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

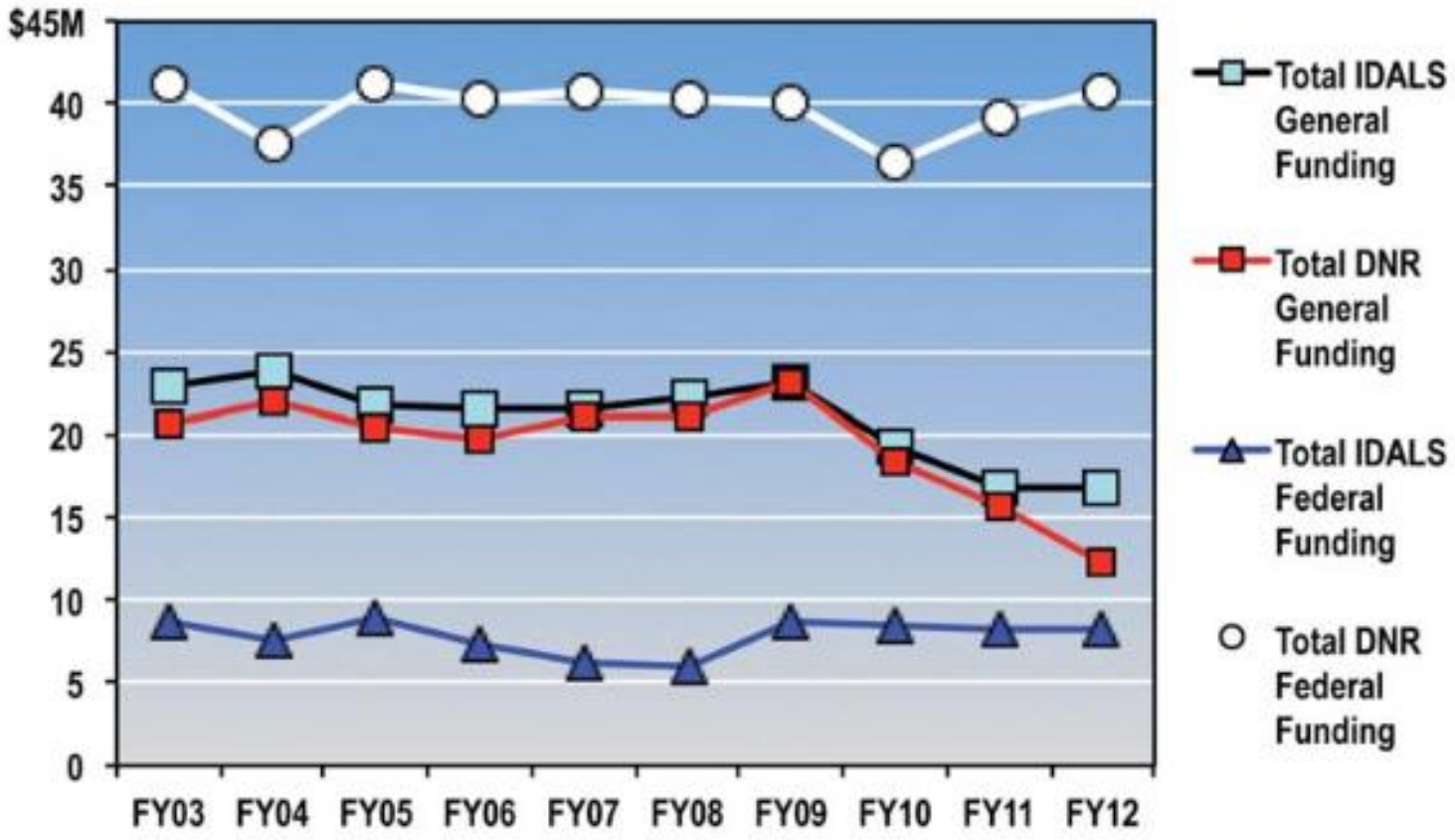
DNR

- 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



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

Farm and Rural Life Poll 2010

	Strongly Disagree	Disagree	Uncertain	Agree	Strongly Agree
			—Percentage—		
a. Cover crops can reduce soil erosion significantly (n=1,275)	0.9	2.6	14.1	67.6	14.7
b. Cover crops reduce N and P losses (n=1,271)	0.6	5.7	35.4	49.3	9.0
c. If 50 percent cost-share were available for cover crop establishment, I would plant them (n=1,263)	3.3	15.3	53.6	22.2	5.5
d. I don't know enough about cover crops to use them (n=1,264)	5.0	27.1	32.9	32.7	2.3
e. Cover crops can improve soil productivity (n=1,263)	0.6	3.2	33.1	54.9	8.2
f. I don't have the necessary equipment for cover crops (n=1,257)	4.0	24.7	31.1	36.2	4.1
g. Cover crops can delay spring planting (n=1,260)	1.5	15.2	45.6	33.7	4.0
h. If shorter-season crop varieties yielded the same as longer-season, I would be more likely to plant cover crops (n=1,258)	1.4	12.4	54.6	29.3	2.3
i. There is rarely enough time between harvest and winter to justify the use of cover crops (n=1,269)	1.1	7.4	30.6	47.8	13.1
j. I would like to learn more about using cover crops (n=1,249)	2.9	13.1	43.6	36.0	4.5

Farm and Rural Life Poll 2010

A good farmer is one who…	Not Important at All	Not Really Important	Somewhat Important	Important	Very Important
	—Percentage—				
d. considers the health of streams that run through or along their land to be their responsibility (n=1,323)	0.5	1.4	16.7	54.0	27.5
e. minimizes soil erosion (n=1,323)	0.1	0.3	7.3	50.0	42.3
f. minimizes nutrient runoff into waterways (n=1,321)	0.1	0.4	8.1	49.1	42.3
k. uses cover crops between harvest and planting (n=1,313)	5.5	38.3	39.5	13.0	3.7
u. avoids fall tillage (n=1,308)	3.9	22.9	33.1	29.2	10.9
y. minimizes tillage (n=1,317)	1.7	11.2	34.7	38.4	14.0
aa. puts long-term conservation of farm resources before short-term profits (n=1,314)	0.8	3.3	28.0	47.6	20.3
ad. thinks beyond their own farm to the social and ecological health of their watershed (n=1,320)	0.7	3.5	32.5	47.8	15.5

Farm and Rural Life Poll 2010

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

Farm and Rural Life Poll

- Examples of other topics
  - Nutrient removal wetlands
  - Perennials, CRP and biomass
  - Land owner attitudes
  - Water quality attitude

Public Cost Share Practices Annual Survey of Partners

Agency

Program

Practice Type/Code

Number of Practices

Practice Units (acres, feet, etc.)

Area Served (ac)

Total C/S

Total Private Match

Year Implemented

Lifetime Expectancy (years)

Contract/Easement Length

State/County/Watershed Level Tracking Potential

Annual N Load Reduction (lbs)

Annual P Load Reduction (lbs)

Annual Sediment Load Reduction (lbs)

Lifetime N Load Reduction (lbs)

Lifetime P Load Reduction (lbs)

Lifetime Sediment Load Reduction (lbs)

Reduction Calculation Method

Farm Service Administration Annual County Level Data Example of crops and use

Crop Code	Crop	Intended Use	Planted Acres
0011	Wheat	Forage	
0016	Oats	Grain	
0094	Rye	Left Standing	
0129	Rapeseed	Forage	
0265	Clover	Grazing	
0296	Mixed forages	Cover Only	
0099	CRP by type		
0158	TRITICALE		

Farm Service Administration CRP in Adair County

CP1 EST PERM INTRO GRASS AND LEGUME

CP2 EST PERM NATIVE GRASSES

CP3 TREE PLANTING

CP4 PERMANENT WL HABITAT

CP8 GRASS WATERWAYS

CP9 SHALLOW WATER AREAS FOR WL

CP10 VEG COVER, GRASS ALREADY EST

CP12 WILDLIFE(WL) FOOD PLOT

CP15 EST PERM VEG CVR CONTOUR STRPS

CP21 FILTER STRIPS

CP22 RIPARIAN BUFFER

CP23 WETLAND RESTORATION

CP25 RARE AND DECLINING HABITAT

CP28 FWP BUFFER

CP29 MPL WL HABITAT BUFFER

CP30 MPL WETLAND BUFFER

CP32 EXPIRED HARDWOOD TREES

CP33 HABITAT BUFRS UPLAND BIRDS

CP3A HARDWOOD TREE PLANTING

CP42 POLLINATOR HABITAT

CP4D PERM WL HABITAT NONEASE

CP5A FIELD WINDBREAK NONEASE

CP8A GRASS WATERWAY NONEASE

CP15A EST CONTR GRASS STRPS NONEASE

CP15B EST CONTR GRAS STRP ON TERRAC

CP23A WETLAND RESTOR NONFLOODPL

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.

DNR 2012 Nonpoint Source Management Plan

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.
6. Adopt system-based implementation and monitoring strategies versus practice-based approaches.

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.*

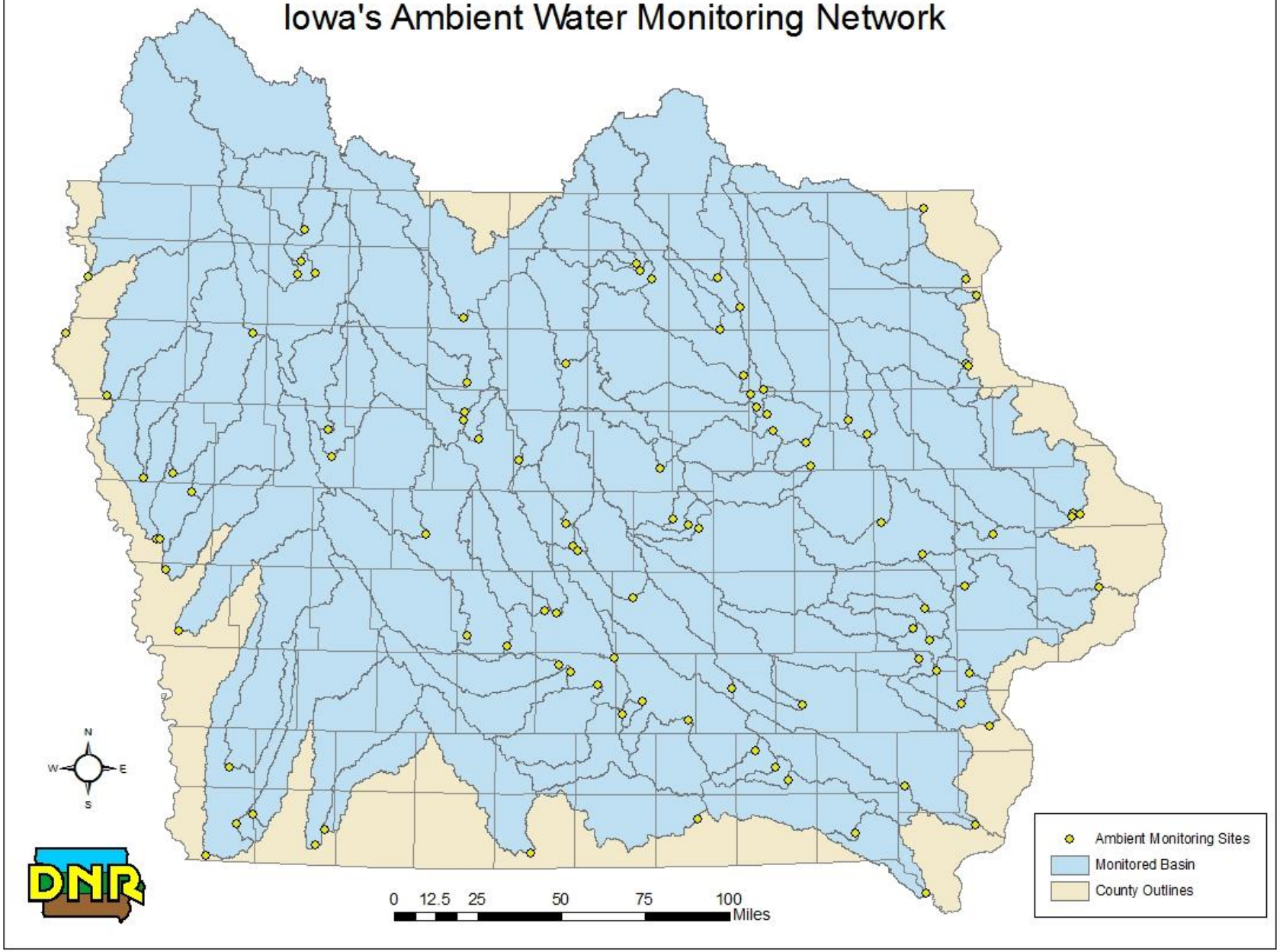
Iowa Department of Natural Resources

Leading Iowans in caring for our natural resources

Iowa's Ambient Monitoring Network

- 75+ Sites throughout State
- Includes Sites Upstream and Downstream of Urban Centers
- Monitored monthly
- Mostly paired with USGS Gage locations
- Data from 2000-2011

Iowa's Ambient Water Monitoring Network



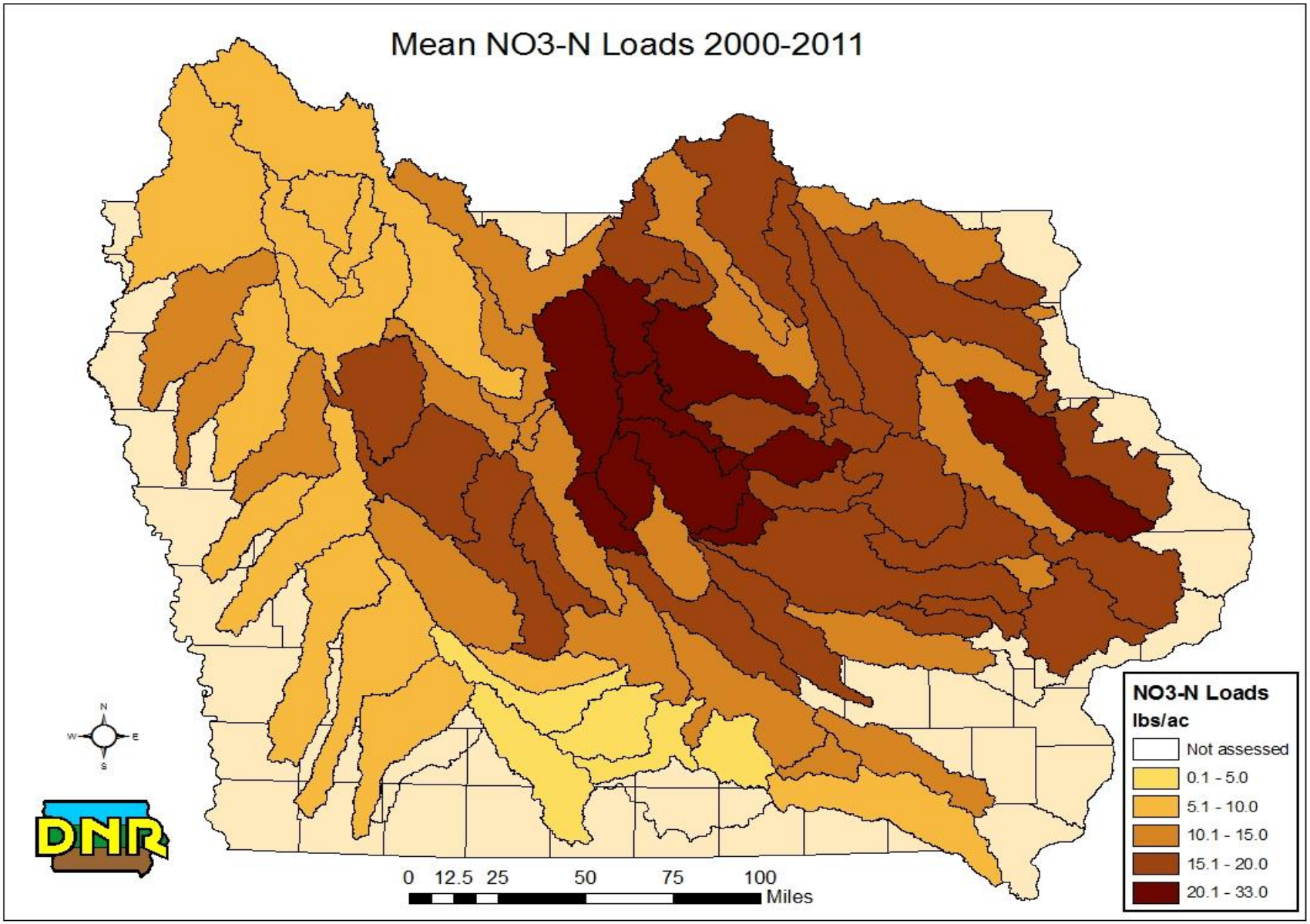
Previous Nutrient Load Estimations for Point and Non-point Sources

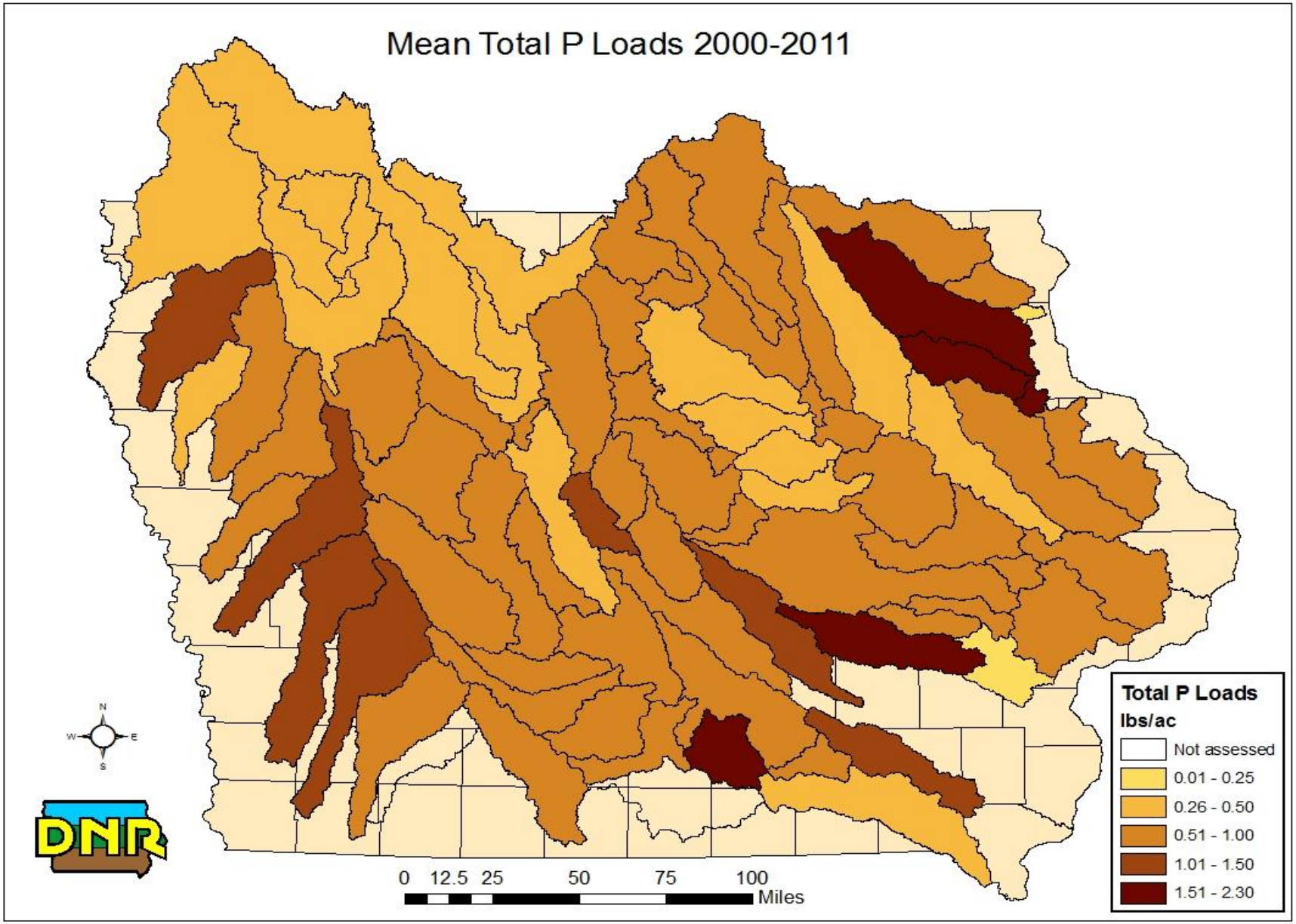
Stream Load Estimation Methods

- AutoBeale, Pete Richards, 1998
- Load Estimator (LoadEst), Rob Runkel, USGS, 2004
- Mean Value

Check for Unreasonable LoadEst Values

- More than +/- 15% of Mean Value loads
- Residual error more than +/- 2.0
- Error ratio > 10
- NO3-N concentration > 25 ppm
- Total P concentration > 10 ppm
- Check hydrograph vs. sample date to see if full range of flows sampled


Mean NO3-N Loads 2000-2011
NO3-N Loads
lbs/ac
Not assessed
0.1 - 5.0
5.1 - 10.0
10.1 - 15.0
15.1 - 20.0
20.1 - 33.0
0 12.5 25 50 75 100
Miles
N
W
E
S
DNR


Mean Total P Loads 2000-2011
Total P Loads
lbs/ac
Not assessed
0.01 - 0.25
0.26 - 0.50
0.51 - 1.00
1.01 - 1.50
1.51 - 2.30
0 12.5 25 50 75 100
Miles
N
W
E
S
DNR

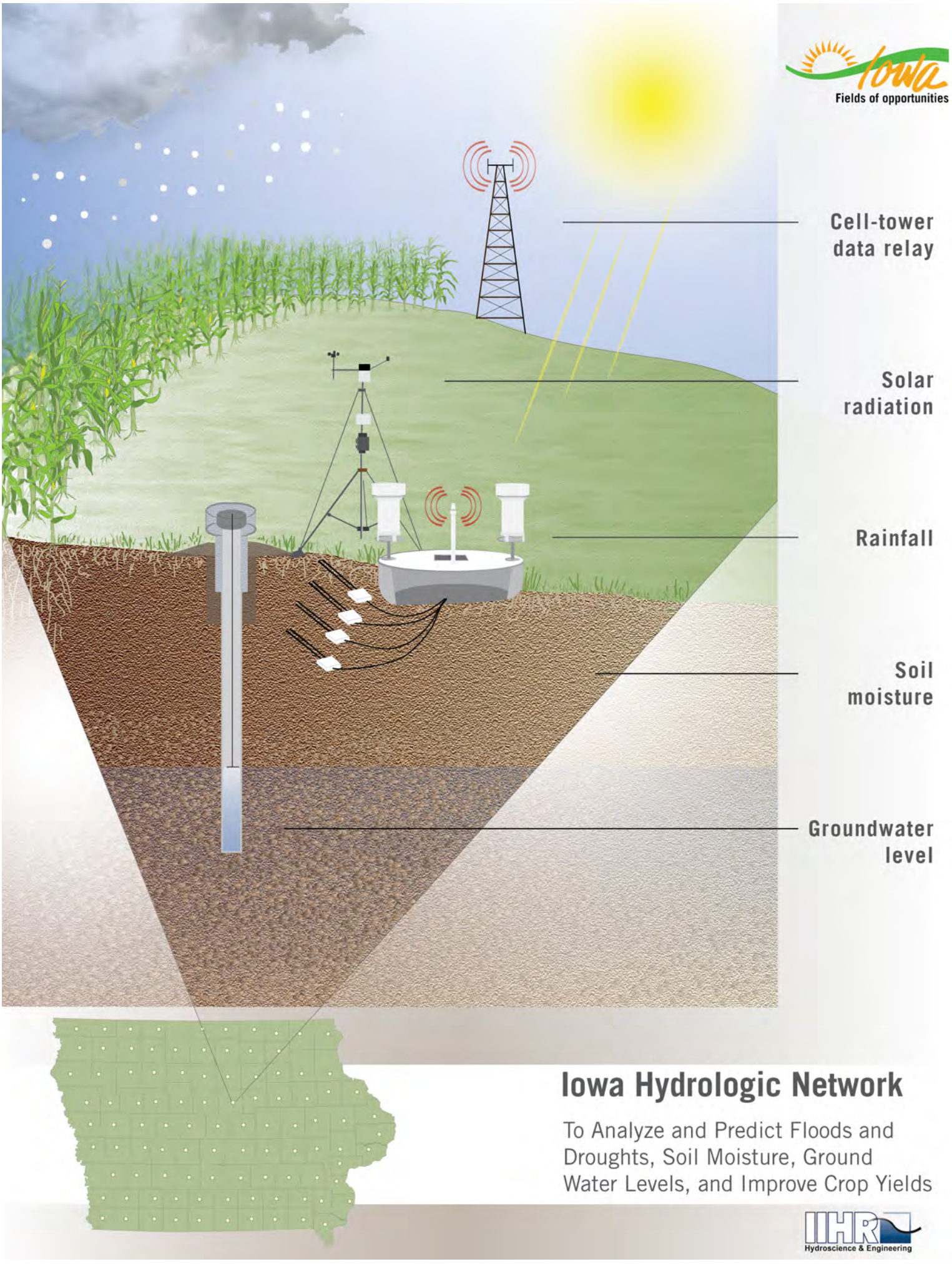
2013 Technical Team : Collaboration

- IDALs
- ISU
- USGS
- IIHR
- Soybean Association
- DNR

2013 Technical Team : Goals

- Identify standard process for regularly calculating loads
  - Resource efficient
  - Use of existing data sources
  - Comparable from year to year
- Standard suite of tools to address problem data sets
- Will review process to incorporate new research as appropriate

Questions?



Iowa Hydrologic Network

To Analyze and Predict Floods and Droughts, Soil Moisture, Ground Water Levels, and Improve Crop Yields

IIHR Hydroscience & Engineering

Iowa Hydrologic Network

What is it?

A network of 100 stations to measure water content and temperature in the soil, groundwater level in shallow wells, rainfall, and other weather data.

Why do we need it?

To better predict floods, assess droughts, manage our water resources, and help Iowa's ag producers with crop management and increased yields.

Who will do it?

IIHR-Hydroscience & Engineering of the University of Iowa with the recently acquired Iowa Geological Survey (formerly with Iowa DNR), Iowa Flood Center, and Iowa State University experts.

Can they do it?

IIHR will leverage the expertise and experience of building and deploying over 200 bridge sensors in Iowa; building similar networks for NASA, and operating a research rainfall network for over 15 years. All data will be publicly available in real time over the Internet.

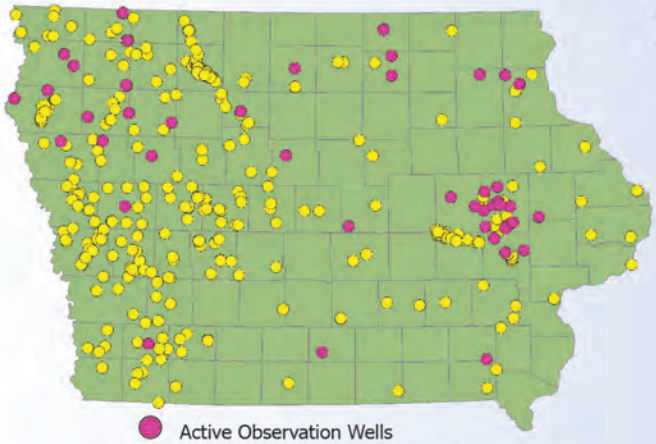
How much will it cost?

One time investment of $1M plus $100K annually for upkeep and operation. Each station costs about $5K plus $5K for well drilling. There will be a station in each county.

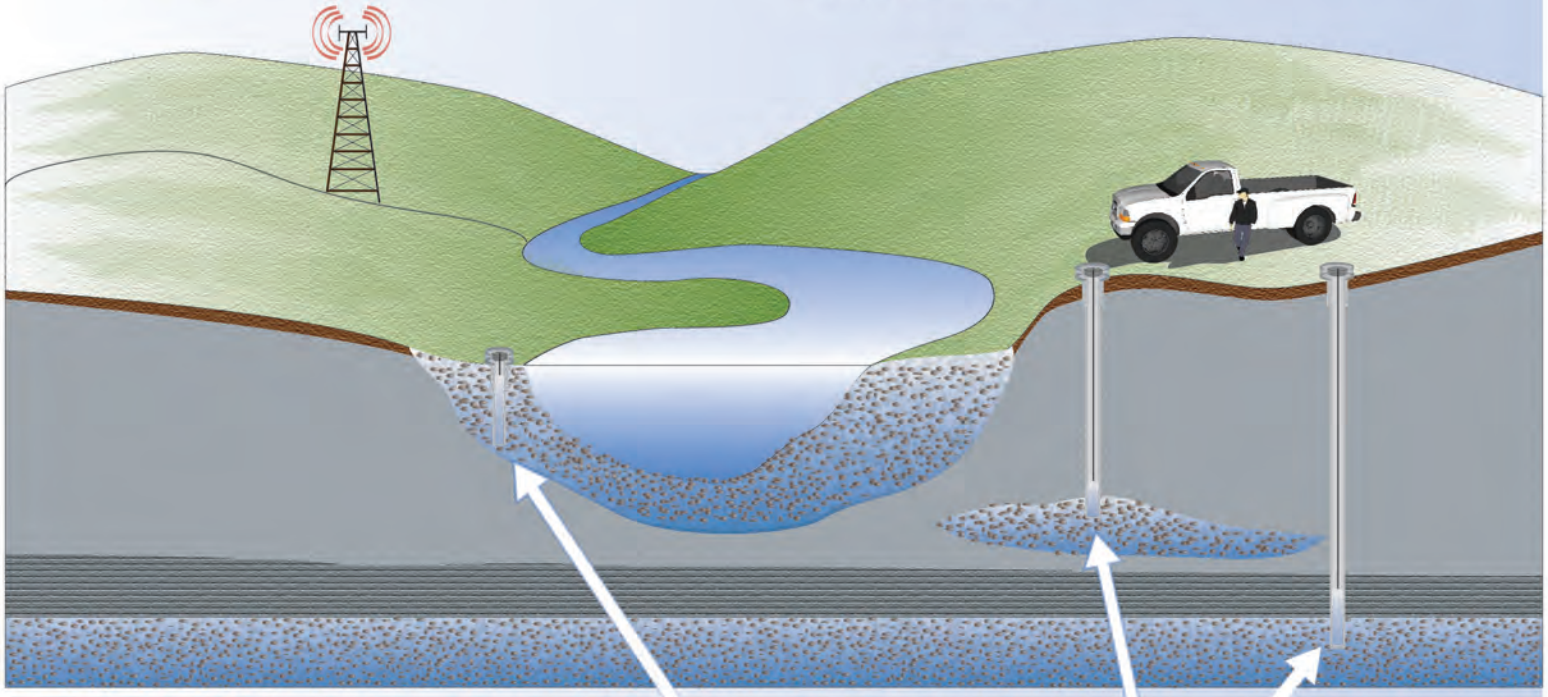
When can we have it?

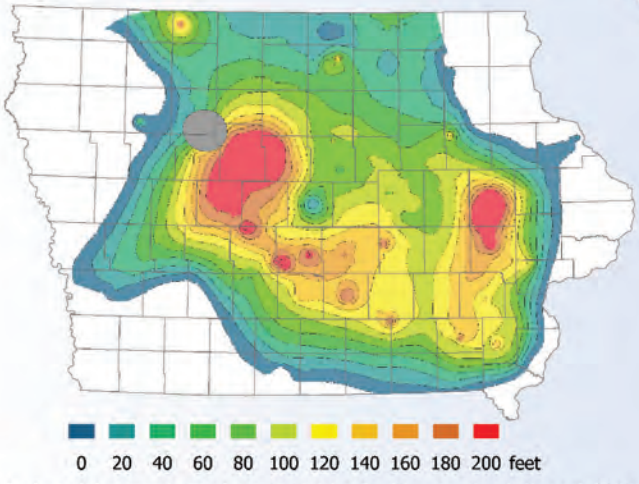
The network will be constructed and deployed over a two-year span 2015-2016.

Iowa Groundwater Observation and Forecasting Program



Current Iowa groundwater observations are inadequate. However, numerous existing observation wells can be used to expand upon available information. Restoration and sampling of wells carefully selected to ensure a complete and accurate characterization of Iowa's aquifers will inform appropriate use of this valuable and limited resource.





Simluated decrease in Cambrian-Ordovician Aquifer water levels through 2034

Alluvial aquifers are well connected to rivers and streams, and respond quickly to changes in rainfall. Automated measurement systems can frequently capture changes in water levels and transmit them to a central database.

Deep aquifers respond slowly to changes in precipitation. They are slowly replenished and are susceptible to overuse. Quarterly manual measurements are sufficient to capture trends in their water levels.

Observations will provide information necessary to create computer simulations of regional groundwater levels. Computer simulations will be used to forecast aquifer changes and aid in planning and management of groundwater resources.

IIHR Hydroscience & Engineering

Iowa Groundwater Observation and Forecasting Program

Groundwater is a valuable but limited resource

A more complete understanding of Iowa's groundwater resources is necessary to ensure they remain a reliable source for municipal, industrial, and private water needs.

More groundwater observations are needed

Numerous wells have already been installed throughout the state and can be used to observe groundwater levels. Manual and automated measurements at up to 120 wells, carefully selected to ensure a complete and accurate characterization of Iowa's aquifers, will capture current conditions and trends in Iowa's groundwater levels.

Groundwater forecasting will aid in planning and resource management

The observation program will provide information necessary to create computer simulations of regional groundwater resources. Computer simulations will be used to forecast aquifer response to changes in rainfall or groundwater withdrawals.

Groundwater information is valuable in understanding droughts and floods

Measurement and simulation of Iowa's groundwater resources will complement ongoing and developing programs at the Iowa Flood Center by providing a complete characterization of atmospheric, surface water, and groundwater systems affecting water quantity. Alluvial wells will allow Iowa Flood Center researchers to better understand surface water / groundwater connectivity and its importance in flood processes, improving their ability to forecast short-term flood risks.

Scope of work

The Iowa Geological Survey, a unit of the University of Iowa's IIHR–Hydroscience & Engineering, will

- develop a groundwater measurement program to track water levels in Iowa aquifers using manual and automated measurement techniques at up to 100 sites;
- drill up to 20 new wells in targeted areas to better understand how withdrawals associated with municipal, industrial, and private activities may interact, and to create nested well groups that allow sampling from multiple aquifers at different depths;
- perform computer simulations of regional groundwater resources to predict groundwater availability;
- and make measurement and simulation data available via a web-based portal.

Budget

• Drilling of new wells in targeted areas of intense withdrawal or geological significance	$ 100,000
• Automated groundwater level measurement instrumentation (up to20 sites)	$ 100,000
• Quarterly well measurement and maintenance (up to 100 sites)	$ 100,000
• Computer simulation of Iowa's groundwater resources	$ 100,000
Total	**$ 400,000**

IIHR Hydroscience & Engineering