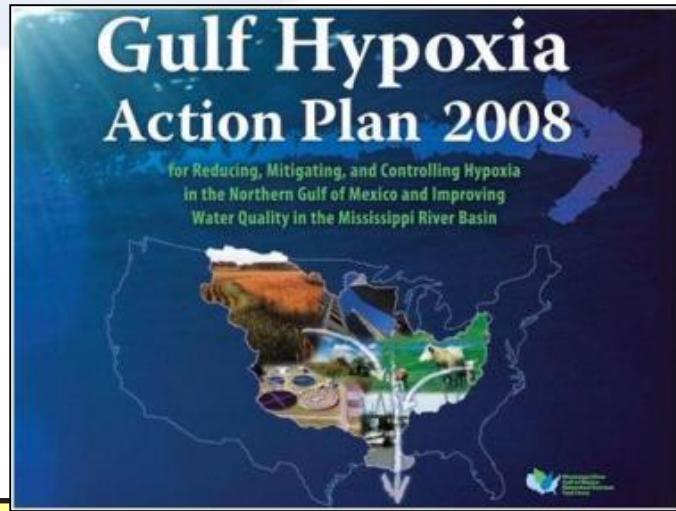
Nitrogen



Phosphorus



Alexander et al,
Environ. Sci. Technol., in press



EPA Hypoxia SAB report
suggested

45% less total N

AND

45% less total P

**discharge to the Gulf to reduce
hypoxia**

Iowa Nutrient Reduction Strategy: 45% N and P Reduction Goals



Nitrogen Practices



Nitrogen moves primarily as nitrate-N with water

	Practice	Comments	% Nitrate-N Reduction*	% Corn Yield Change**
			Average (SD*)	Average (SD**)
Nitrogen Management	Timing	Moving from fall to spring pre-plant application	6 (25)	4 (16)
		Spring pre-plant/sidedress 40-60 split Compared to fall-applied	5 (28)	10 (7)
		Sidedress – Compared to pre-plant application	7 (37)	0 (3)
	Sidedress	Sidedress – Soil test based compared to pre-plant	4 (20)	13 (22)**
Source	Liquid swine manure compared to spring-applied fertilizer	4 (11)	0 (13)	
	Poultry manure compared to spring-applied fertilizer	-3 (20)	-2 (14)	
Nitrogen Application Rate	Nitrogen rate at the MRTN (0.10 N:corn price ratio) compared to current estimated application rate. (ISU Corn Nitrogen Rate Calculator – http://extension.agron.iastate.edu/soilfertility/nrate.aspx can be used to estimate MRTN but this would change Nitrate-N concentration reduction)	10	-1	
	Nitrification Inhibitor	Nitrpyrin in fall – Compared to fall-applied without Nitrpyrin	9 (19)	6 (22)
Cover Crops	Rye	31 (29)	-6 (7)	
	Oat	28 (2)	-5 (1)	
Living Mulches	e.g. Kura clover – Nitrate-N reduction from one site	41 (16)	-9 (32)	
Land Use	Perennial	Energy Crops – Compared to spring-applied fertilizer	72 (23)	
	Land Retirement (CRP)	– Compared to spring-applied fertilizer	85 (9)	
	Extended Rotations	At least 2 years of alfalfa in a 4 or 5 year rotation	42 (12)	7 (7)
Grazed Pastures	No pertinent information from Iowa – assume similar to CRP	85		
Edge-of-Field	Drainage Water Mgmt.	No impact on concentration	33 (32)	
	Shallow Drainage	No impact on concentration	32 (15)	
	Wetlands	Targeted water quality	52	
	Bioreactors		43 (21)	
	Buffers	Only for water that interacts with the active zone below the buffer. This would only be a fraction of all	91 (20)	
Saturated Buffers	Divert fraction of tile drainage into riparian buffer to remove Nitrate-N by denitrification.	50 (13)		

Phosphorus Practices



Phosphorus moves primarily with eroded soil

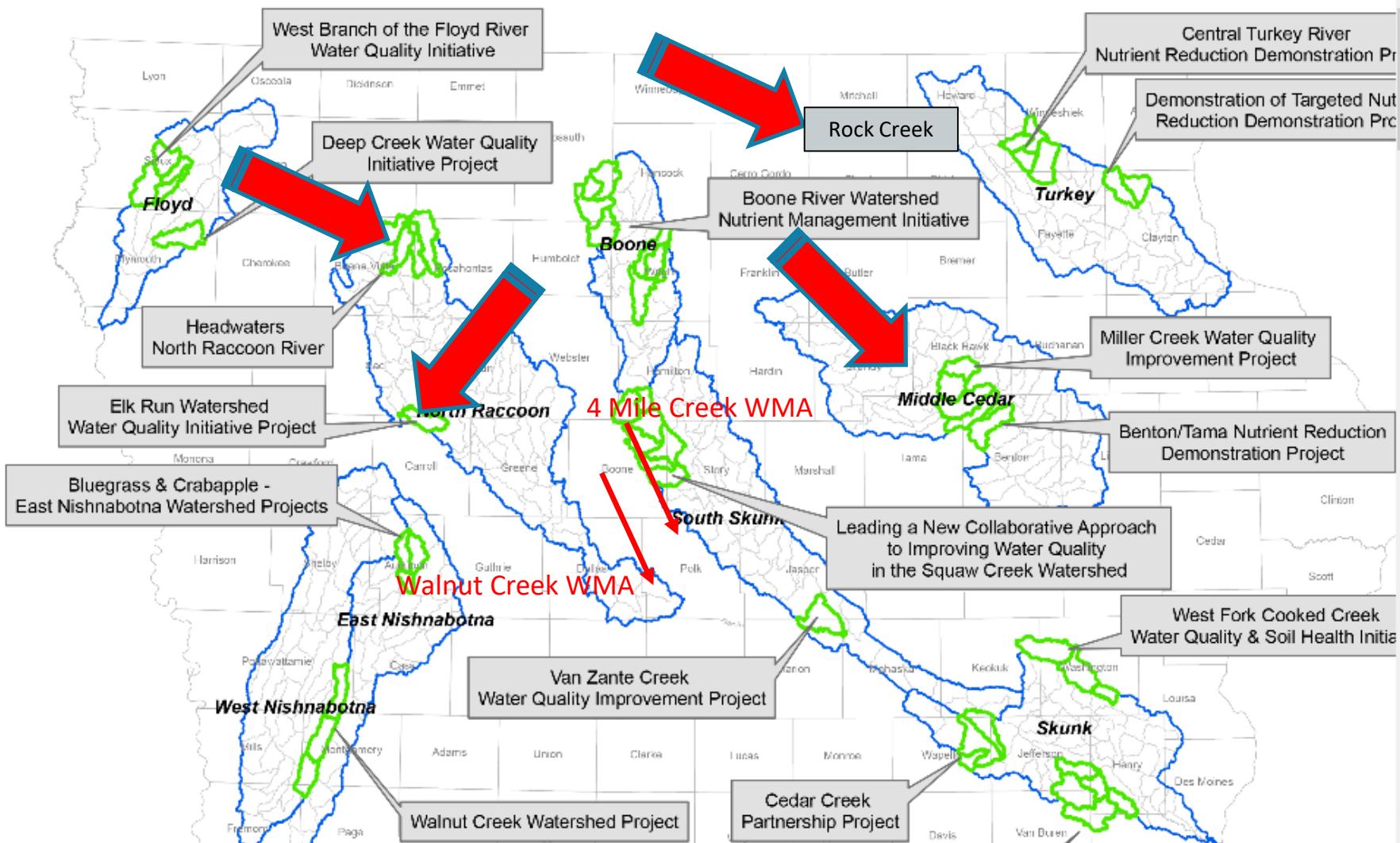
	Practice	Comments	% P Load Reduction*	% Corn Yield Change ^b
			Average (SD*)	Average (SD*)
Phosphorus Management Practices	Phosphorus Application	Applying P based on crop removal – Assuming optimal STP level and P incorporation	0.6 ^d	0
		Soil-Test P – No P applied until STP drops to optimum	17 ^e	0
		Liquid swine, dairy, and poultry manure compared to commercial fertilizer – Runoff shortly after application	46 (45)	-1 (13)
	Source of Phosphorus	Beef manure compared to commercial fertilizer – Runoff shortly after application	46 (96)	
Placement of Phosphorus	Broadcast incorporated within 1 week compared to no incorporation, same tillage	36 (27)	0	
	With seed or knifed bands compared to surface application, no incorporation	24 (46)	0	
Cover Crops	Winter rye	29 (37)	-6 (7)	
	Conservation till – chisel plowing compared to moldboard plowing	33 (49)	0 (6)	
	No till compared to chisel plowing	90 (17)	-6 (8)	
Tillage				
	Energy Crops	34 (34)		
	Land Retirement (CRP)	75		
Land Use Change	Grazed pastures	59 (42)		
Erosion Control and Edge-of-Field Practices	Terraces		77 (19)	
	Buffers		58 (32)	
	Control	Sedimentation basins or ponds	85	

Iowa Nutrient Reduction Strategy

- *Transformational change* will be required to meet these targets, cost upwards of \$4B
- No single practice will meet these reductions
- Current rate of adoption and investment – centuries; best case – decades



Watershed Approach



Conservation Infrastructure



Opportunity for Economic Growth and Innovation



Cover Crops

- Now: ~880K-1.5M acres
- Need: 12-17 Million acres

Future Opportunities

- 300,000 acres of seed production
- 300 aerial seed applicators
- 1000's drills
- 100's-1000's seed cleaners
- 17,000 semis to transport seed and people...

Opportunity for Economic Growth and Innovation



Bioreactors / Saturated Buffers

- Now: ~85 installed
- Need: 1000's more

Future Opportunities

- Engineering design
- Materials
- Construction
- Monitoring
- Maintenance

CI Vision and Definition of Success



Water Quality



VISION: We envision a prosperous, sustainable and resilient Iowa with **HEALTHY SOIL AND WATER** and **ECONOMICALLY VIBRANT COMMUNITIES** that is recognized as **THE** national leader in both agriculture and conservation.



Economic development

DEFINITION OF SUCCESS: Conservation practices are economically compelling and easier for farmers and landowners to implement. Increased investments in conservation practices that lead to healthy soil and improved water quality for the benefits of all Iowans and downstream communities.

CI Update

Recommendations Projects Leadership Resource Library Search

LEADING THE CONSERVATION INFRASTRUCTURE INITIATIVE

In the first two years, more than 200 representatives from the public and private sectors have been engaged in defining and developing this initiative.

The overall Co-Chairs of the Conservation Infrastructure (CI) Initiative are Iowa Secretary of Agriculture Mike Naig and former Water Ray Generet.

Use the filters below to see the [Core Leads and Core Team Members](#) involved in the three Working Groups: Strategy, Cover Crops, and Conservation Drainage. You can also see who is involved from academics, associations, conservation groups, federal agencies, private companies, state agencies, and urban and rural groups by selecting an organization type.

To see the complete listing of all Working Group members, [continue reading here](#).

SORT BY WORKING GROUP
Select Category

SORT BY
ORGANIZATION TYPE
Select Category



Steve Glensman
Iowa Grows
Co-Lead, Conservation Drainage Working Group



Brett Hooper
La Crosse Seed
Co-Lead, Cover Crop Working Group



Bill Hensley
USDA Under Secretary for Farm and Foreign Agriculture Services
Past Co-Chair, Conservation Infra Initiative



Brian Fehringer
Iowa Economic Development Authority
Co-Lead, Strategy



Captain Michael Higginbotham
Agri-Division
Co-Lead, Conservation Drainage Working Group



Clark Hays
Iowa Soybean Association
Co-Lead, Conservation Drainage Working Group

CONSERVATION WORKING GROUPS

During the 18 month process, Working Groups reviewed and evaluated the political, environmental, social, technical, legal and economic issues and external forces associated with conservation infrastructure at multiple scales within an extensive list of related documents and materials.



ABOUT THE CONSERVATION INFRASTRUCTURE INITIATIVE

The 2017 IowaNRS Progress Report sets the vision by saying, "While many programs are in place to further the NRS, **there is great need for developing other opportunities and investments that will support the enormous level of scaling-up that is required.**" Leaders in Iowa recognized the public and private infrastructure issues (i.e., physical, financial, human, communication, technical and leadership) required to increase the pace and scale of conservation practice adoption and other barriers. Conservation Infrastructure (CI) Initiative to address these and other infrastructure gaps and barriers.

[Learn more about our leadership](#)

How can I get involved?
Are you a...

Business or Organization
Former
Landowner
Other

LEAVING A LAND LEGACY

As a landowner, you have the ability to leave behind a legacy through your land. The Conservation Infrastructure (CI) Initiative can help connect you with the right resources and partners, so you can take the next steps towards improving your land and留下 your legacy through conservation practices – all while maintaining or increasing your Return on Investment (ROI).

To get involved, please leave your name and email address in the form to the right. Use the Message box to tell us more information about how you would like to get involved and if you are interested in helping with one or more of the CI Working Groups.

First Name *

Last Name *

Email *

Message

48 partners have onboard since 2016

30,000 acres planted, with a goal of 1 million

29 projects started, with 22 projects ready to begin

JOIN US AS WE WORK TOGETHER TO MEET IOWA'S WATER QUALITY GOALS

Join our effort

RECENT PROJECTS

Taylor Family Farm, Dugger, Iowa

Henderson Initiative, Decorah, Iowa

Ringgold County Drainage, Mt. Ayr, Iowa

[View more projects](#)

The Conservation Infrastructure Initiative



www.iowaci.org

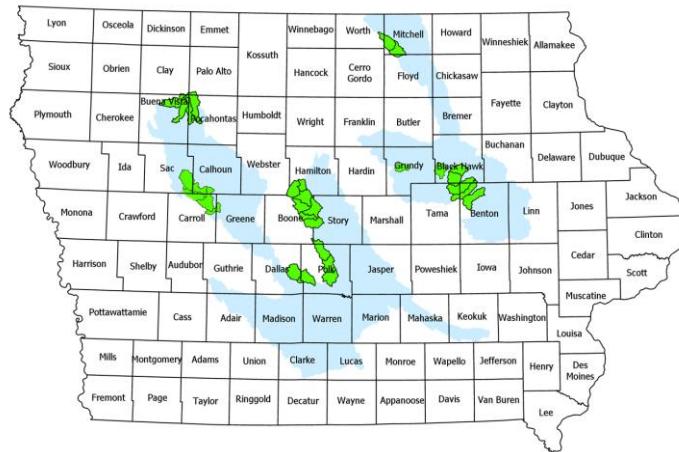
IAWA
IOWA AGRICULTURE
WATER ALLIANCE

www.iowaagwateralliance.com

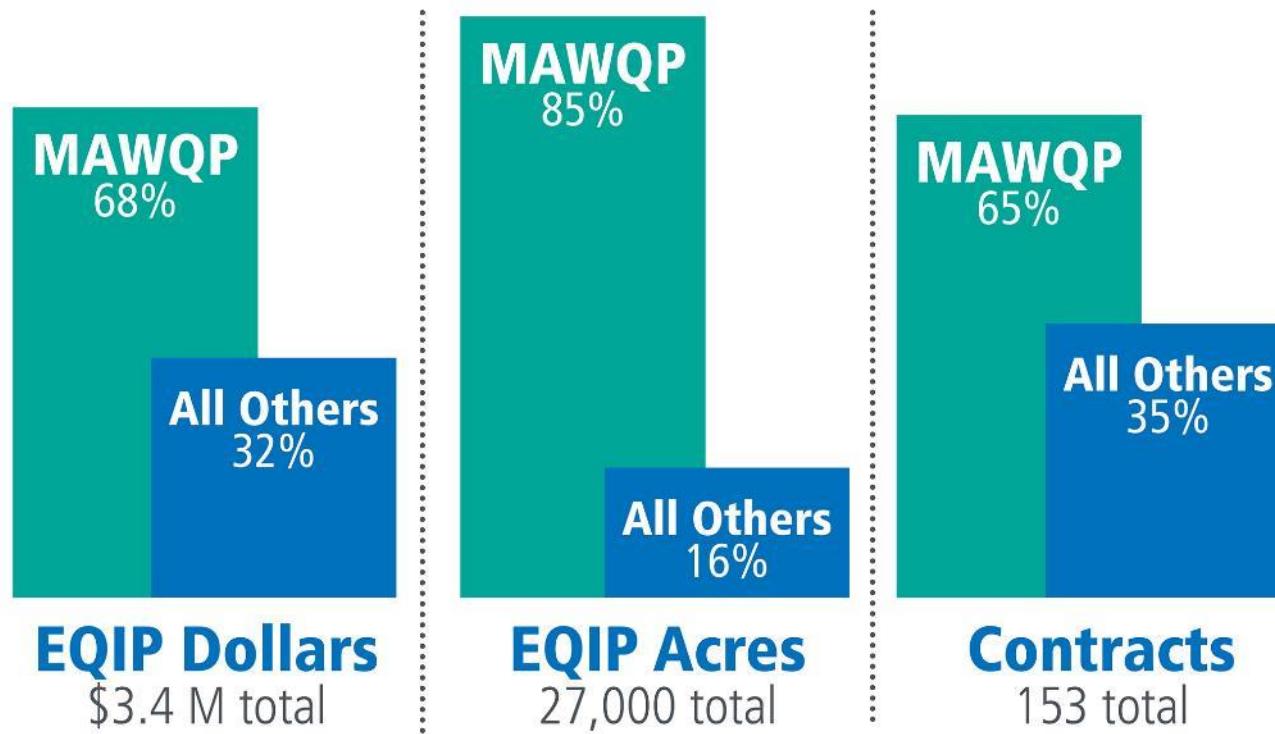
Midwest Agriculture Water Quality Partnership RCPP

\$50M, 47 Partners

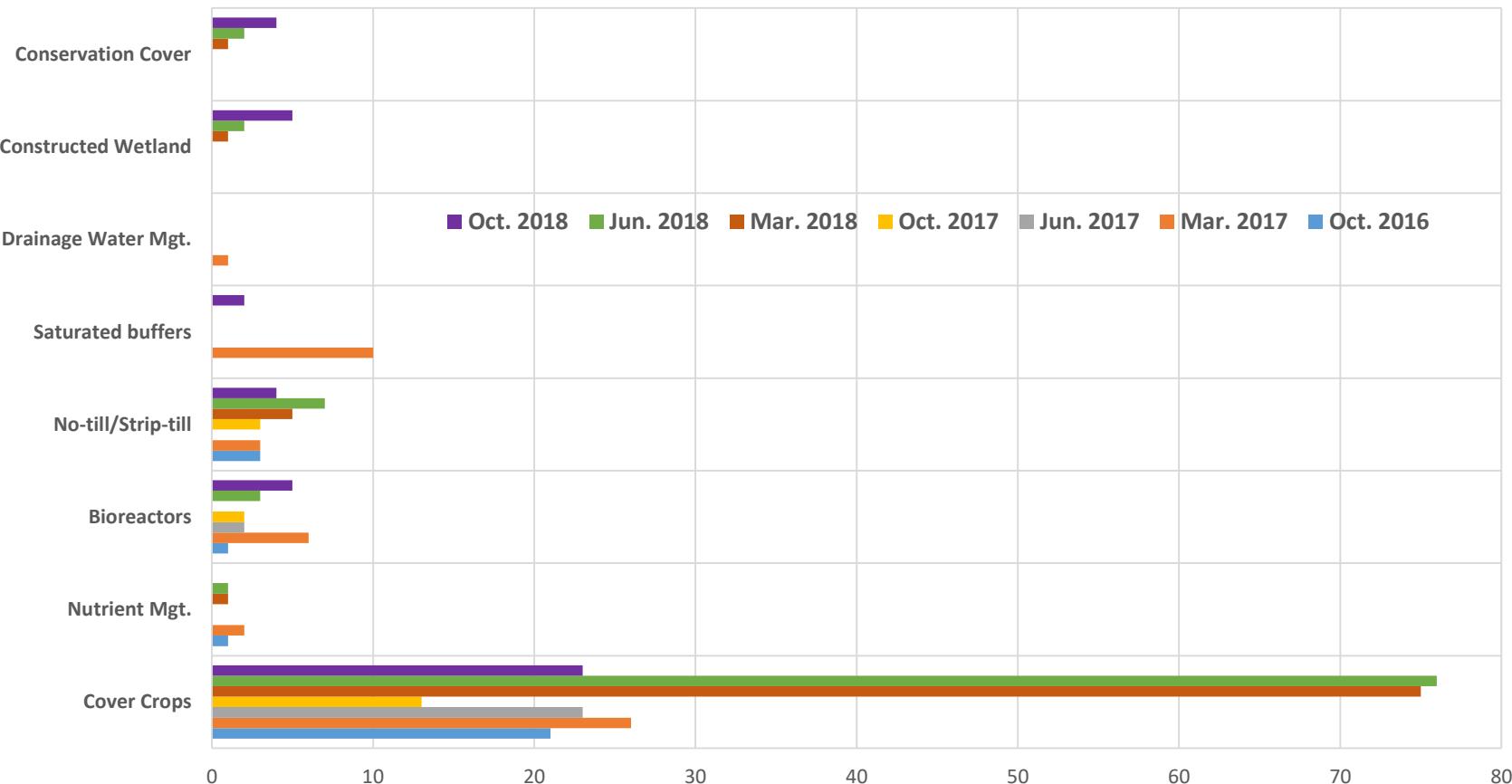
- 3.5M ac improved conservation in 3 years
- >90% original funding obligated
- ~99% of original 4:1 match requirement has been met



Eight RCPP Programs in Iowa



RCPP Practices by Signup

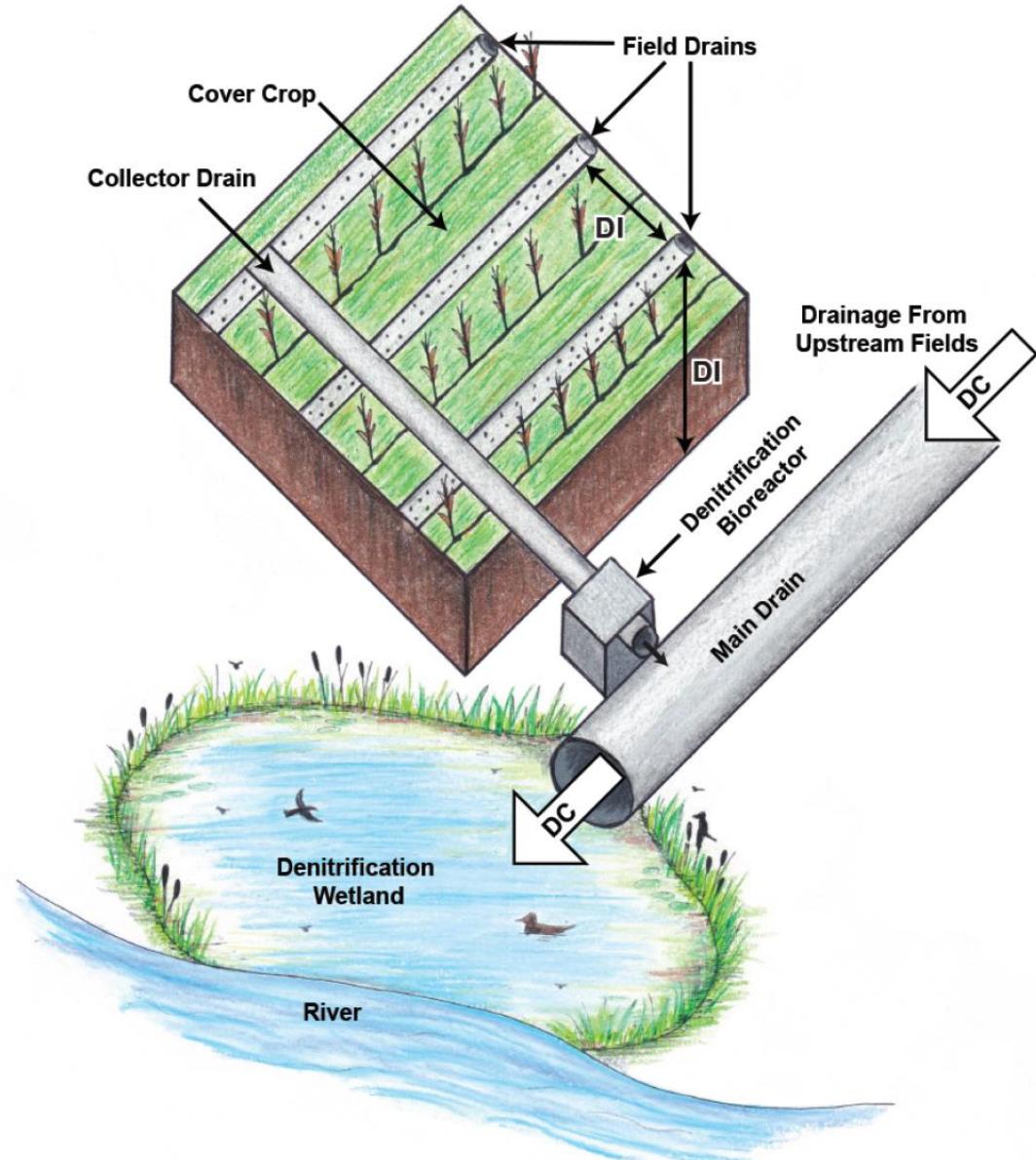


Future Fertilizer Management Sustainability Projects:

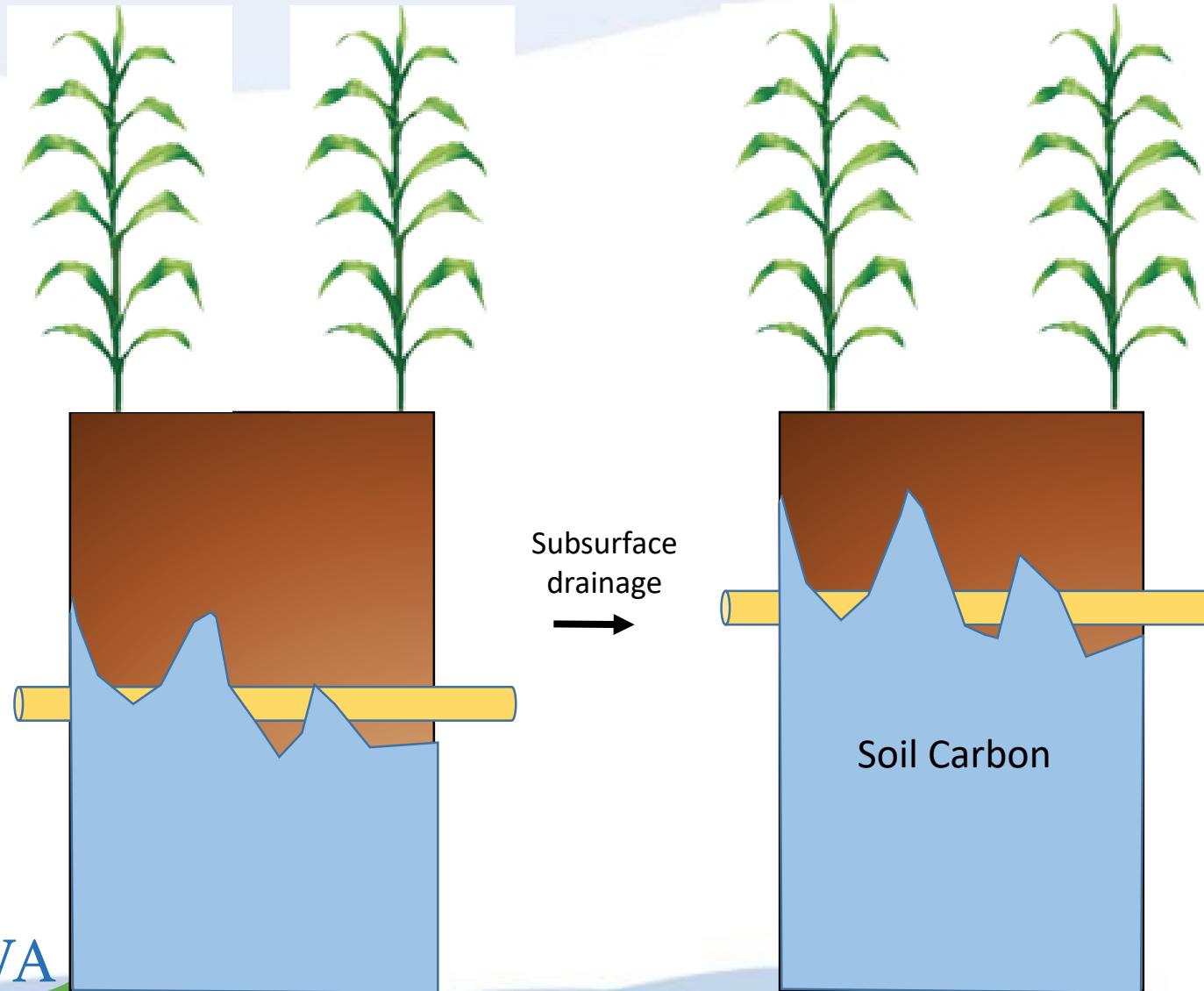
- Fertilizer Management payment flexibility in RCPP in exchange for new practices.
- Payments to Ag Retail for EQIP Contracts
- Supply Chain partnerships driven by consumers
- Payments for Ecosystem Services
- Systems Approach to Sustainable Intensification of ag drainage

Alternatives

- Wetlands
- Saturated buffers
- Shallow drainage
- Controlled drainage



Shallow drainage: robust soil carbon sequestration



NASDA National Public Private Partnerships Award – IAWA Business Council



IA

ce.com

Questions?

Get involved!

Sean McMahon

smcmahon@iowaagwateralliance.com

515-334-1017

www.IowaAgWaterAlliance.com

@IowaAgWater



[**www.iowaagwateralliance.com**](http://www.iowaagwateralliance.com)

