Iowa Nutrient Reduction Strategy, Measures of Success Process Report

John D. Lawrence
August 26, 2015
Overview

• Iowa’s Strategy
• Measurement approach
• Progress to date
What is the Iowa Nutrient Reduction Strategy?

• Voluntary, science-based program to reduce Nitrogen and Phosphorous impact on water
• Includes cities, industry and agriculture
• **A practice-based approach to show meaningful and measurable progress**
• A framework for innovation and verification of new practices and technologies
How it was developed

• Policy section
  – Led by IDALS and IDNR with input from point and nonpoint source stakeholders who will make the investments

• Science Assessment
  – Led by ISU with scientists from IDALS, IDNR, USDA- ARS and NRCS, and other institutions
  – Point source technical assessment by wastewater engineers and cities
Point source goals

• 102 cities/facilities
  – Serve 55--60% of Iowa’s population
  – Treat over 80% of wastewater

• 28 permitted industrial facilities

• Required to implement technically and economically feasible process changes for nutrient removal.
  – Designed to achieve targeted reductions of at least 67% of N and 75% of P current levels discharged
  – This accounts for 4%N and 16%P of the 45%
Non-point source Goals

• Implement science-based practices to achieve the remaining reduction to 45%.
  – 41% N and 29% P

• Action items identified
  – Strengthen outreach, education, collaboration
  – Setting priorities
  – Funding cost share
  – Research and technology
  – Documenting progress
Nitrogen moves primarily as nitrate-N with water

<table>
<thead>
<tr>
<th>Practice</th>
<th>Comments</th>
<th>% Nitrate-N Reduction*</th>
<th>% Corn Yield Change*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen Management</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Source</td>
<td>Liquid swine manure compared to spring-applied fertilizer</td>
<td>4 (11)</td>
<td>0 (13)</td>
</tr>
<tr>
<td>Nitrogen Application Rate</td>
<td>Nitrogen rate at the MRTN (0.10 N core price ratio) compared to current estimated application rate. (ISU Corn Nitrogen Rate Calculator – <a href="http://extension.agron.iastate.edu/nitrog/erate.aspx">http://extension.agron.iastate.edu/nitrog/erate.aspx</a> can be used to estimate MRTN but this would change Nitrate-N concentration reduction)</td>
<td>10</td>
<td>-1</td>
</tr>
<tr>
<td>Nitratification 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>Rye</td>
<td>31 (29)</td>
<td>-6 (7)</td>
</tr>
<tr>
<td></td>
<td>Oat</td>
<td>28 (2)</td>
<td>-5 (1)</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 moves primarily with eroded soil

<table>
<thead>
<tr>
<th>Practice</th>
<th>Comments</th>
<th>% P Load Reduction*</th>
<th>% Corn Yield Change*</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>0.5&lt;sup&gt;1&lt;/sup&gt;</td>
<td>0</td>
</tr>
<tr>
<td>Source of Phosphorus</td>
<td>Liquid swine, dairy, and poultry manure compared to commercial fertilizer – Runoff shortly after application</td>
<td>46 (45)</td>
<td>-1 (13)</td>
</tr>
<tr>
<td>Placement of Phosphorus</td>
<td>Broadcast incorporated within 1 week compared to no incorporation, same tillage</td>
<td>46 (36)</td>
<td>0</td>
</tr>
<tr>
<td>Cover Crops</td>
<td>Winter rye</td>
<td>29 (37)</td>
<td>-6 (7)</td>
</tr>
<tr>
<td>Tillage</td>
<td>Conservation till – chisel plowing compared to moldboard plowing</td>
<td>33 (49)</td>
<td>0 (6)</td>
</tr>
<tr>
<td></td>
<td>No till compared to chisel plowing</td>
<td>90 (17)</td>
<td>-6 (8)</td>
</tr>
</tbody>
</table>

ISU Extension and Outreach: SP 435, September 2014
Measures of success committee

Measurable indicators of desirable change
Specific indicators in attached text

**Inputs**
- People
- Funding
- Agency resources
- Private sector resources

**Human**
- Partner Organizations
- Partner Agribusinesses
- Farmer knowledge and attitude
- Point source communities and management knowledge and attitude

**Land**
- Land use changes
  - Net acres cover crops
  - Net acres perennials
  - Etc.
- Practice adoption
  - Acres of practice X
  - Acres of practice Y
  - Etc.
- Point source implementation
  - Feasibility studies
  - Permit applications
  - Construction

**Water**
- Calculated load reduction
- Measured loads in priority watersheds
- Organized watersheds reported load changes
- Measured loads at existing monitoring stations
Annual Progress Report 2014-2015

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Inputs
<table>
<thead>
<tr>
<th>2015 Public Investment</th>
<th>Million $</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iowa Dept of Ag and Land Stewardship</td>
<td>17.9</td>
</tr>
<tr>
<td>State Revolving Fund</td>
<td>35.7</td>
</tr>
<tr>
<td>Natural Resource Conservation Service</td>
<td>34.0</td>
</tr>
<tr>
<td>Iowa Nutrient Research Center</td>
<td>1.3</td>
</tr>
</tbody>
</table>
# NGO Investment 2015

<table>
<thead>
<tr>
<th>Organization/Partnership</th>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iowa Farm Bureau Federation SHARE</td>
<td>Grants/Partnerships in various other projects</td>
<td>$72,350</td>
</tr>
<tr>
<td>Iowa Pork Producers Association IAWA/Partnership in other projects</td>
<td></td>
<td>$210,000</td>
</tr>
<tr>
<td>Iowa Soybean Association</td>
<td>Various research, outreach, conservation planning, practice installation, and monitoring programs</td>
<td>$1,594,303</td>
</tr>
</tbody>
</table>
Raising Awareness and Education
Reported by WRCC/WPAC
June 1, 2014 - May 30th, 2015

<table>
<thead>
<tr>
<th>Description</th>
<th>Number</th>
<th>Attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field Days</td>
<td>637</td>
<td>23,366</td>
</tr>
<tr>
<td>Presentations</td>
<td>239</td>
<td>14,887</td>
</tr>
<tr>
<td>Conferences</td>
<td>16</td>
<td>3,842</td>
</tr>
<tr>
<td>Workshops/Meetings</td>
<td>168</td>
<td>3,266</td>
</tr>
<tr>
<td>Print or Media</td>
<td>252</td>
<td>975,258</td>
</tr>
<tr>
<td>Radio &amp; Television</td>
<td>258</td>
<td>4,300,000</td>
</tr>
<tr>
<td>Newsletters</td>
<td>240</td>
<td>489,845</td>
</tr>
<tr>
<td>Awards/Recognition</td>
<td>21</td>
<td>116</td>
</tr>
<tr>
<td>Activities</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Surveys</strong></td>
<td>6</td>
<td>1,033</td>
</tr>
</tbody>
</table>
Human
Iowa Learning Farms

- Farmers attending Iowa Learning Farms field days report they successfully influence 65% more farmers to try conservation practices.
  - 88% of farmers attending ILF field days have made a change in their behavior between 2010-2014
  - An average of 373 new acres with no-till or strip-till per survey respondent since 2010
  - 38% of farmers responding increased surface residue management (no-till/strip-till) on 97,331 new acres since 2010
  - 47% of farmers responding increased cover crop usage since 2010, on 77,492 acres
NRS Farmer Survey

• Funded by IDALS, Conducted by ISU
• Survey objectives:
  – 1) measure farmer knowledge, attitudes, and behavior,
  – 2) identify barriers to and facilitators of behavior change
  – 3) measure change in these over time.
• Sampling approach:
  – 5-year annual rotating longitudinal survey.
  – Six HUC6 watersheds, survey 2/year
    • Compare over time,
    • across watersheds and
    • Targeted v. non-targeted watersheds
## Survey Response as of June 12, 2015.

<table>
<thead>
<tr>
<th>Watershed</th>
<th>Sample</th>
<th>Completed Surveys</th>
<th>Response Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>HUC6 Iowa</td>
<td>2375</td>
<td>900</td>
<td>43.9%</td>
</tr>
<tr>
<td>HUC8 Lower Iowa</td>
<td>1175</td>
<td>412</td>
<td>40.2%</td>
</tr>
<tr>
<td>HUC8 Middle Cedar</td>
<td>1200</td>
<td>488</td>
<td>47.6%</td>
</tr>
<tr>
<td>HUC6 Missouri-Little Sioux</td>
<td>2027</td>
<td>734</td>
<td>40.6%</td>
</tr>
<tr>
<td>HUC8 Big Papillion-Mosquito &amp; Boyer</td>
<td>1011</td>
<td>332</td>
<td>37.2%</td>
</tr>
<tr>
<td>HUC8 Floyd</td>
<td>1016</td>
<td>402</td>
<td>43.9%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>4402</td>
<td>1634</td>
<td>42.4%</td>
</tr>
<tr>
<td>Unknown Watershed (Case ID removed)</td>
<td>--</td>
<td>22</td>
<td>--</td>
</tr>
<tr>
<td><strong>TOTAL + UNKNOWN WATERSHED</strong></td>
<td>4402</td>
<td>1656</td>
<td>42.9%</td>
</tr>
</tbody>
</table>
Land
Point source procedures

• Feasibility studies submitted
• Permits amended with nutrient removal/reduction construction schedules
• Nutrient removal/reduction facilities in place/in design/under construction
• Facilities monitoring nutrient in their effluent
• Nitrogen and phosphorus loads discharged
Point Sources

• Weekly monitoring now are being submitted by the 54 facilities whose permits have been issued since the strategy was released.
Non-Point Sources

• Land use changes
• Edge-of-field practices
• In-field management
NPS Public data

- Land Use
- FSA reported data

<table>
<thead>
<tr>
<th>Iowa Crop Reporting District</th>
<th>Corn</th>
<th>Soybeans</th>
<th>Alfalfa</th>
<th>Oats &amp; Small Grains</th>
<th>Forage &amp; Grazing Crops</th>
<th>Alternative Agricultural Crops and Practices</th>
<th>CRP</th>
<th>Prevent Plant, Left Standing &amp; Failed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northwest</td>
<td>2,041,319</td>
<td>1,435,589</td>
<td>30,082</td>
<td>8,951</td>
<td>40,129</td>
<td>5,864</td>
<td>94,599</td>
<td>82,213</td>
</tr>
<tr>
<td>North Central</td>
<td>1,706,198</td>
<td>1,090,862</td>
<td>16,821</td>
<td>10,473</td>
<td>22,869</td>
<td>6,511</td>
<td>132,733</td>
<td>391,039</td>
</tr>
<tr>
<td>Northeast</td>
<td>1,594,102</td>
<td>722,649</td>
<td>135,771</td>
<td>48,052</td>
<td>102,215</td>
<td>6,262</td>
<td>206,448</td>
<td>172,318</td>
</tr>
<tr>
<td>West Central</td>
<td>2,125,863</td>
<td>1,404,368</td>
<td>39,399</td>
<td>11,892</td>
<td>139,724</td>
<td>12,344</td>
<td>142,380</td>
<td>96,231</td>
</tr>
<tr>
<td>Central</td>
<td>1,913,802</td>
<td>1,328,168</td>
<td>37,784</td>
<td>11,280</td>
<td>75,831</td>
<td>6,486</td>
<td>142,274</td>
<td>115,267</td>
</tr>
<tr>
<td>East Central</td>
<td>1,407,880</td>
<td>896,048</td>
<td>61,337</td>
<td>21,129</td>
<td>107,557</td>
<td>5,583</td>
<td>158,345</td>
<td>52,691</td>
</tr>
<tr>
<td>Southwest</td>
<td>1,085,809</td>
<td>956,697</td>
<td>37,857</td>
<td>15,516</td>
<td>237,763</td>
<td>810</td>
<td>160,585</td>
<td>58,352</td>
</tr>
<tr>
<td>South Central</td>
<td>536,096</td>
<td>554,269</td>
<td>59,156</td>
<td>24,907</td>
<td>462,994</td>
<td>4,492</td>
<td>318,638</td>
<td>126,679</td>
</tr>
<tr>
<td>Southeast</td>
<td>877,903</td>
<td>787,753</td>
<td>36,910</td>
<td>152,200</td>
<td>1,189,082</td>
<td>4,139</td>
<td>293,419</td>
<td>1,094,790</td>
</tr>
<tr>
<td>Statewide</td>
<td>13,288,972</td>
<td>9,176,403</td>
<td>455,117</td>
<td>304,400</td>
<td>2,378,164</td>
<td>52,491</td>
<td>1,644,421</td>
<td>2,189,580</td>
</tr>
</tbody>
</table>
NPS Public data

• Edge-of-field practices
• NRCS and IDALS reported data
• Challenges
  – Consistency in reporting
  – Access to data (FOIA)
  – Duplication of reporting
  – Installed not existing
NPS Public data

• In-field management
• Private sector data = confidentiality worry
• Engage ag retailers in public-private project
  – Statistically sample fields to be surveyed
  – ISU involved in survey and sample design
  – Farmer permission to cooperate
  – CCA’s collect the field level data
  – Return aggregated data to ISU
  – Audited process
Proposed funding-reporting plan

Funding for Measurement

ISU CALS

Farmer Attitude and Knowledge Survey

Summarize public data from IDALS, NRCS and FSA

Design survey protocol and data format

In-field & validate practices by Private Partner

Aggregate Data without name & location

Measured water quality load reduction

Watershed project monitoring

Ambient water monitoring

Load estimate based on practices

Reporting Coordinator (Public)
Water
Water Quality Monitoring Summary

• A technical work group working to define a standard method to calculate nutrient loads based on the existing ambient stream monitoring.
  – Representatives from: DNR, ISU, IDALS, ISA, USGS, and UI.
  – Nitrogen completed, working on Phosphorus
Water Quality Monitoring Summary

• Work was initiated in March 2015 to begin to coordinate public and NGO nutrient monitoring efforts.
• U of Iowa IIHR Flood Center real-time N monitors
  – Funding to add to current network
  – With USGS will have 40 state-wide
Load calculations

- Calculate load based on practices
- Change in practices produces an estimated change in loads
Summary

• The goal is difficult but not impossible
• Logic model approach has appeal, but
  – Some only want to focus on monitoring
  – Some want date benchmarks
• Measuring everything we can now and improve as we go
• Agriculture operates on an annual cycle, but the news cycle is 24/7/365