2015-2016 Winter Flood

Retrospective

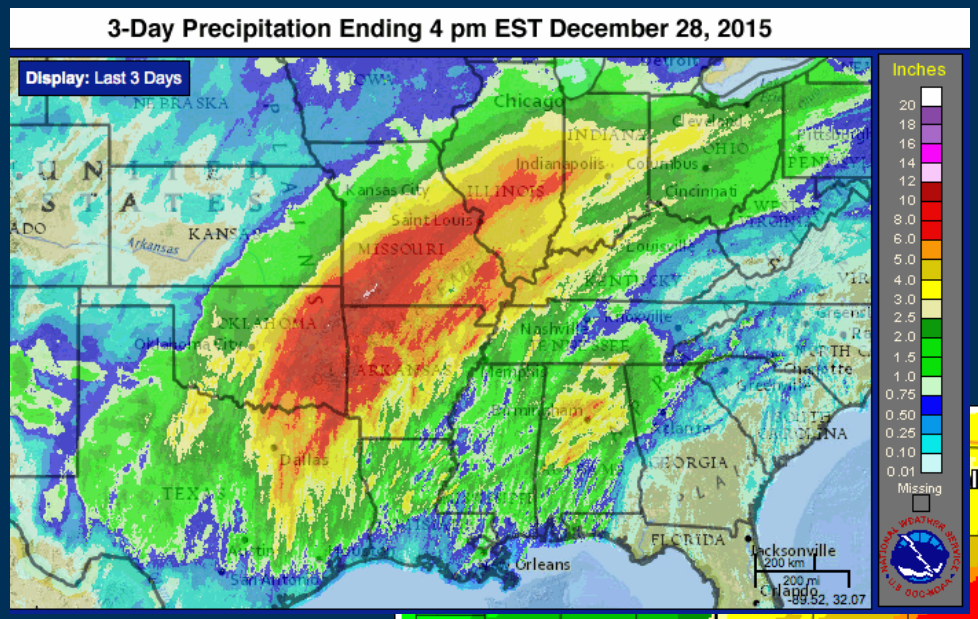
USGS Missouri Water Science Center

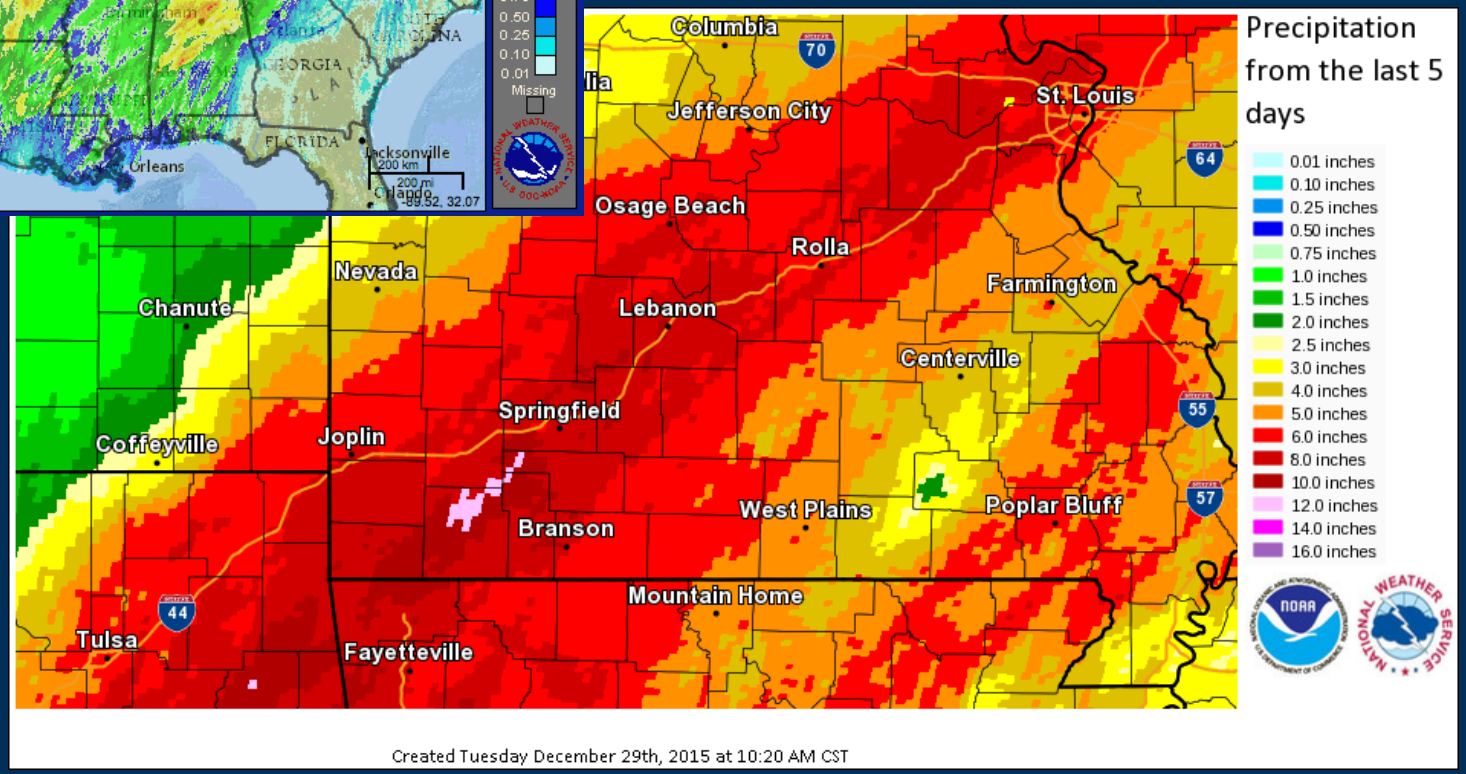
Our Missouri Waters – Lower Meramec River Meeting

U.S. Department of the Interior
U.S. Geological Survey

Photos courtesy of Post-Dispatch

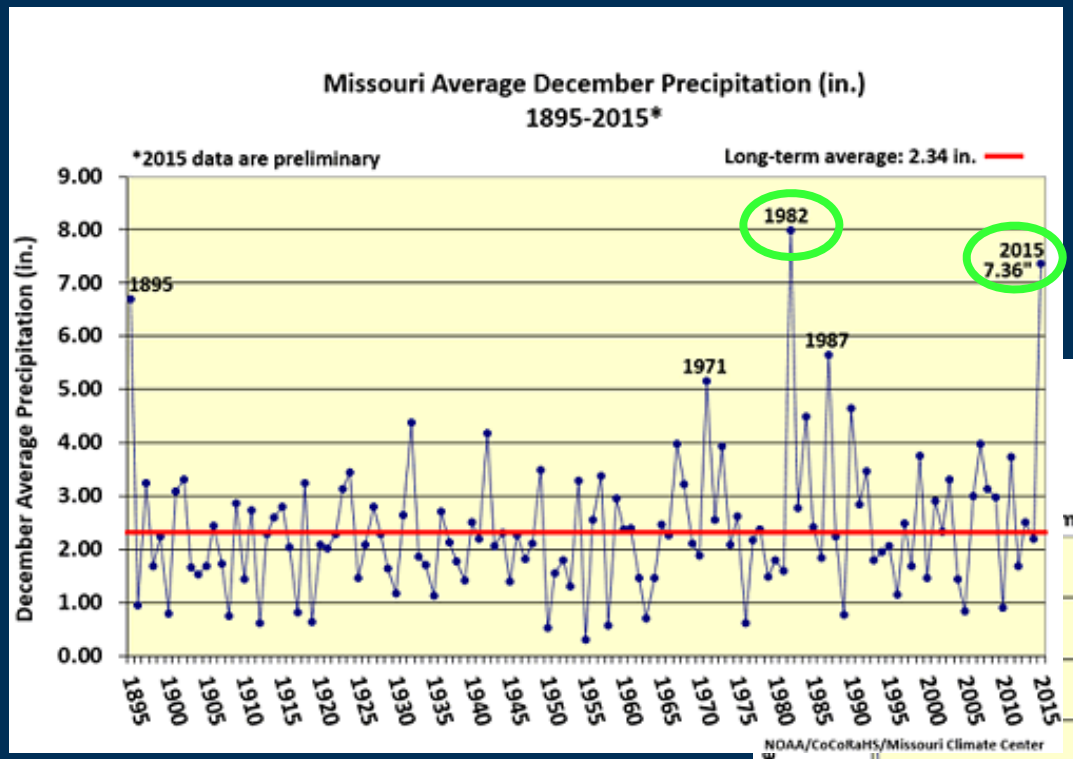
Precipitation Storm Totals



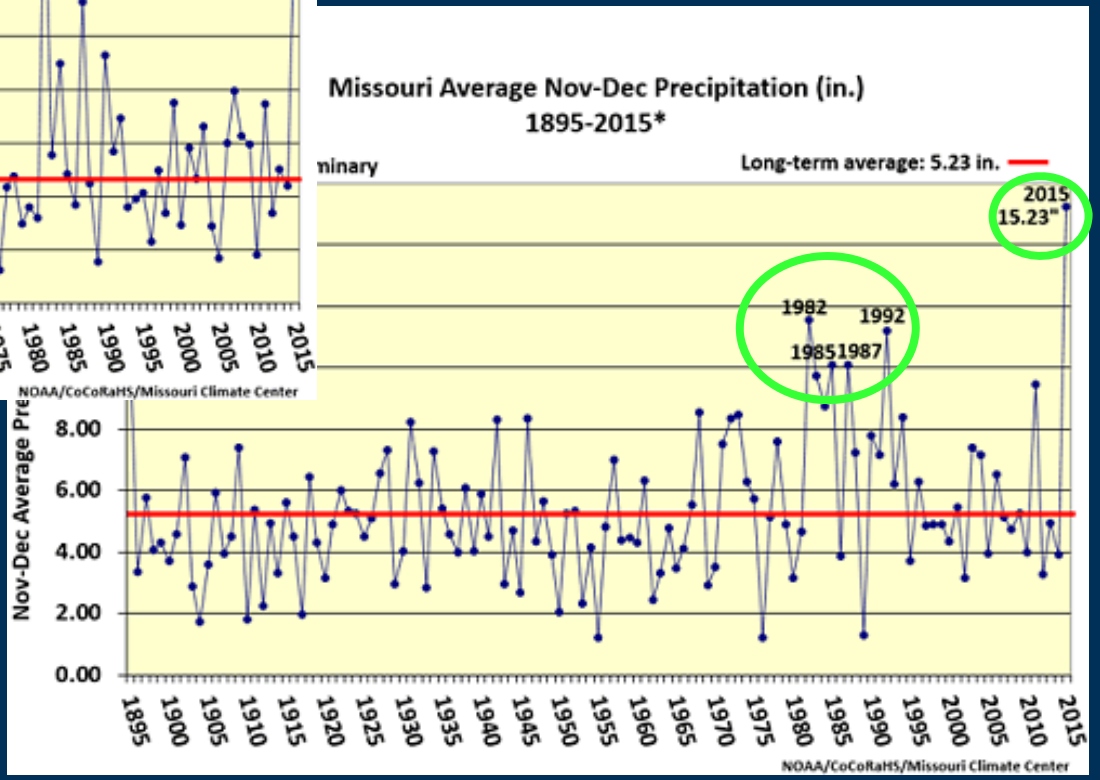


USGS

Historic Rainfall



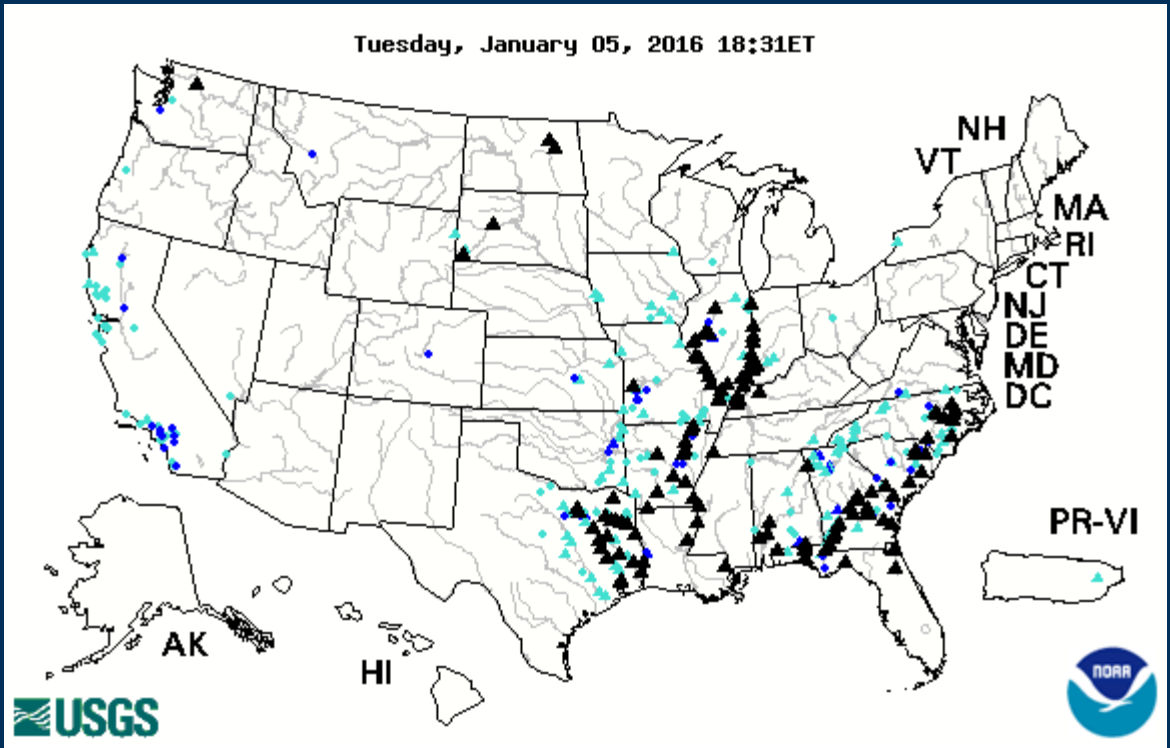
Annual Average Precipitation



Guinan, P., 2015, December 2015 Weather and Its Impacts on Missouri, Commercial Agriculture/ University of Missouri Extension

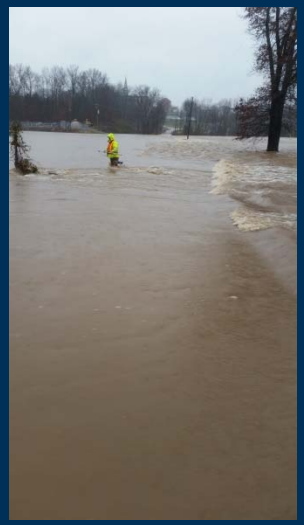
USGS

Flood evolution depicted by real-time streamflow



Deployments and Logistics

Tethered Platforms

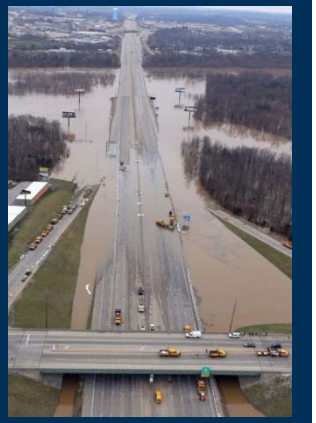


Manned Boat Platforms

USGS

1982-2015 Winter Flood Comparisons

River / Location	1982 Crest (ft)	2015 Crest (ft)	Difference (+)
Meramec Pacific	32.7	33.4	0.7
Meramec Eureka	42.9	46.1	3.2
Meramec Valley Park	39.7	44.1	4.4
Meramec Arnold	43.9 45.3 (‘93)	47.3	3.4 2.0 (‘93)
Bourbeuse Union	33.8	34.3	0.5



Preliminary Gage Statistics

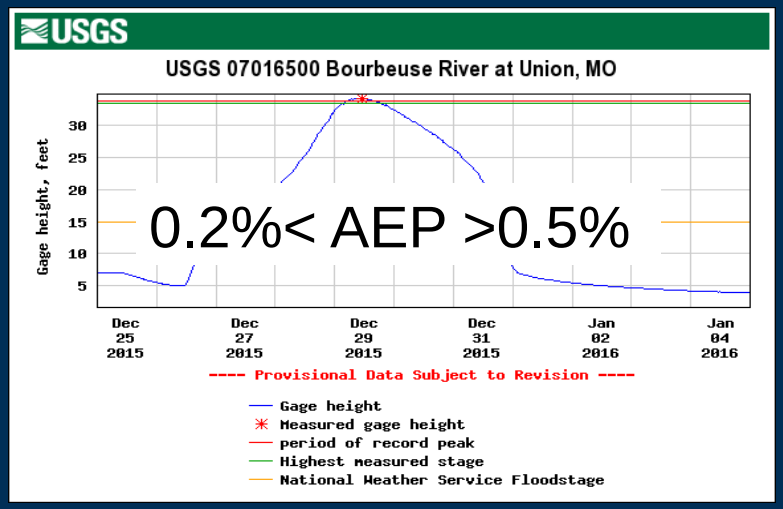
Period of Record Peak Stage/Discharge

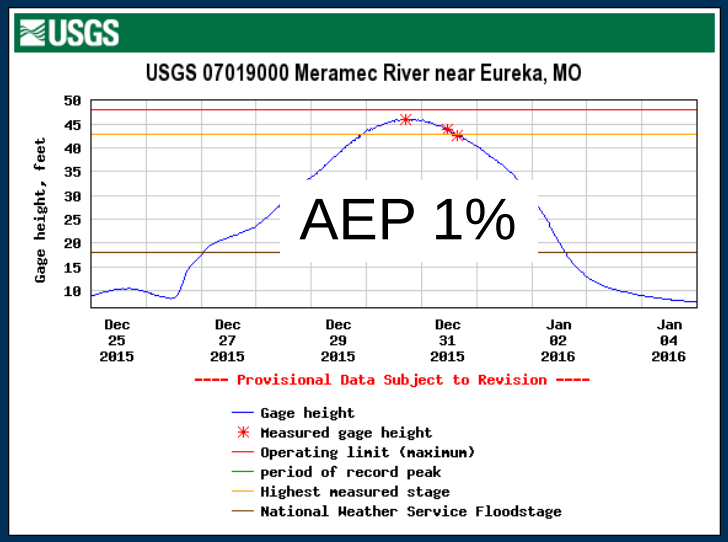
Years of Record	Number of Streamgages
>90	4
20-90	9
10-20	8

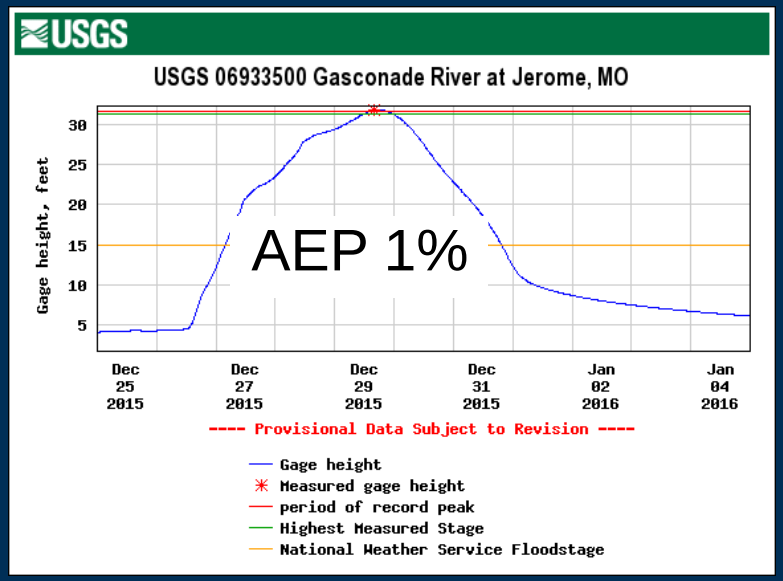
USGS

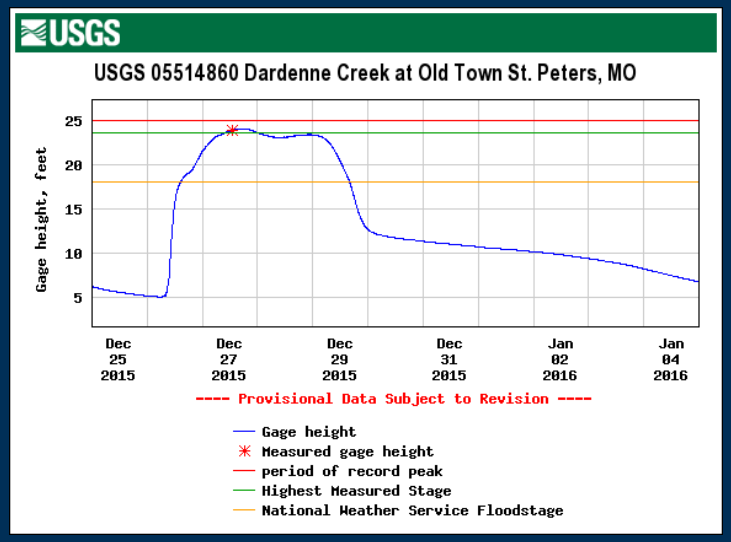
Peak Measurements

..and Annual Exceedance Probabilities (AEP's)



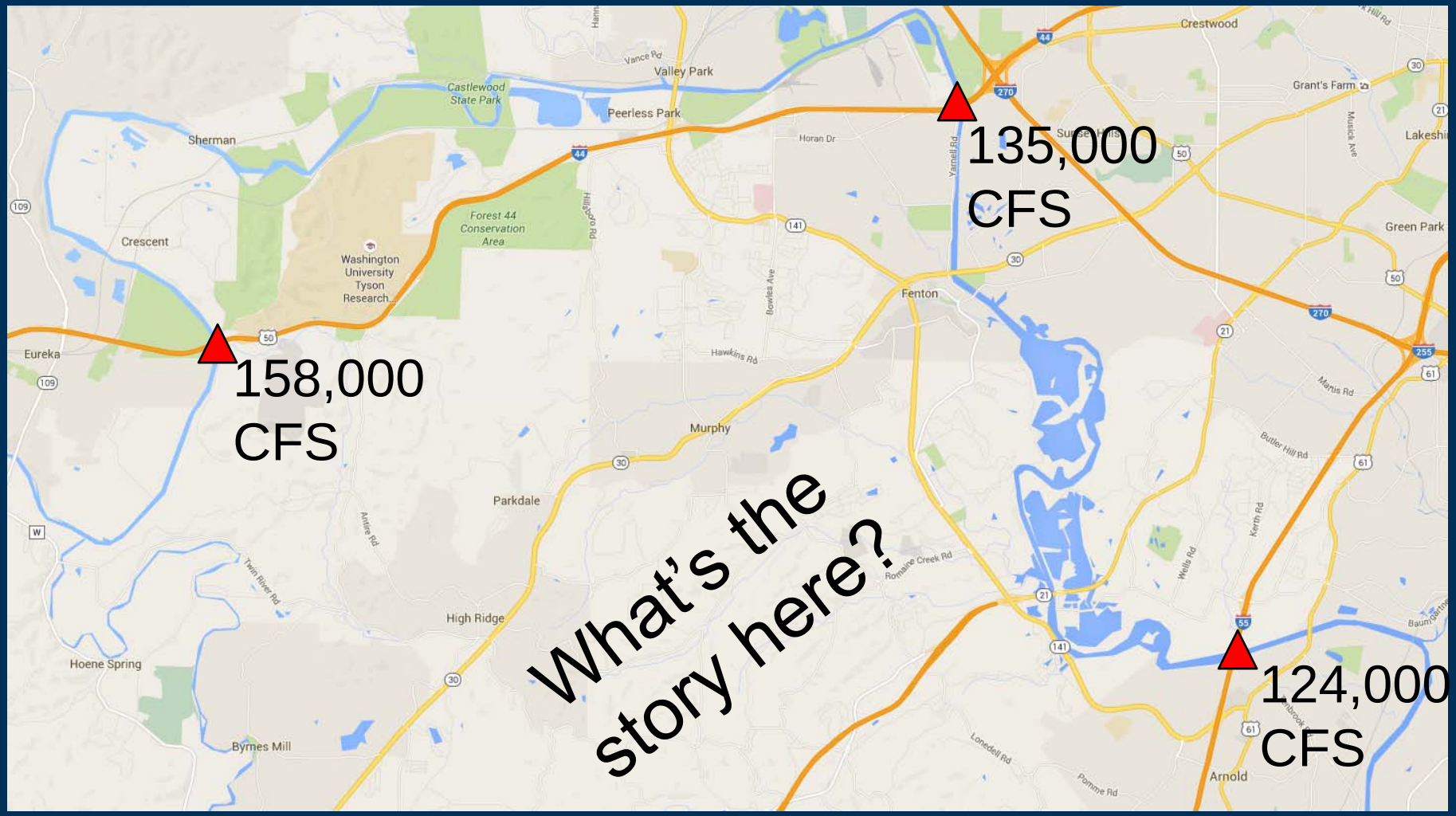






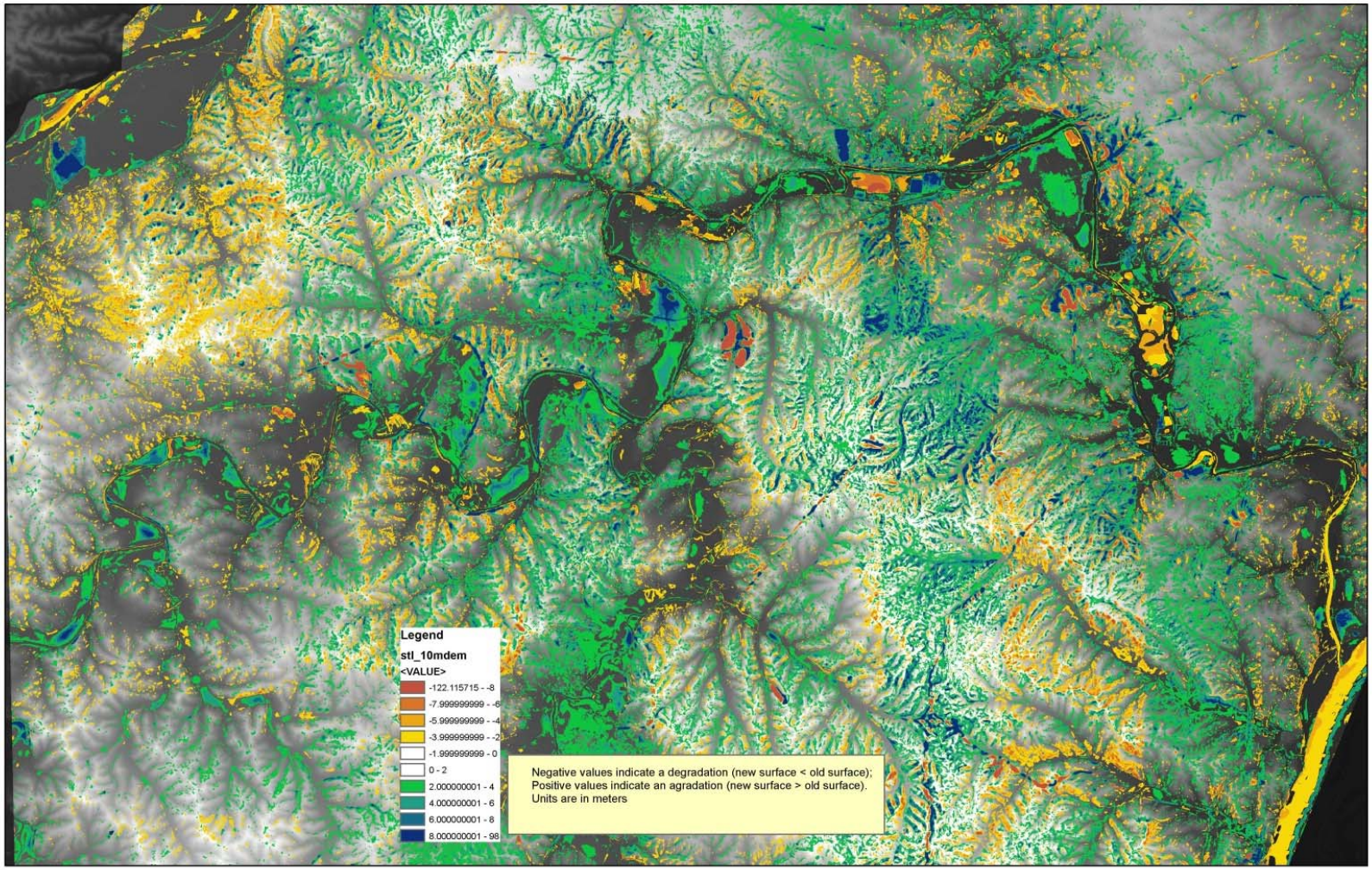
Meramec Flood Peak – December 30, 2015

Storage and Attenuation

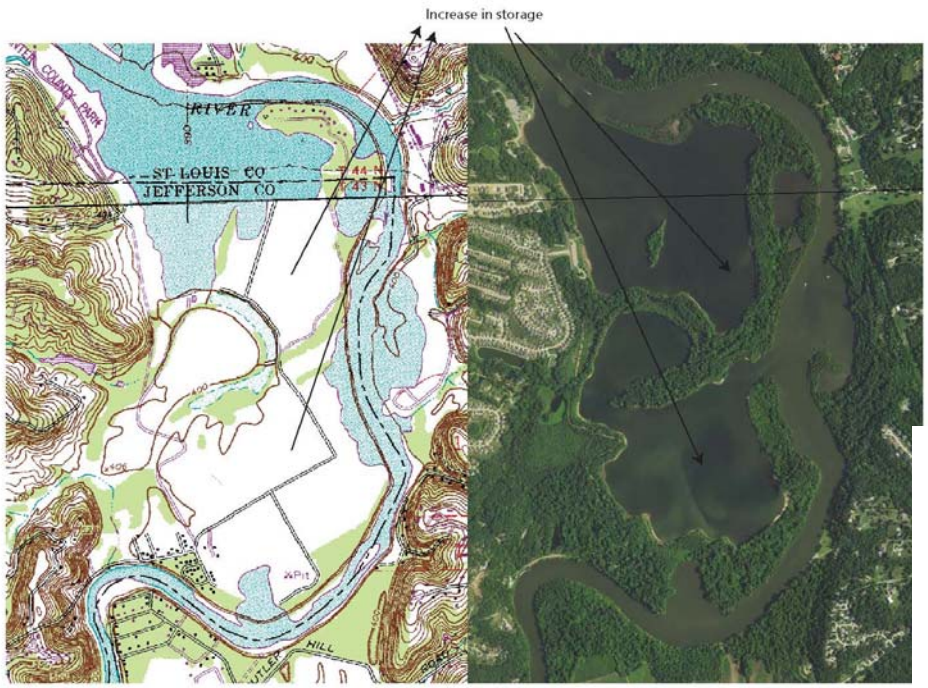


Meramec Valley - Map Differencing

Early 80's Topo/DEM contrasted with modern LiDAR

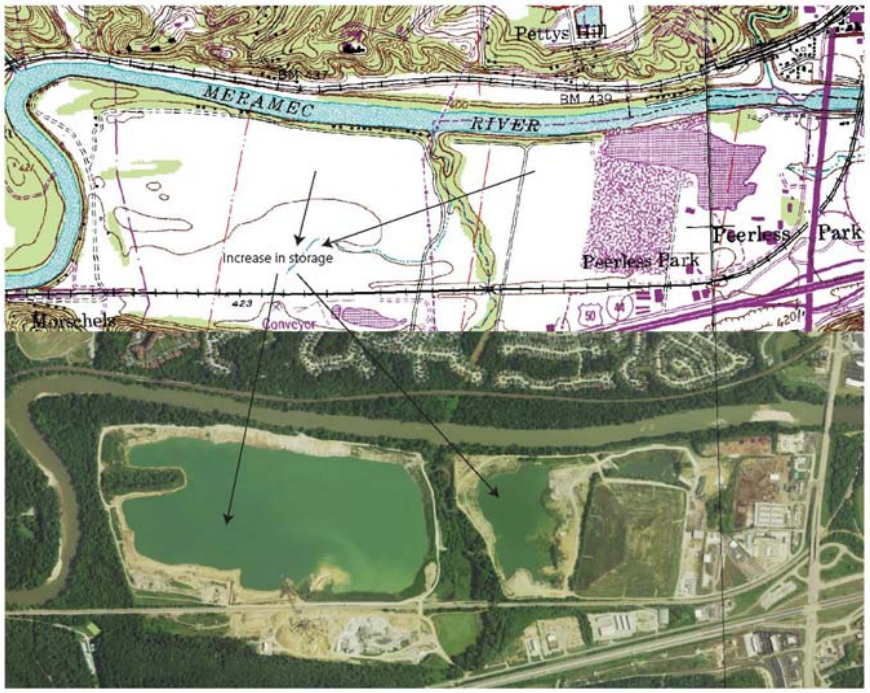


Floodplain Surface Change



George Winter Park

Peerless Park



USGS

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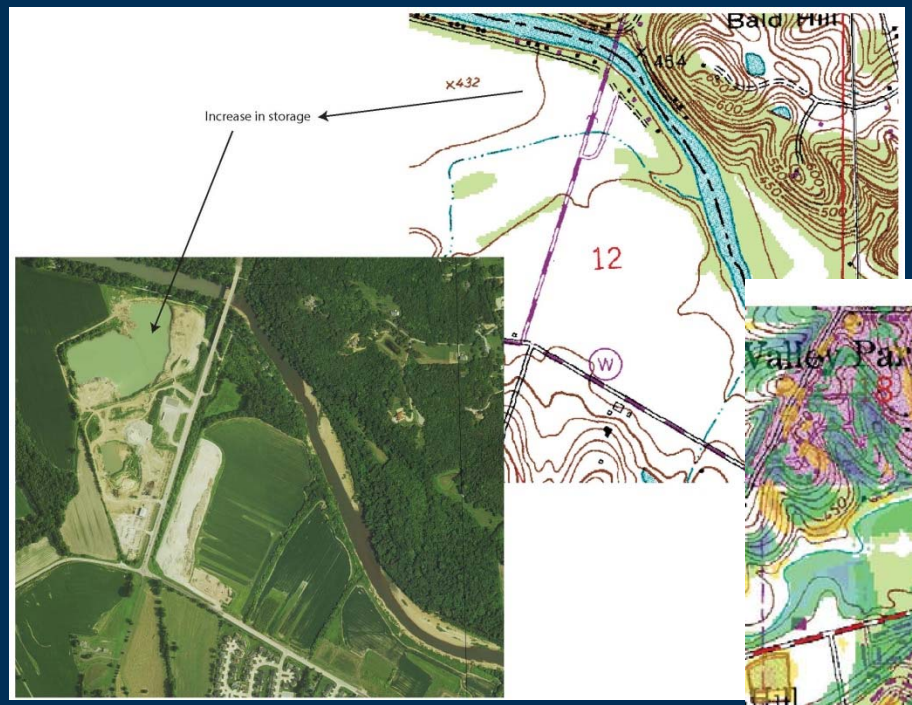
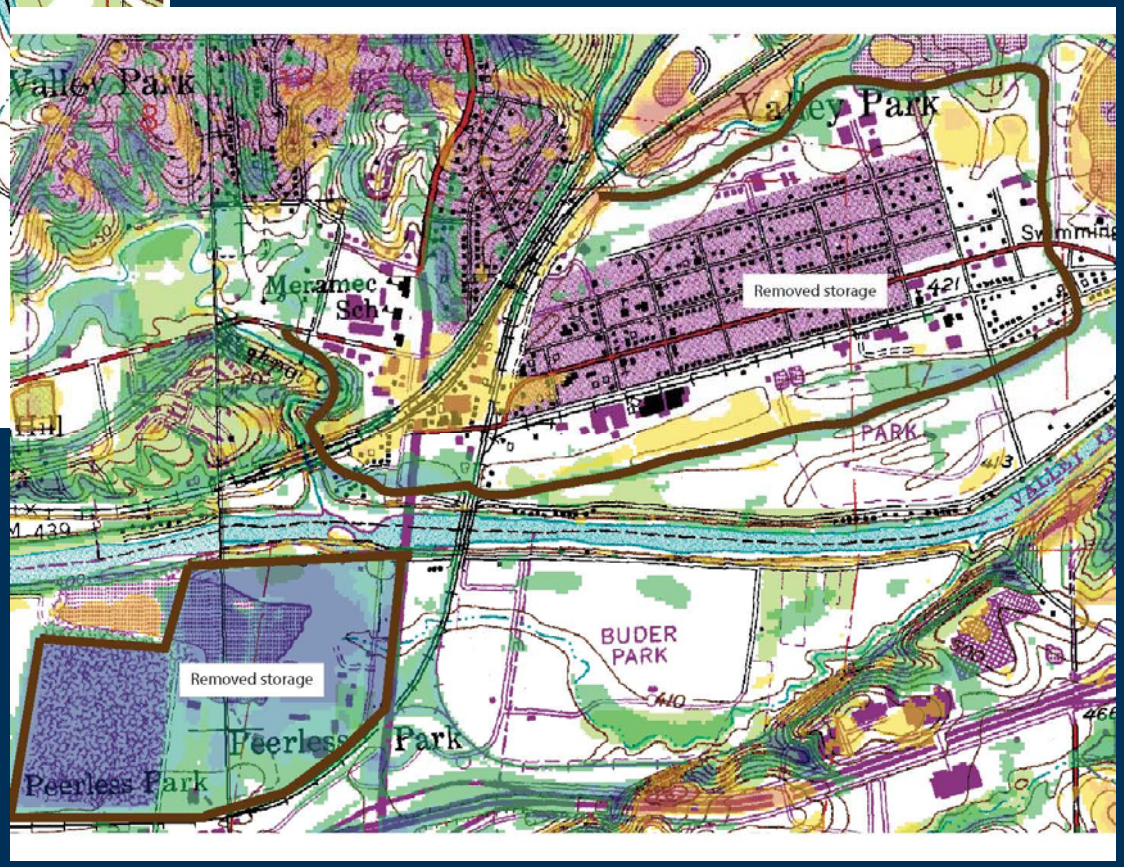


Kirkwood Material Supply

Valley Park / Peerless Landfill



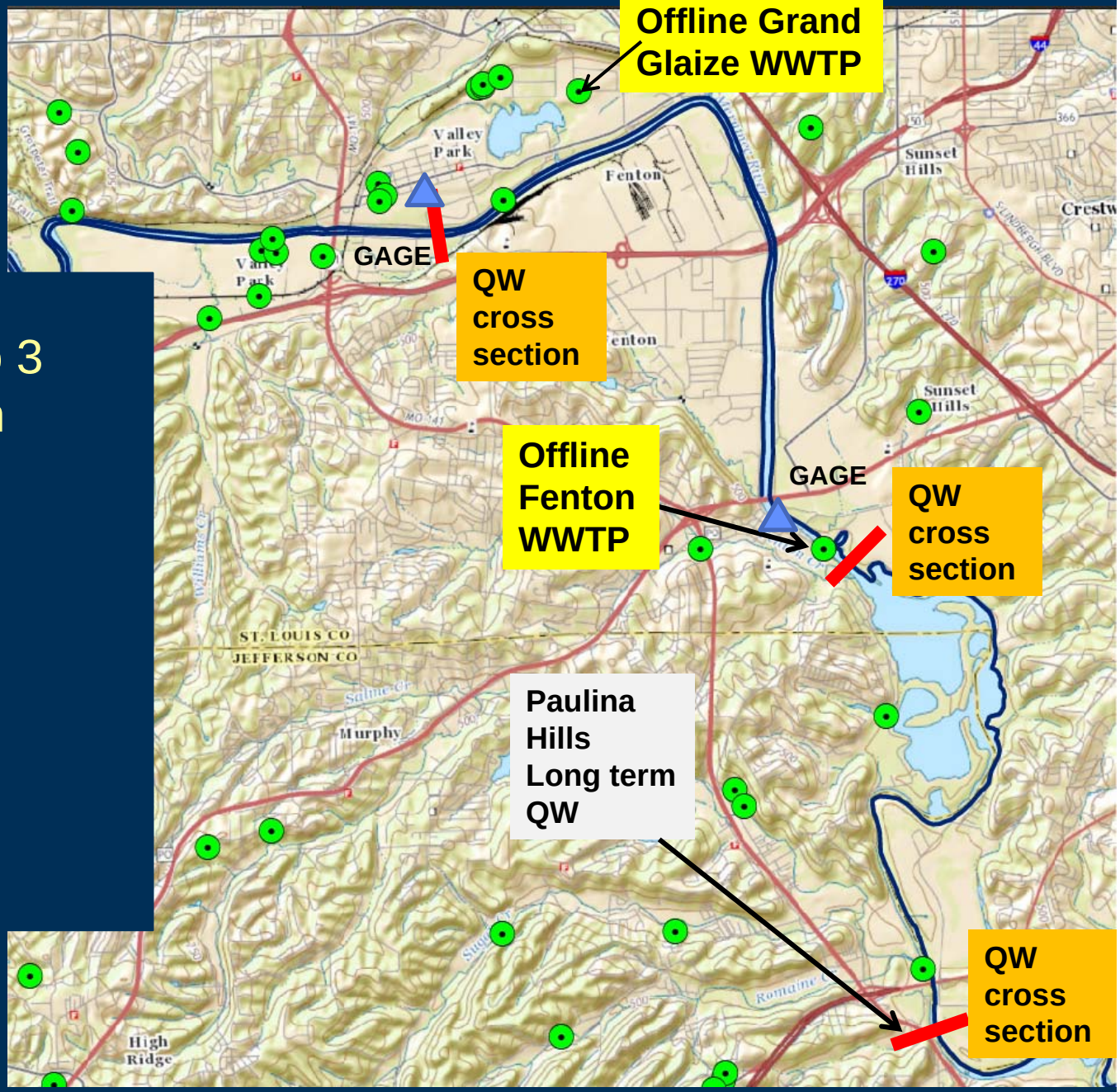
USGS

Water Quality Sampling - Meramec River Flood

Feb, 2016 shifted to 3 sites on lower reach

Cross sections (left, mid, right) at most sites

Green circles are permitted outfalls



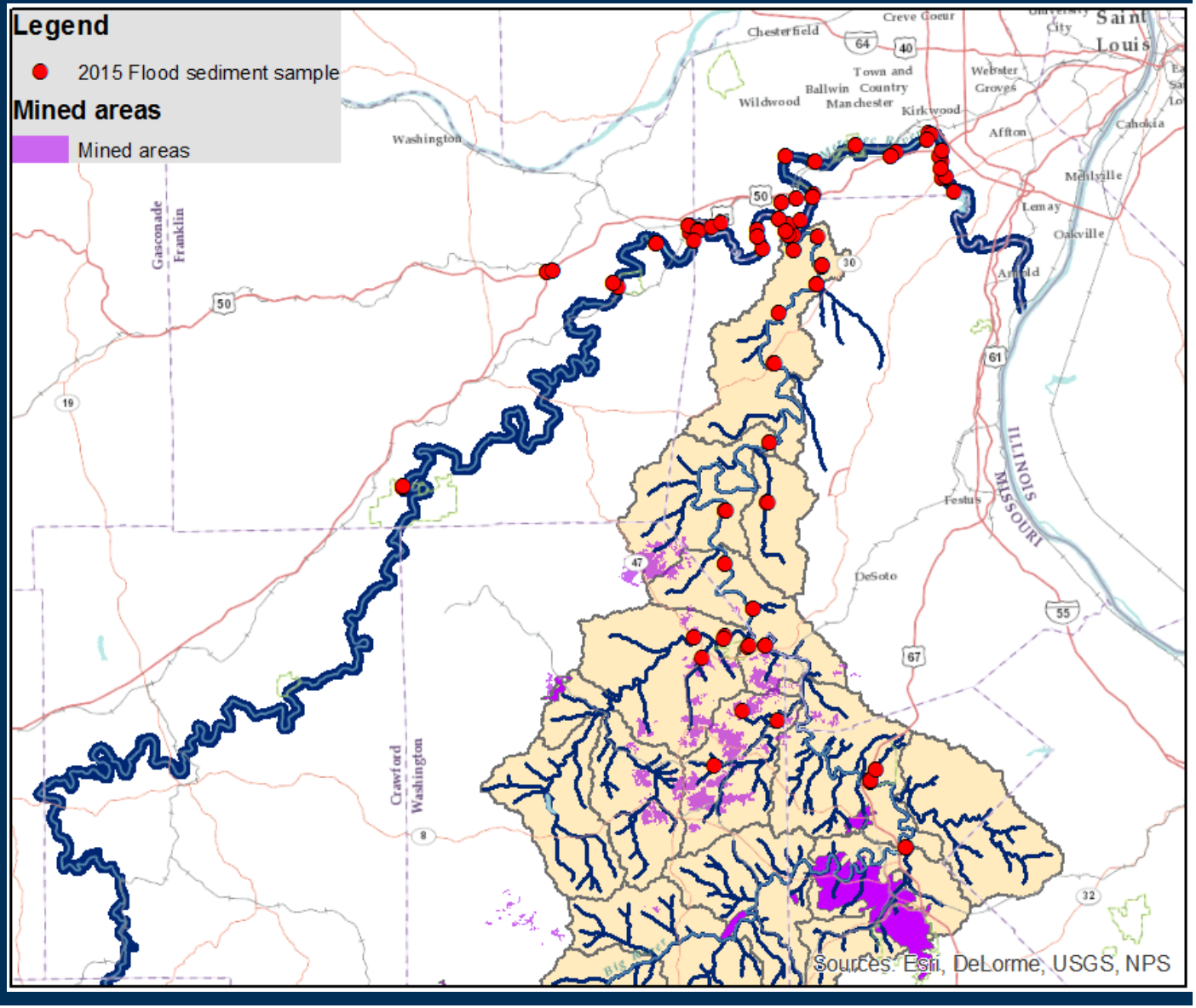
USGS

Meramec River Flood Deposit Sample Collection

- Concern about metals from historic mined areas in Big River
- (Ba, Cd, Pb, Zn)

- - 121 Total Samples
- - 94 Flood sediment
- - 27 underlying soil

- Samples to be analyzed for metals using X-ray fluorescence

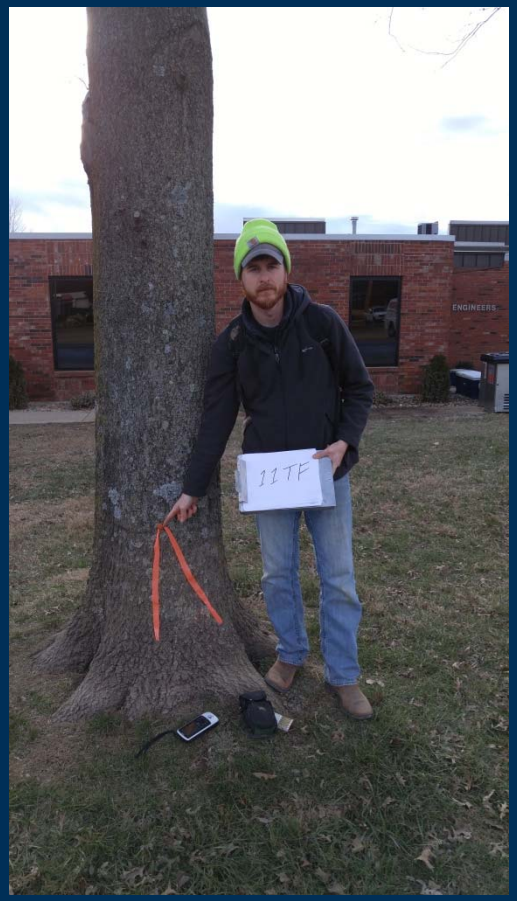


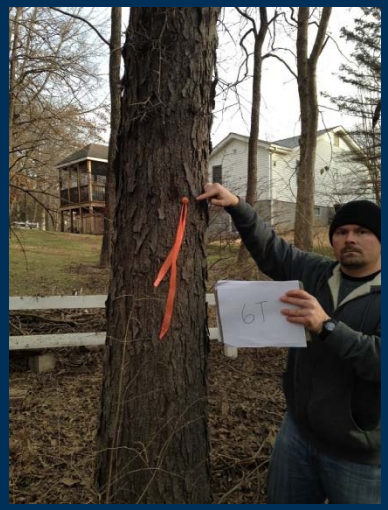
Post Flood Data Collection

What?

Monumentation
- Perishable High-Water Marks
- Flood Extents

Observation and record of flood dynamics





Post-Flood Data Collection

High Water Marks

Pacific

USGS

Post-Flood Data Collection

High Water Marks

Valley
Park - Grand
Glaize WWTP

USGS

Post-Flood Data Collection

High Water Marks

Keyes
Summit

USGS

Post-Flood Data Collection

High Water Marks

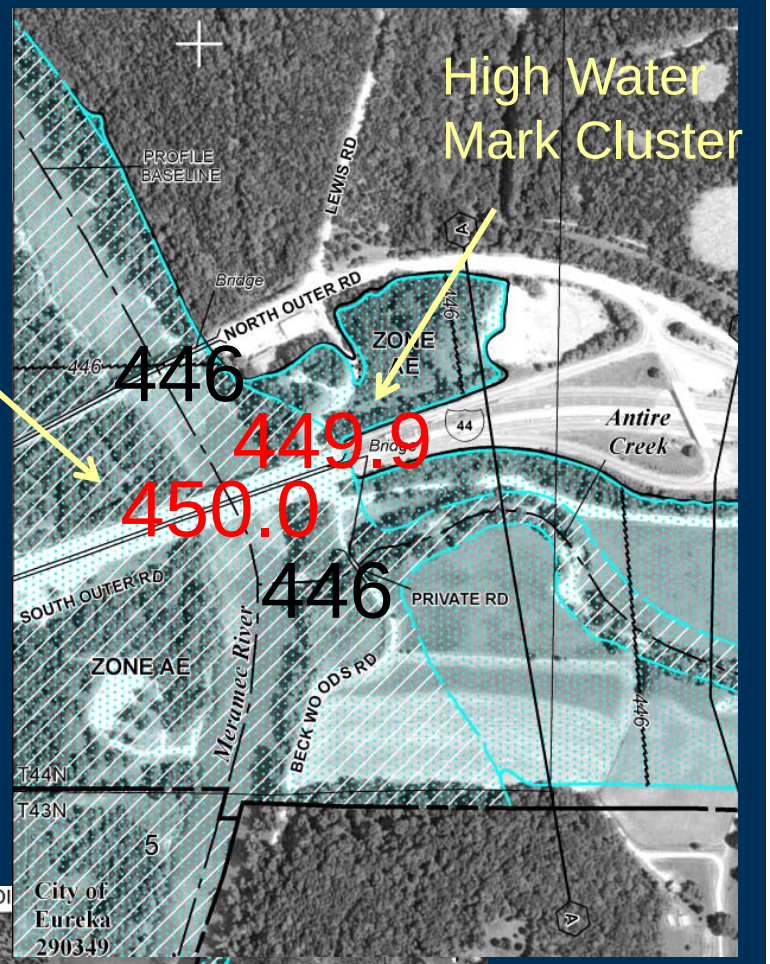
Fenton
WWTP

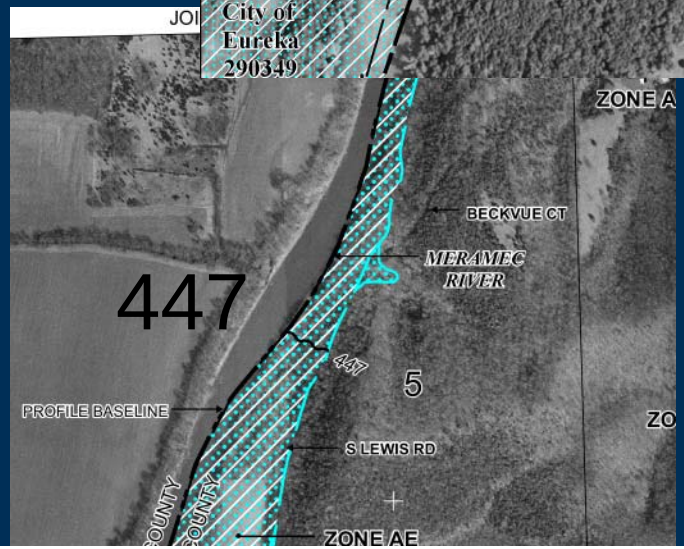
USGS

Post-Flood Data Collection

Base Flood Elevation Corrections?

Areas subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods. Base Flood Elevations (BFEs) are shown. Mandatory flood insurance purchase requirements and floodplain management standards apply.





USGS

Meramec River at Eureka, MO.

Post Flood Data Collection

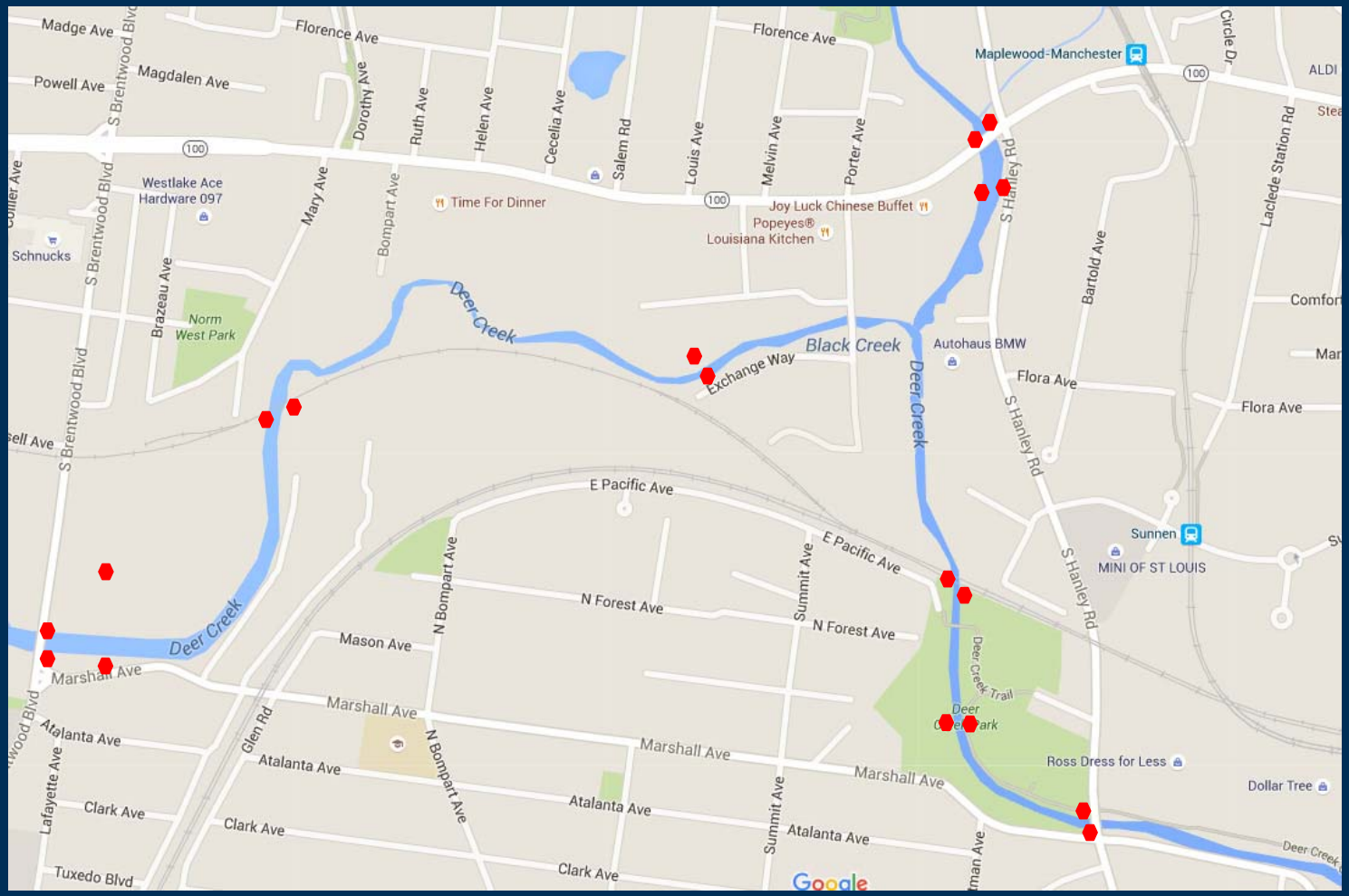
Base Flood Elevation Corrections?

Meramec River at Valley Park, MO

USGS

Post Flood Data Collection

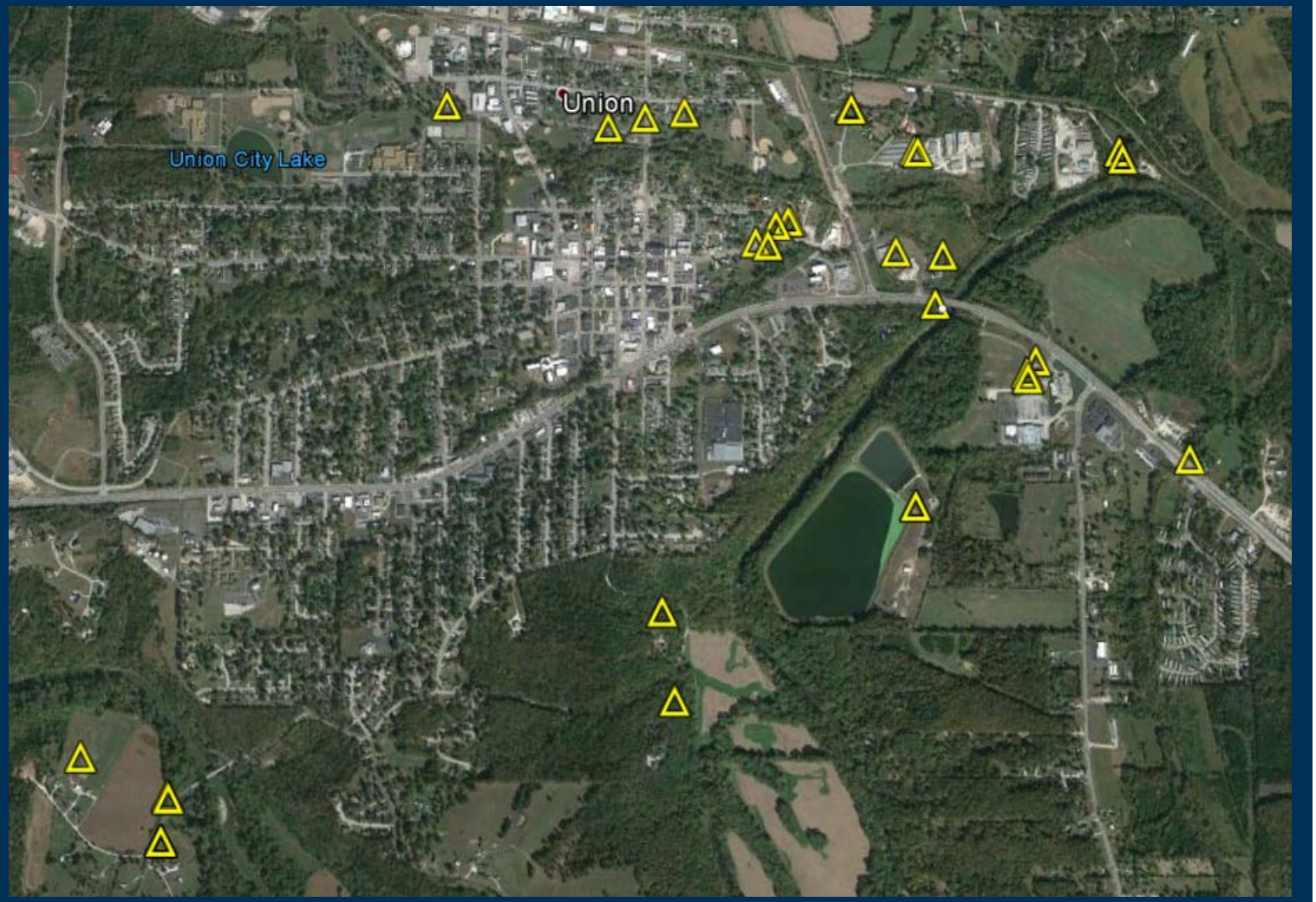
High-Water Marks – Deer / Black Creek



USGS

Post Flood Data Collection

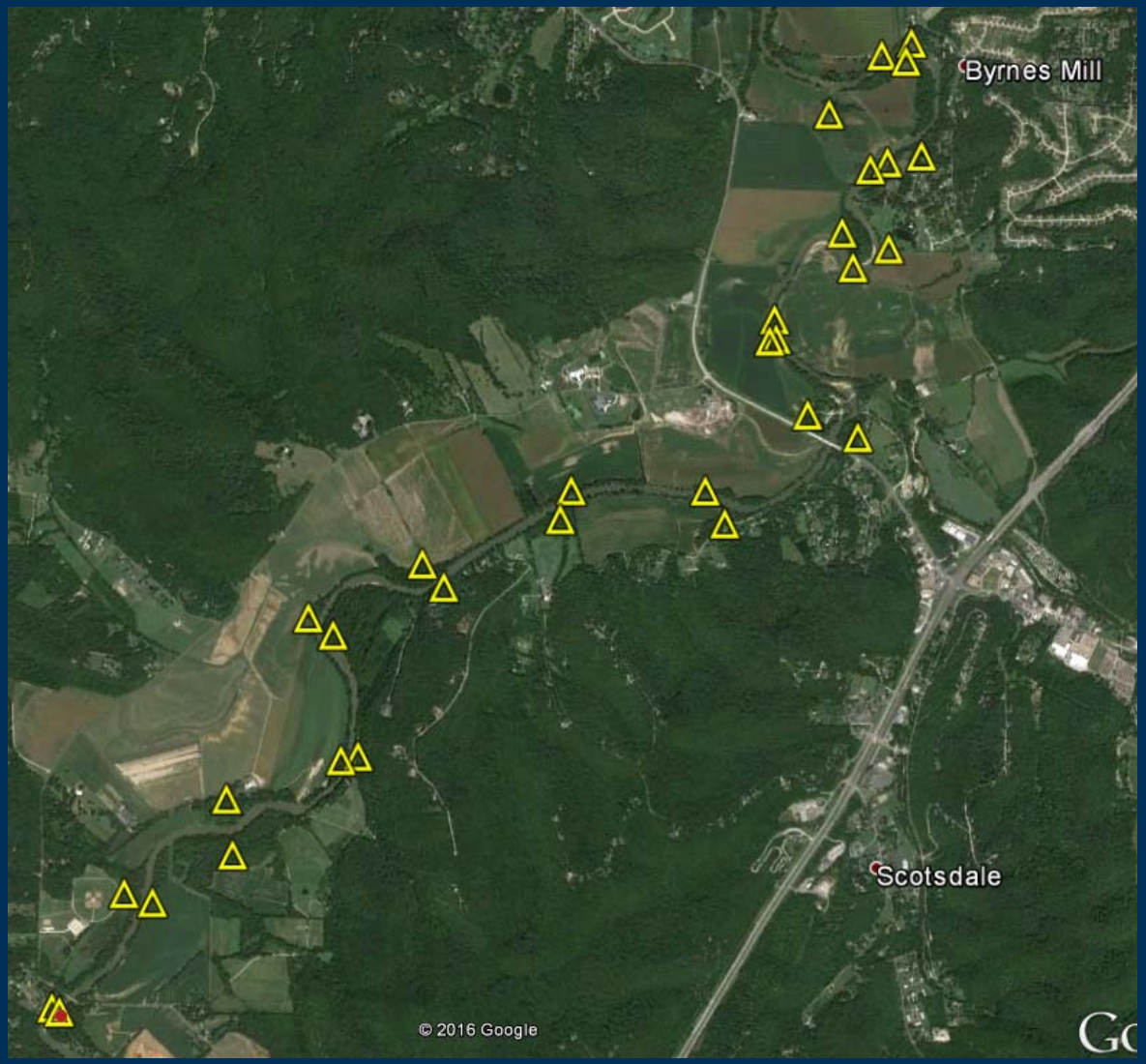
High-Water Marks – Bourbeuse River Union



USGS

Post Flood Data Collection

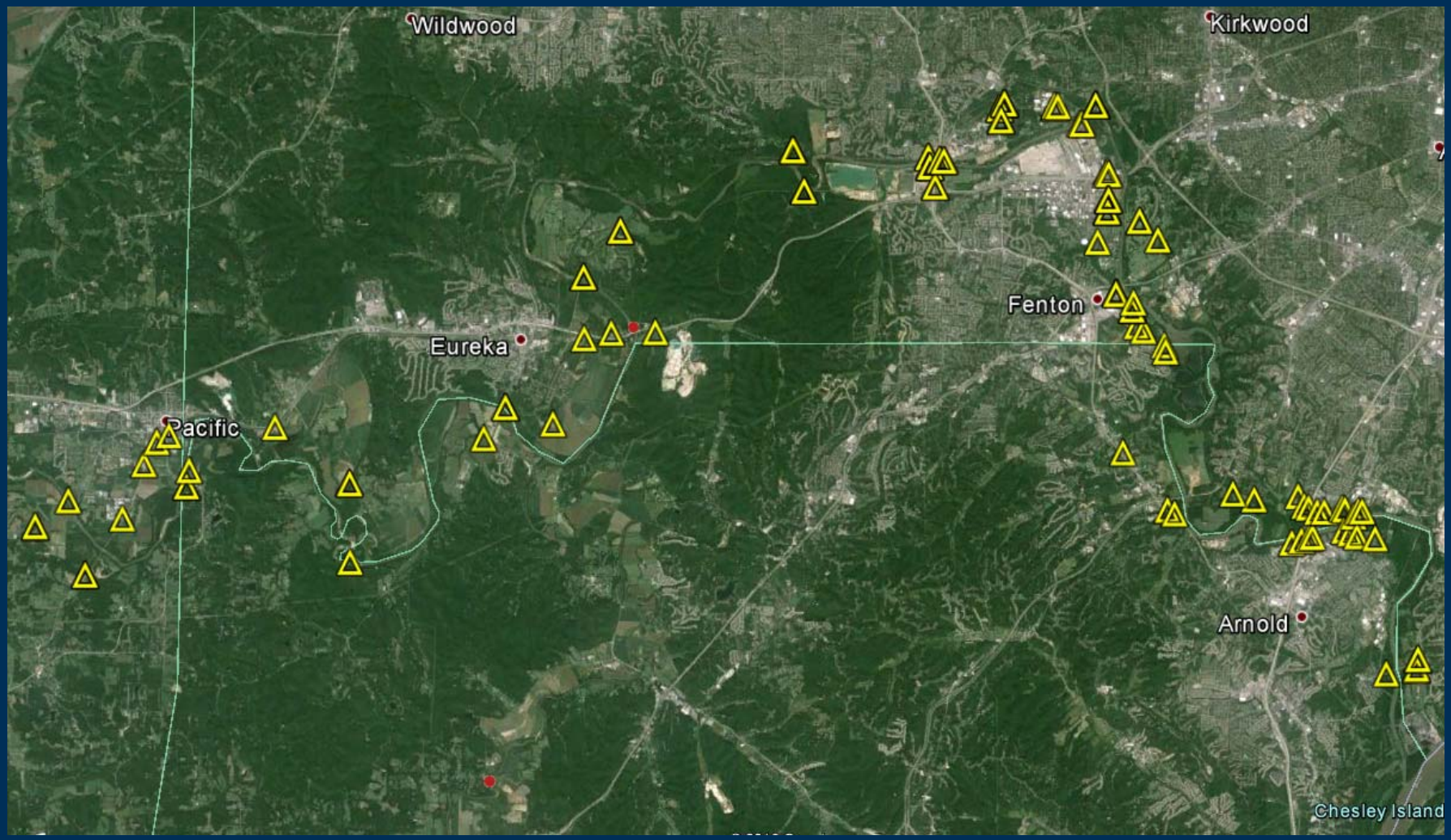
High-Water Marks – Big River Reach



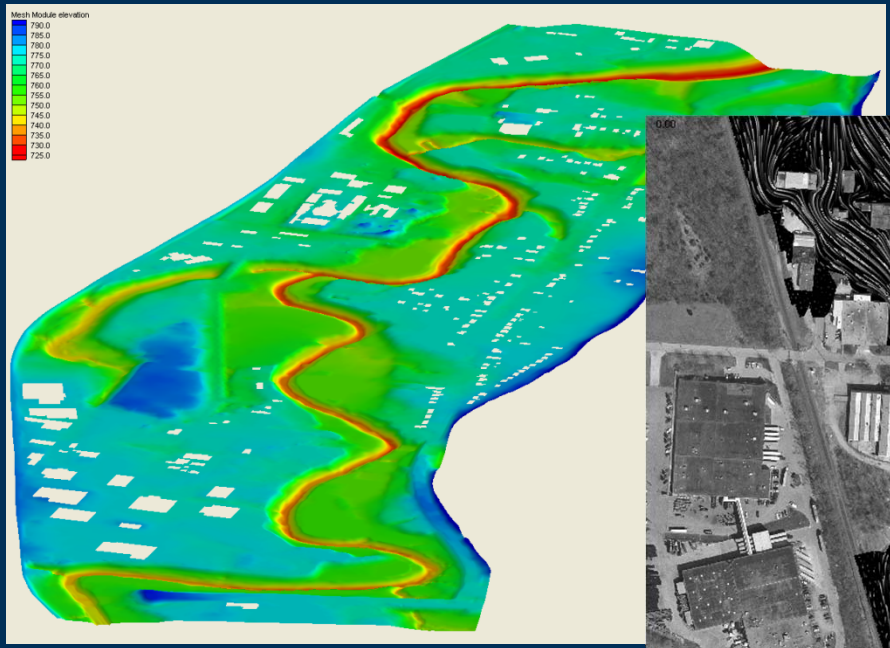
USGS

Post Flood Data Collection

High-Water Marks - Lower Meramec Basin

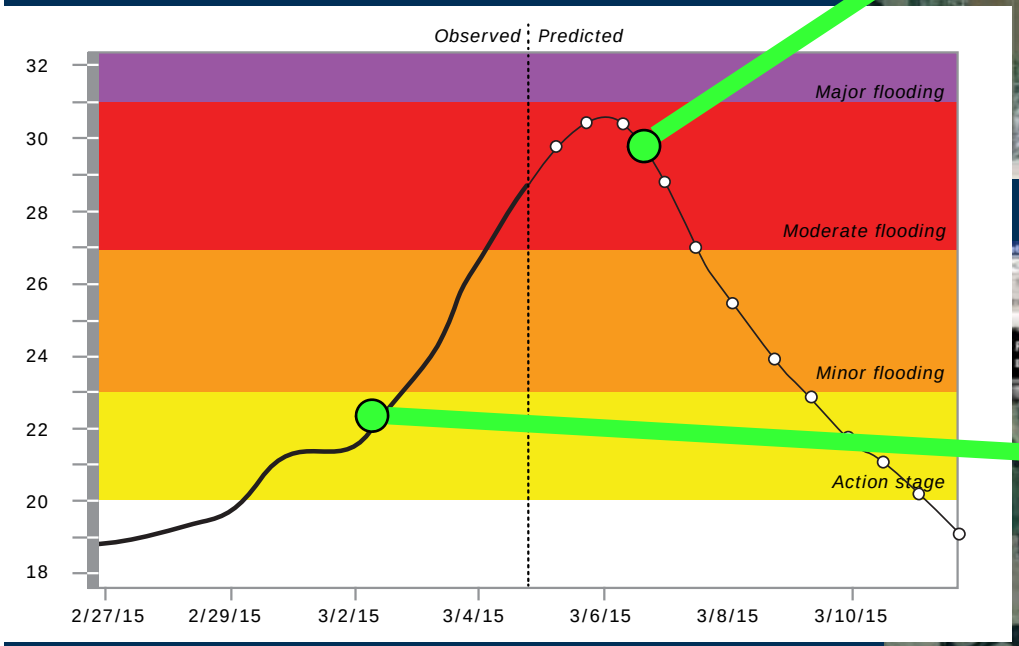


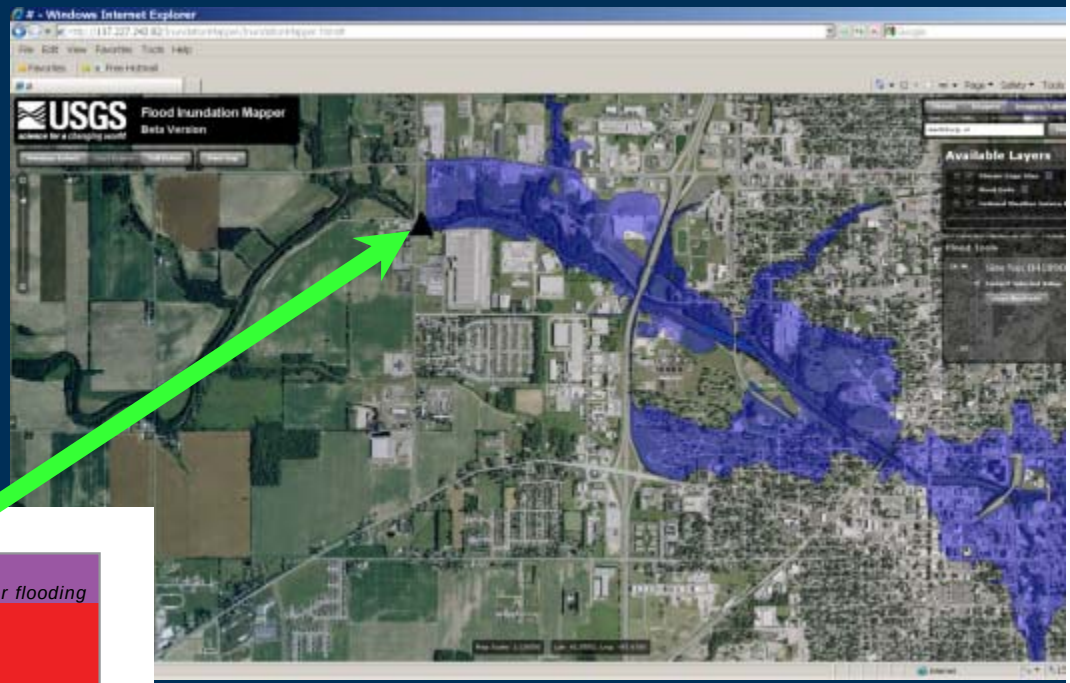
High Water Marks to Hydraulic Modeling

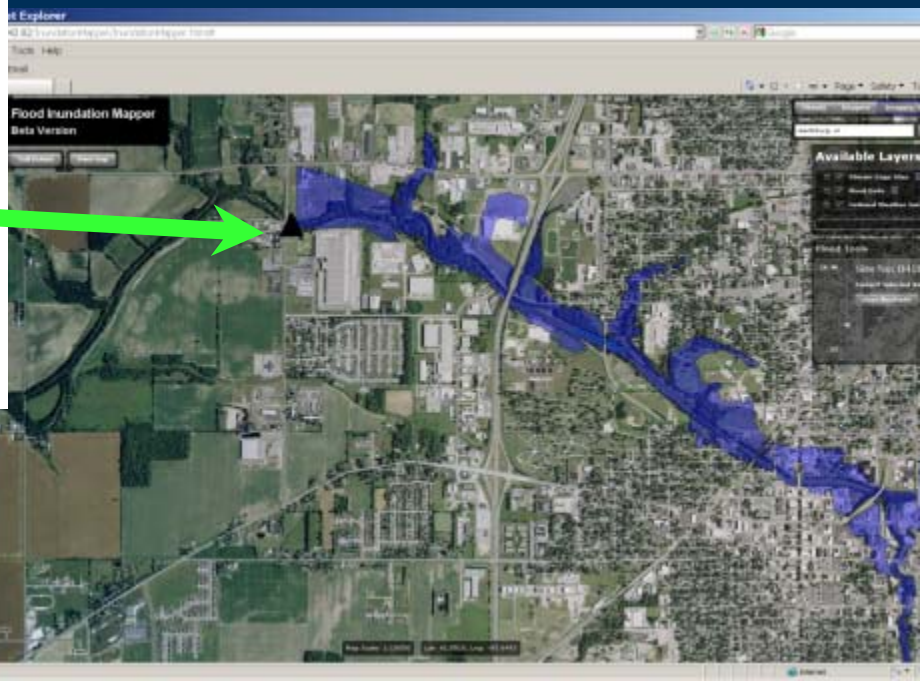


USGS

Flood Inundation Maps translate a hydrograph into operational maps that communicate risk and consequences

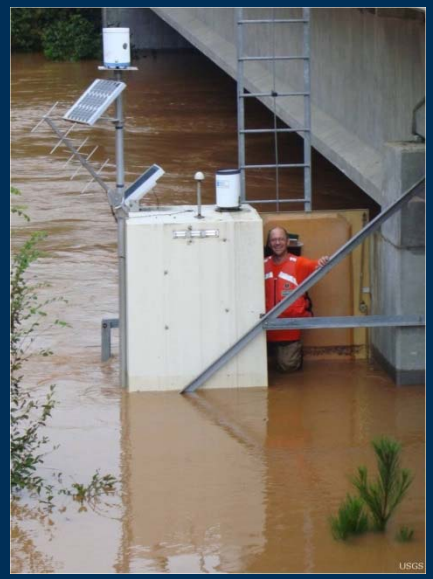






USGS

FIM becomes a tool for flood…

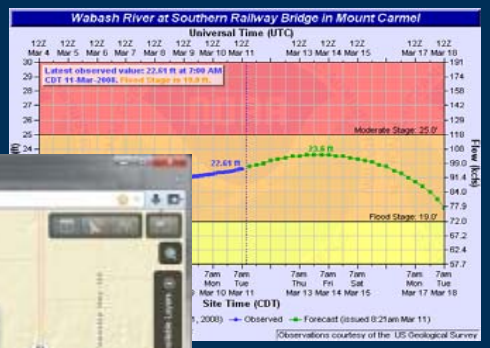


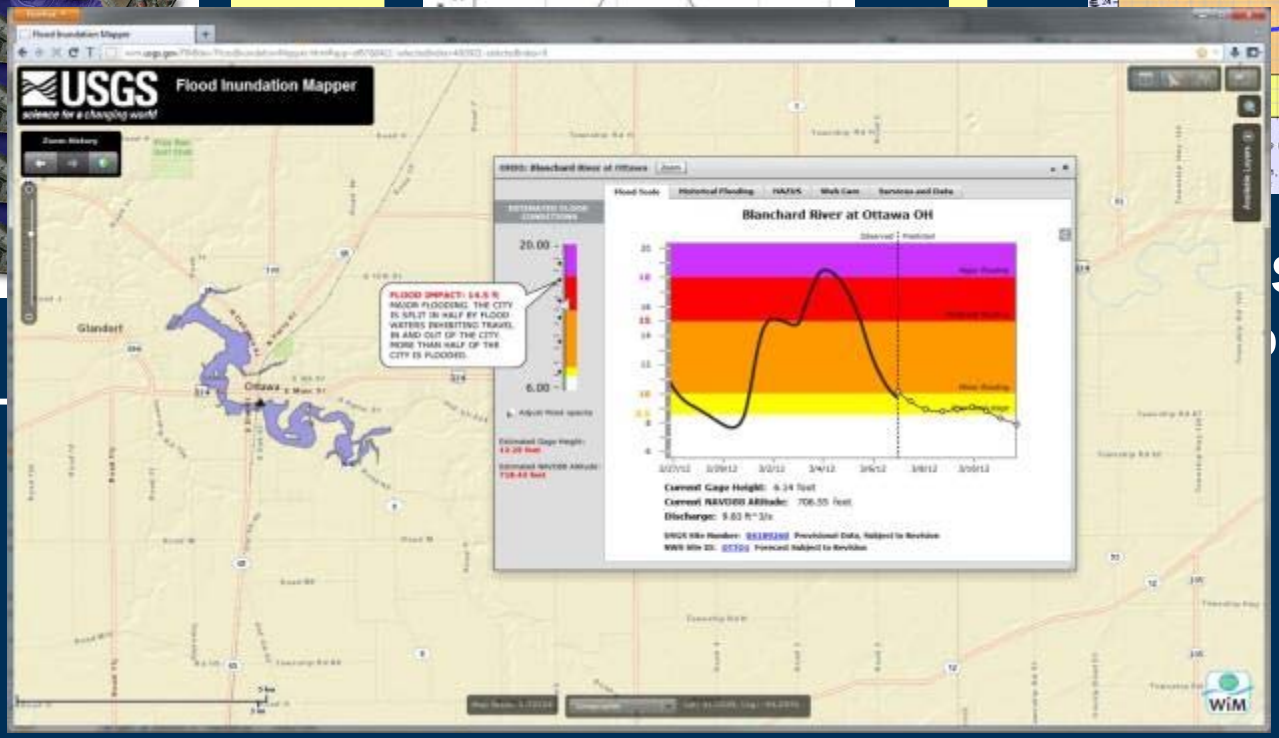
- Preparedness
  - "What-if" scenarios
- Response
  - Tied to gage & forecast data
- Recovery
  - Damage assessment

- Mitigation & planning
  - Flood risk analyses
- Environmental & ecological assessments

USGS

FIM Mapper – more than just maps





Flood L

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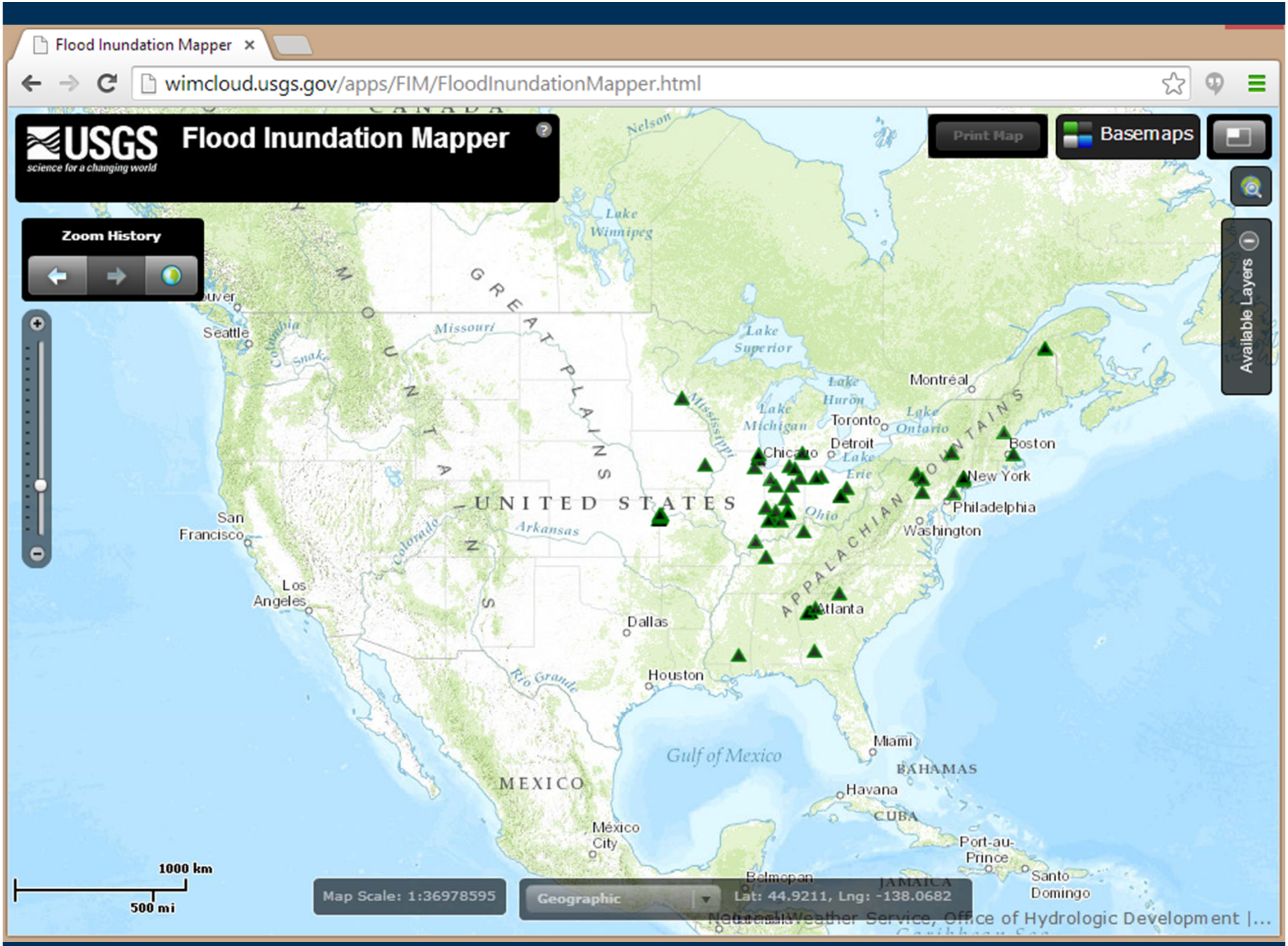
USGS

http://water.usgs.gov/osw/flood_inundation/


Flood Inundation Mapper
wimcloud.usgs.gov/apps/FIM/FloodInundationMapper.html
USGS
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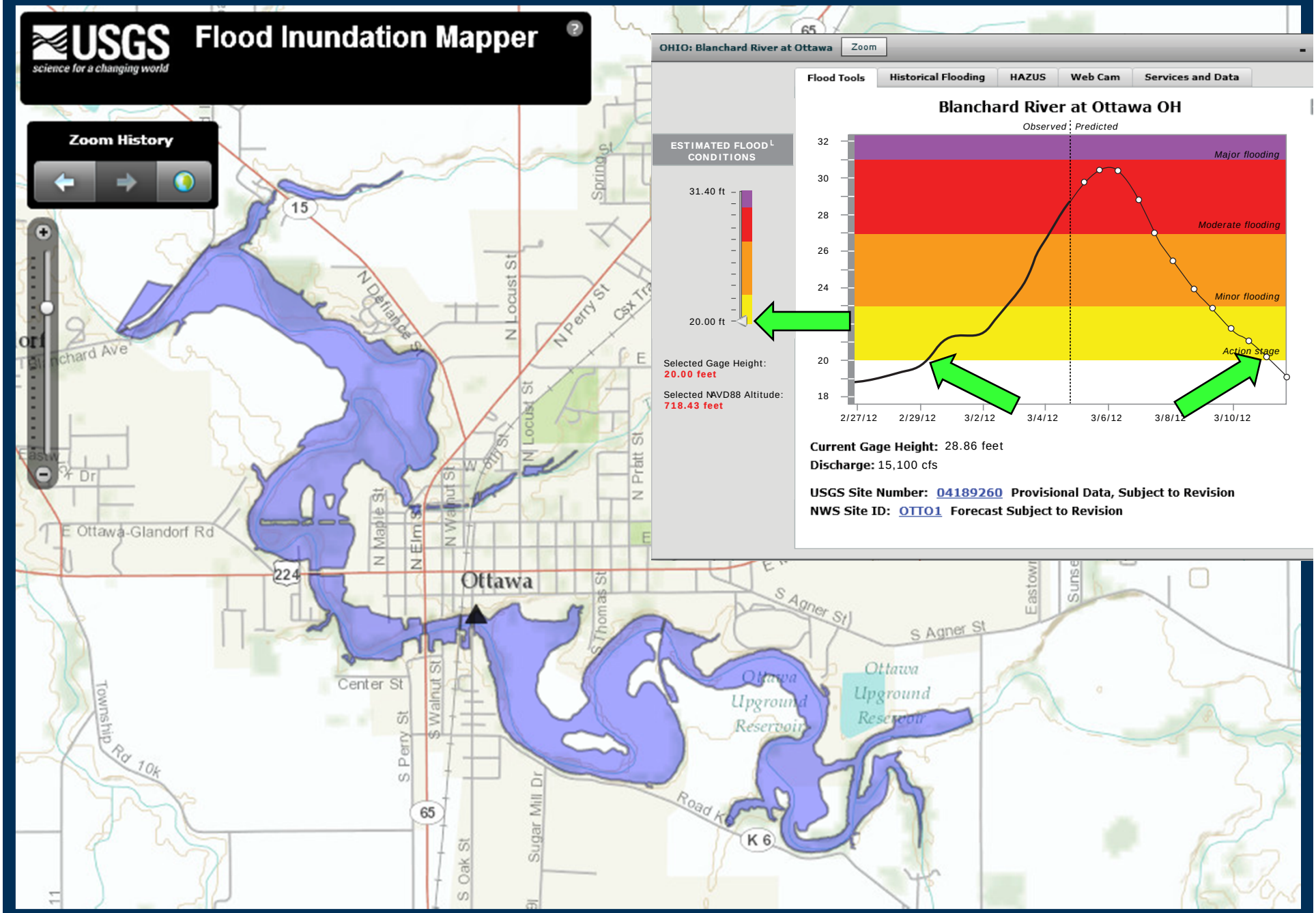
Flood Inundation Mapper
Print Map
Basemaps
Zoom History
Available Layers
Seattle
San Francisco
Los Angeles
Dallas
Houston
Chicago
Detroit
Toronto
Montréal
Boston
New York
Philadelphia
Washington
Atlanta
Miami
Havana
Port-au-Prince
Santo Domingo
México City
Belmopan
Lake Winnipeg
Lake Superior
Lake Huron
Lake Michigan
Lake Ontario
Lake Erie
Gulf of Mexico
UNITED STATES
MEXICO
BAHAMAS
CUBA
JAMAICA
GREAT PLAINS
ROCKY MOUNTAINS
APPALACHIAN MOUNTAINS
Missouri
Mississippi
Ohio
Arkansas
Colorado
Rio Grande
Columbia
Snake
Nelson
1000 km
500 mi
Map Scale: 1:36978595
Geographic
Lat: 44.9211, Lng: -138.0682
National Weather Service, Office of Hydrologic Development |...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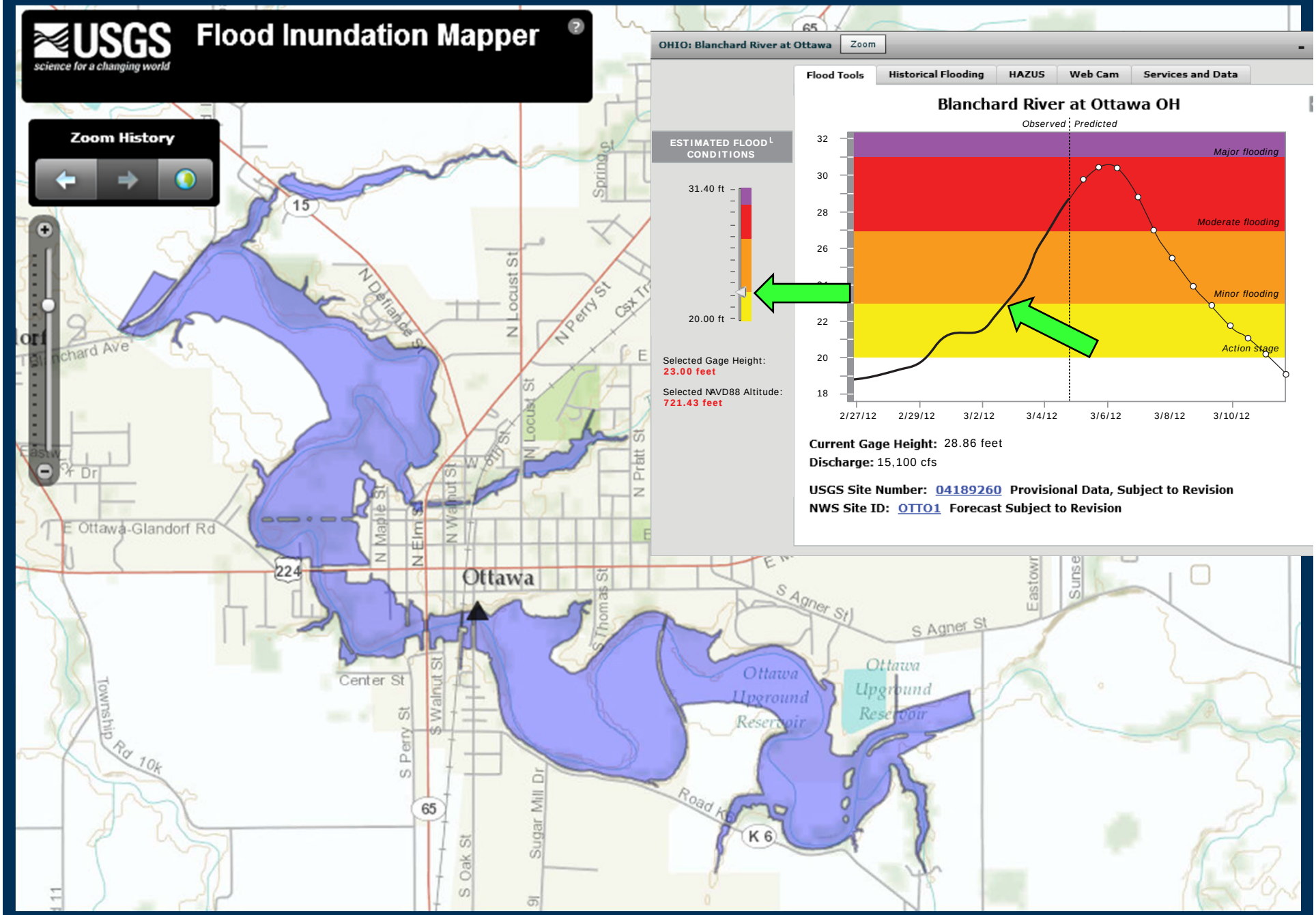
Flood Inundation Mapper
Zoom History
OHIO: Blanchard River at Ottawa
Zoom
Flood Tools
Historical Flooding
HAZUS
Web Cam
Services and Data
Blanchard River at Ottawa OH
Observed
Predicted
Major flooding
Moderate flooding
Minor flooding
Action stage
32
30
28
26
24
20
18
2/27/12
2/29/12
3/2/12
3/4/12
3/6/12
3/8/12
3/10/12
ESTIMATED FLOOD CONDITIONS
31.40 ft
20.00 ft
Selected Gage Height:
20.00 feet
Selected NAVD88 Altitude:
718.43 feet
Current Gage Height: 28.86 feet
Discharge: 15,100 cfs
USGS Site Number: 04189260 Provisional Data, Subject to Revision
NWS Site ID: OTTO1 Forecast Subject to Revision
Ottawa
E Ottawa-Glandorf Rd
Center St
S Agner St
Ottawa Upground Reservoir
Road K6
K 6
65
224
15
N Locust St
N Perry St
N Maple St
N Elm St
N Walnut St
N Pratt St
S Thomas St
S Perry St
S Walnut St
S Oak St
Sugar Mill Dr
Township Rd 10k
Eastown
Sunset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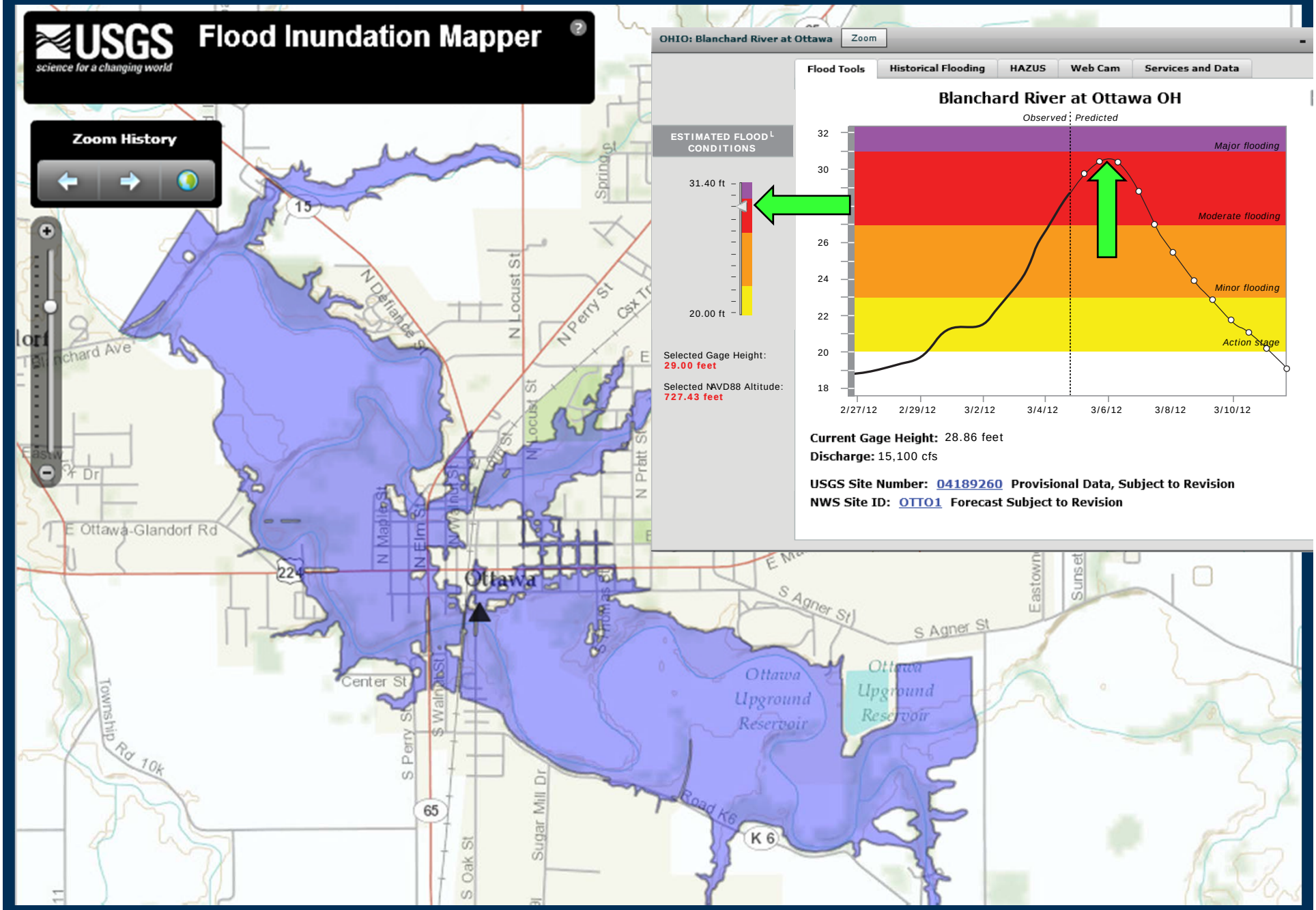
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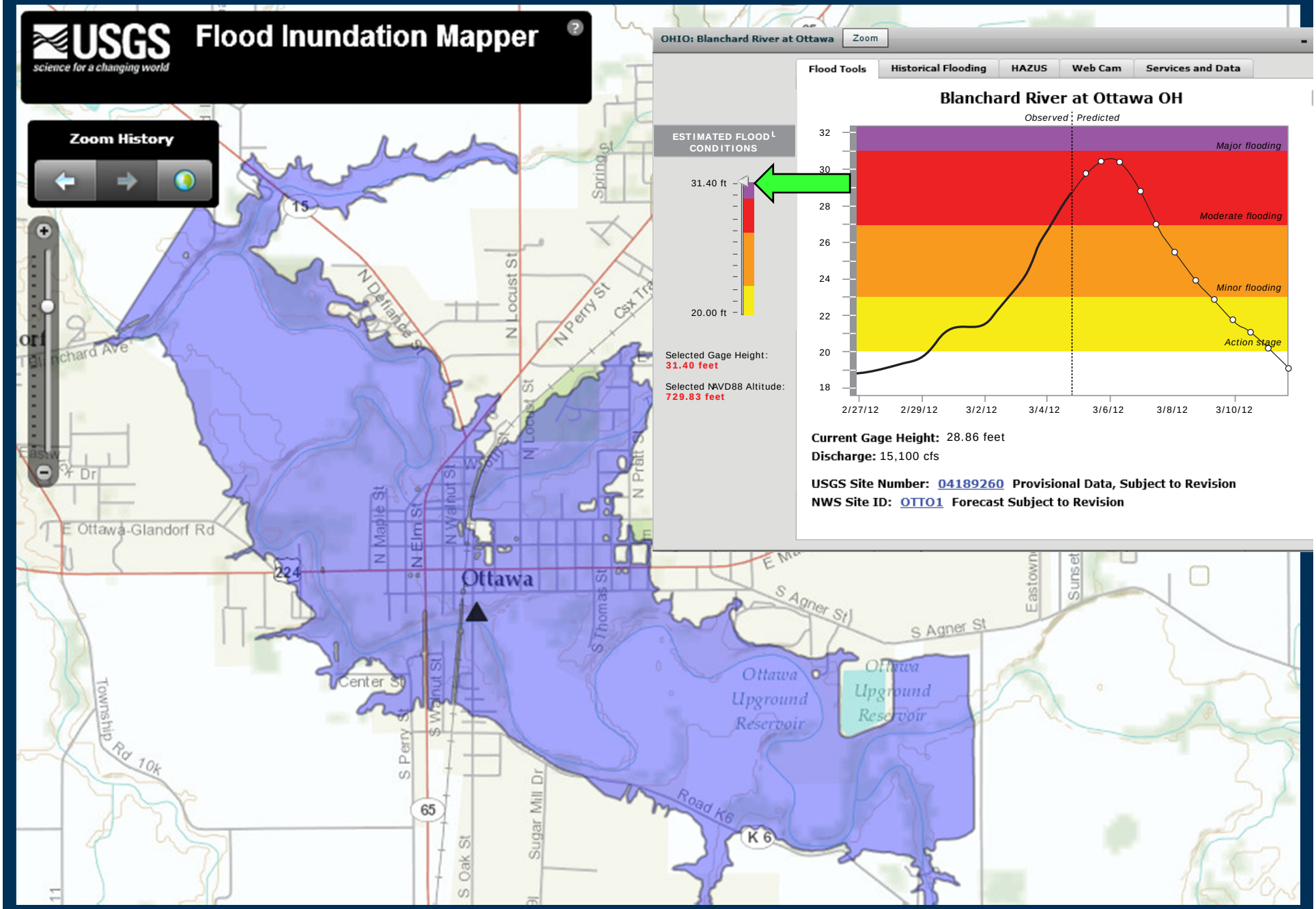
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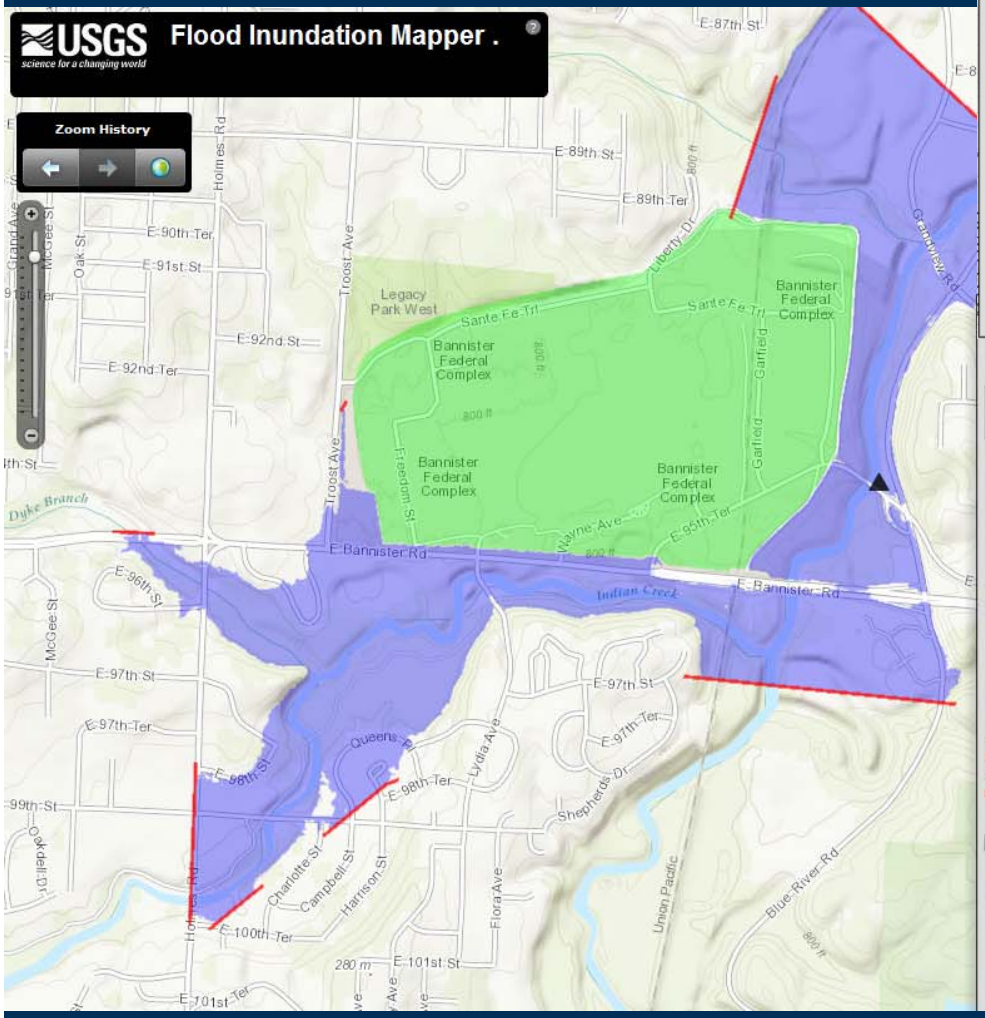
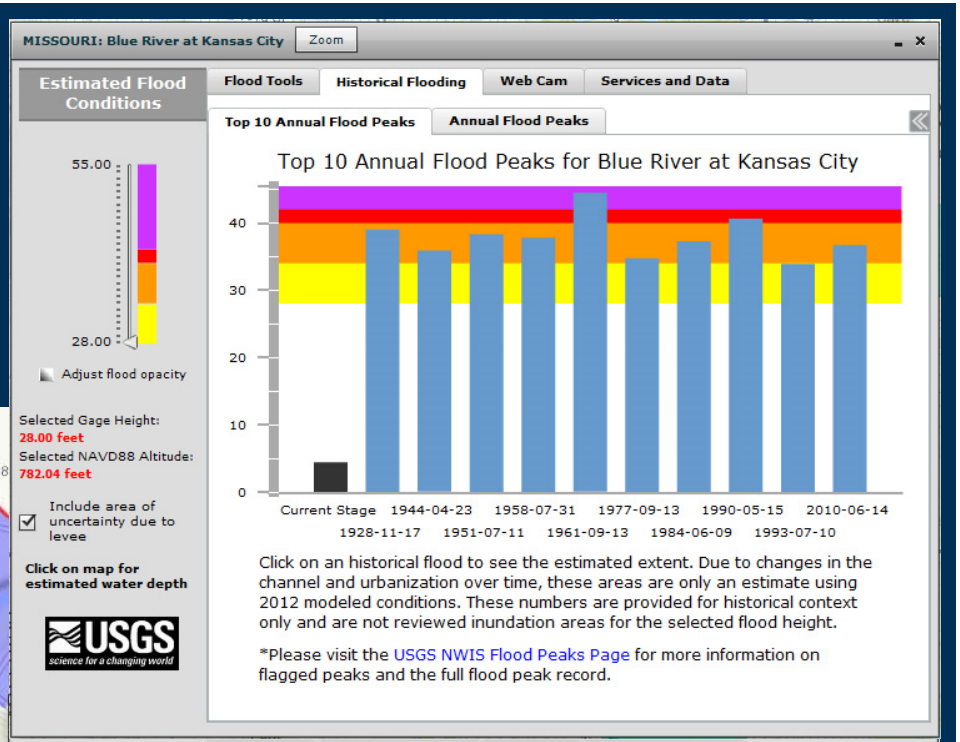
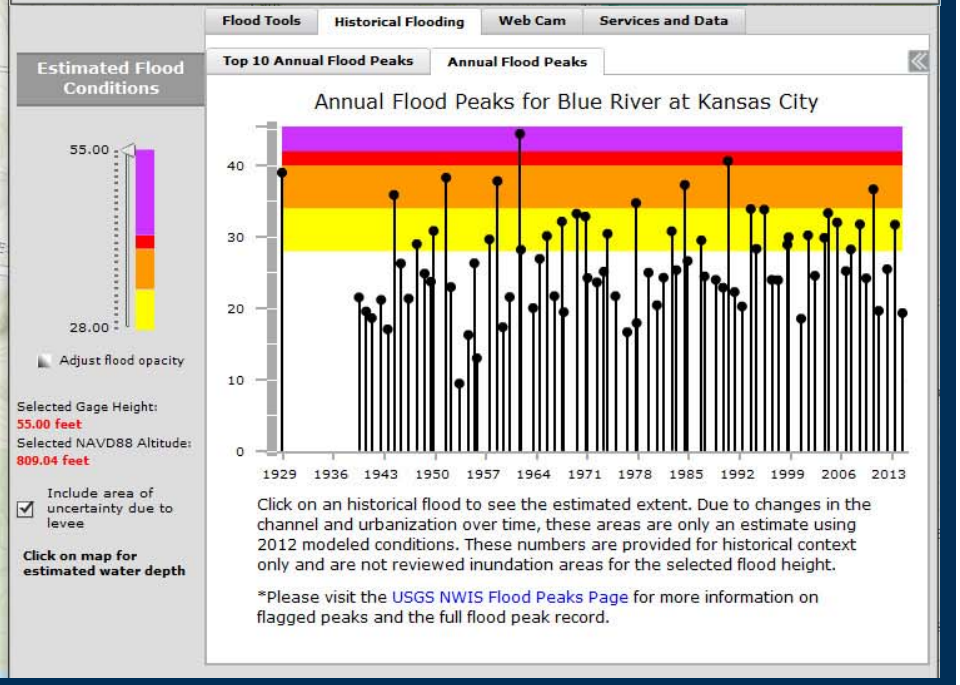
Blue River, Kansas City, Missouri - *Historical Flooding*

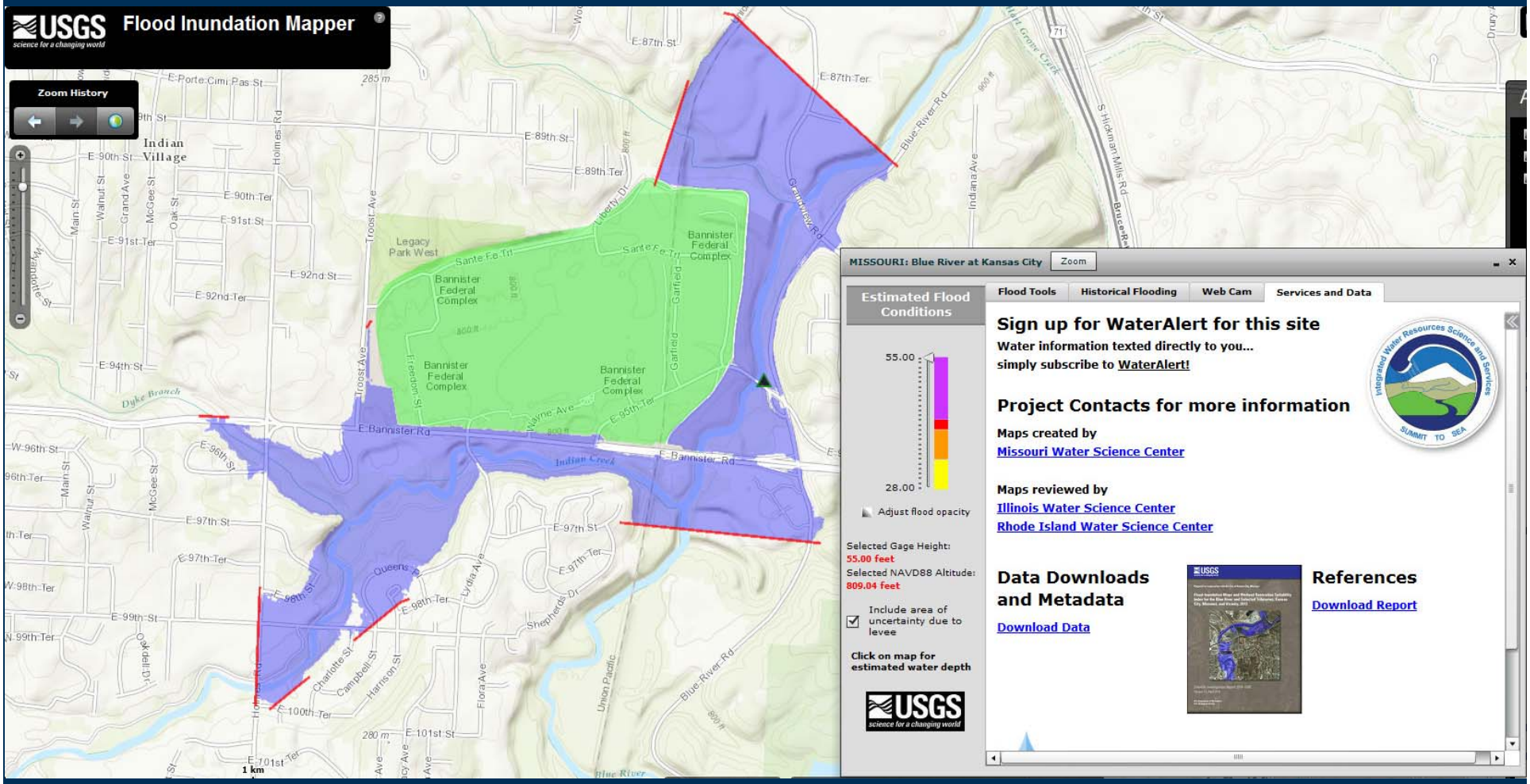






Blue River, Kansas City, Missouri

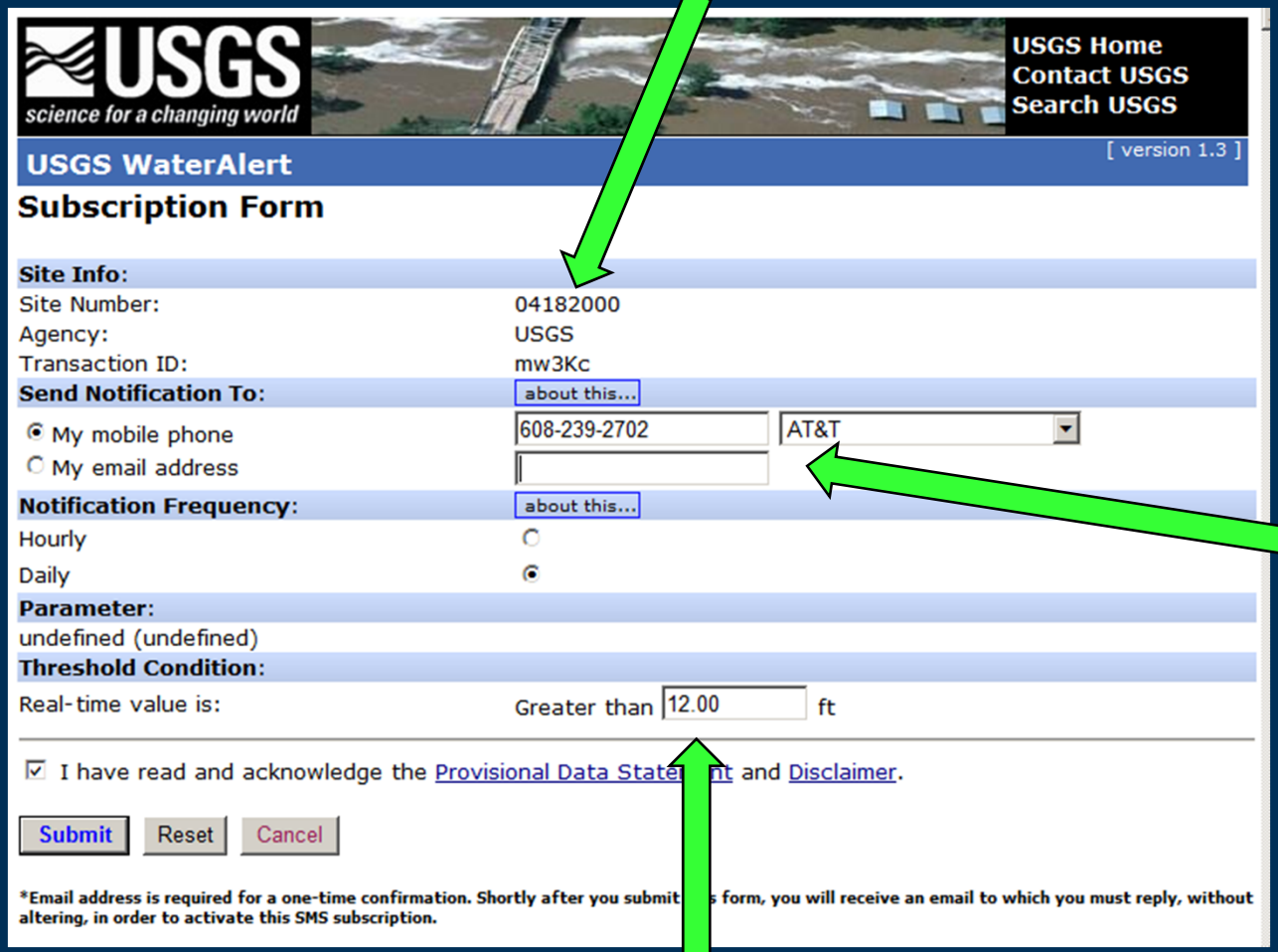
Services and Data – Water Alert….



USGS

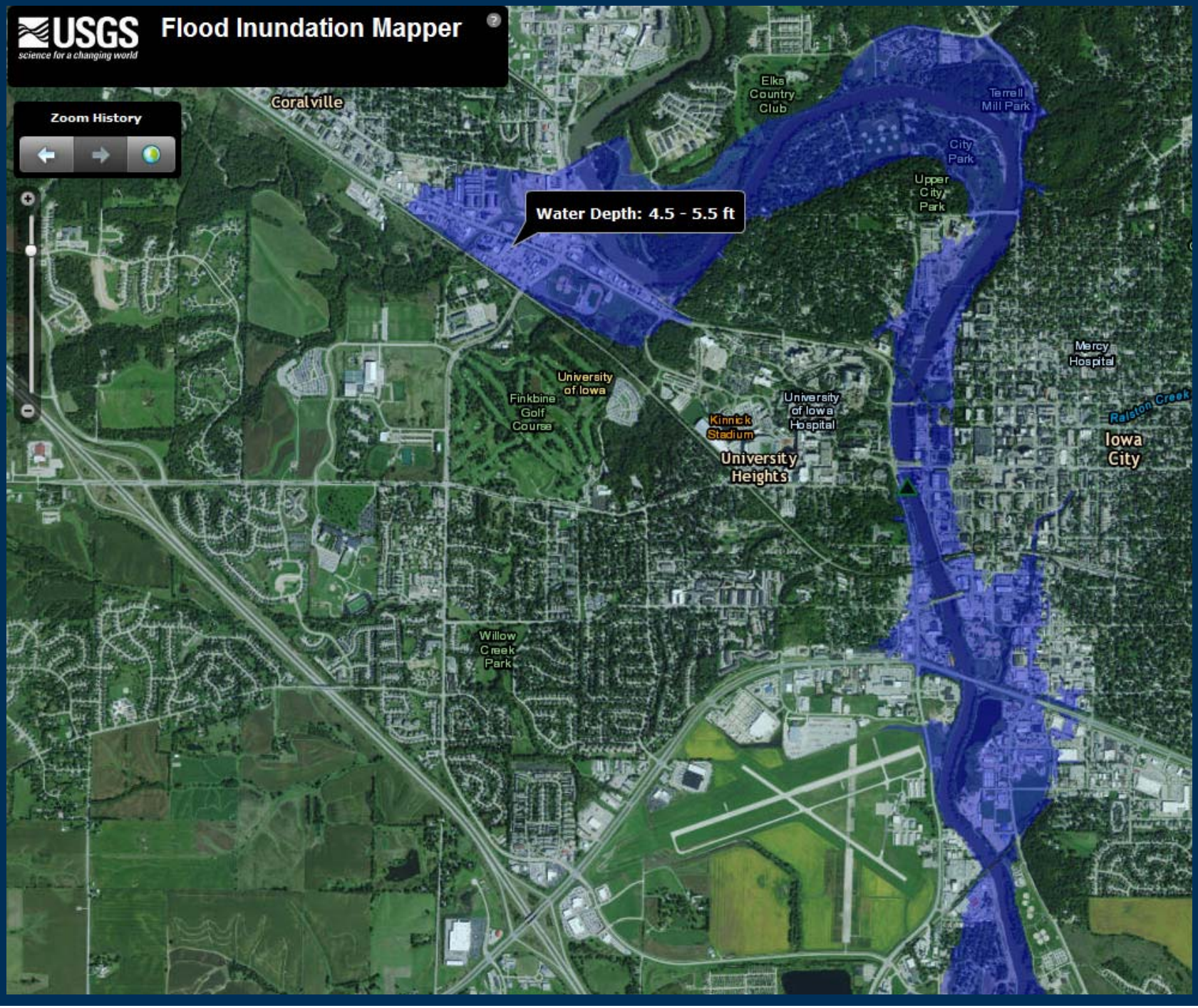
WaterAlert form

Site number, sent by mapper



Personal info

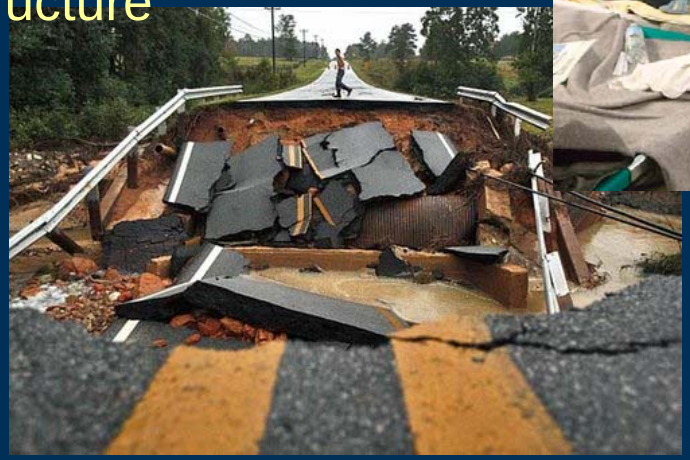
Threshold level, selected by mapper


USGS
science for a changing world
Flood Inundation Mapper
Zoom History
Water Depth: 4.5 - 5.5 ft
Coralville
Elks Country Club
Terrell Mill Park
City Park
Upper City Park
Mercy Hospital
Ralston Creek
Iowa City
University of Iowa
Finkbine Golf Course
Kinnick Stadium
University of Iowa Hospital
University Heights
Willow Creek Park

BENEFITS of Flood Inundation Mapping

State Agencies

- State EMA can better focus state flood response & recovery resources
- State DOT can quickly assess potential road/bridge damage
- State health departments can focus resources on special populations and facilities
- State environmental agencies can determine where pollutant impacts may occur from infrastructure damage



USGS

NATIONAL WEATHER SERVICE
U.S. DEPARTMENT OF COMMERCE-NOAA

BENEFITS of Flood Inundation Mapping

Local Agencies

- EMA director can focus warnings using automated technologies to get people/property out of harm's way
- Evacuation routes can be assessed quickly for flood access
- Police would know where to place barricades in advance of flood crest to block flooded roads and prevent accidents
- Officials would have answers quickly
- Public can be better educated to threat of floods