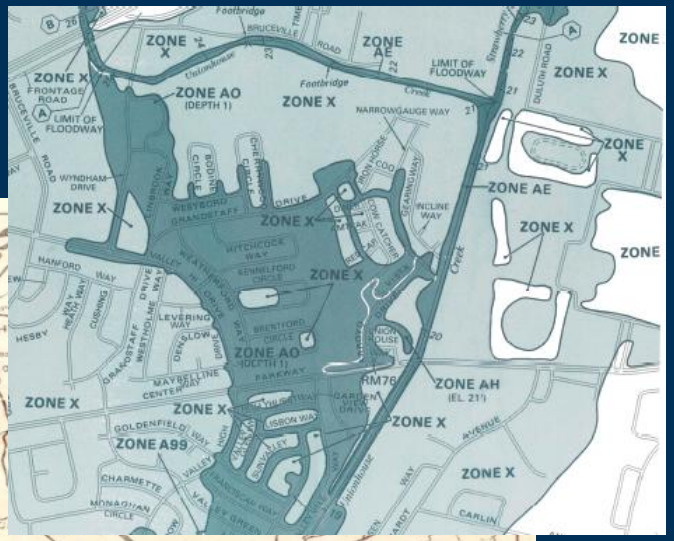
USGS Flood Inundation Mapping Initiative (FIMI)

A Science Based Initiative for the 21st Century

K. Scott Jackson, P.E.
USGS Ohio Water Science Center

June 9, 2011
Arizona Floodplain Managers Conference

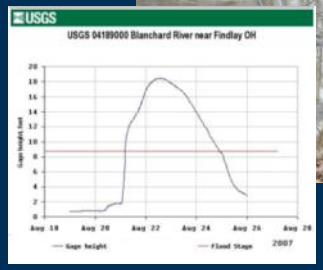
Not a new concept!



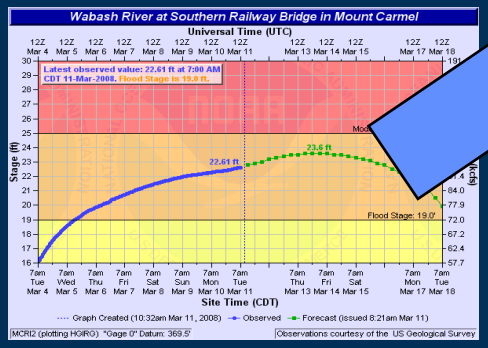
Courtesy of Louisiana Digital Map Library:
http://www.usgwarchives.org/maps/louisiana/

Flood Information – From a point on the landscape to geospatial products

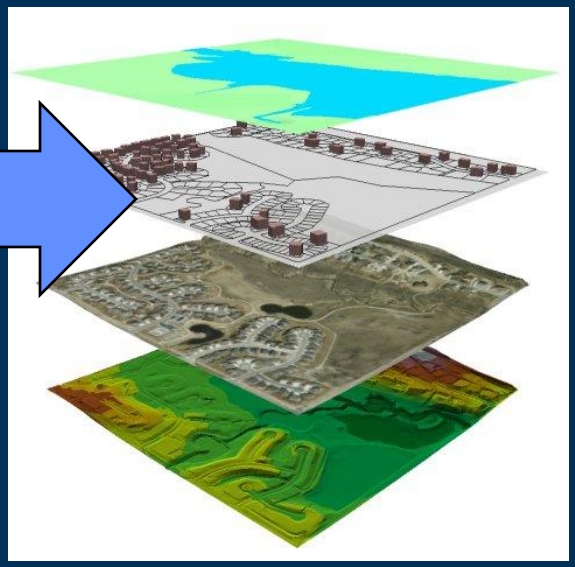
High-water marks



USGS Real-time streamgage data



National Weather Service flood forecasts



http://las.depaul.edu/geography/images/Misc_Images/gis.jpg

Flood Inundation Mapping Initiative

Major Goals

- **Consistent visual and electronic format for USGS inundation geospatial products**

- **Static flood inundation map libraries linked to gages/flood forecasts**

- **State-of-the art dynamic, real-time flood inundation applications**

USGS

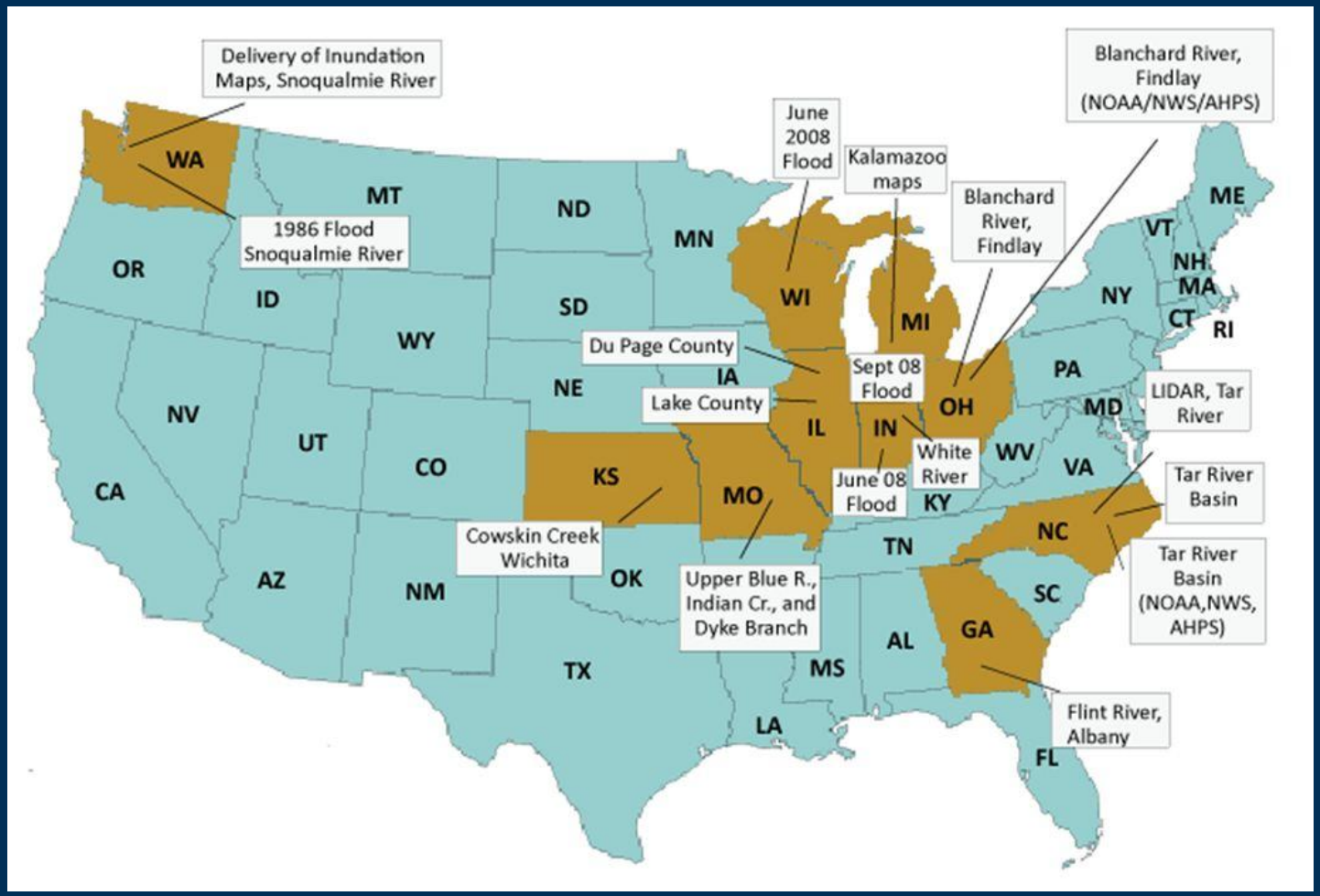
Flood Inundation Mapping Initiative

Major Goals

- A core of USGS and partner agencies
- Connection to Integrated Water Resources Science and Services
- National USGS FIMI Web Portal and Web Mapping Applications

USGS

USGS Flood Inundation Mapping Science Projects, by State



USGS

FIMI – Partner Oriented

- State/local level, to leverage resources for inundation

- On the Federal level, getting the agencies to work together
  - USGS
  - NWS
  - USACE
  - FEMA
  - Integrated Water Resources Science and Services (IWRSS)

USGS

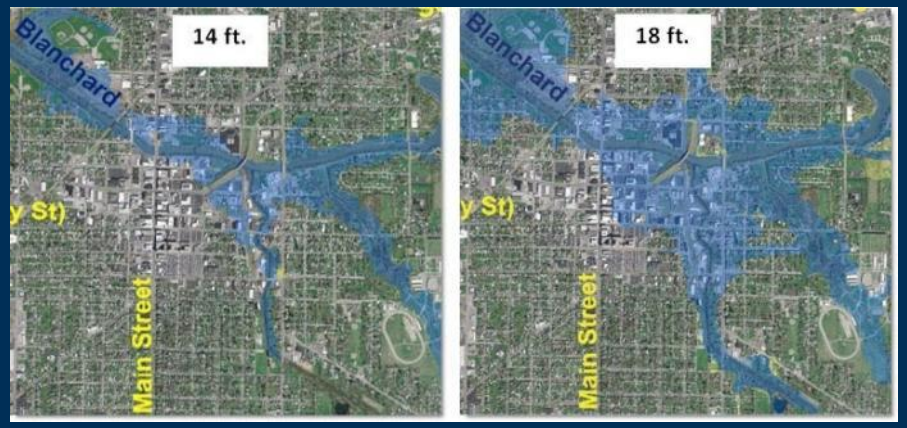
Progress To Date

- **Develop minimal standards for flood-map file format, appearance, and metadata.** ***A tech steering committee was formed and has developed initial guidance for pilot projects.***
- **Undertake pilot projects to produce a flood inundation map libraries and a Web interface for performing flood risk assessments.** ***Several pilot projects are underway.***
- **Create a large-scale, nationally partnered initiative that brings together the USGS, NWS, USACE, FEMA, and other stakeholders.** ***Three national level meetings have been held so far!***

USGS

USGS FIMI Focus Areas

- Major flood documentation studies using high-water marks
- Static inundation map libraries at gages/flood forecast points
- Real-time, dynamic applications for the future

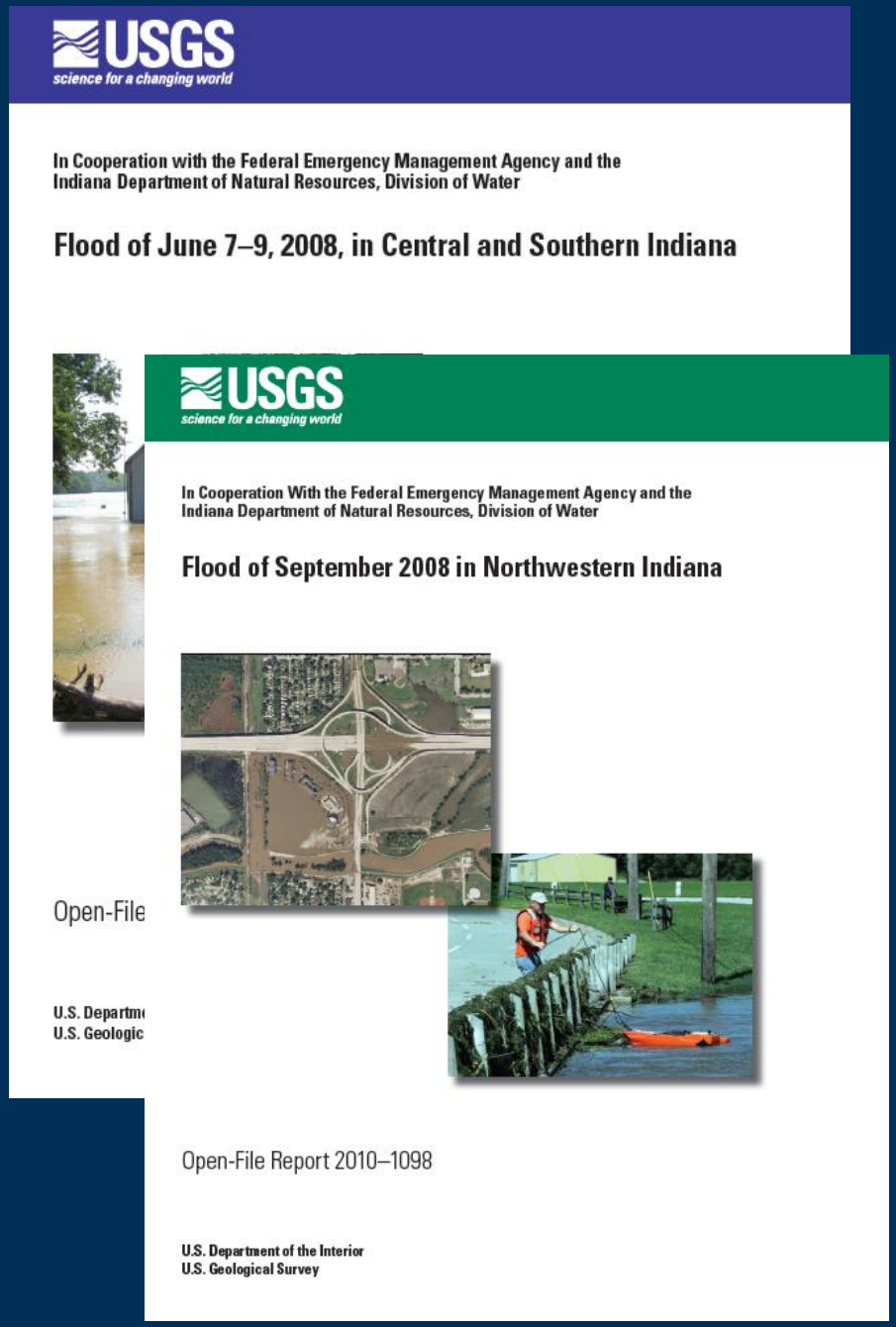


USGS

Major Flood Documentation

- Reports published - typically in cooperation with FEMA & State/local partners
- Flood magnitudes and impacts
- Peak profiles and inundation maps

USGS



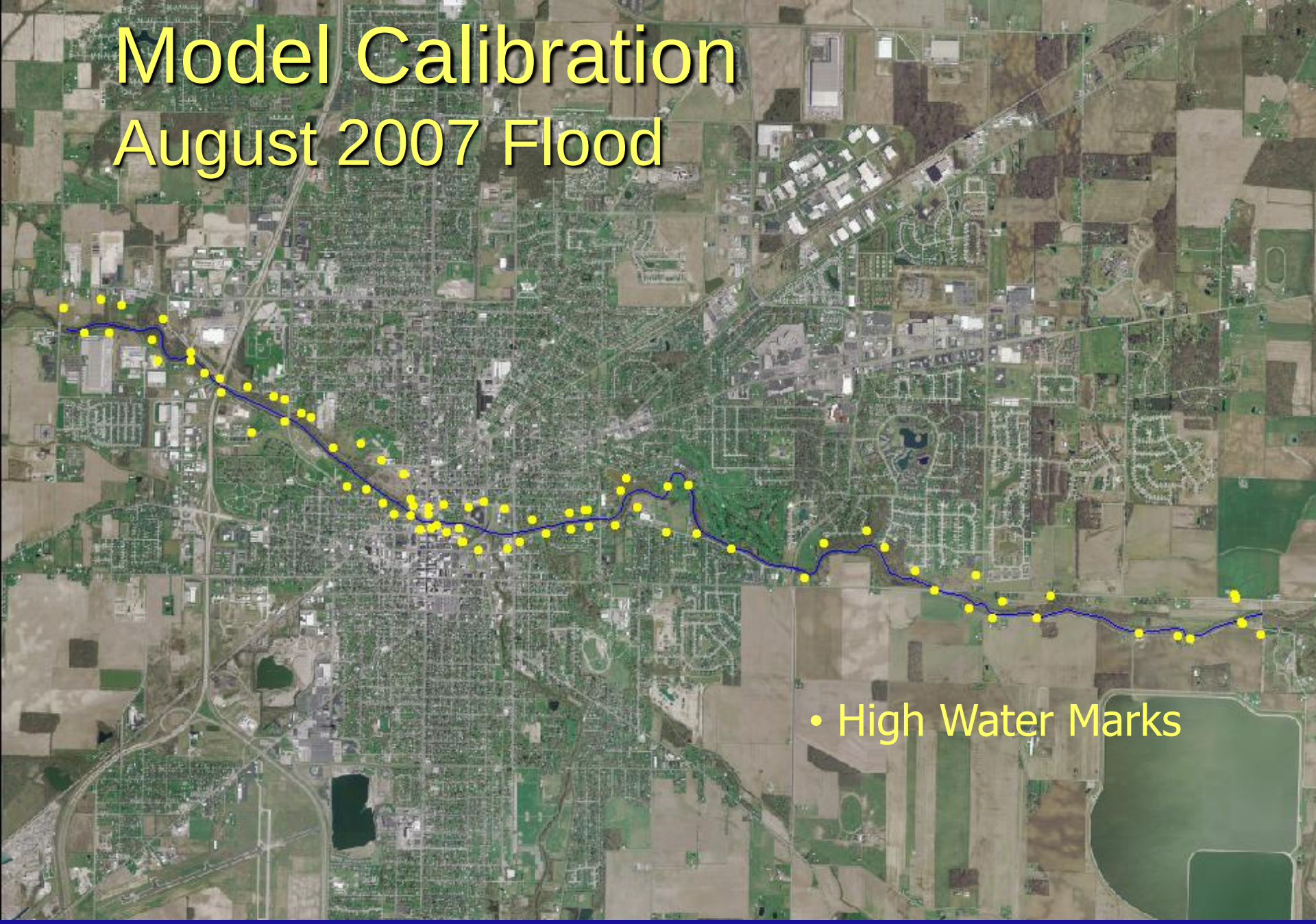
Flood-Inundation Warning System Findlay, Ohio

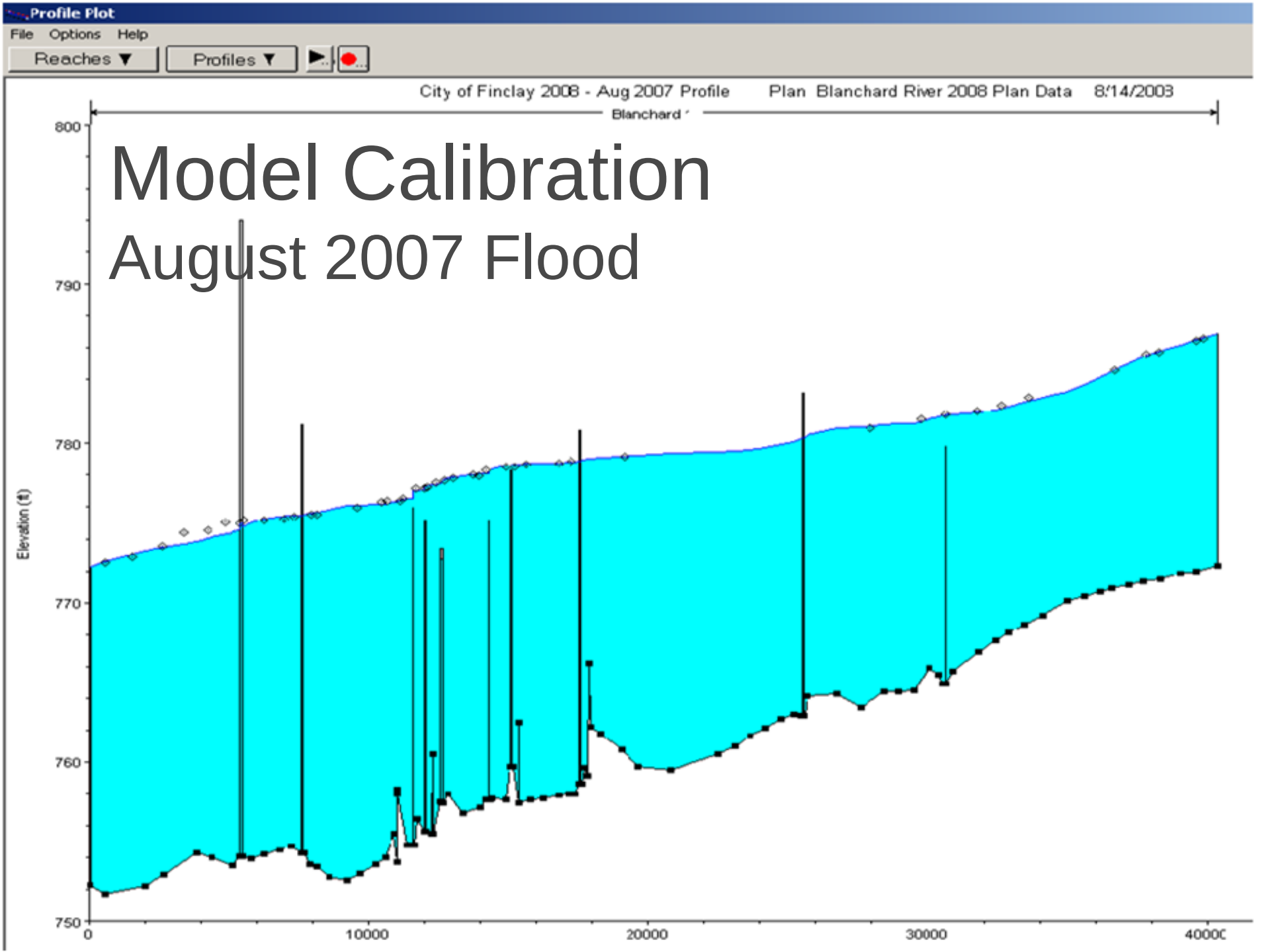
Blanchard River in Findlay Ohio - August 2007
Estimated Flood Damage – $100 Million

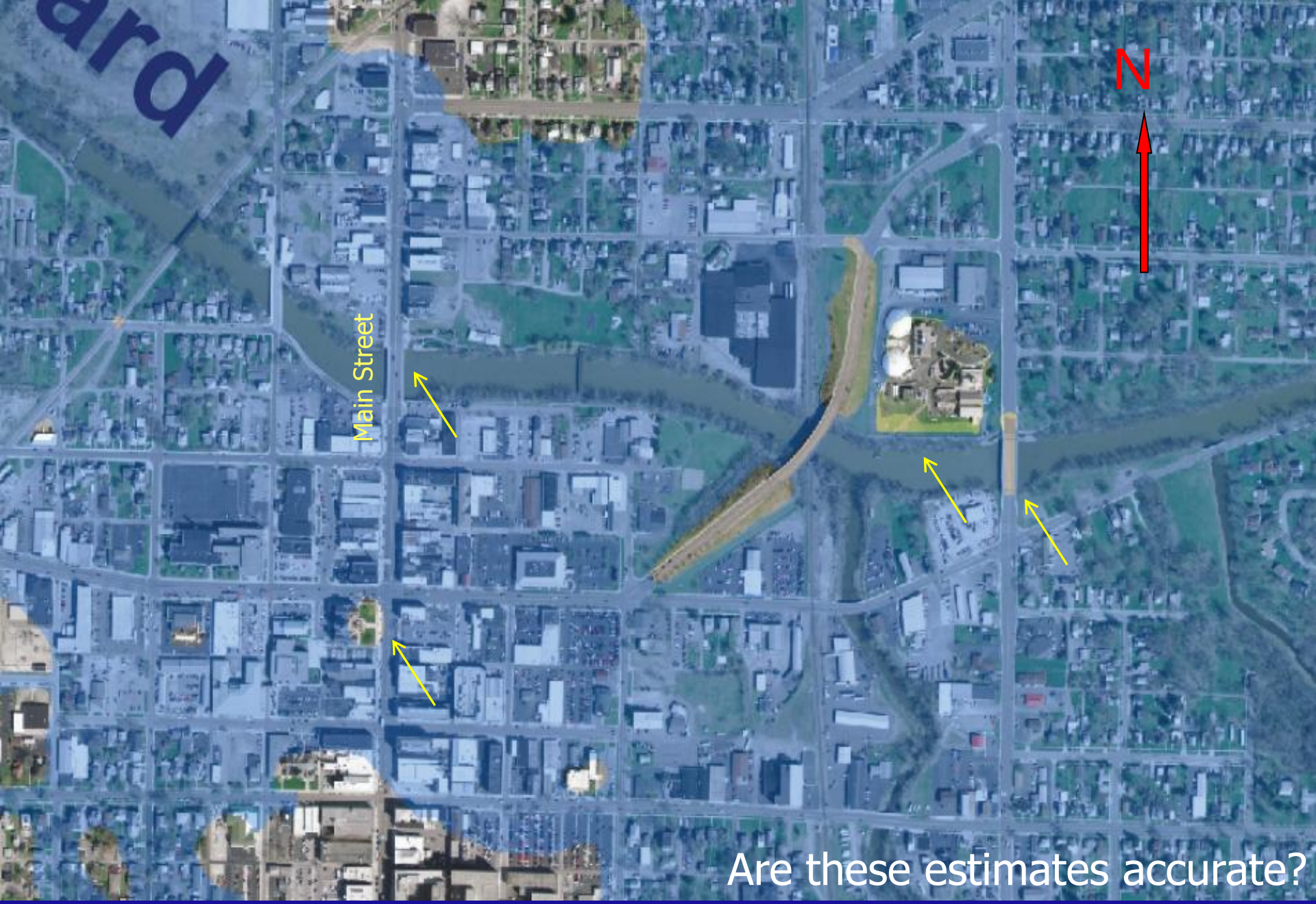
USGS
science for a changing world

Model Calibration

August 2007 Flood




Profile Plot
File Options Help
Reaches
Profiles
City of Finclay 2008 - Aug 2007 Profile
Plan Blanchard River 2008 Plan Data 8/14/2003
Blanchard
Model Calibration
August 2007 Flood
Elevation (ft)
800
790
780
770
760
750
0
10000
20000
30000
40000



Estimated Flood Inundation Boundary for stage of 18.46

USGS
science for a changing world

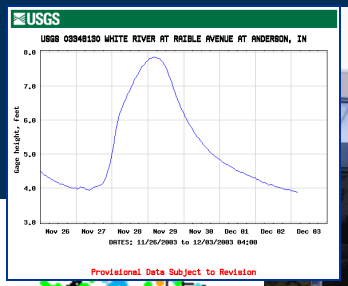
August 2007 Flooding

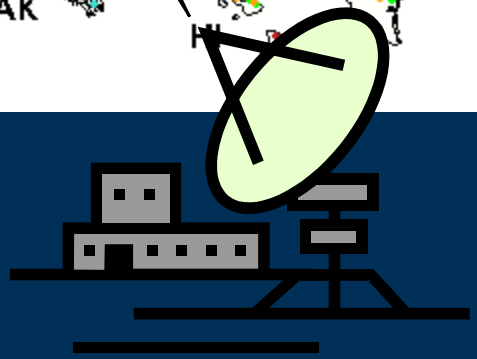
USGS
science for a changing world

August 2007 Flooding

USGS
science for a changing world

Static Inundation Map Libraries



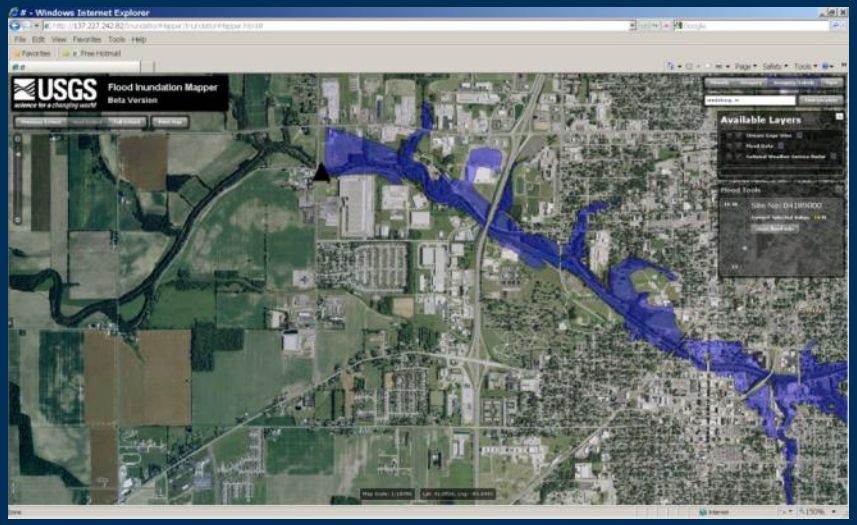


USGS

USGS streamgages: 8000 points

Creation of Inundation-Map Libraries

- DEMs (LiDAR) + hydraulic model
- Gage/HWM calibration data
- GIS generated maps
  - bankfull-record stage
  - Predefined map interval
- Linked to USGS real-time gage and NWS flood forecast

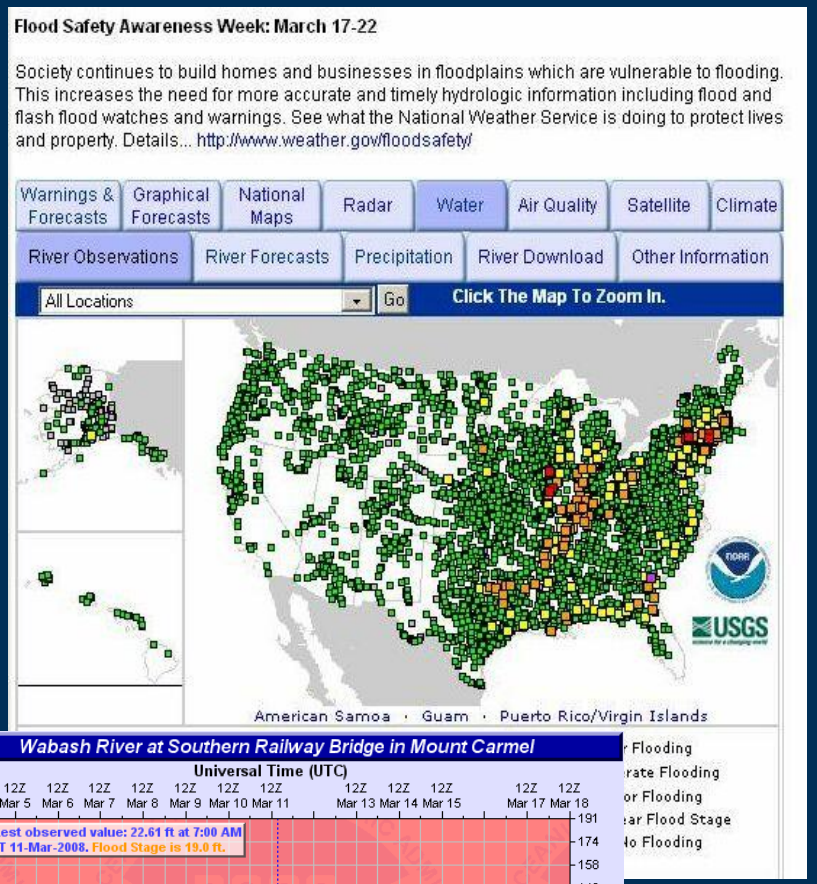


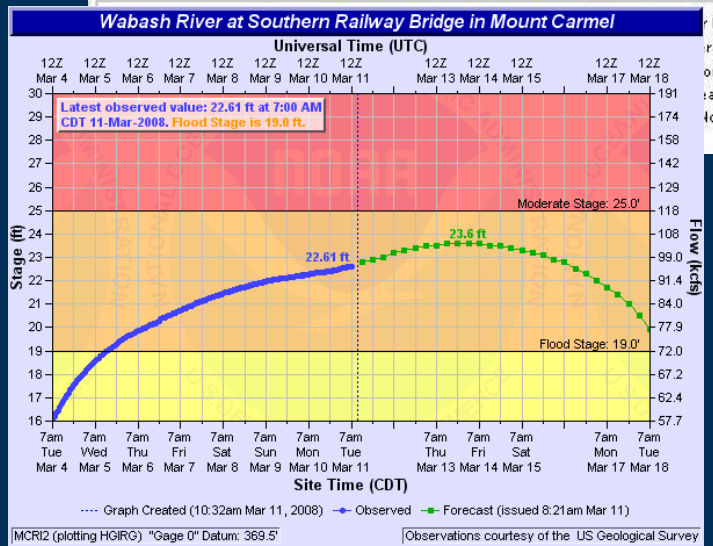
USGS

NWS AHPS: Advanced Hydrologic Prediction Service

- Forecast stage at flood forecast points
- Most collocated at USGS gages

http://www.weather.gov/ahps/

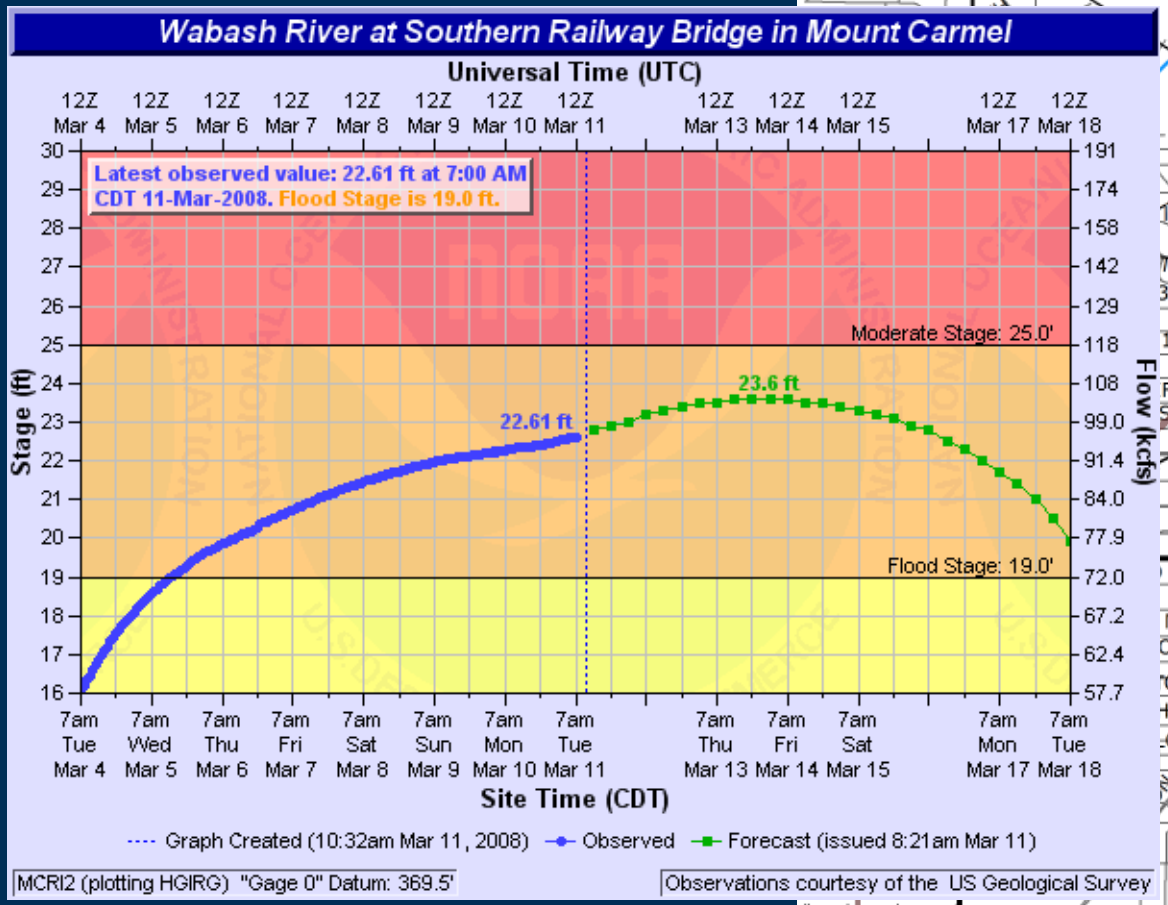


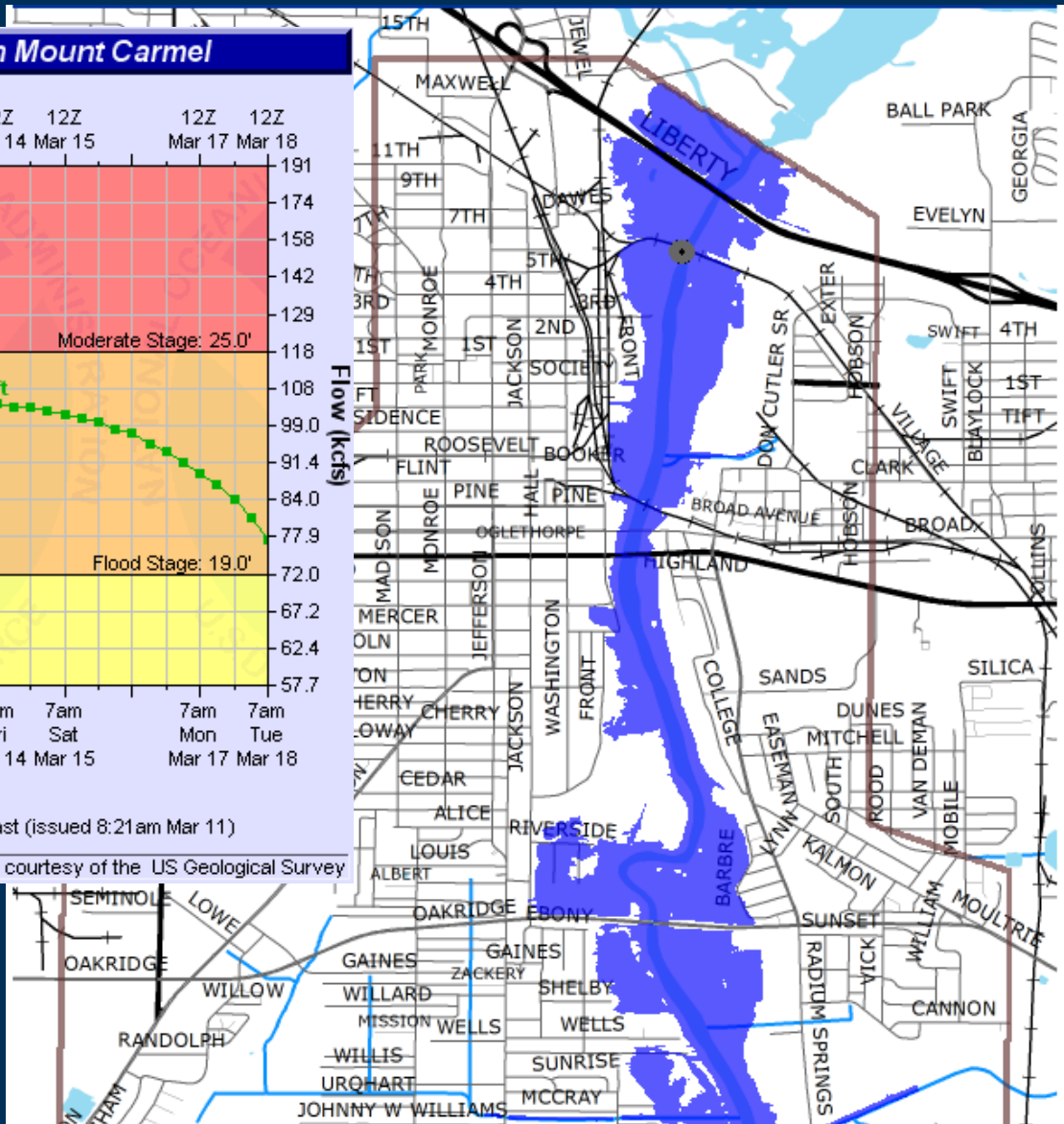


USGS

NOAA NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION U.S. DEPARTMENT OF COMMERCE

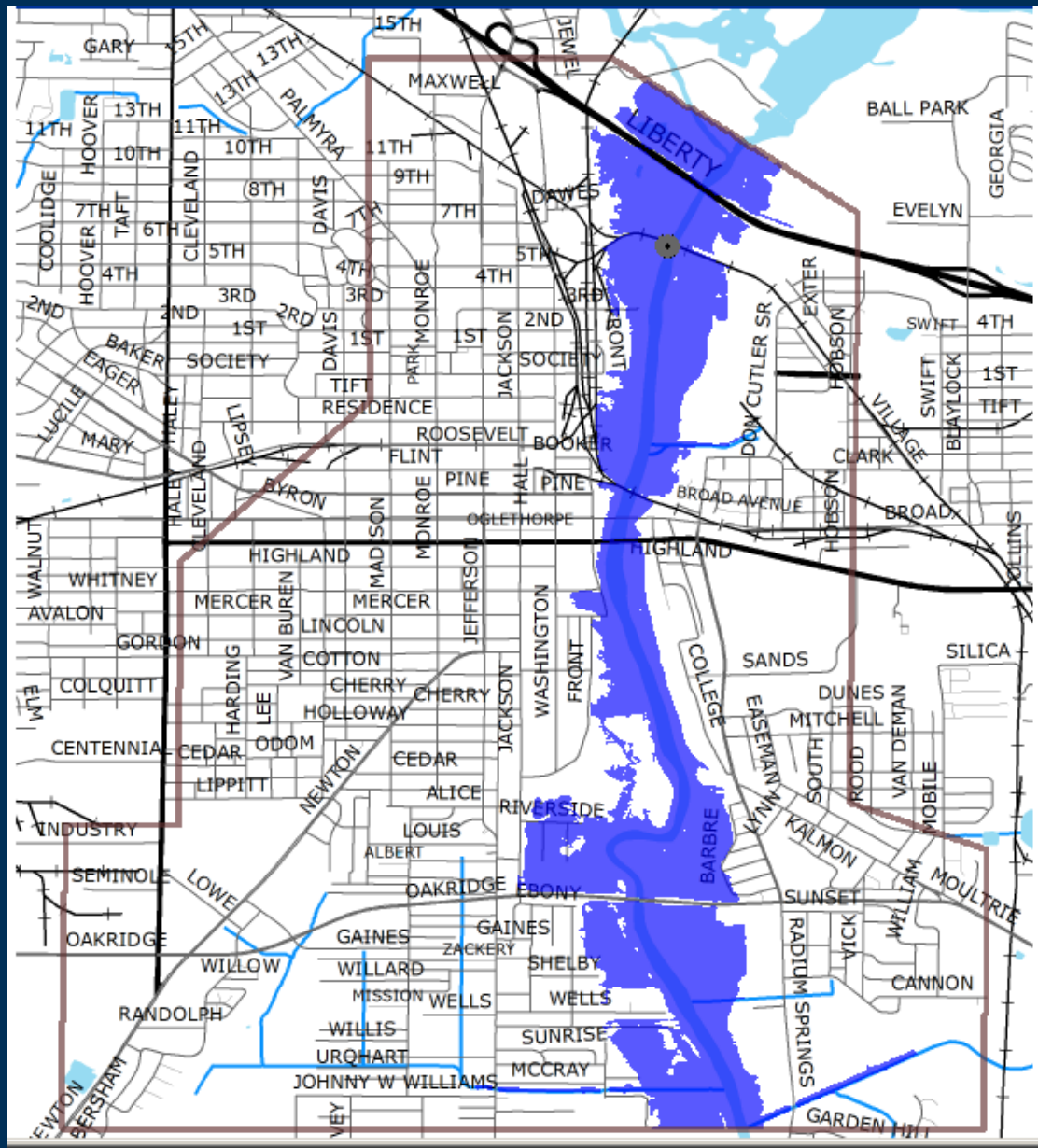
Static Libraries served through NWS Advanced Hydrologic Prediction Service





Static Libraries

12 feet

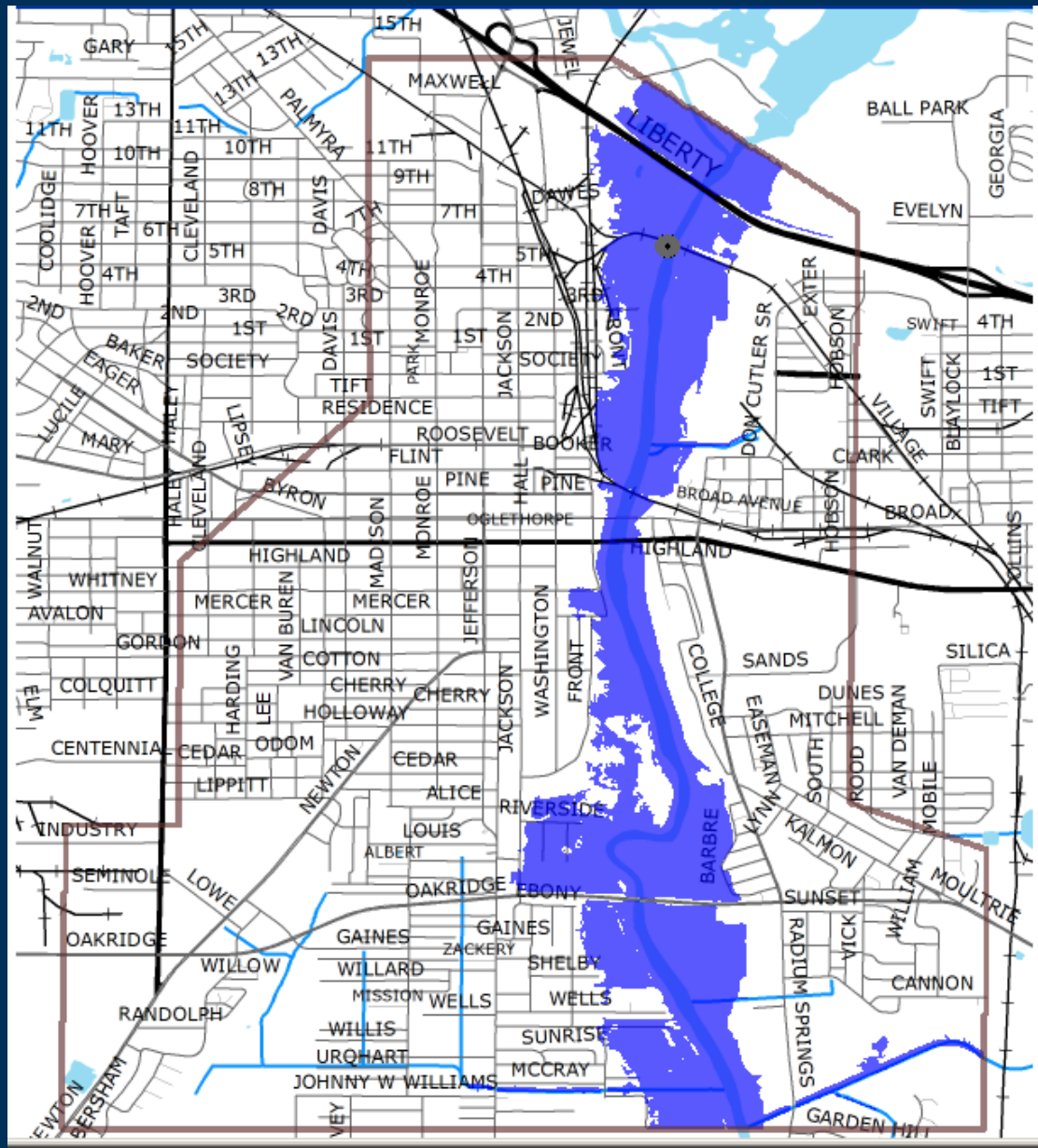


USGS

NATIONAL WEATHER SERVICE

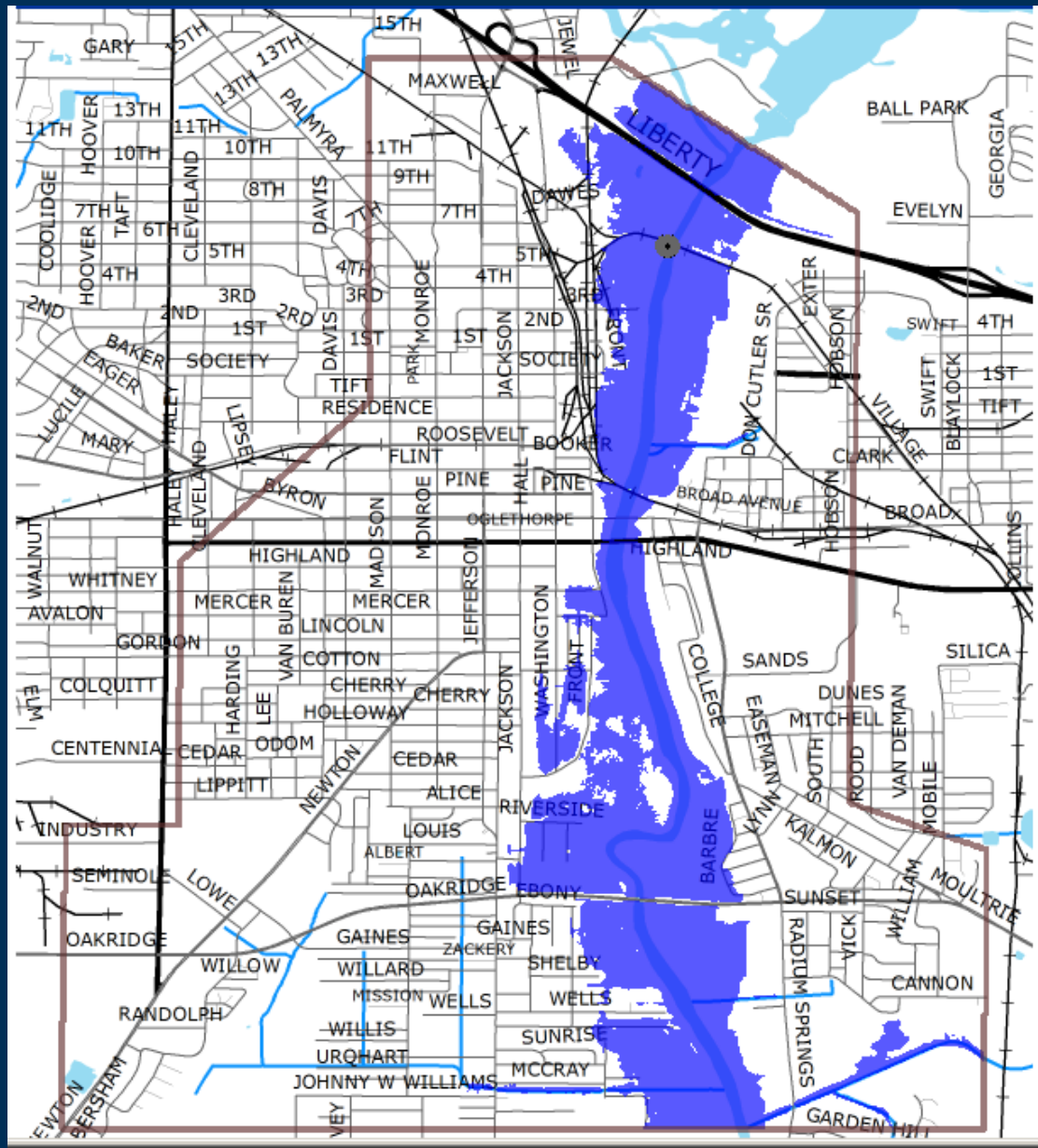
Static Libraries

13 feet



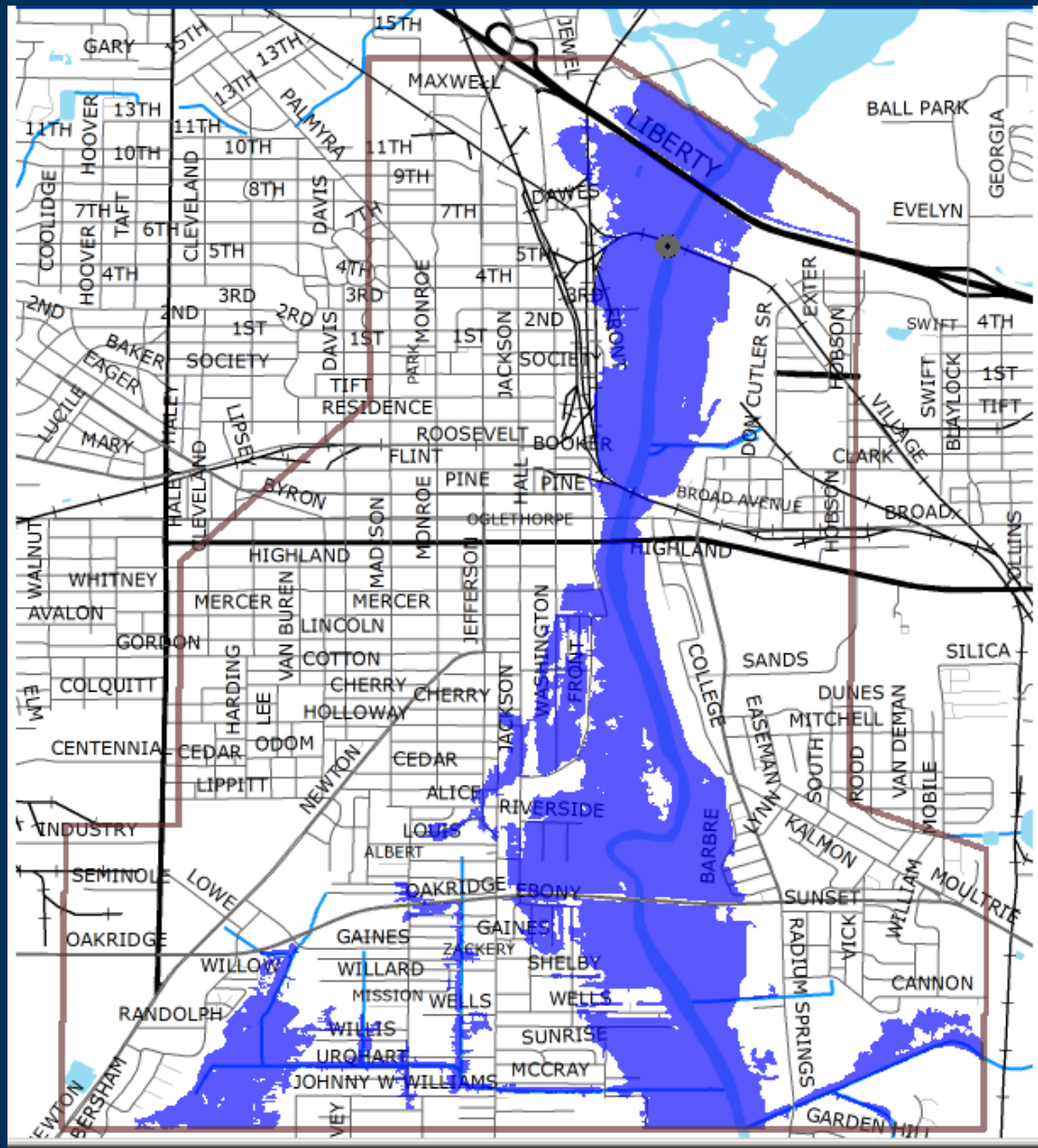
Static Libraries

14 feet



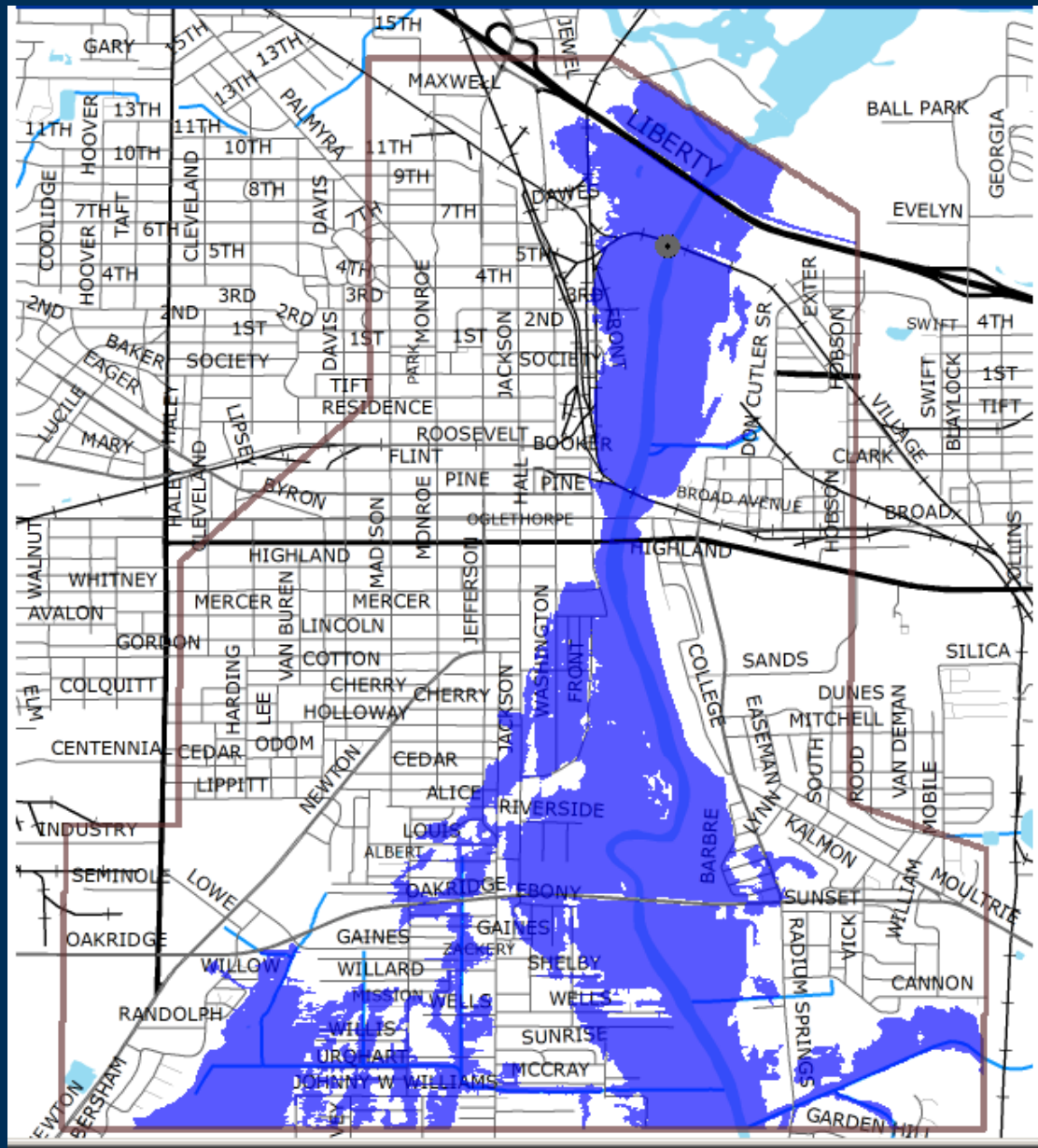
Static Libraries

15 feet



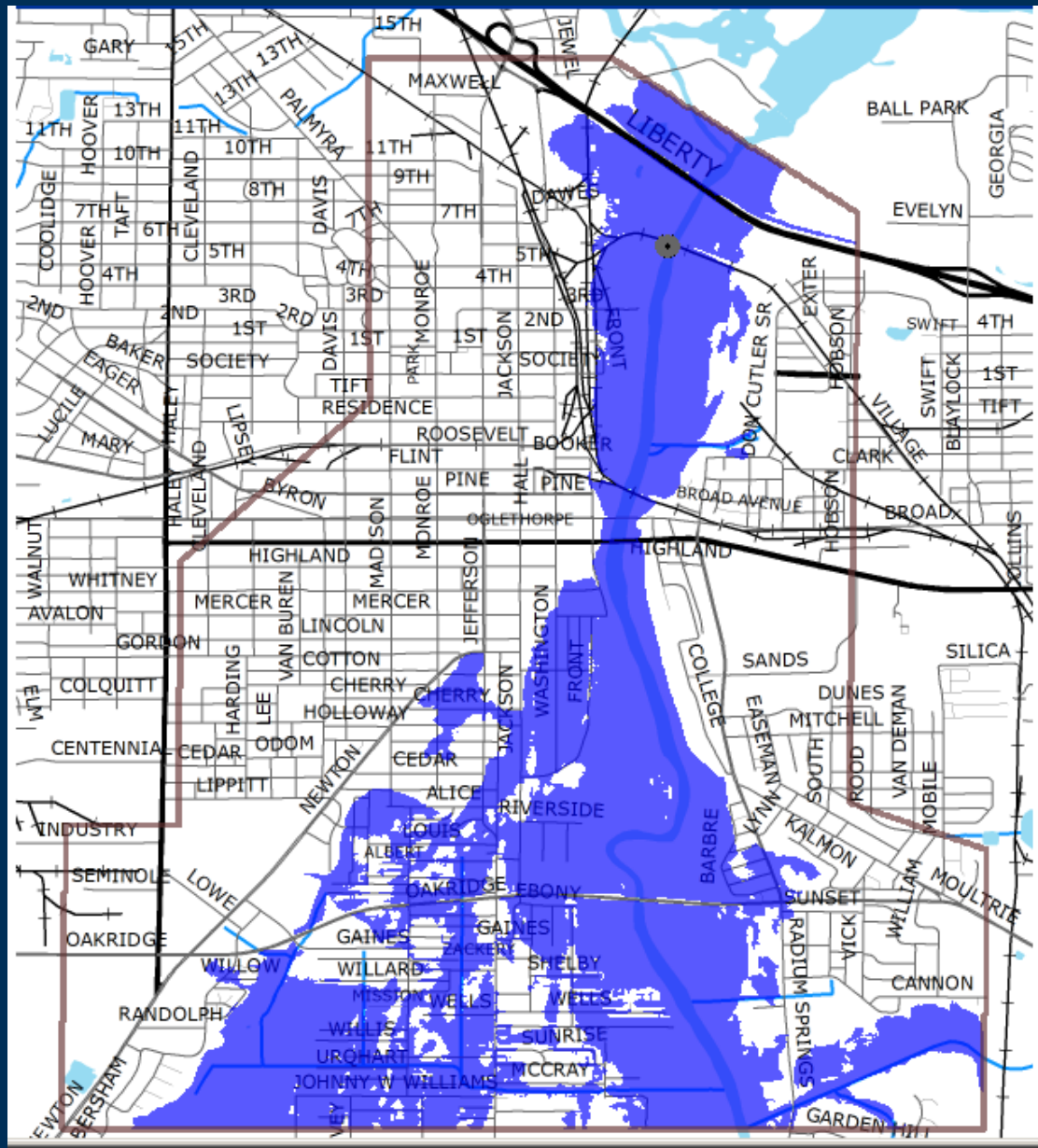
Static Libraries

16 feet



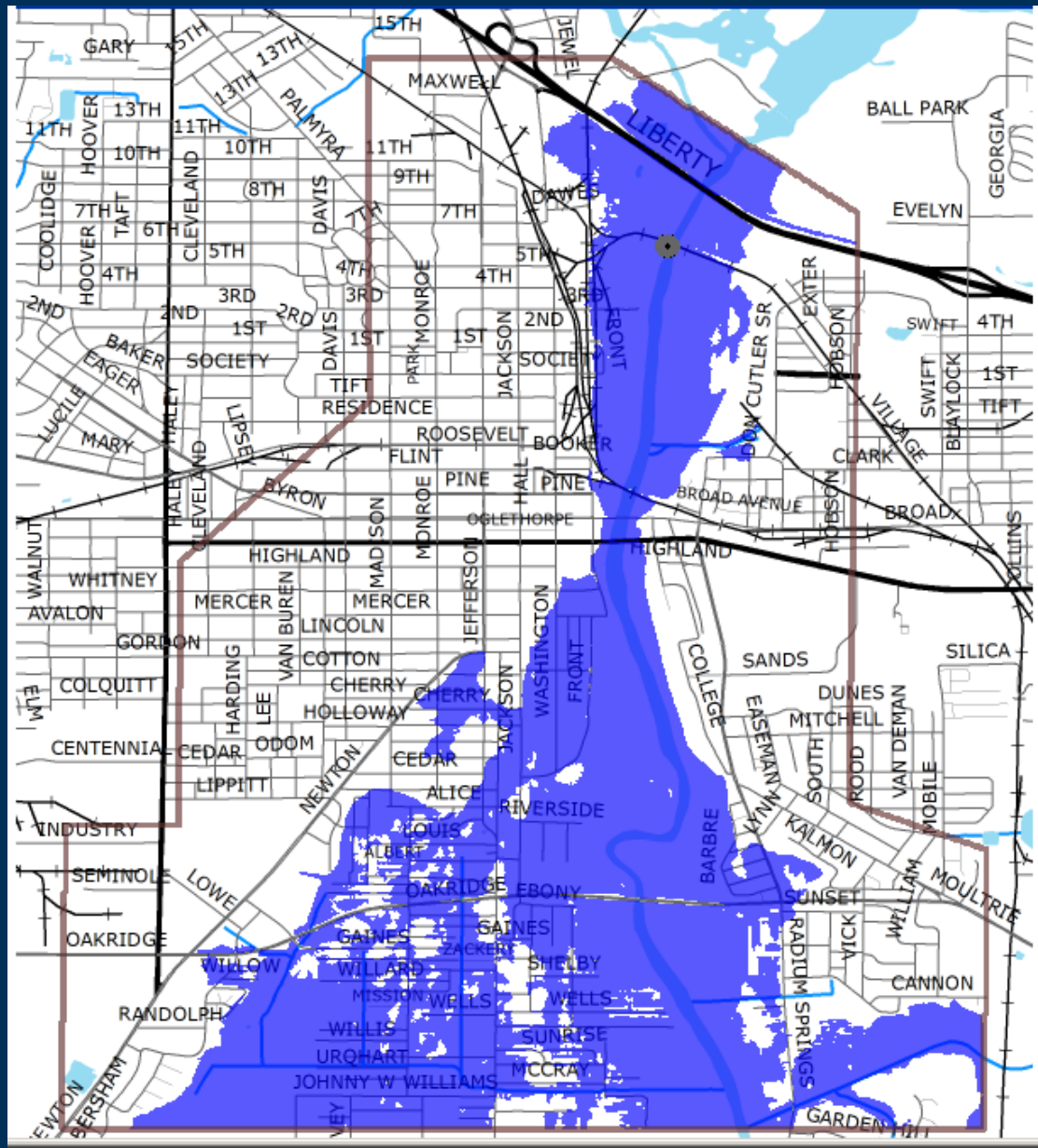
Static Libraries

17 feet



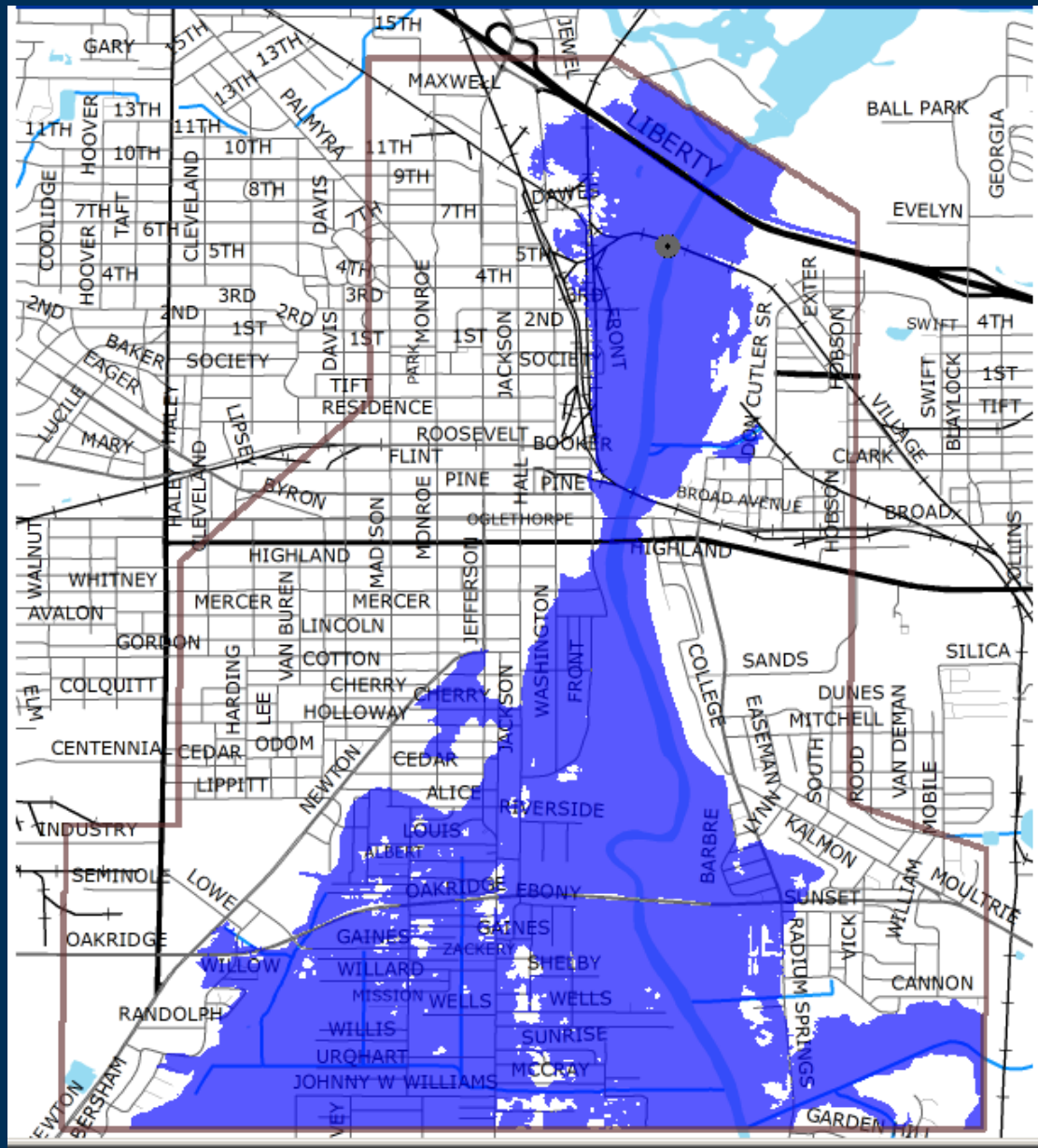
Static Libraries

18 feet



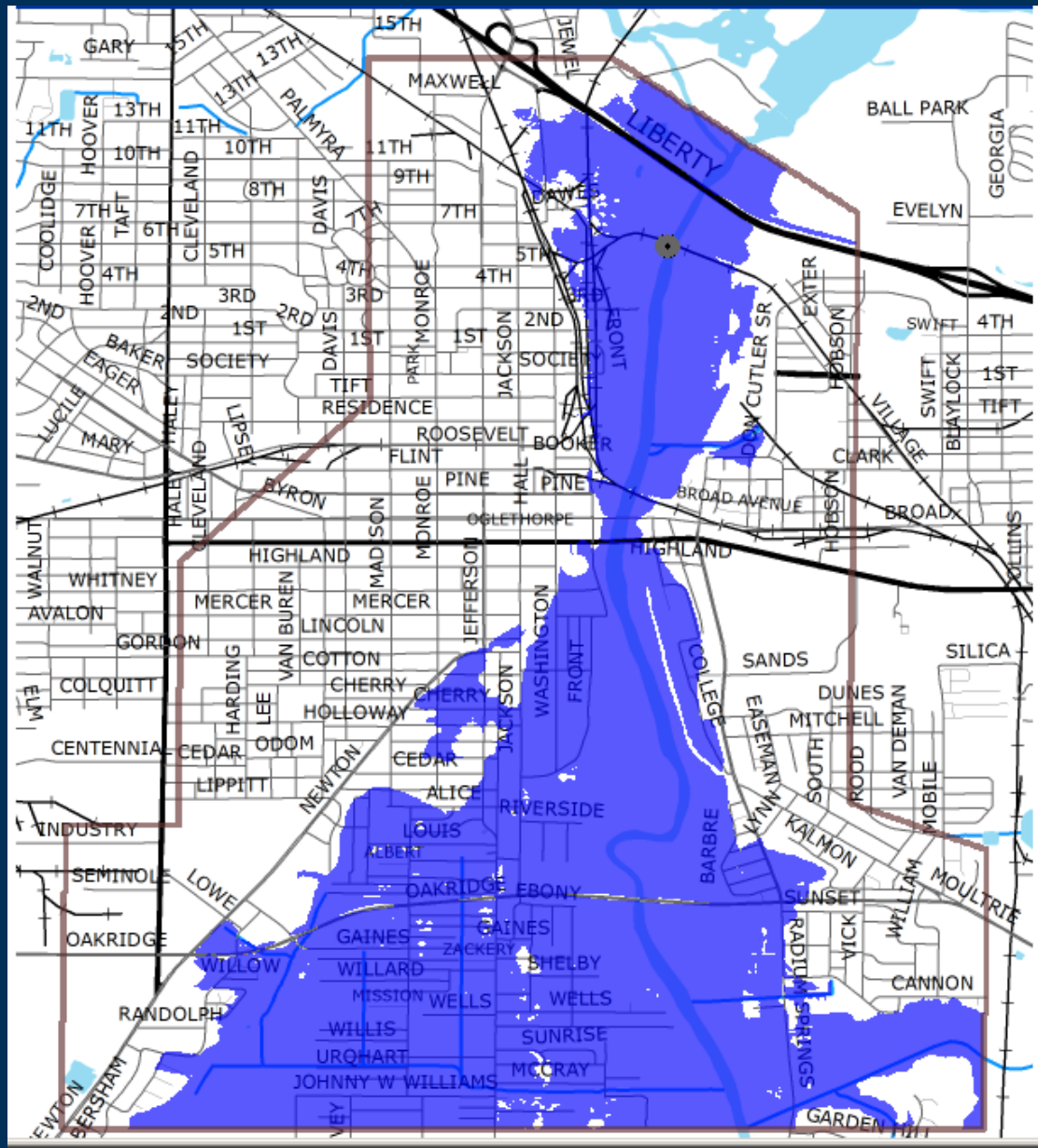
Static Libraries

19 feet



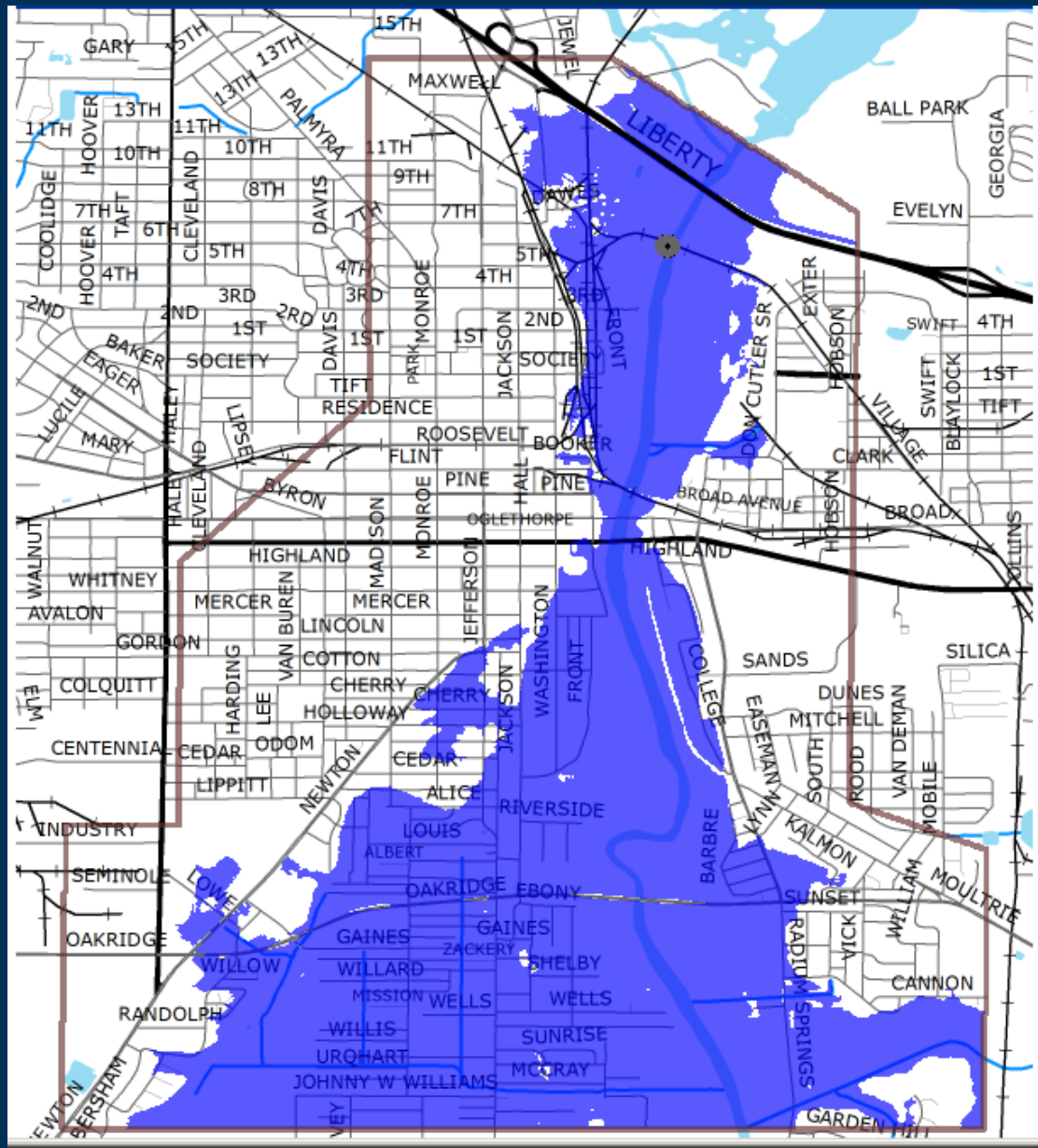
Static Libraries

20 feet



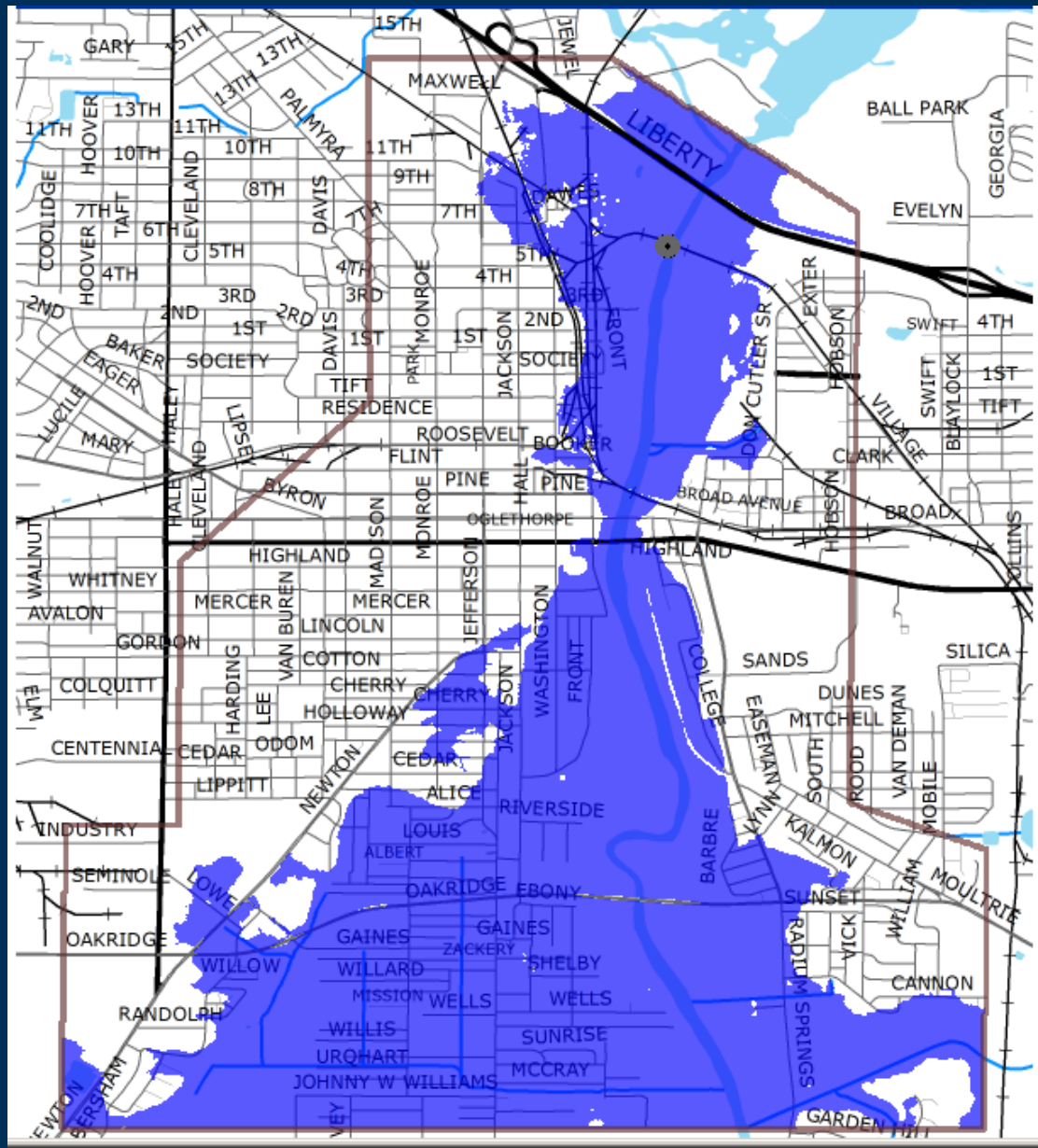
Static Libraries

21 feet



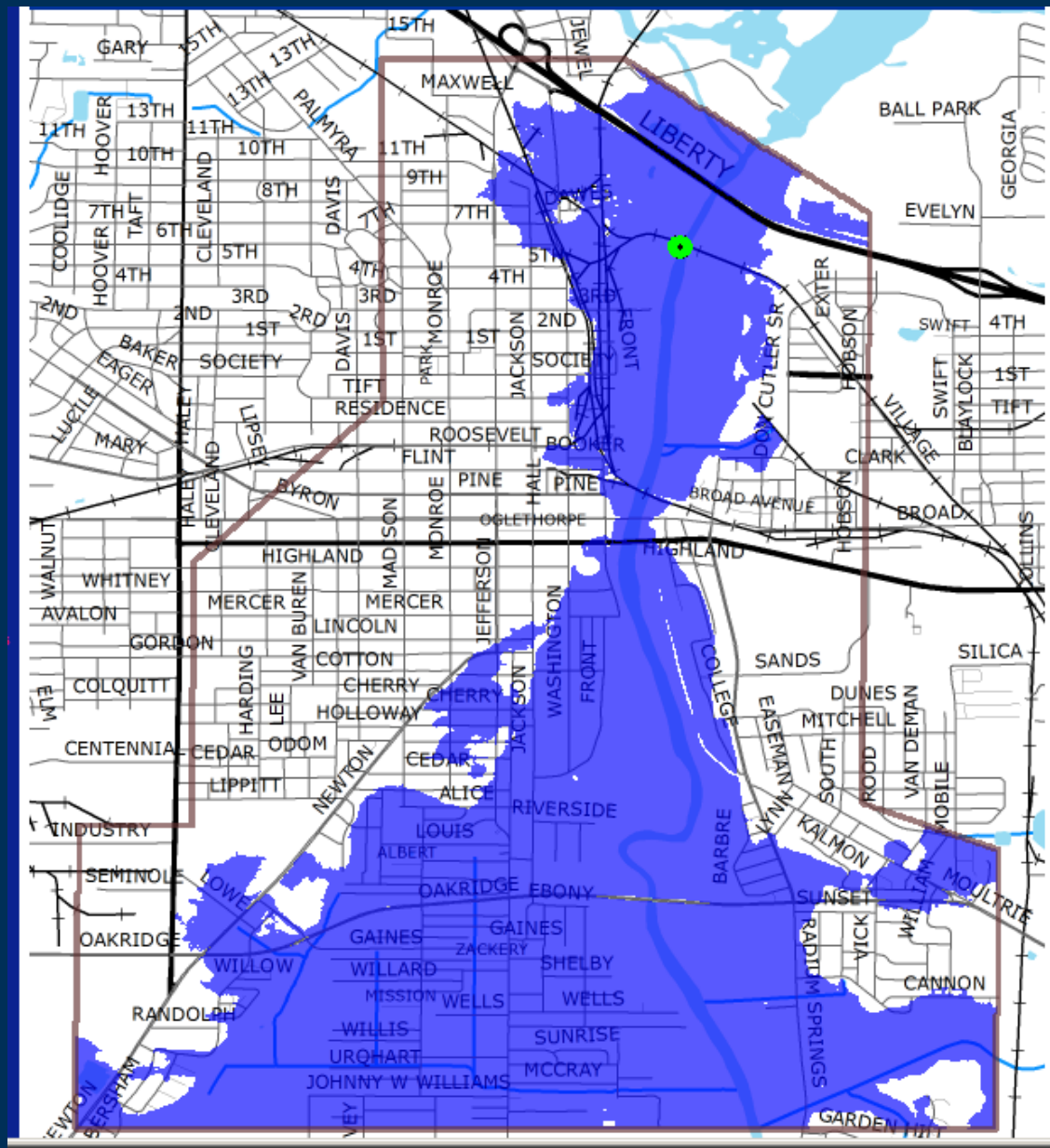
Static Libraries

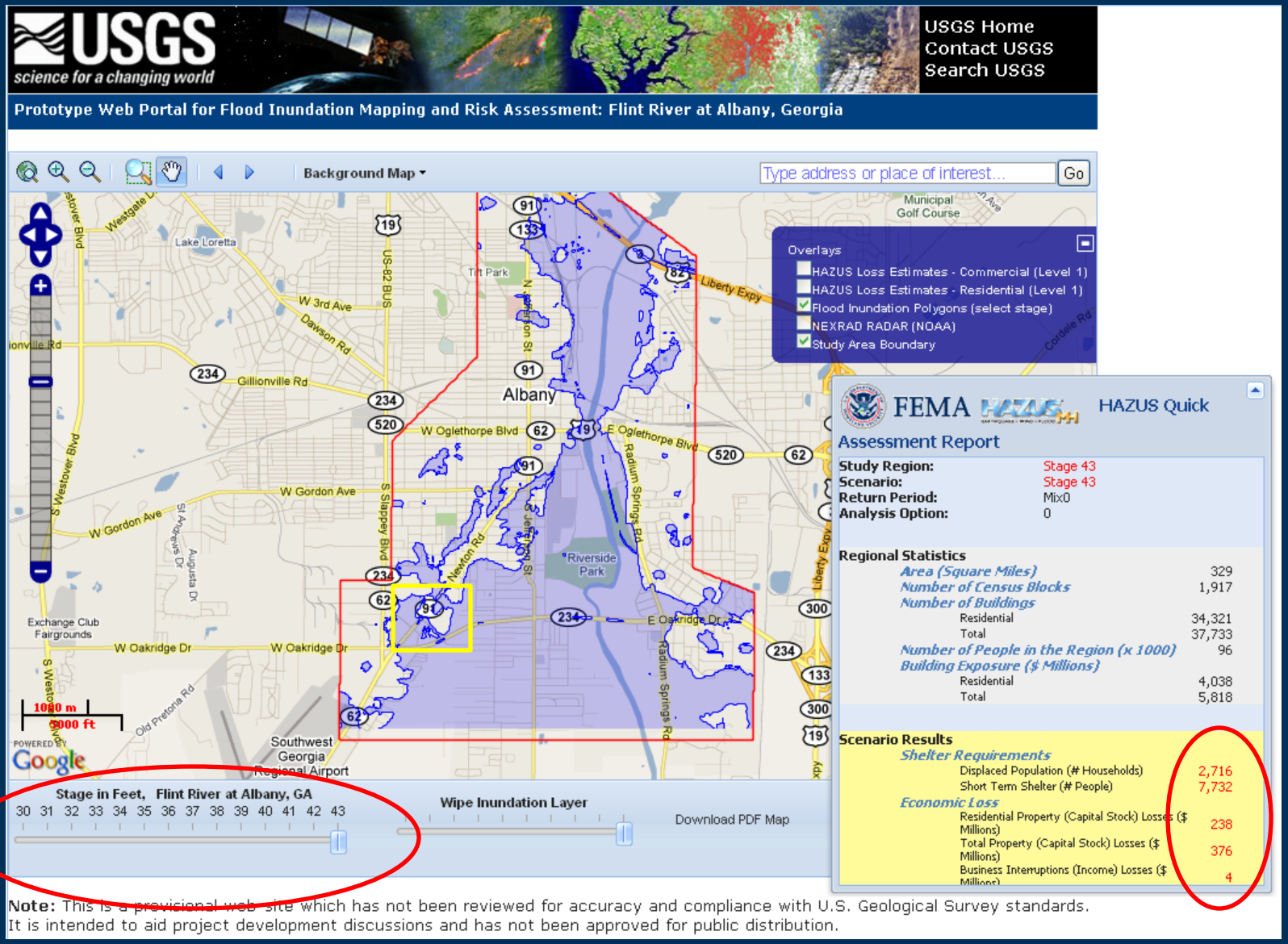
22 feet



Static Libraries

Forecast
Peak



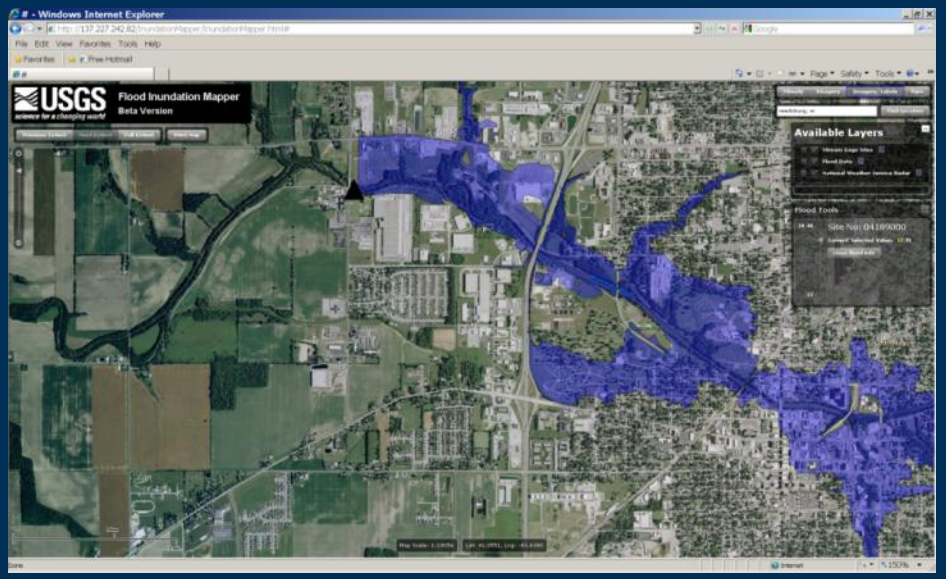


USGS *HAZUS Incorporate affected populations & property*

Other outlets and viewers

File formats make products portable:

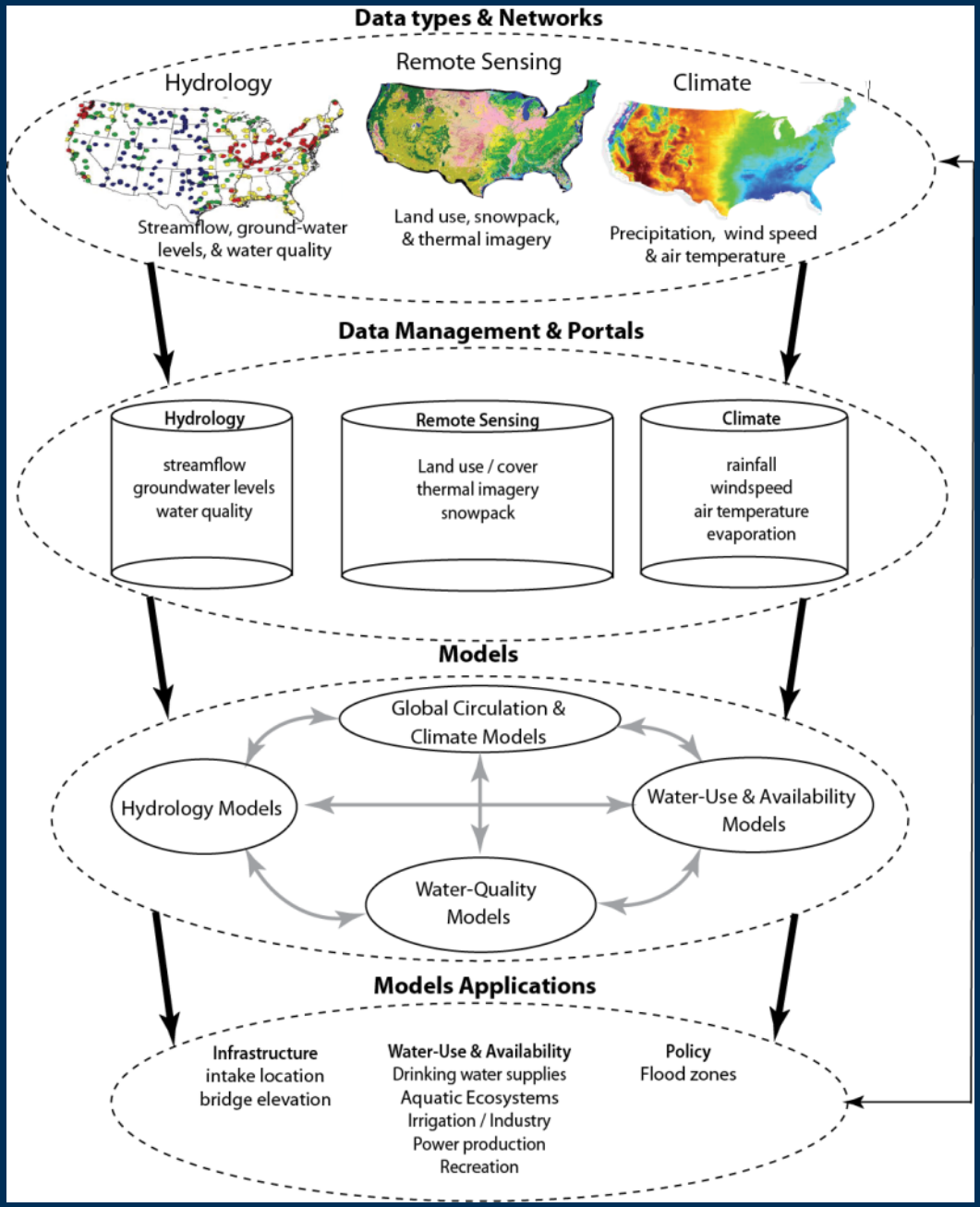
- **National Weather Service Advanced Hydrologic Prediction Service (AHPS)**
- **USGS Web Mapping Applications**
- **Outside map viewers through web services**



USGS

Core Sciences

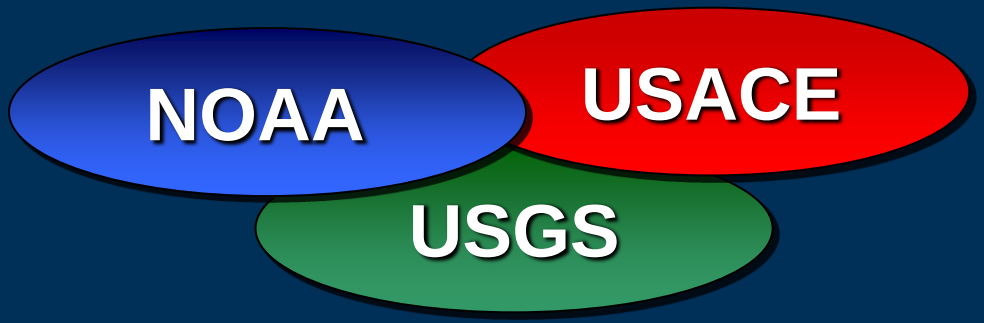
Interoperability – making FIMI products more relevant by being delivered across multiple platforms



USGS

Integrated Water Resources Science and Services (IWRSS)

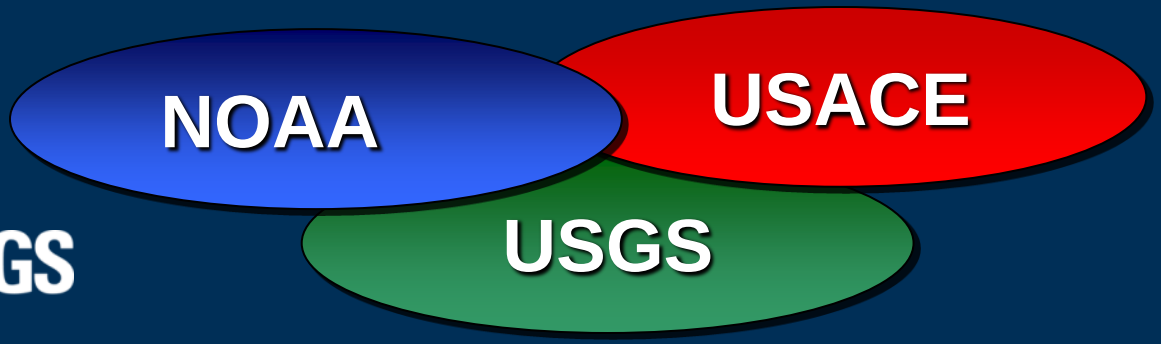
- Integrate information and streamline access
  - Share technology, information, models, best practices
  - Develop system interoperablity and data synchronization
  - Create a Common Operating Picture
- Increase Accuracy and Timeliness of Water Information
- Provide new Summit-to-Sea High Resolution Water Resources Information and Forecasts



USGS

Next Steps

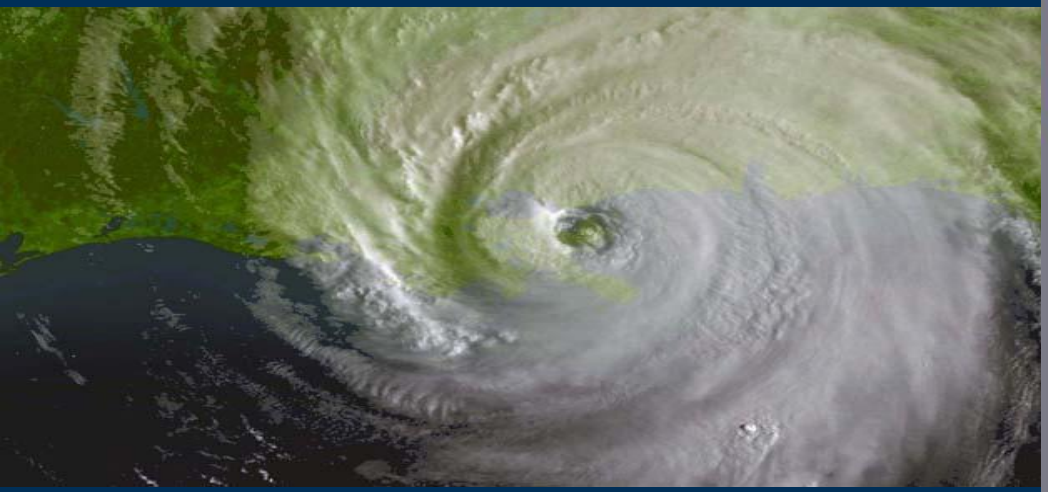
- Map libraries - continue to add States and sites as resources allow (collaborative efforts)
- Continue partner building
  - Solidify Federal Tech Standards through IWRSS
  - Work with FEMA e.g. HAZUS and Risk MAP
  - Floodplain Managers
  - Emergency Management Officials

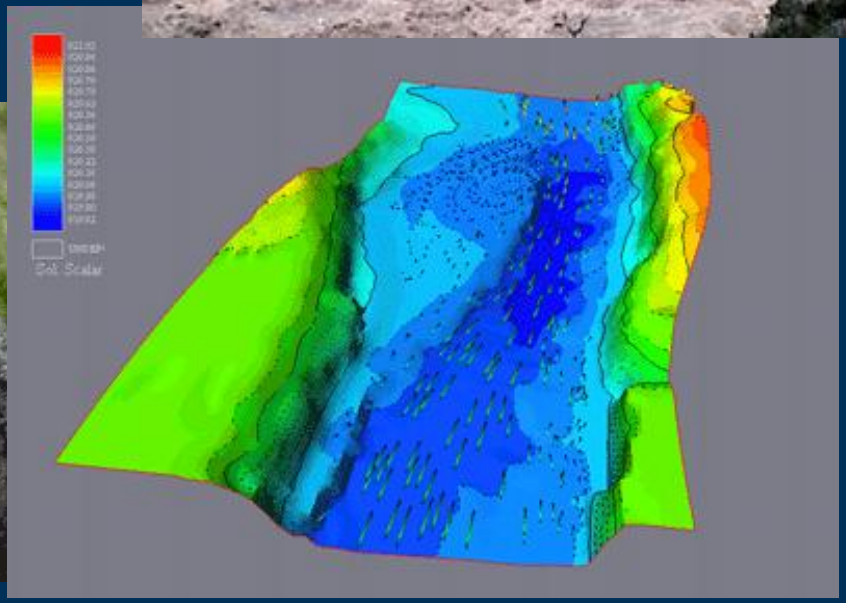


USGS

Mid- to Long-Term Science Challenges

- Conveying uncertainty
- Coastal inundation
- Multi-dimensional modeling methods
- Breach analysis/inundation
- Dynamic applications





Summary and Conclusions

- **Inundation Maps + Real Time Observations + Forecast = Powerful New Tool for Flood Loss Reduction**
  - Partnerships make it possible
  - Partnering Reduces Costs and Improves Efficiency
  - Process is Highly expandable in scope and scale
- **A multi-agency effort will be required to develop and improve**
  - numerical models,
  - inundation mapping,
  - visualization, and
  - decision-support tools

that will help meet future challenges / needs

USGS and NWS believe current Flood Inundation Mapping collaborations and IWRSS are steps in the right direction.

Thank you!

K. Scott Jackson, P.E.
USGS Ohio Water Science Center

June 9, 2011
Arizona Floodplain Managers Conference