Flood Inundation Mapping

Meramec River : 2015-2016 Winter Flood

USGS Missouri Water Science Center

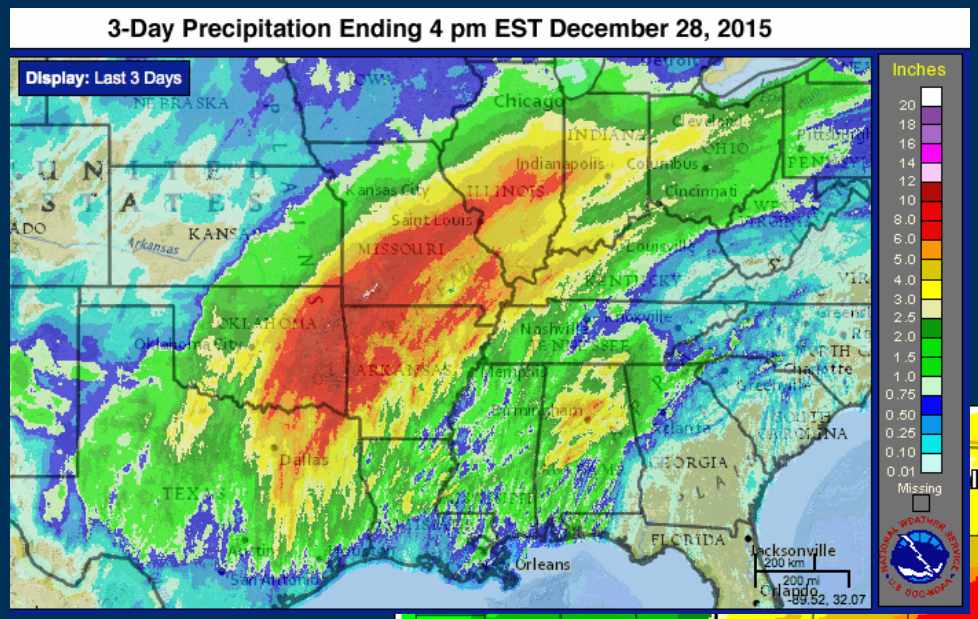
Water Resources Advisory Committee Meeting

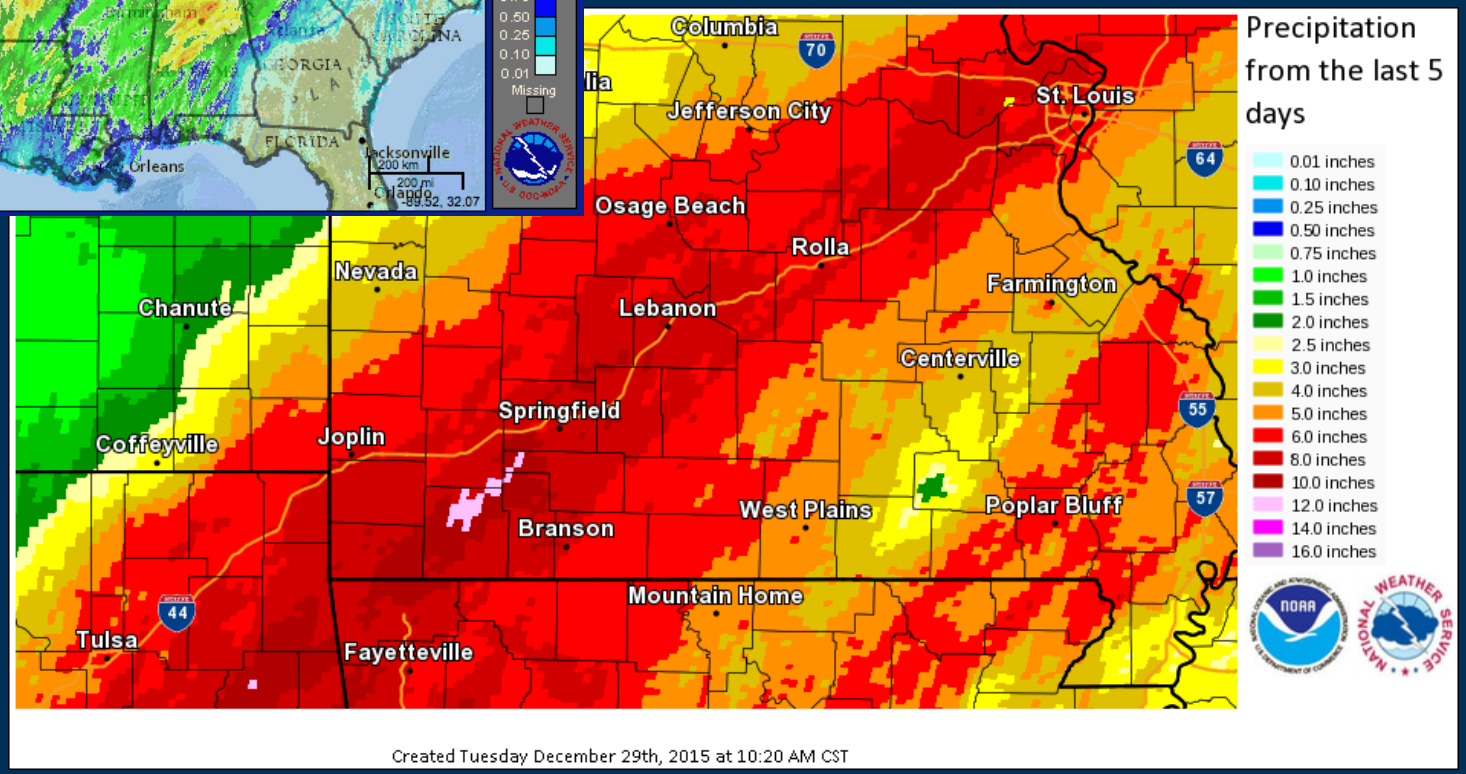
June 24, 2016

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

Photos courtesy of Post-Dispatch

Precipitation Storm Totals

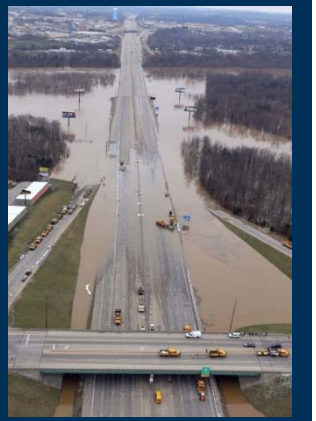




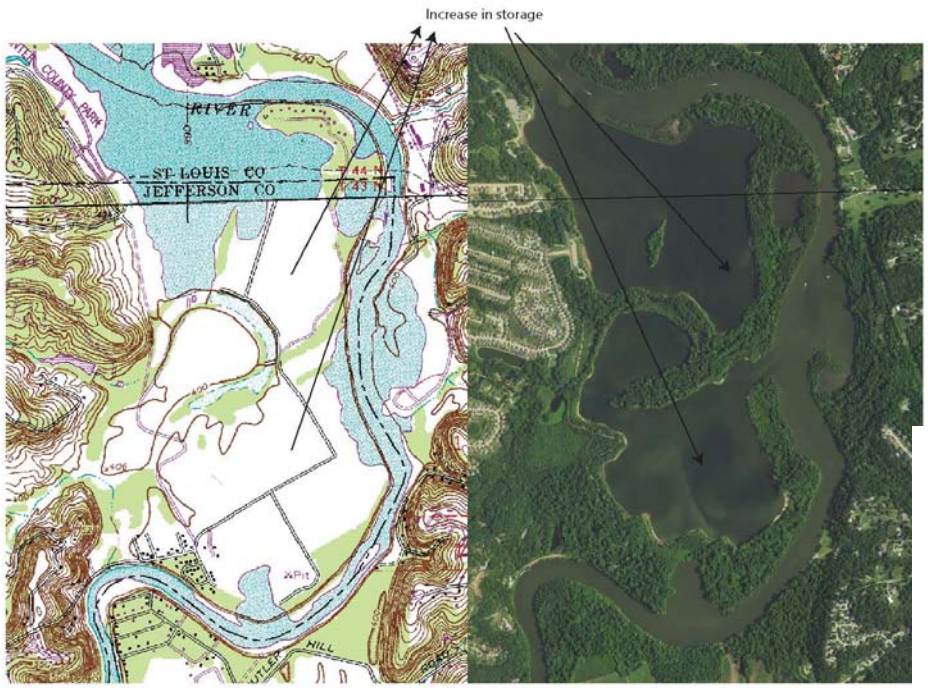
USGS

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	45.1	2.2
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

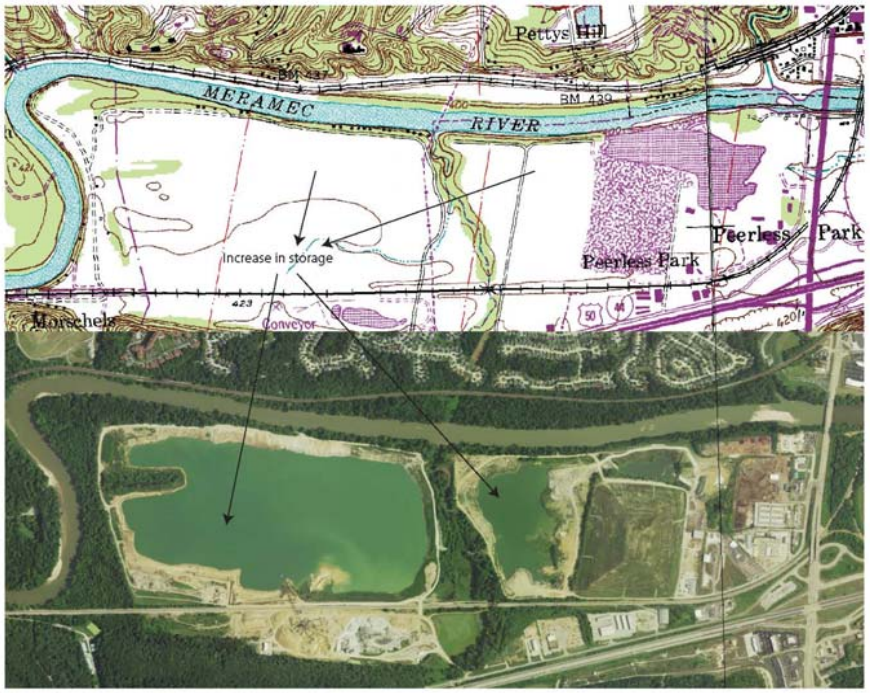


Floodplain Surface Change



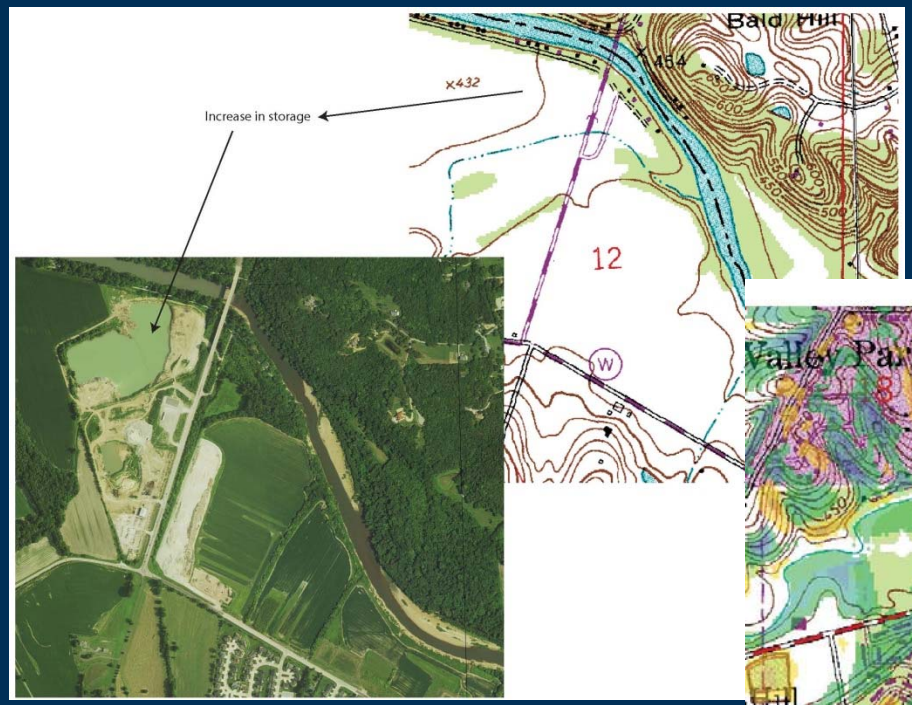
George Winter Park

Peerless Park



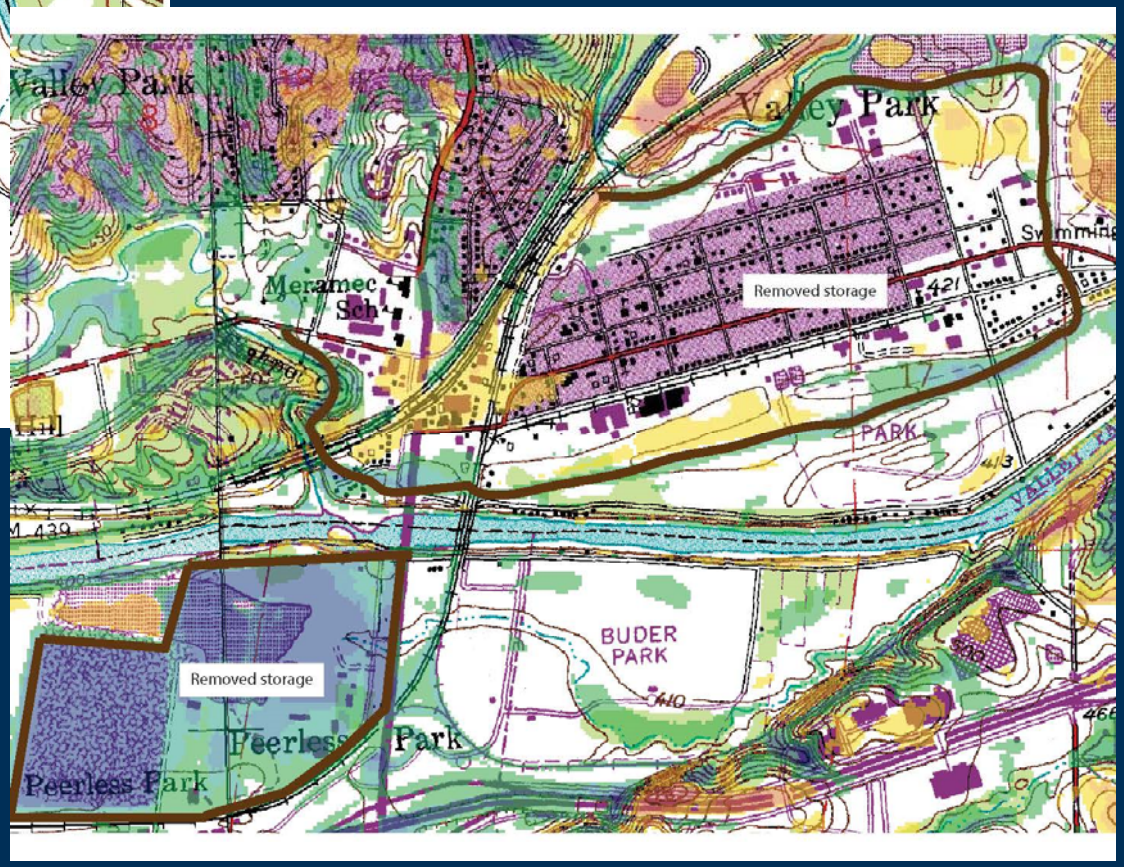
USGS

Floodplain Surface Change



Kirkwood Material Supply

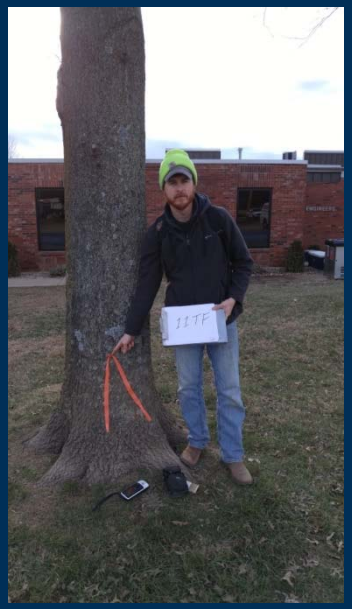
Valley Park / Peerless Landfill



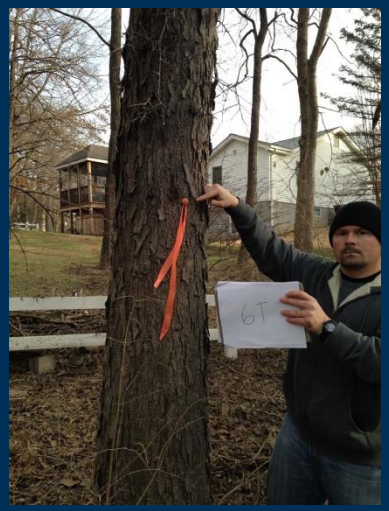
USGS

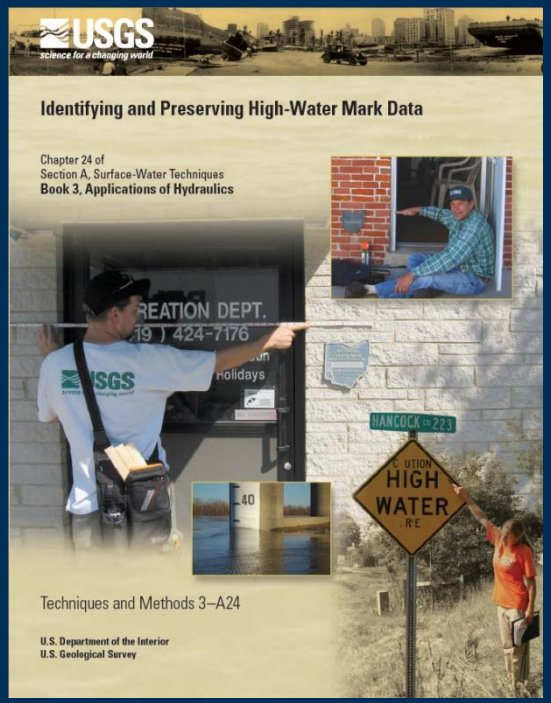
Post Flood Data Collection

What?



Monumentation
- Perishable High-Water Marks
- Flood Extents





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

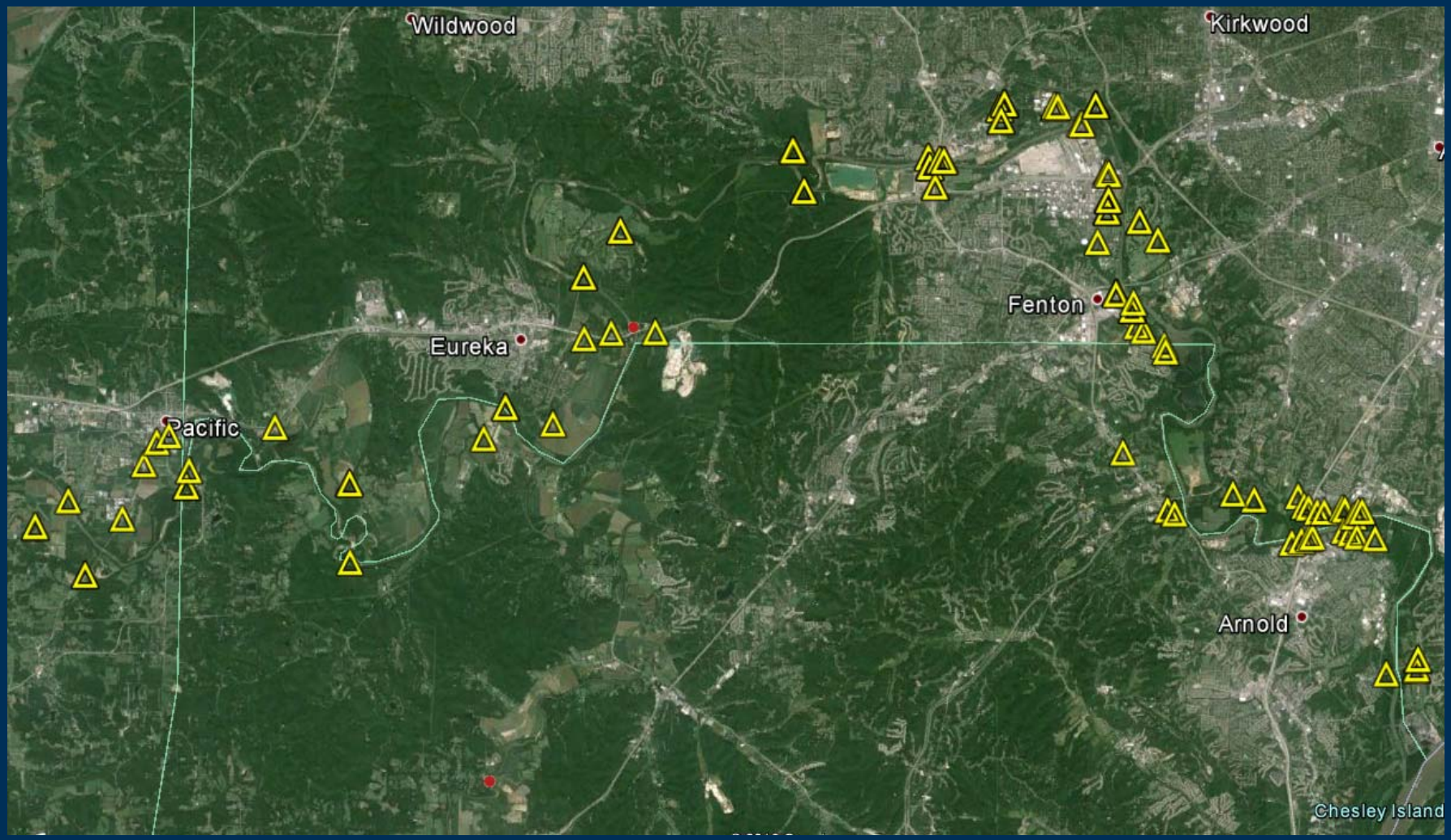
High Water Marks

Fenton
WWTP

USGS

Post Flood Data Collection

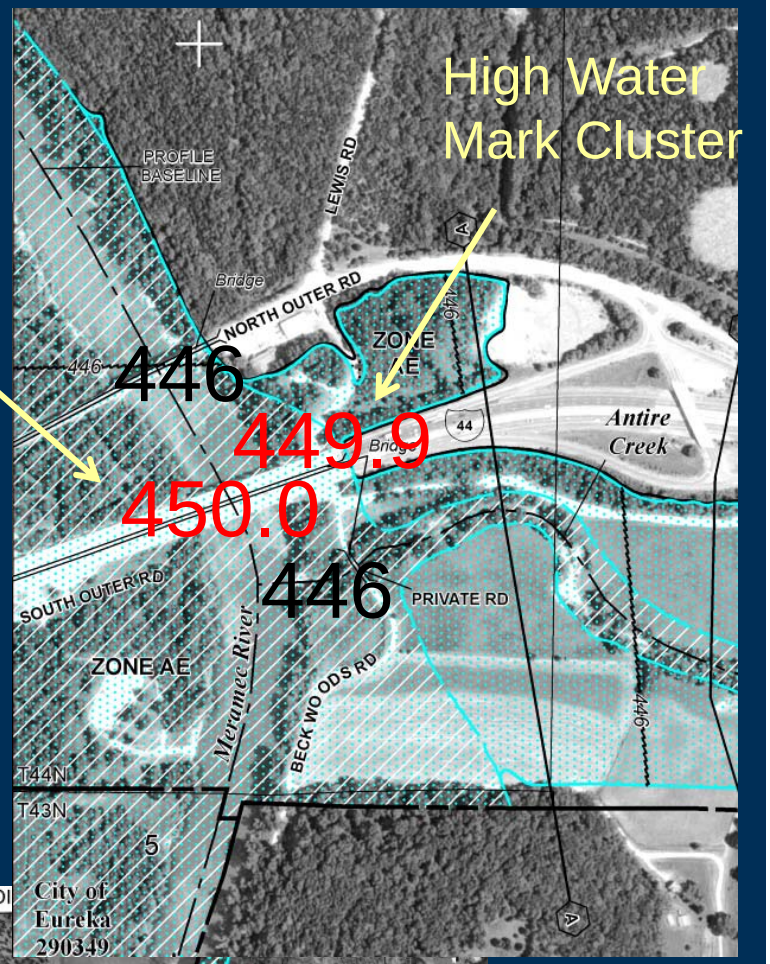
High-Water Marks - Lower Meramec Basin

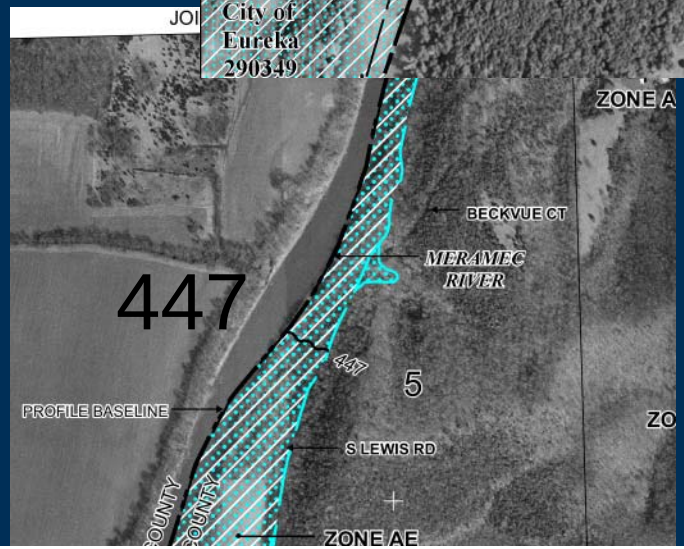


Post-Flood Data Collection

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.





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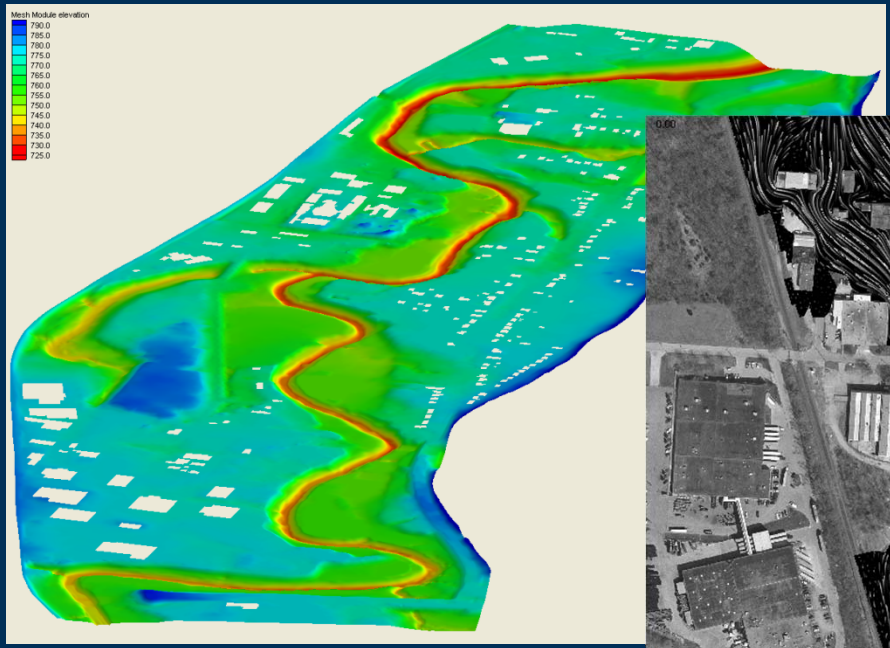
Meramec River at Eureka, MO.

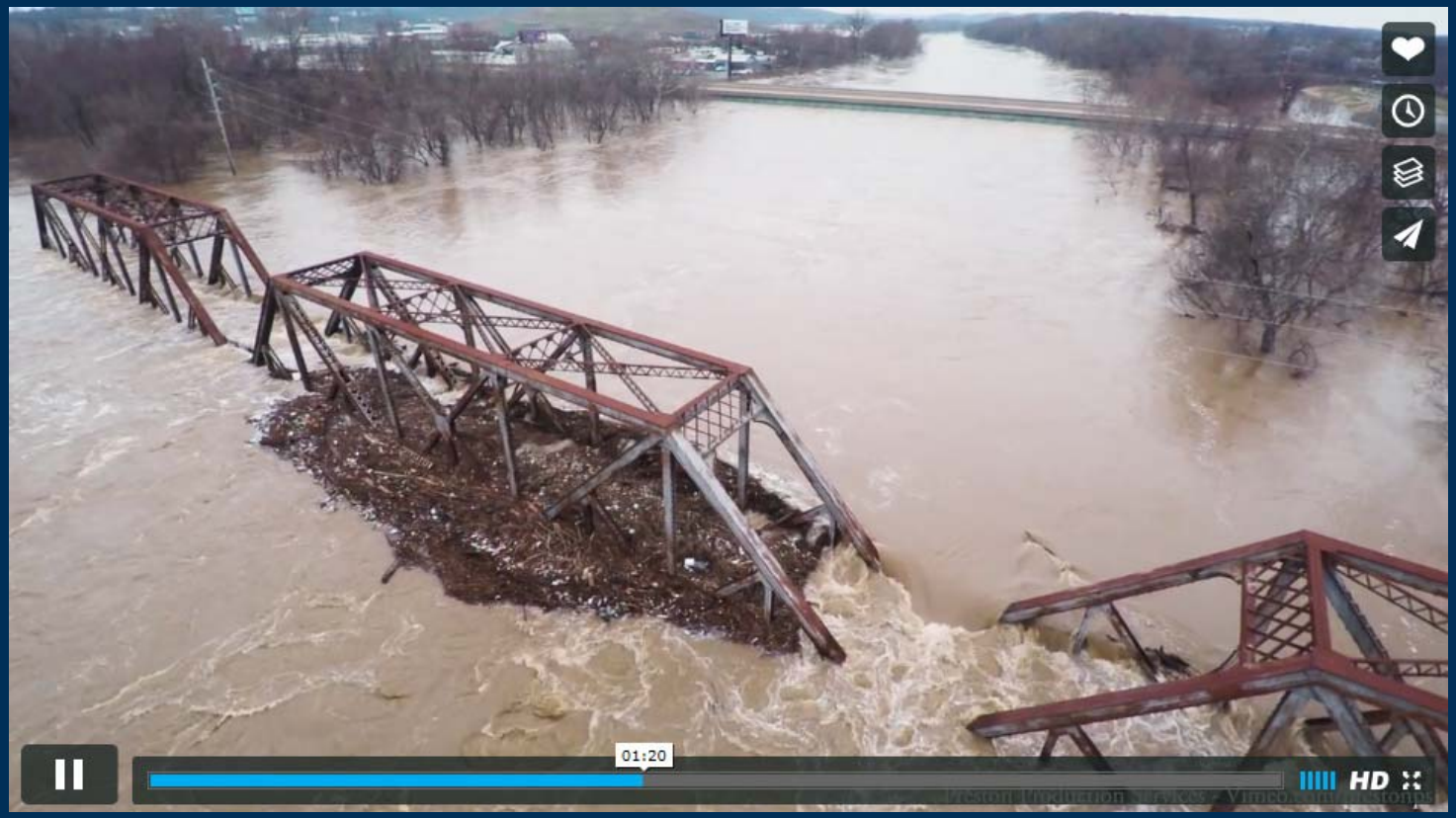
High Water Marks to Hydraulic Modeling



USGS

Hydraulic Modeling - Validation

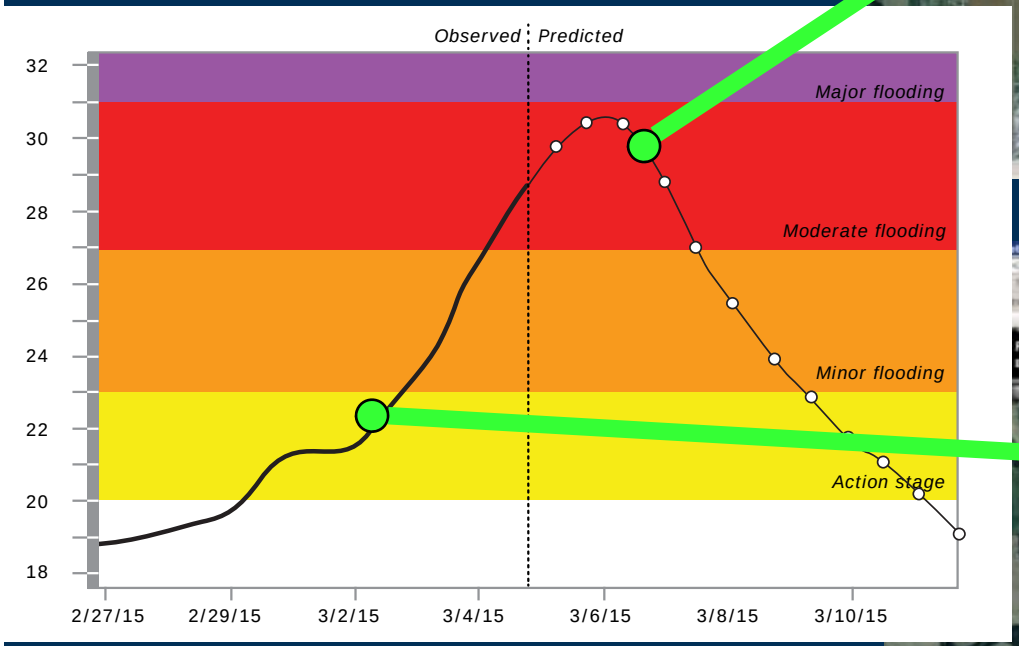
Drone footage

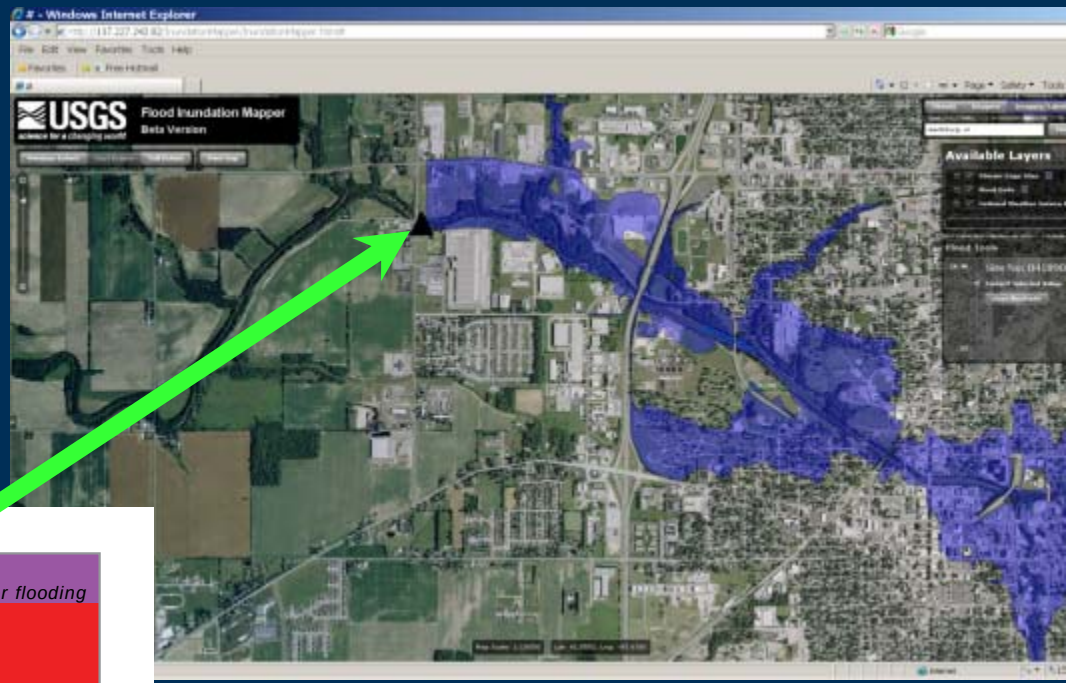


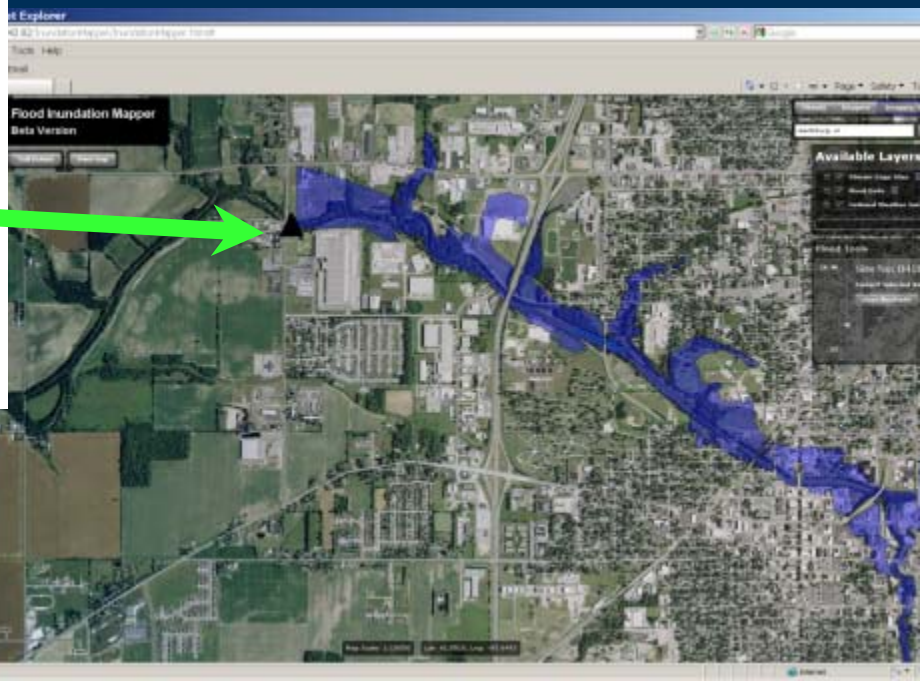
Courtesy Preston Production Services

https://vimeo.com/150387869

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







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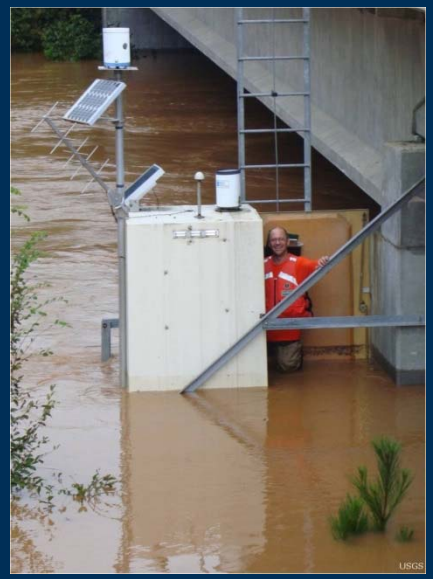
FIM becomes a tool for flood…

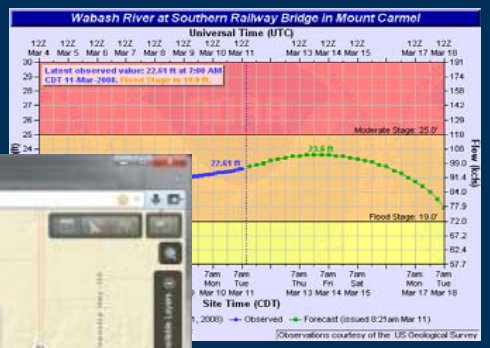


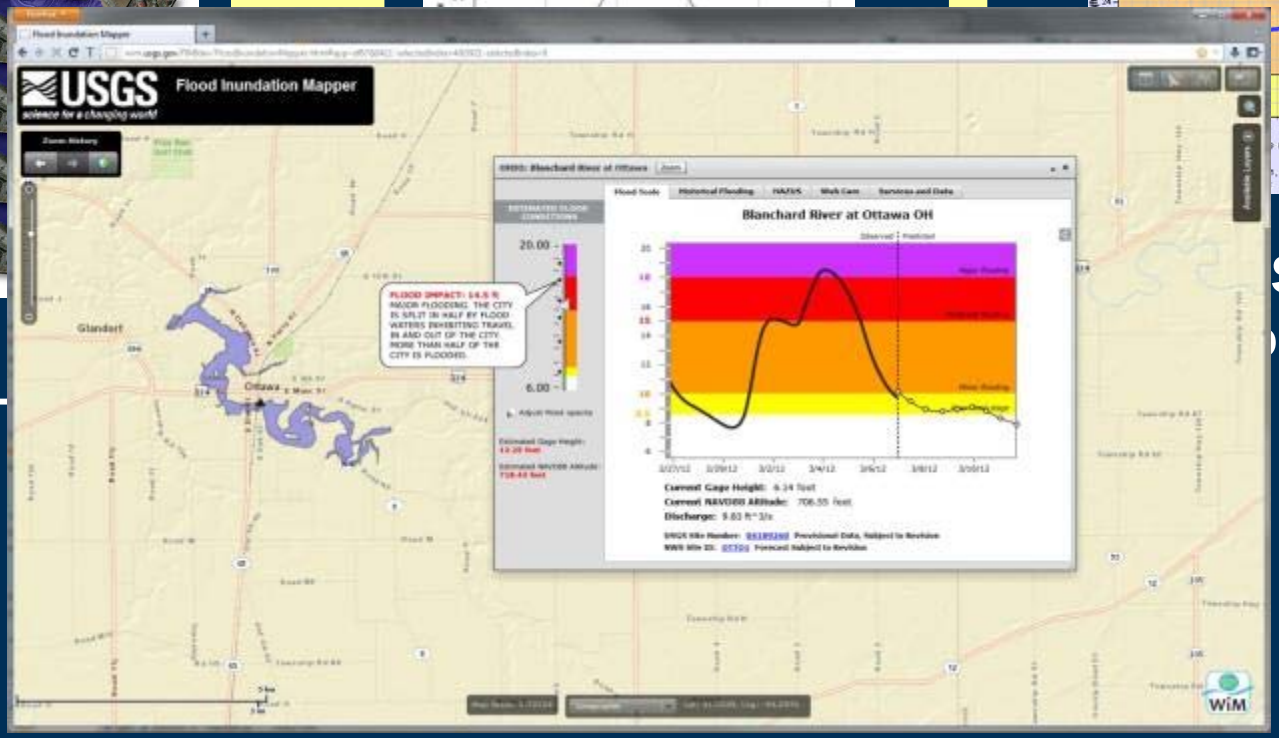
- Preparedness
  - "What-if" scenarios
- Response
  - Tied to gage & forecast data
- Recovery
  - Damage assessment

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

USGS

FIM Mapper – more than just maps





Flood L

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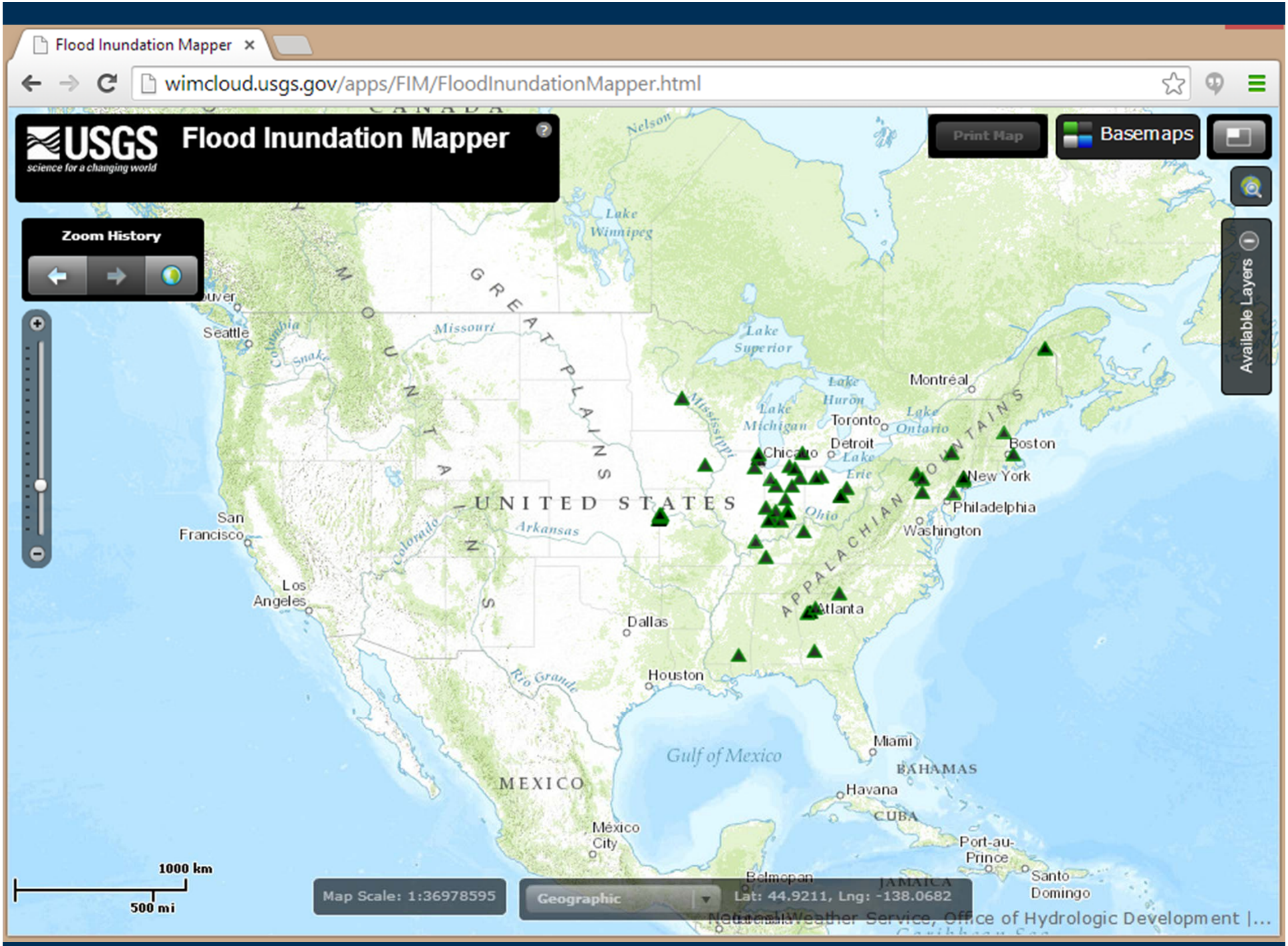
USGS

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


Flood Inundation Mapper
wimcloud.usgs.gov/apps/FIM/FloodInundationMapper.html
USGS
science for a changing world
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
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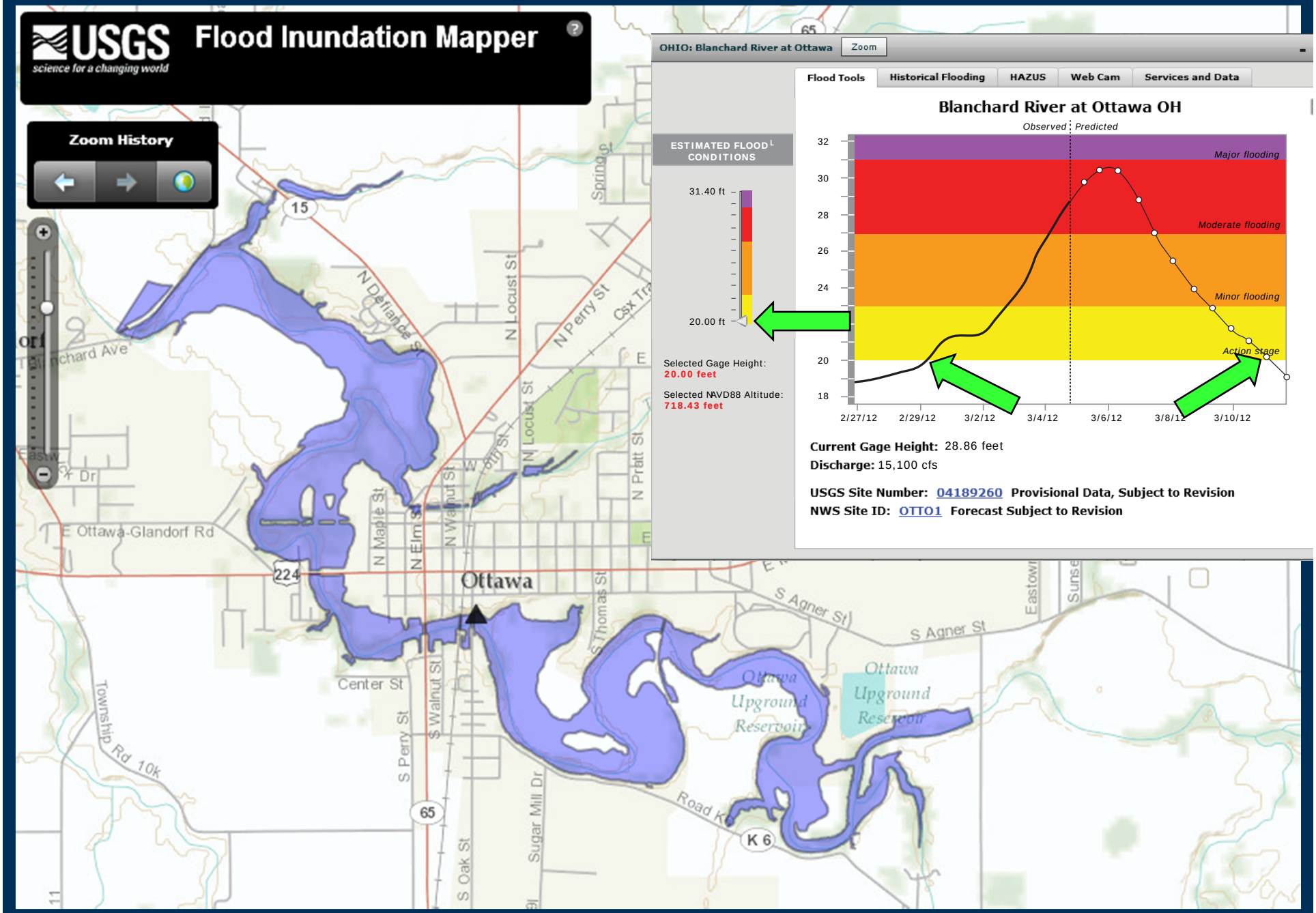
National Weather Service, Office of Hydrologic Development |...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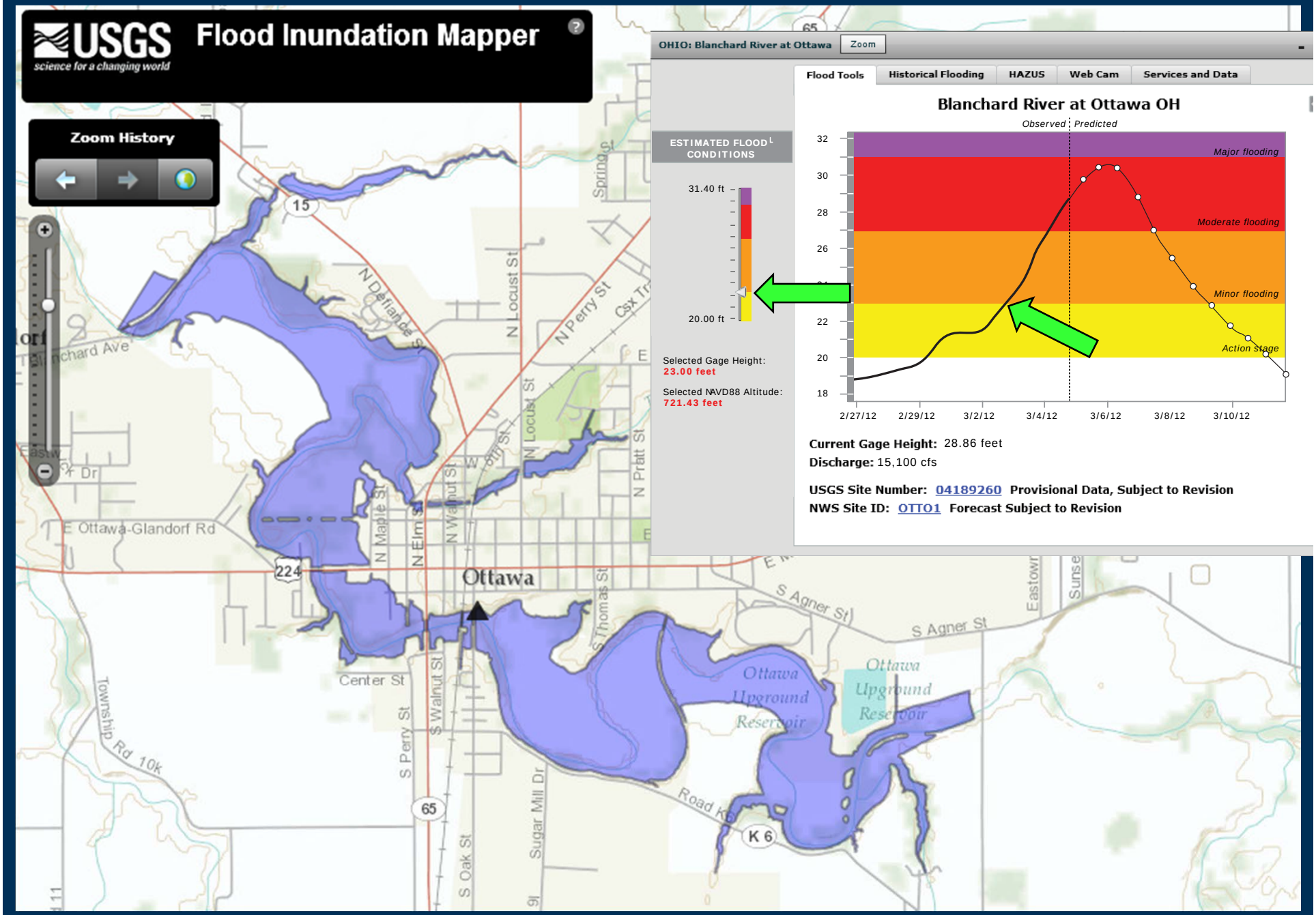
Flood Inundation Mapper
Zoom History
OHIO: Blanchard River at Ottawa
Zoom
Flood Tools
Historical Flooding
HAZUS
Web Cam
Services and Data
Blanchard River at Ottawa OH
Observed
Predicted
Major flooding
Moderate flooding
Minor flooding
Action stage
32
30
28
26
24
20
18
2/27/12
2/29/12
3/2/12
3/4/12
3/6/12
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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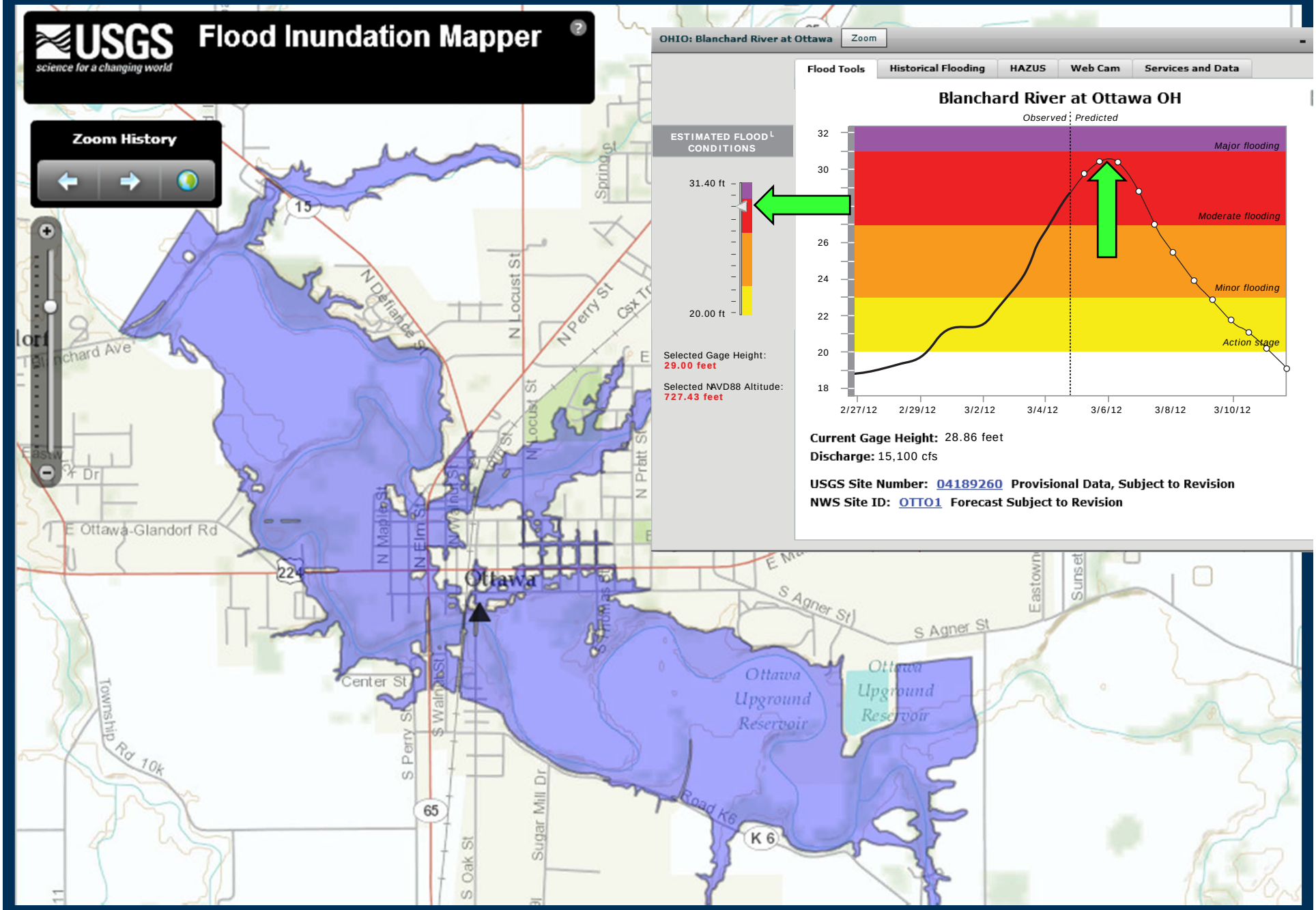
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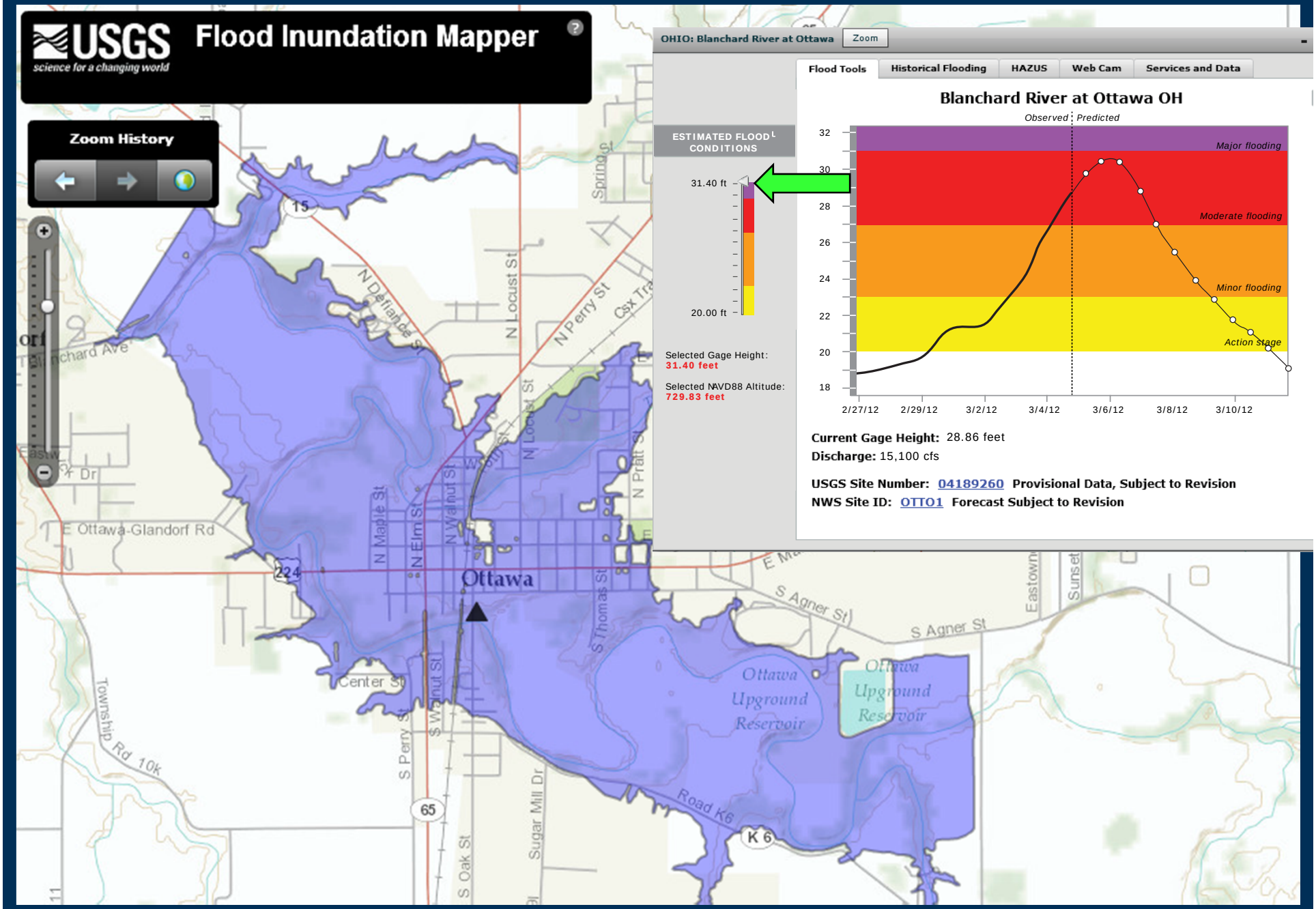
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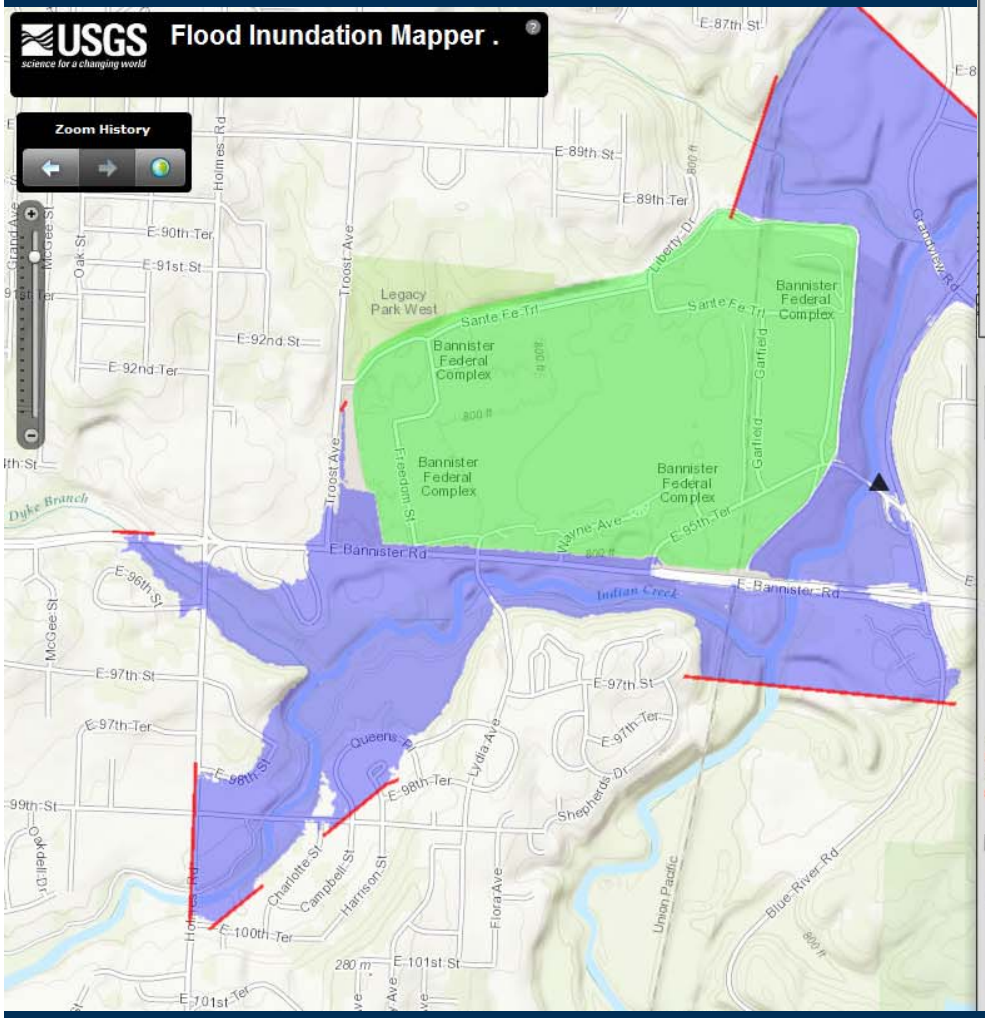
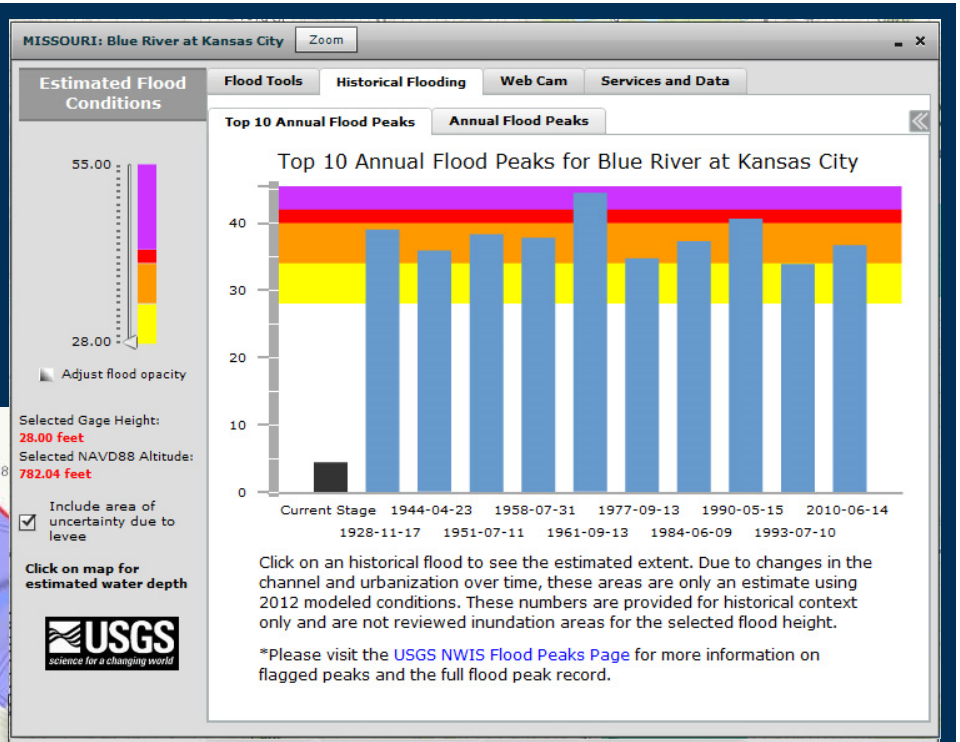
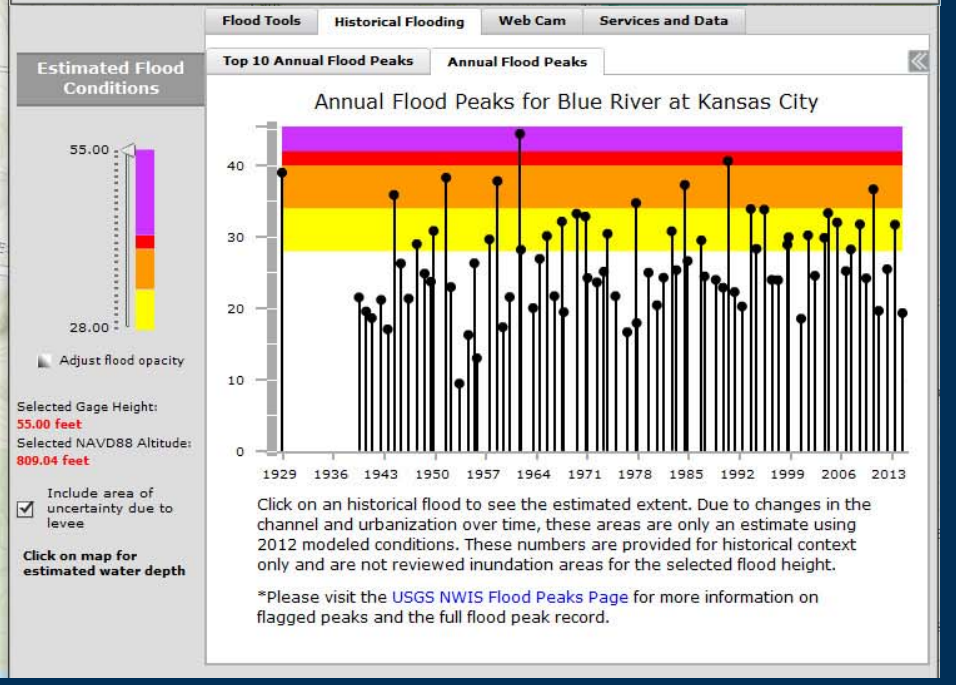
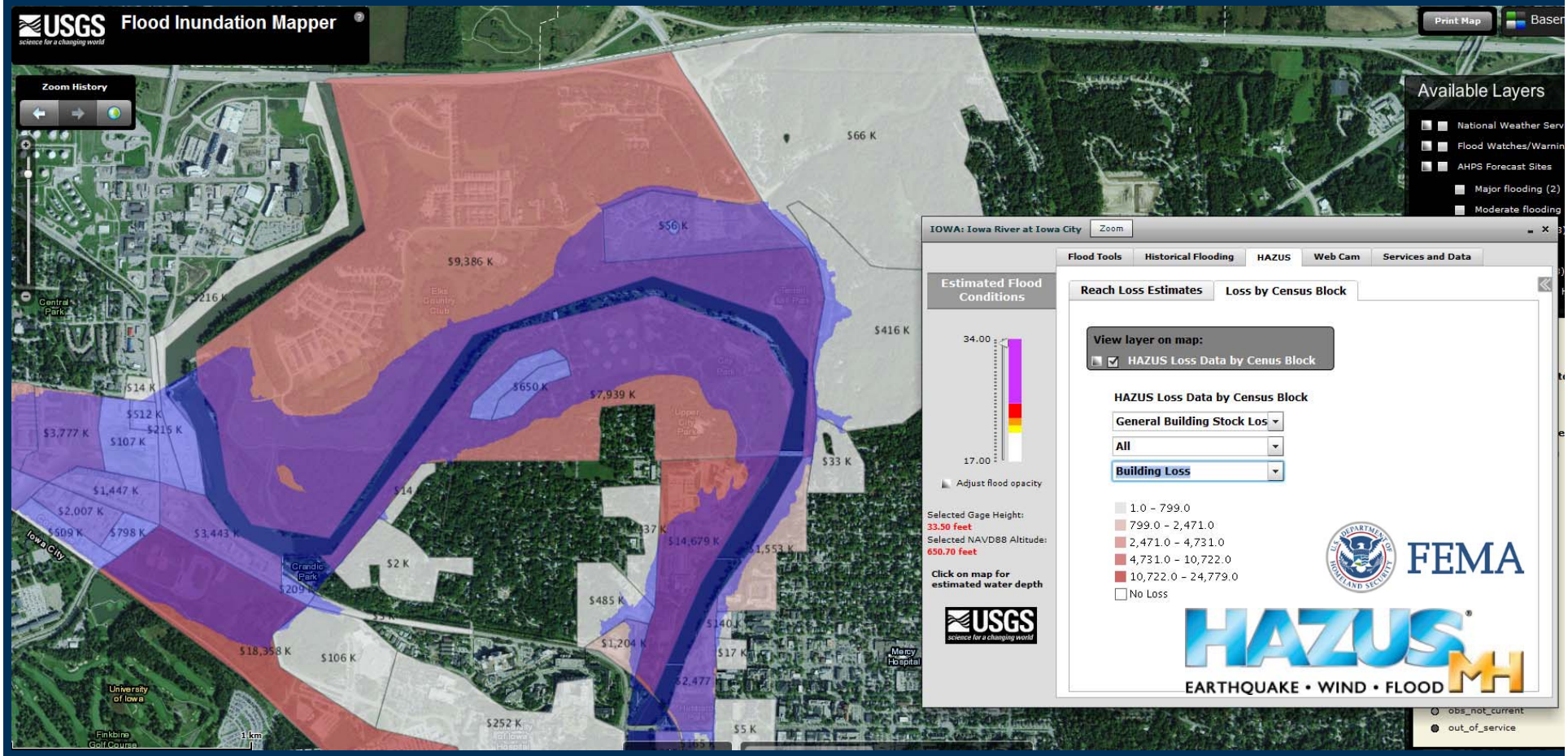
Blue River, Kansas City, Missouri - *Historical Flooding*







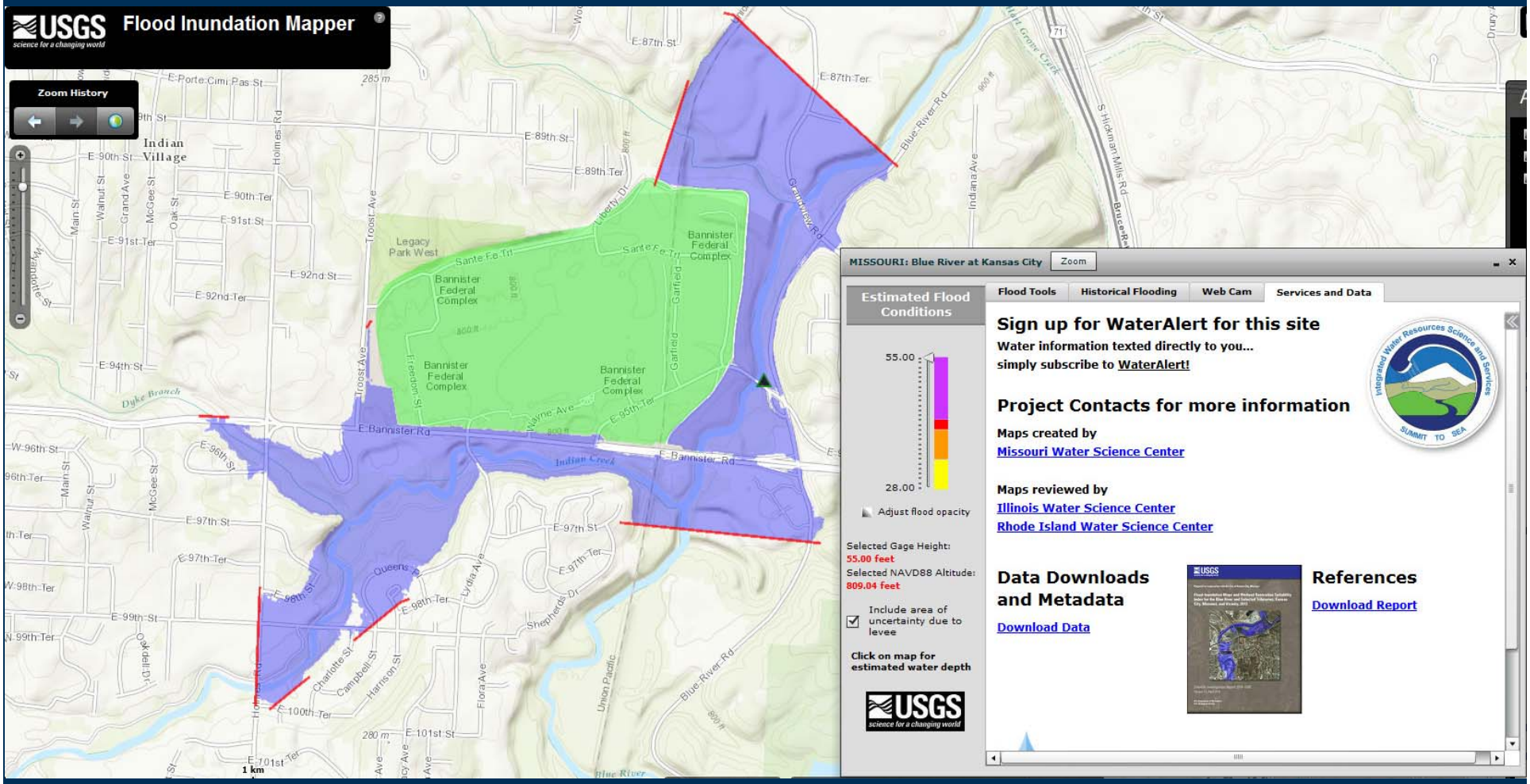
HAZUS – Building loss…vehicles…shelter…



USGS

Blue River, Kansas City, Missouri

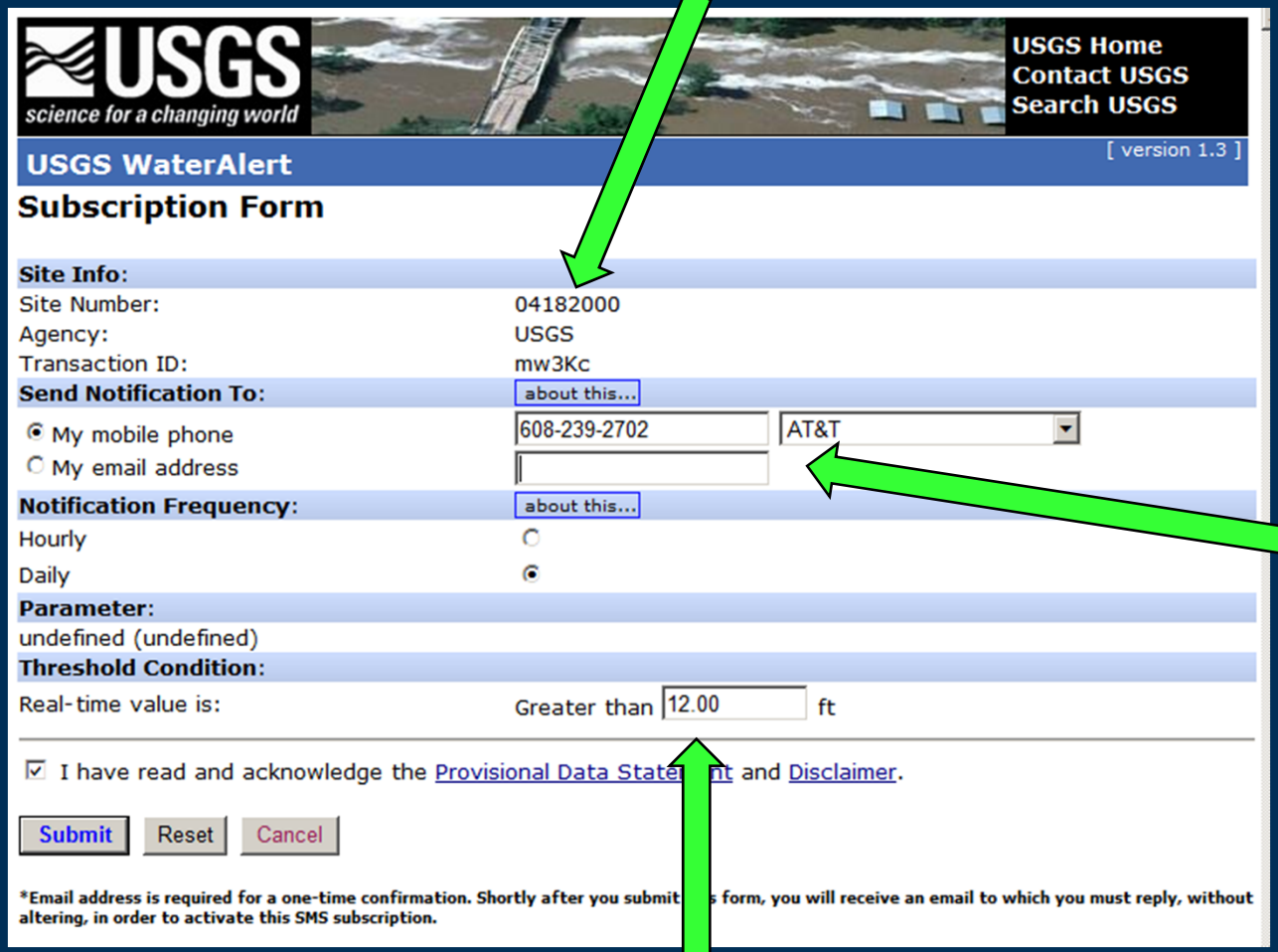
Services and Data – Water Alert….



USGS

WaterAlert form

Site number, sent by mapper



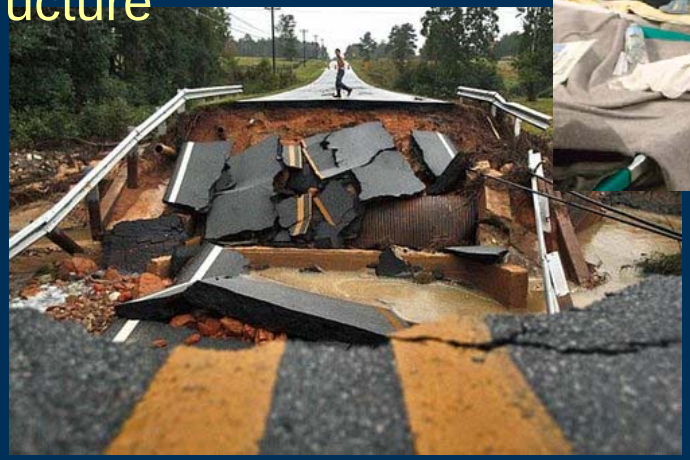
Personal info

Threshold level, selected by mapper

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

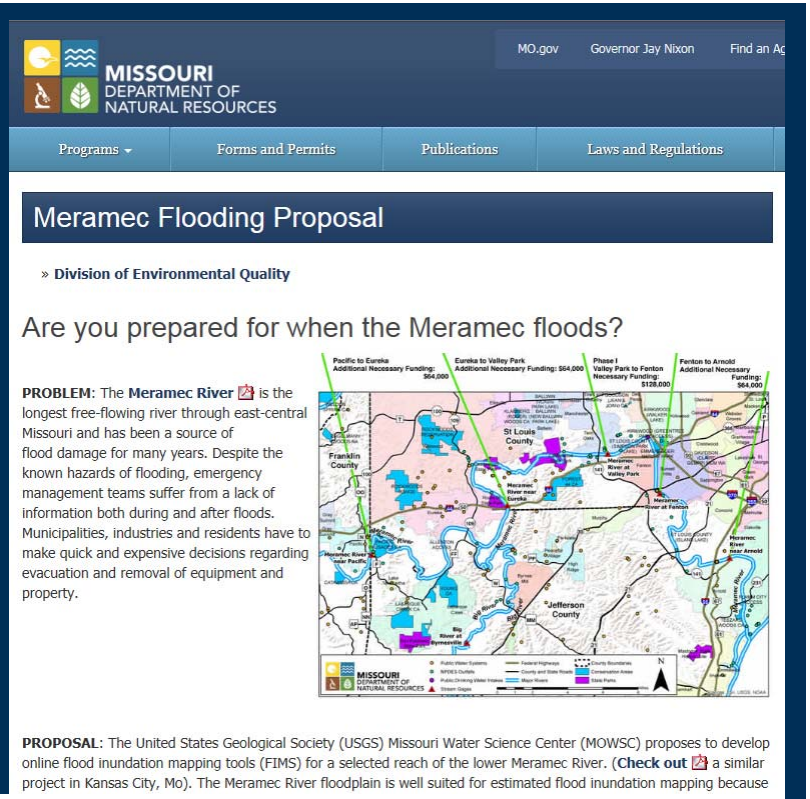
BENEFITS of Flood Inundation Mapping

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

Proposal & Funding

http://dnr.mo.gov/env/meramecflodingproposal.htm



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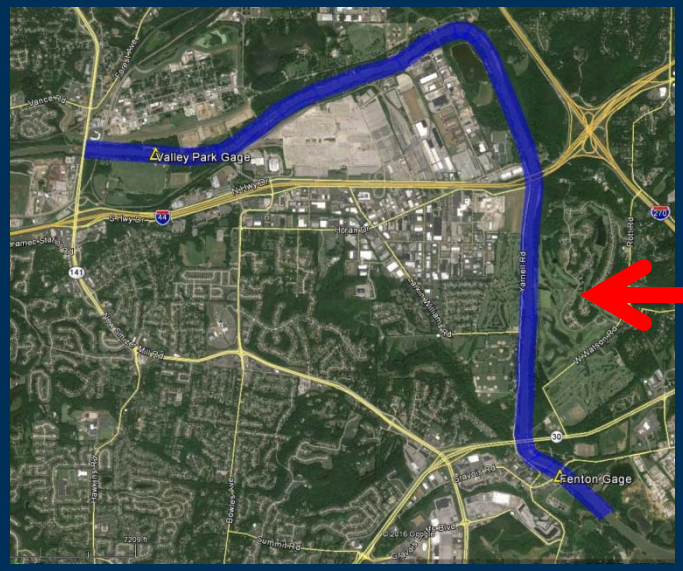
Meramec Flooding Proposal

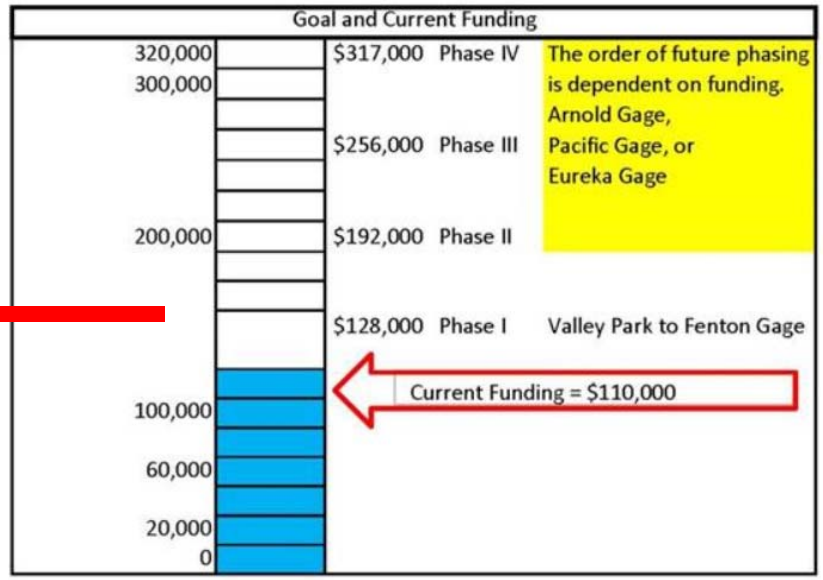
» Division of Environmental Quality

Are you prepared for when the Meramec floods?

PROBLEM: The **Meramec River** is the longest free-flowing river through east-central Missouri and has been a source of flood damage for many years. Despite the known hazards of flooding, emergency management teams suffer from a lack of information both during and after floods. Municipalities, industries and residents have to make quick and expensive decisions regarding evacuation and removal of equipment and property.

PROPOSAL: The United States Geological Society (USGS) Missouri Water Science Center (MOWSC) proposes to develop online flood inundation mapping tools (FIMS) for a selected reach of the lower Meramec River. (**Check out** a similar project in Kansas City, Mo). The Meramec River floodplain is well suited for estimated flood inundation mapping because





COSTS: The total estimated cost to develop and publish USGS FIMs for the Lower Meramec River from Highway 141 upstream of the Valley Park gage to just below the Fenton gage is $128,000 (map above). In addition, Flood Inundation Maps could also be developed along the Meramec for reaches at the Eureka, Pacific and Arnold gages for an additional cost of $64,000 per gage reach, or a total additional cost of $192,000. More information on the details of the map development can be found on the **USGS website**.