

A topographic map showing a river network in blue and brown terrain. A large, semi-circular grid of colored squares (ranging from green to orange) is overlaid on the map, representing a hydroinformatics model. The grid is centered on a river and extends outwards, following its course.

# Hydroinformatics and the Iowa Flood Information System





## 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.**

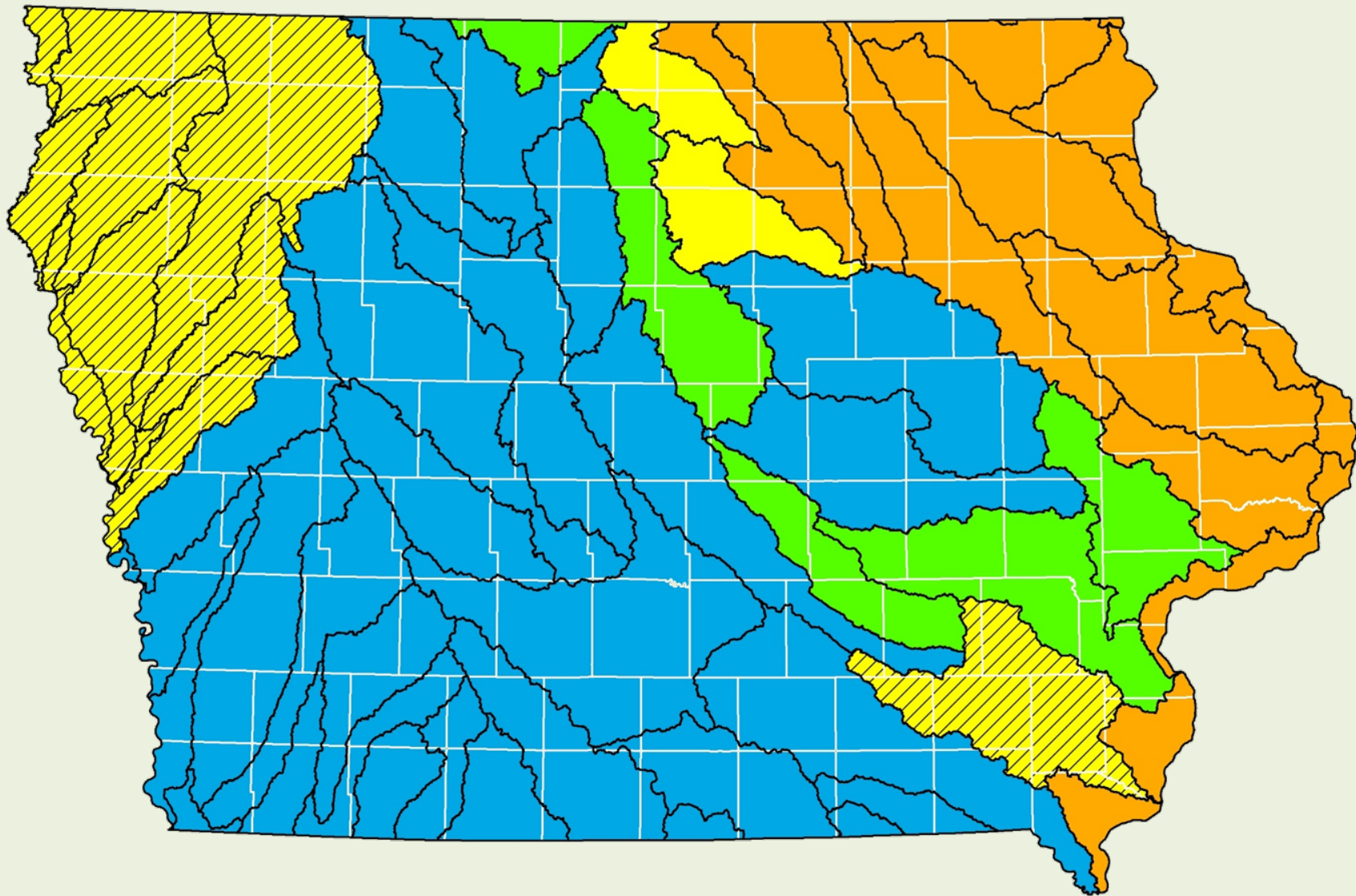
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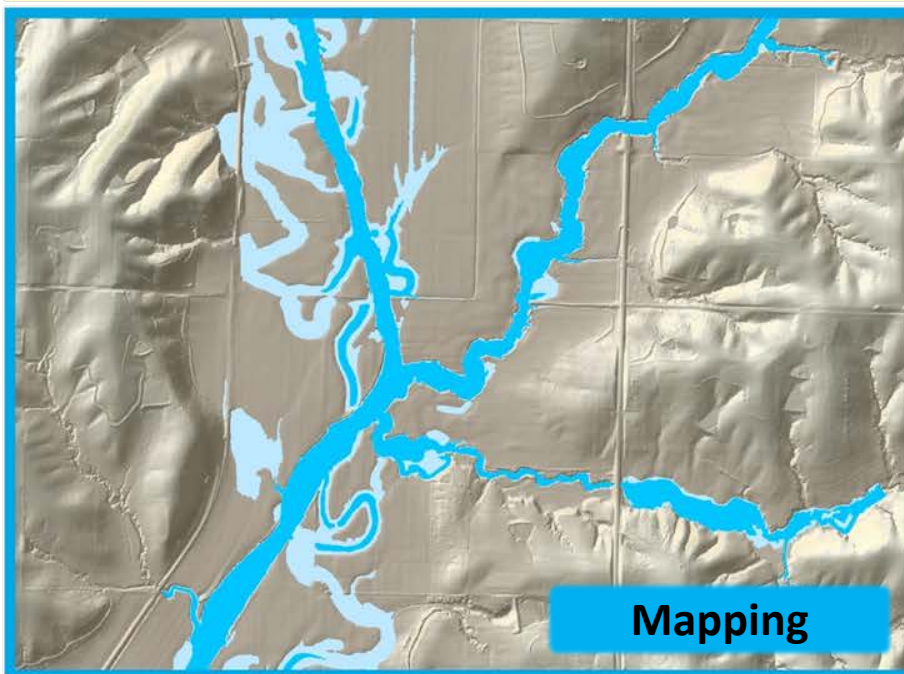
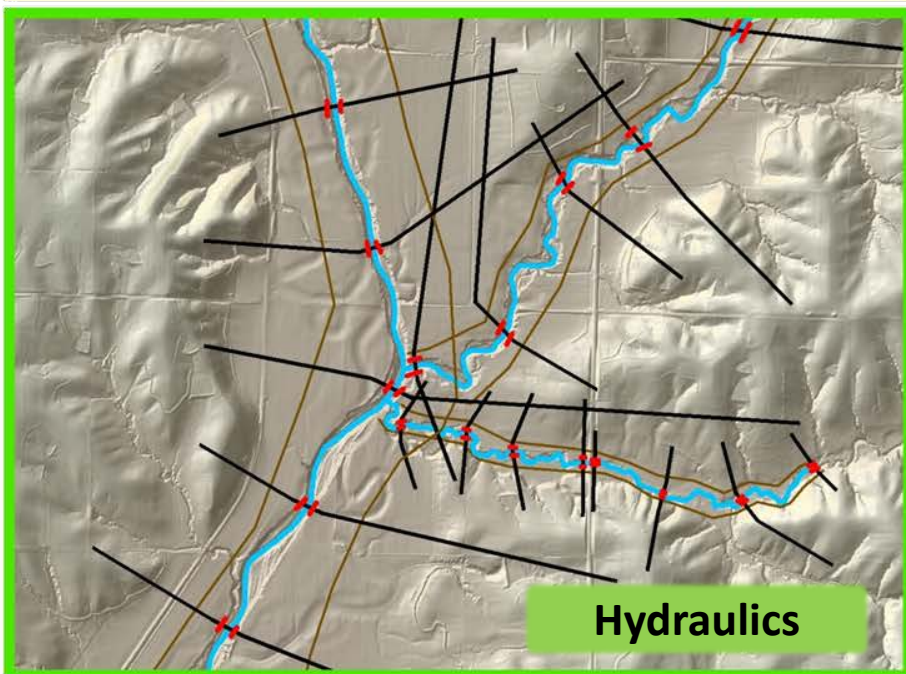
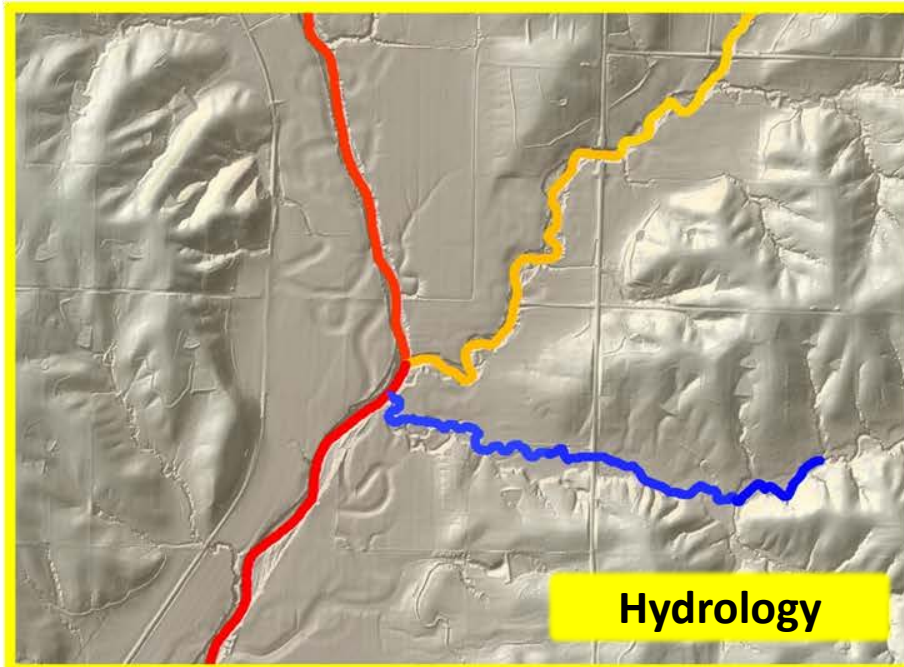
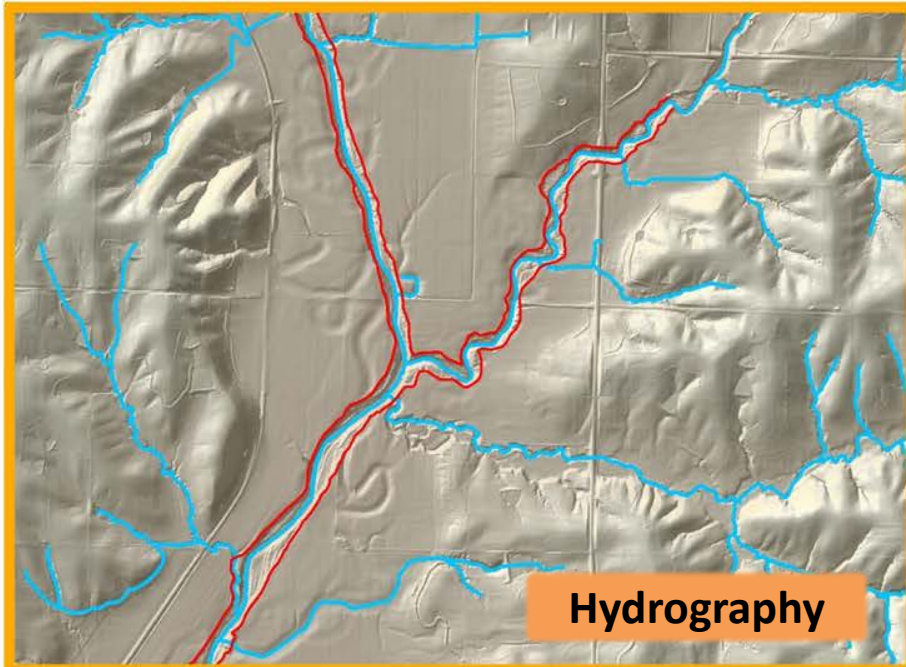


# Inundation mapping



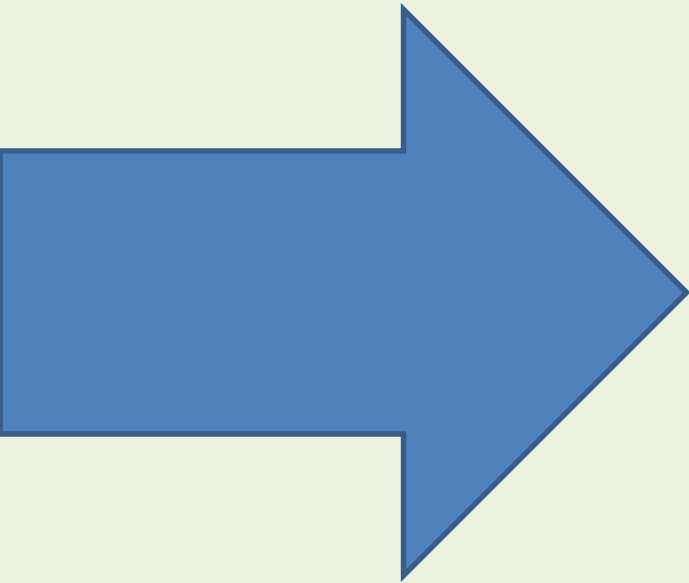
hydrography (13) hydrology (10) hydraulics (5) mapping (28)

////// USACE watersheds



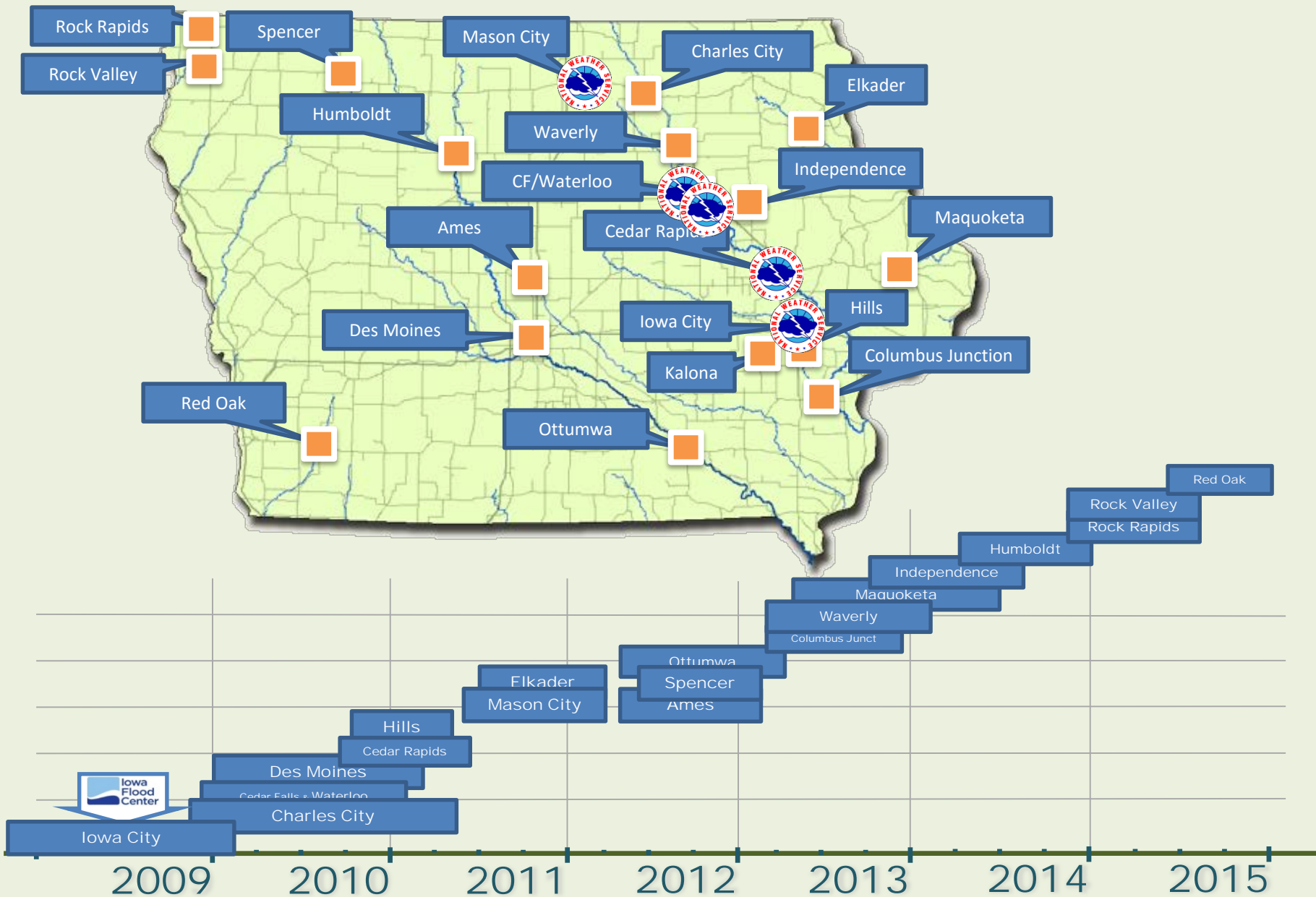


# State-Wide Mapping

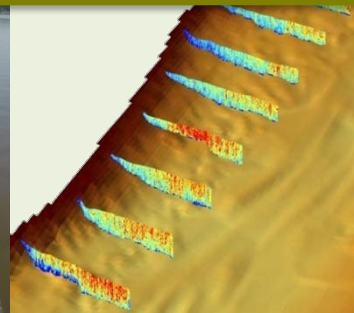
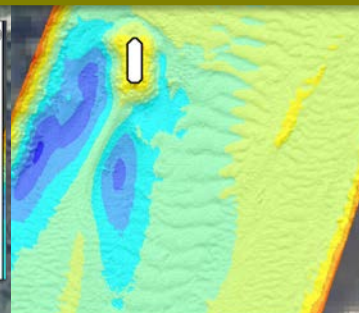


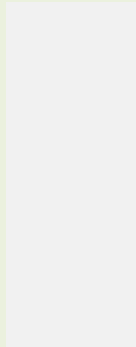
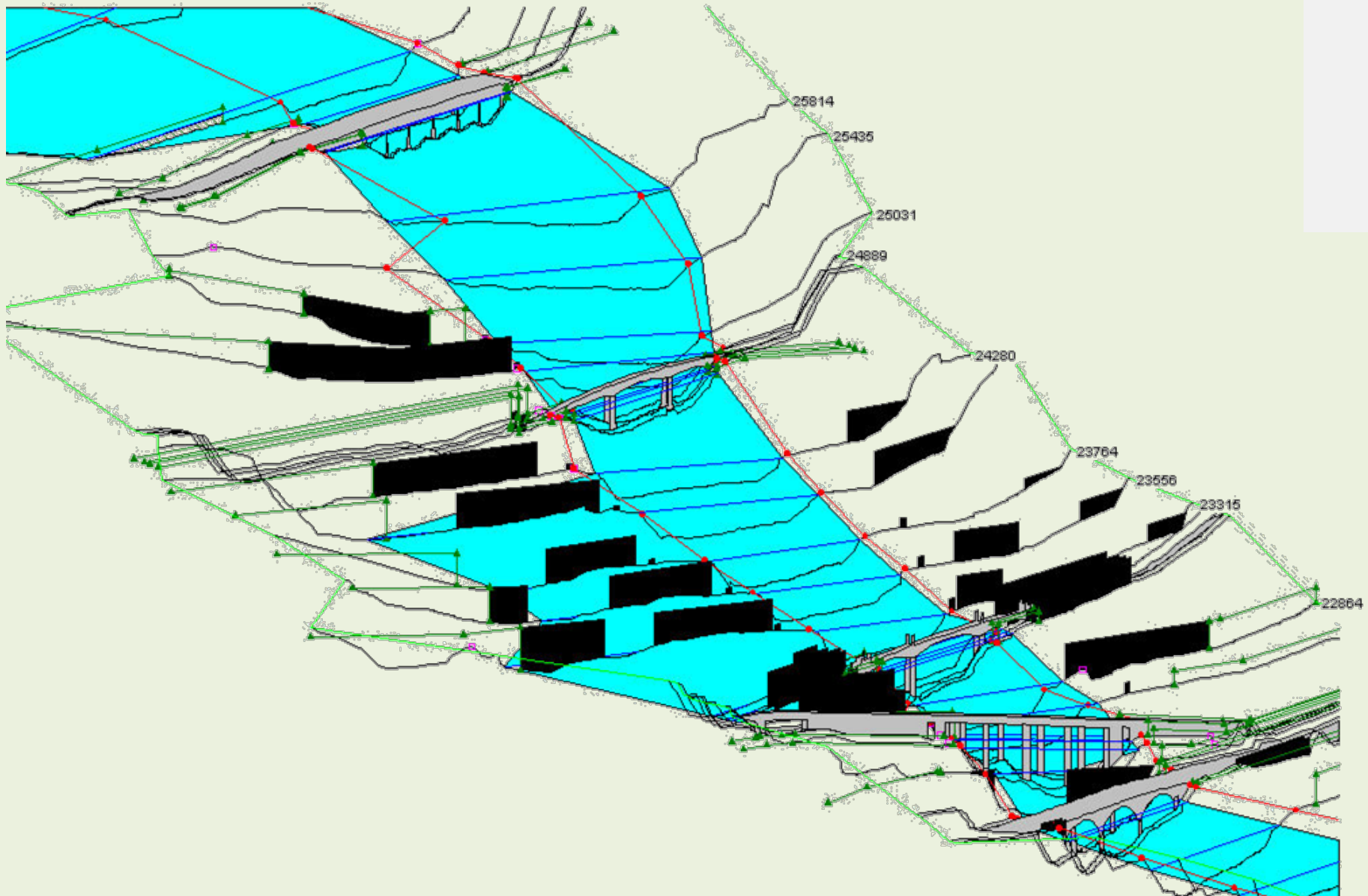
**Flood Frequency  
Estimation**

# Flood Inundation Map Libraries

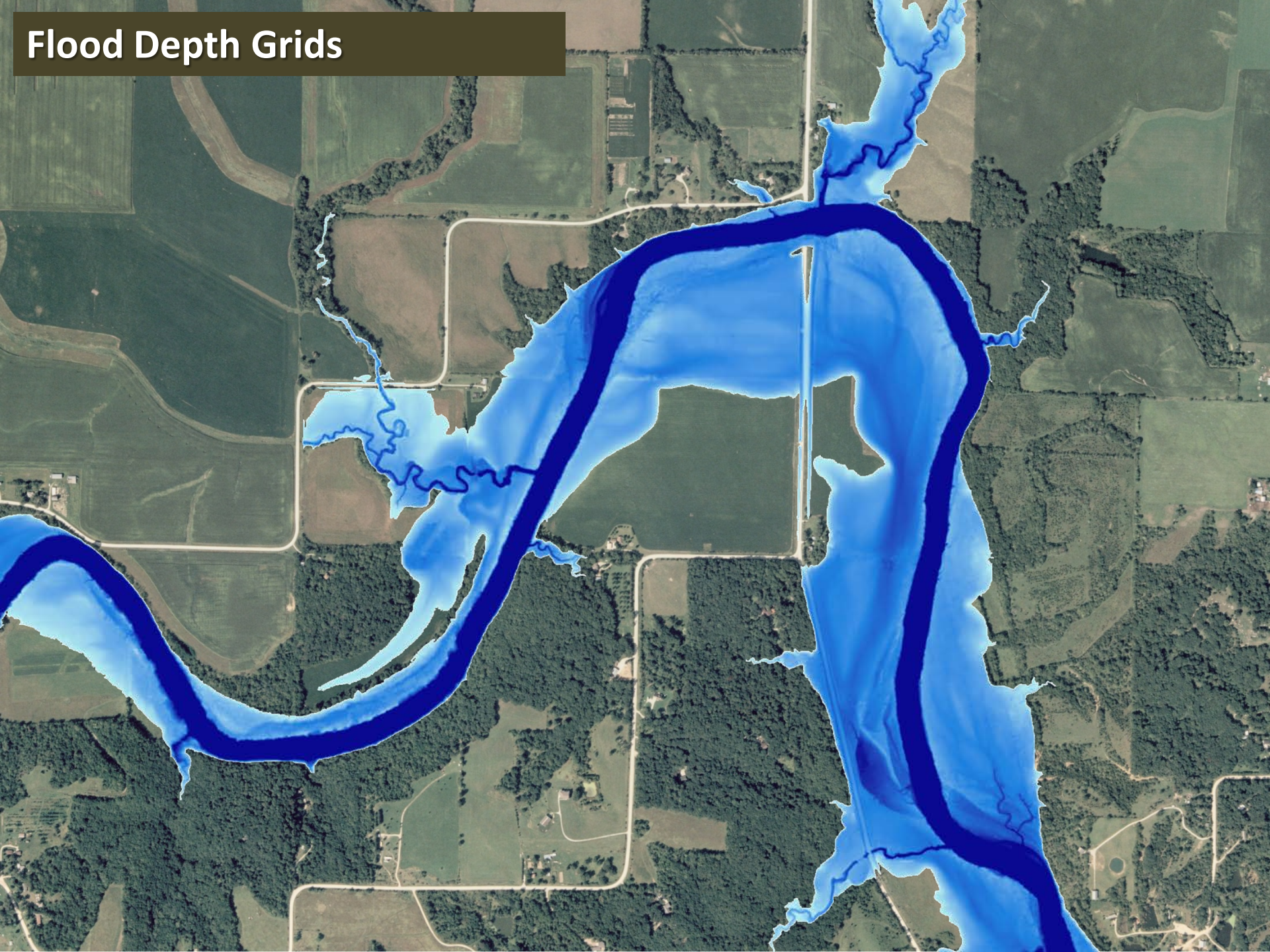




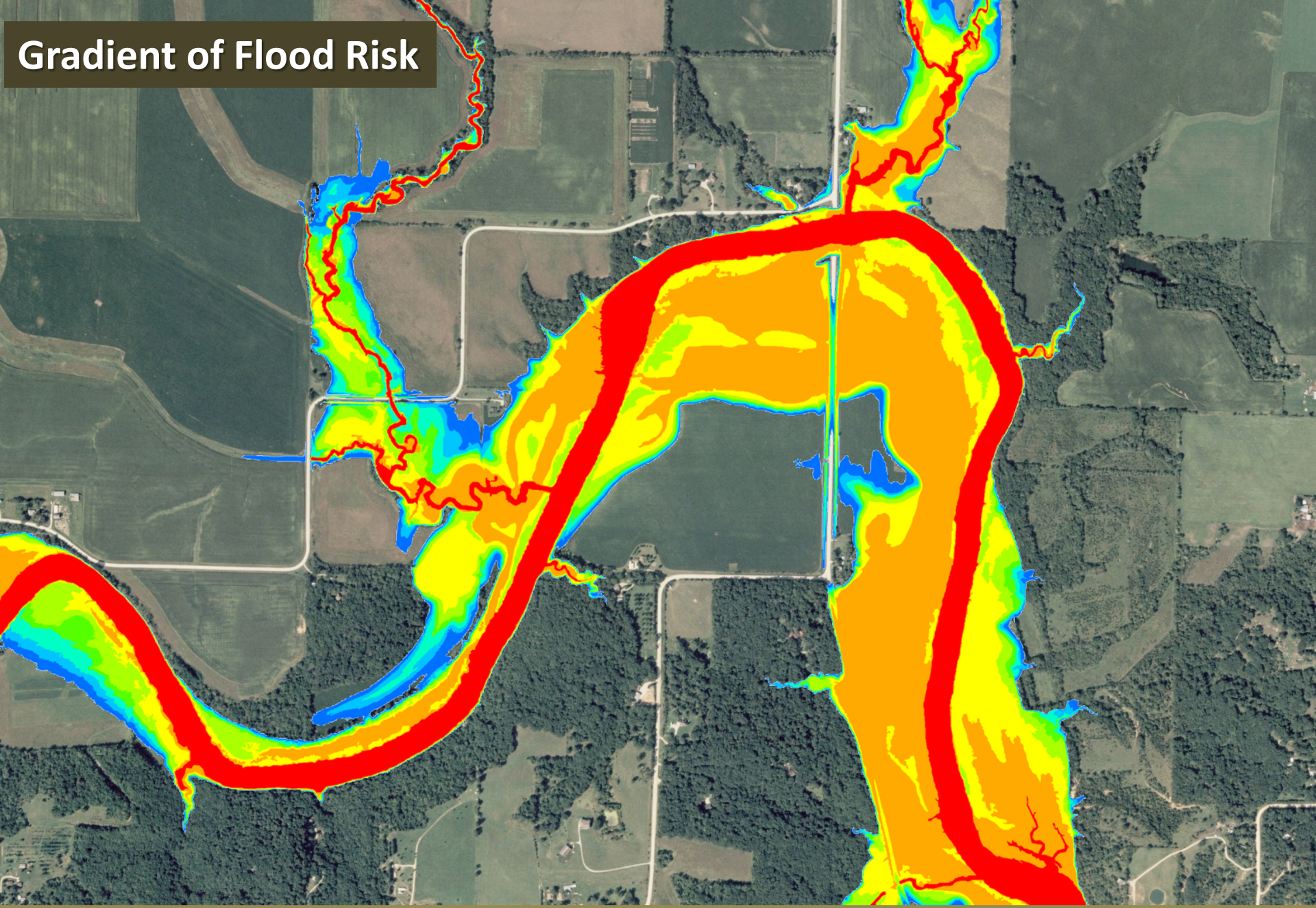




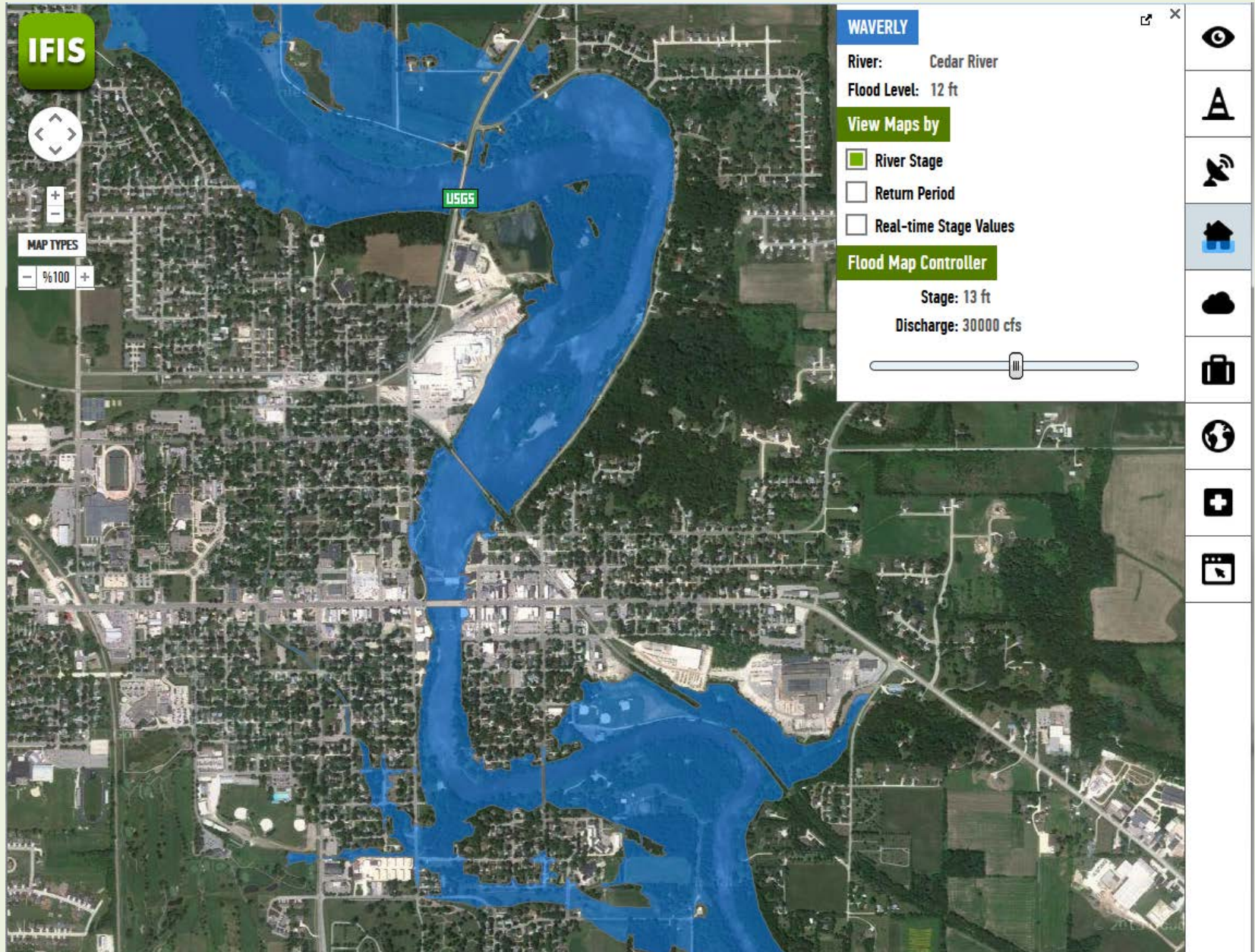
# Flood Depth Grids



# Gradient of Flood Risk



# Waverly







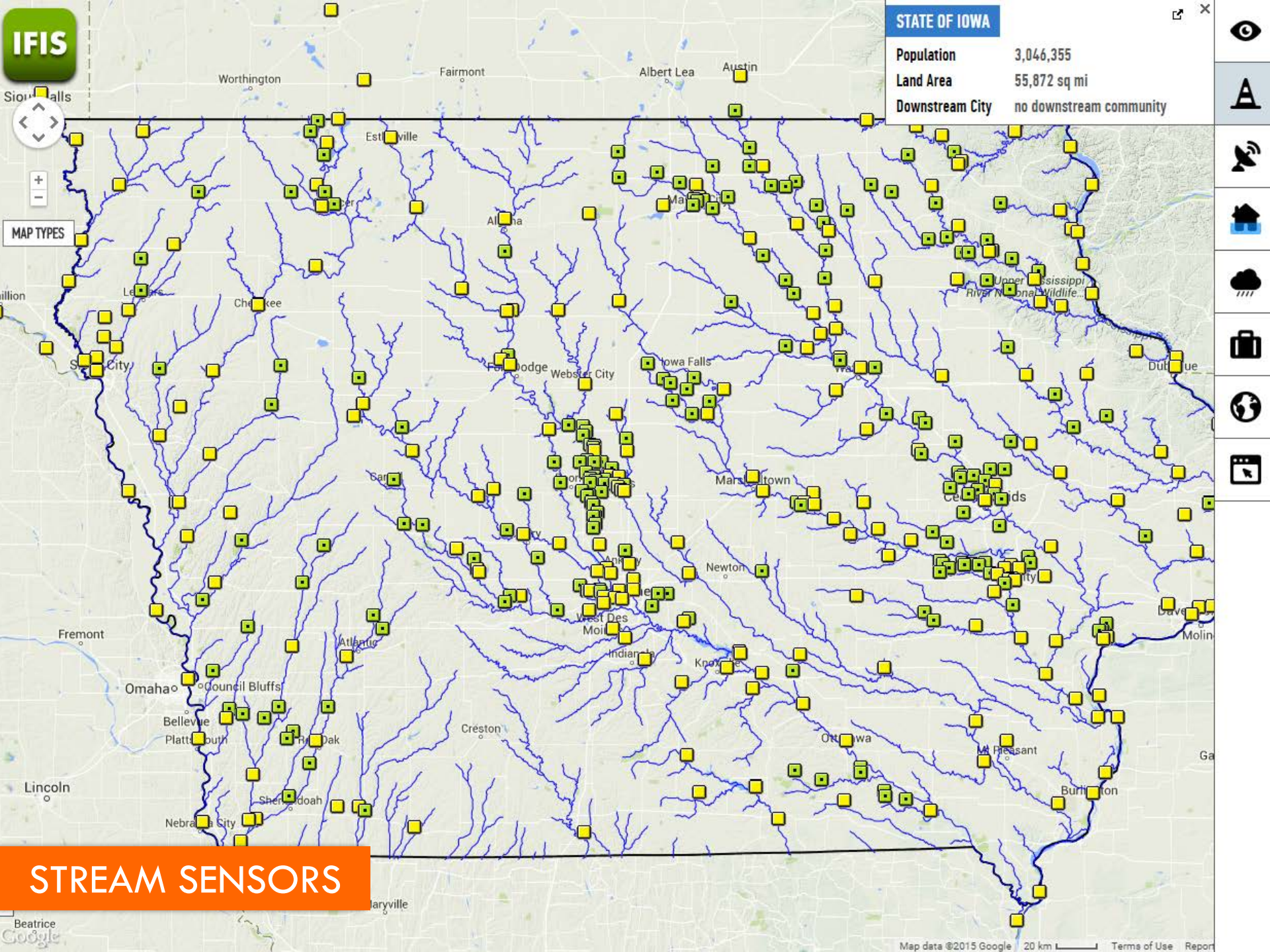
# Streamflow monitoring

Population	3,046,355
Land Area	55,872 sq mi
Downstream City	no downstream community

MAP TYPES

+

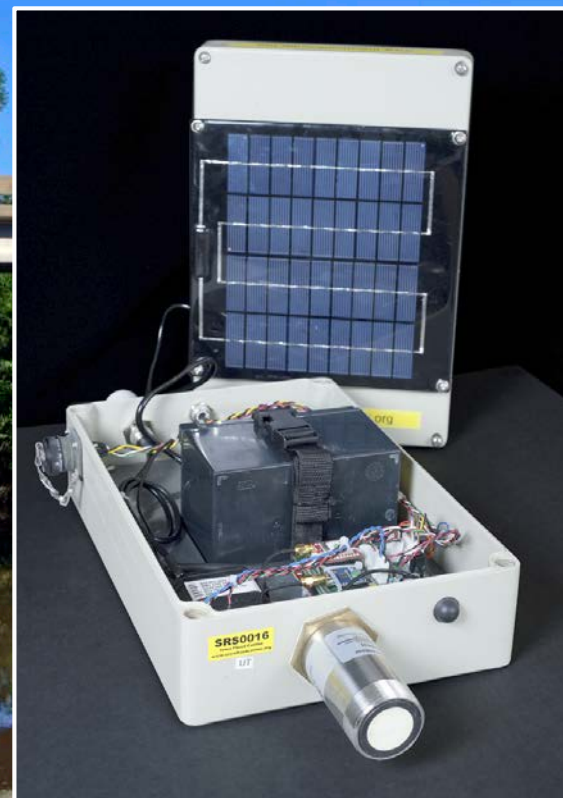
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STREAM SENSORS

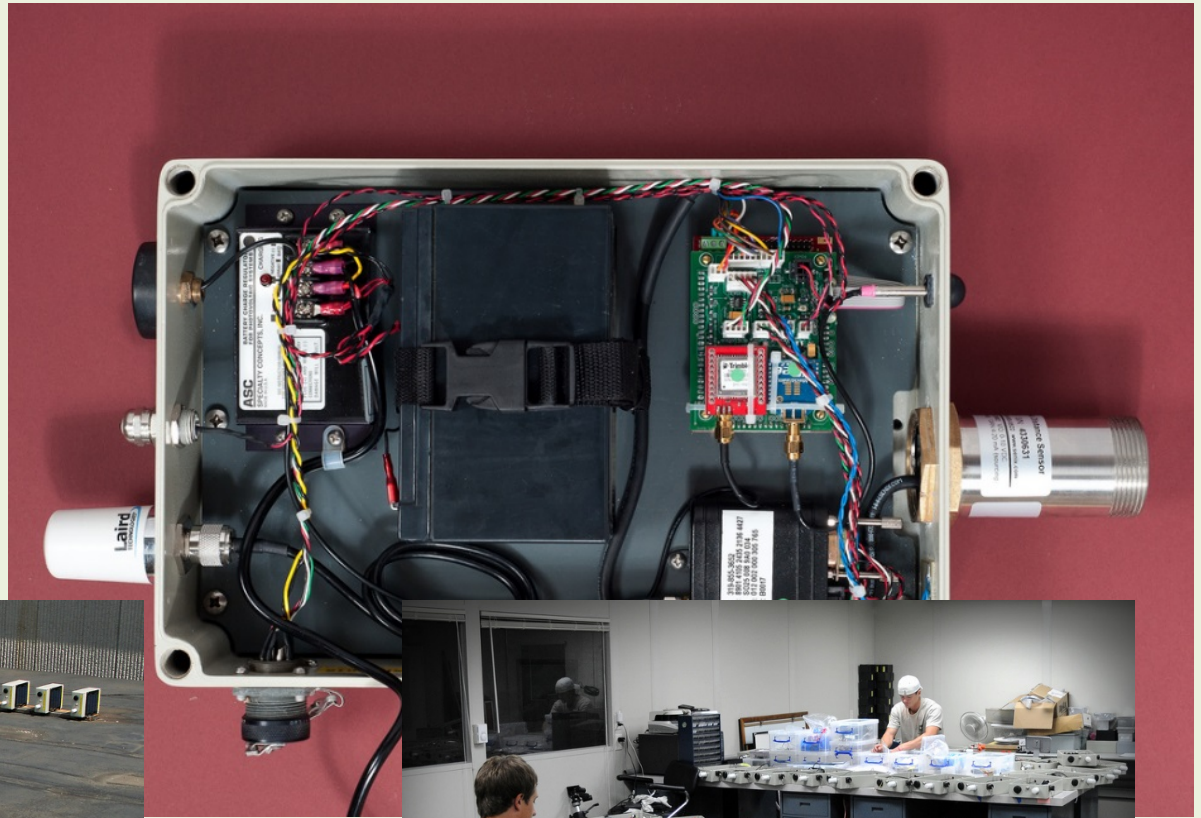
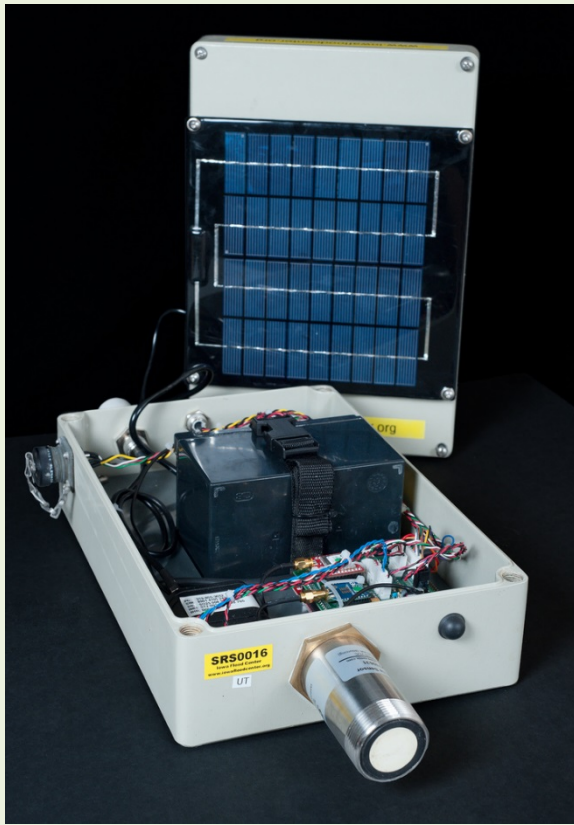


To establish community-based programs to **improve flood monitoring** and prediction along Iowa's major waterways and to support ongoing flood research.





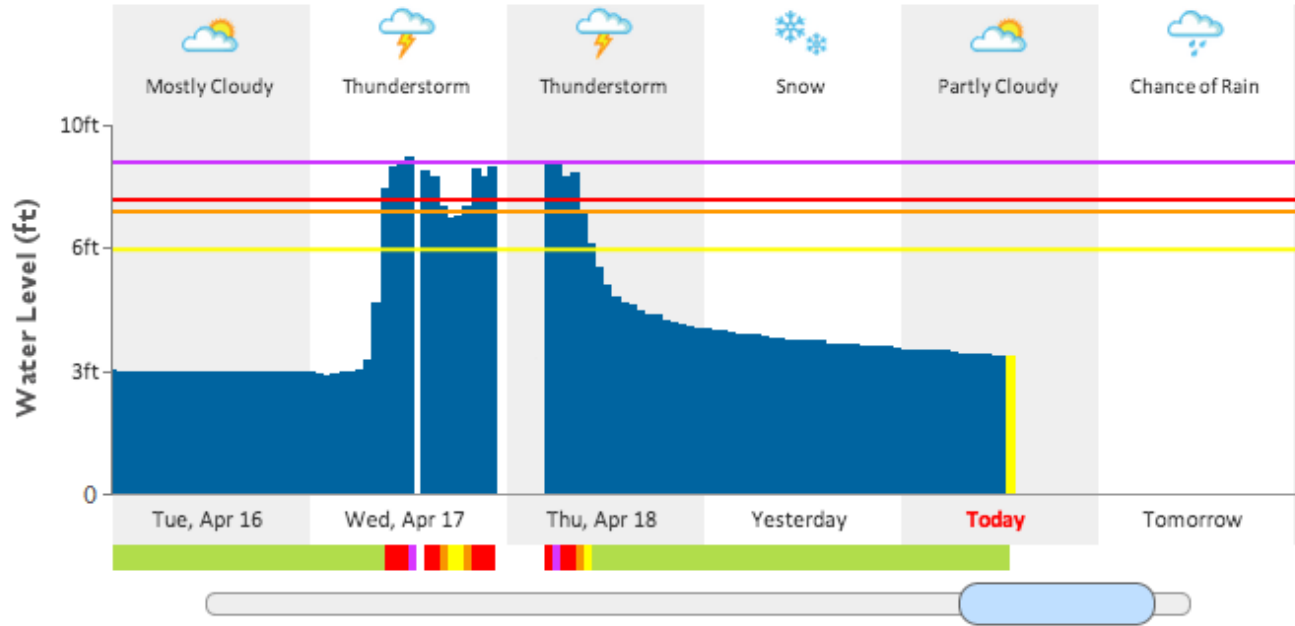
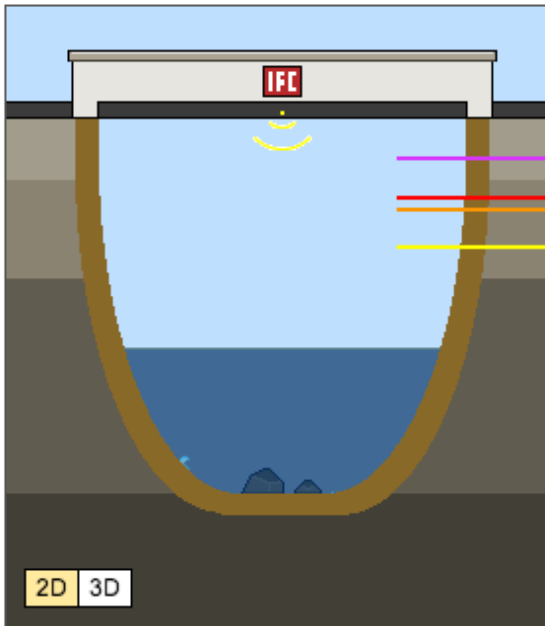
# Almost 250 Bridge Sensors...

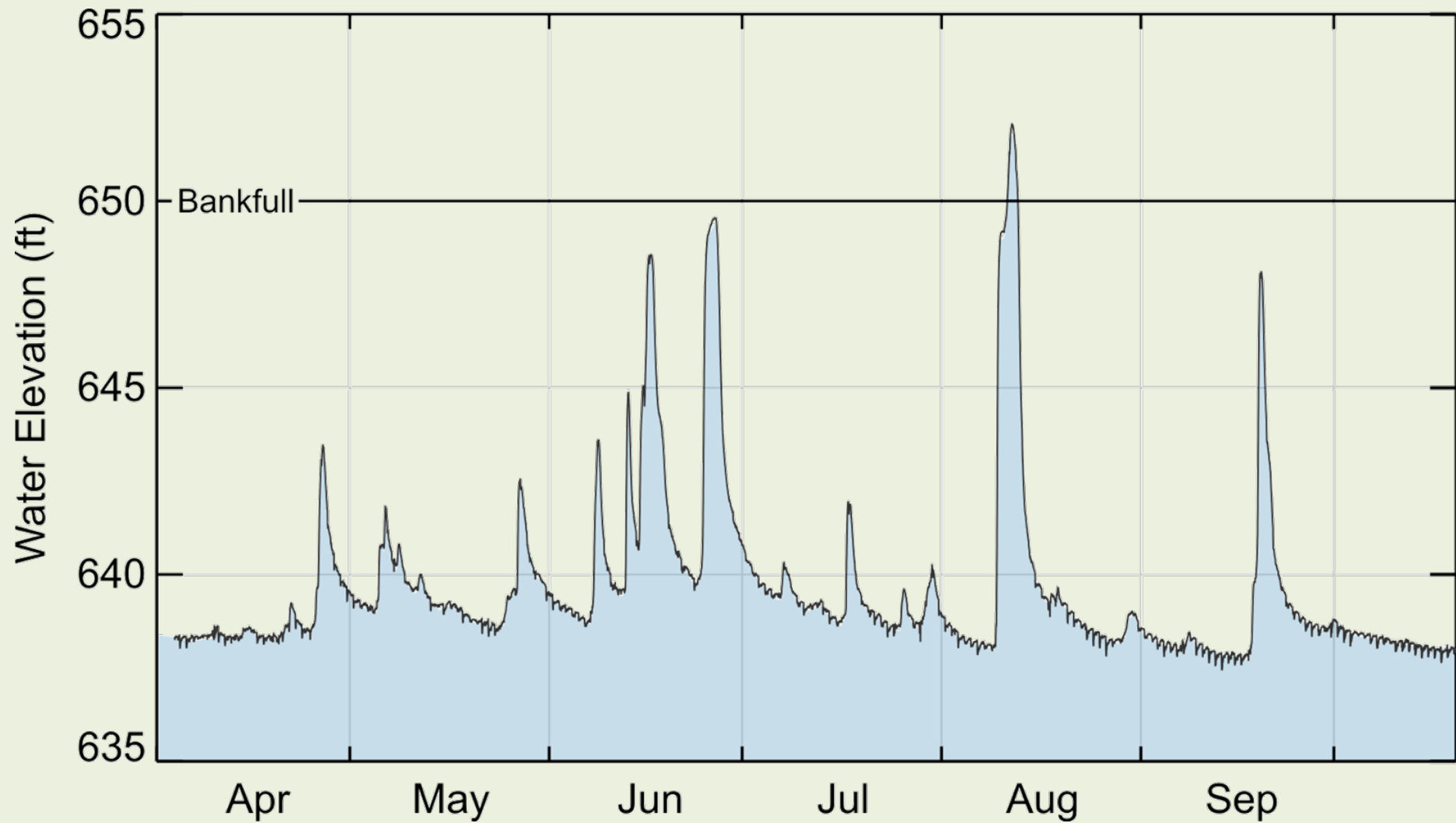




## IFC BRIDGE SENSOR

**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



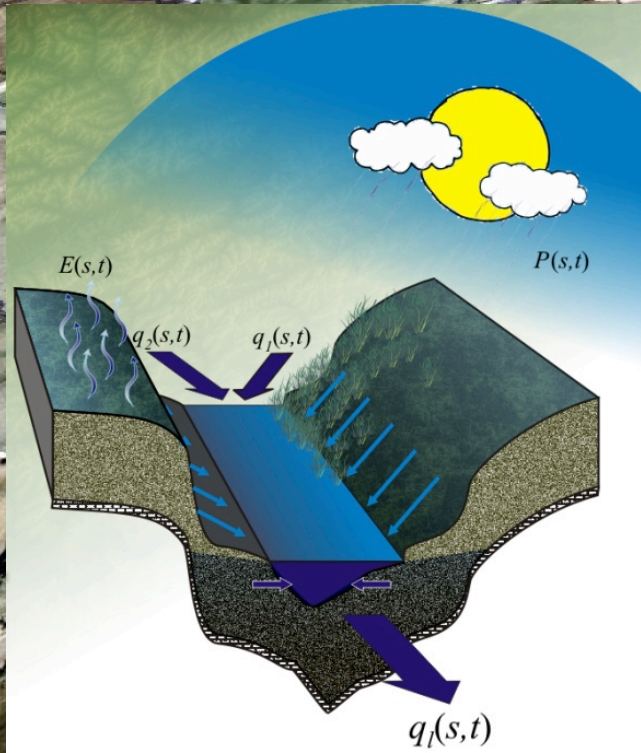






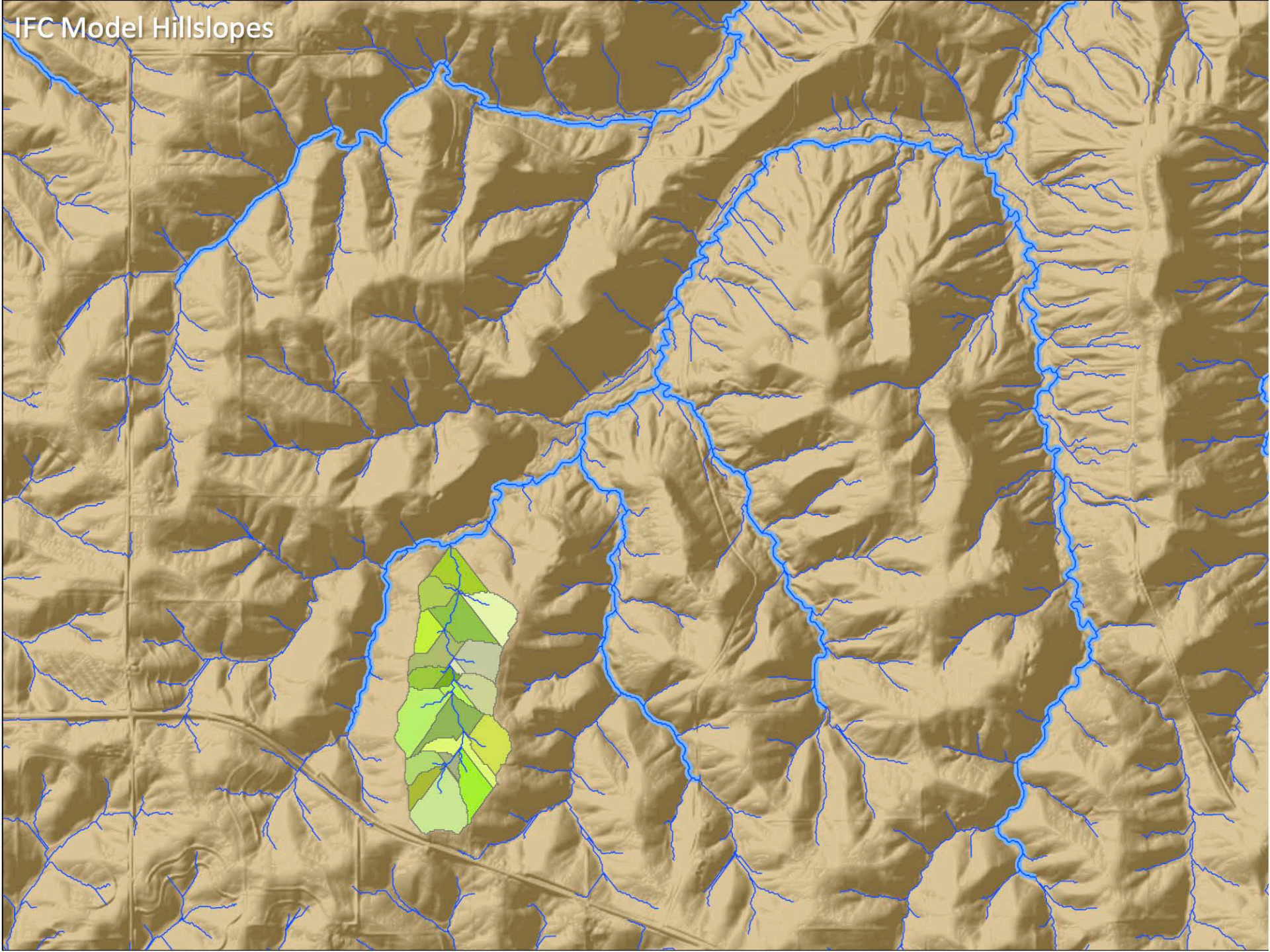
# Flood forecasting

Hillslopes → Decompose the landscape  
Links → Decompose the river network



Hillslope-link partitioning = Irregular grid  
Hillslope area  $\sim 0.1 \text{ km}^2$   
Channel link length  $\sim 400 \text{ m}$

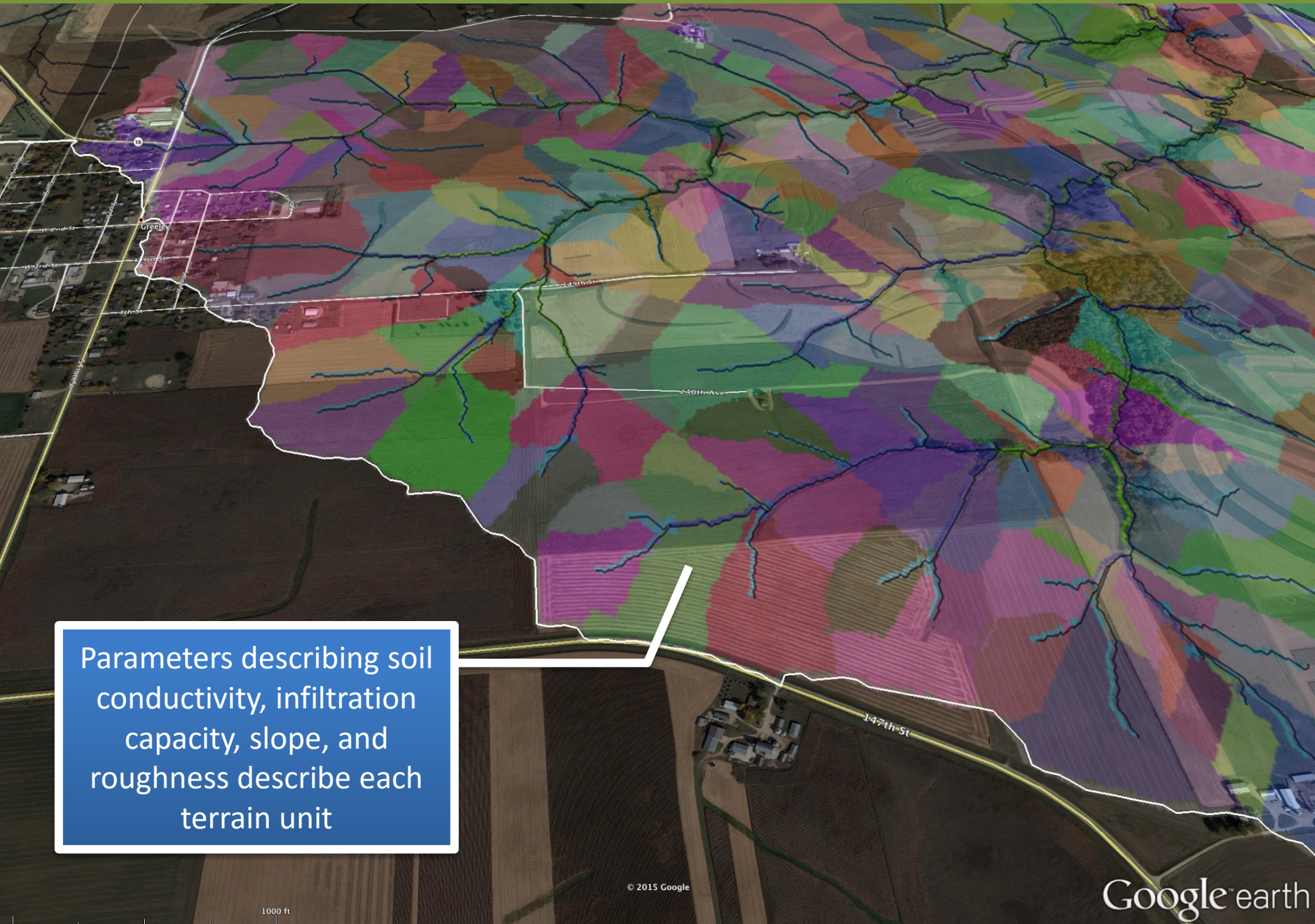
# IFC Model Hillslopes



# Terrain is dissected by a finite self-similar river network



It creates a unique decomposition of the landscape surface



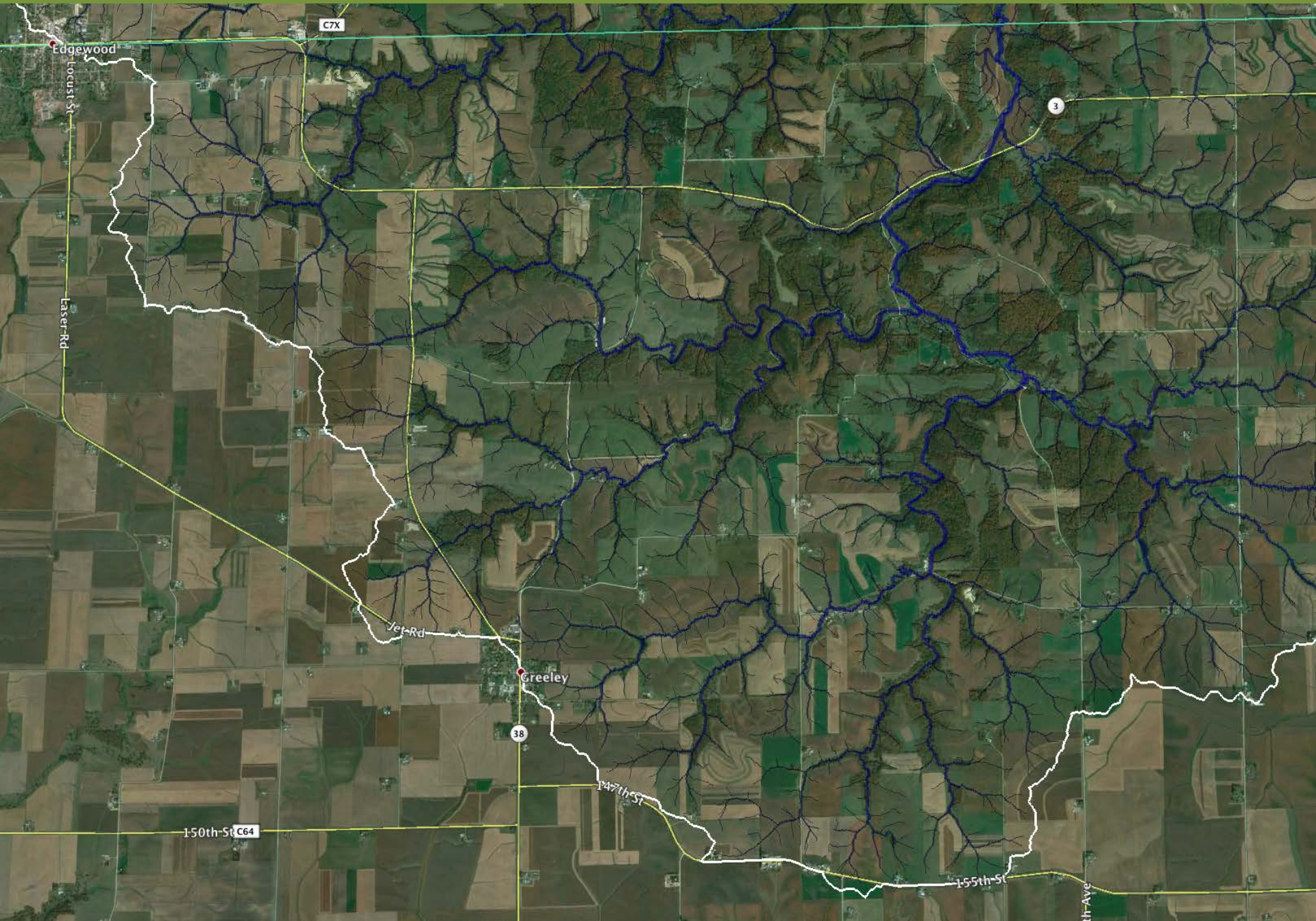
Parameters describing soil conductivity, infiltration capacity, slope, and roughness describe each terrain unit

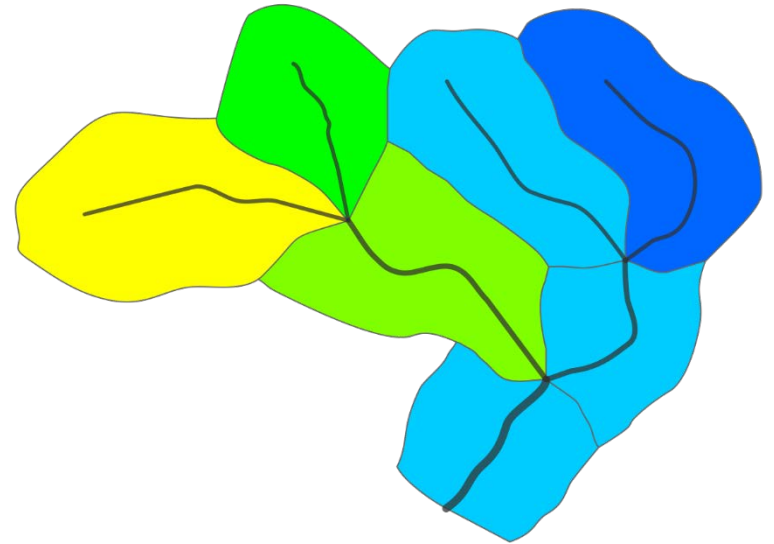
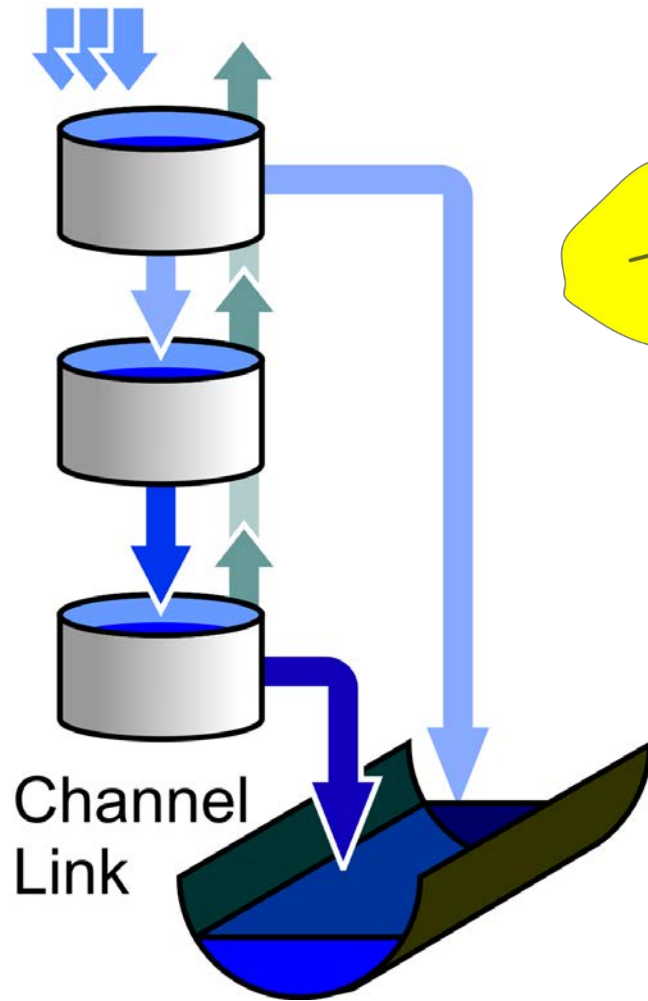
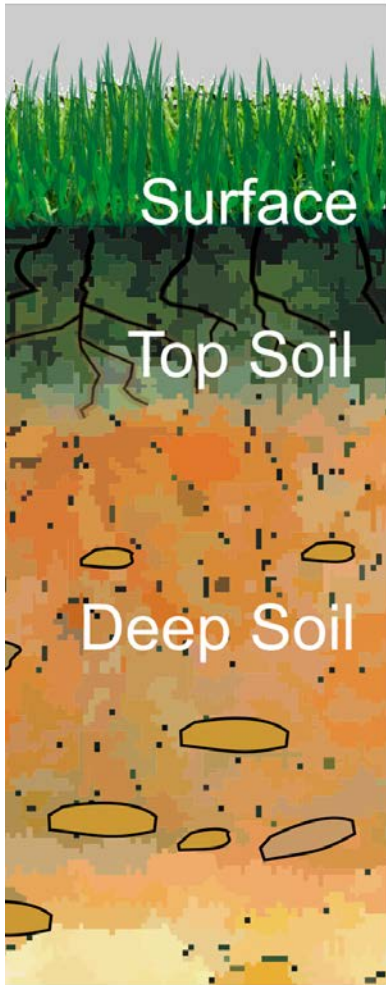
1000 ft

© 2015 Google

Google™ earth

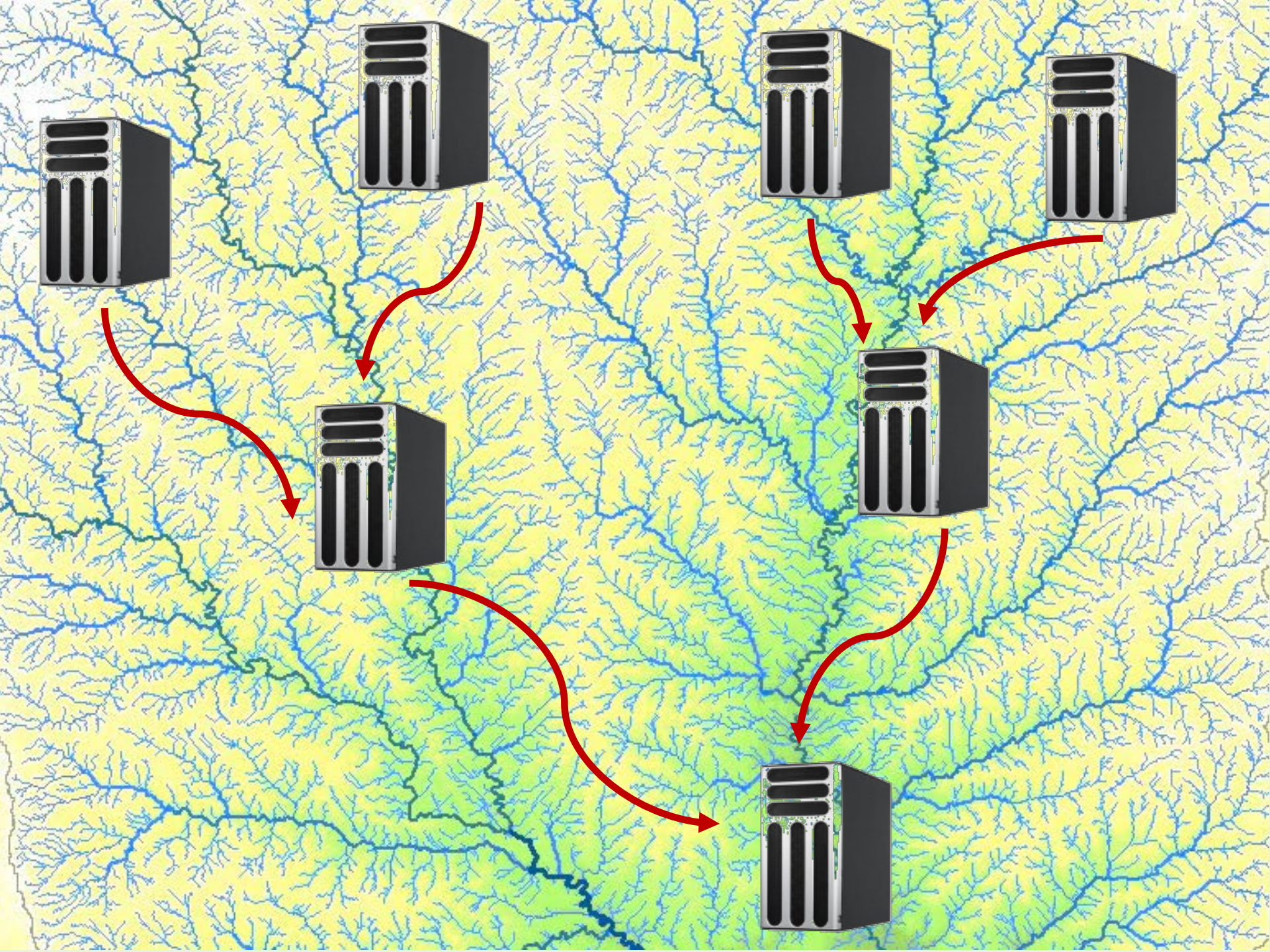
# The river network connects flows across scales





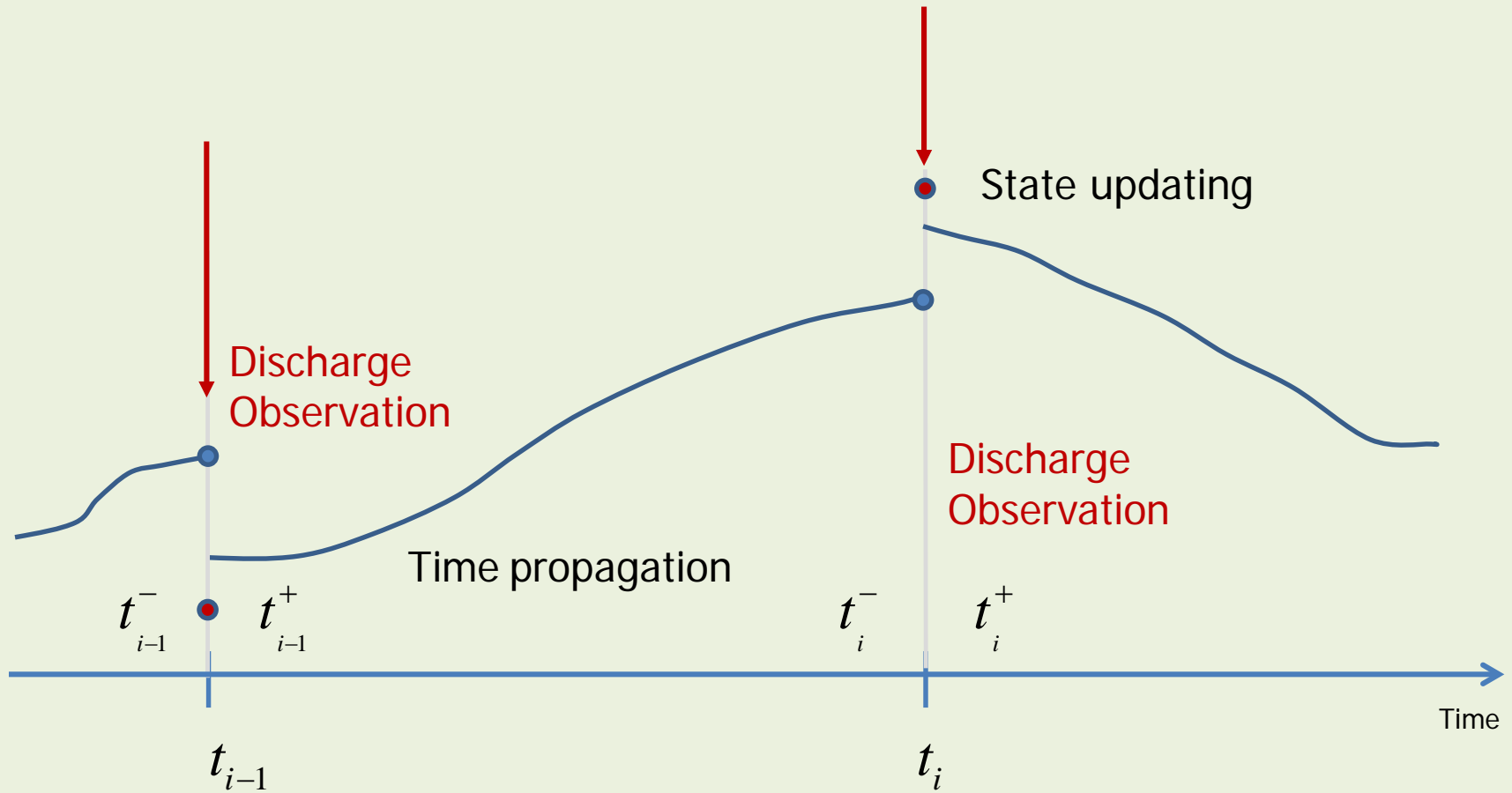
$$\frac{d\mathbf{S}}{dt} = \mathbf{f}(\mathbf{S}, \mathbf{I}, \mathbf{P})$$

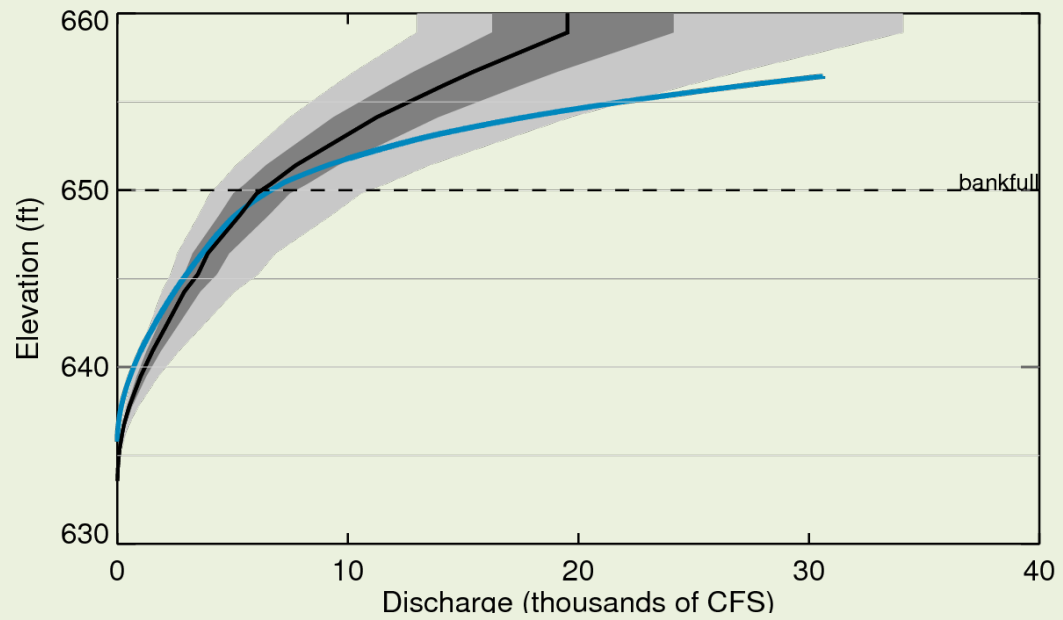
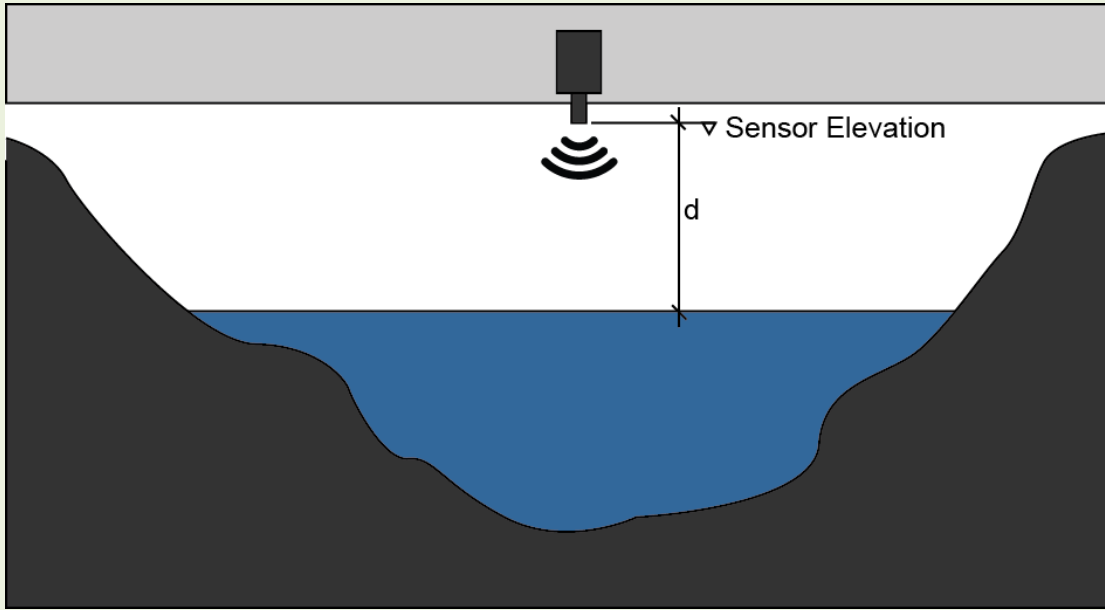
For Iowa the system of  
~500,000 equations





# Data Assimilation



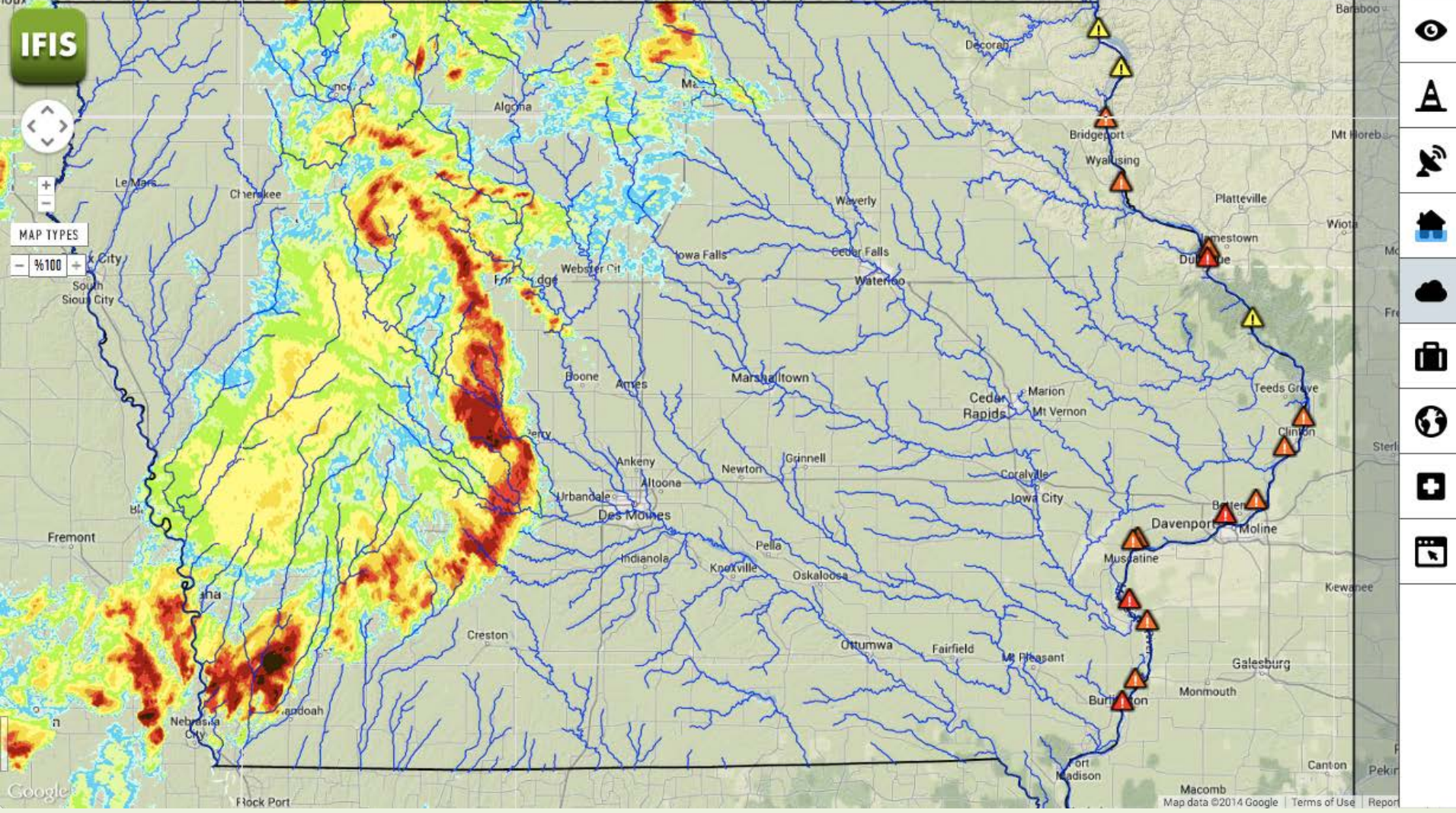


IFIS

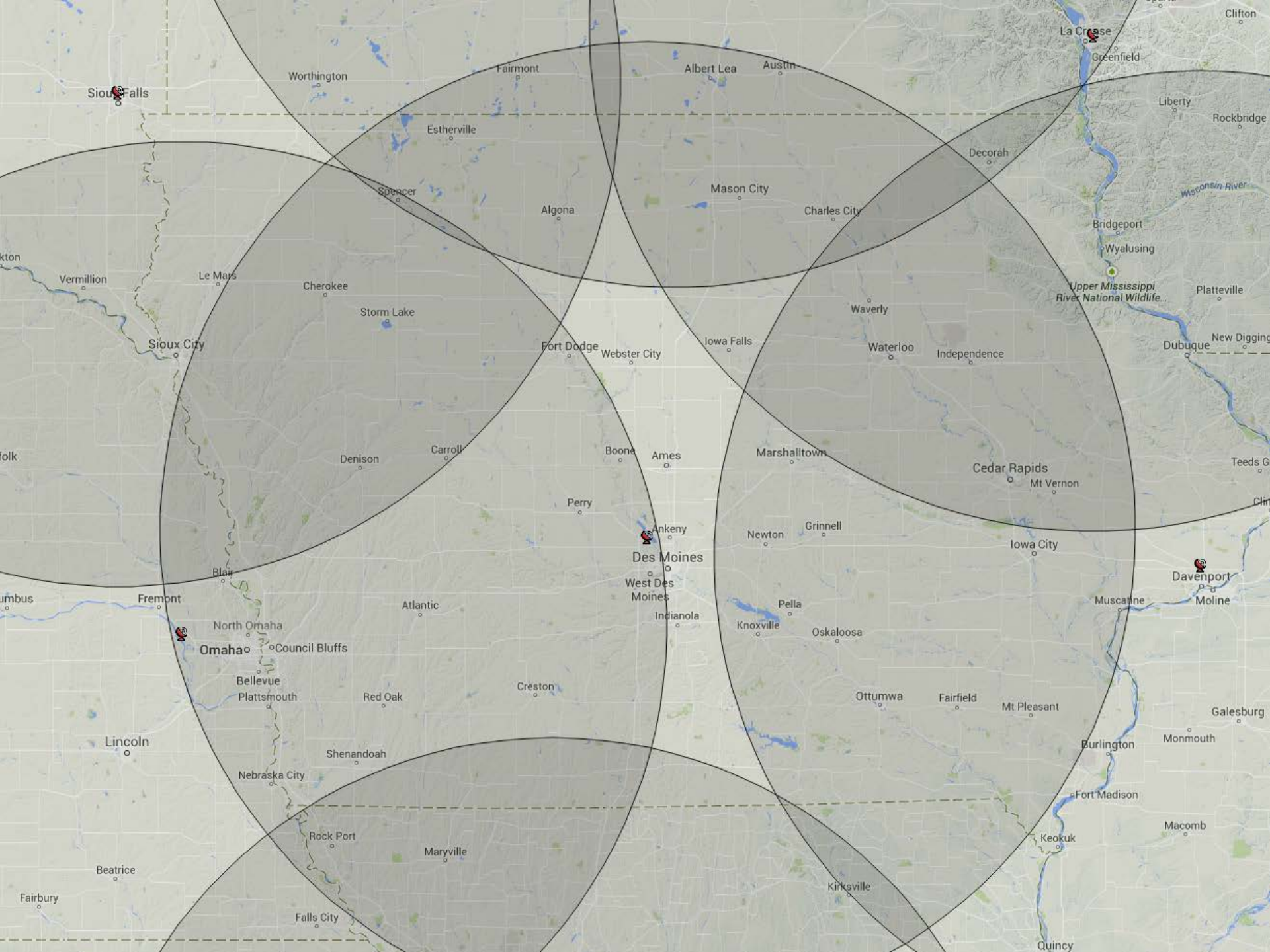


MAP TYPES

100%



▶ play
|| pause
◀◀
▶▶
▶ now
8:10 am
Drizzle
Light
Moderate
Heavy
Downpour



**STATE OF IOWA**

**Population** 3,046,355  
**Land Area** 55,872 sq mi

Product: IFIS  
Frequency: 24 hours  
Nov 30, 2015 11:00 pm

Map data

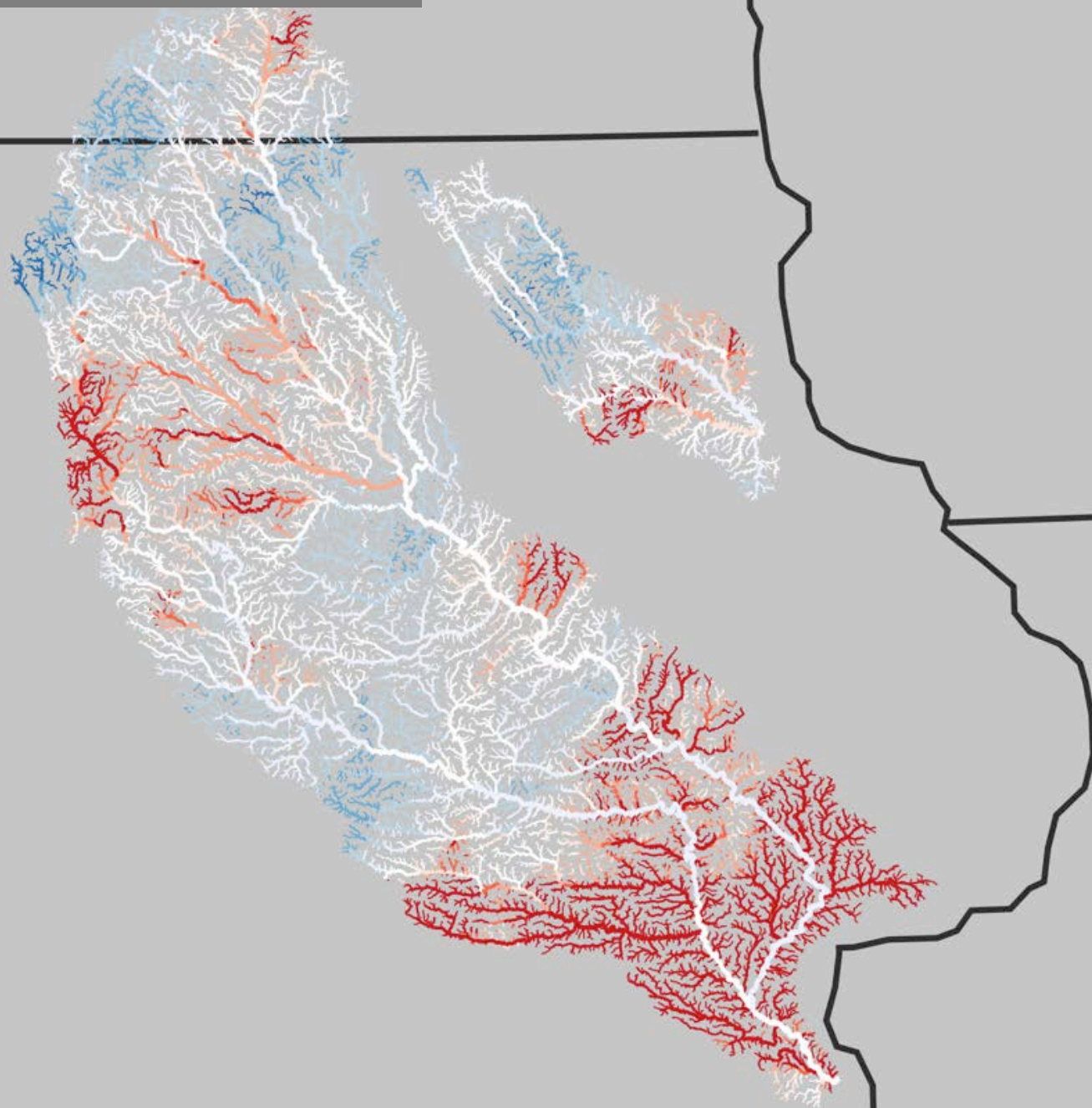
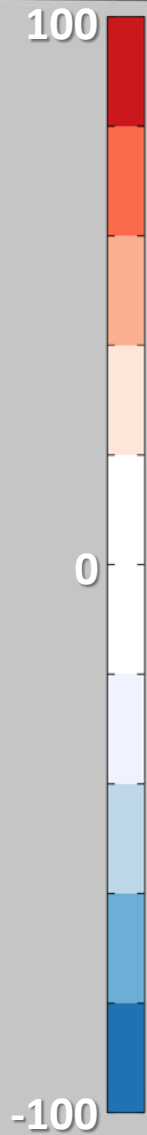
**STATE OF IOWA**

**Population** 3,046,355  
**Land Area** 55,872 sq mi

Product: Comparison  
Frequency: 24 hours  
Nov 30, 2015 11:00 pm

Map data

# IFC vs. MRMS

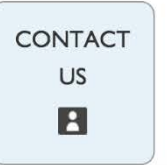
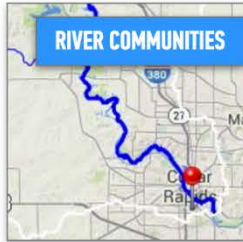
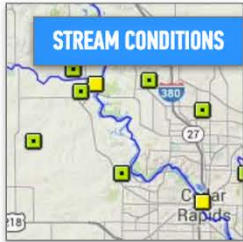
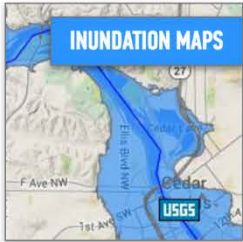


# Model or Radar?



# 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 data, information, and applications





IFIS



MAP TYPES

- %100 +

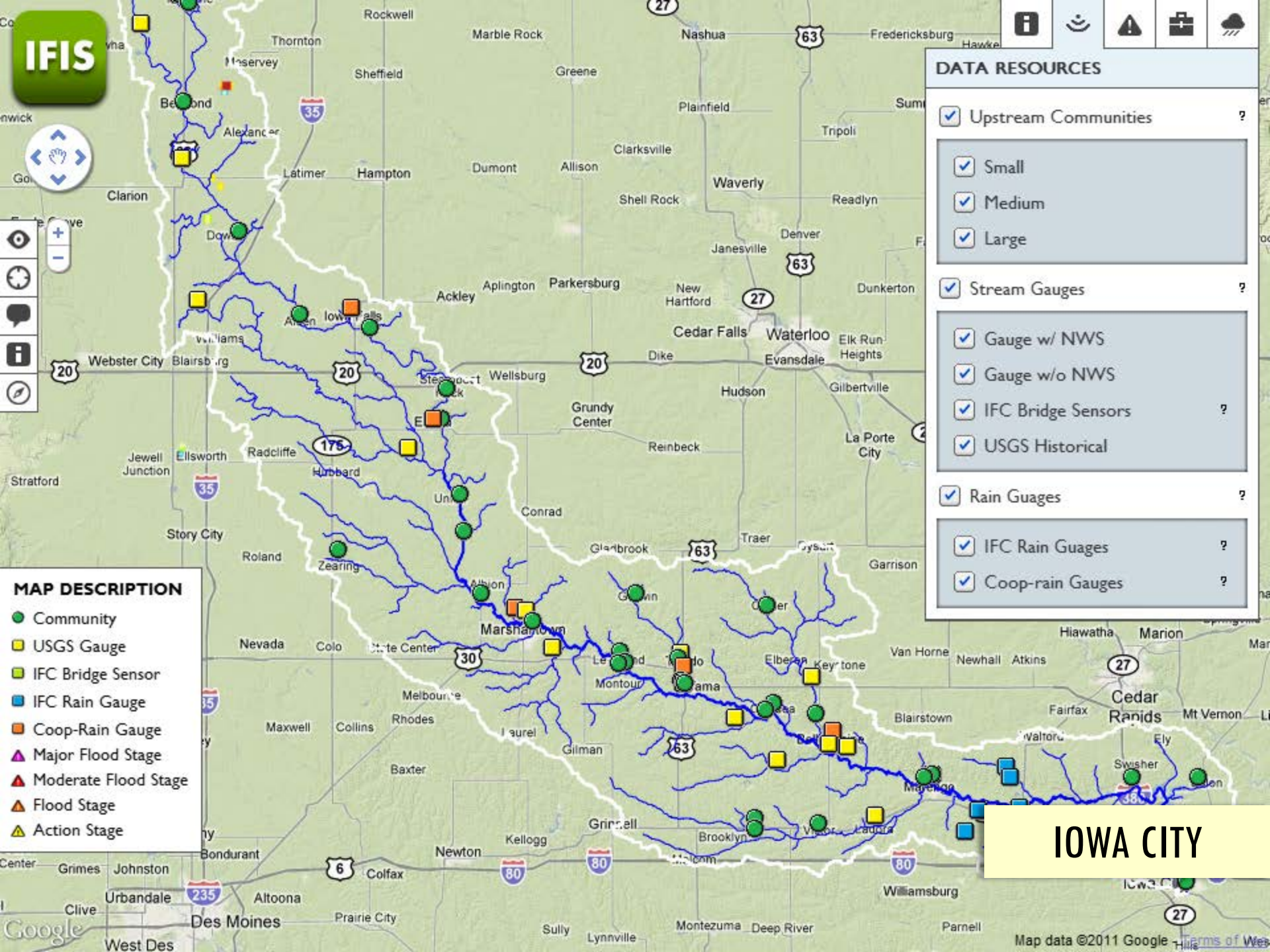


# RAINFALL MAPS

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



### DATA RESOURCES

- Upstream Communities ?
  - Small
  - Medium
  - Large
- Stream Gauges ?
  - Gauge w/ NWS
  - Gauge w/o NWS
  - IFC Bridge Sensors ?
  - USGS Historical
- Rain Gauges ?
  - IFC Rain Gauges ?
  - Coop-rain Gauges ?

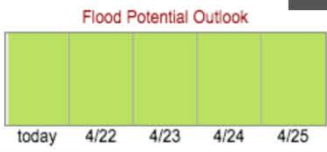
### MAP DESCRIPTION

- Community
- USGS Gauge
- IFC Bridge Sensor
- IFC Rain Gauge
- Coop-Rain Gauge
- ▲ Major Flood Stage
- ▲ Moderate Flood Stage
- ▲ Flood Stage
- ▲ Action Stage

IOWA CITY

IFIS

TRAEER (WOLF CREEK)



DATA RESOURCES

- Upstream Communities: 5
- IFC Stream Sensors: 0
- USGS Gauges with IFC Forecast: 0
- USGS Gauges with NWS Forecast: 0

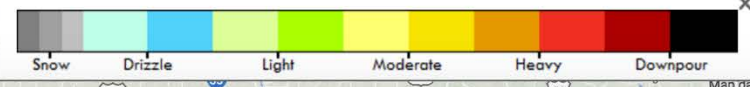
NO POTENTIAL FLOODING

SELECT COMMUNITY

STATE OF IOWA

Population 3,046,355  
 Land Area 55,872 sq mi

Community



12:00 am  
Thursday

April 21, 2016

PLAY PAUSE << >> NOW

- 👁️
- 🗺️
- 📶
- 🏠
- ☁️
- 👜
- 🌐
- 📅

IWIS

USGS ID: 05490500 - NWS ID: KEQ14  
Stage Height: 13 ft 8 in  
Last Reported: Feb 27, 2015 4:15 pm

Population 3,046,355  
Land Area 55,872 sq mi  
Downstream City no downstream community

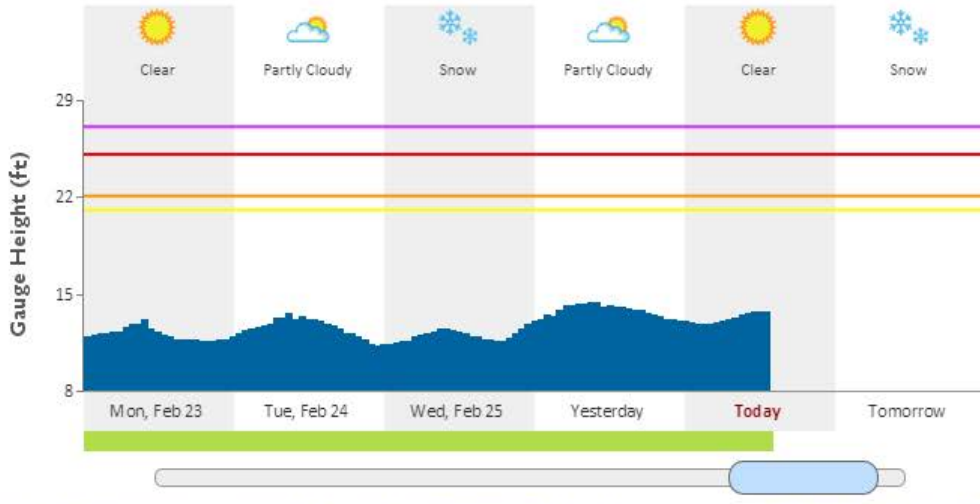
Stream Sensor



NO FLOOD WARNING

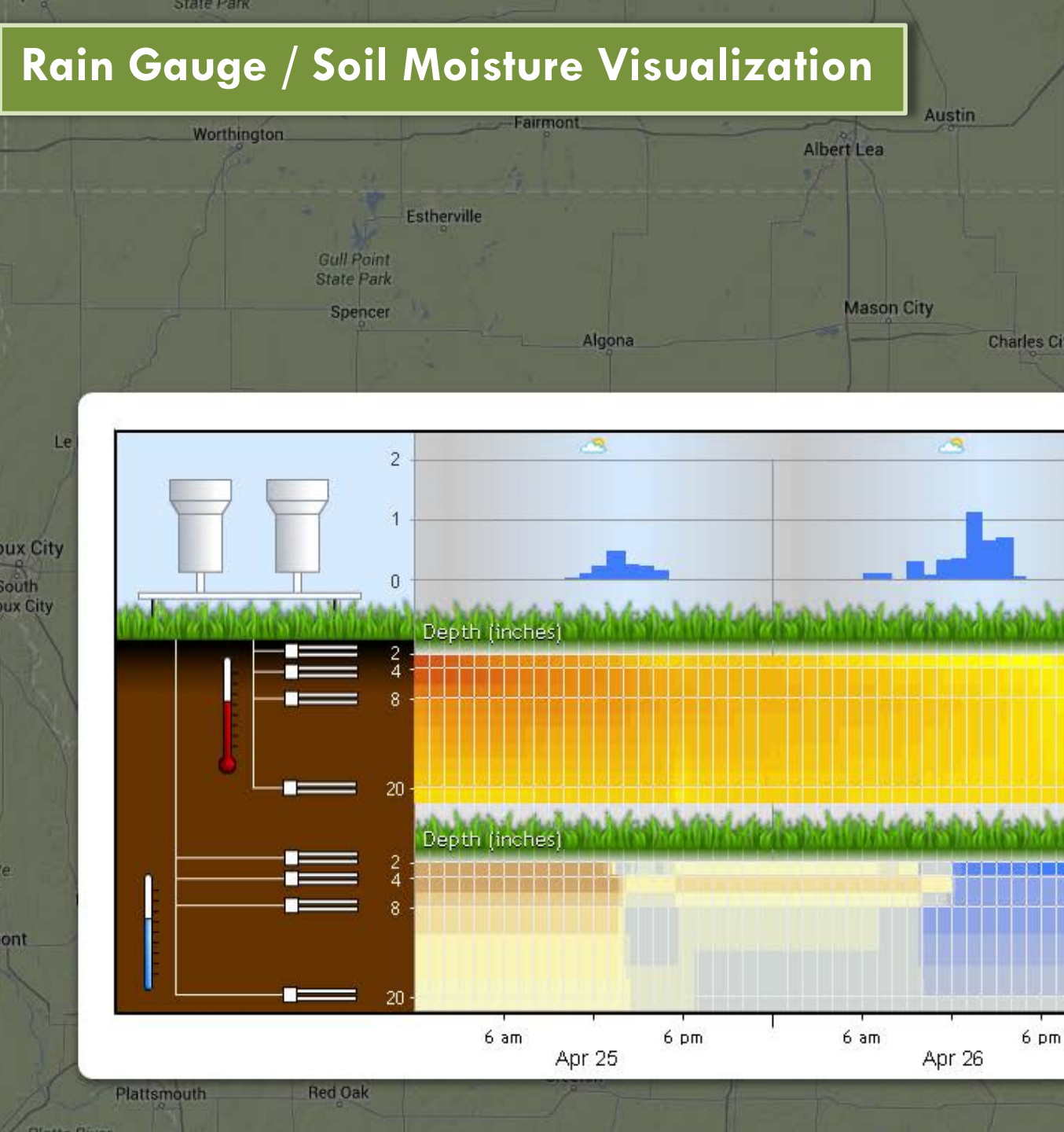
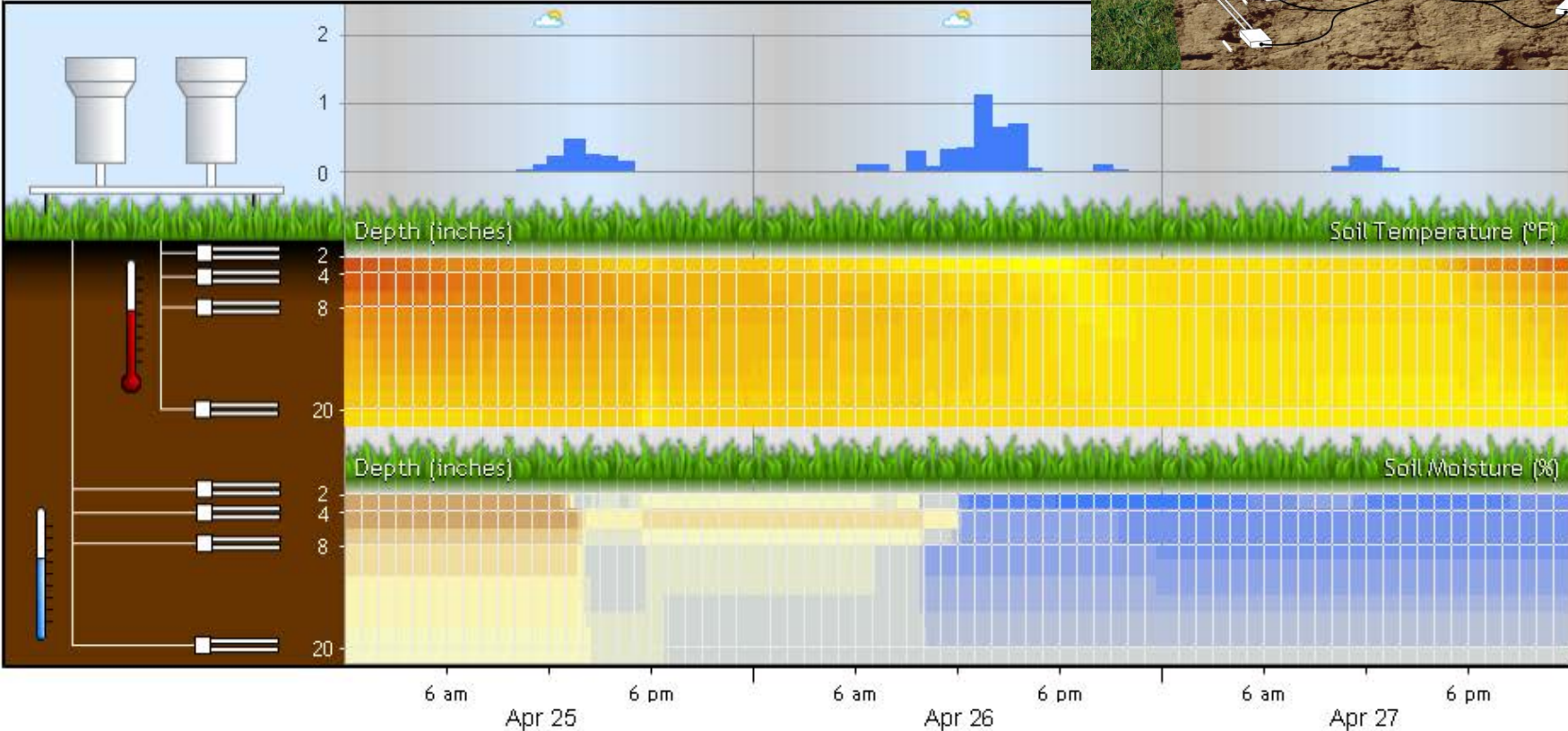
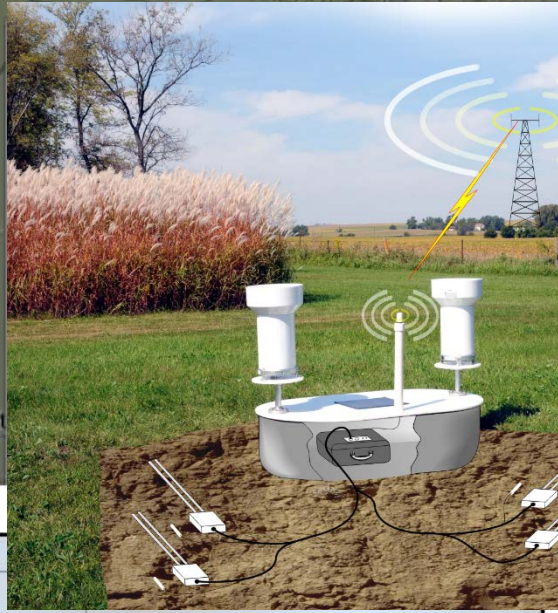
### USGS STREAM GAUGE

**River / City:** Des Moines River at Keosauqua  
**Station ID:** [05490500](#) (USGS) - [KEQ14](#) (NWS)  
**Stream Forecast:** not available  
**Last Reported:** Fri, February 27, 2015 4:15 pm  
**Last Reading:** 13 ft 8 in

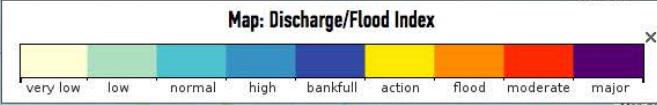
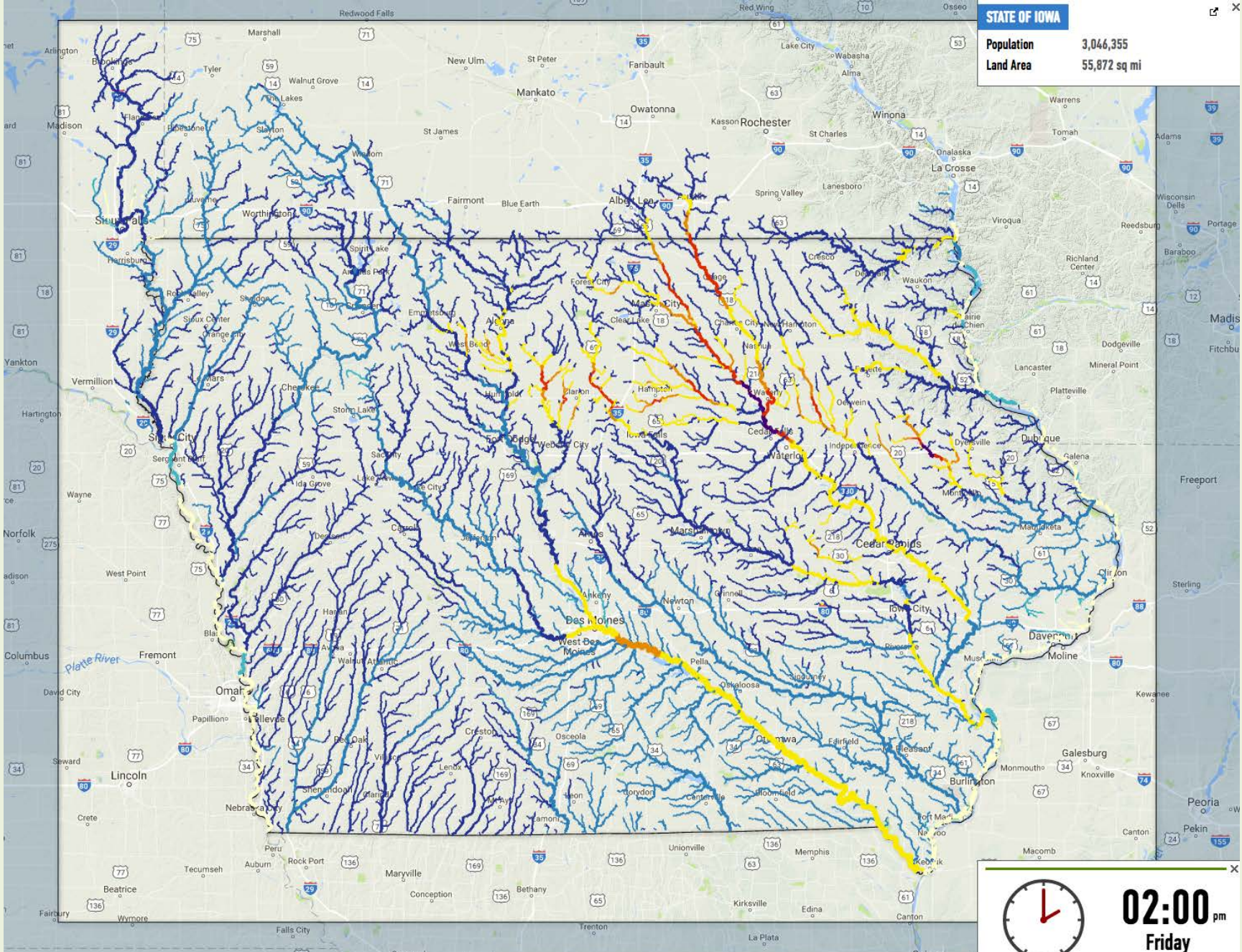


# STREAM CONDITIONS

# Rain Gauge / Soil Moisture Visualization



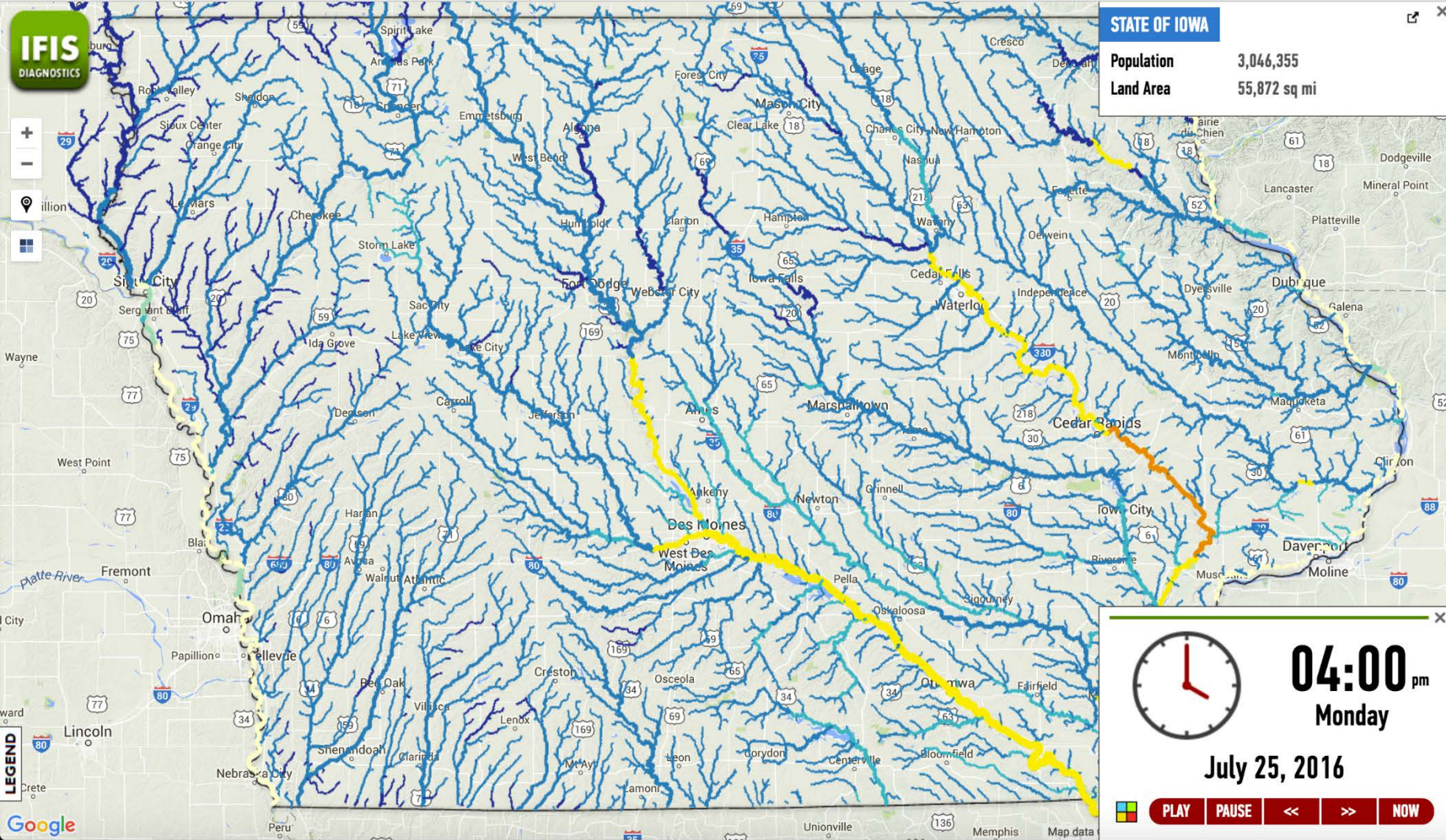
**STATE OF IOWA**  
 Population 3,046,355  
 Land Area 55,872 sq mi



 **02:00 pm**  
**Friday**  
**September 23, 2016**

 **PLAY**  **PAUSE**  **<<**  **>>**  **NOW**

**IFIS**  
DIAGNOSTICS



**STATE OF IOWA**

Population 3,046,355  
Land Area 55,872 sq mi



**04:00** pm  
Monday

July 25, 2016

PLAY PAUSE << >> NOW

- ☰
- 👁
- 📏
- 📶
- 🏠
- ☁
- 👜
- 🌐
- 📄

IWIS

What is the flood condition for Iowa City?

Minor flood warning issued for Iowa City

list type voice

- What is the flood condition for Iowa City [Cedar Rapids]?
- What is the flood potential for my community?
- Is it raining in Iowa City [Cedar Rapids] right now?
- What does 100-year flood mean?
- How can I bookmark a community in IFIS?



Flood AI Alpha - IFIS

Iowa Flood Information System

help

Flood AI Alpha - IFIS

[Flood AI Alpha]  
HELP  
You can ask me anything about flooding like  
- What is the weather forecast for Iowa City?  
- Show me stage data for nearest sensor?  
- What does catchment area mean?  
- How many stream sensors are there in Iowa City watershed?

What is the weather forecast for Iowa City?

Flood AI Alpha - IFIS

It will be partly cloudy in Iowa City.

Show me stage data for nearest sensor

Flood AI Alpha - IFIS

Here is the 5-day graph of nearest gauge (USGS: 05454500) at Iowa City

Iowa River at Iowa City

Stage Height: 12.8 ft  
Last Reported: May 9, 2014 12:00 pm  
Stage Height (ft)

NO FLOOD ALERT



Flood AI  
Active on Messenger

What is the upstream area of my community?

IFIS Upstream Area: 870 sq mi

what will be the weather forecast for Iowa City?

IFIS It will be partly cloudy in Iowa City.

What is drainage basin?

A drainage basin or catchment basin is an extent or an area of land where all surface water from rain, melting snow, or ice converges to a single point at a lower elevation, usually the exit of the basin, where the waters join another body of water, such as a river, lake, reservoir, estuary, wetland, sea, or ocean.

How many stream sensors are there in Iowa City watershed?

IFIS There are 45 stream sensors in Iowa City (Iowa River) watershed

Show me stage data for nearest sensor?

IFIS Here is the 5-day graph of nearest gauge (USGS: 05454500) at Iowa City

Type a message...



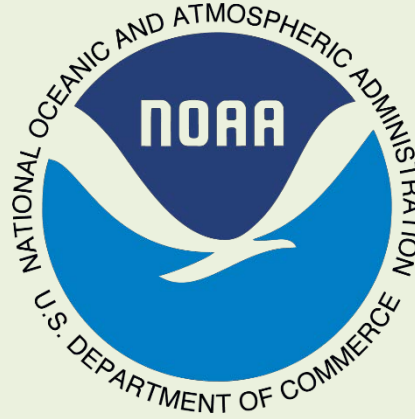
FLOOD AI

SMART ASSISTANT

VOICE RECOGNITION

ARTIFICIAL INTELLIGENCE





**US Army Corps  
of Engineers®**



**IOWA STATE  
UNIVERSITY**



The End

Thank you!



**Fields of opportunities**

