Keith Schilling, Geological Survey – Nutrient Loading Study
- Nutrient load is a product of concentration X discharge. The INRS goal is focused on a 45% reduction of load.
- Soil loss peaked in the 1970s and has remained about the same since the 1990s.
- Streams account for approximately 5% of nitrate outputs.
- Temporal correlation may exist up to 2 years, which is a long lag time.
- From 1998 (when monitoring began) through 2012, 46 ambient (out of 60) sites were assessed (for nitrates), 37 of the sites did not show a significant trend. 6 sites with significant increasing trends were in western Iowa (MO River watershed).
- Collectively, nitrate concentrations are increasing at an average rate of .05 mg/l over the 14 year period.
- Reasons for the increase – weather patterns were not significant and some increases in fertilizer and animal units in NW Iowa, but more data is needed to determine why this happens.
- Discharge was not a part of the calculation. Including discharge could change the N trend, showing a possible decrease.
- A similar study for phosphorus, including discharge, at 12 sites saw 2.0-8.2% decrease.
- The model used is available and can be used to calculate annual trends in the future.

Chris Jones, IA Soybean Association (ISA) – ISA On-Farm Nitrate Study in the Raccoon River
- Study years 1999-2013, 60 monitoring sites (10,000 samples) and data from 500 fields.
- Found an increase in corn acres.
- Record nitrate levels occurred in 2012 with the Raccoon River reaching nitrates at 24 mg/l and the Des Moines River at 19/mg/l.
- Many county tile lines can be found with nitrate levels above 60 mg/l (for example Elk Run Creek 68 mg/l and a tile in Eastern Iowa was 89 mg/l).
- Historical data shows a correlation of higher nitrate levels to periods following drought.
- In the presenters opinion is that the correlation may be the result of side-dressing nitrogen.
    - 40 sites 47 sites
    - 38 sites trending down 45 sites trending down
    - 0.28 mg/l per year (average) 0.62 mg/l per year (average)
- All six flow-gauged sites (Sac City, Jefferson, Redfield, Panora, Van Meter, and Fleur) showed a drop in nitrate concentration with flow-weighted data.
- Precipitation has increased – inputs have not changed.
- Nitrogen efficiency has not changed since the 1990s.
- Other findings:
  - More de-nitrification under corn.
  - More losses from soil mineralization after soybean in the fall, especially with fall tillage.
  - Farmers are more aggressively managing corn on corn.
  - More immobilization of N into the soil under corn.
  - Greater tile flow under soybeans, concentration remains the same, but there is more water.
• Going forward:
  o There has been incremental change – but conditions are still not acceptable
  o Transformational changes in agricultural production are needed.
  o There is a need to better manage soybeans.
  o Additional monitoring and credible data are needed for making policy and spending conservation dollars.
  o The public needs to understand that water must be better managed, keeping it on the landscape where it falls.

Jamie Benning, IA State University, Conservation Practices Central Database

• ...  
• ...  
• ... 

Questions for Discussion: WPAC Communication and Annual Report
  1. Decisions will be based on consensus.
  2. Requests for forwarding informational papers or articles, project updates, and so forth to WPAC members will be fulfilled by distribution at the WPAC meeting following the request.
  3. Recipients of the WPAC annual report is outlined in IA Code 466B31 (3).
  4. Inclusion in the WRCC/WPAC annual report, also included in IA Code 466B31 (3). In addition to IA Code requirements:
     a. Comments and recommendations in response to measurables.
     b. Summary of presentations – to include the issues being addressed, what has occurred and where are they headed.
     c. Identification of gaps.
     d. How do they measure success?

Future Program Suggestions:
• Panel – Watershed Management Authority (WMA), Water Quality Initiative, IA Department of Natural Resources (IDNR), and Resource Conservation and Development (RC & D)
• USDA – NRCS – Technical Assistance
• Point Source Trading
• Economic of Nutrient Management – Nutrient Research Center and/or Center for Agriculture and Rural Development (CARD)
• Watershed Planning
• New Technologies – saturated buffers, control drainage, etc.

Next meeting – September 26, 2014 – 10:00 AM- 3:00 PM – Iowa Corn Growers Association
Measures of Success
Progress report 3/20/14

Update from Lawrence, not the full committee
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
Resources for Water Quality

Drops in the Bucket:
The Erosion of Iowa Water Quality Funding

– Will Hoyer, Brian McDonough, David Osterberg
– March, 2012. The Iowa Policy Project

Report tracks funding for 10 distinct funding lines directed to water quality for the FY 2002-2012 period.
Resources for Water Quality

IDALS
• Conservation Reserve Enhancement Program (CREP)
• Conservation Reserve Program (CRP)
• Watershed Protection Fund
• Soil Conservation Cost Share
• Agricultural Drainage Well Closure
• Water Protection Loan Program

DNR and IDALS
• Resource Enhancement and Protection

DNR
• Geographic Information Systems (GIS) for Watersheds
• Water quality monitoring
• Water Quality Protection Fund
Resources for Water Quality

Figure 2. Adjusted for Inflation, General Funding Flat or Down from Iowa, U.S.
Values in Millions — 2011 Dollars

IOWA STATE UNIVERSITY
Extension and Outreach
Farm and Rural Life Poll

- Iowa State University
- Established in 1982
- Approximately 2,000 Iowa farm operators participate annually
- Reoccurring questions that include conservation attitude and action
<table>
<thead>
<tr>
<th>Question</th>
<th>Strongly Disagree</th>
<th>Disagree</th>
<th>Uncertain—Percentage—</th>
<th>Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Cover crops can reduce soil erosion significantly (n=1,275)</td>
<td>0.9</td>
<td>2.6</td>
<td>14.1</td>
<td>67.6</td>
<td>14.7</td>
</tr>
<tr>
<td>b. Cover crops reduce N and P losses (n=1,271)</td>
<td>0.6</td>
<td>5.7</td>
<td>35.4</td>
<td>49.3</td>
<td>9.0</td>
</tr>
<tr>
<td>c. If 50 percent cost-share were available for cover crop establishment, I would plant them (n=1,263)</td>
<td>3.3</td>
<td>15.3</td>
<td>53.6</td>
<td>22.2</td>
<td>5.5</td>
</tr>
<tr>
<td>d. I don’t know enough about cover crops to use them (n=1,264)</td>
<td>5.0</td>
<td>27.1</td>
<td>32.9</td>
<td>32.7</td>
<td>2.3</td>
</tr>
<tr>
<td>e. Cover crops can improve soil productivity (n=1,263)</td>
<td>0.6</td>
<td>3.2</td>
<td>33.1</td>
<td>54.9</td>
<td>8.2</td>
</tr>
<tr>
<td>f. I don’t have the necessary equipment for cover crops (n=1,257)</td>
<td>4.0</td>
<td>24.7</td>
<td>31.1</td>
<td>36.2</td>
<td>4.1</td>
</tr>
<tr>
<td>g. Cover crops can delay spring planting (n=1,260)</td>
<td>1.5</td>
<td>15.2</td>
<td>45.6</td>
<td>33.7</td>
<td>4.0</td>
</tr>
<tr>
<td>h. If shorter-season crop varieties yielded the same as longer-season, I would be more likely to plant cover crops (n=1,258)</td>
<td>1.4</td>
<td>12.4</td>
<td>54.6</td>
<td>29.3</td>
<td>2.3</td>
</tr>
<tr>
<td>i. There is rarely enough time between harvest and winter to justify the use of cover crops (n=1,269)</td>
<td>1.1</td>
<td>7.4</td>
<td>30.6</td>
<td>47.8</td>
<td>13.1</td>
</tr>
<tr>
<td>j. I would like to learn more about using cover crops (n=1,249)</td>
<td>2.9</td>
<td>13.1</td>
<td>43.6</td>
<td>36.0</td>
<td>4.5</td>
</tr>
</tbody>
</table>
# Farm and Rural Life Poll 2010

A good farmer is one who...  

<table>
<thead>
<tr>
<th>Activity</th>
<th>Not Important at All</th>
<th>Not Really Important</th>
<th>Somewhat Important</th>
<th>Important</th>
<th>Very Important</th>
</tr>
</thead>
<tbody>
<tr>
<td>d. considers the health of streams that run through or along their land</td>
<td>0.5</td>
<td>1.4</td>
<td>16.7</td>
<td>54.0</td>
<td>27.5</td>
</tr>
<tr>
<td>e. minimizes soil erosion</td>
<td>0.1</td>
<td>0.3</td>
<td>7.3</td>
<td>50.0</td>
<td>42.3</td>
</tr>
<tr>
<td>f. minimizes nutrient runoff into waterways</td>
<td>0.1</td>
<td>0.4</td>
<td>8.1</td>
<td>49.1</td>
<td>42.3</td>
</tr>
<tr>
<td>k. uses cover crops between harvest and planting</td>
<td>5.5</td>
<td>38.3</td>
<td>39.5</td>
<td>13.0</td>
<td>3.7</td>
</tr>
<tr>
<td>u. avoids fall tillage</td>
<td>3.9</td>
<td>22.9</td>
<td>33.1</td>
<td>29.2</td>
<td>10.9</td>
</tr>
<tr>
<td>y. minimizes tillage</td>
<td>1.7</td>
<td>11.2</td>
<td>34.7</td>
<td>38.4</td>
<td>14.0</td>
</tr>
<tr>
<td>aa. puts long-term conservation of farm resources before short-term</td>
<td>0.8</td>
<td>3.3</td>
<td>28.0</td>
<td>47.6</td>
<td>20.3</td>
</tr>
<tr>
<td>ad. thinks beyond their own farm to the social and ecological health</td>
<td>0.7</td>
<td>3.5</td>
<td>32.5</td>
<td>47.8</td>
<td>15.5</td>
</tr>
</tbody>
</table>

SOURCE: IOWA STATE UNIVERSITY Extension and Outreach
# Farm and Rural Life Poll 2010

## Conservation practices

<table>
<thead>
<tr>
<th>Practice</th>
<th>Have established practice to adequate extent</th>
<th>Should establish or improve practice</th>
<th>Practice not needed or not applicable</th>
<th>Don’t know</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Terraces (n=1,283)</td>
<td>36.2</td>
<td>12.0</td>
<td>46.9</td>
<td>4.9</td>
</tr>
<tr>
<td>b. Grassed waterways (n=1,296)</td>
<td>66.0</td>
<td>18.1</td>
<td>14.4</td>
<td>1.5</td>
</tr>
<tr>
<td>c. Conservation tillage (no-till, reduced tillage, strip tillage, etc.) (n=1,292)</td>
<td>66.5</td>
<td>11.6</td>
<td>18.0</td>
<td>3.9</td>
</tr>
<tr>
<td>d. Buffer strips of grass and/or trees along ditches, streams, and other waterways (n=1,291)</td>
<td>53.3</td>
<td>13.3</td>
<td>29.7</td>
<td>3.7</td>
</tr>
<tr>
<td>e. Contour buffer strips of grass or other perennial vegetation (n=1,287)</td>
<td>28.4</td>
<td>11.7</td>
<td>53.8</td>
<td>6.1</td>
</tr>
<tr>
<td>f. Manure management plan (n=1,282)</td>
<td>24.6</td>
<td>6.8</td>
<td>64.0</td>
<td>4.6</td>
</tr>
<tr>
<td>g. Nutrient management plan (n=1,274)</td>
<td>41.6</td>
<td>18.1</td>
<td>31.6</td>
<td>8.7</td>
</tr>
<tr>
<td>h. Cover crops (n=1,275)</td>
<td>11.5</td>
<td>18.2</td>
<td>57.5</td>
<td>12.9</td>
</tr>
<tr>
<td>i. Integration of small grain or forage crops into your crop rotation (n=1,255)</td>
<td>25.7</td>
<td>11.0</td>
<td>53.1</td>
<td>10.1</td>
</tr>
</tbody>
</table>
Farm and Rural Life Poll

• Examples of other topics
  – Nutrient removal wetlands
  – Perennials, CRP and biomass
  – Land owner attitudes
  – Water quality attitude
<table>
<thead>
<tr>
<th>Agency</th>
<th>Contract/Easement Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Program</td>
<td>State/County/Watershed Level Tracking Potential</td>
</tr>
<tr>
<td>Practice Type/Code</td>
<td>Annual N Load Reduction (lbs)</td>
</tr>
<tr>
<td>Number of Practices</td>
<td>Annual P Load Reduction (lbs)</td>
</tr>
<tr>
<td>Practice Units (acres, feet, etc.)</td>
<td>Annual Sediment Load Reduction (lbs)</td>
</tr>
<tr>
<td>Area Served (ac)</td>
<td>Lifetime N Load Reduction (lbs)</td>
</tr>
<tr>
<td>Total C/S</td>
<td>Lifetime P Load Reduction (lbs)</td>
</tr>
<tr>
<td>Total Private Match</td>
<td>Lifetime Sediment Load Reduction (lbs)</td>
</tr>
<tr>
<td>Year Implemented</td>
<td>Reduction Calculation Method</td>
</tr>
<tr>
<td>Lifetime Expectancy (years)</td>
<td></td>
</tr>
</tbody>
</table>

IOWA STATE UNIVERSITY
Extension and Outreach
## Farm Service Administration

### Annual County Level Data

#### Example of crops and use

<table>
<thead>
<tr>
<th>Crop Code</th>
<th>Crop</th>
<th>Intended Use</th>
<th>Planted Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>0011</td>
<td>Wheat</td>
<td>Forage</td>
<td></td>
</tr>
<tr>
<td>0016</td>
<td>Oats</td>
<td>Grain</td>
<td></td>
</tr>
<tr>
<td>0094</td>
<td>Rye</td>
<td>Left Standing</td>
<td></td>
</tr>
<tr>
<td>0129</td>
<td>Rapeseed</td>
<td>Forage</td>
<td></td>
</tr>
<tr>
<td>0265</td>
<td>Clover</td>
<td>Grazing</td>
<td></td>
</tr>
<tr>
<td>0296</td>
<td>Mixed forages</td>
<td>Cover Only</td>
<td></td>
</tr>
<tr>
<td>0099</td>
<td>CRP by type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0158</td>
<td>TRITICALE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Farm Service Administration
CRP in Adair County

CP1 EST PERM INTRO GRASS AND LEGUME  CP21 FILTER STRIPS  CP3A HARDWOOD TREE PLANTING
CP2 EST PERM NATIVE GRASSES  CP22 RIPARIAN BUFFER  CP42 POLLINATOR HABITAT
CP3 TREE PLANTING  CP23 WETLAND RESTORATION  CP4D PERM WL HABITAT NONEASE
CP4 PERMANENT WL HABITAT  CP25 RARE AND DECLINING HABITAT  CP5A FIELD WINDBREAK NONEASE
CP8 GRASS WATERWAYS  CP28 FWP BUFFER  CP8A GRASS WATERWAY NONEASE
CP9 SHALLOW WATER AREAS FOR WL  CP29 MPL WL HABITAT BUFFER  CP15A EST CONTR GRASS STRPS NONEASE
CP10 VEG COVER, GRASS ALREADY EST  CP30 MPL WETLAND BUFFER  CP15B EST CONTR GRAS STRP ON TERRAC
CP12 WILDLIFE(WL) FOOD PLOT  CP32 EXPIRED HARDWOOD TREES  CP23A WETLAND RESTOR NONFLOODPL
CP15 EST PERM VEG CVR CONTOUR STRPS  CP33 HABITAT BUFRS UPLAND BIRDS  CP38B SAFE WETLANDS
CP38E SAFE GRASS
N and P Load Measurement in Iowa’s Water

- Iowa DNR: Iowa's Ambient Watershed Monitoring and Assessment Program
  - 98 Sites throughout State
  - Includes Sites Upstream and Downstream of Urban Centers
  - Monitored monthly
  - Mostly paired with USGS Gage locations
  - Data from 2000-2010
N and P Load Measurement in Iowa’s Water

- ISU, U of Iowa and UNI have monitoring
- Watershed scale monitoring
- Demonstration site monitoring
- Research scale monitoring
Other ongoing activities

• AAI technical committee on utilizing CCAs and agronomic databases to document acres
• WQI Communications Committee suggesting elements of “Partner Organizations”
• WPAC asked to suggest elements of “Partner Agribusinesses”
• DNR Nutrient Balance Committee discussing load measurements.
Goals

1. Build Partnerships to Enhance a Collaborative Watershed Approach to Nonpoint Source Water Pollution

2. Improve Technical Assistance, Outreach and Education to Facilitate NPS Assessment, Planning and Implementation

3. Science-Based Performance Measures

4. Funding
DNR 2012 Nonpoint Source Management Plan

Objective 3: SCIENCE-BASED PERFORMANCE MEASURES

1. Encourage greater public participation in the monitoring and evaluation of water quality best management practices.
2. Develop local natural resource goals with targeted solutions to meet watershed needs.
3. Utilize long-term research projects, including monitoring, funding, and alternative management practices to confirm post-project results of demonstration projects.
4. Place greater focus on up-scaling small-plot research to watershed scale.
5. Establish uniform practices and protocols for monitoring that can be applied to watershed needs.
Challenges

• What agency is responsible to
  – Collect each measure
  – Compile report
  – Post report

• What resources are available
DNR 2012 Nonpoint Source Management Plan

- Objective 1.1 Recommends a centralized clearing house for information and data sharing.
- The WRCC and WPAC provide the perfect structure for a centralized clearing house for this type of reporting.
- Since the councils closely associate with the Secretary of Agriculture, the Department of Agriculture and Land Stewardship’s Division of Soil Conservation acts as the lead entity in this objective.
On the Contradiction of Increased Corn Acres and Declining Raccoon River Nitrate, 1999-2013
Raccoon River is a Stream of National Significance. Why?

- Water used by Des Moines Water Works since 1947
- Groundwater under the influence of the Raccoon has been used since 1880s
- Land use in watershed is almost completely agricultural
1960s: Elevated Nitrate begins

DMWW Average Drinking Water Nitrate

mg/L N

Biofuels: Making it Worse?

Pollution from corn farming is a leading cause of water quality problems in the Upper Mississippi River watershed, polluting drinking water in agricultural areas and degrading rivers and lakes, while also expanding the Gulf of Mexico’s “dead zone” (a large area deprived of oxygen). These problems—and their associated economic and health impacts—are exacerbated by government policies that increase demand for corn ethanol, in turn expanding U.S. corn production. Better agricultural practices that keep fertilizer out of freshwater can mitigate the water quality problems associated with corn cultivation and corn ethanol production, but if we want to protect water quality while also reducing U.S. oil dependence, biofuel production must move beyond corn to more diverse and environmentally friendly crops and waste materials.

The Corn Belt and Mississippi River Basin

The Mississippi-Atchafalaya River Basin drains 31 states that cover 40 percent of the contiguous United States (Figure 1) (Committee on Environment and Natural Resources 2010). The Corn Belt states of Illinois, Indiana, Iowa, Kansas, Minnesota, Nebraska, Ohio, and South Dakota grew more than three-quarters of the corn grown in America. This corn is used for livestock majority of the overall growth in corn production over the same period (Figure 3, p. 2) (ERS 2010).

This increase in corn production—and the fertilizer use associated with it—has implications for water quality from the Corn Belt to the Gulf of Mexico. Rains wash nitrogen and phosphorus pollution from farm fields into creeks, then small rivers, large riv-
Sponsored Monitoring at ~60 sites in Raccoon Watershed since 1999

6325 ACWA samples and 2889 samples collected at DMWW
On-Farm Network Fertilizer Data

On-Farm Network

Raccoon River Watershed Fields with Fertilizer Data by County 2006-2008

Legend
- Raccoon River Watershed
- County Boundary

Advancing Agricultural Performance

IOWA SOYBEAN Association
Expanding Opportunities. Delivering Results.
Corn and Soybean Acreage
Crop Area

RRWS Crop Area and Average ACWA NO$_3$-N

- **Corn Area**
- **Soybean Area**

1000s of Ha

Year:
- 1999
- 2000
- 2001
- 2002
- 2003
- 2004
- 2005
- 2006
- 2007
- 2008
- 2009
- 2010
- 2011
- 2012
- 2013
## Fertilizer Data

<table>
<thead>
<tr>
<th></th>
<th>Commerical N</th>
<th></th>
<th>Manure N</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Following Soybean</strong></td>
<td><strong>Fields</strong></td>
<td><strong>Average Rate</strong> (lbs/acre)</td>
<td><strong>Fields</strong></td>
<td><strong>Average Rate</strong> (lbs/acre)</td>
</tr>
<tr>
<td><em>Example Data:</em></td>
<td>266</td>
<td>150</td>
<td>56</td>
<td>168</td>
</tr>
<tr>
<td><strong>Following Corn</strong></td>
<td><strong>Fields</strong></td>
<td><strong>Average Rate</strong> (lbs/acre)</td>
<td><strong>Fields</strong></td>
<td><strong>Average Rate</strong> (lbs/acre)</td>
</tr>
<tr>
<td><em>Example Data:</em></td>
<td>107</td>
<td>185</td>
<td>39</td>
<td>206</td>
</tr>
</tbody>
</table>
2013: Extraordinary Year for WQ

• DMWW Record for Raccoon: 24 mg/L
• DMWW Record for Des Moines: 19 mg/L
• June and May two biggest loading months ever for Raccoon
• 49 of the 50 ACWA sites monitored in 2013 had their highest nitrate concentration ever
• Elk Run Creek: 68 mg/L
• County tile lines in RR and DMR WSs >60 mg/L
• E. Iowa Tile sample: 89 mg/L
Effect of Drought

Raccoon River Nitrate-N

mg/L N

N Budget Raccoon River Watershed

Thousands of Mg of N

- Applied N + N Fixation from Soy + Deposition N (Mg)
- River Load N + Grain Export N (Mg) - Point Source N (Mg)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• 40 sites with enough samples to test for trend</td>
<td>• 47 sites with enough samples to test for trend</td>
<td></td>
</tr>
<tr>
<td>• 38 sites trending down</td>
<td>• 45 sites trending down</td>
<td></td>
</tr>
<tr>
<td>• Average decline = 0.28 mg L(^{-1}) yr(^{-1})</td>
<td>• Average decline = 0.62 mg L(^{-1}) yr(^{-1})</td>
<td></td>
</tr>
</tbody>
</table>
Raccoon River Watershed
SeaKen Trends in Nitrate Concentration 2004-2013

Legend
Sample Locations Percentage Reduction
-11.6 -10%
-9.9 -9%
-7.9 -8%
-5.9 -7%
-3.9% - 0

Advancing Agricultural Performance®
Flow Weighted Averages 1999-2003

-18%
-16%
-22%
-36%
-19%
-17%
Soybeans?

RRWS Crop Area and Average ACWA NO₃-N

- Corn Area
- Soybean Area
- LR Trend Ave ACWA NO3-N


1000s of Ha

10 11 12 13 14

mg L⁻¹ NO₃-N
Why Soybean?

We know that accurately targeting the optimal N rate is more difficult following soybean

Graphs provided P. Kyveryga
Why Soybean?

• More denitrification under Corn

• More losses from soil mineralization after SB in autumn, especially with fall tillage
  
  • Farmers are managing more aggressively with C-C
  
  • More immobilization into the soil under corn
  
  • Greater tile flow under Soybean
Going Forward

• Incremental Improvement Likely, but current condition still unacceptable to most

  • Transformational Improvements? Cover Crops?

• Better management of Soy may have disproportionately positive effects on Water Quality

• Monitoring and credible data will be critical for making policy and spending conservation dollars