A vision for a more resilient Iowa

The Iowa Watershed Approach

Larry Weber

Principal Investigator, Iowa Watershed Approach

Co-founder, Iowa Flood Center

Edwin B Green Chair of Hydraulics, University of Iowa

larry-weber@uiowa.edu

IIHR—Hydroscience & Engineering

Celebrating 100 years of expertise in 2020!

IIHR is a unit of the University of Iowa's College of Engineering. At IIHR, students, faculty members, and research engineers work together to understand and manage one of the world's greatest resources—water.

HIGH WATER OVERTAKES DOWNTOWN CEDAR RAPIDS
THOUSANDS EVACUATED IN UNPRECEDENTED FLOOD
POWER LOSS WIDESPREAD; WATER IN SHORT SUPPLY

The Gazette
AN INDEPENDENT NEWSPAPER IN IOWA'S TECHNOLOGY CORRIDOR
VOL. 130 NO. 166
FRIDAY
June 13, 2008
www.gazetteonline.com
75 CENTS

EPIC SURGE

Al Morris/The Gazette

The swollen Cedar River continues to rise Thursday afternoon on its way to an unprecedented crest today, overtaking city bridges, pouring into downtown and encroaching May's Island (right). The island is home to the Linn County Jail (background), Linn County Courthouse (middle) and Cedar Rapids City Hall (foreground).

MORE FLOODING COVERAGE AT
WWW.GAZETTEONLINE.COM

- GET THE LATEST ON FLOODING IN LINN COUNTY, JOHNSON COUNTY AND EAST IOWA
- VIEW PHOTO GALLERIES OF RESCUES, EVACUATIONS AND DEVASTATION
- SEE AERIAL VIDEO TAKEN FROM ATOP A HOTEL IN DOWNTOWN CEDAR RAPIDS
- WATCH VIDEO OF RESIDENTS BEING RESCUED BY BOAT IN THE TIME CHECK AREA

Index
TODAY'S WEATHER

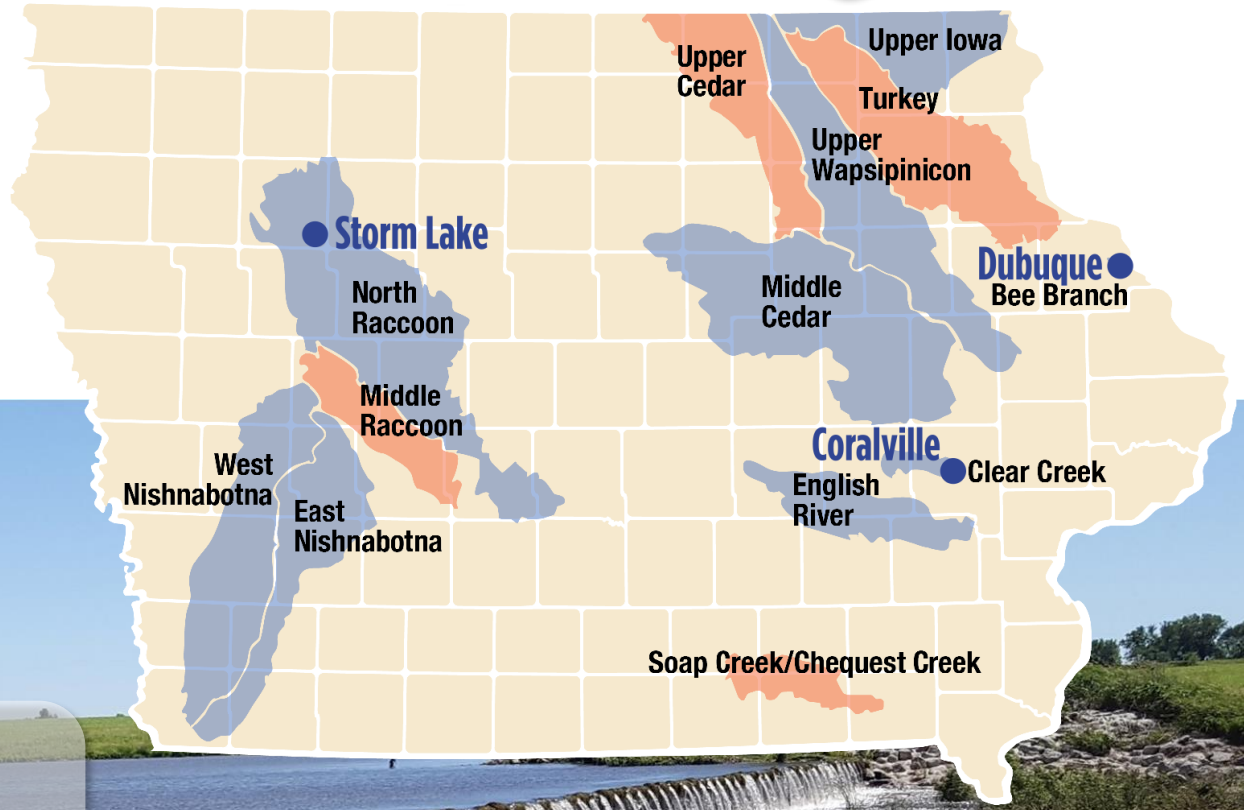

Cedar Rapids, June 2008

Iowa Flood Center—Serving Iowans since 2009

Thanks to our legislators, IFC is the only academic research center across the country devoted solely to floods. IFCs innovative tools and reliable information helps Iowans understand flood risks, prepare, and mitigate for future flood events.

A vision for a more resilient Iowa

The Iowa Watershed Approach



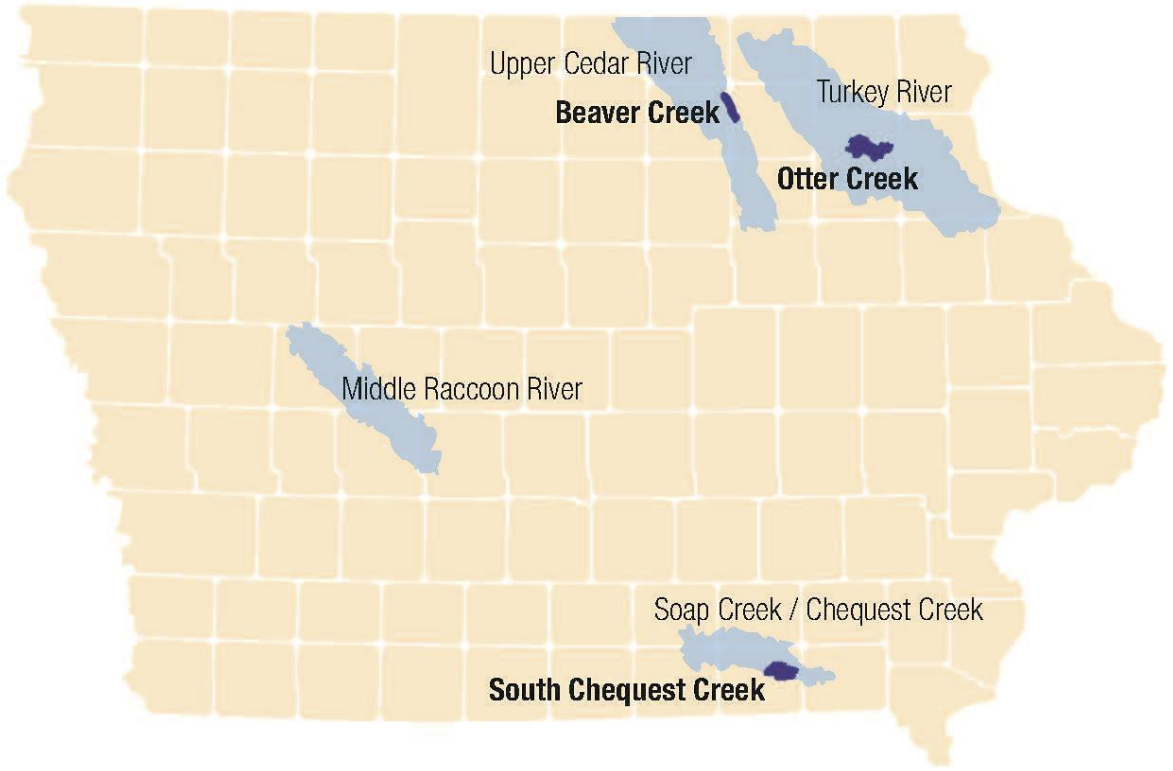
Iowans working together to reduce flooding, improve water quality, and build resilient communities!

A vision for a more resilient Iowa

The Iowa Watershed Approach

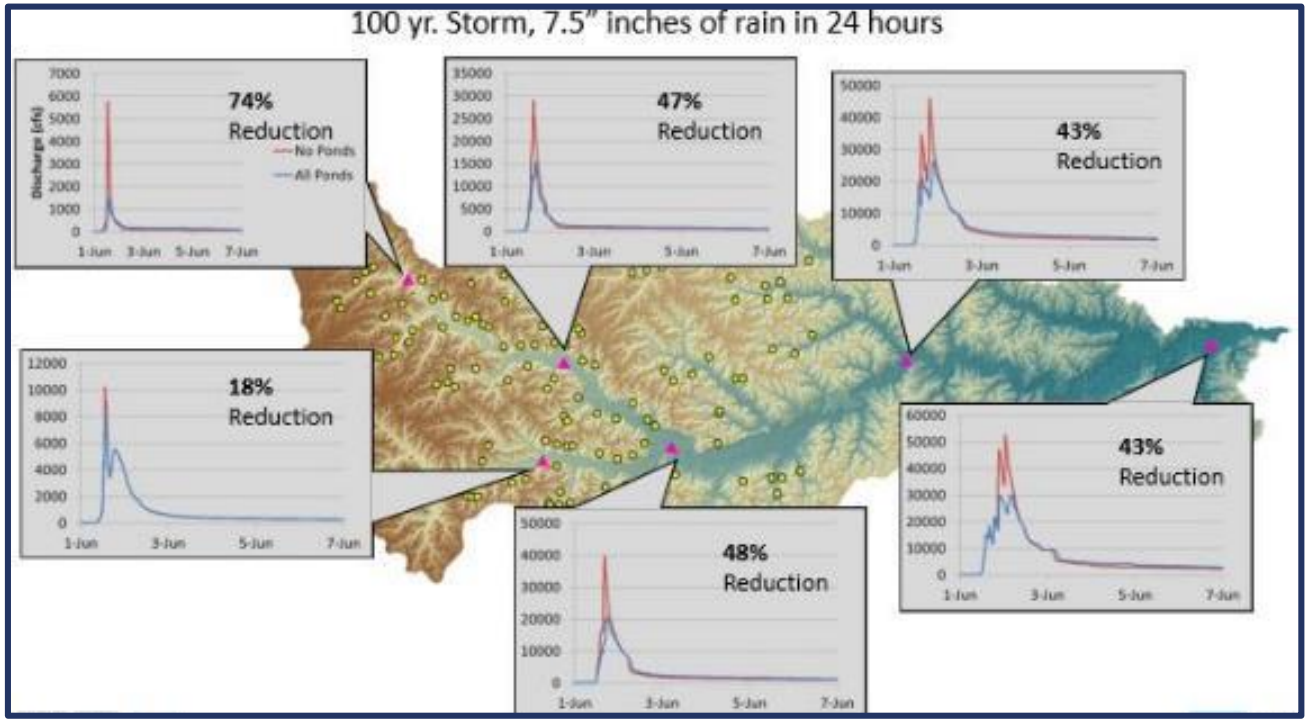
IWA Built off the Framework of Iowa Watersheds Project (2010-2016)

- August 2010, HUD announces $312M for Disaster Recovery Enhancement Fund (DREF) to 13 states in response to flood mitigation efforts
- Iowa received the largest grant of $84.1M of CDBG funds
- $10M allocated to watershed demonstration projects directed toward flood damage reduction and educational programming
- $8.8M set aside for watershed demonstration projects overseen by the Iowa Flood Center
- $800K was used to establish the first WMAs in Iowa



The Iowa Watershed Approach

Case Study: Soap Creek Watershed



1986 – Formation of Soap Creek Watershed Board – 28E

1988 – Study identifies 154 project locations to reduce flooding

2012 – 132 watershed projects complete

A vision for a more resilient Iowa

The Iowa Watershed Approach

National Disaster Resilience Competition (2016-2021)

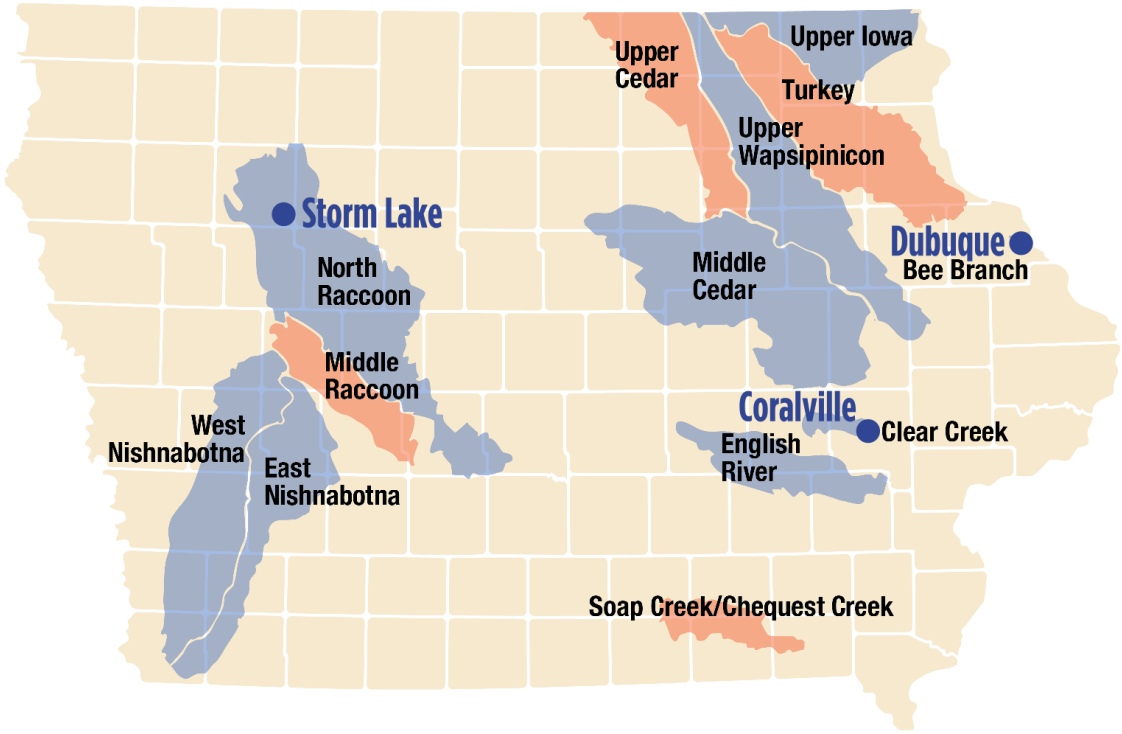
- Funder: US Dept. of Housing and Urban Development, in collaboration with the Rockefeller Foundation
- Funding level: $1B; CDBG; Superstorm Sandy
- **Out of 14 applicants, Iowa received the 4th largest grant award totaling $96,887,177**
- Applicant: State of Iowa, Iowa Economic Development Authority (IEDA)
- Iowa Watershed Approach program developed by IFC in consultation with many, many partners

A vision for a more resilient Iowa

The Iowa Watershed Approach

IWA Program Description

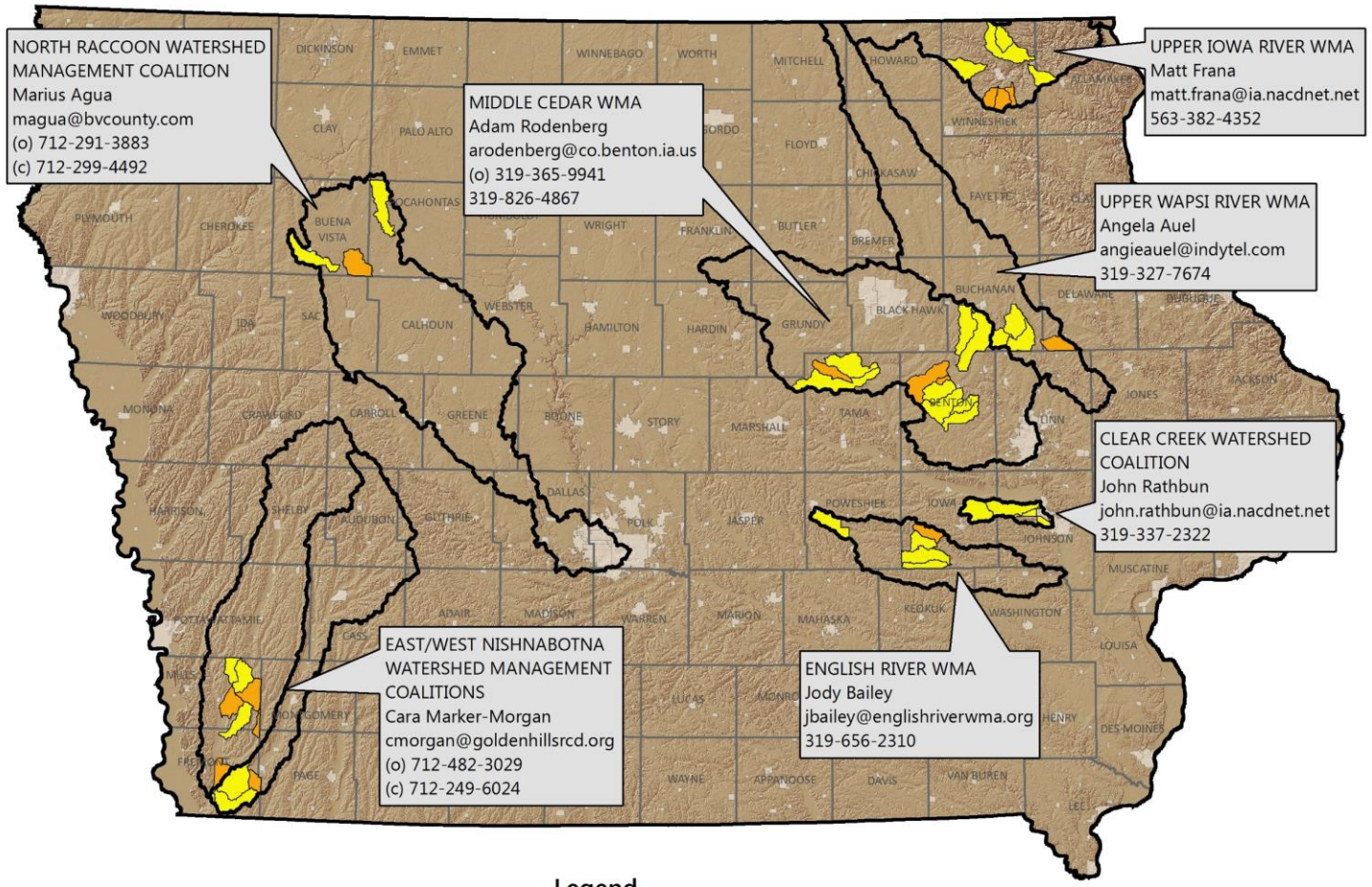
- Establish a WMA
- Develop a hydrologic assessment and watershed plan
- Deploy monitoring equipment
- Work with ***project coordinators*** and volunteer landowners to implement projects that reduce the magnitude of downstream flooding and improve water quality
- Assess project benefits based on monitoring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



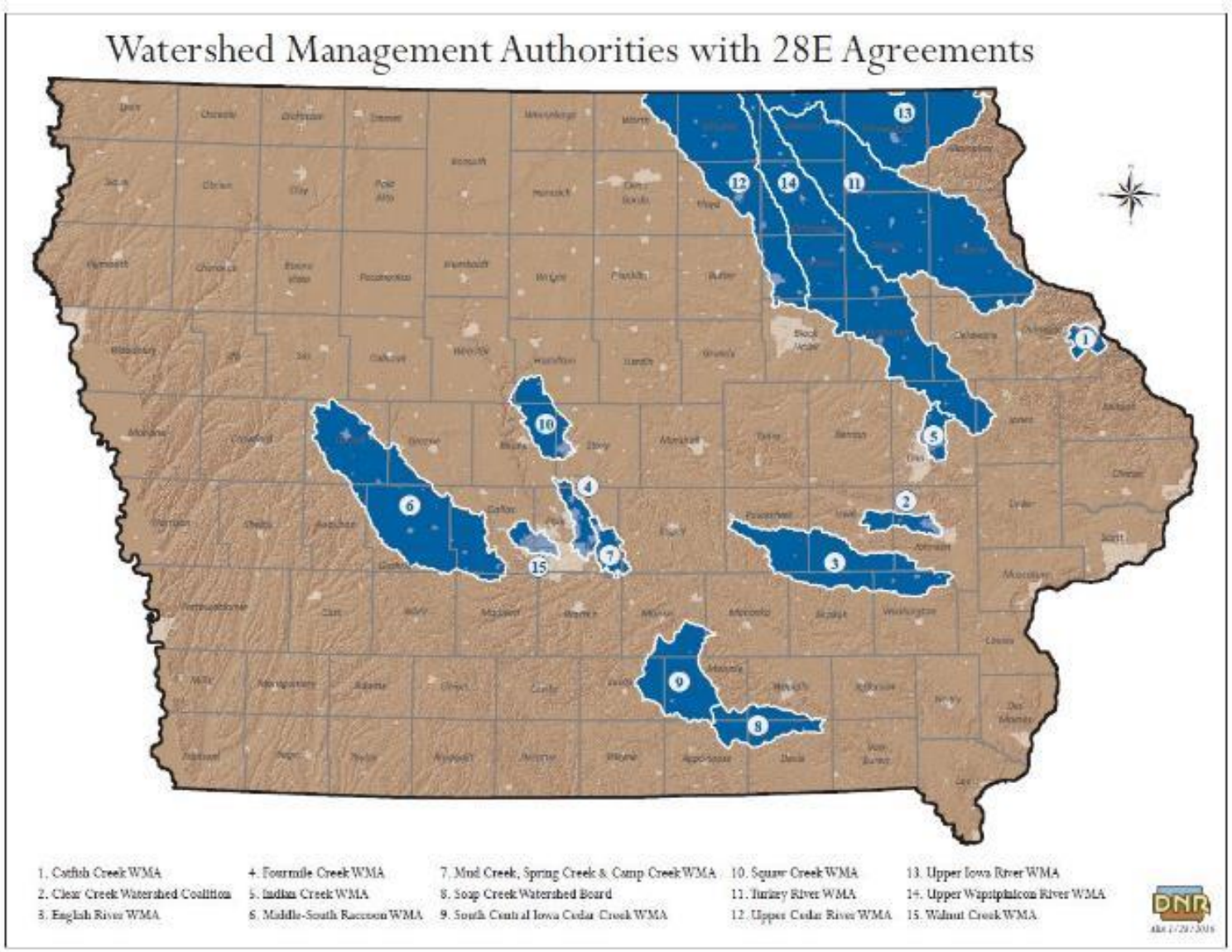
A vision for a more resilient Iowa

The Iowa Watershed Approach

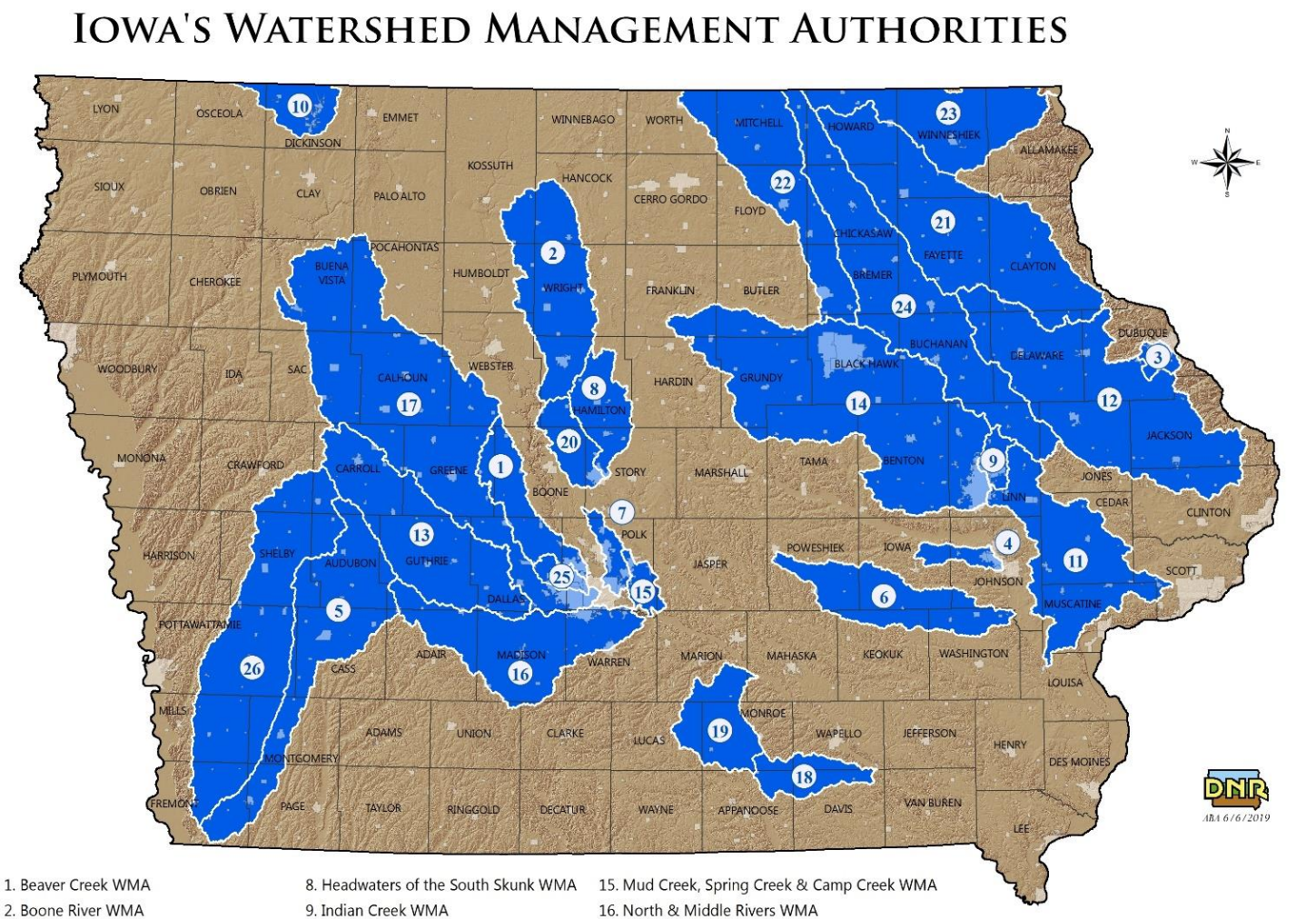
NDR - IWA BMP Implementation Areas



Watershed Management Authorities in Iowa – January 2016



Watershed Management Authorities in Iowa – July 2019



The Iowa Watershed Approach

Hydrologic Assessment

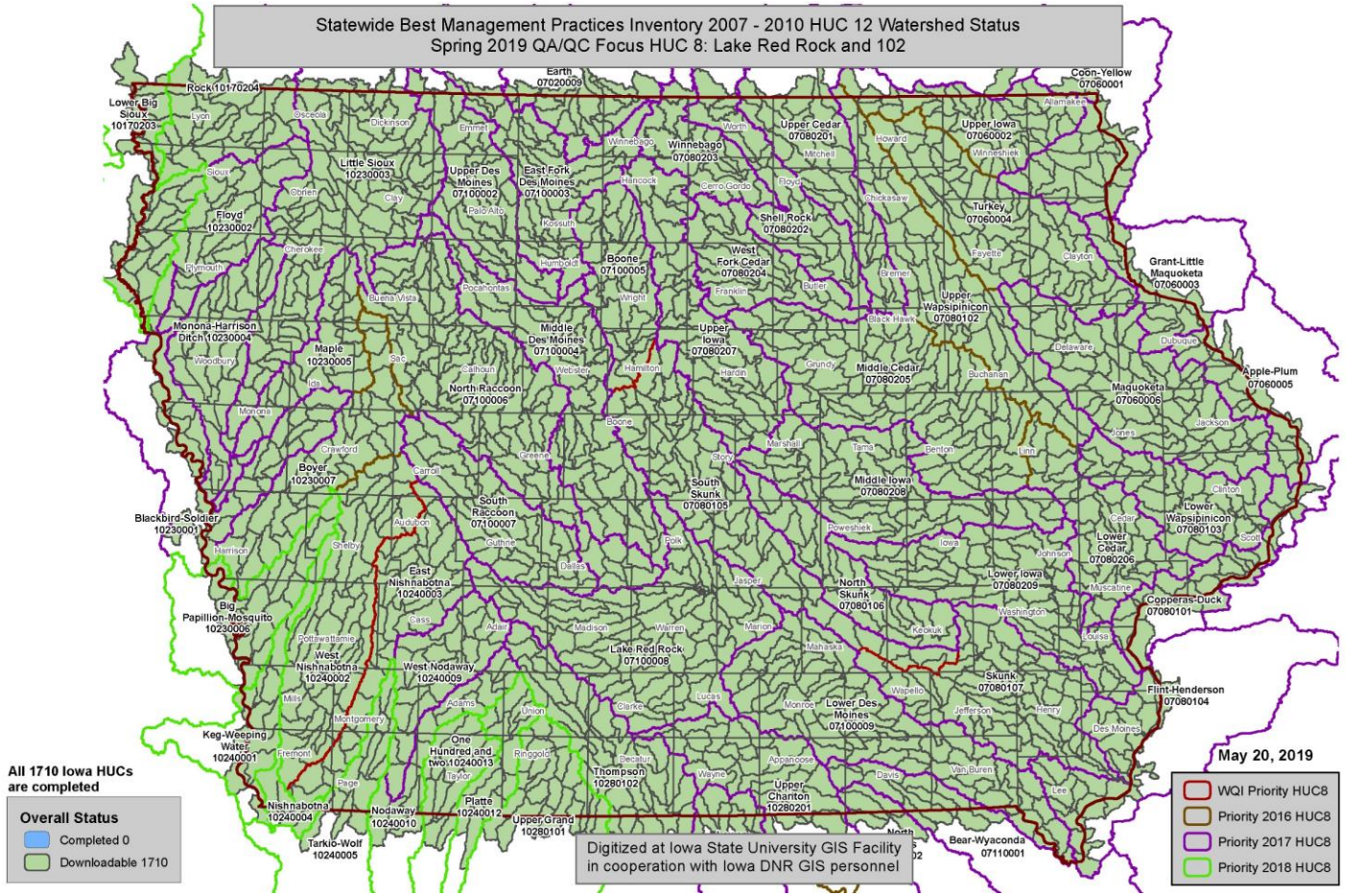
- Iowa's Flood Hydrology & Water Quality
- Conditions in each IWA Watershed
  - Hydrology
  - Geology & Soils
  - Topography
  - Land Use
  - Instrumentation/Data Records
- BMPs: Existing vs. Potential
- Hydrologic Model
- Watershed Scenarios
  - Ex. row crop to tall-grass prairie, row crop using cover crop, distributed ponds/wetlands

A vision for a more resilient Iowa

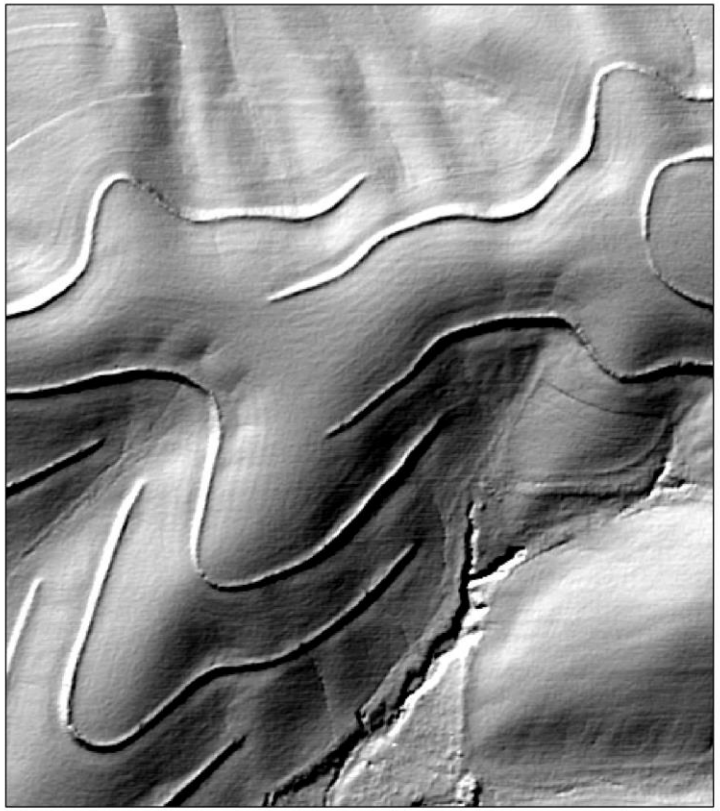
The Iowa Watershed Approach

Iowa BMP Mapping Project

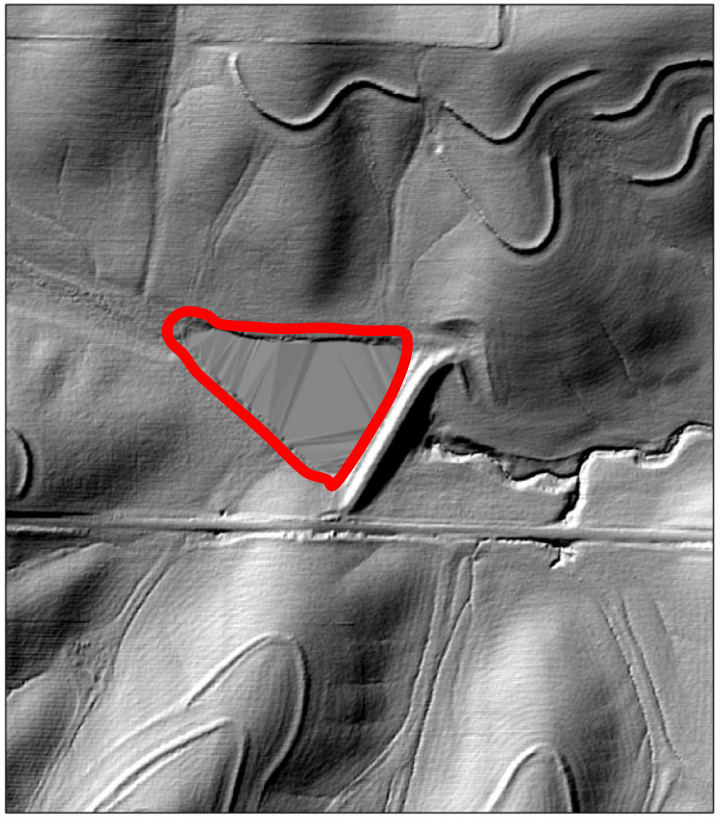
- Iowa State University
- Iowa Department of Natural Resources
- Iowa Department of Agriculture and Land Stewardship
- National Laboratory for Agriculture and the Environment
- Iowa Nutrient Research Center (ISU)
- Iowa Nutrient Research and Education Council



Iowa BMP Mapping Project



Hillshade showing narrow base terraces



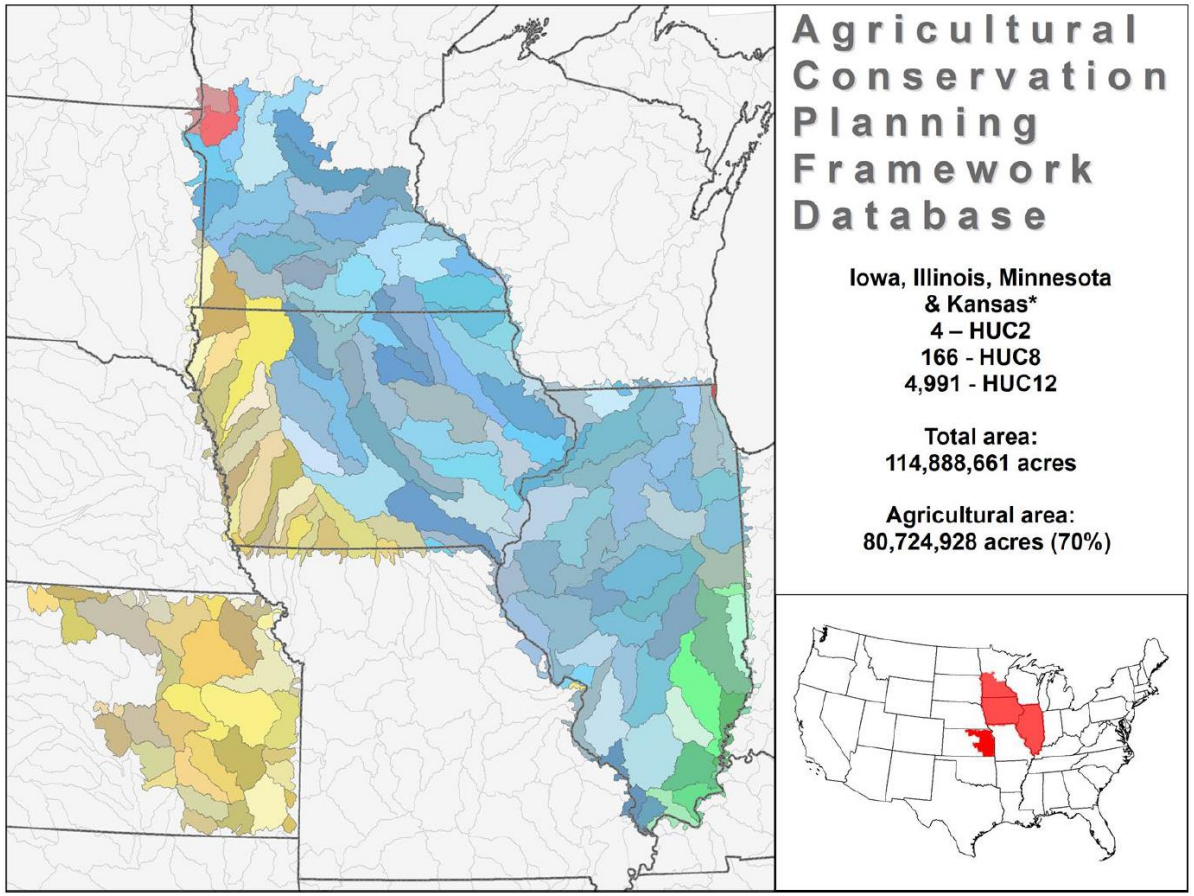
Pond dam on hillshade

Iowa BMP Mapping Project

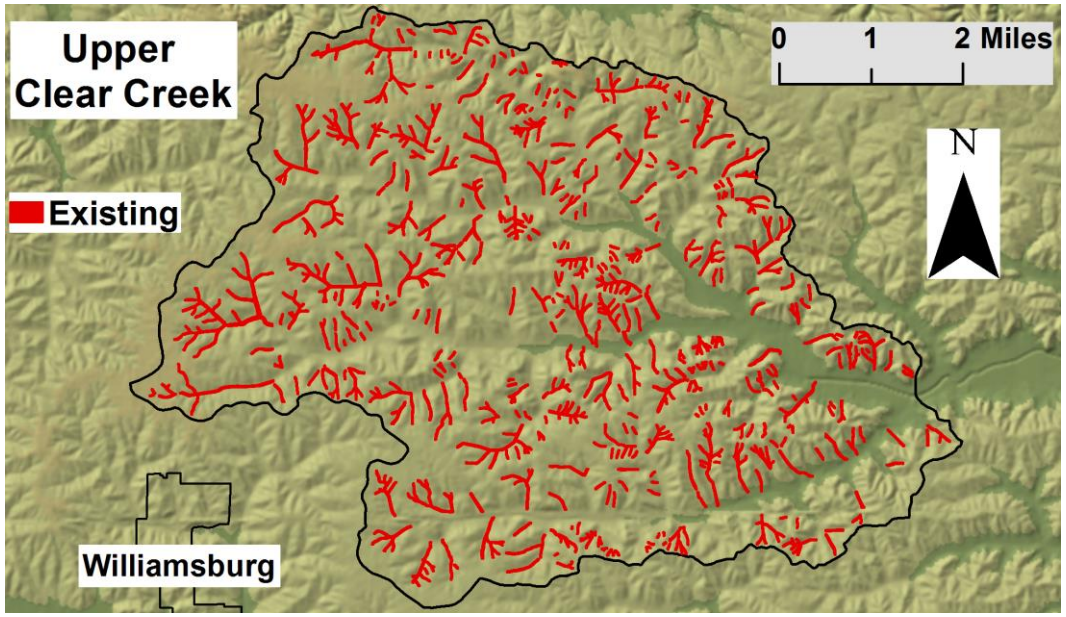
Contour buffer strips with grassed waterways on CIR image

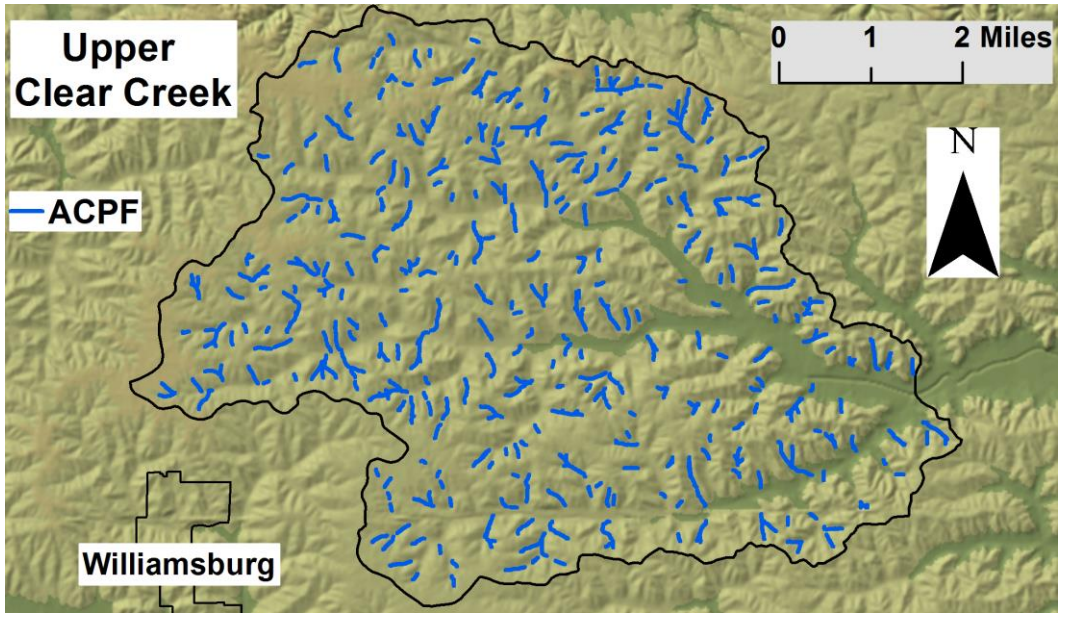
Contour strip cropping with grassed waterways on CIR image

Agricultural Conservation Planning Framework (ACPF)



BMP Mapping + ACPF

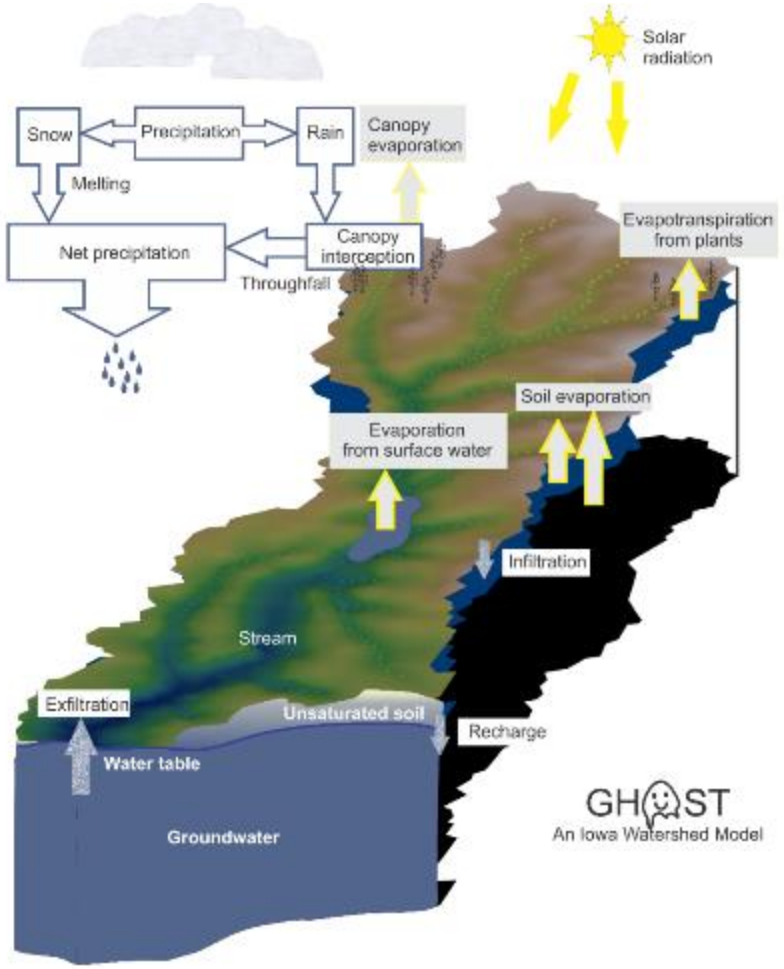




Grassed Waterways	Distance (miles)
Existing	131.7
ACPF	62.0
Potential	30.3

A vision for a more resilient Iowa

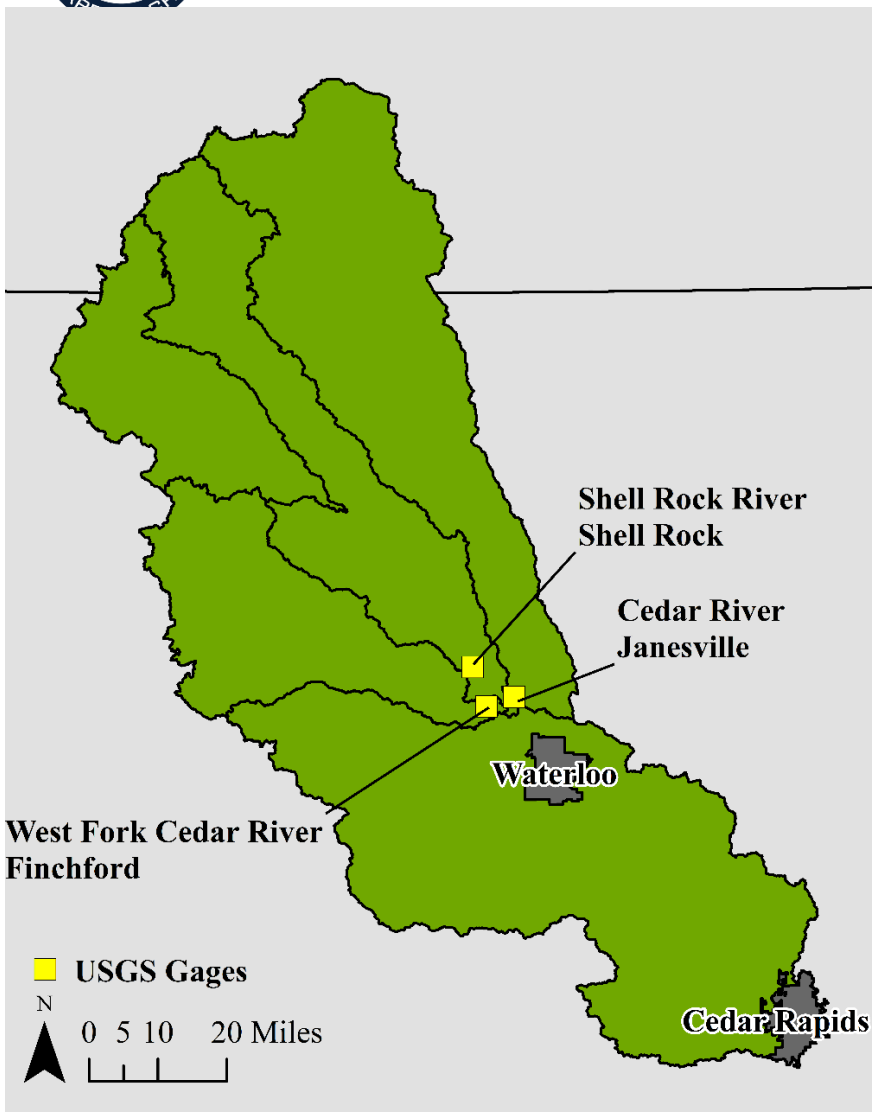
The Iowa Watershed Approach



- 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
- Watershed Scenarios

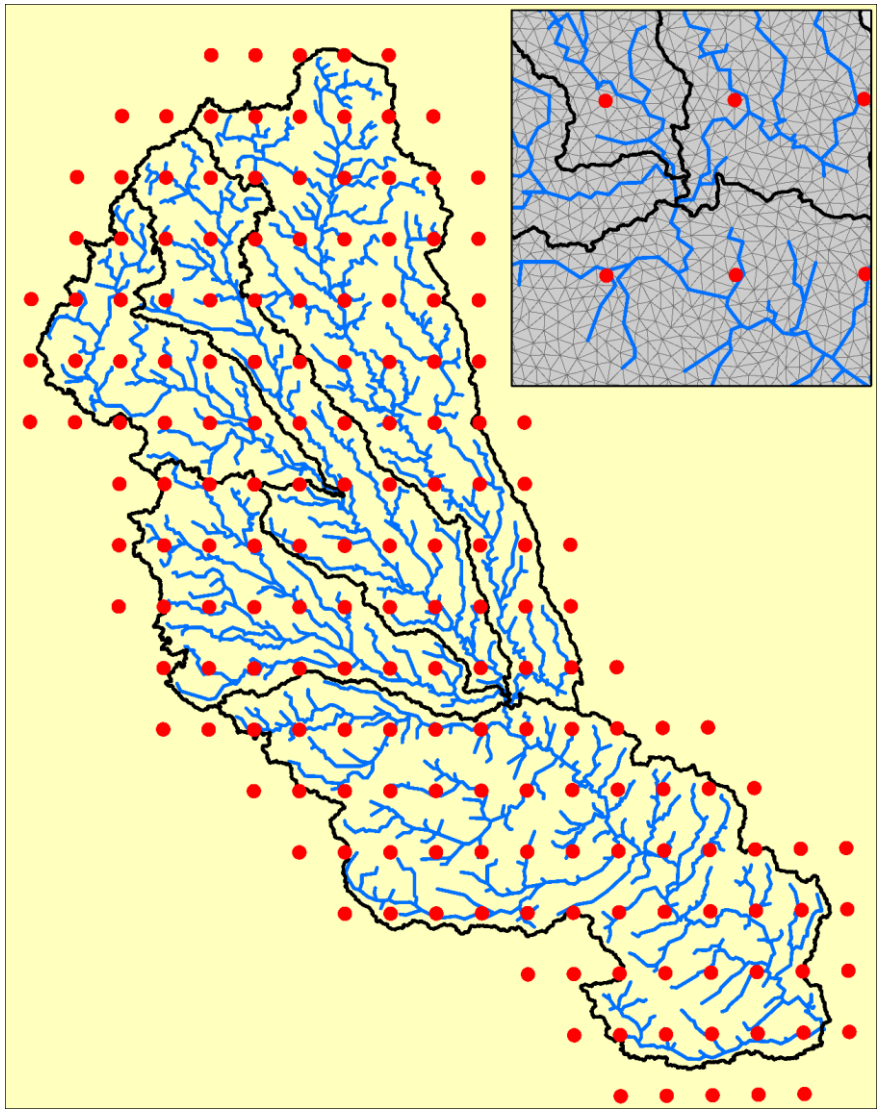
A vision for a more resilient Iowa

The Iowa Watershed Approach

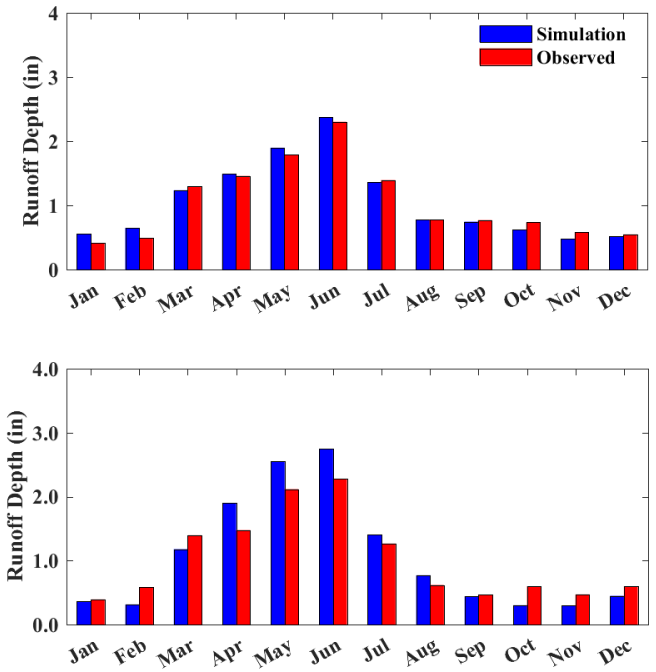


- Computing time: 3.5 hr/yr
- 6,800 mi^2 (4.3 M acres)
- 3,475 River Segments
- 28,000 Triangles:

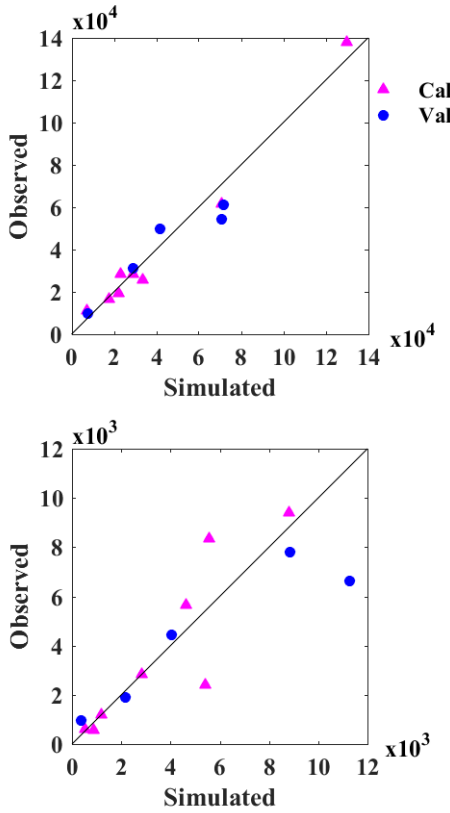
Metric	Acres
Min	6.6
Max	247.1
Mean	153.7
Median	149.0
Std	39.8



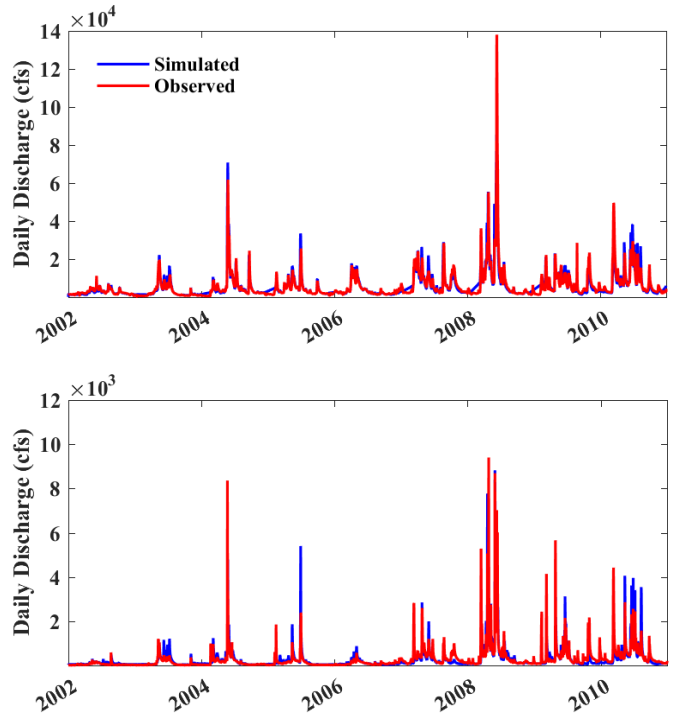
Hydrologic Model Calibration and Validation



Observed and simulated average monthly runoff depth (in inches) for the Middle watershed. Results are shown for both the calibration and validation periods (2002-2016). Top: Cedar River at Cedar Rapids, Bottom: Wolf Creek near Dysart.

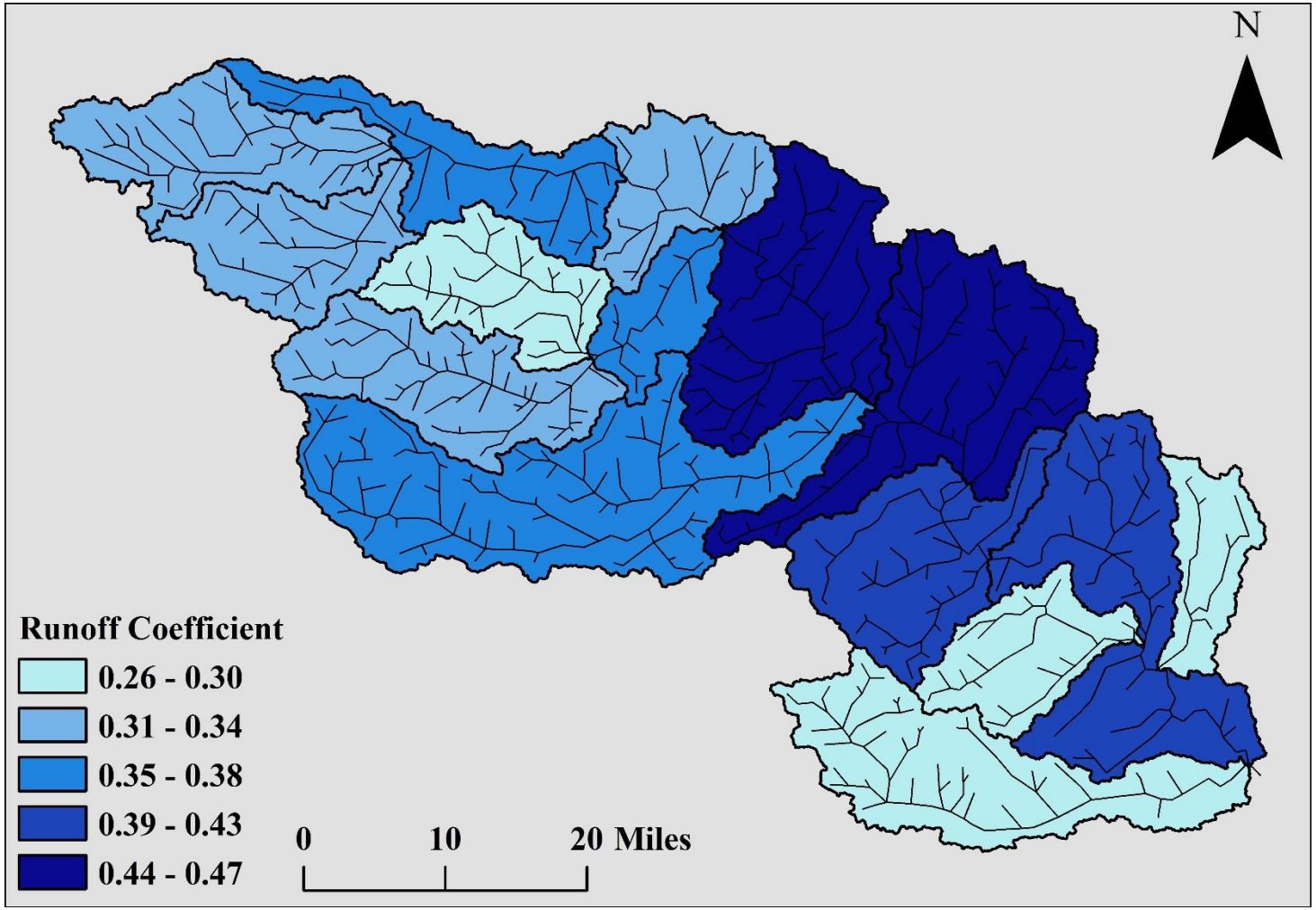


Simulated versus observed annual maximum peak daily discharges (cfs) for the Middle Cedar. Top: Cedar River at Cedar Rapids, Bottom: Wolf Creek near Dysart.



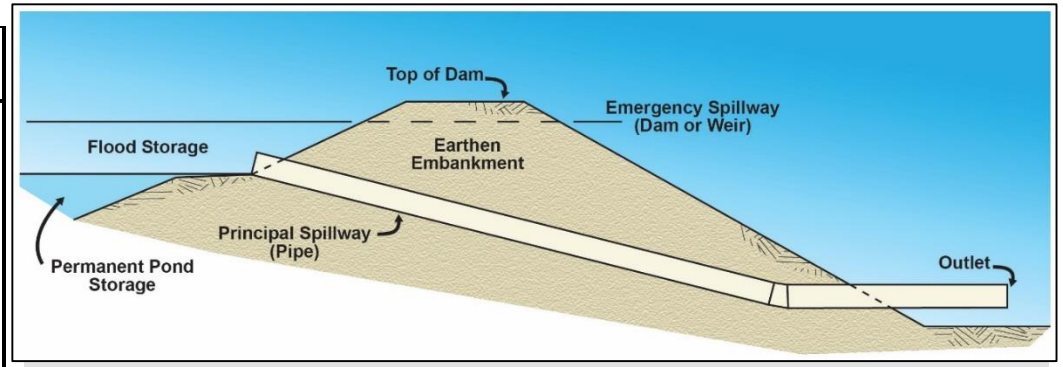
Observed and simulated daily flow time series. Calibration period. Top: Cedar River at Cedar Rapids, Bottom: Wolf Creek near Dysart. Measured flows were obtained from USGS gauge stations USGS 05464500, USGS 05464220.

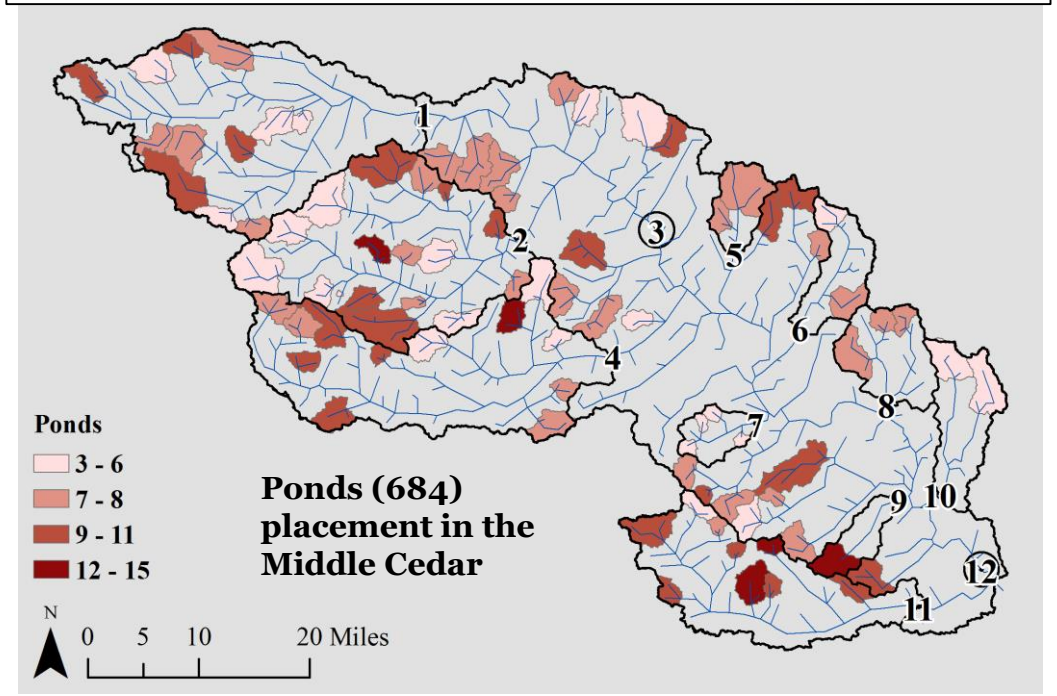
Runoff Coefficient



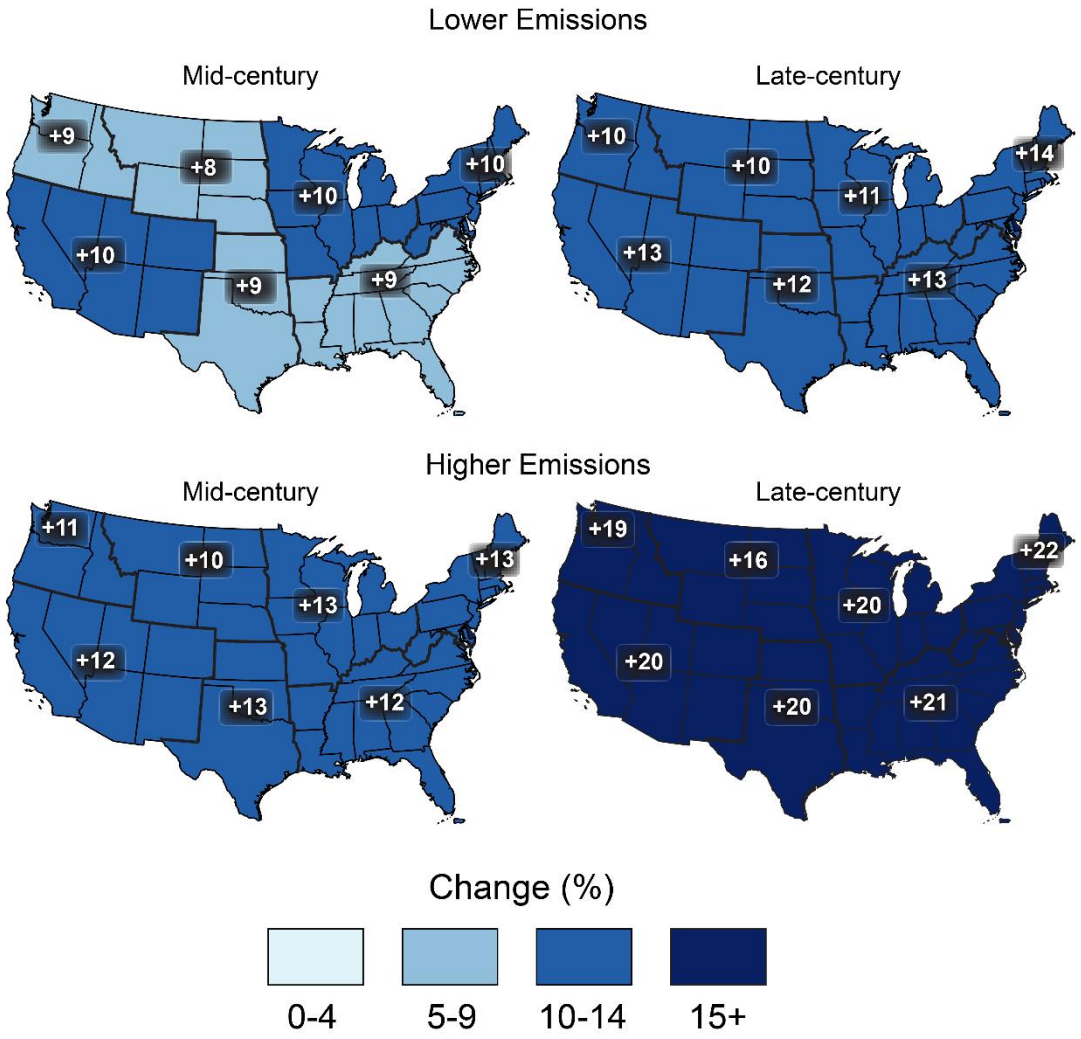
Pond Locations and Index Points

Index Point	Description
1	USGS 05463000 Beaver Creek at New Hartford
2	USGS 05463500 Black Hawk Creek at Hudson
3	Middle Cedar at Gilbertville
4	USGS 05464220 Wolf Creek near Dysart
5	High Flood Risk Spring Creek
6	Bear Creek Near 380
7	Hinkle Creek Inflow Vinton
8	Blue Creek - Tributary to Cedar River
9	Dry Creek at Palo
10	Otter Creek above Cedar River Flood Plain
11	Prairie Creek at Fairfax
12	USGS 05464500 Cedar River at Cedar Rapids



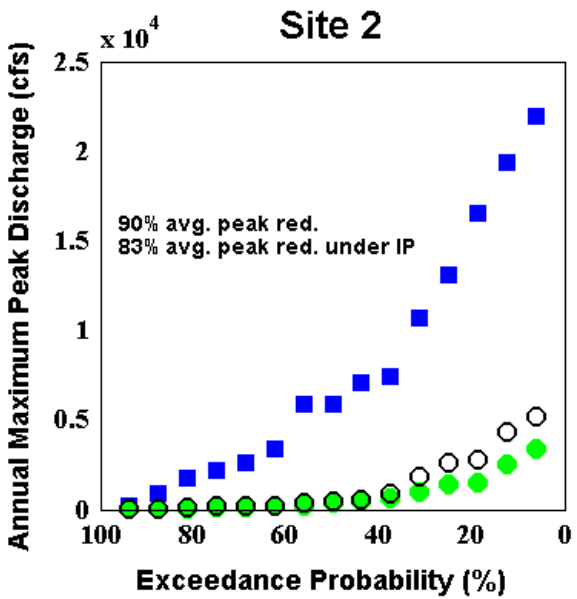


Hydroscience & Engineering
Iowa Flood Center

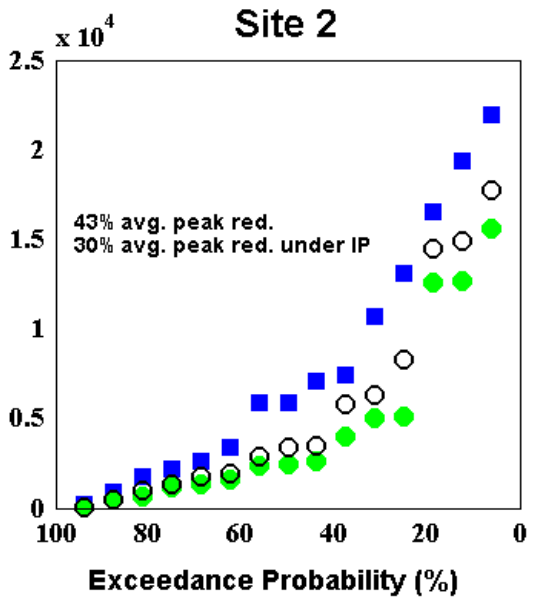


Projected change in heavy precipitation. Twenty-year return period amount for daily precipitation for mid- (left maps) and late-21st century (right maps). Results are shown for a lower emissions scenario (top maps; RCP4.5) and for a higher emissions scenario (bottom maps, RCP8.5). Figure taken from The Climate Science Special Report (Easterling et al. 2017) (https://science2017.globalchange.gov/).

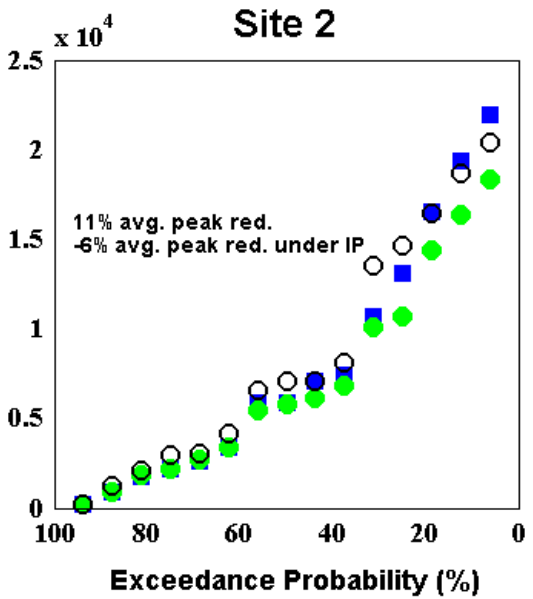
Scenario Results/Historic Precipitation/Increased Precipitation (IP)



Native Vegetation. 100% adoption.



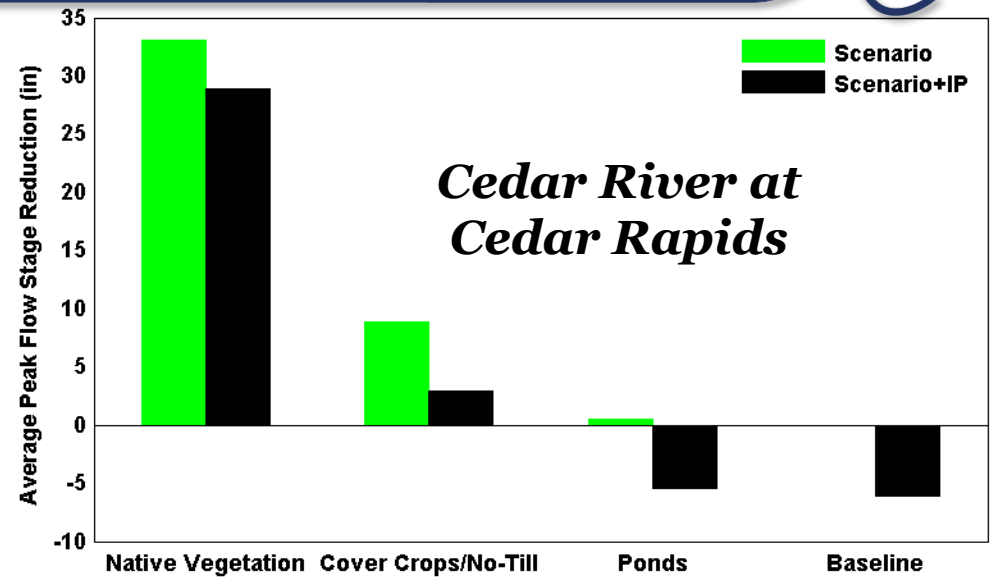
Cover Crops/Soil Health/No-Till scenario. 100% adoption.

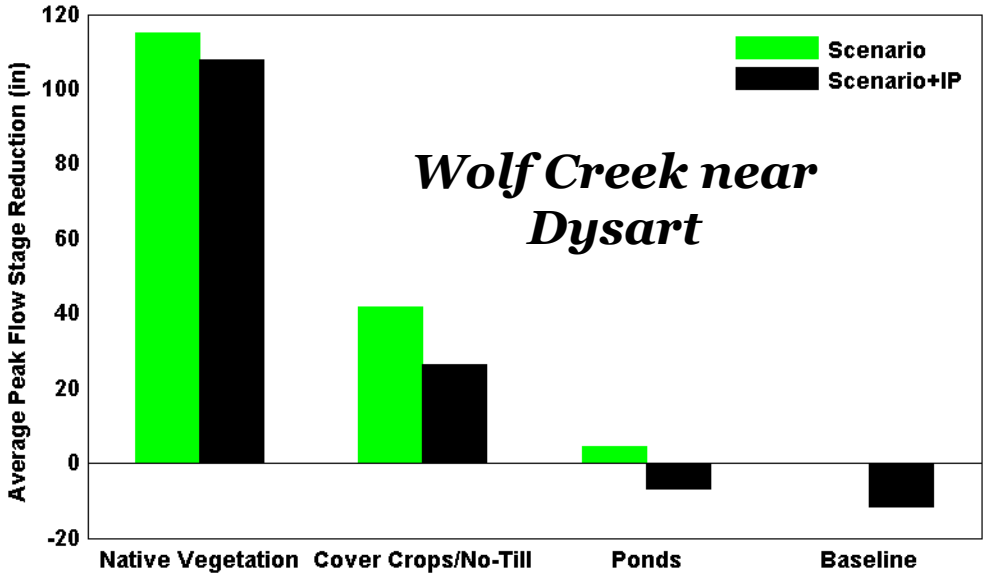


Distributed Storage. 684 ponds. 20 acre-ft. 12” outlet pipe.

Scenario Results/Summary

- Native Vegetation. **100% adoption.**
- Cover Crops/Soil Health/No-Till scenario. **100% adoption.**
- Distributed Storage. 684 ponds. 20 acre-ft. 12" outlet pipe.





Farmers, scientists, researchers, and public utilizing real-time data to make informed decisions.

A vision for a more resilient Iowa

The Iowa Watershed Approach

- 90% Cost-share
- 1,000 projects sited and under design
- Nearly $30 million allocated to date

Soap Creek Pond Structure from IWP


CATERPILLAR

What is Flood Resilience?

Flood resilience is the ability of a community within a watershed to plan and act collectively, using local capacities to mitigate, prepare for, respond to, and recover from a flood.

We connect with local community organizations partners to support local interest and create a sustainable approach for building community resilience

NORSE
LUTHER COLLEGE

IVR&D
Iowa Valley Resource Conservation & Development

HACAP

NORTHEAST IOWA RC&D
Resource Conservation & Development

ASTIG
PLANNING

FRENCH-RENEKER-
ASSOCIATES
ENGINEERS & SURVEYORS

FLOOD RESILIENT VINTON

Middle Cedar– Vinton

- [Flood Resilient Vinton website]

IVR&D
Iowa Valley Resource Conservation & Development

FLOOD RESILIENT CORALVILLE

- Flood Resilient Coralville website
- Interviewing key partners and stakeholders
- Connecting with the community through online workshops, interviews, business pledge campaign and at the community food pantry
- Creating a geographical database
- Developing a final plan

ASTIG PLANNING

BEE BRANCH HEALTHY HOMES

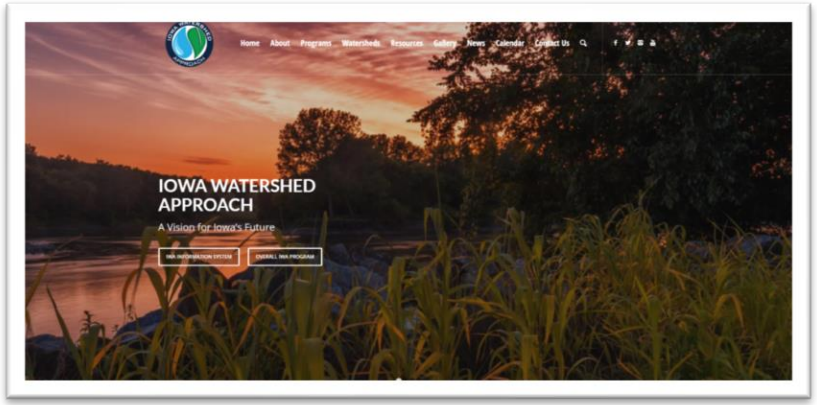
- $8.4 million of forgivable loans to improve 275 housing units.
- Funds awarded to low-to-moderate-income residents to make repairs and implement onsite stormwater management principles to decrease environmental healthy and safety issues from flooding

A vision for a more resilient Iowa

The Iowa Watershed Approach

Outreach and Communication

Website, Newsletters, and Story maps:



Media and Field Days:

We are social:

@IWAReduceFloods

A vision for a more resilient Iowa

The Iowa Watershed Approach

Partnerships support the IWA!

North Carolina Flood Resilience Exchange- August 2019

A vision for a more resilient Iowa

The Iowa Watershed Approach

Texas Delegation – Jan 2020


The Nature Conservancy
Protecting nature. Preserving life.
Iowa Natural Heritage Foundation
Environmental Programs & Services
IOWA SOYBEAN ASSOCIATION
CORALVILLE
IOWA CORN
USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service
IOWA FARM BUREAU
PEOPLE. PROGRESS. PRIDE.
IOWA DEPARTMENT OF AGRICULTURE AND LAND STEWARDSHIP
IAWA
IOWA AGRICULTURE WATER ALLIANCE
CEDAR RAPIDS
City of Five Seasons
Iowa
CDI
ANTARES
Group Incorporated
THE CITY OF DUBUQUE
Masterpiece on the Mississippi
CEDAR FALLS Iowa
University of Northern Iowa
StormLake
Jump Right In!
SILVER JACKETS
IOWA
economic development
GOLDEN HILLS
RESOURCE CONSERVATION & DEVELOPMENT
CITY OF DES MOINES
OFFICE OF THE CITY MANAGER
IOWA STATE UNIVERSITY
NORTHEAST IOWA RC&D
RESOURCE CONSERVATION & DEVELOPMENT
ISAC
Iowa State Association of Counties
IOWADOT
SMARTER | SIMPLER | CUSTOMER DRIVEN
IOWA WATER CENTER
DNR
U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
NASA
IOWA HOMELAND SECURITY AND EMERGENCY MANAGEMENT
NOAA
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE
USGS
science for a changing world
US Army Corps of Engineers
U.S. DEPARTMENT OF HOMELAND SECURITY
FEMA
NATIONAL WEATHER SERVICE

Serving Iowans with innovative tools & reliable information

The Iowa Flood Center

Iowa Flood Center
The University of Iowa
100 C. Maxwell Stanley Hydraulics Laboratory
Iowa City, IA 52242

319-384-1729
www.iowafloodcenter.org

The University of Iowa College of Engineering

IIHR Hydroscience & Engineering