

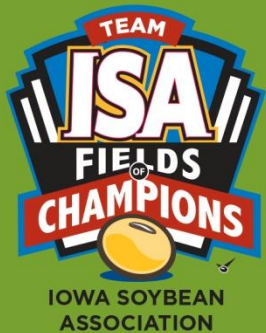
# ISA Environmental Programs



*Water Resources Coordinating Council  
April 10, 2013. Metro Waste Authority, Des Moines, Iowa*

***Todd Sutphin***  
*Operations Manager, Environmental Programs and Service*





# Iowa Soybean Association Environmental Programs and Services

- Advance agricultural leadership for environmental quality by developing, applying, and promoting programs that assist producers to perform agronomically and economically
- Develops policies and programs that help farmers expand profit opportunities while promoting environmentally sensitive production using the soybean checkoff and other resources.
- The Association is governed by an elected volunteer board of 21 farmers.
- Largest State-based row commodity association in U.S. serving 45,000 Iowa soybean farmers.





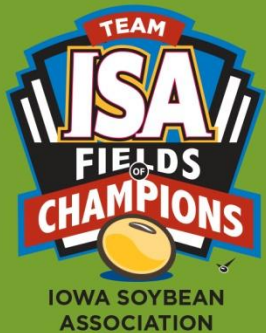
# Environmental Programs and Services

- Provide leadership for agriculture; have impact
  - **Conservation and Environment**
  - **Policy**
  - **Profitability**
- Seeking and capturing performance
- Apply science methods to gain understanding
- Crosses multiple geographic scales
- Valuing cooperative partnerships and collaborations
- Provide value to membership



**Environmental  
Programs & Services**  
IOWA SOYBEAN ASSOCIATION

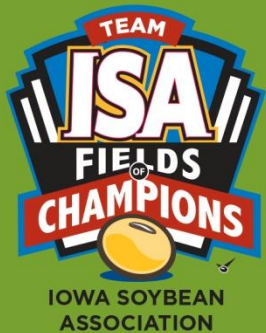




# ISA EPS Strategies

- Technical assistance for farmers, watersheds and organized stakeholder groups
- Leveraging farmer investment with public – private partnerships
- Monitoring and assessment
- Data management and analysis
- Adaptive management framework – PLAN, DO, CHECK, ACT
- Targeting for cost effectiveness and measuring outcomes for performance
- Public education, communication and outreach
- Management evaluation and reporting

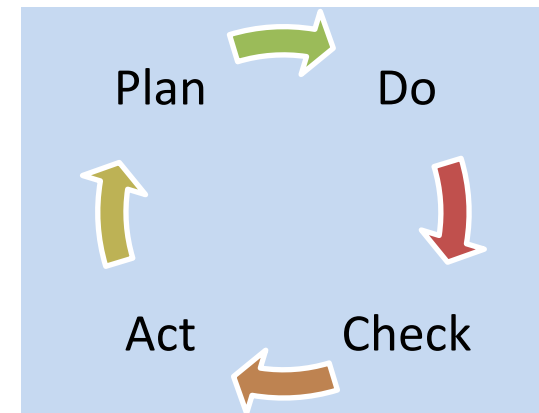




# Farm Scale Planning



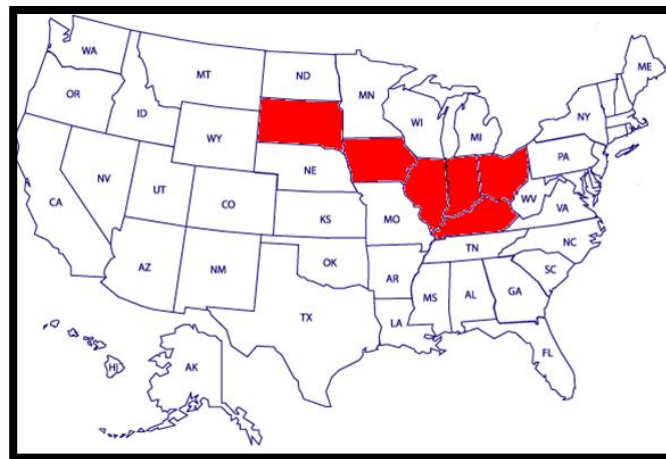
- **Create a plan to help farmers address natural resource concerns**
  - Document: nutrient, soil and pest management planning
  - Partner with TSPs, CCAs and Agronomists
- **Incorporates business management principles**
  - Environmental policy, legal requirements and communication
  - Continual improvement cycle
- **Implement evaluation and testing**
  - Provides feedback to the plan





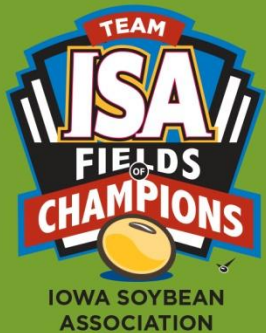
# STARS

Strategies Targeting *American* Agricultural Resources and Sustainability



- Multi-state project to improve farm profitability, energy efficiency, and environmental performance.



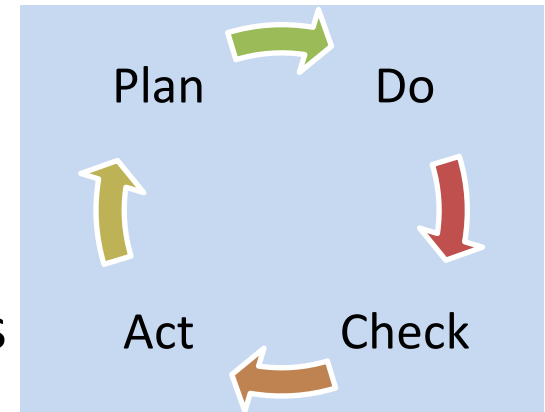


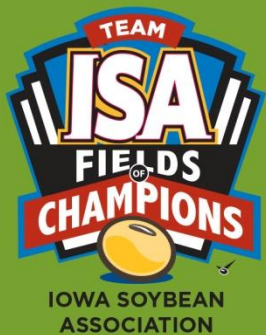
# STARS

Strategies Targeting American Agricultural Resources and Sustainability



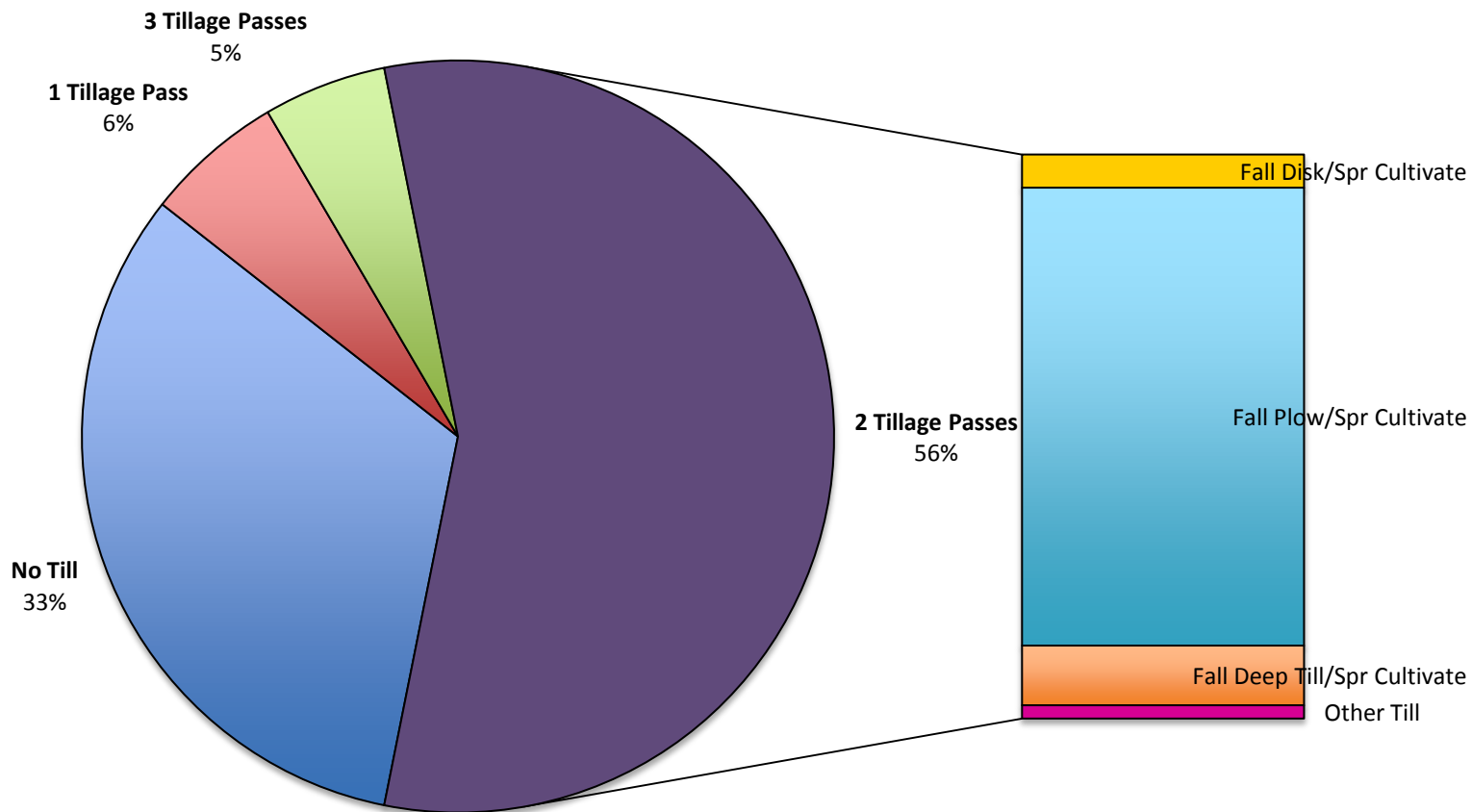
- Enroll approximately 500 participants across 6 states in CEMSA (soil, nutrient and energy)
- Partner with state soybean commodity groups
- Document and analyze energy use, other input use and management practices—3 years
- Address on-farm resource management and sustainability





# Quantifying Practices

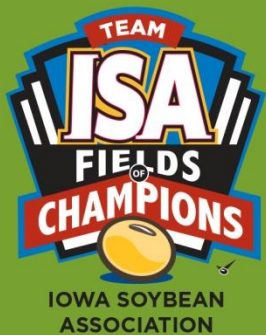
Frequency of Tillage among 2010 Iowa Soybean Fields (n=151)



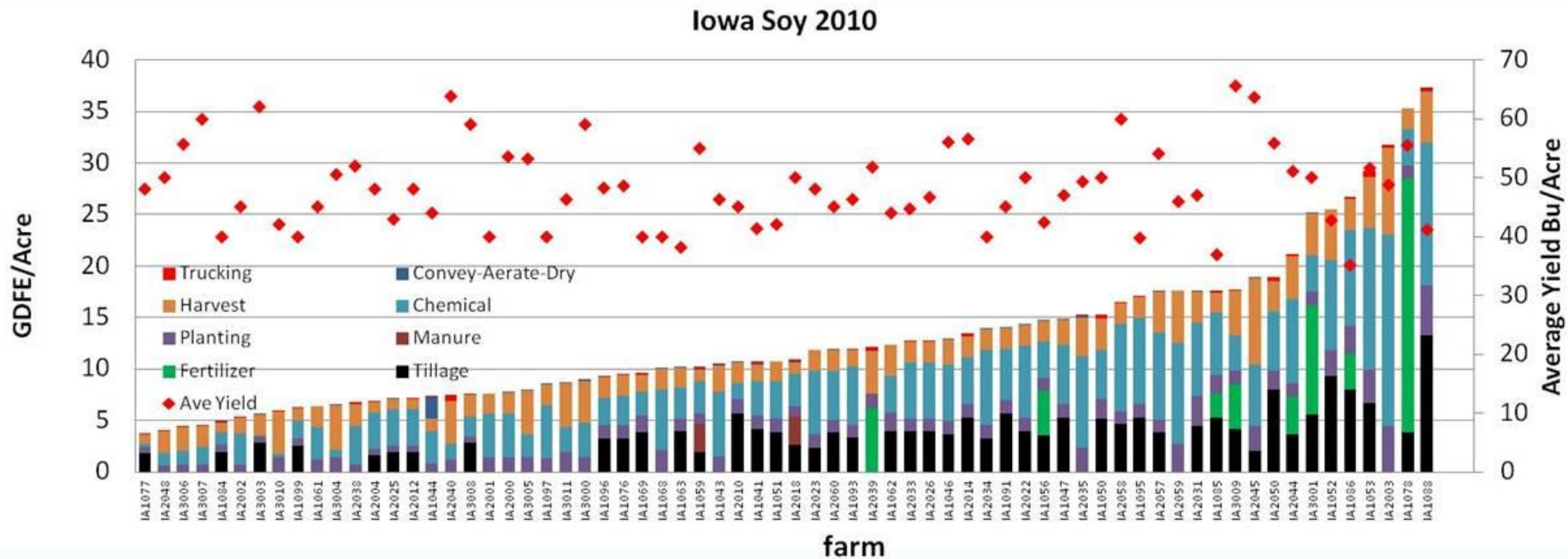
Source: Preliminary STAARS Data Analysis  
Iowa Soybean Association Environment Programs and Services,  
February 2013  
Funded by: Soybean Checkoff, USB and 6 QSSB 's







# GDFE/ACRE & Yield 2010 Iowa Soy

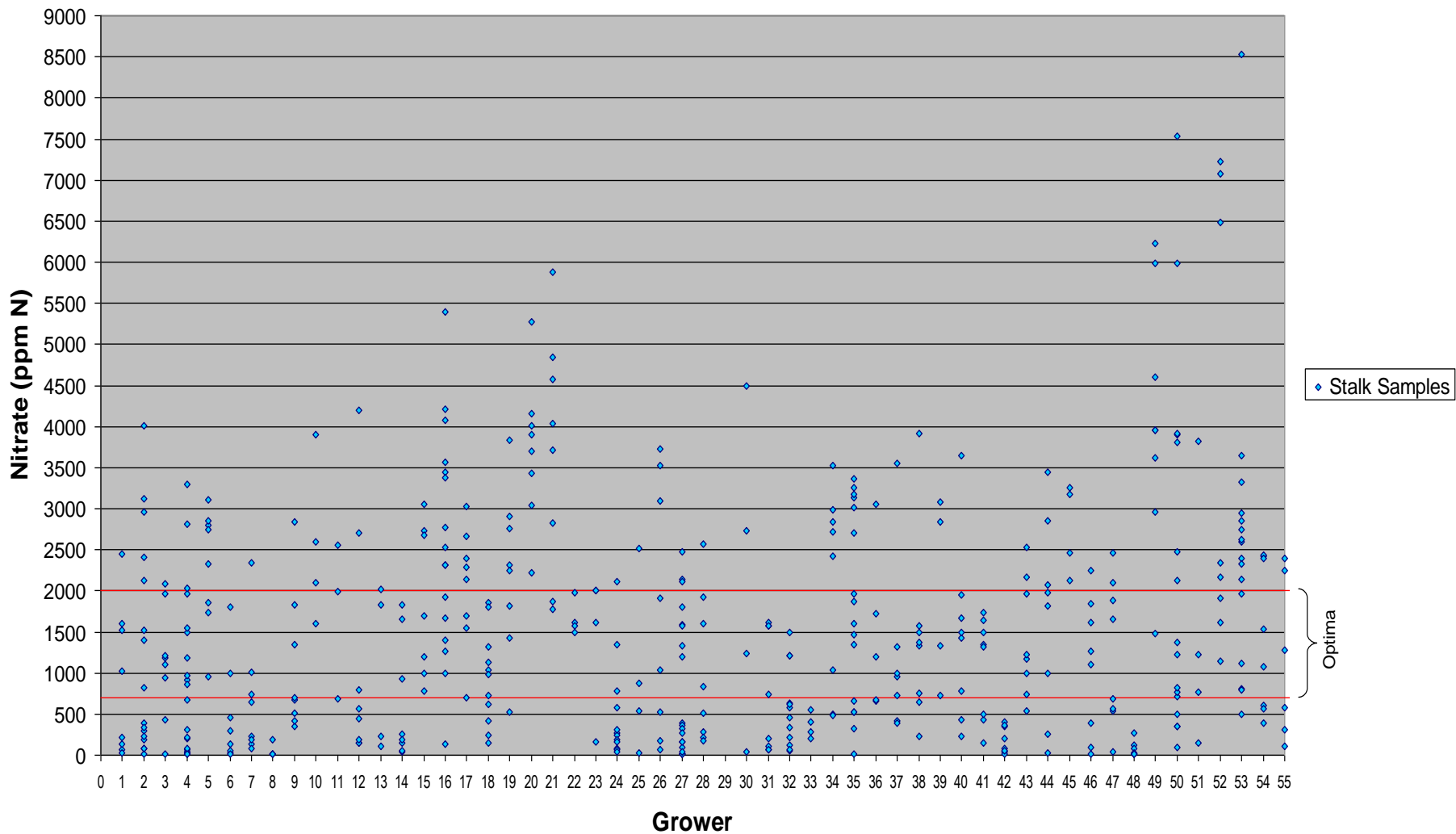


Source: Preliminary STAARS Data Analysis N= 72 Producers 149 Fields  
 Iowa Soybean Association Environment Programs and Services,  
 February 2013  
 Funded by: Soybean Checkoff, USB and 6 QSSB 's





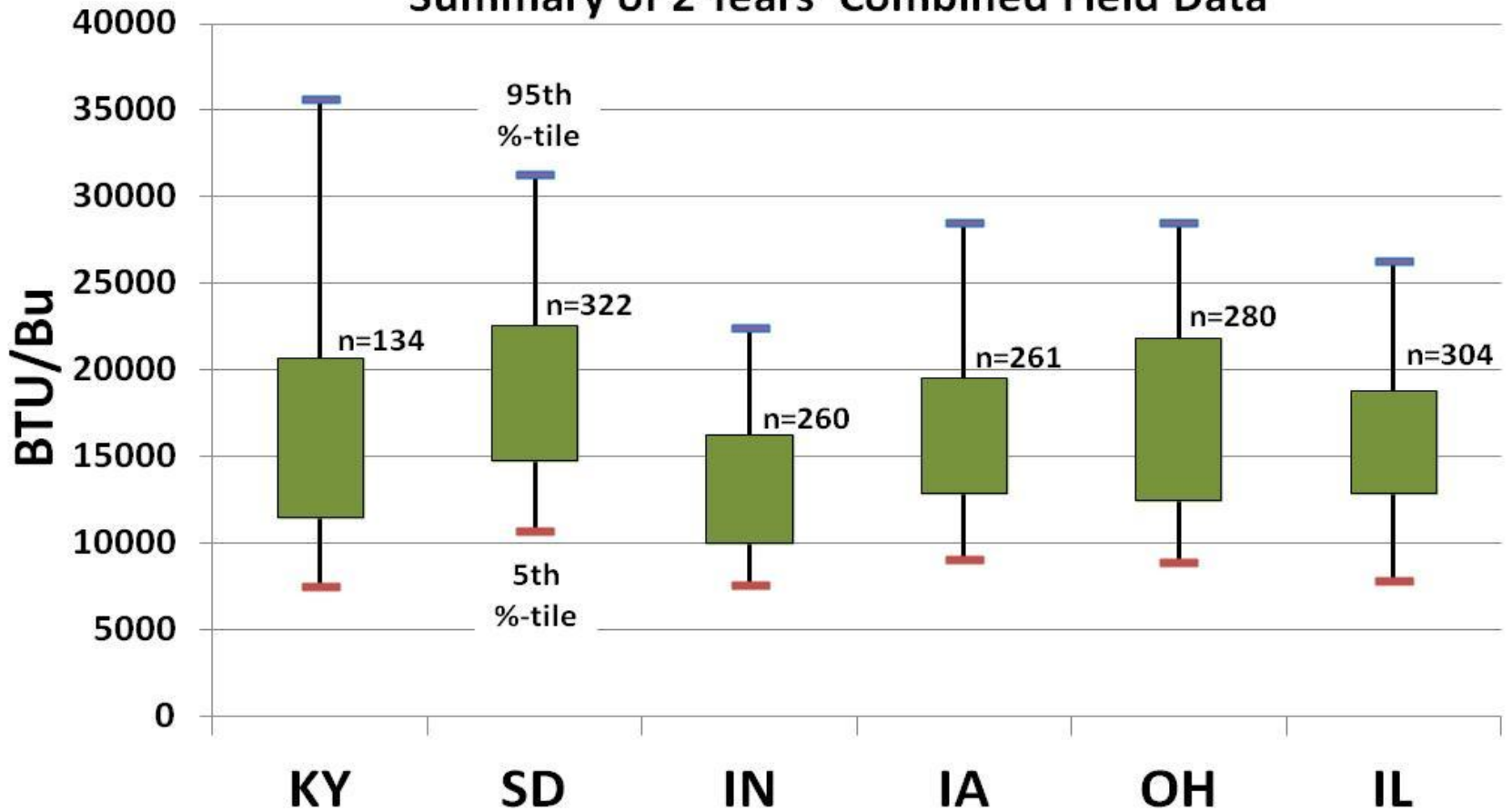
## 2006 Corn Stalk Nitrate Analysis (*Boone River*): Comparison Between Growers





# STAARS Data

## Energy to Produce Soybeans: Summary of 2 Years' Combined Field Data

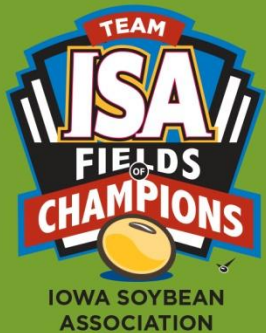


Source: Preliminary STAARS Data Analysis  
Iowa Soybean Association Environment Programs and Services,  
February 2013  
Funded by: Soybean Checkoff, USB and 6 QSSB 's



Environmental  
Programs & Services  
IOWA SOYBEAN ASSOCIATION





# Watershed Planning

- **A comprehensive plan for the watershed (follows watershed planning protocol)**
  - Farmer involvement; locally-led
  - Identify resource concerns
  - Establish specific goals/objectives
  - Inventory watershed
  - Formulate alternatives/evaluate alternatives
  - Make decisions/write plan; includes implementation schedule and resource needs.
- **Infield/Edge of Field**
- **Set of integrated solutions; no silver bullet**
- **Implementation**



**Environmental  
Programs & Services**  
IOWA SOYBEAN ASSOCIATION

## Don Williams Lake Watershed Management Plan



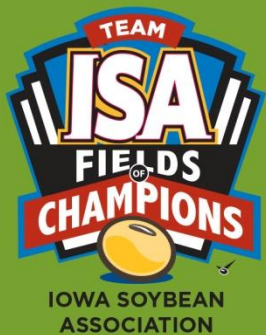
### Vision Statement

Establish the Don Williams Lake Watershed Project as a study in the joining of people and processes leading to ecological health, recreational enjoyment and Iowa's agriculture for future generations.

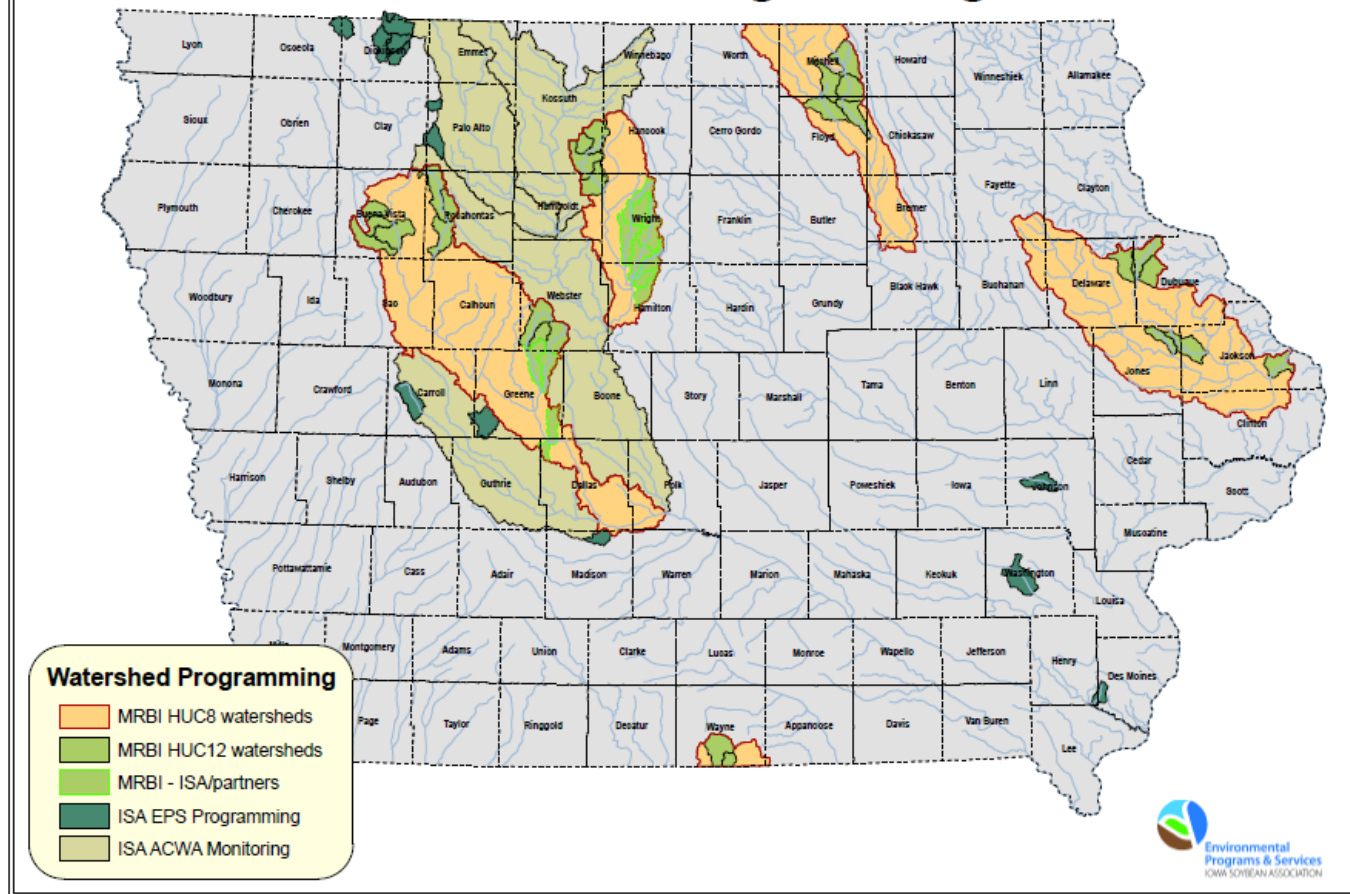
**November 2011**

*(Plan will be updated on a 5-year cycle: years 2016, 2021, 2026, and 2031)*

Prepared by:  
Boone County Soil & Water Conservation District



## ISA Environmental Programs and Services - Watershed Programming



**225 farms**

**65 defined watersheds**

**-39 active and 26 supporting ~ 6 million acres**

**- over 35 public and private partners.**



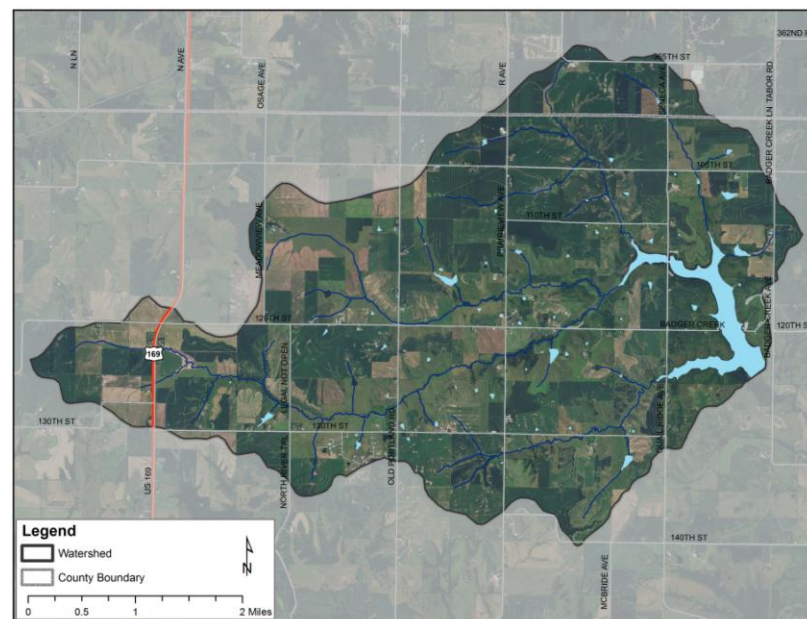


# Badger Creek Lake Watershed Goals and Objectives

**Goal 1:** Reduce non-point source pollution to at or below TMDL levels in the Badger Creek Lake watershed while maintaining agricultural productivity.

*Objective 1:* Reduce sediment delivery to Badger Creek Lake by 7,078 tons within 8 years, and an additional 3,805 tons by year 20 for a 10,883 ton per year or 74% load reduction.

*Objective 2:* Reduce phosphorus delivery to Badger Creek Lake by 9,202 pounds within 8 years, and an additional 4,945 pounds by year 20 for a 14,147 pounds per year or 74% load reduction.





# Badger Creek Lake Watershed

Table 9. Summary of Best Management Practices.

Upland Practices	Targeted Areas	Erosion Target Type	Treatment Type	Overall Goal (Acres/Practices)	Sediment Reduction Efficiency	Phosphorus Reduction Efficiency	Erosion Reduction (t/y)	SD Reduction (t/y)	P Reduction (lbs)
Cover Crops <sup>1</sup>	Cropland	Sheet & Rill Erosion	Source Control	400	50%	50%	687.00	171.75	223.28
Grassed Waterways	Cropland	Ephemeral Gullies	Source Control	75	30%	-	154.58	108.20	140.66
Bioreactor	Cropland	NA	Source Control	1(#)	-	-	-	-	-
Grade Stabilization Structures	Cropland/ Park	Gully Erosion	Trap	9(#)- 459	90%	90%	2,838.00	1,986.60	2,582.58
Water and Sediment Control Basins	Cropland	Sheet & Rill Erosion	Trap	20(#)- 1,224 ac	90%	90%	7,567.99	1,892.00	2,459.60
Nutrient Management	Cropland	NA	Source Control	5,500	-	-	-	-	-
Terraces <sup>3</sup>	Cropland	Sheet & Rill Erosion	Trap	200,000 (ft) - 2,443 ac	90%	50%	5,082.75	1,270.69	1,651.90
Prescribed Grazing	Pasture	Sheet & Rill Erosion	Source Control	90	25%	25%	17.55	4.39	5.70
Residue & Tillage Management(No Till/Strip Till) <sup>2</sup>	Cropland	Sheet & Rill Erosion	Source Control	4,000	50%	50%	13,740.00	3,435.00	4,465.50
<b>Riparian, In-Stream, Edge of Field Practices</b>									
Pasture/Grassland Management	Pasture	Streambank Erosion	Source Control	200	50%	50%	78.00	19.50	25.35
Riparian Buffers	Cropland	Sheet & Rill Erosion	Trap	50	45%	45%	154.58	38.64	50.24
Wetland Restoration	All Sources	All Sources	Trap	2(#)- 5,225 ac	20%	20%	5,291.27	1,322.82	1,719.66
Streambank Protection	Streambank	Streambank/ Shoreline Erosion	Source Control	3,800 (ft)	90%	90%	350.00	315.00	409.50
Shoreline Protection	Shoreline	Shoreline Erosion	Source Control	5,000 (ft)	100%	100%	318.00	318.00	413.40

TOTAL

10,882.59 14,147.36

# Badger Creek Lake Watershed - Implementation

Table 12. Implementation schedule.

Goal 1	Reduce non-point source pollution to at or below TMDL levels in the Badger Creek Lake watershed while maintaining agricultural productivity.	Phase 1			Phase 2			Phase 3			Phases 4 & 5		
		Years 1-4			Years 5-8			Years 9-12			Years 13-20		
		Units (Acres/ Practice)	SD Reduction (tons)	P Reduction (lbs)	Units (Acres/ Practice)	SD Reduction (tons)	P Reduction (lbs)	Units (Acres/ Practice)	SD Reduction (tons)	P Reduction (lbs)	Units (Acres/ Practice)	SD Reduction (tons)	P Reduction (lbs)
Obj. 1&2	Reduce sediment and phosphorus delivery to the lake.												
	Cover Crops (340)	100	42.9	55.8	100	42.9	55.8	100	42.9	55.8	100	42.9	55.8
	Grassed Waterways (412)	30	43.3	56.3	30	43.3	56.3	15	21.6	28.1	--		
	Grade Stabilization Structures (410)	6(#)	1,324.4	1,721.72	3(#)	662.2	860.86	--			--		
	Water and Sediment Control Basins (638)	10(#)	946	1,229.80	5(#)	473	614.9	5(#)	473	614.9	--		
	Nutrient Management (590)	2,000	0	0	1,500	0	0	1,000	0	0	1,000	0	0
	Bioreactor (747)	1(#)	0	0	--			--			--		
	Terraces (600)	70,000 (ft.)	444.7	578.2	50,000 (ft.)	317.7	413.0	40,000 (ft.)	254.1	330.4	40,000 (ft.)	254.1	330.4
	Prescribed Grazing (528)	35	1.70	2.21	35	1.70	2.21	10	.5	.63	10	.5	.63
	Residue & Tillage Management(No Till/Strip Till) (329)	1,600	1,374	1,786.2	1,200	1,030.5	1,339.7	600	515.3	669.8	600	515.3	669.8
	Pasture/Grassland Management 512)	80	7.8	10.1	60	5.9	7.6	40	3.9	5.1	20	2.0	2.5
	Riparian Buffers (393)	20	15.5	20.1	10	7.7	10.0	10	7.7	10.0	10	7.7	10.0
	Wetland Restoration	--			--			1(#)	1,183.6	1,538.6	1(#)	139.2	181.0
	Streambank Protection	1,000 (ft)	82.9	107.8	1,000 (ft)	82.9	107.8	1,000 (ft)	82.9	107.8	800 (ft)	66.3	86.2
	Shoreline Protection	1,000 (ft)	63.6	82.7	1,000 (ft)	63.6	82.7	1,500 (ft)	95.4	124.0	1,500 (ft)	95.4	124.0
<b>TOTAL Reduction</b>			<b>4,346.8</b>	<b>5,650.9</b>		<b>2,731.4</b>	<b>3,550.9</b>		<b>2,680.9</b>	<b>3,485.1</b>		<b>1,123.4</b>	<b>1,460.3</b>

# Badger Creek Lake Watershed *Planning Maps*

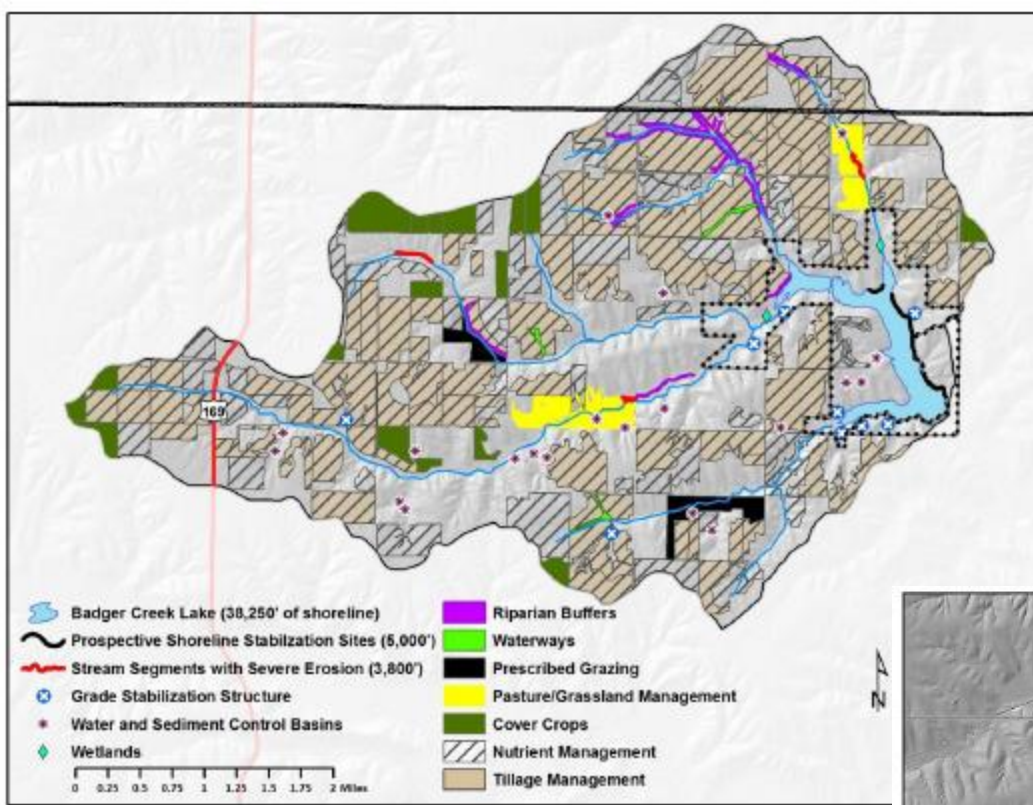


Figure 19. Ideal BMP placement scenario.

## Implementation Funding:

- National Water Quality Initiative  
 ~\$250,000; 2012  
 ~\$328,000; 2013
- EPA Section 319  
 ~\$420,000
- Iowa DNR - TBD
- Local Match/Other - TBD

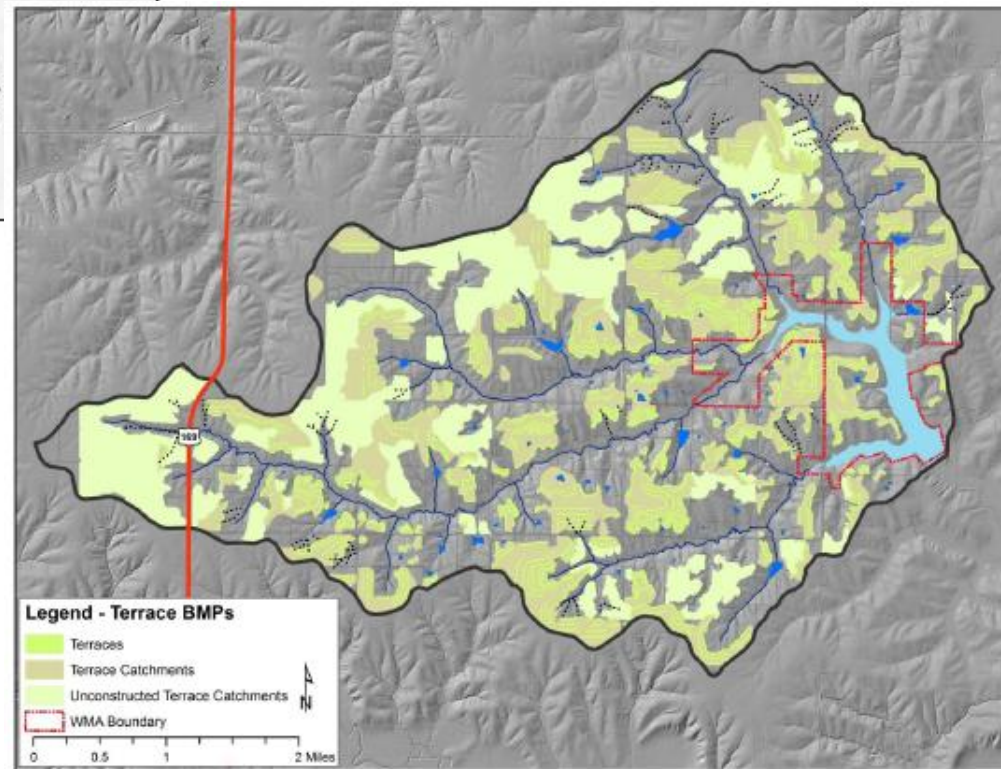
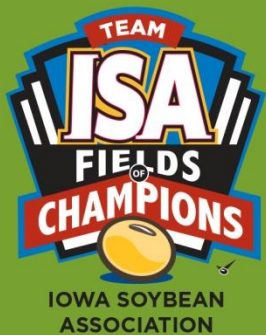


Figure 20. Ideal BMP placement scenario – constructed and unconstructed terraces.

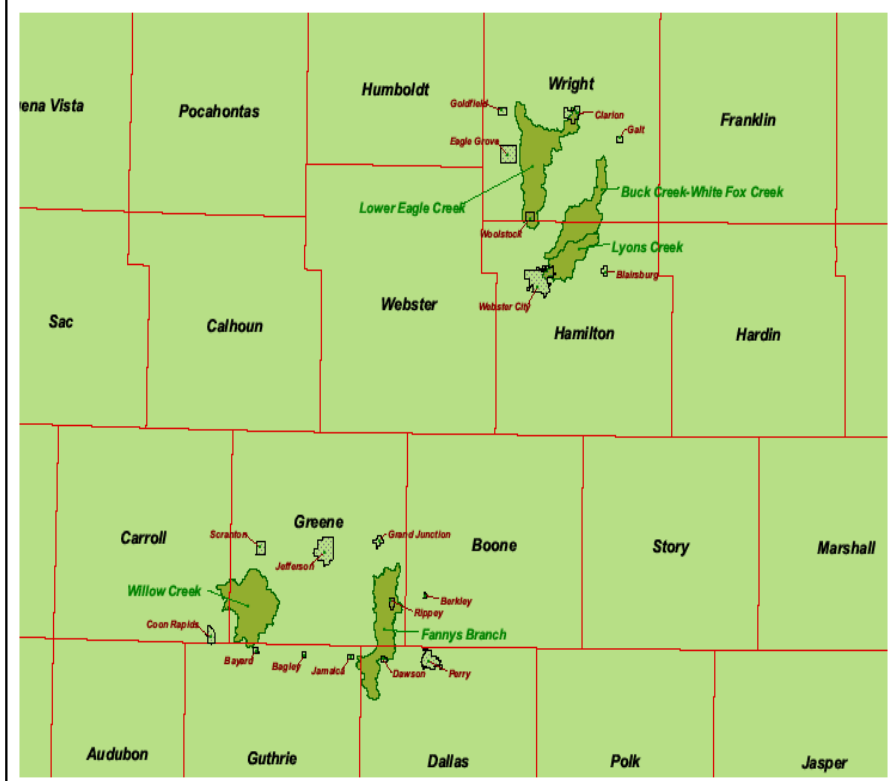


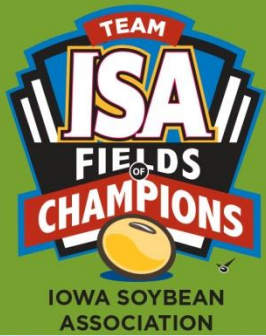


# ISA Conservation Innovation Grant

- Develop watershed plans
- Monitor water quality
- Develop Resource Management plans for 100 – 120 producers
- Conduct evaluation for 100 – 120 producers
- Aggregate evaluation results
- Bring additional financial and technical resources to the watersheds

*ISA Sub-Watersheds in the Boone and Raccoon River Watersheds*



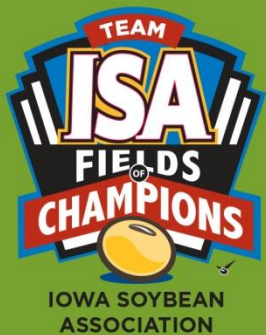


# Highlights/Lessons Learned

- Local commitment and participation/Locally-led
- Planning is essential (farm/watershed)
- Infrastructure to gain capacity
- Adaptive Management or Plan-Do-Check-Act
- Alignment (agronomists, co-op, CCA)
- Program Delivery; Tech. Assist. (public/private)
- No “silver bullet”
- TIME

## Next steps:

- Update existing plans; interim goals; adaptive management – continual improvement
- Develop watershed plans for priority watersheds identified in State Nutrient Strategy



# Iowa Nutrient Reduction Strategy

- A science-based framework for assessing and reducing nutrient loss from both point and nonpoint sources.
- Nonpoint Source Goals
  - Reduce Total N by 41%
  - Reduce Total P 29%
- Dedicated funding soon



## Iowa Strategy to Reduce Nutrient Loss: Nitrogen Practices

This table lists practices with the largest potential impact on nitrate-N concentration (except where noted). Corn yield impacts associated with each practice also are shown as some practices may be detrimental to corn production. If using a combination of practices, the reductions are not additive. Reductions are field level results that may be expected where practice is applicable and implemented.

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/sidress 40-60 split Compared to fall-applied	5 (28)	10 (7)
	Source	Sidress – Compared to pre-plant application	7 (37)	0 (3)
		Sidress – Soil test based compared to pre-plant	4 (20)	13 (22)**
		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 – <a href="http://extension.agron.iastate.edu/soilfertility/nrate.aspx">http://extension.agron.iastate.edu/soilfertility/nrate.aspx</a> can be used to estimate MRTN but this would change Nitrate-N concentration reduction)	10	-1
	Nitrification Inhibitor	Nitraptyin in fall – Compared to fall-applied without Nitraptyin	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 water that makes it to a stream.	91 (20)		

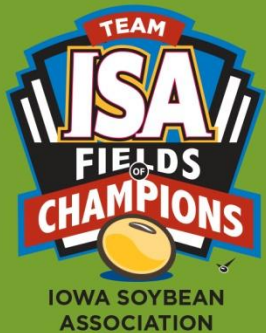
\* A positive number is nitrate concentration or load reduction and a negative number is an increase.

\*\* A positive corn yield change is increased yield and a negative number is decreased yield. Practices are not expected to affect soybean yield.

SD = standard deviation. Large SD relative to the average indicates highly variable results.

\*\* This increase in crop yield should be viewed with caution as the sidress treatment from one of the main studies had 95 lb-N/acre for the pre-plant treatment but 110 lb-N/acre to 200 lb-N/acre for the sidress with soil test treatment so the corn yield impact may be due to nitrogen application rate differences.

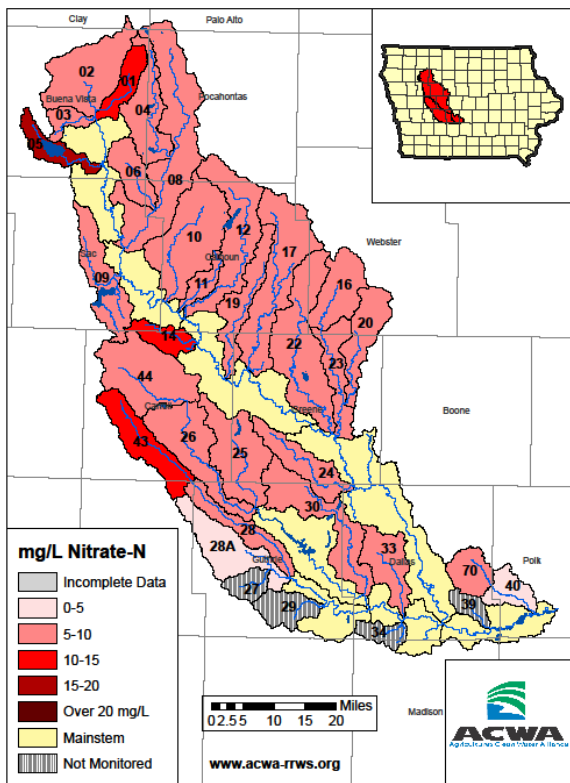




# Environmental Programs and Services

## Association and Contract Management

2011 Ave. Nitrate Concentrations-Raccoon River Tributaries



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*Ag organizations working for better water quality*

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*Our partners make this work possible. Thanks to:*

### ACWA THANKS

THE MCKNIGHT FOUNDATION  
[www.mcknight.org](http://www.mcknight.org)  
*for special project funding*

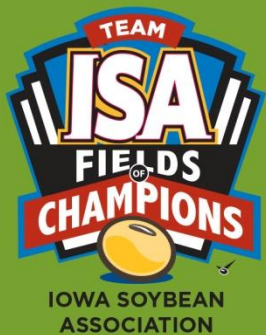


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Agriculture's Clean Water Alliance

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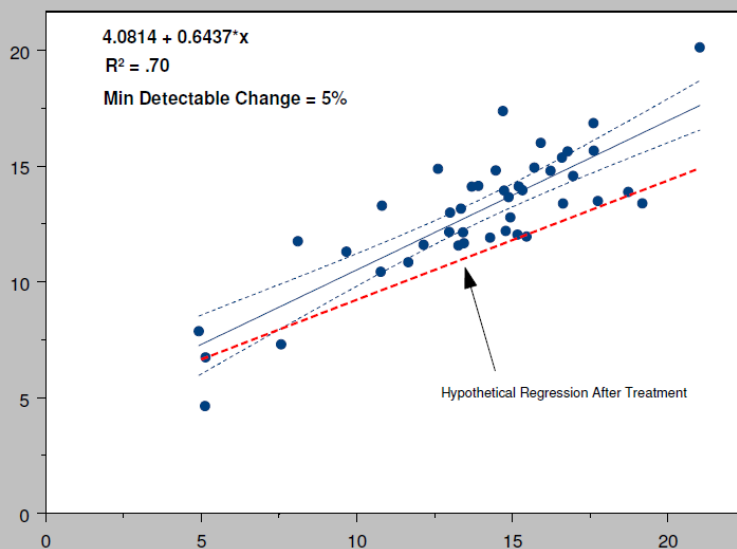
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[WWW.ACWA-RRWS.ORG](http://WWW.ACWA-RRWS.ORG)



# Water Monitoring Analytical Services



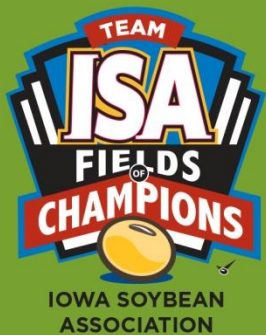
LCR4T Preliminary Calibration  
mg/L Nitrate-N



Water laboratory,  
auto samplers and  
paired micro  
watershed study  
analysis.







## Agriculture and Forestry in a Changing Climate: The Road Ahead

January, 2012



A Product of the 25x25 Adaptation Initiative

# Environmental Programs and Services

**Leadership Services** - Provided staff leadership and farmer champions including sustainability tours for food companies, ISA Farm Bill Task force, National Soy Sustainability Task Force, Iowa Nutrient Reduction Strategy and several national committees working on Mississippi River issues.

#### THE Unilever/ADM/Iowa Soy Grower - Sustainability Pilot Project

**PURPOSE:** ADM would like to help Unilever create a more direct connection to provide high-quality soybeans for its Hellmann's Mayonaisse. To do this, ADM and Unilever are involved in this supply-chain together to discuss and determine the best practices for a successful project. A successful project should include benefits to grow communities, and the environment.



**ADM:** Our vision is to be the most-admired global agri-business. To achieve this, we recognize the critical business relationships that it enjoys along the supply chain from the US grower, we source from the most productive set of farms in the world. And when ADM refines and sells our crop products, we are committed to advanced and responsible consumer products companies in the world. As a customer, ADM is committed to the kind of business performance and environmental impact that impacts local communities and the environment.



**Unilever:** On any given day, two billion people use Unilever products to get more out of life. With more than 400 brands focused on health and wellness, we touch so many people's lives in so many different ways. Unilever's portfolio includes nutritionally balanced foods to indulgent ice creams, affordable soaps, and everyday household care products. We produce world-leading brands like Dove, Axe, Hellmann's and Omo, alongside trusted local names such as Suave.

#### Family's Sustainability Pledge to Our Global Customers

##### DRAFT REVIEW DOCUMENT ONLY

Our overall commitment of continuing to provide the highest quality soy value system to the U.S. Soybean Growers and organizations we represent offer you the Sustainability Pledge. This pledge is more than words and comparisons with other commitments to our customers that the U.S. soybean family will deliver healthy human consumption, that offer superior amino acid profiles, enhanced feed efficiency, improved overall animal performance; we remain committed to providing you with the best soybean value after the sale, a supply system second to none, and continued access to the best soybean products developed by the most prolific public and private research in the world. We pledge that we are 100% committed to do everything possible to ensure our soybean value link in the value chain continues to operate in a sustainable manner consistent with our environmental objectives, is socially responsible, promotes economic growth, and supports agricultural practices.

This pledge is on behalf of the 589,182 responsible U.S. soybean growers, and the thousands of soybean growers who are anxious to carry on our legacy of superior service to our customers.







# Environmental Programs and Services

Science publications - Four scientific papers published in respected environmental journals - including our work on bioreactors, water quality and watersheds.



**Woodchip bioreactors for N-source reduction in a highly managed landscape** 1203070  
Iowa Soybean Association Environmental Programs and Services

**Introduction**  
Excess fertilization and the resulting hypoxia in the Gulf of Mexico are increasingly understood to originate in managed landscapes of the Upper Mississippi River basin. Nitrogen inputs to cropland fields are high in landscapes with soils containing high organic nitrogen content that, when mineralized, releases nitrogen in the soluble nitrate form. These in situ sources supply extensive subsurface drainage systems that readily transport nitrogen to streams and ultimately the Gulf. Aggressive in-field N management can reduce loading to streams, but will not reduce loads to sufficiently impact Gulf hypoxia. Edge of Field (EOF) treatment will be needed to reach water quality objectives. Denitrification bioreactors are one technology being studied for practical and economical EOF nitrate reduction. Bioreactors intercept the high-N tile-drain effluent with woodchip substrates that provide carbon and energy to support denitrification. Iowa Soybean Association (ISA) installed six bioreactors. Design of the ISA bioreactors has focused on the diameter of the field tile and the catchment area.

**Process**  
Aerobic organisms must deplete dissolved oxygen sufficient so anaerobic denitrifying organisms can compete. Insufficient HRT results in unsatisfactory NO<sub>3</sub> reductions. Conditions favoring incomplete denitrification (g/L N<sub>2</sub>). Excesses retards, enabling SO<sub>2</sub> reducing bac results: conversion of SO<sub>2</sub> to toxic CO<sub>2</sub> and methane.

**Performance**  
The figures below depict the performance of the bioreactors. Dashed lines at 4 and 8 hr HRT show the window in which bioreactors are typically designed for. The flow weighted average

**Study**  
The stop logs in the WDS allow sufficient denitrification the bioreactor prior to prevent the undesirable CO<sub>2</sub> evaluated the water month framed in the context of denitrifying bioreactors design and management of

**Design**  
A Water Diversion Structure (WDS) is used to direct water from the field tile to the bioreactor. A Flow Control Structure (FCS) is used to manipulate the flow rate of water within the bioreactor. Designs balance discharge with retention times. The bioreactors have been designed to have a 4-hour hydraulic retention time (HRT) capable of treating 20% of peak flow from the tile treated.

Media	Influent	Effluent
Size	100 (100) mg/L	100 (100) mg/L
Diameter	9.7	9.7
Retention	10.4	10.4
Removal	18.6	18.6
Water	12.2	12.2

**Concentration Reduction**  
The table above describes effluent nitrate-N content, percent reduction of conc. Bioreactor has seen an in effluent values of bioreactor has the highest amount of flow through it load reduction. The month reduction of 78% with the 10.4/2.2 mg L<sup>-1</sup>. The mean average concentration red

**Conclusions**  
• 35 – 60% overall NO<sub>3</sub>-N ↓  
• Improved performance + time  
• Stop log levels in the WDS annually to enhance perf.  
• Reaction rates increase w increasing nitrate-N conc.  
• Treats 18 – 32 hectare (4

TECHNICAL REPORTS: SURFACE WATER QUALITY

**From Agricultural Intensification to Conservation: Sediment Transport in the Raccoon River, Iowa, 1916–2009**

Christopher S. Jones\* and Keith E. Schilling

Fluvial sediment is a ubiquitous pollutant that negatively affects water quality and municipal water supply art of its routine water supply monitoring. Water Works (DMWW) has been measuring in the Raccoon River since 1916. For this study daily turbidity readings to modern (solid TSS) concentrations to develop an early sediment concentrations in the river 1009. Our objectives were to evaluate long- and trends, and relate those to changes in se, and agricultural practices that occurred 1-y monitoring period. Results showed S concentrations and estimated sediment sily from year to year. TSS concentrations ster in the early 20th century despite dier less discharge, and declined throughout the a backdrop of increasing discharge in the and widespread agricultural adaptations by nt loads increased and peaked in the early n have slowly declined or remained steady 1980s to present. With annual sediment load ring extreme events in the spring and early used sediment reductions in the Raccoon should be focused on conservation practices ell impacts and sediment mobilization. from this study suggest that efforts to reduce out the watershed area to be working.

FLUVIAL SEDIMENT is one of the most ubiquitous pollutants that impair surface waters (Johnson et al., 2009). Light attenuation by fine sediment and other particles diminishes water clarity, reduces the depth at which photosynthesis can occur (Kirk, 1994), affects the distance at which sighted animals can detect other objects in the water (Vogel and Beauchamp, 1999), alters thermal properties by lessening the depth of solar energy dissipation (Kirk, 1985), and smothers the benthos (Henley et al., 2000; Newcombe and Jensen, 1996), all of which can subsequently reduce the productivity of a lake or stream below that which nutrient availability would predict (Kirk, 1985). Solid particles in the water column can facilitate the transport of both organic and inorganic toxins (Tessier, 1992), and represents an important pathway in the global geochemical cycle (Walling and Fang, 2003). Suspended solids in lakes and streams diminish their aesthetic and recreational value for human beings (Smith et al., 1995a, 1995b; Smith and Davies-Colley, 1992). Municipal water treatment is also negatively impacted by the presence of excessive solid material in the source water. Eroded sediment adversely affects water treatment through increased color, turbidity, and costs to dispose of the sediment removed from the water (AWWA, 1990). Sediment costs borne by the water supply industry that are a result of agricultural production alone are estimated between US\$277 and \$831 million yr<sup>-1</sup> (Tegmeier and Duffy, 2004). Other negative impacts that are the result of sediment include lost capacity in reservoirs, increased costs for navigation, diminished value of commercial fisheries, and costs to industrial water users (Tegmeier and Duffy, 2004).

Sampling and analysis that assess sediment delivery challenge conventional approaches. Sediment is typically transported via infrequent but high intensity events (Wolman and Miller, 1960), making it difficult to characterize true sediment concentrations and loads with traditional sampling schemes (DeVries and Klavers, 1994; Phillips et al., 1999; Jastram et al., 2010). Analytical indicators of sediment include both total suspended solids (TSS) and suspended sediment concentration (SSC), both gravimetric procedures. The TSS data are produced by measuring the dry weight of sediment from a known volume of subsample of the original. The SSC data are generated by measuring the dry

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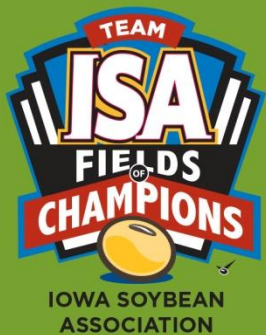
Abbreviations: DMWW, Des Moines Water Works; JCT, Jackson Candler Turbiditymeter; JTL, Jackson Turbidity Units; NTU, Nephelometric Turbidity Units; SSC, suspended sediment concentration; TSS, total suspended solids.

Volume 38, Issue 1, January 2012 ISSN 0025-8674

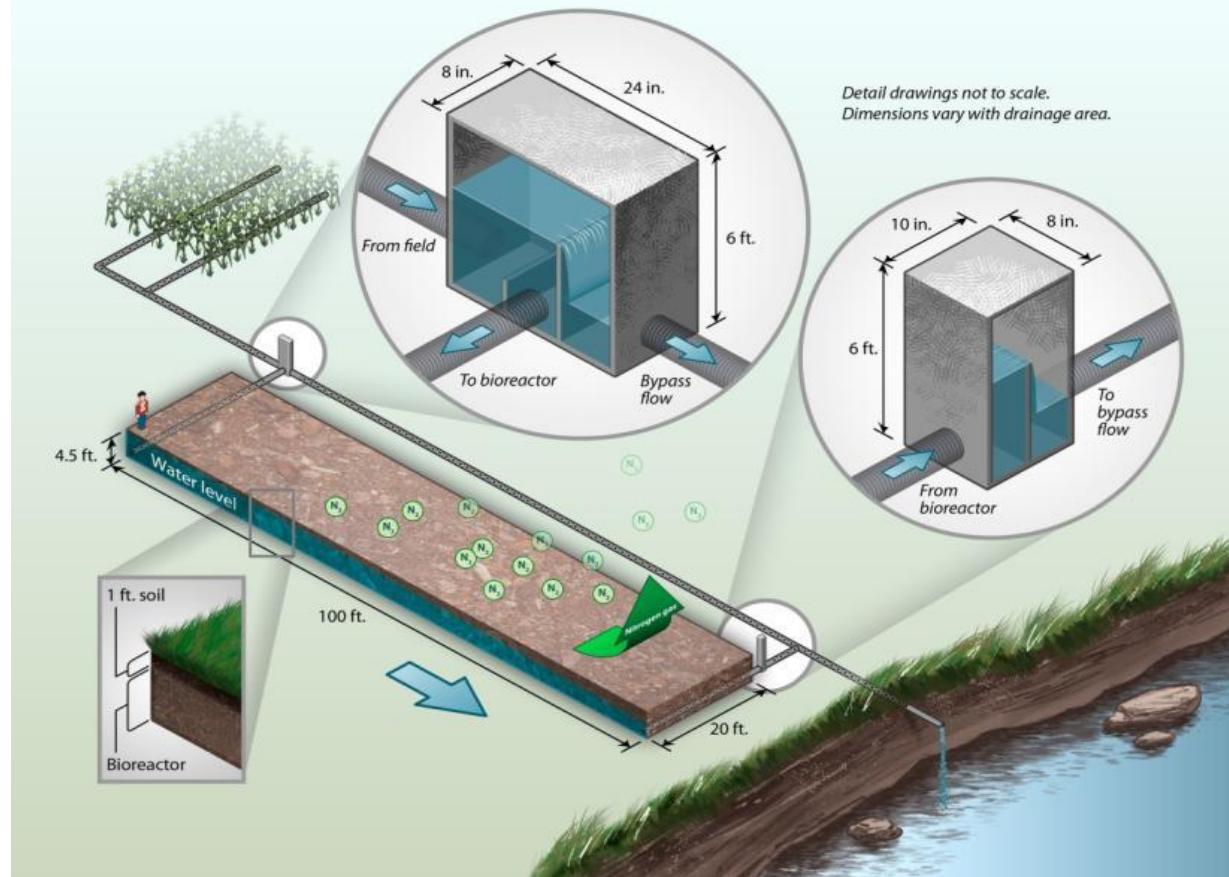
ELSEVIER

**ECOLOGICAL ENGINEERING**  
THE JOURNAL OF ECOSYSTEM RESTORATION

Editor-in-chief  
William J. Mitsch



# Drainage Water Treatment Woodchip Bioreactor



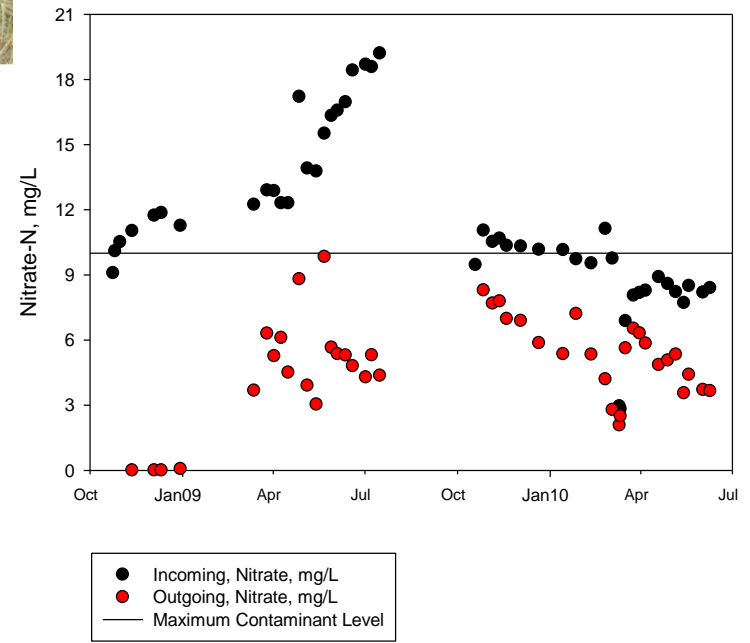
Source: Christianson, Laura and Matthew Helmers. 2011. Woodchip bioreactors for nitrate in agricultural drainage. Iowa State University Extension Publication. PMR 1008.

Available at: <https://store.extension.iastate.edu/ItemDetail.aspx?ProductID=13691>.

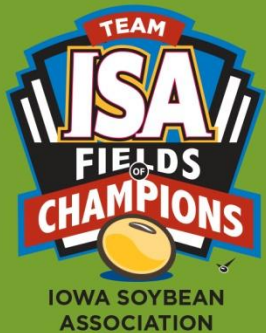




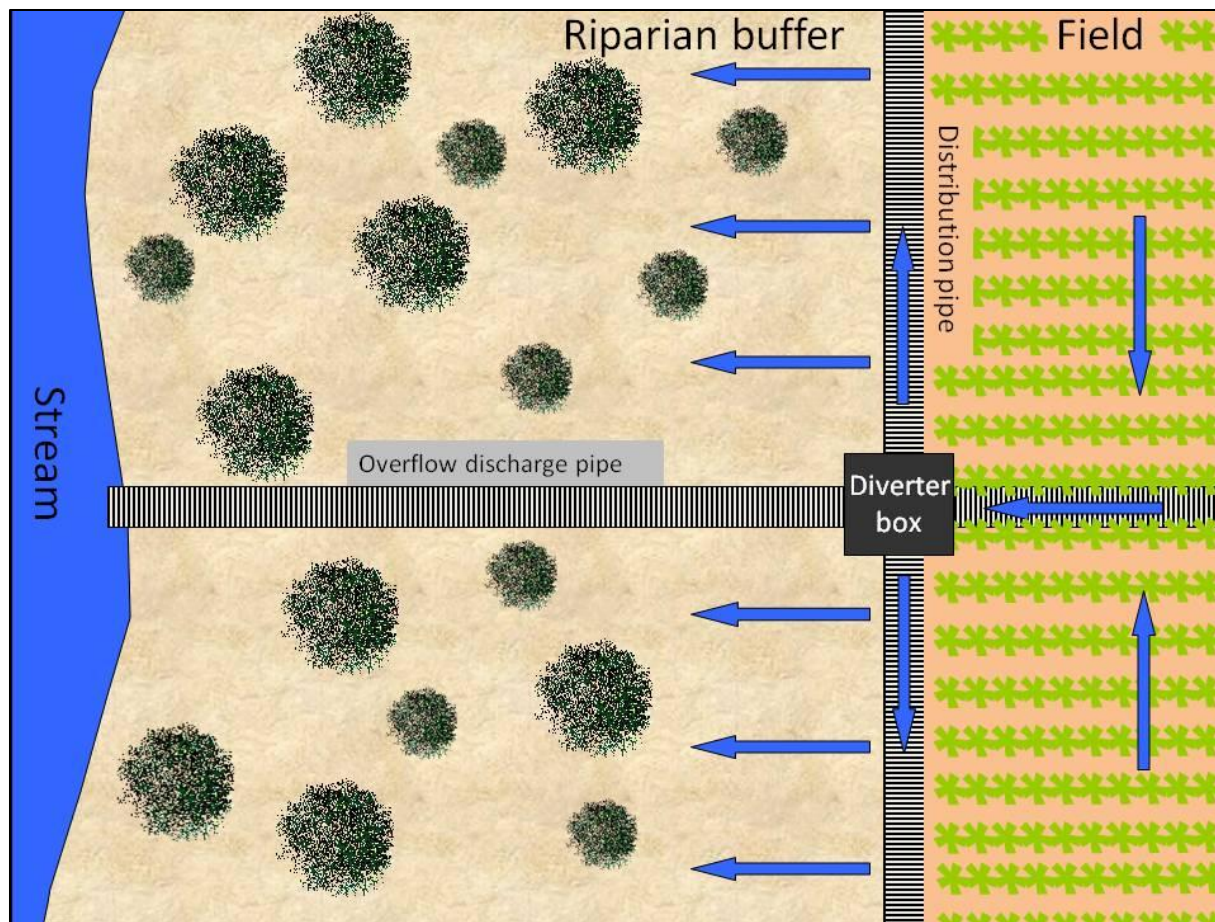
**Woodchip Bioreactors for N removal.** An innovative practice being applied in watersheds with nitrogen resource concerns. Water monitoring data to validate performance.

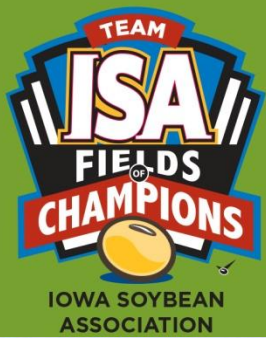






# Re-saturated Riparian Buffers





# Cover Crops

Numerous opportunities

- Wheat, rye, oats, radishes, etc
- **They are a tool, and like any good tool must be used and managed properly**
- Challenges
  - Lack of moisture after planting leading to poor germination
  - Flying into standing beans seem to work better than standing corn
  - Herbicide (before corn planting) sprayed, weather turned cool and wet, corn planted into cover crop that was still green, 40 bushel yield loss
- But great potential
  - **Reduced erosion**, increased nutrient retention, increased soil organic matter, increased earthworm population, **weed suppression**, green fields in March!, grazing, adds option to treating HEL ground, carbon sequestration, **moisture retention**







# Midwest Cover Crops Council - Cover Crop Decision Tool

## Iowa: Boone County Seeding Dates

Location Information Cash Crop Information Soil Information Attribute Information

Location Information Iowa Boone

Cash Crop Soybeans Plant Date: 05/01/2013 Harvest Date: 09/20/2013

Drainage Information Select a Drainage Class Flooding No

Goal #1 Erosion Fighter Goal #2 Nitrogen Scavenger Goal #3 Select an attribute

Select cover crop to create information sheet 50% HV/50% WC Rye Submit

Attribute Ratings: 0-Poor, 1-Fair Reliable Establishment Freeze Risk to Establishment Frost Seeding  
 2-Good, 3-Very Good, 4-Excellent Cash Crop Growing Period: Requires Aerial Seeding or Interseeding of Cover Crop

	Mar 15	Apr 1	Apr 15	May 1	May 15	Jun 1	Jun 15	Jul 1	Jul 15	Aug 1	Aug 15	Sep 1	Sep 15	Oct 1	Oct 15	Nov 1	Nov 15	Dec 1	Dec 15	Jan 1	Jan 15	Feb 1	Feb 15	
<b>Nitrogen Scavenger</b>																								
<b>Erosion Fighter</b>																								
<b>Nonlegumes</b>																								
Barley, Winter	3																							
Buckwheat	1																							
Millet, Japanese	2																							
Millet, Pearl	2																							
Oats	3																							
Rye, Winter Cereal	4																							
Ryegrass, Annual	2																							
Sorghum-sudangrass	3																							
Sudangrass	3																							
Triticale, Winter	4																							
Wheat, Winter	4																							
<b>Brassicas</b>																								
Mustard, Oriental	1																							
Radish, Oilseed	1																							
Rapeseed/Canola	1																							
Turnip/Rape, Forage type	1																							
<b>Legumes</b>																								
Alfalfa - Dormant	2																							
Alfalfa - Non-dormant	2																							
Clover, Crimson	2																							
Clover, Red	2																							
Clover, White	2																							
Cowpea	1																							
Pea, Field/Winter	2																							
Soybeans	1																							
Sweetclover	2																							
Vetch, Hairy	2																							
<b>Mixes</b>																								



3/20/12



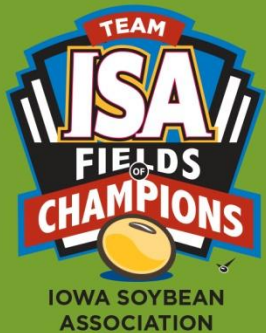
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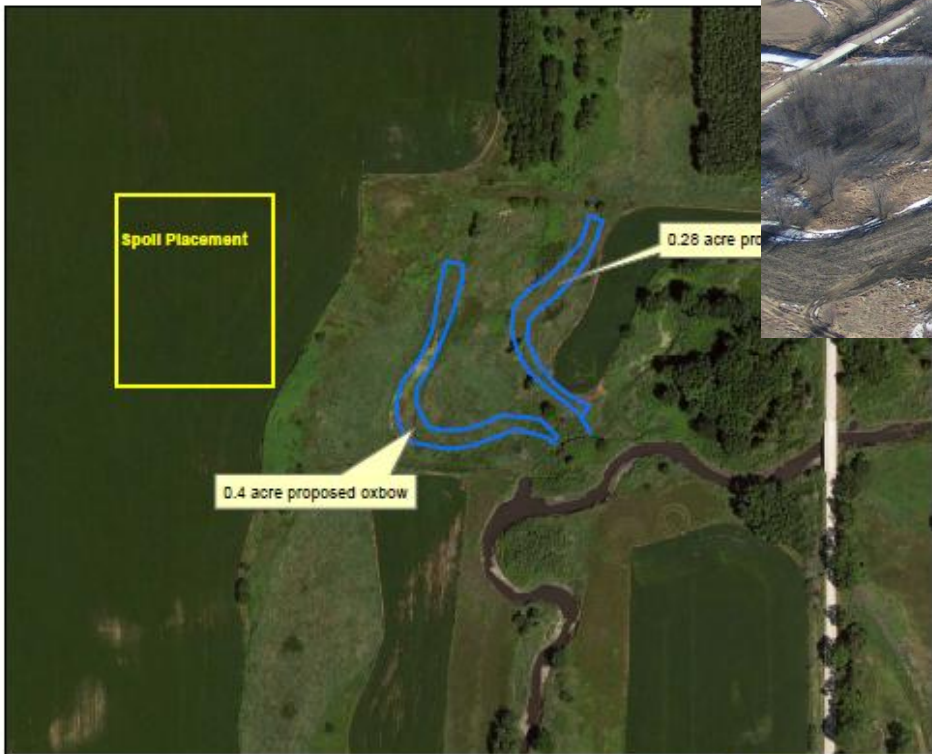
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██████████ Preliminary Oxbow Restoration Map  
Wright County, IA  
██████████



0 140 280 560 Feet

Estimated oxbow removal 4,387 cubic yards PSA. Excavate oxbow bottoms to old river bottom, not to exceed 88.8. Leave oxbow bottoms uneven with 2:1 slopes. Haul all spoils out of the floodplain and reseed disturbed areas. Also two nearby active tile lines will be diverted into each of the oxbows in order to improve water quality within White Fox Creek.



Design by: Aleshia Kenney, USFWS  
Rock Island Ecological Services Field Office  
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Moline, IL 61265  
309-757-5800 x218

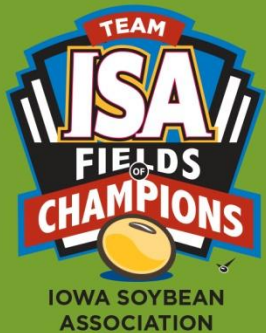


**Environmental Programs & Services**  
IOWA SOYBEAN ASSOCIATION

8-30-2012

Oxbow Restoration within Boone River Watershed supports biodiversity and water quality goals





# Oxbow Restoration



Before



After







Thank You  
Questions?