A vision for a more resilient Iowa

The Iowa Watershed Approach

Larry Weber

Iowa Watershed Approach Project Lead

Exec. Associate Dean, UI College of Engineering

Larry-weber@uiowa.edu

The University of Iowa College of Engineering

IIHR Hydroscience & Engineering

Iowa Flood Center

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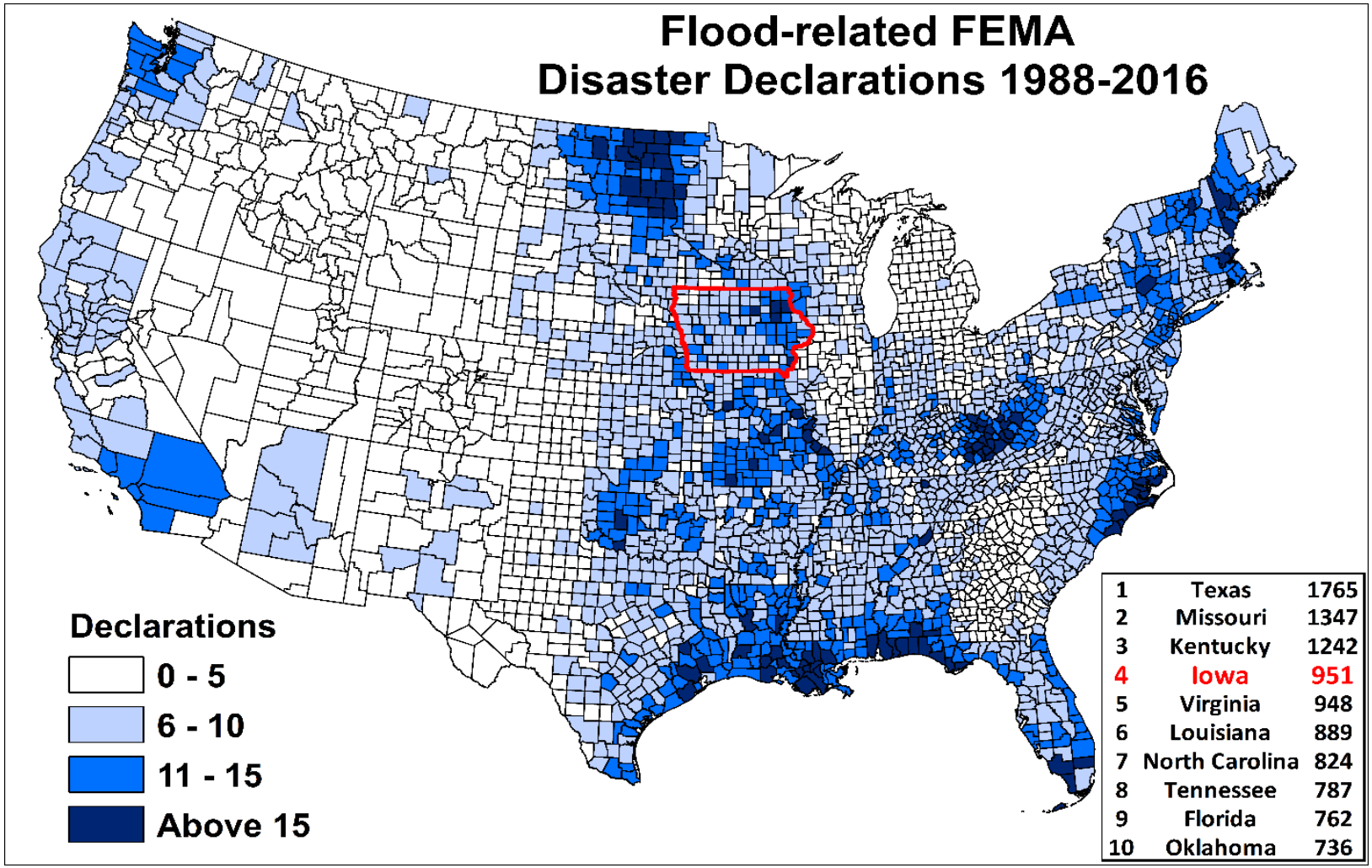

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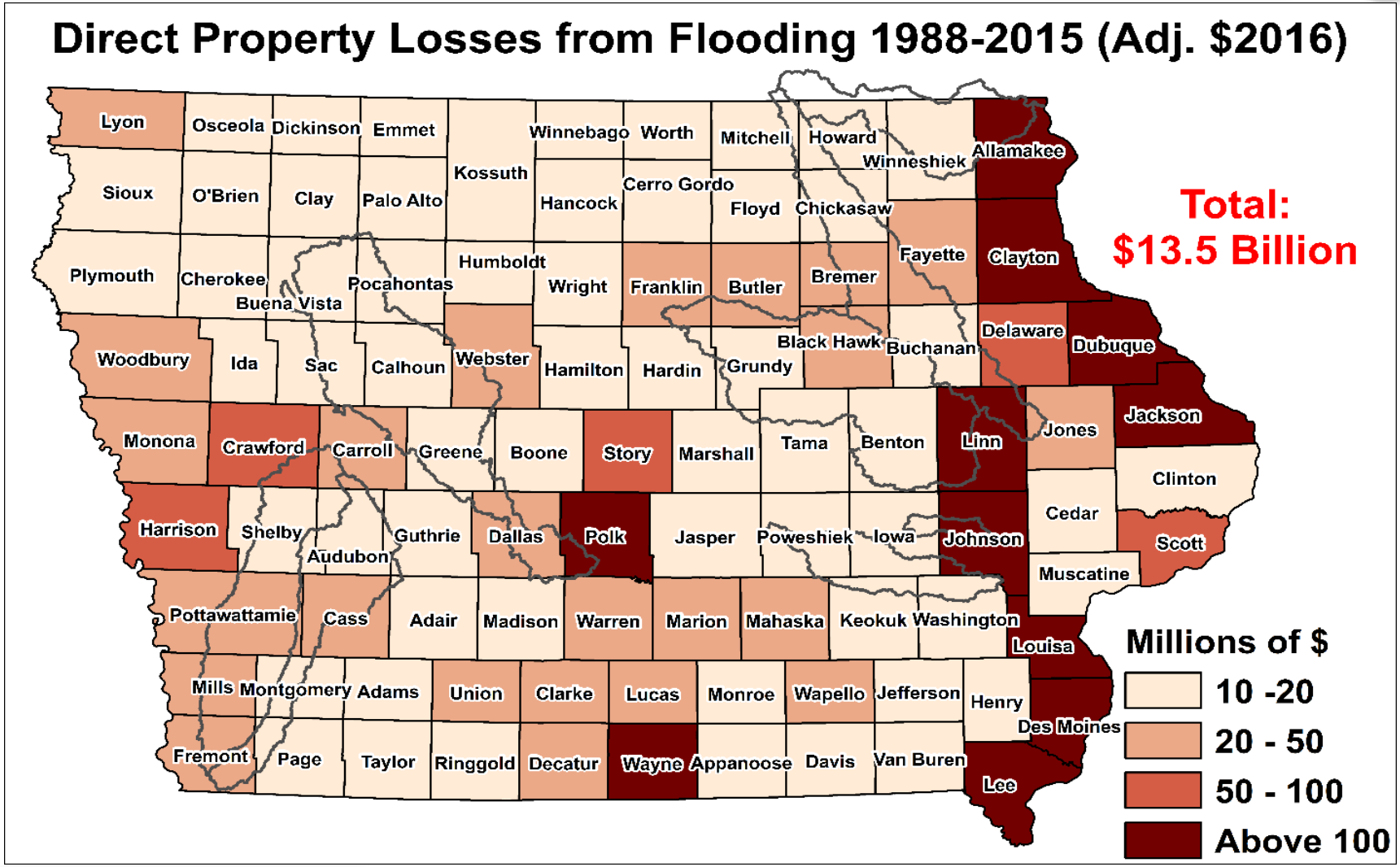


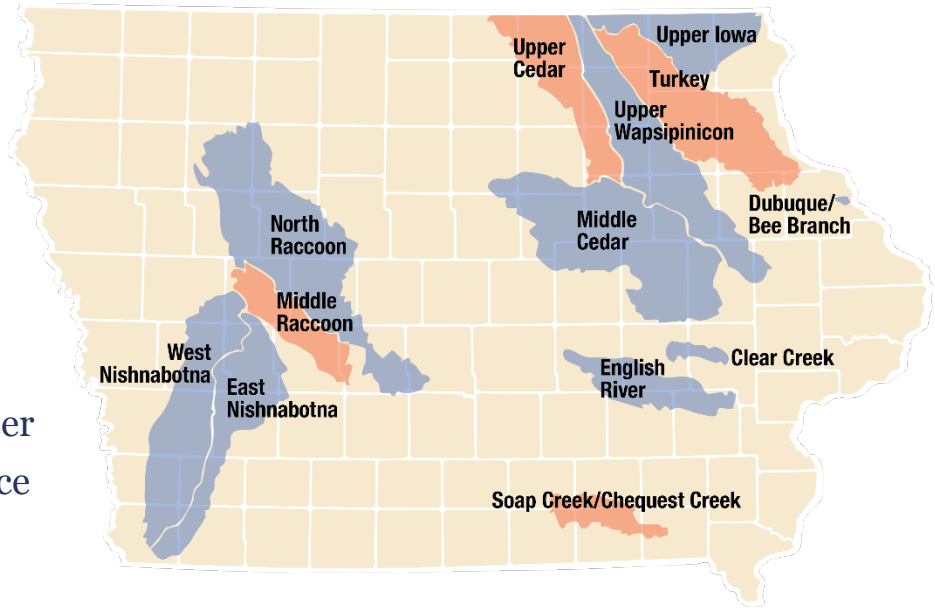
Iowa Watershed Approach: $96,887,177

IWA Goals

- Reduce flood risk
- Improve water quality
- Increase resilience
- Engage stakeholders through collaboration and outreach/education
- Improve quality of life and health, especially for vulnerable populations
- Develop a program that is replicable throughout the Midwest and the United States

IWA Project Description

- **Built off the framework of the IWP**
- Establish a WMA
- Develop a hydrologic assessment and watershed plan
- Deploy monitoring equipment
- Work with *project coordinators* and volunteer landowners to implement projects that reduce the magnitude of downstream flooding and improve water quality
- Assess project benefits based on monitoring and modeling data



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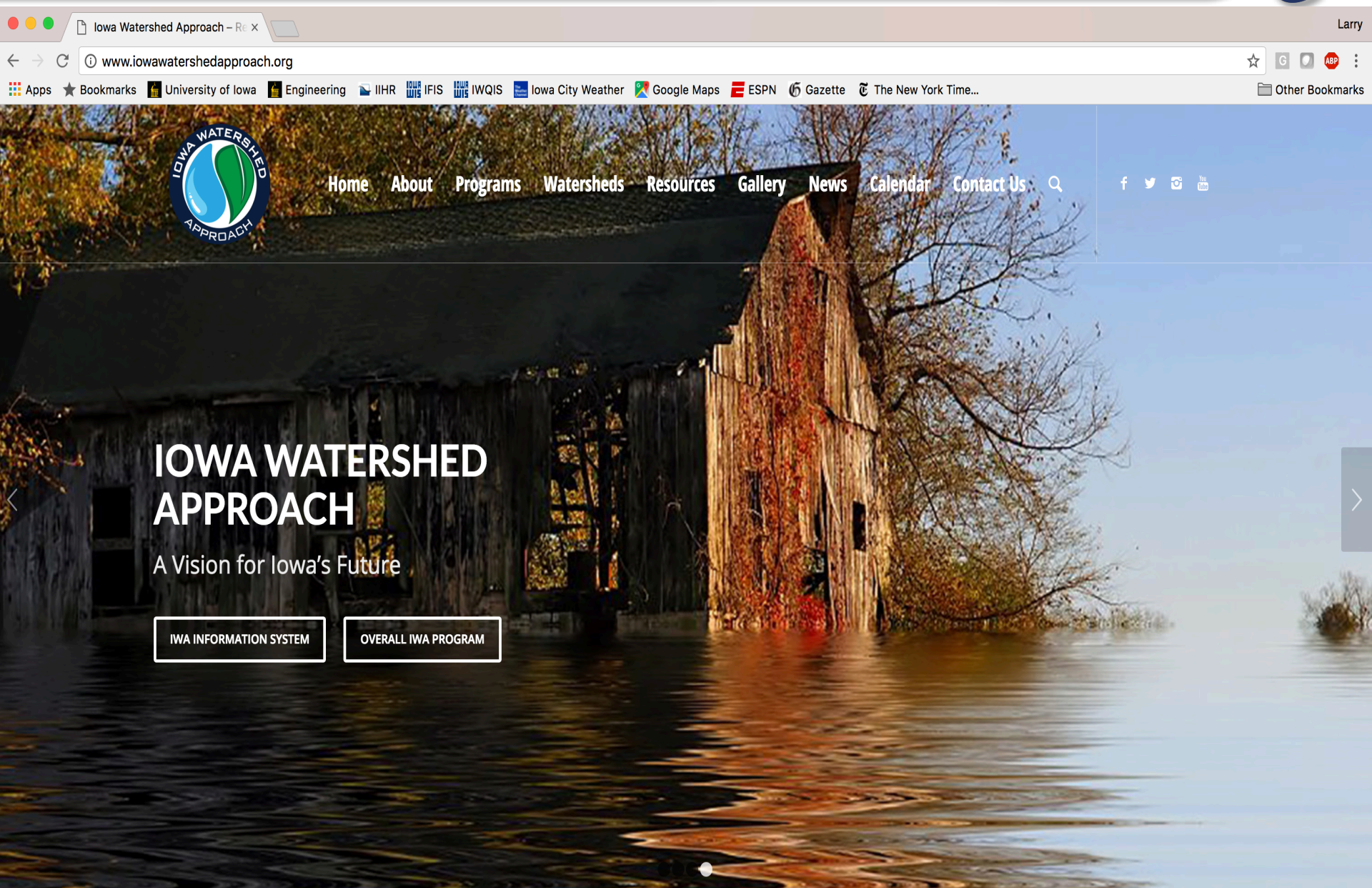
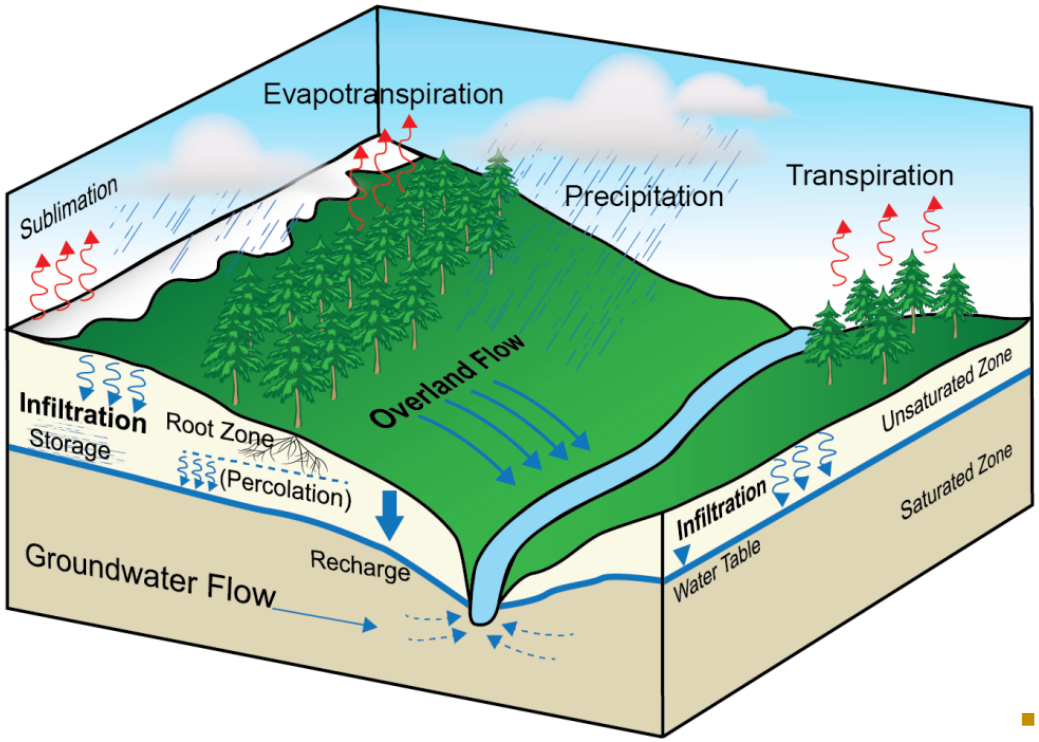
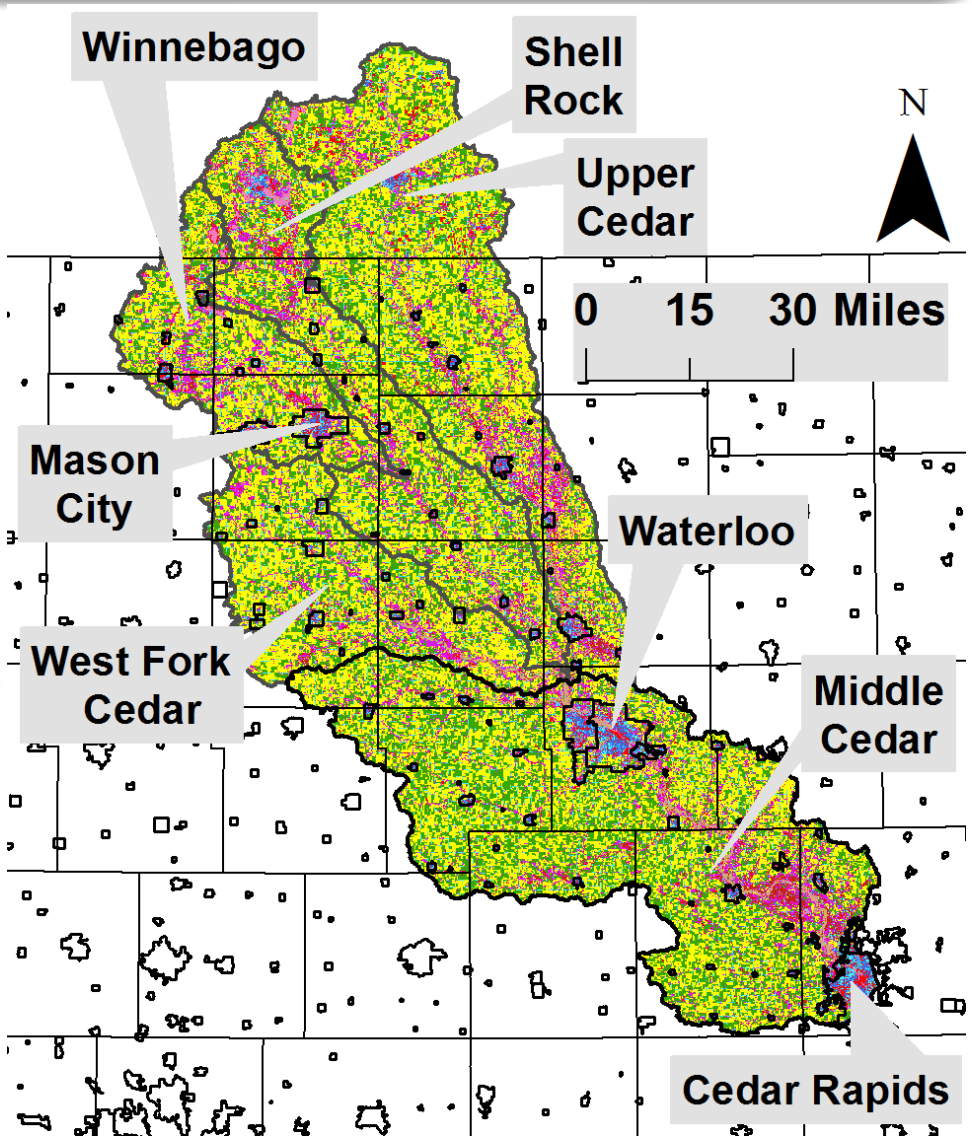


Modeling



- Develop and run watershed-scale hydrologic models (GHOST) to estimate watershed responses to rainfall events
  - Modeler breaks the watershed down into manageable and representative user defined areas
  - Simulate hydrologic processes using a physically-based approach
  - Compare simulated results to observed hydrologic time series (e.g. streamflow) to assess model performance
  - Quantify the impact of existing and potential BMPs
- Documentation

The Iowa Watershed Approach



- Corn (40.7% -45.6%)
- Soybeans (31.9% -27.0%)
- Grassland/Pasture (10.2% -12.4%)
- Developed/Open Space (6.0% -5.8%)
- Deciduous Forest (2.7% -2.5%)
- Developed/Low Intensity (3.1% -1.7%)
- Woody Wetlands (1.9% -1.3%)
- Open Water (0.6% -0.9%)
- Other (2.8% -2.9%)

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antonio-arenasamado@uiowa.edu

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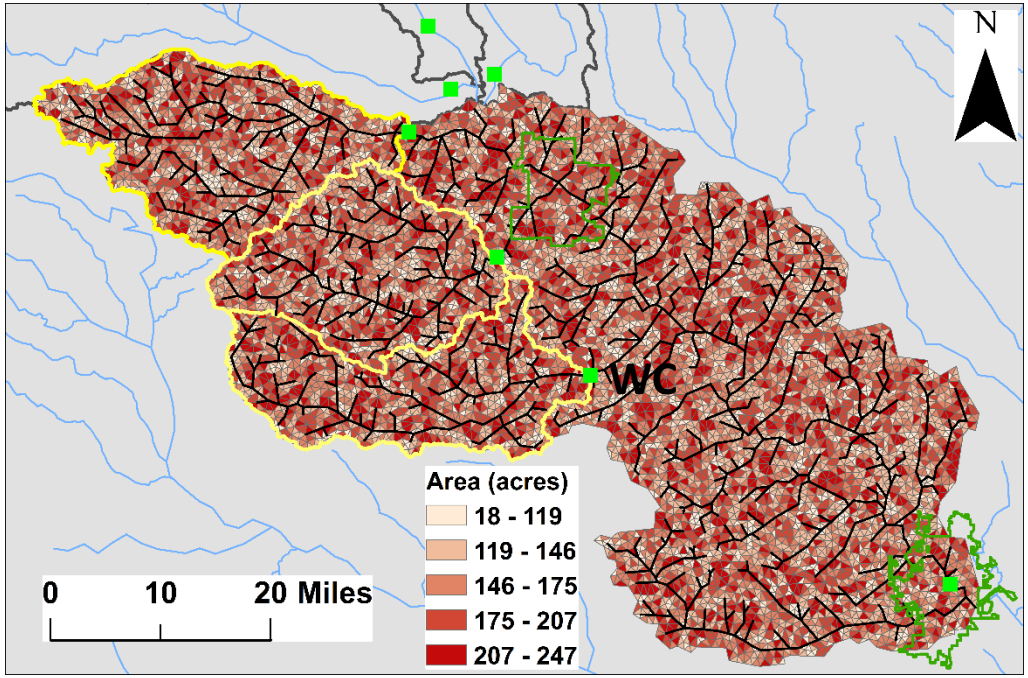

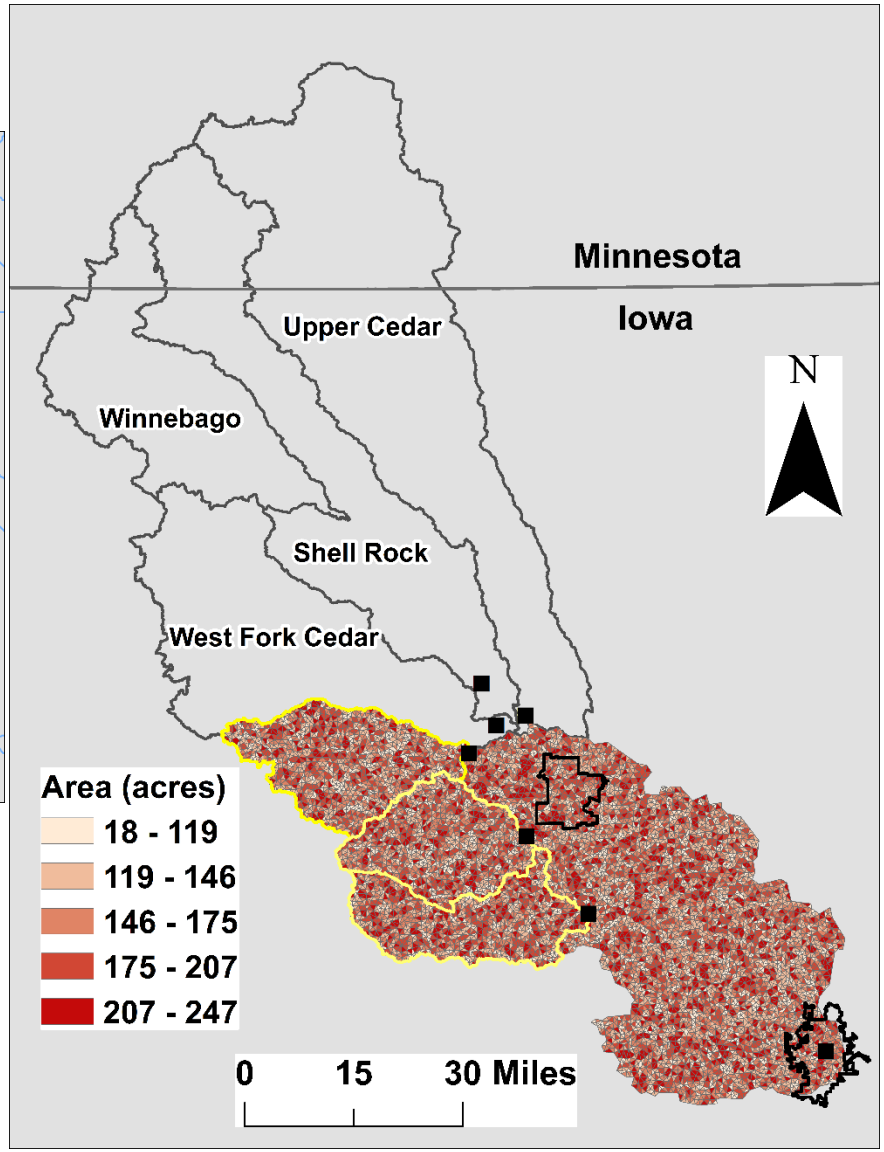

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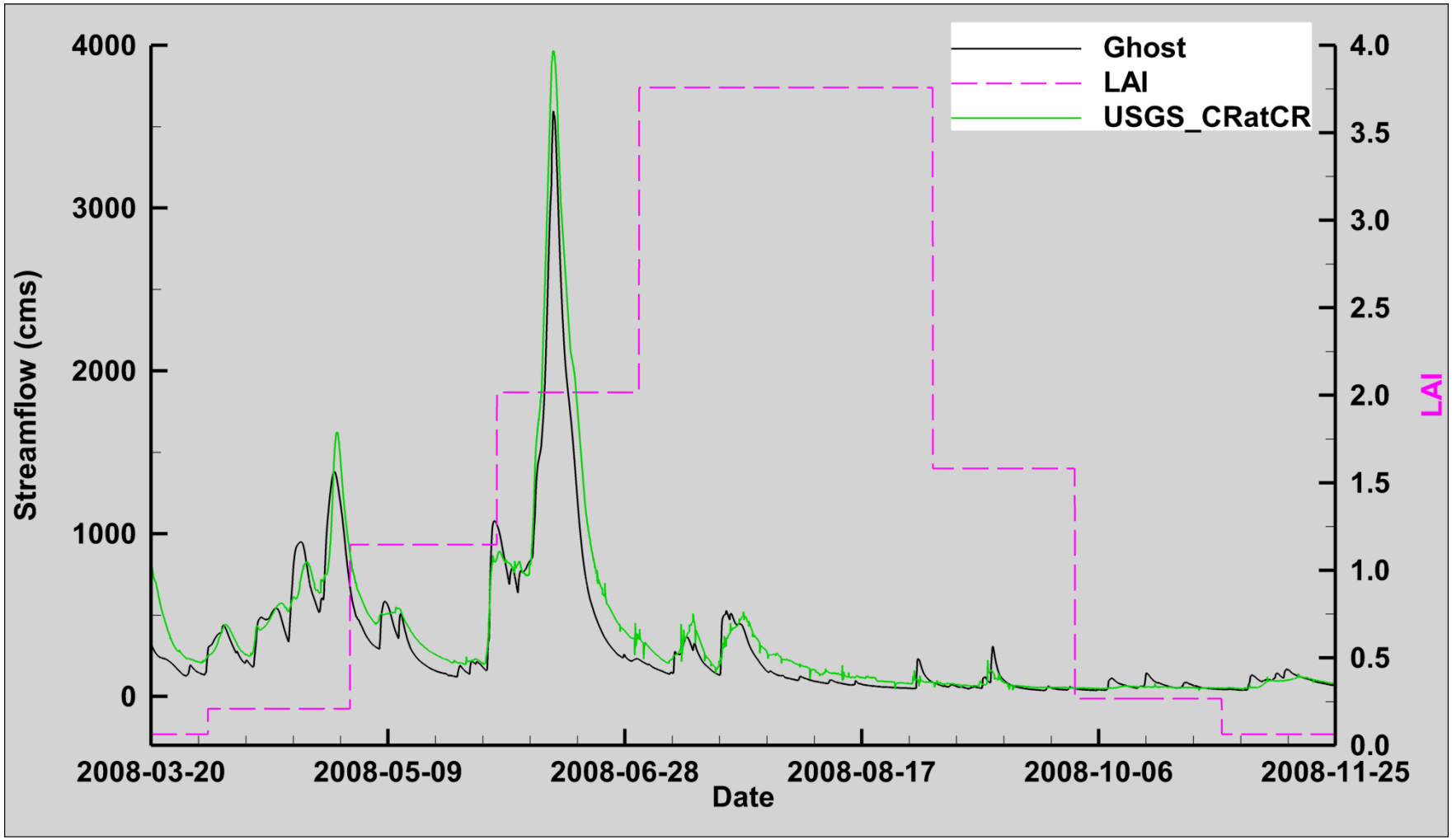
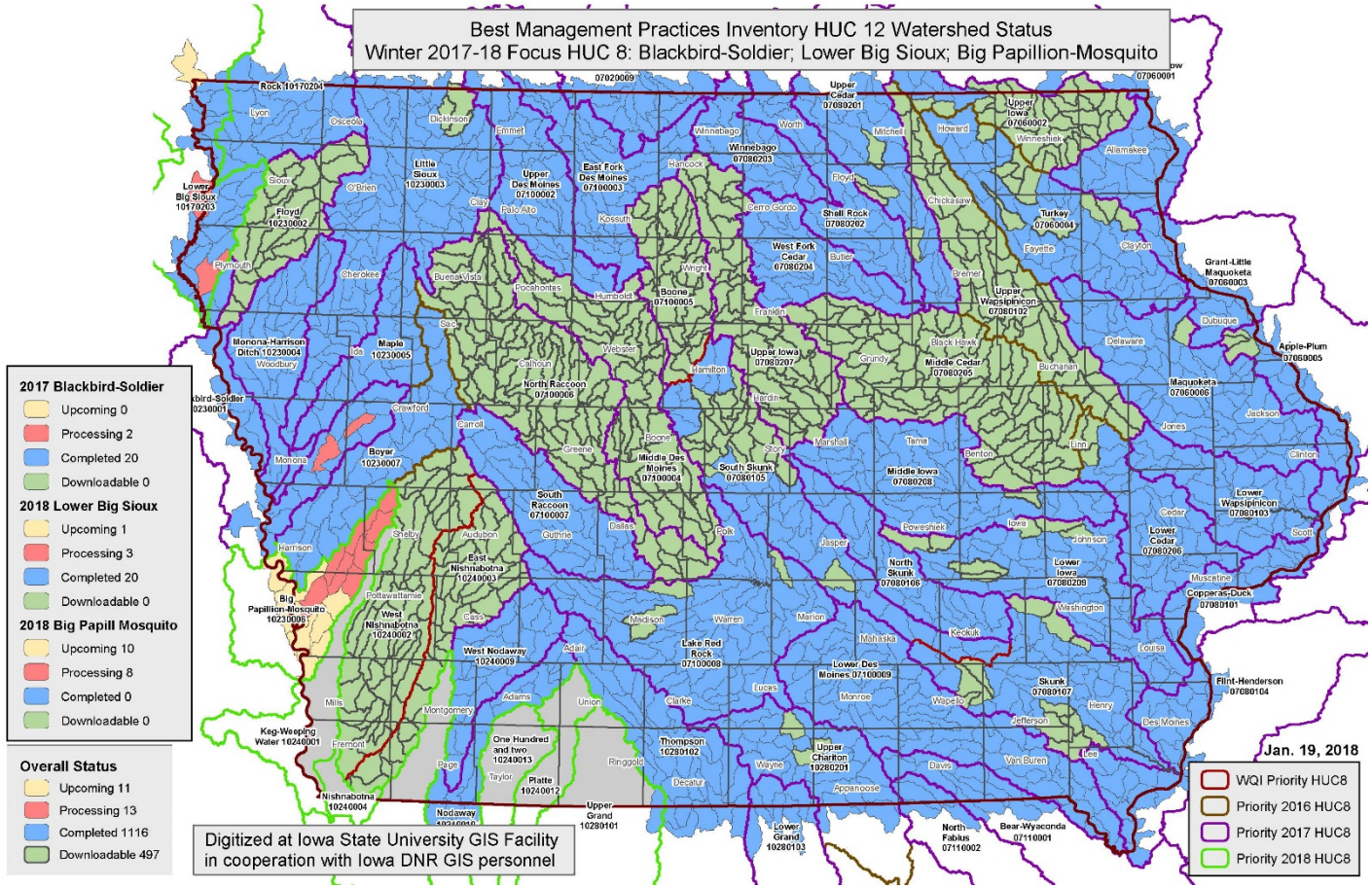


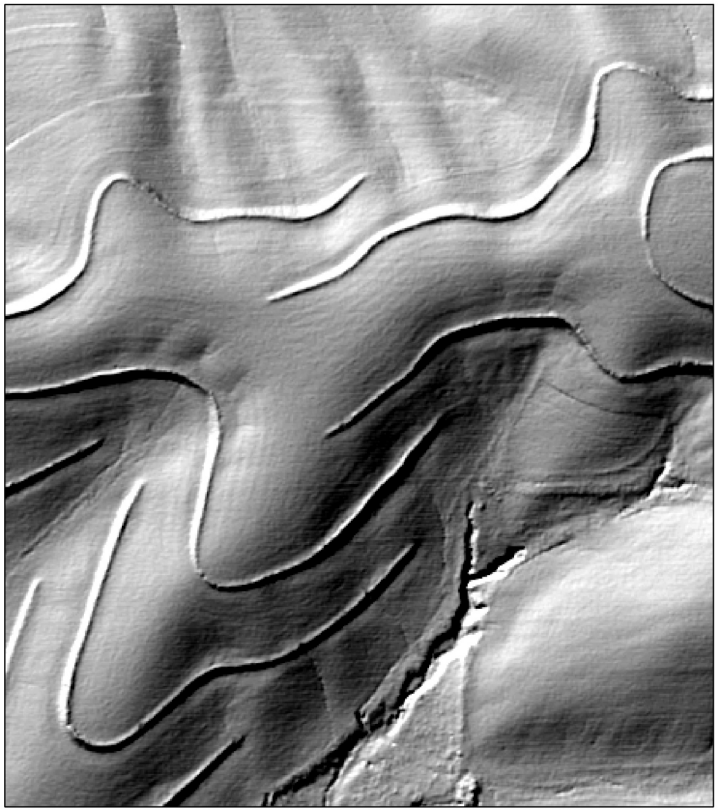
Iowa BMP Mapping Project



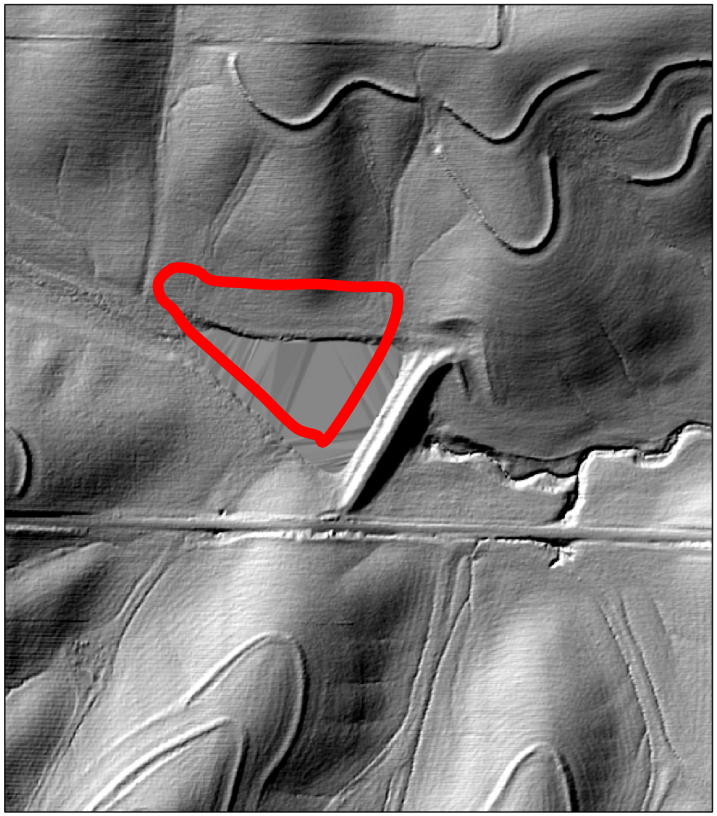
- **Iowa State University**
- **Iowa Department of Natural Resources**
- **Iowa Department of Agriculture and Land Stewardship**
- **National Laboratory for Agriculture and the Environment**
- **Iowa Nutrient Research Center (ISU)**
- **Iowa Nutrient Research and Education Council**

http://www.gis.iastate.edu/gisf/projects/conservation-practices

Iowa BMP Mapping Project



Hillshade showing narrow base terraces



Pond dam on hillshade

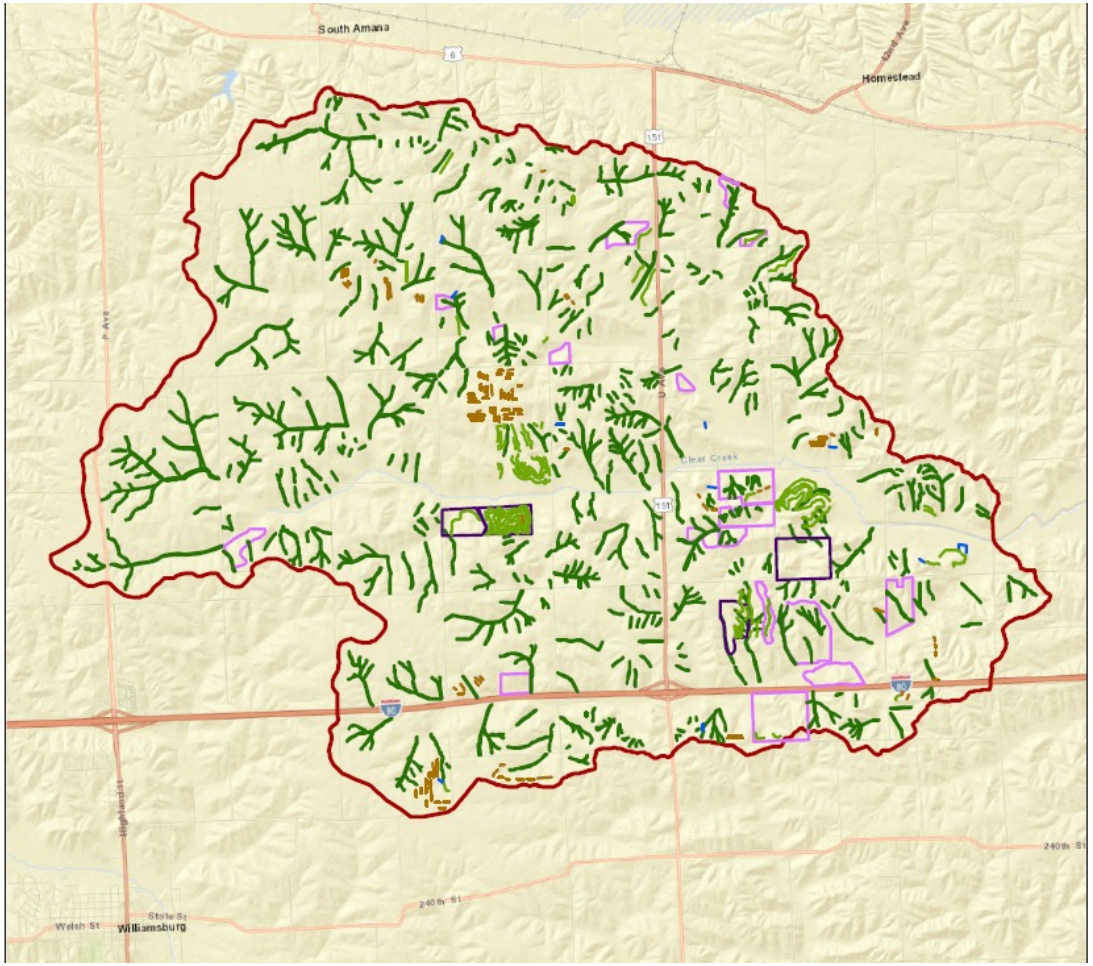
Images provided by: Calvin Wolter, GIS Analyst. Iowa Department of Natural Resources

Iowa BMP Mapping Project

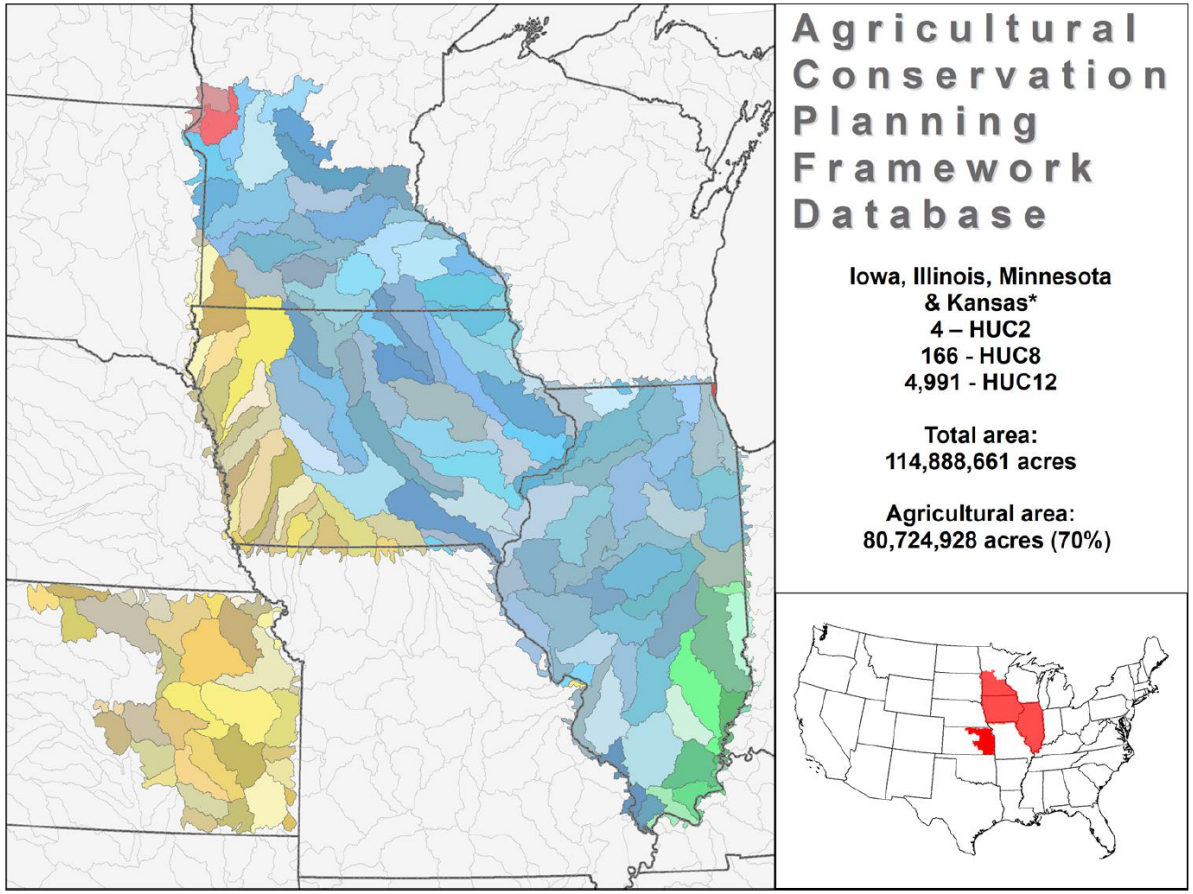
Upper Clear Creek

HUC12: 070802090101

Best Management Practices
- WASCOB
- TERRACE
- POND_DAM
- STRIPCROPPING
- GRASSED_WATERWAY
- CONTOUR_BUFFER_STRIPS

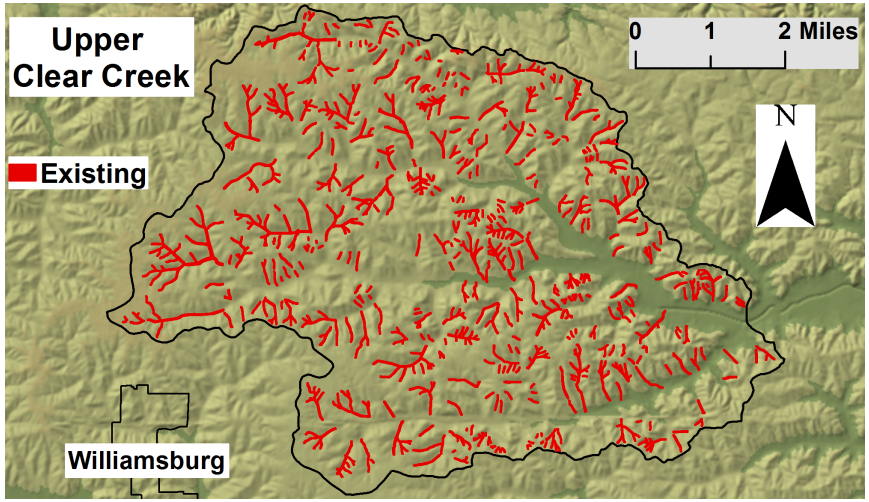


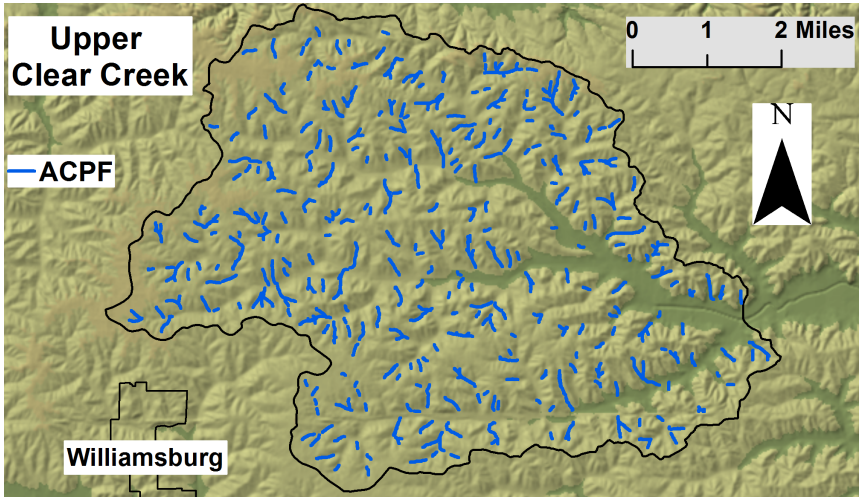
Agricultural Conservation Planning Framework (ACPF)



http://northcentralwater.org/acpf/

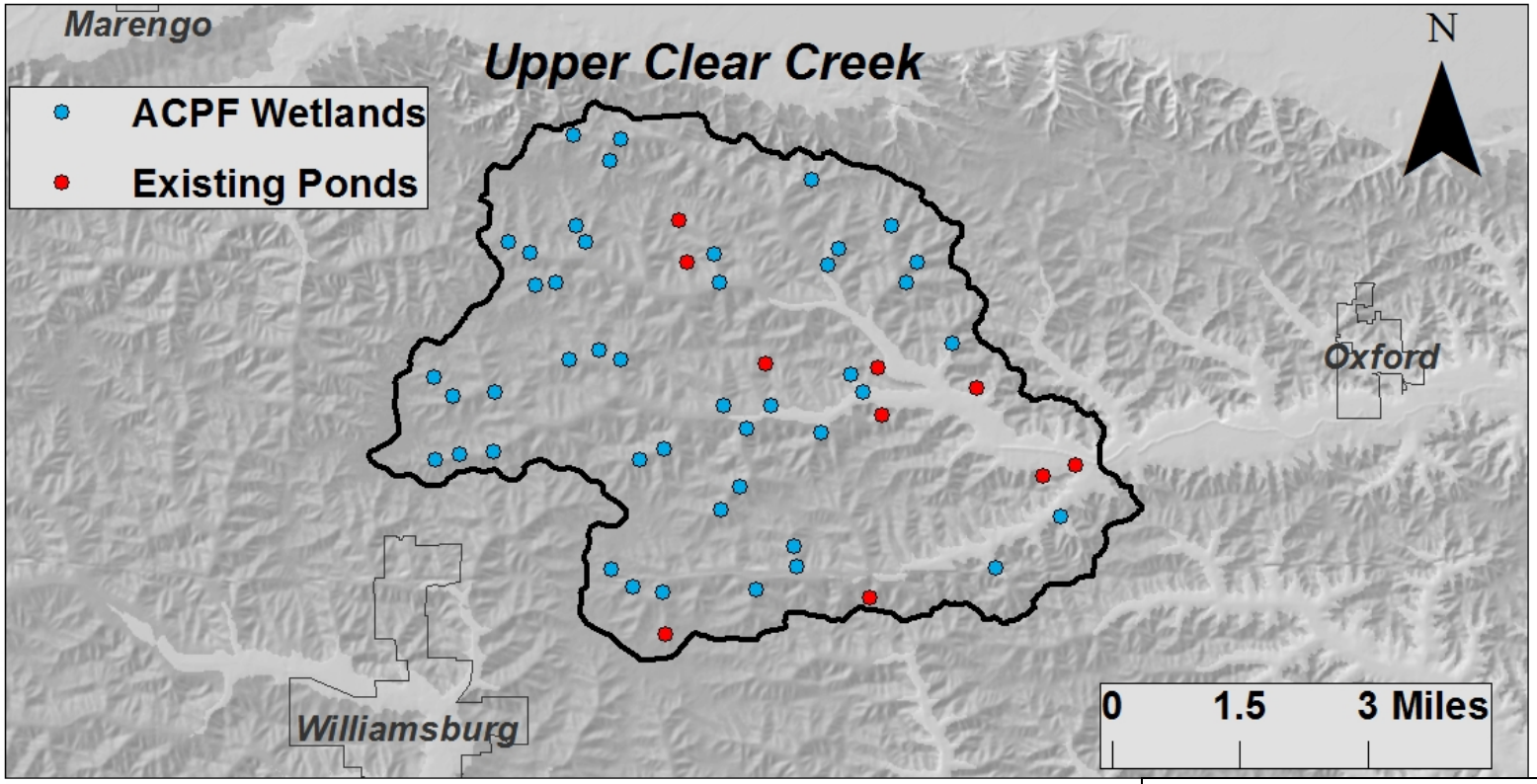
BMP Mapping + ACPF





Grassed Waterways	Distance (miles)
Existing	131.7
ACPF	62.0
Potential	30.3

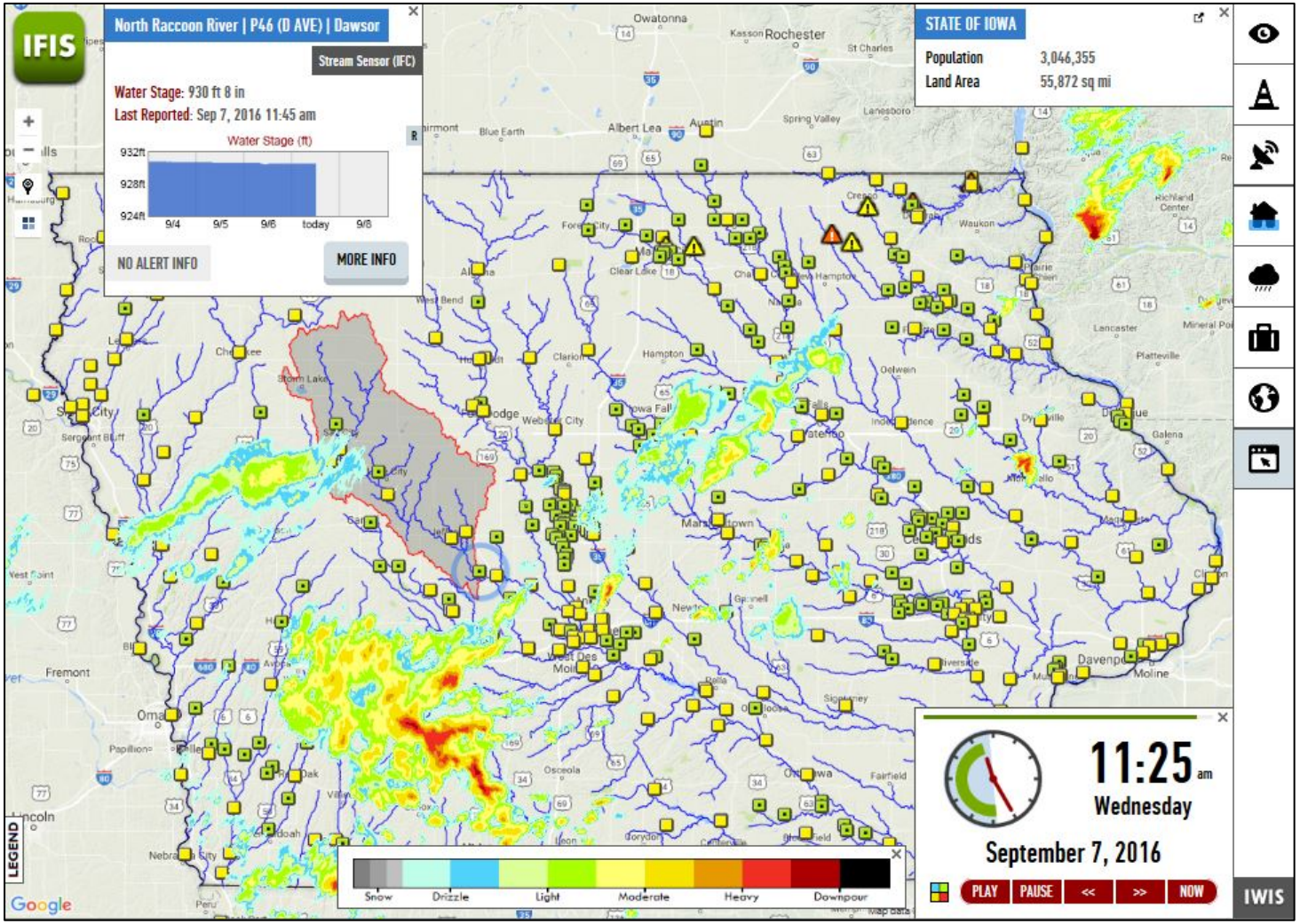
BMP Mapping + ACPF



Upper Clear Creek	
Existing Ponds	10
ACPF Wetlands	45

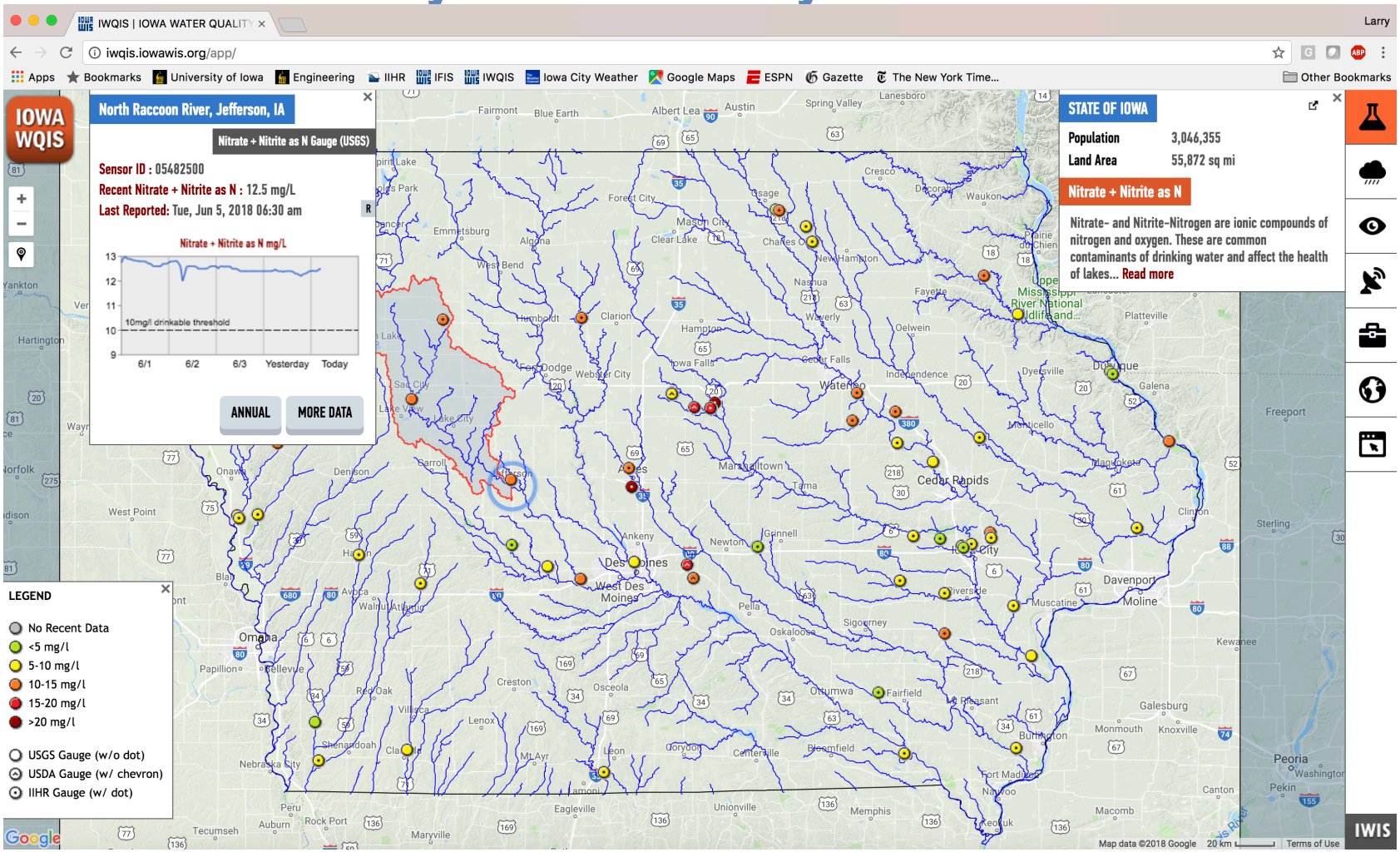
Data Collection & Monitoring

Iowa Flood Information System



http://ifis.iowafloodcenter.org/ifis/en/app/

Iowa Water Quality Information System



http://iwqis.iowawis.org/app/

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RESEARCH ARTICLE

Iowa stream nitrate and the Gulf of Mexico

Christopher S. Jones, Jacob K. Nielsen, Keith E. Schilling, Larry J. Weber

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Abstract

The main objective of this work was to quantify and update the U.S. Midwest agricultural state of Iowa's contribution of nitrate-nitrogen to the Mississippi River stream network against the backdrop of the ongoing problem of Gulf of Mexico hypoxia. To achieve this objective, we used stream nitrate and discharge data collected from 1999 until 2016 at 23 Iowa stream sites near watershed outlets, along with publicly-available data for sites downstream of Iowa on the Missouri and Mississippi Rivers. Our analysis shows that Iowa contributes between 11 and 52% of the long-term nitrate load to the Mississippi-Atchafalaya Basin, 20 to 63% to the Upper Mississippi River Basin, and 20 to 89% to the Missouri River Basin, with averages of 29, 45 and 55% respectively. Since 1999, nitrate loads in the Iowa-inclusive basins have increased and these increases do not appear to be driven by changes in discharge and cropping intensity unique to Iowa. The 5-year running annual average of Iowa nitrate loading has been above the 2003 level for ten consecutive years, implying that Gulf hypoxic areal goals, also based on a 5-year running annual average, will be very difficult to achieve if nitrate retention cannot be improved in Iowa. An opportunity exists for land managers, policy makers and conservationists to manifest a positive effect on water quality by targeting and implementing nitrate reducing-practices in areas like Iowa while avoiding areas that are less likely to affect Gulf of Mexico hypoxia.

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Subject Areas

Iowa | Watersheds | Nitrates | Surface water | Hypoxia | Maize | Missouri | Soybean

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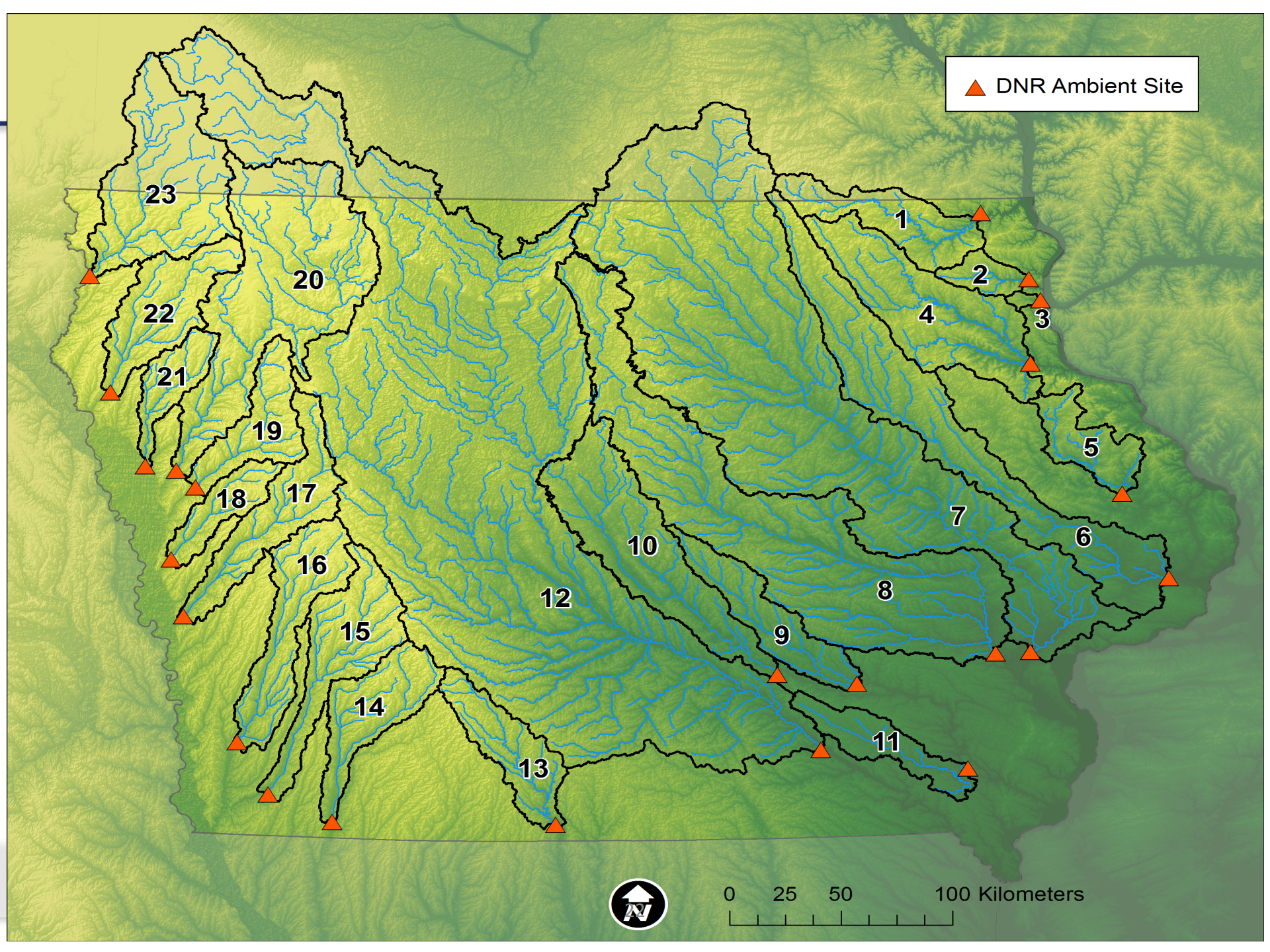
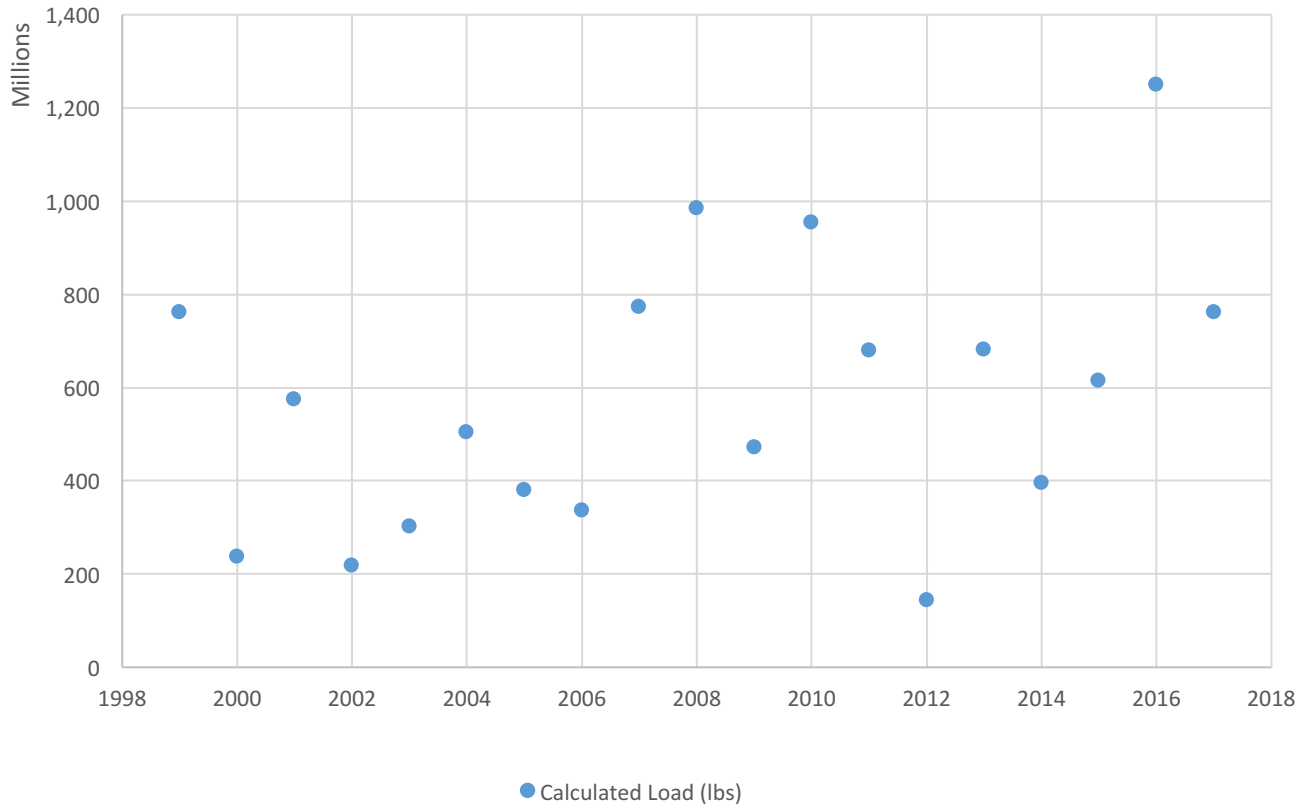
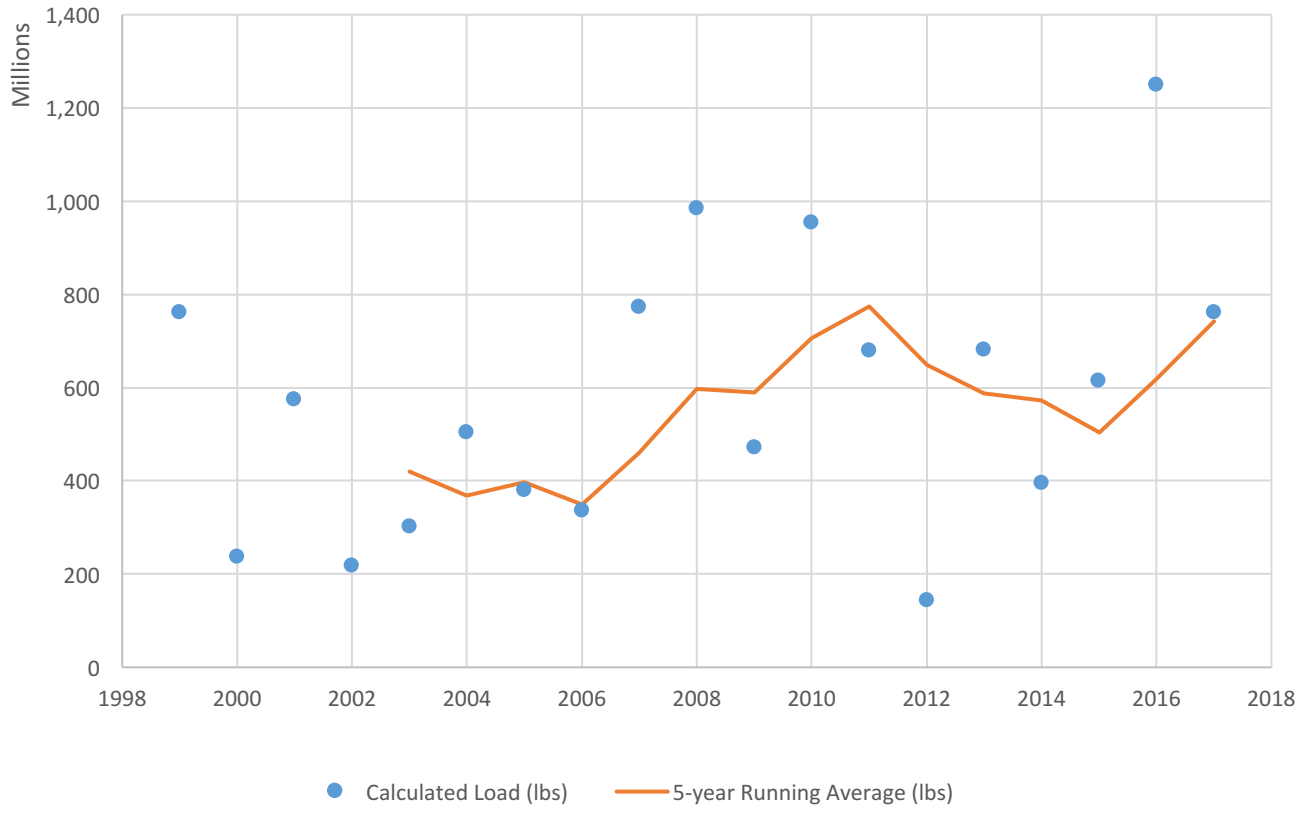

DNR Ambient Site
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
0
25
50
100 Kilometers

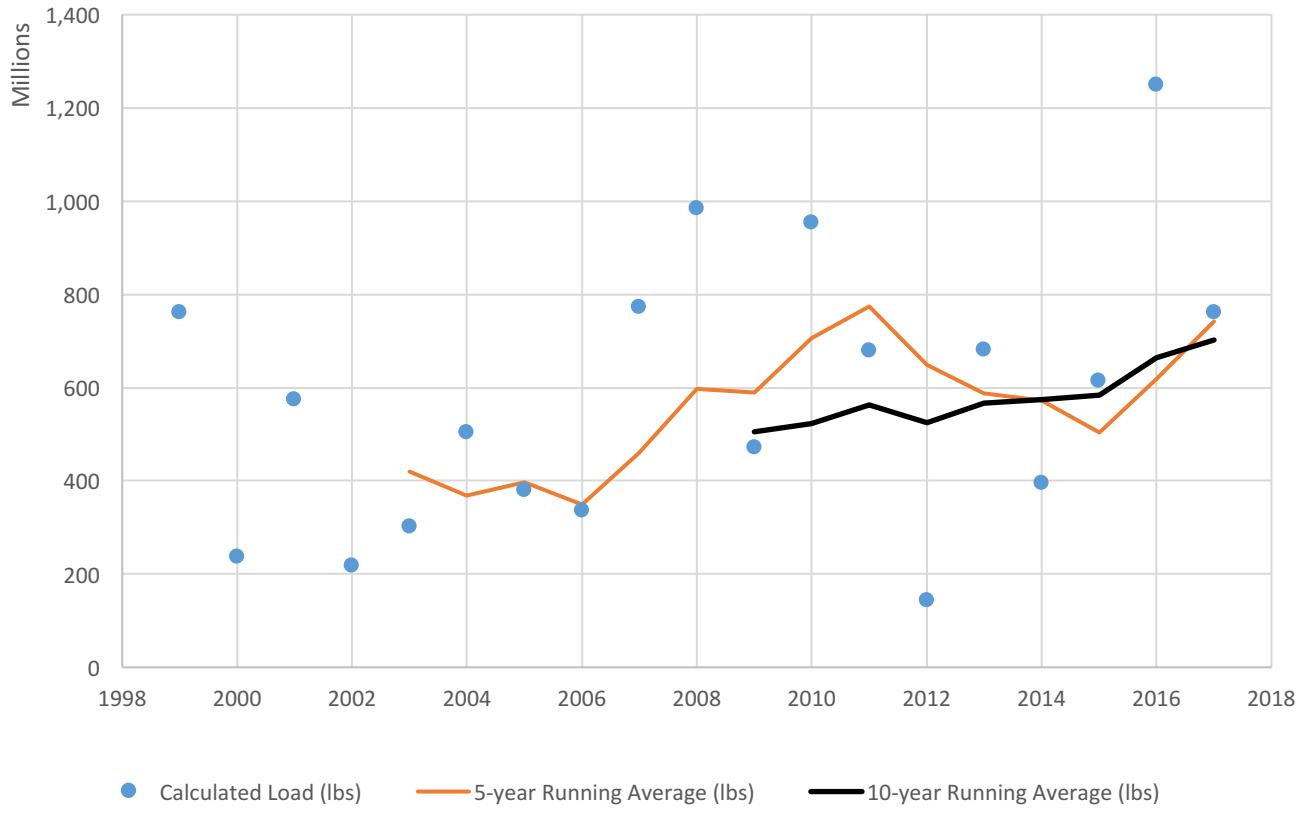
5- and 10-Year Moving Average of Load Leaving Iowa



5-Year Moving Average of Load Leaving Iowa



Nitrate Load Leaving Iowa



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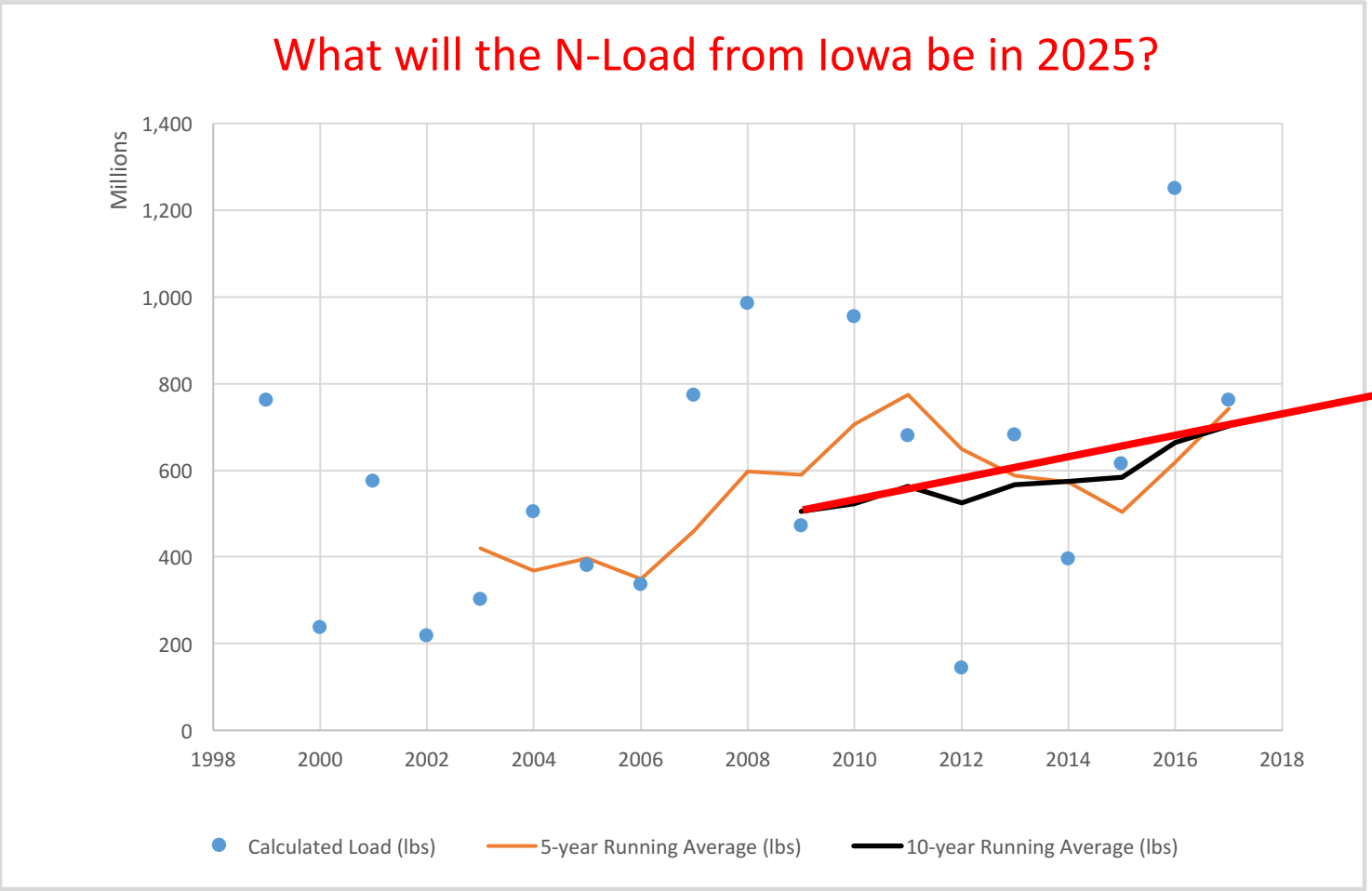

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- Make Solar Energy Economical
- Enhance Virtual Reality
- Reverse-Engineer the Brain
- Engineer Better Medicines
- Advance Health Informatics
- Restore and Improve Urban Infrastructure
- Secure Cyberspace
- Provide Access to Clean Water
- Provide Energy from Fusion
- Prevent Nuclear Terror
- Manage the Nitrogen Cycle
- Develop Carbon Sequestration Methods
- Engineer the Tools of Scientific Discovery

Enhance virtual re

True virtual reality creates the illusion of actually being in a different space. It can be used for training, treatment, and communication.

SHAPE THE FUTURE

- NAE Grand Challenges Scholars Program
- Vest Scholars Program

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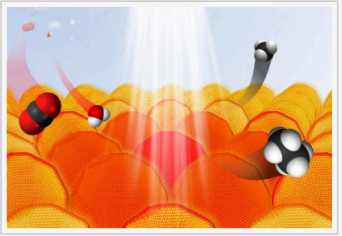

Carbon-Recycling

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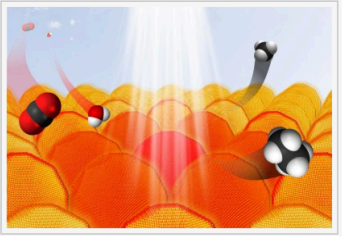

Carbon-Recycling

Far and away the best prize that life has to offer is the chance to work hard at work worth doing

– Theodore Roosevelt