Farmer-led Efforts to Improve Water Quality

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Fluid Fertilizer Foundation
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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
Total Grain Production (Metric Tons)
Iowa – 55 Million
Canada – 45 Million
Total Soybean Production (Metric Tons)

China – 15 Million
Iowa – 14 Million
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

<table>
<thead>
<tr>
<th>Year</th>
<th>Corn Production</th>
<th>Nutrient Use on Corn</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>6.64</td>
<td>10.58</td>
</tr>
<tr>
<td>1990</td>
<td>7.93</td>
<td>9.04</td>
</tr>
<tr>
<td>2000</td>
<td>9.92</td>
<td>9.28</td>
</tr>
<tr>
<td>2010</td>
<td>12.43</td>
<td>10.18</td>
</tr>
<tr>
<td>2014</td>
<td>14.22</td>
<td>11.06</td>
</tr>
</tbody>
</table>

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

105% Increase in Efficiency!
Microbial production of nitrate from native soil (100-400 lbs N/acre/year)

Fertilizer to Corn (~150 lbs N/acre/year)

Nitrate leaching to water (~30 lbs N/acre/year)

Gaseous Loss (~10 lbs N/acre/year)

Corn Grain Harvest (~100 lbs N/acre/year)

Corn Nitrate Use (~165 lb N/acre)

Corn Residue Return (~65 lbs N/acre/year)

Native Soil Organic Matter Nitrogen ~ 10,000 lb N/acre

Microbial re-uptake of nitrate (150-350 lbs N/acre/year)

NITRATE

Corn Nitrate Use (~165 lb N/acre)
Soybean Nitrogen Cycling & Budget

- Soybean Grain Harvest (~165 lbs N/acre/year)
- Soybean Nitrogen Use (~230 lb N/acre)
- Atmospheric Fixation (~100 lbs N/acre/year)
- Gaseous Loss (~2 lbs N/acre/year)
- Soybean Nitrate Use (~130 lb N/acre/year)
- Soybean Residue Return (~65 lbs N/acre/year)
- Native Soil Organic Matter Nitrogen ~ **10,000 lb N/acre**
- Microbial production of nitrate from native soil (100-400 lbs N/acre/year)
- Microbial re-uptake of nitrate (150-350 lbs N/acre/year)
- Nitrate leaching to water (~30 lbs N/acre/year)
Iowa Water Challenges and Opportunities

List of Iowa's Impaired Waterbodies (2012)

Impaired Lakes (141 Lakes/234 Impairments)
- Category 5 Impairment - TMDL Required (93 Lakes/161 Impairments)
- Category 4 Impairment - TMDL Not Needed (66 Lakes/73 Impairments)

Impaired Stream Segments (480 Segments/591 Impairments)
- Category 5 Impairment - TMDL Required (391 Segments/488 Impairments)
- Category 4 Impairment - TMDL Not Needed (107 Segments/111 Impairments)
Changes in Land Use

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

0 2000 4000 6000 8000 10000 12000 14000 16000
years


Barley
Corn Grain Harvested
Flaxseed
Hay Alfalfa
Hay Other
Oats
Rye
Sorghum
Soybeans Harvested
Wheat

acres harvested in thousands

www.iowaagwateralliance.com
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

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

<table>
<thead>
<tr>
<th>Practice</th>
<th>Comments</th>
<th>% Nitrate-N Reductiona</th>
<th>% Corn Yield Changeb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen Management Rate</td>
<td>Poultry manure compared to spring-applied fertilizer</td>
<td>-3 (20)</td>
<td>-2 (14)</td>
</tr>
<tr>
<td>Nitration Inhibitor</td>
<td>Nitrapyrin in fall – Compared to fall-applied without Nitrapyrin</td>
<td>9 (19)</td>
<td>6 (22)</td>
</tr>
<tr>
<td>Cover Crops</td>
<td>Ryegrass</td>
<td>31 (26)</td>
<td>-5 (7)</td>
</tr>
<tr>
<td>Living Mulches</td>
<td>e.g. Kura clover – Nitrate-N reduction from one site</td>
<td>41 (16)</td>
<td>9 (32)</td>
</tr>
</tbody>
</table>

## Phosphorus Practices

<table>
<thead>
<tr>
<th>Practice</th>
<th>Comments</th>
<th>% P Load Reductiona</th>
<th>% Corn Yield Changeb</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phosphorus Application</td>
<td>Applying P based on crop removal – Assuming optimal STP level and P incorporation</td>
<td>0.6</td>
<td>0</td>
</tr>
<tr>
<td>Source of Phosphorus</td>
<td>Soil Test P – No P applied until STP drops to optimum</td>
<td>17</td>
<td>0</td>
</tr>
<tr>
<td>Placement of Phosphorus</td>
<td>Broadcast incorporated within 1 week compared to no incorporation, same tillage</td>
<td>46 (45)</td>
<td>-1 (13)</td>
</tr>
<tr>
<td>Tillage</td>
<td>Conservation till – chisel plowing compared to moldboard plowing</td>
<td>50 (49)</td>
<td>0 (6)</td>
</tr>
</tbody>
</table>

## Nitrogen Characteristics

- Nitrogen moves primarily as nitrate-N with water

## Phosphorus Characteristics

- Phosphorus moves primarily with eroded soil

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**Note:**
- a: % Load Reduction
- b: % Corn Yield Change
- iowaaagwateralliance.com
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

- West Branch of the Floyd River Water Quality Initiative
- Deep Creek Water Quality Initiative Project
- Headwaters North Raccoon River
- Elk Run Watershed Water Quality Initiative Project
- Bluegrass & Crabapple - East Nishnabotna Watershed Projects
- 4 Mile Creek WMA
- Rock Creek
- Boone River Watershed Nutrient Management Initiative
- 4 Mile Creek WMA
- Central Turkey River Nutrient Reduction Demonstration Project
- Demonstration of Targeted Nutrient Reduction Demonstration Project
- Miller Creek Water Quality Improvement Project
- Benton/Tama Nutrient Reduction Demonstration Project
- Leading a New Collaborative Approach to Improving Water Quality in the Squaw Creek Watershed
- West Fork Cooked Creek Water Quality & Soil Health Initiative
- Van Zante Creek Water Quality Improvement Project
- Walnut Creek Watershed Project
- Cedar Creek Partnership Project

IOWA AGRICULTURE WATER ALLIANCE

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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

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.

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.

Water Quality

Economic development
CI Update

LEADING THE CONSERVATION INFRASTRUCTURE INITIATIVE

In the first year, work will focus on bringing the public and private sectors together to develop a strategy.

The work of the Iowa Water Quality Initiative is bringing together a diverse group of partners, including businesses, NGOs, and others, to develop a strategy.

Join us as we work together to meet Iowa’s water quality goals.

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

www.IowaCI.org

CONSERVATION WORKING GROUPS

There is an existing working group that focuses on conservation issues and is collaboration, but we need to expand that and develop a strategy. We need to be able to monitor and track the progress of that working group.

The 2017 Iowa/NIW Project Proposal states the vision to bring together private and public sectors to develop a strategy.

About the Conservation Infrastructure Initiative

The 2017 Iowa/NIW Project Proposal states the vision to bring together private and public sectors to develop a strategy.

How can I get involved?

LEAVING A LAND LEGACY

A landowner can leave a valuable legacy through their land. The Conservation Infrastructure Initiative will work with landowners to develop a plan to leave a legacy.

www.IowaCI.org

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

- **MAWQP**
  - 68%
  - All Others: 32%

- **EQIP Dollars**
  - $3.4 M total

- **EQIP Acres**
  - 27,000 total

- **MAWQP**
  - 85%
  - All Others: 16%

- **MAWQP**
  - 65%
  - All Others: 35%

- **Contracts**
  - 153 total

IAWA
IOWA AGRICULTURE WATER ALLIANCE

www.iowaagwateralliance.com
RCPP Practices by Signup

- Conservation Cover
- Constructed Wetland
- Drainage Water Mgt.
- Saturated buffers
- No-till/Strip-till
- Bioreactors
- Nutrient Mgt.
- Cover Crops

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
Questions?

Get involved!

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