Welcome to *The Current*, the North Central Region Water Network's Speed Networking Webinar Series

Flood Prevention: 2PM CT

1. Submit your questions for presenters via the chat box. The chat box is accessible via the purple collaborate panel in the lower right corner of the webinar screen.
2. There will be a dedicated Q & A session following the last presentation.
3. A phone-in option can be accessed by opening the Session menu in the upper left area of the webinar screen and selecting "Use your phone for audio".

This session will be recorded and available at northcentralwater.org and learn.extension.org.

Today's Presenters:

- **Corey Loveland**, Service Coordination Hydrologist, NOAA/NWS North Central River Forecast Center
- **Witold F Krajewski**, Professor, Civil and Environmental Engineering, The University of Iowa, and Director, Iowa Flood Center
- **Laura Edwards**, South Dakota State University Extension State Climatologist

Follow @northcentralh2o and #TheCurrent on Twitter for live tweets!

Corey Loveland

Corey is the Service Coordination Hydrologist for the National Weather Service (NWS) North Central River Forecast Center (NCRFC). Corey serves as the liaison between the River Forecast Center and Federal, State, and Tribal agencies throughout the upper Mississippi River, Hudson Bay and Great Lakes basins. He works to assist and help partners be aware of NWS hydrologic forecasting and service capabilities and provides technical guidance to partners, including Weather Forecast Offices. He provides decision support tools and other hydrologic information to emergency managers, water resource managers/partners and various other entities. He also provides NCRFC and NWS products and services outreach and education to the public and partners.

National Weather Service

Quick River Forecast Operations, Products, and Services Briefing

The Current

Corey Loveland
Service Coordination Hydrologist

NOAA / NWS
North Central River Forecast Center (NCRFC)
Chanhassen, MN

April 15, 2020

corey.loveland@noaa.gov
952-368-2530

Weather Offices & River Centers

122 Weather Forecast Offices

Based upon radar coverage

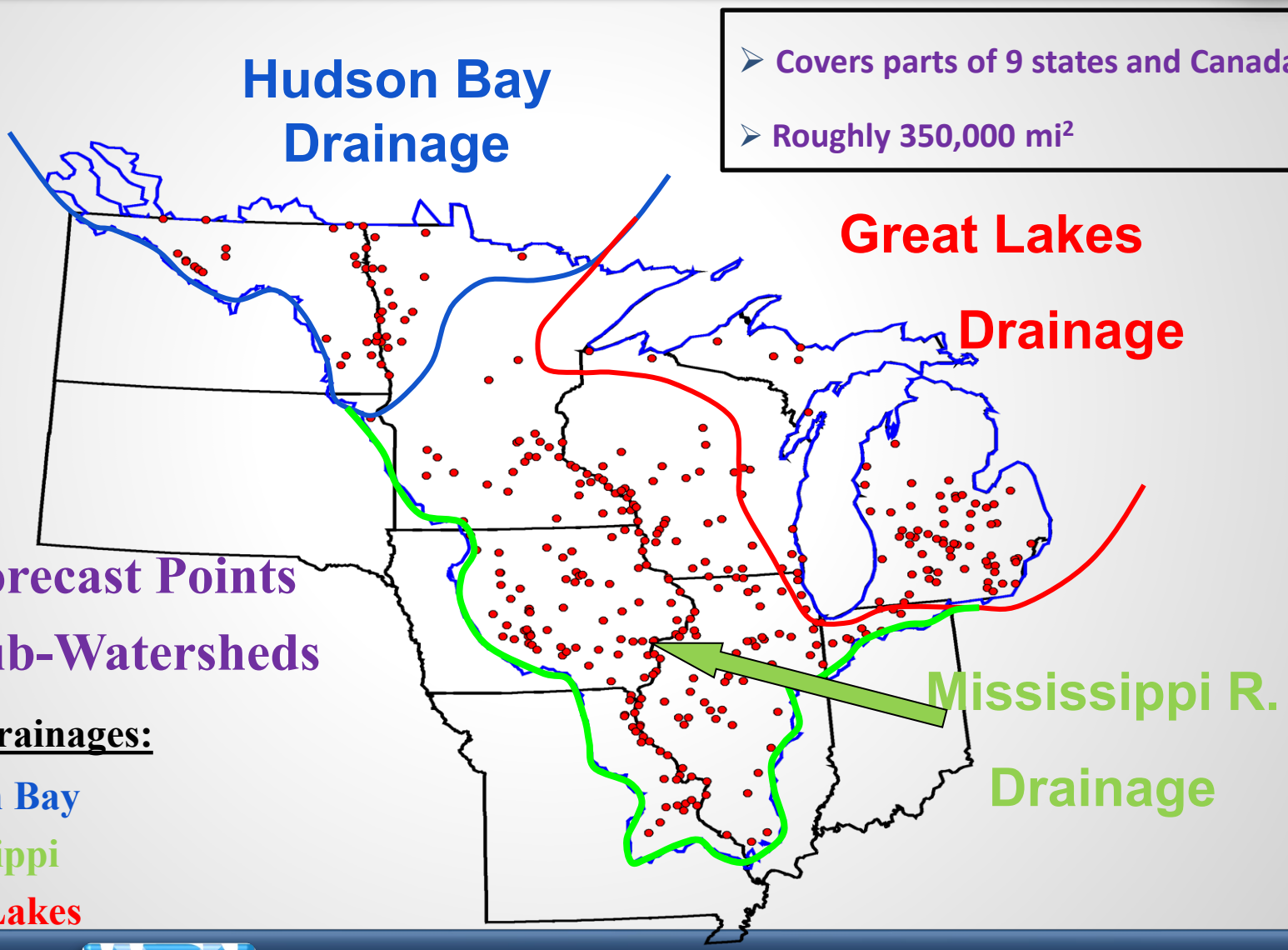
13 River Forecast Centers

(12 CONUS + 1 Alaska/Pacific)

Based upon watershed boundaries

NCRFC Area of Responsibility

● = Forecast Point Locations



- Covers parts of 9 states and Canada
- Roughly 350,000 mi^2

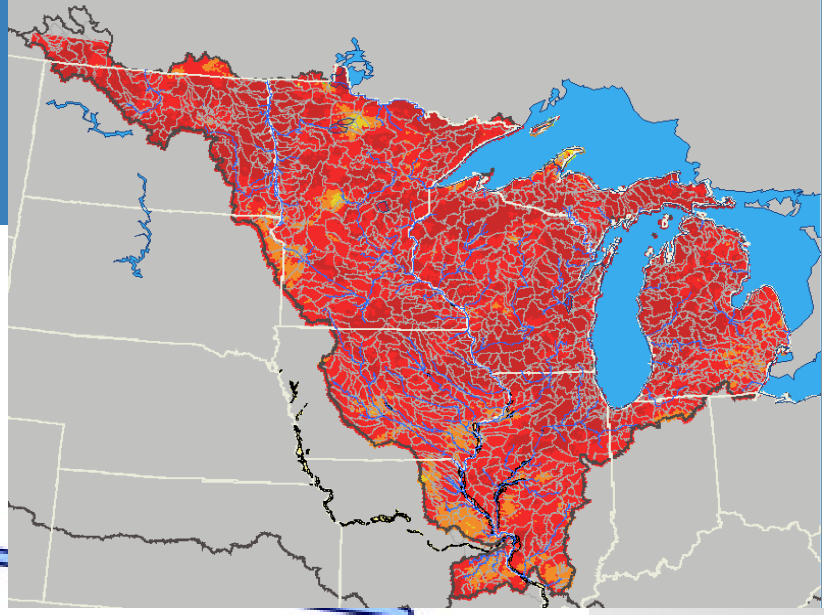
- ~400 Forecast Points
- ~950 Sub-Watersheds

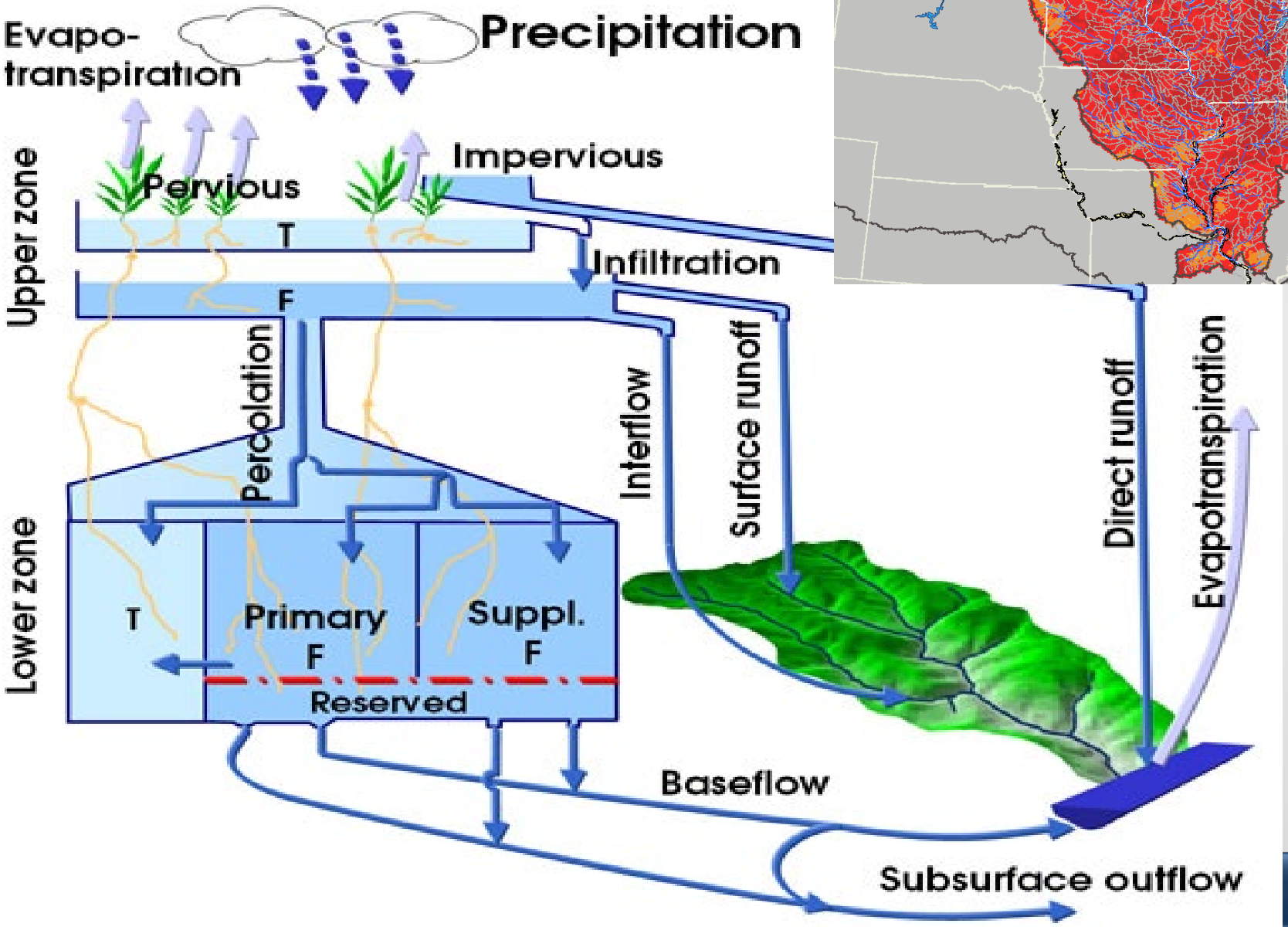
Major Drainages:

- Hudson Bay
- Mississippi
- Great Lakes

Our River Forecast Model

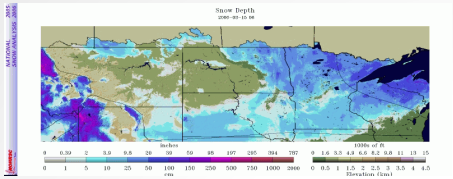
...attempt at simulating the water cycle





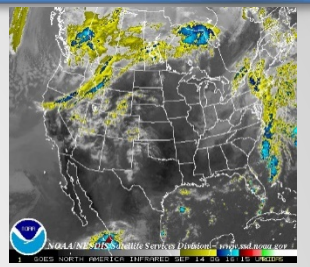
Hydrologic Analysis
Data needs….

Reservoir Releases



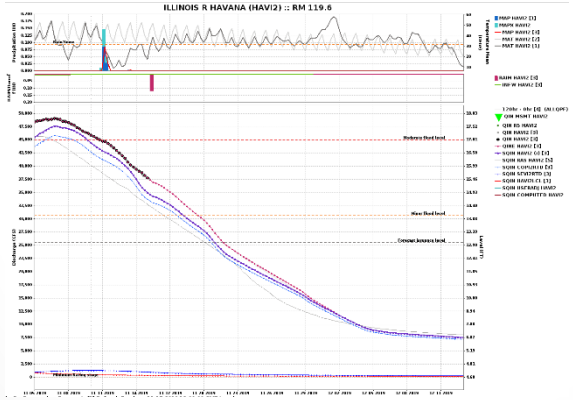
Snow Data

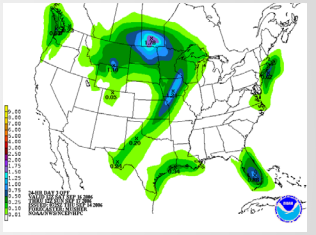
Radar Precipitation Estimates



Satellite Data

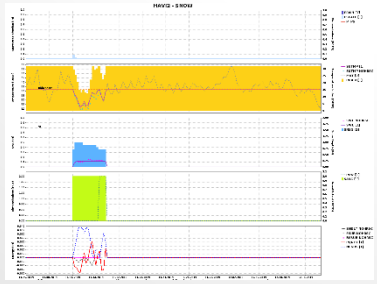
River Gage Data

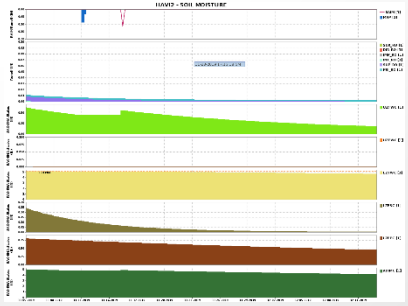


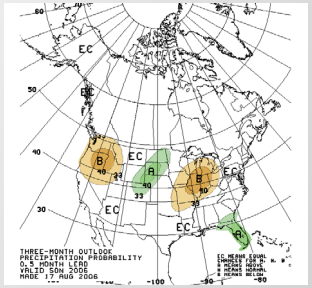


Precipitation & Temperature Forecasts

Weather Observations

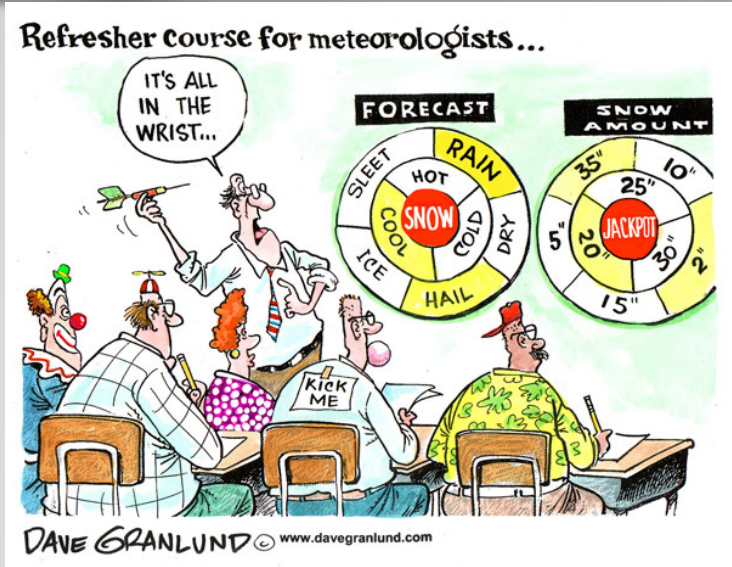


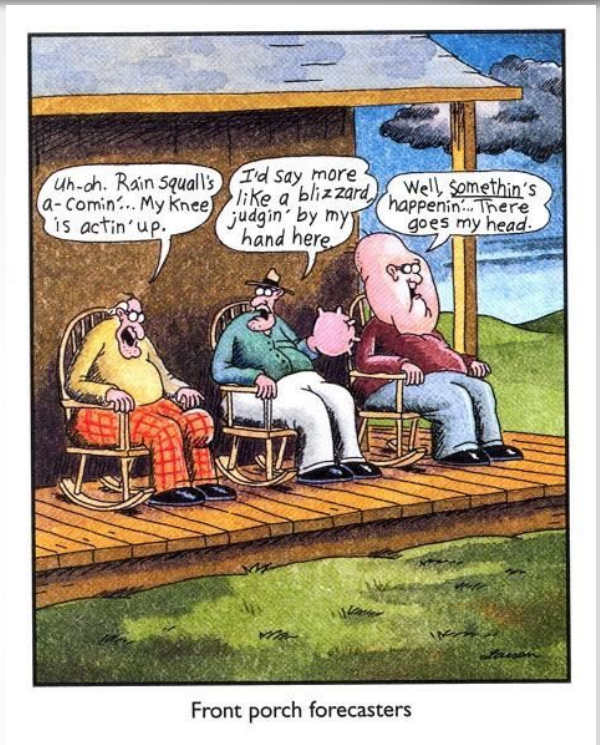




Climate Predictions

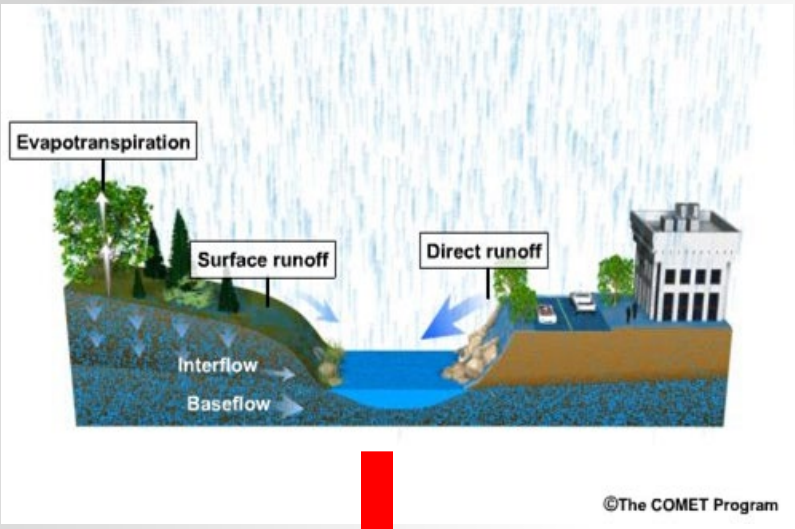
Shhh!!……Forecasting Secrets……



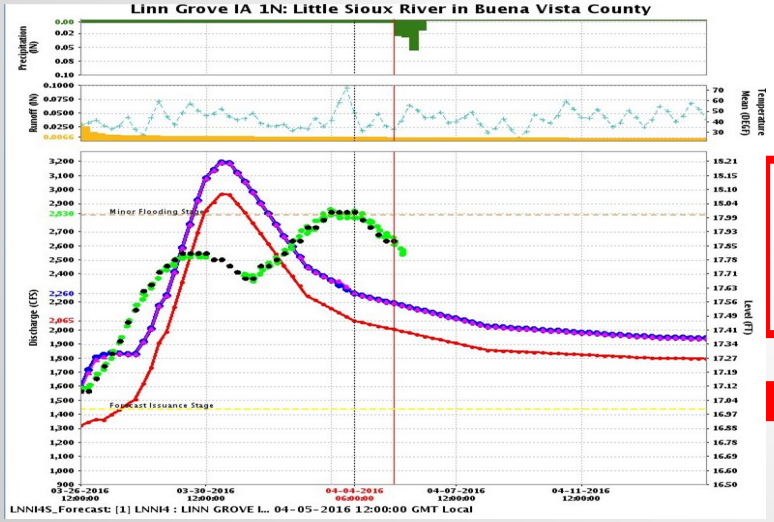


Front porch forecasters

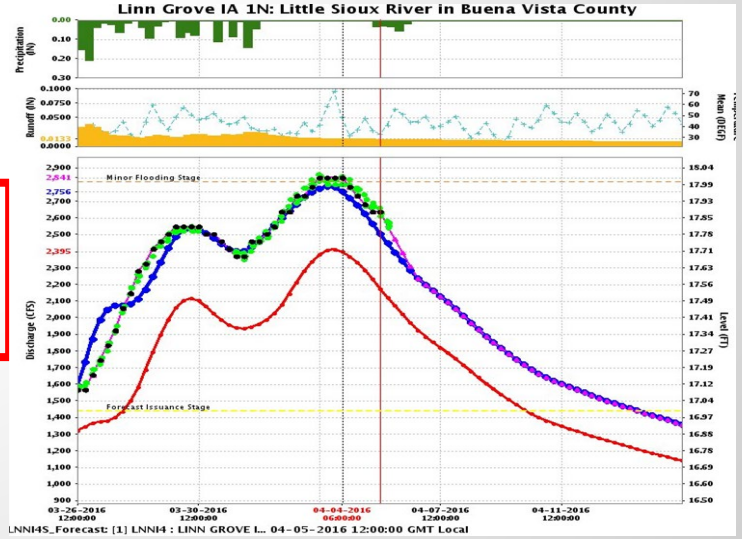
River Forecast Process



- Several models run for each basin (snow, soil moisture, unit hydrograph, reservoir modeling) to simulate physical processes on 6-hr time step
- Models are analyzed and adjusted daily -models run twice per day at 12z and 00z (7am CDT & 7pm)
- Goal is to accurately simulate streamflow while maintaining reasonable model 'basin" states
- Models have been calibrated/evaluated using historical data from 1948-2012 (working towards 2018)
- Only make adjustments when necessary and justified



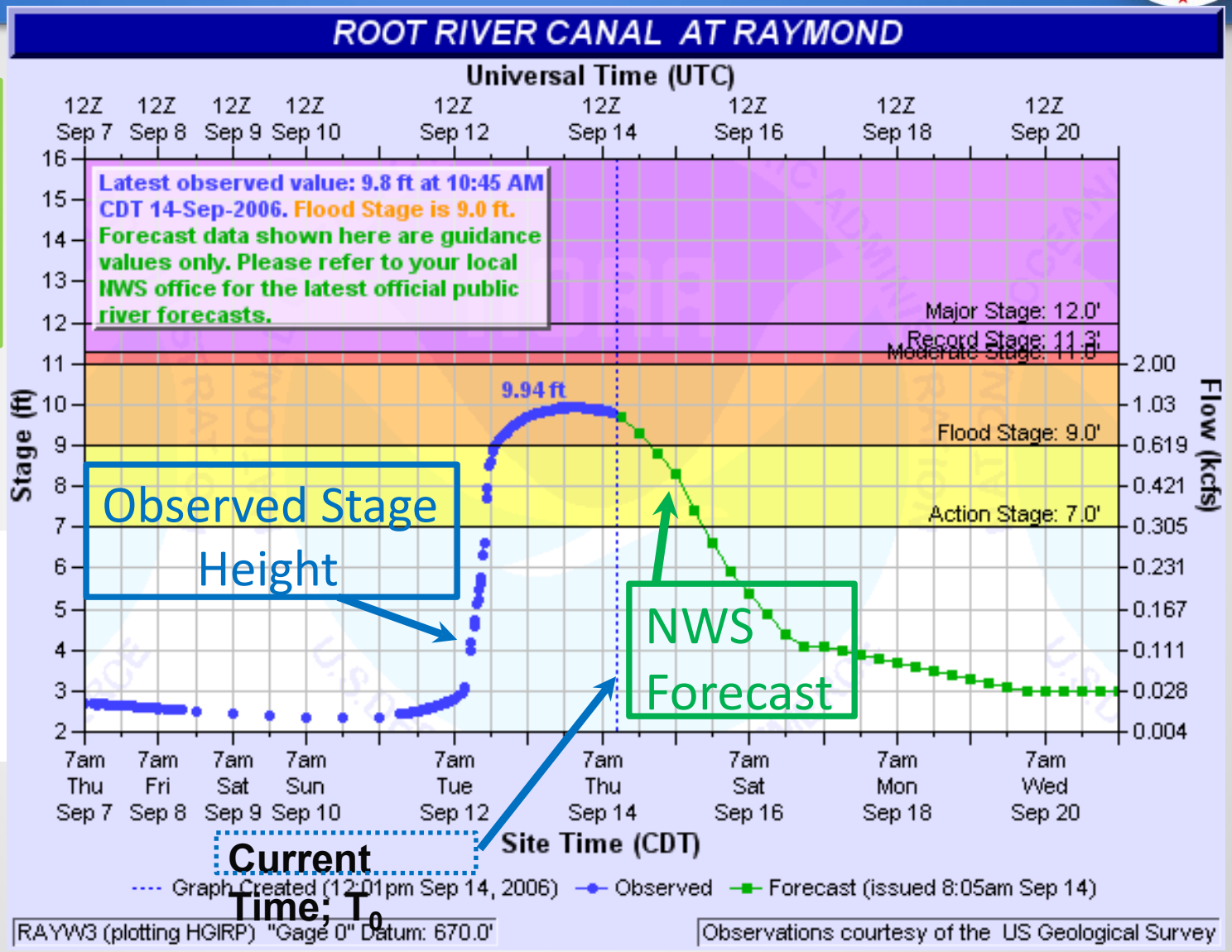
Forecasters adjust model parameters in real time



FINAL PRODUCT… The Forecast!…

Color Coded Flood Categories

Flood Categories (in feet)	
Major Flood Stage:	23
Moderate Flood Stage:	17
Flood Stage:	14
Action Stage:	13



Primary Drivers of Spring Snowmelt Flooding

1. **Snowpack (especially water content of snow)**
2. **Soil Moisture Content (carryover from Fall)**
3. **Frozen Soil/Frost Depths (infiltration vs. runoff)**
4. ?Spring Precipitation (form: rain v. snow and timing)
5. ?Melt Onset Timing (i.e. earlier the better; before spring rains)
6. ?Temperatures and Spatial Distribution of Melting
   (Quick and/or substantial temp changes v. gradual warmup)

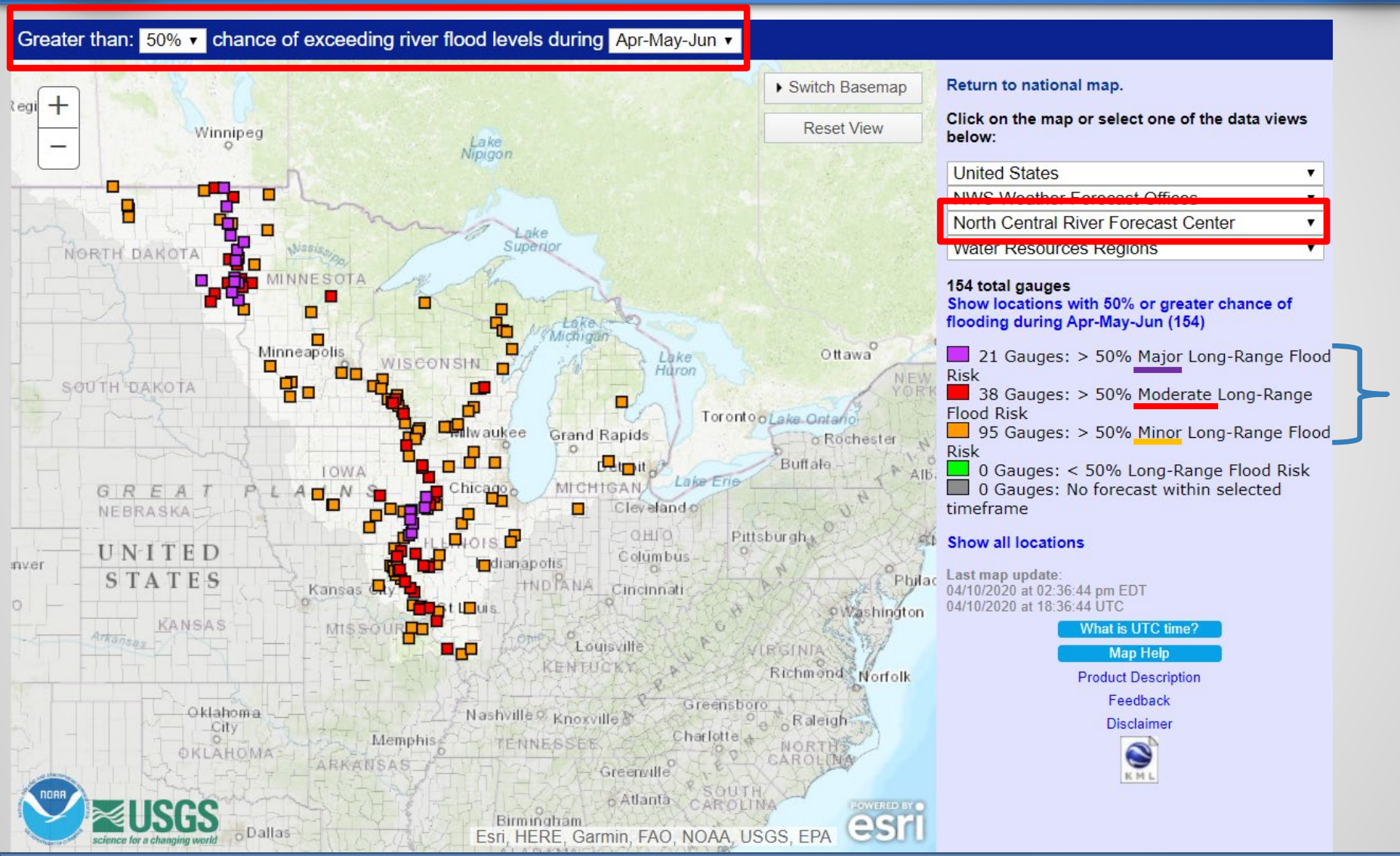
   (snowmelt above areas of already high flows or reservoir releases)
7. ?Ice Jams/Flow Obstructions

Spring Flood Outlooks

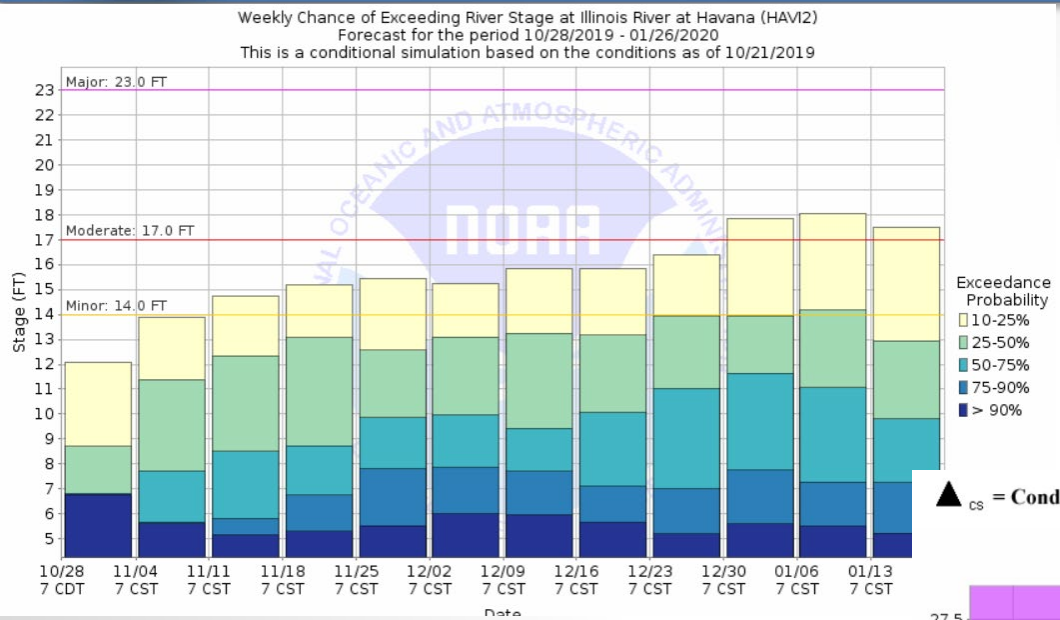
- Issued yearly; late February and early March
- 3 month (90 days) flood potential/outlook using current model input and forecast short term weather
- Comprehensive review of existing conditions: snow, soil (frost depths and wetness), ice jam potential, etc.
- Collaborate with NWS WFO offices, other RFC's and core partners
- Narrative and Graphics www.weather.gov/ncrfc/LMI_ROF_NFP_SpringHydroOutlook

➢ Purpose: to give public and core partners a "heads up" for spring flooding potential and to make necessary plans for mitigation.

Long-Term Probabilistic River Forecasts
(90 Day Outlook) {rolling 3 Month window}

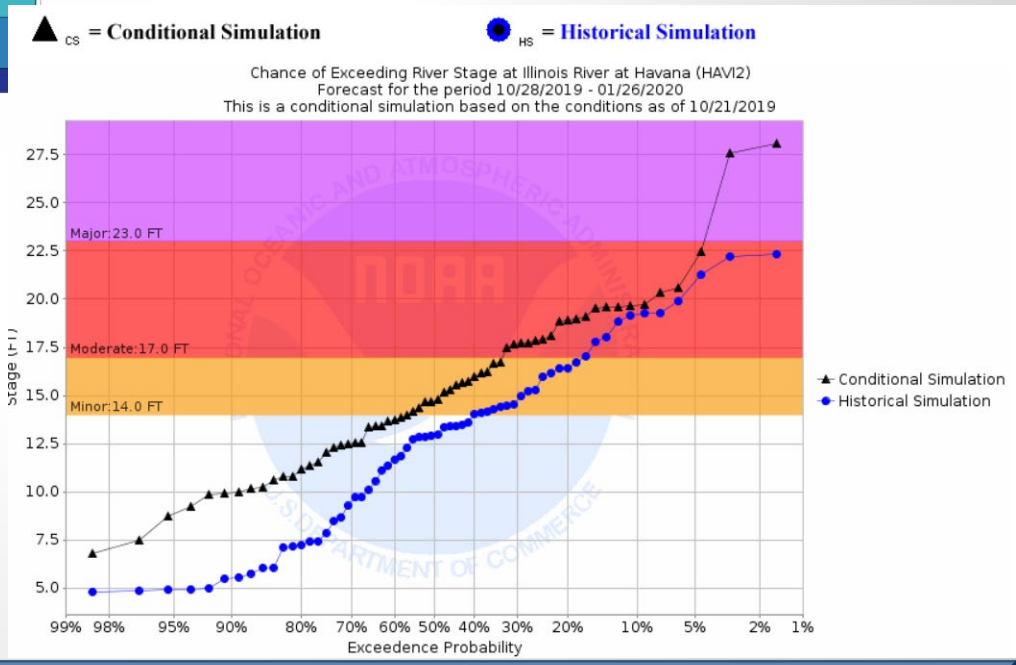


Long-Term Probabilistic River Forecasts
(90 Day Outlook Graphics)



…Can Break it down to weekly chance

…And How it compares to the Period of Record (Historical Simulation)



THANKS!!!!

Corey Loveland

Service Coordination Hydrologist

corey.loveland@noaa.gov

952-368-2530

NATIONAL WEATHER SERVICE

North Central River Forecast Center

1733 Lake Drive West

Chanhassen, MN 55317

Primary Web Resource → weather.gov/ncrfc

facebook.com/nwsncrfc

twitter.com/nwsncrfc

Witold Krajewski

Witold Krajewski is a professor of civil and environmental engineering in the University of Iowa College of Engineering. He also holds the Rose and Joseph Summers Chair in Water Resources Engineering and is a faculty research engineer at IIHR—Hydroscience & Engineering. He is one of the world's most respected experts in rainfall monitoring and forecasting using radar and satellite remote-sensing.

Dr. Krajewski has served as director of the Iowa Flood Center for the past 10 years since its founding. His research in hydrometeorology, remote-sensing, and water resources engineering has resulted in more than 250 journal publications and has enriched the education of dozens of UI graduate students with whom he has worked and collaborated. He has been instrumental in the development of the Iowa Flood Information System (IFIS), a free, easy-to-access online platform that disseminates information on precipitation, stream levels, flood predictions, and more

Iowa Flood Center:
A Model for the Nation

The University of Iowa

Iowa Flood Center


June 2008: Cedar Rapids, Iowa

IOWA HOUSE FILE 822

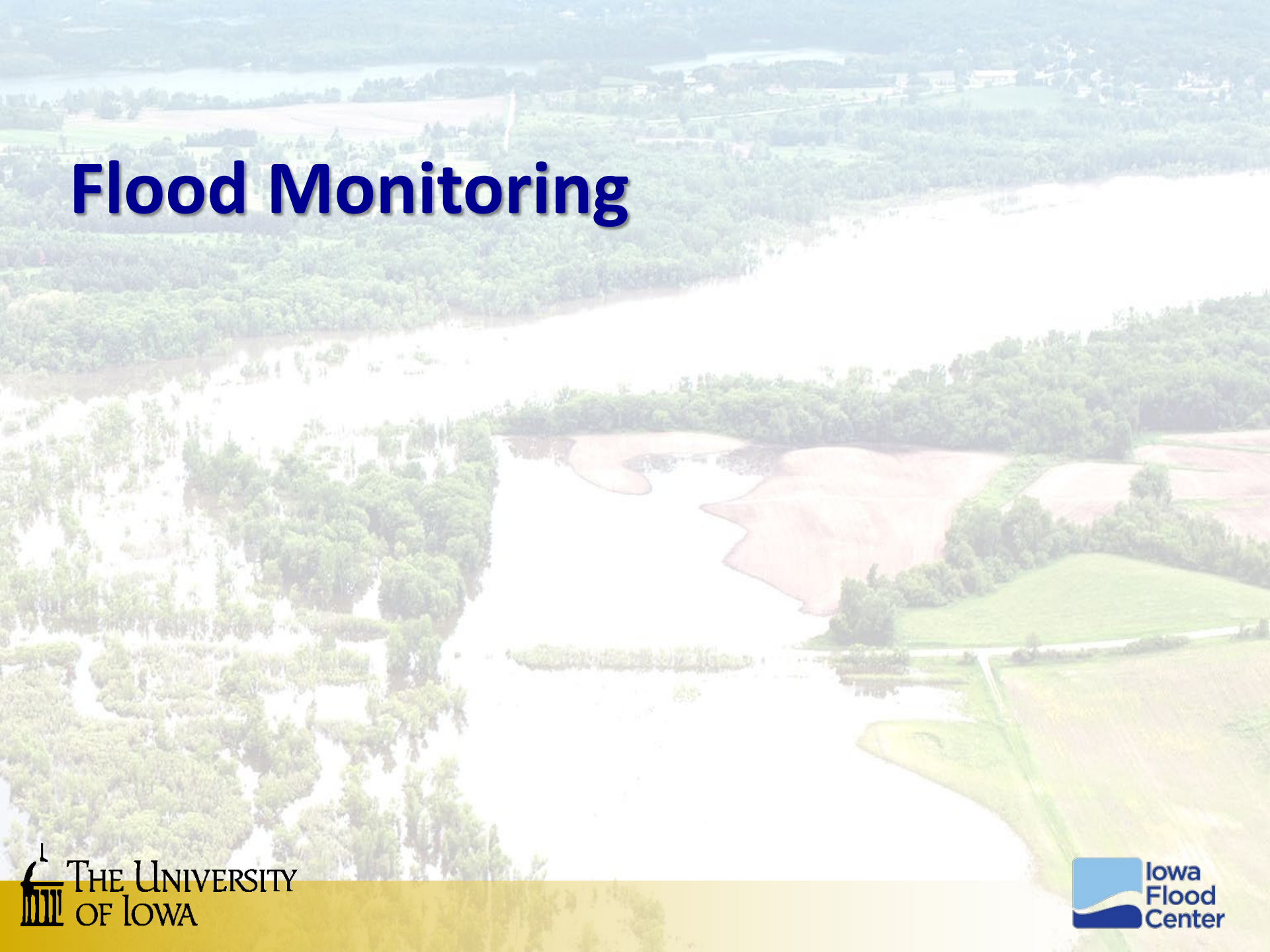
Spring 2009

DIVISION VI

Sec. 15. NEW SECTION. 466C.1 IOWA FLOOD CENTER

1. The state board of regents shall establish and maintain in Iowa City as a part of the state university of Iowa an Iowa Flood Center. In conducting the activities of this chapter, the center shall work cooperatively with the department of natural resources, the department of agriculture and land stewardship, the water resources coordinating council, and other state and federal agencies.
2. The Iowa flood center shall have all of the following purposes:
   a. To develop hydrologic models for physically based flood frequency estimation and real-time forecasting of floods, including hydraulic models of flood plain inundation mapping.
   b. To establish community-based programs to improve flood monitoring and prediction along Iowa's major waterways and to support ongoing flood research.
   c. To share resources and expertise of the Iowa flood center.
   d. To assist in the development of a workforce in the state, knowledgeable regarding flood research, prediction, and mitigation strategies.

Flood Monitoring

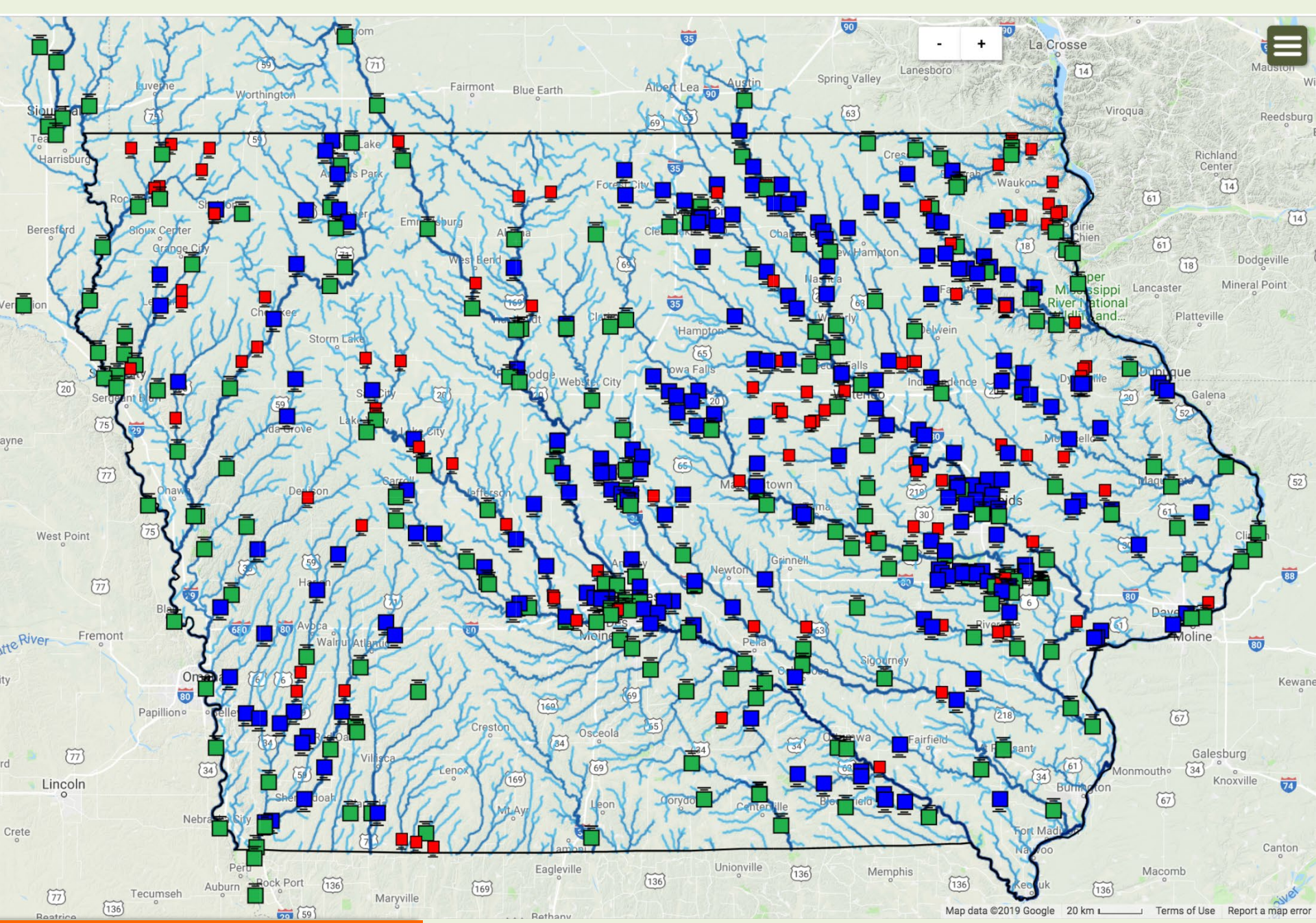


The University of Iowa

Iowa Flood Center

First 50 bridge-mounted stage sensors

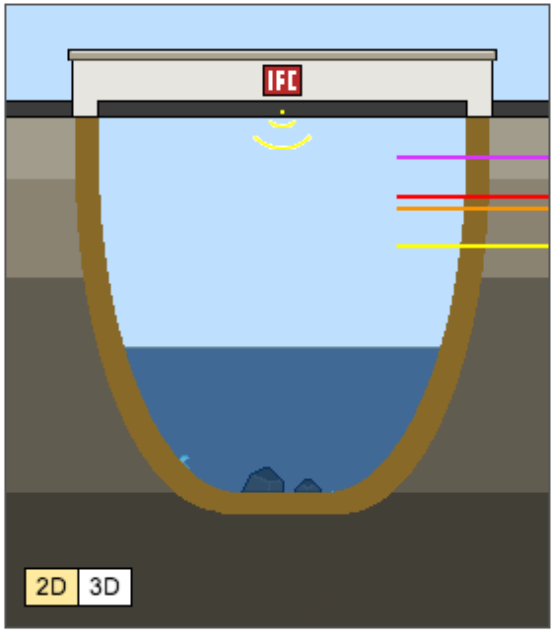
Summer 2010

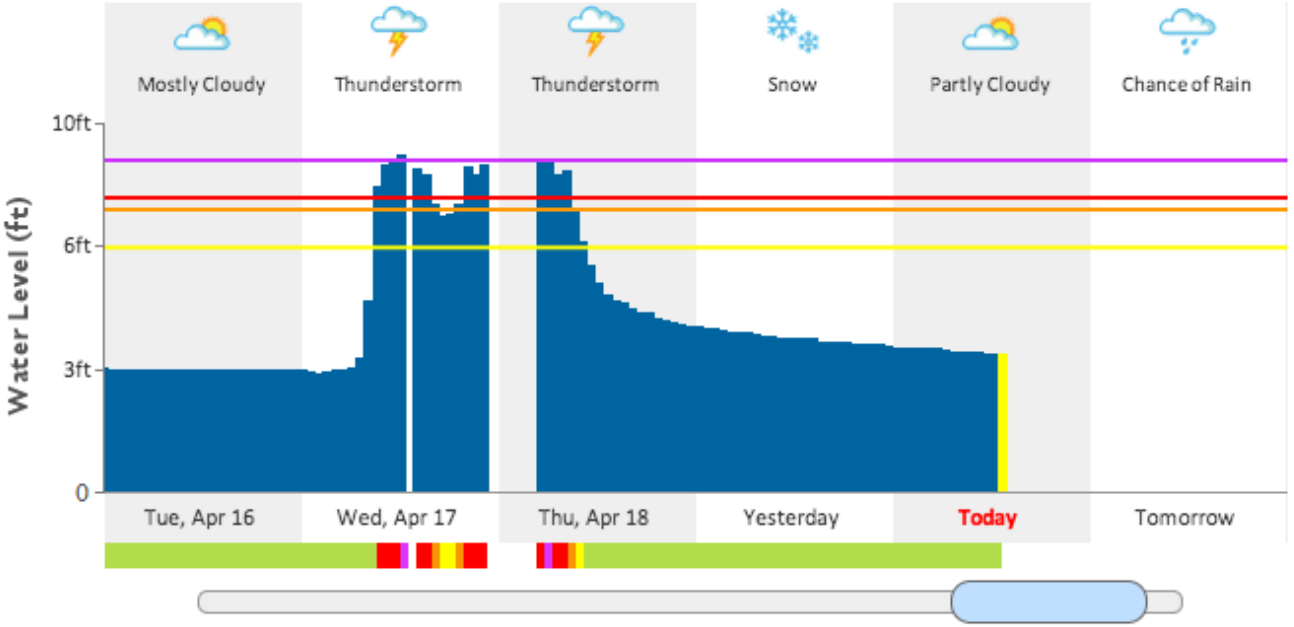


200 sensors followed

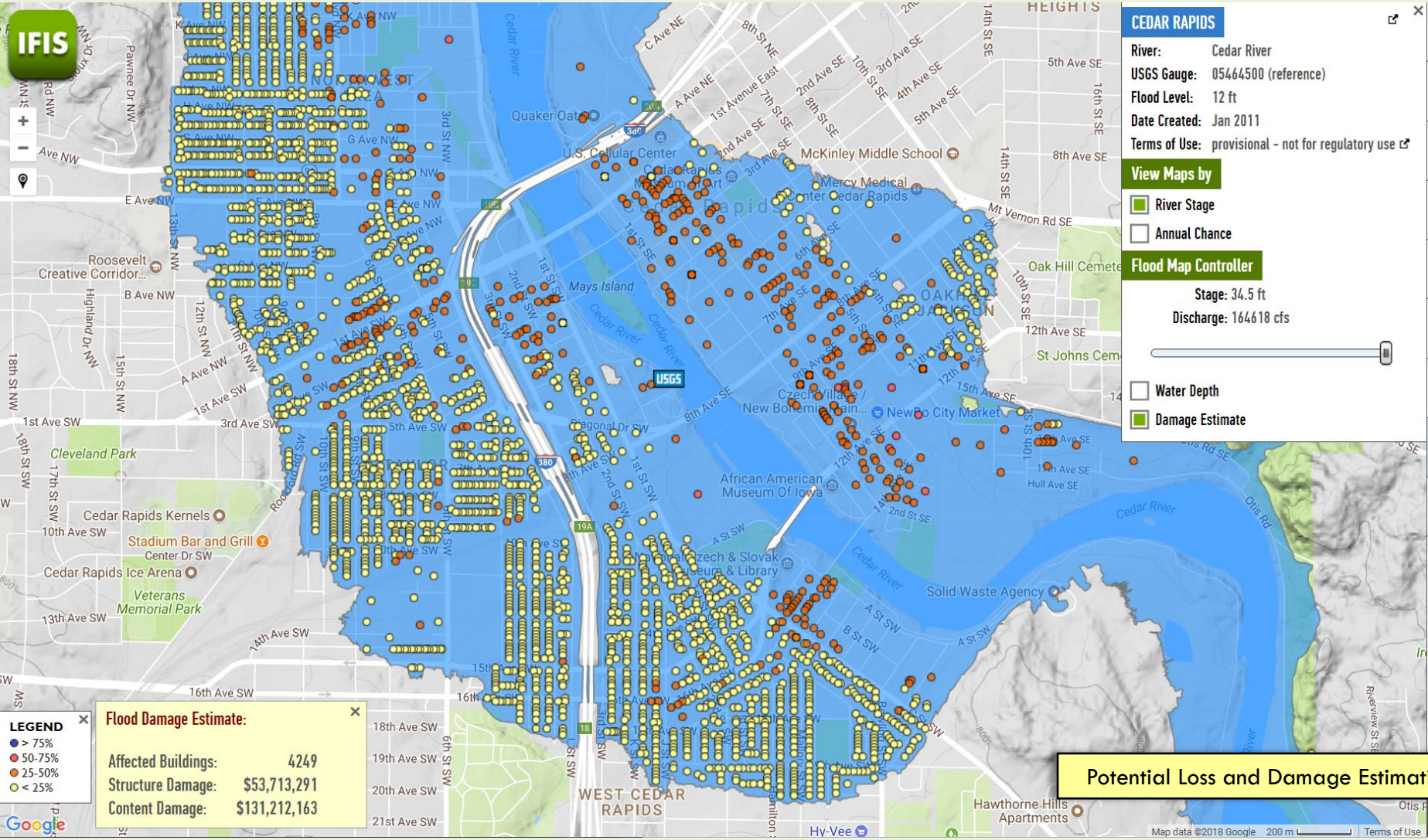
IFC BRIDGE SENSOR

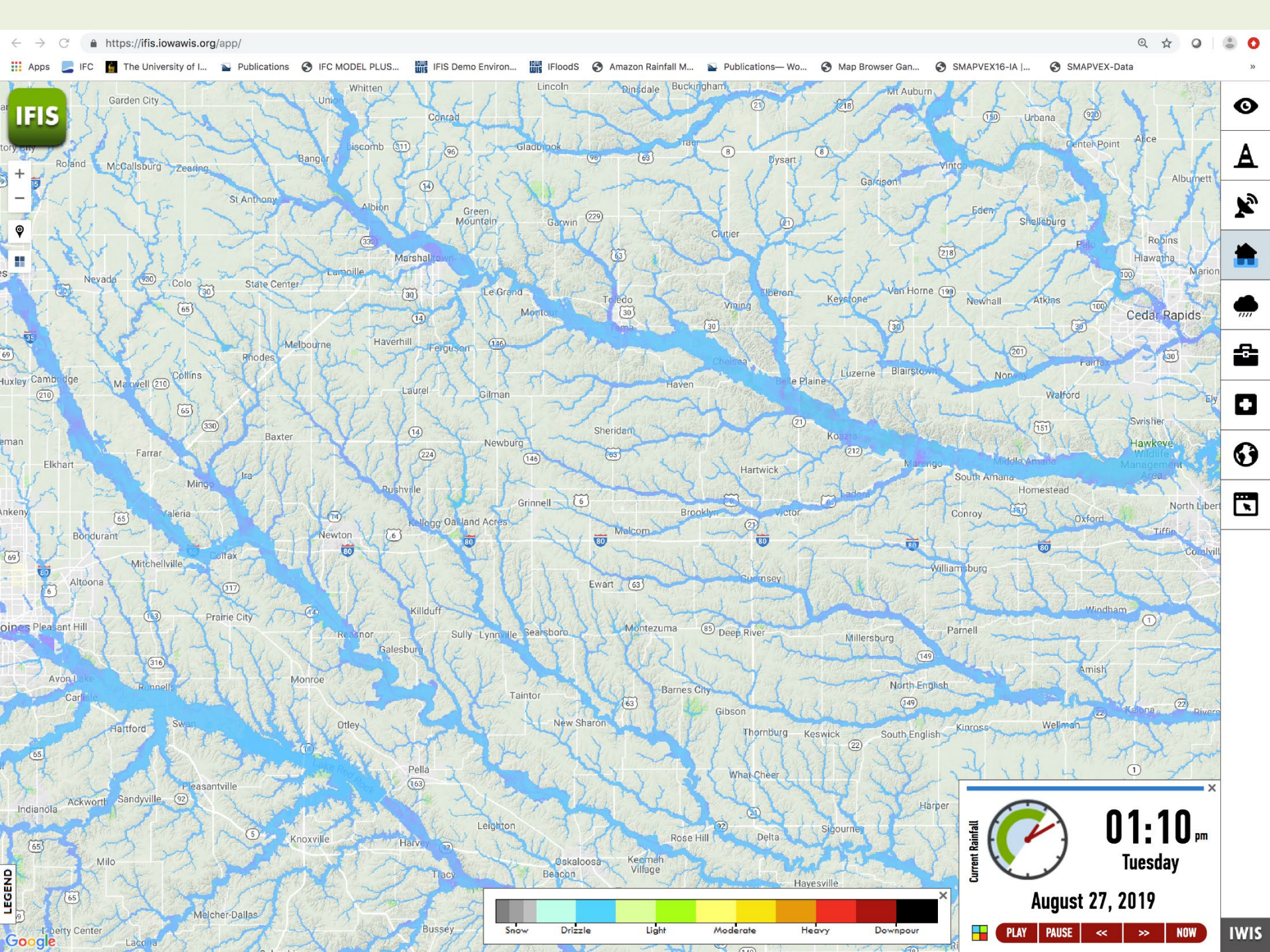
Street Name (City):	210th St. / County F35 (Homestead)
River Name:	Clear Creek Tributary
Elevation:	747 ft (above sea level)
Bridge Height:	9 ft 8 in
Last Reported:	Saturday, April 20, 2013 3:15 pm
Last Reading:	3 ft 8 in



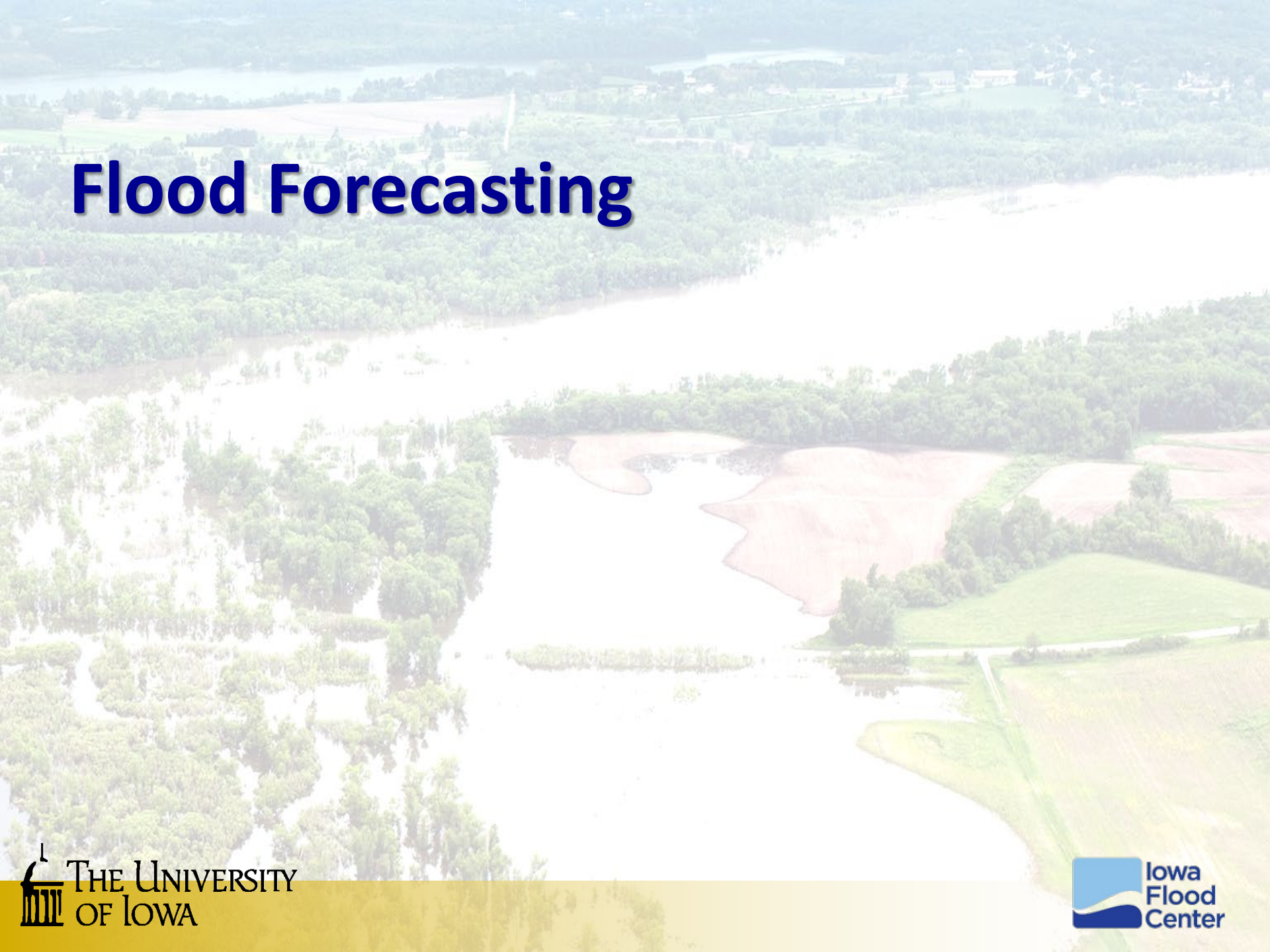


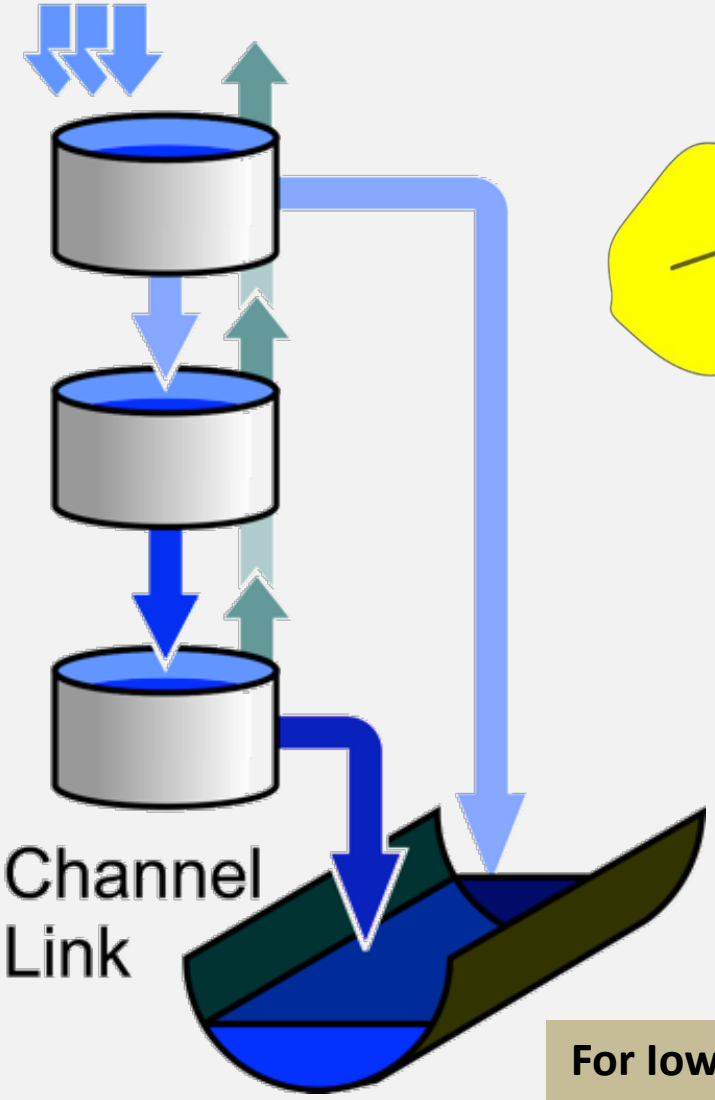
Flood Mapping

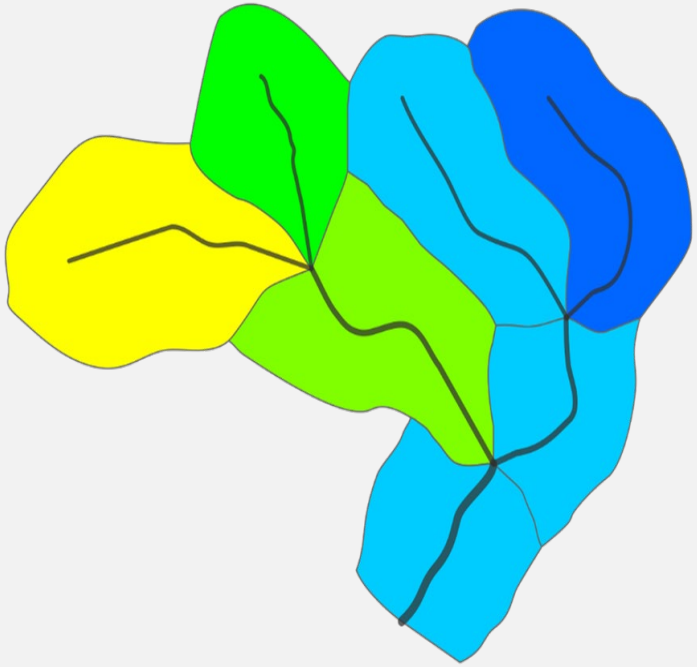

IFIS
CEDAR RAPIDS
River: Cedar River
USGS Gauge: 05464500 (reference)
Flood Level: 12 ft
Date Created: Jan 2011
Terms of Use: provisional - not for regulatory use
View Maps by
River Stage
Annual Chance
Flood Map Controller
Stage: 34.5 ft
Discharge: 164618 cfs
Water Depth
Damage Estimate
LEGEND
> 75%
50-75%
25-50%
< 25%
Flood Damage Estimate:
Affected Buildings: 4249
Structure Damage: $53,713,291
Content Damage: $131,212,163
Potential Loss and Damage Estimation
IWIS
Cedar River
Mays Island
WEST CEDAR RAPIDS
Quaker Oats
U.S. Cellular Center
McKinley Middle School
Mercy Medical Center Cedar Rapids
African American Museum Of Iowa
Czech & Slovak Museum & Library
Solid Waste Agency
Hawthorne Hills Apartments
Hy-Vee
Cedar Rapids Kernels
Stadium Bar and Grill
Cedar Rapids Ice Arena
Veterans Memorial Park
Cleveland Park
Roosevelt Creative Corridor...
Oak Hill Cemetery
St Johns Cemetery
Newbo City Market
Czech Village / New Bohemia Main...
Google
Map data ©2018 Google
200 m
Terms of Use


https://ifis.iowawis.org/app/
Apps
IFC
The University of I...
Publications
IFC MODEL PLUS...
IFIS Demo Environ...
IFloodS
Amazon Rainfall M...
Publications— Wo...
Map Browser Gan...
SMAPVEX16-IA |...
SMAPVEX-Data
IFIS
Garden City
Whitten
Lincoln
Dinsdale
Buckingham
Mt Auburn
Conrad
Urbana
Center Point
Alice
Roland
McCallsburg
Zearing
Gladbrook
Dysart
Vinton
Albion
Green Mountain
Garwin
Garrison
Albumett
Eden
Shellsburg
Marshalltown
Clutier
Robins
Hiawatha
Marion
Nevada
Colo
State Center
Le Grand
Toledo
Montour
Tama
Vining
Tiberon
Keystone
Van Horne
Newhall
Atkins
Cedar Rapids
Melbourne
Haverhill
Ferguson
Rhodes
Chelsea
Luzerne
Blairstown
Norway
Fairfax
Huxley
Cambridge
Maxwell
Collins
Laurel
Gilman
Haven
Belle Plaine
Walford
Baxter
Sheridan
Newburg
Kosota
Swisher
Hawkeye Wildlife Management Area
Farrar
Elkhart
Ira
Hartwick
Marengo
Middle Amana
South Amana
Homestead
Rushville
Grinnell
Brooklyn
Victor
Conroy
Oxford
North Liberty
Bondurant
Newton
Kellogg
Oakland Acres
Melcom
Tiffin
Mitchellville
Colfax
Williamsburg
Altoona
Ewart
Guernsey
Killduff
Windham
Prairie City
Pleasant Hill
Sully
Lynnville
Searsboro
Montezuma
Deep River
Millersburg
Parnell
Galesburg
Amish
Monroe
Taintor
Barnes City
North English
Gibson
New Sharon
Thornburg
Keswick
South English
Kinross
Wellman
Hartford
Otley
What Cheer
Pella
Pleasantville
Harper
Indianola
Ackworth
Sandyville
Leighton
Knoxville
Rose Hill
Delta
Sigourney
Milo
Oskaloosa
Keomah Village
Beacon
Tracy
Hayesville
Melcher-Dallas
Liberty Center
Bussey
Lacona
Google
LEGEND
Snow
Drizzle
Light
Moderate
Heavy
Downpour
Current Rainfall
01:10 pm
Tuesday
August 27, 2019
PLAY
PAUSE
<<
>>
NOW
IWIS

Flood Forecasting

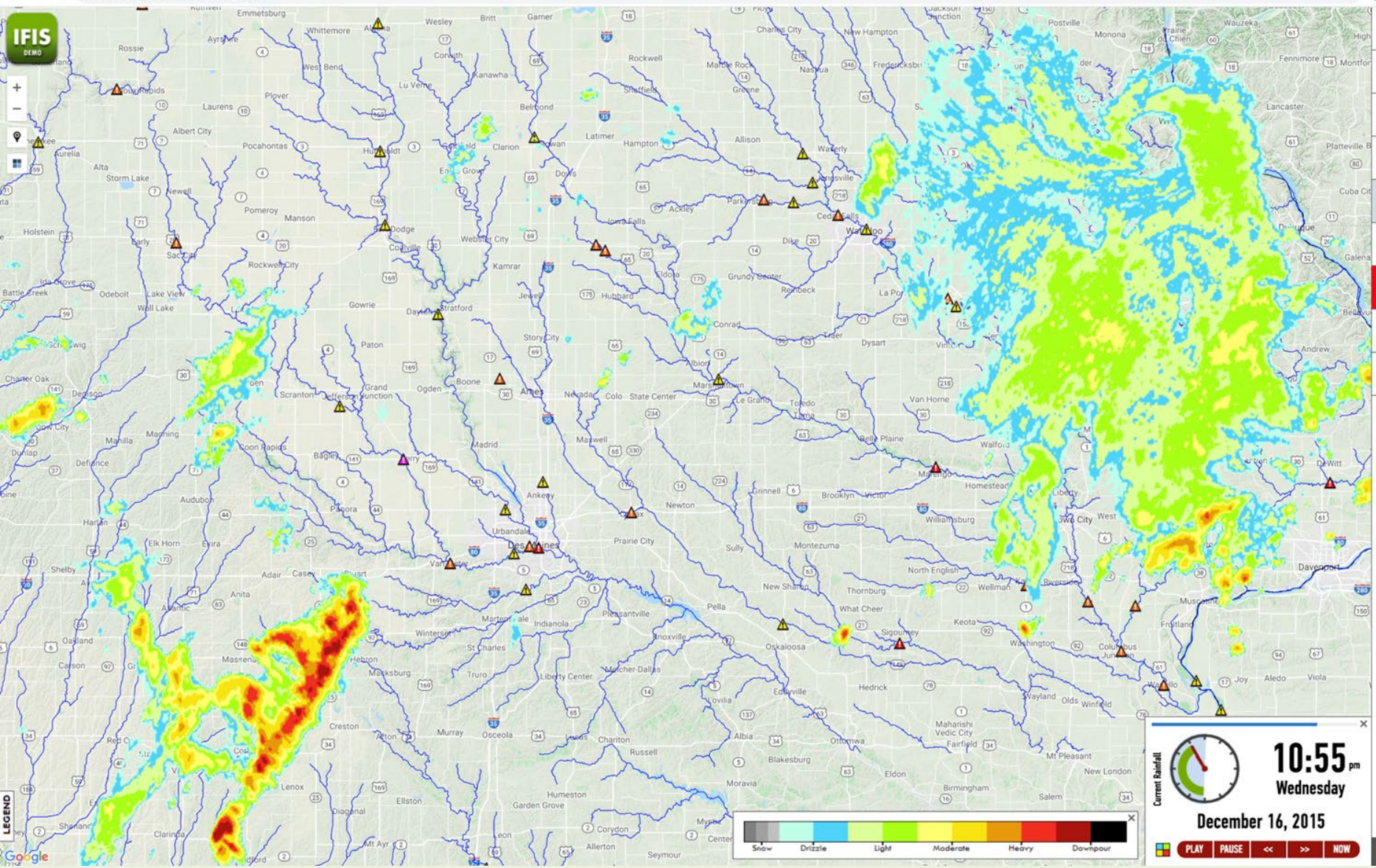


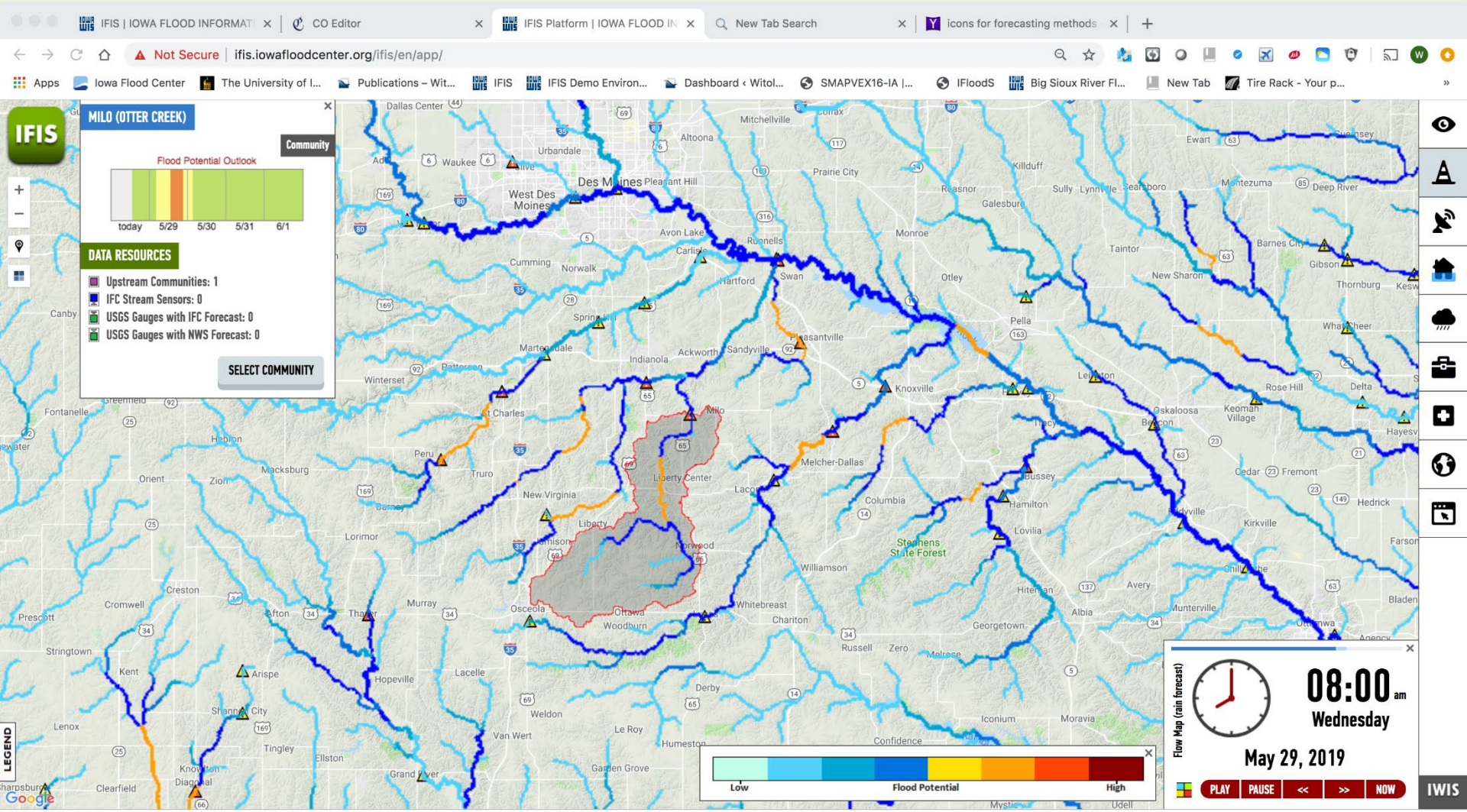




$$\frac{d\mathbf{S}}{dt} = \mathbf{f}(\mathbf{S}, \mathbf{I}, \mathbf{P})$$

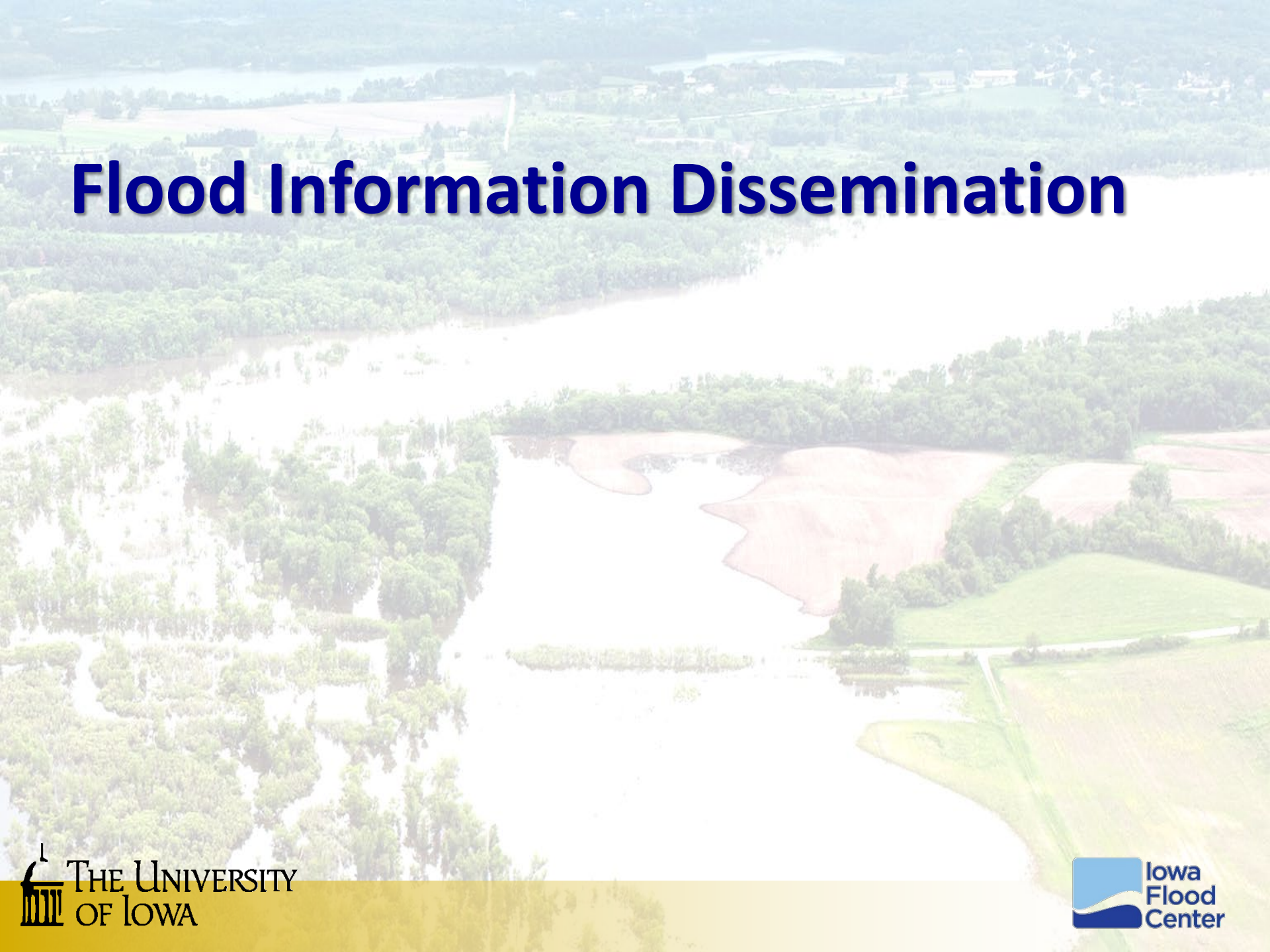
For Iowa the system of ~500,000 equations


Not Secure | ifis.iowawis.org/app/
IFIS
DEMO
Snow
Drizzle
Light
Moderate
Heavy
Downpour
Current Rainfall
10:55 pm
Wednesday
December 16, 2015
PLAY
PAUSE
<<
>>
NOW
LEGEND
IWIS
Google



swot_icons_cir....png | Biarri-icons_D....png | forecasting-ic....png | forecasting_icon.jpg | amt-2019-189-....pdf | 2018RCm511009.pdf | Show All

Flood Information Dissemination



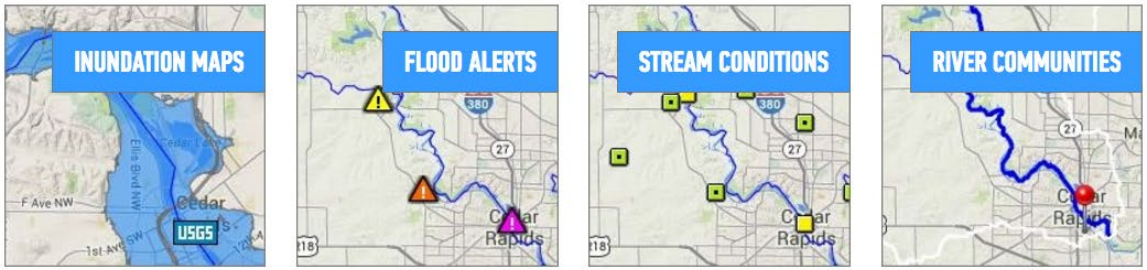
Spring 2011

IOWA FLOOD INFORMATION SYSTEM

The Iowa Flood Information System (IFIS) is a one-stop web-platform to access community-based flood conditions, forecasts, visualizations, inundation maps and flood-related information, visualizations and applications

LAUNCH IFIS

IFIS Widget | Video Tutorial | Flood Alerts

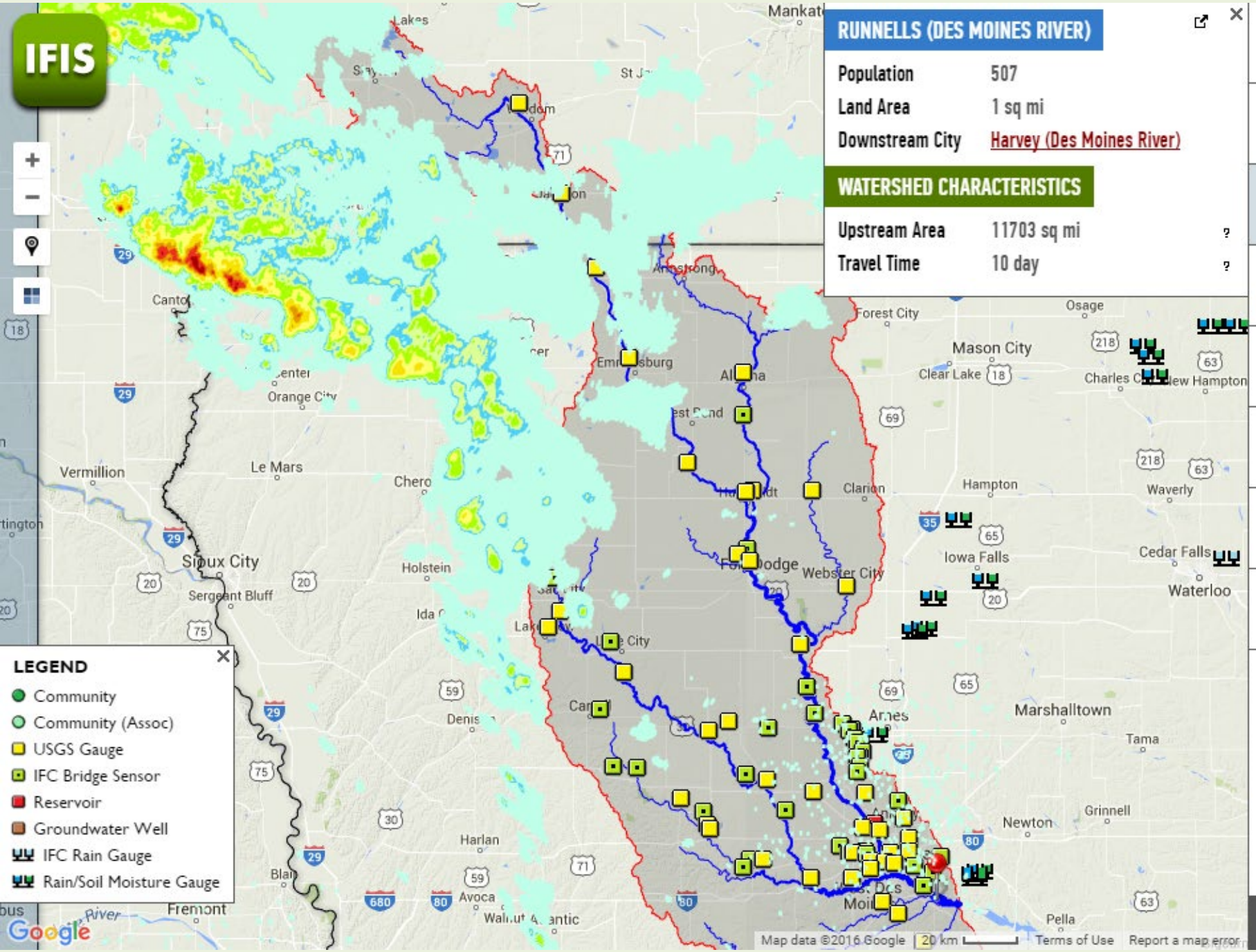


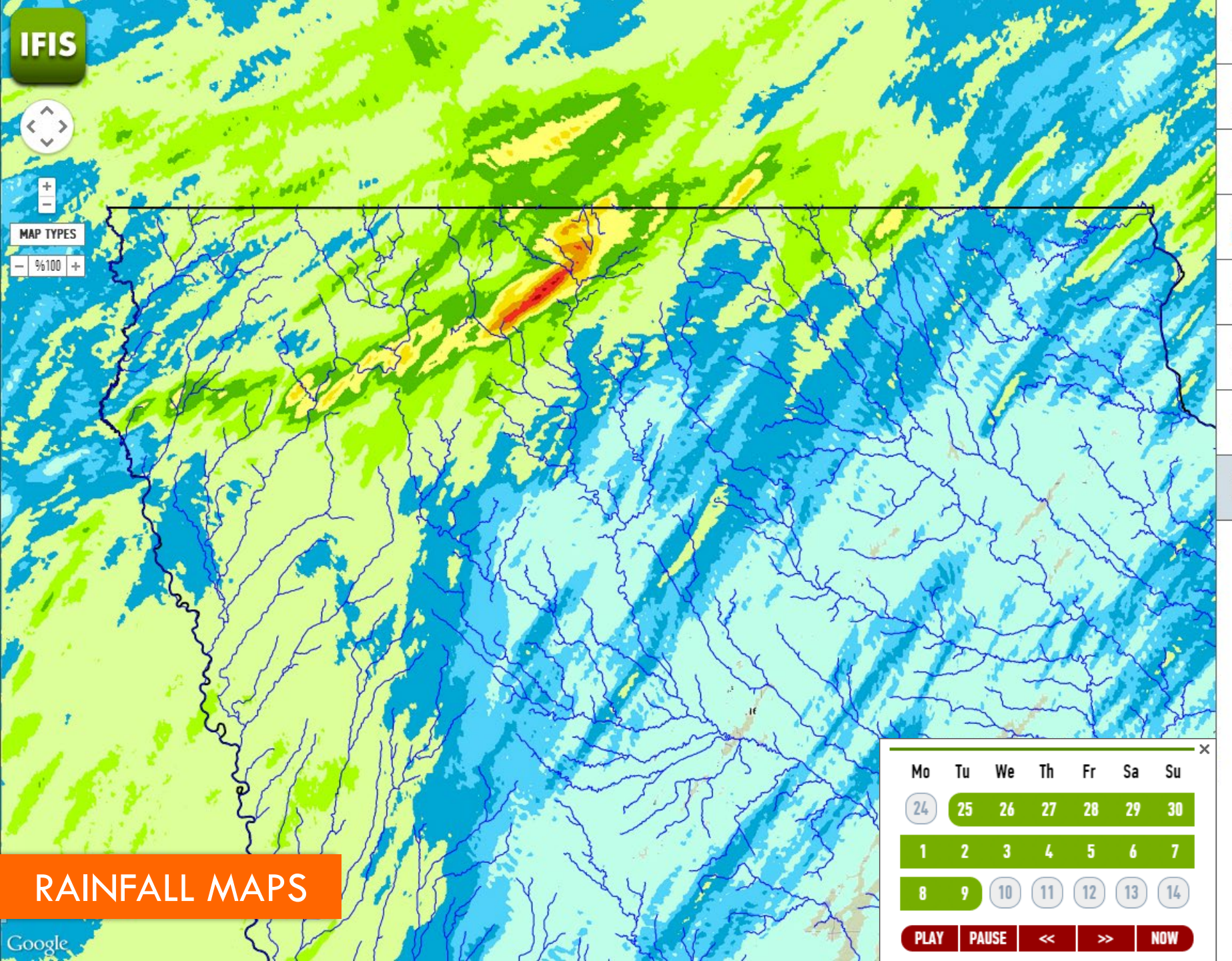
ABOUT | FEATURES | TOOLS | RESOURCES

Iowa Flood Center | IIHR | The University of Iowa

ALERTS | IFIS

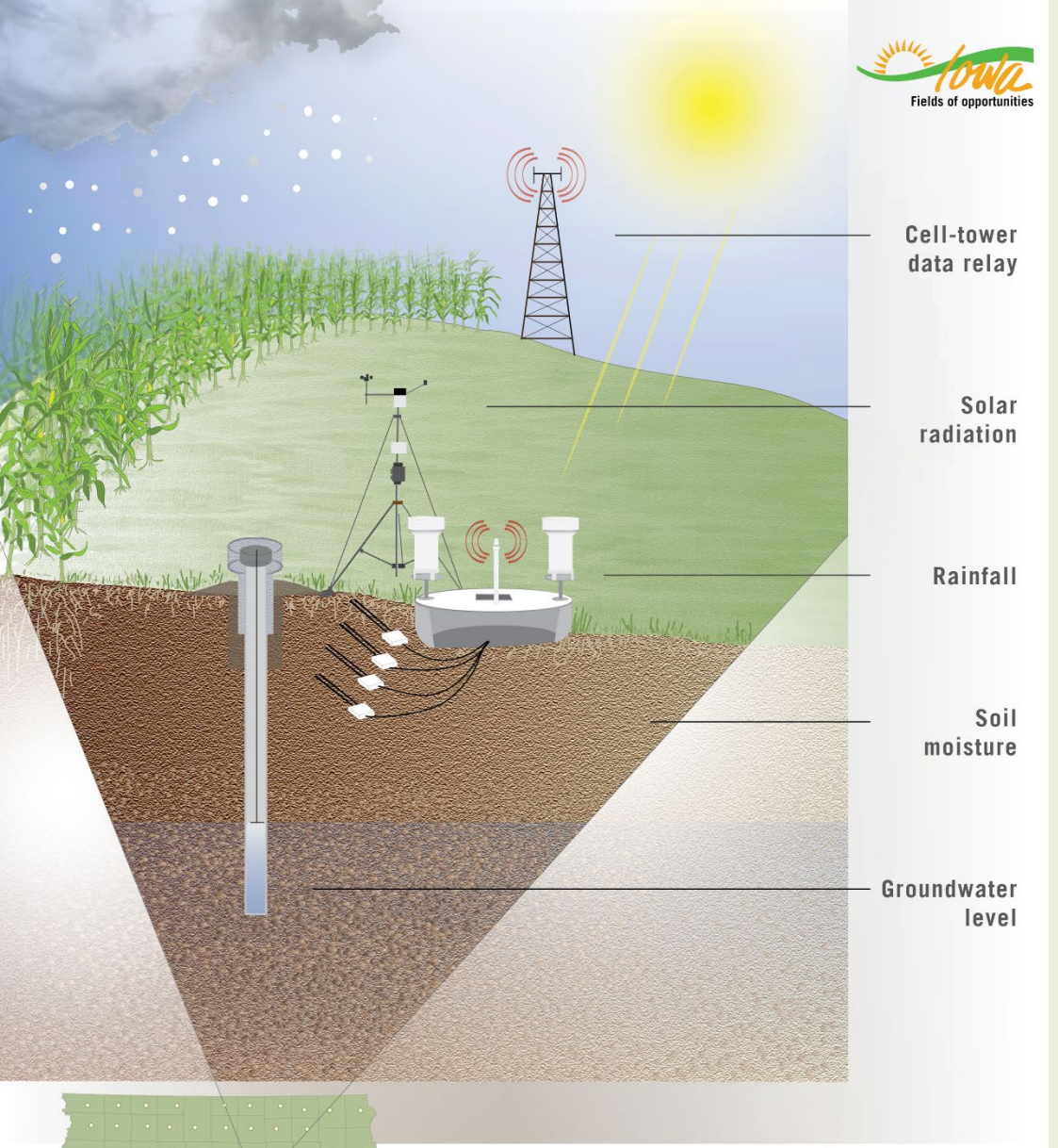
http://ifis.iowafloodcenter.org/ifis/en/

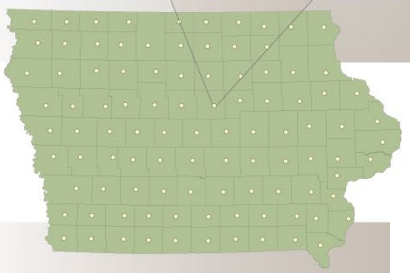

IFIS
RUNNELLS (DES MOINES RIVER)
Population 507
Land Area 1 sq mi
Downstream City Harvey (Des Moines River)
WATERSHED CHARACTERISTICS
Upstream Area 11703 sq mi
Travel Time 10 day
LEGEND
Community
Community (Assoc)
USGS Gauge
IFC Bridge Sensor
Reservoir
Groundwater Well
IFC Rain Gauge
Rain/Soil Moisture Gauge
Sioux City
Le Mars
Vermillion
Sergeant Bluff
Holstein
Orange City
Mason City
Clear Lake
Forest City
Osage
Hampton
Waverly
Clarion
Webster City
Iowa Falls
Cedar Falls
Waterloo
Marshalltown
Tama
Grinnell
Newton
Pella
Harlan
Avoca
Fremont
Map data ©2016 Google
20 km
Terms of Use
Report a map error
IWIS


IFIS
MAP TYPES
%100
Mo Tu We Th Fr Sa Su
24 25 26 27 28 29 30
1 2 3 4 5 6 7
8 9 10 11 12 13 14
PLAY PAUSE << >> NOW
RAINFALL MAPS
Google

Other activities:

Instrumentation, Outreach, Partnership





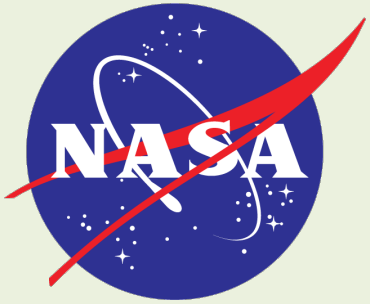
Iowa Hydrologic Network

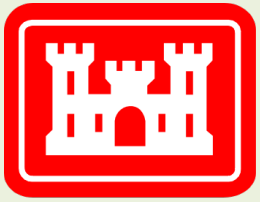
To Analyze and Predict Floods and Droughts, Soil Moisture, Ground Water Levels, and Improve Crop Yields

The University of Iowa

Iowa State University


Iowa
Flood
Center
IOWA
WATER
TRAILS
Great
River
Rumble





US Army Corps of Engineers®

IOWA STATE UNIVERSITY

40 Years
CDBG
Building Better Neighborhoods


Iowa
Fields of opportunities
Thank You!

Laura Edwards

Laura Edwards was appointed as the SDSU Extension State Climatologist in January 2017. She is based at the Aberdeen Regional Extension Center. Previous to her appointment as State Climatologist, she had been the SDSU Extension Climate Field Specialist from 2011 to 2017. Her previous experience includes 8 years as a research climatologist at the Western Regional Climate Center in Reno, Nevada and 2 years as the Assistant State Climatologist in Maryland. She holds a Master's degree in Meteorology from the University of Maryland and a Bachelors degree in Physics and French from the University of Minnesota.

Long-term Flooding: Extension's role in preparedness, management and mitigation

Laura Edwards

SD State Climatologist

@SDSUclimate

New project!

- February 2019-January 2020
- Funded by NCRWN and North Central Region Center for Rural Development
- Focus on long-term flooding, different from flash flooding or seasonal snowmelt-driven flooding
- End product: white paper to include recommendations for Extension to further preparedness, management and mitigation of long-term flooding
- *How can we build on what has been done to create a stronger multi-state, multi-disciplinary effort to address long-term flooding?*

Motivation

2019 Flooding in Dakotas and Nebraska, Mississippi River basin

2009-2011 wet period in Missouri River basin

Motivation

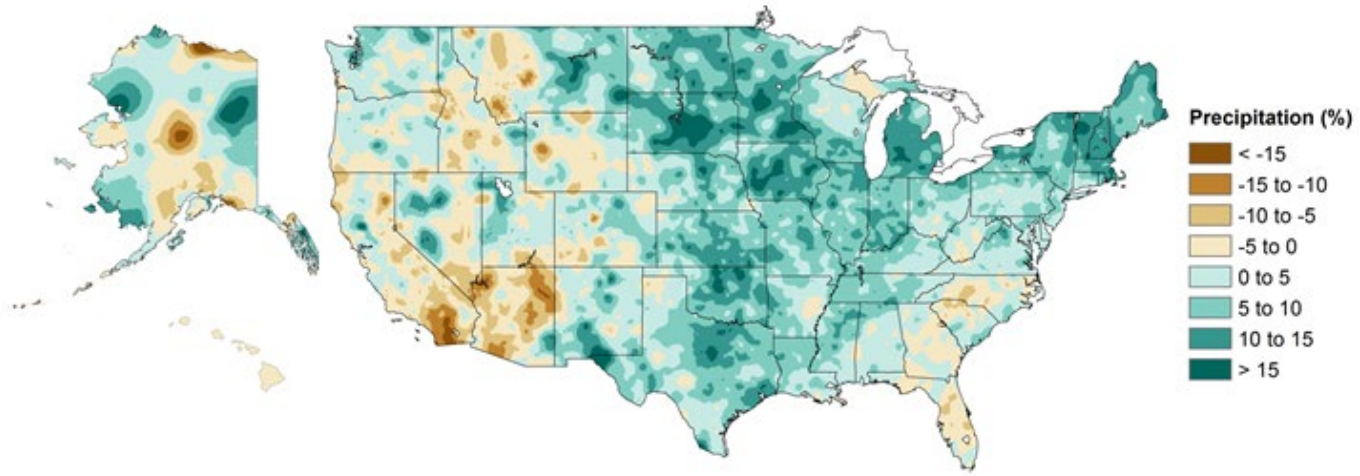
2019 Flooding in Dakotas and Nebraska, Mississippi River basin

2009-2011 wet period in Missouri River basin

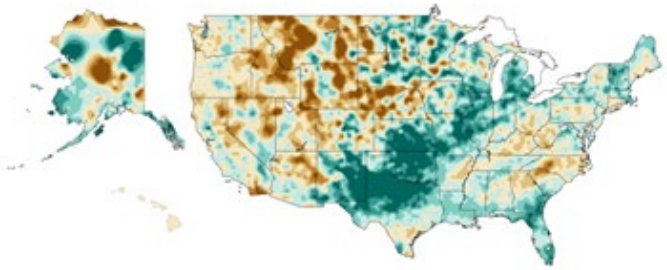
FEMA disasters:

- 51 flood-related declarations in last 20 years in 12 state region
- $935 million in individual, household and public assistance grants ($406 million to ND alone)
- Does not include crop insurance, homeowners, or state/local assistance (e.g., relocating homes, roads/infrastructure)
- FEMA better at responding to short-term disasters, with a specific start and end date

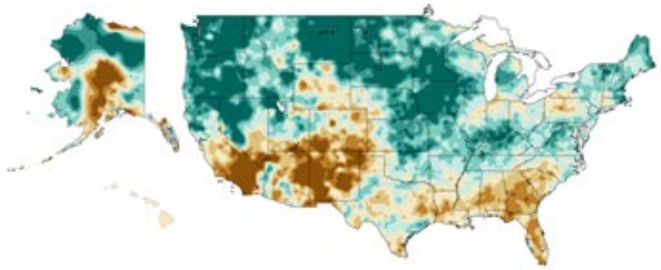
Annual Precipitation



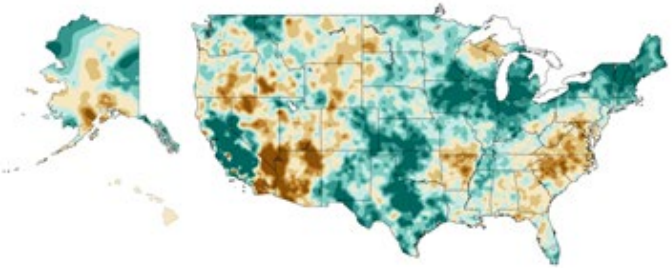
Winter Precipitation



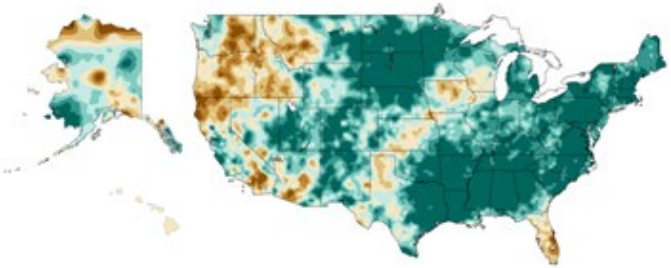
Spring Precipitation



Summer Precipitation



Fall Precipitation



https://science2017.globalchange.gov/

Project Goals

• document existing resources, programs and activities for addressing long-term flooding and what may have been done in the past that is no longer available;

Project Goals

- document existing resources, programs and activities for addressing long-term flooding and what may have been done in the past that is no longer available;
- perform a gap analysis to discover areas of potential development or growth, both in resources or services that are offered, and what audiences or clientele that could be underserved;

Project Goals

SDSU Extension

- document existing resources, programs and activities for addressing long-term flooding and what may have been done in the past that is no longer available;
- perform a gap analysis to discover areas of potential development or growth, both in resources or services that are offered, and what audiences or clientele that could be underserved;
- and present some recommendations for future actions to further develop Extension's capacity to plan for and respond to long-term flooding in the North Central region.

James River, March 27, Bath, SD looking south

May 21, Bath, SD looking north

Team Members

States:

- Indiana
- Missouri
- Iowa
- North Dakota
- Minnesota
- Michigan
- Illinois
- Kansas
- South Dakota
- Nebraska

Multi-disciplinary:

- Ag & natural resources
- Community development
- EDEN
- Emergency mgmt. & safety
- Climate & water

Workgroups

3 groups:

- Data Discovery
  - What has been done previously, is still ongoing, or planned?
- Workshop
  - Originally planned for early summer 2020
  - Will likely work towards online meeting format in smaller groups
  - Invited groups may include: NOAA, Tribal colleges & tribal water, NRCS, Watershed groups, Civic leaders, EM & public safety, agriculture groups and state agencies
- Writing/Synthesis
  - Collate feedback and data from other two workgroups

How can you help?

Data Discovery phase:

- Don’t let your hard work sneak by us, let us know what you’ve done
- Leveraging existing networks like EDEN
- If a survey or questionnaire comes your way, please respond

How can you help?

Data Discovery phase:

- Don’t let your hard work sneak by us, let us know what you’ve done
- Leveraging existing networks like EDEN
- If a survey or questionnaire comes your way, please respond

Workshop/Web meetings:

- Broad range of perspectives and impacts, so a diverse group will be invited
- If you get an invite, participate if you can

SDSU Extension

Laura Edwards

SDSU Extension State Climatologist

Office: 605.626.2870

laura.edwards@sdstate.edu

Aberdeen Regional Center
13 Second Ave. SE
Aberdeen, SD 57401

AASC
AMERICAN ASSOCIATION OF STATE CLIMATOLOGISTS

AMBASSADOR™
WRN
WEATHER-READY NATION

SDSUExtClimate

@SDSUClimate

Question and Answer Session

We will draw initial questions and comments from those submitted via the chat box during the presentations.

Today's Speakers

Corey Loveland – corey.loveland@noaa.gov
Witold Krajewski – witold-krajewski@uiowa.edu
Laura Edwards – laura.edwards@sdstate.edu

Thank you for participating in today's *The Current*!

Visit our website, northcentralwater.org, to access the recording and our webinar archive!

Upcoming Webinar:

Bioenergy and Ecosystem Services – What's Next?
Hosted by the North Central Climate Collaborative
Monday, April 27th at 1pm CT
Register at https://northcentralclimate.org/webinars/