

# Using LiDAR for Floodplain Mapping

**KGS Annual Meeting**

**May 16, 2014**

**Division of Water**

**Department for Environmental Protection  
Energy & Environment Cabinet**



*To Protect and Enhance Kentucky's Environment*

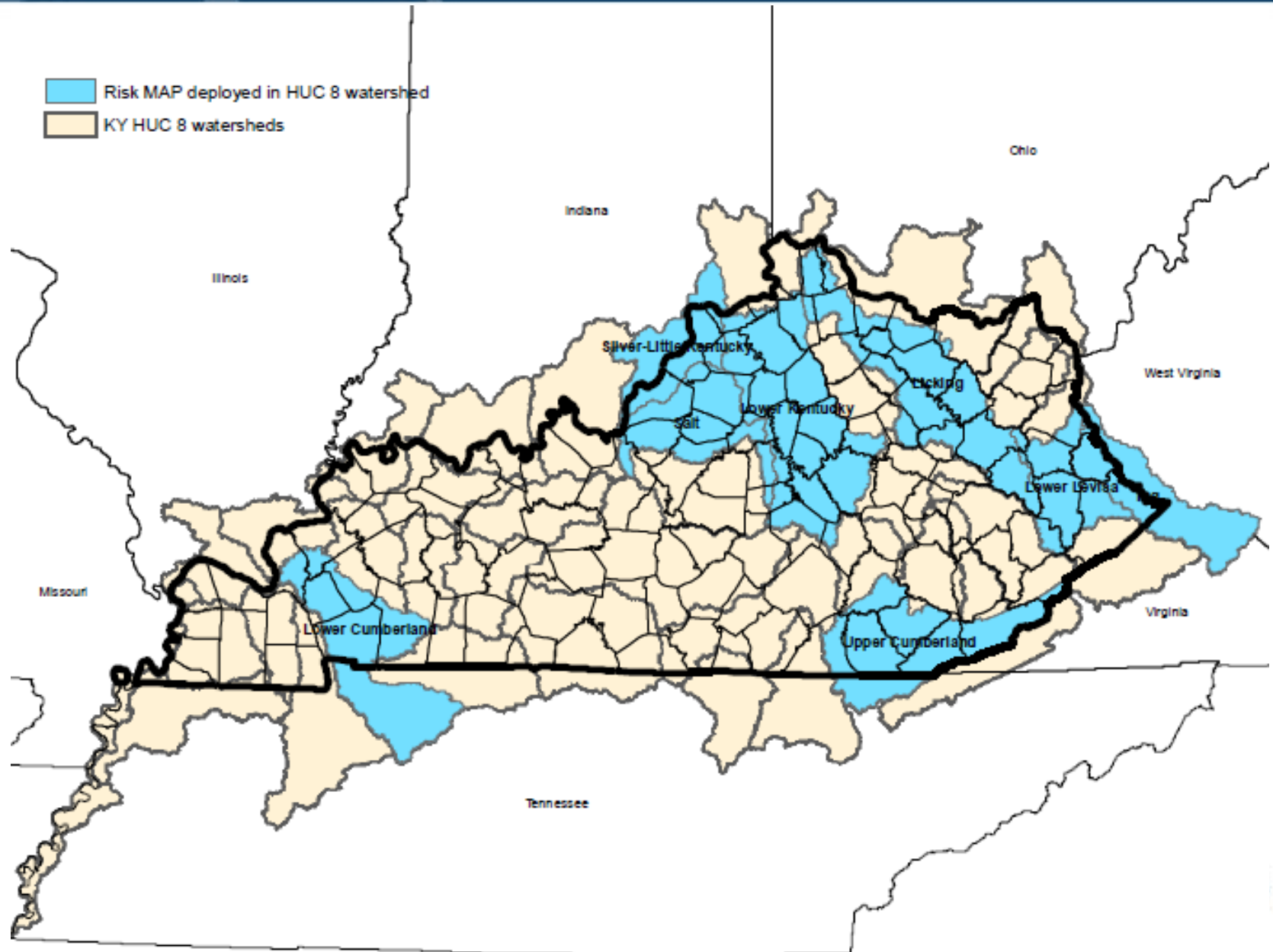
**Kentucky**  
UNBRIDLED SPIRIT™

# Risk MAP in Kentucky

- Risk Mapping, Assessment, and Planning (Risk MAP) is a collaborative effort that will provide communities with flood information and tools they can use to better protect their citizens.
  - Builds on traditional



# Risk MAP Deployment



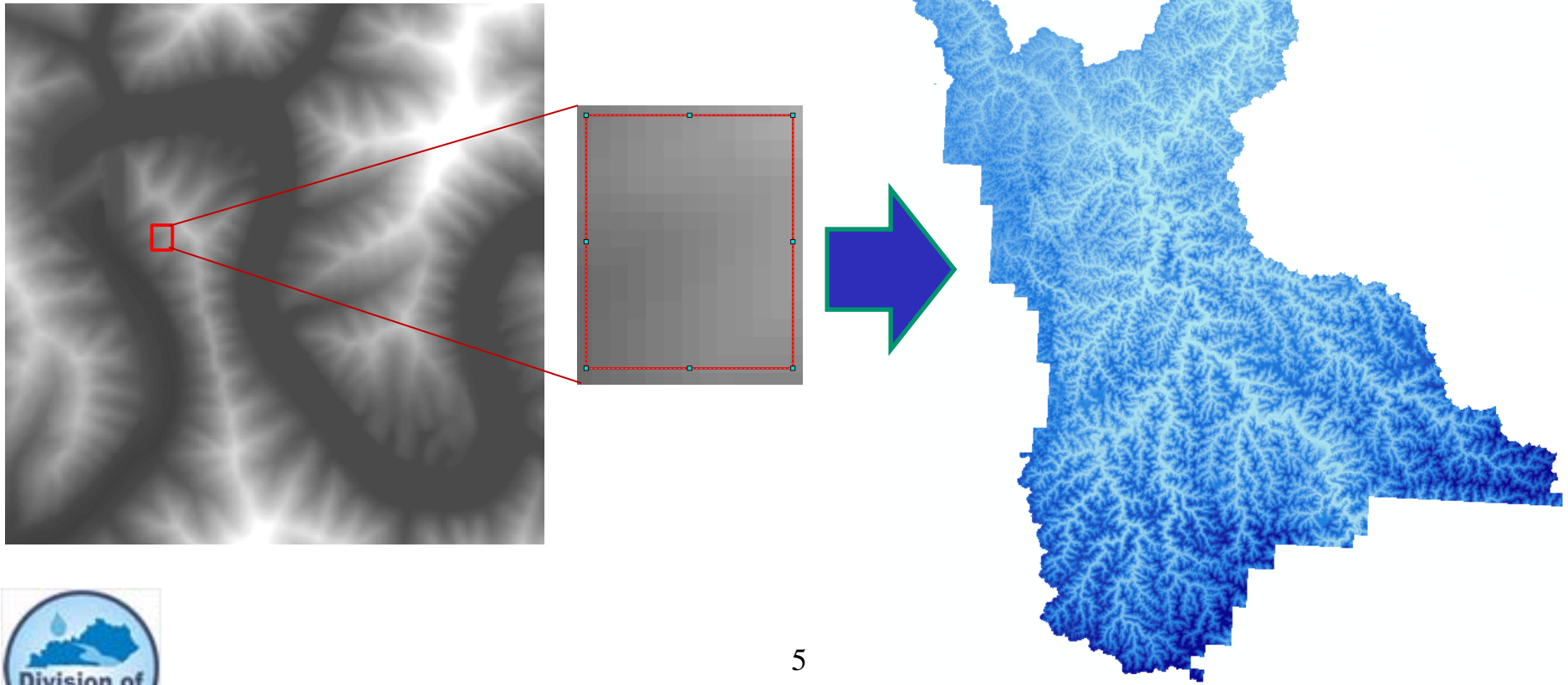
# LiDAR for Floodplain Mapping

- Used for:
  - Base terrain layer
  - Hydraulic analyses
  - Floodplain delineation
  - Non-regulatory Risk MAP datasets



# Base Terrain Layer

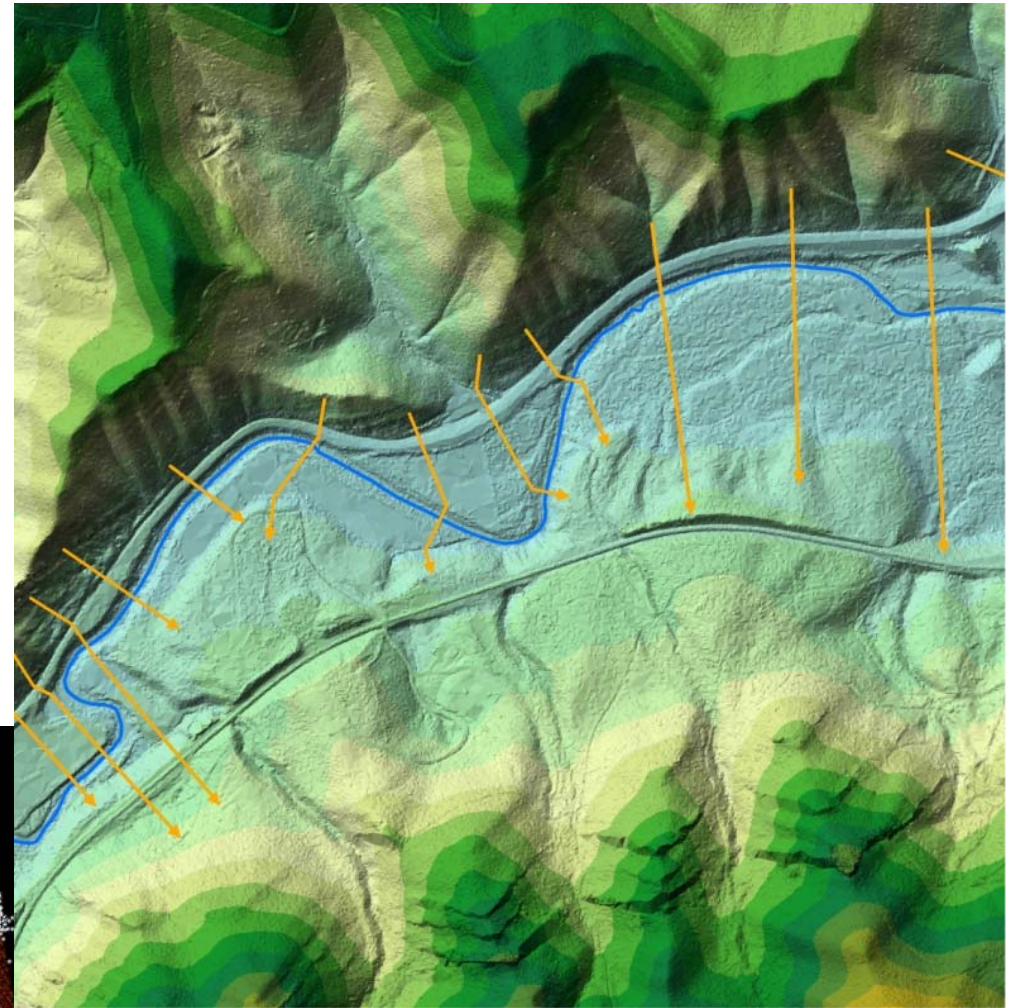
- 5ft cell size DEMs
- Mosaiced to create terrain DEM





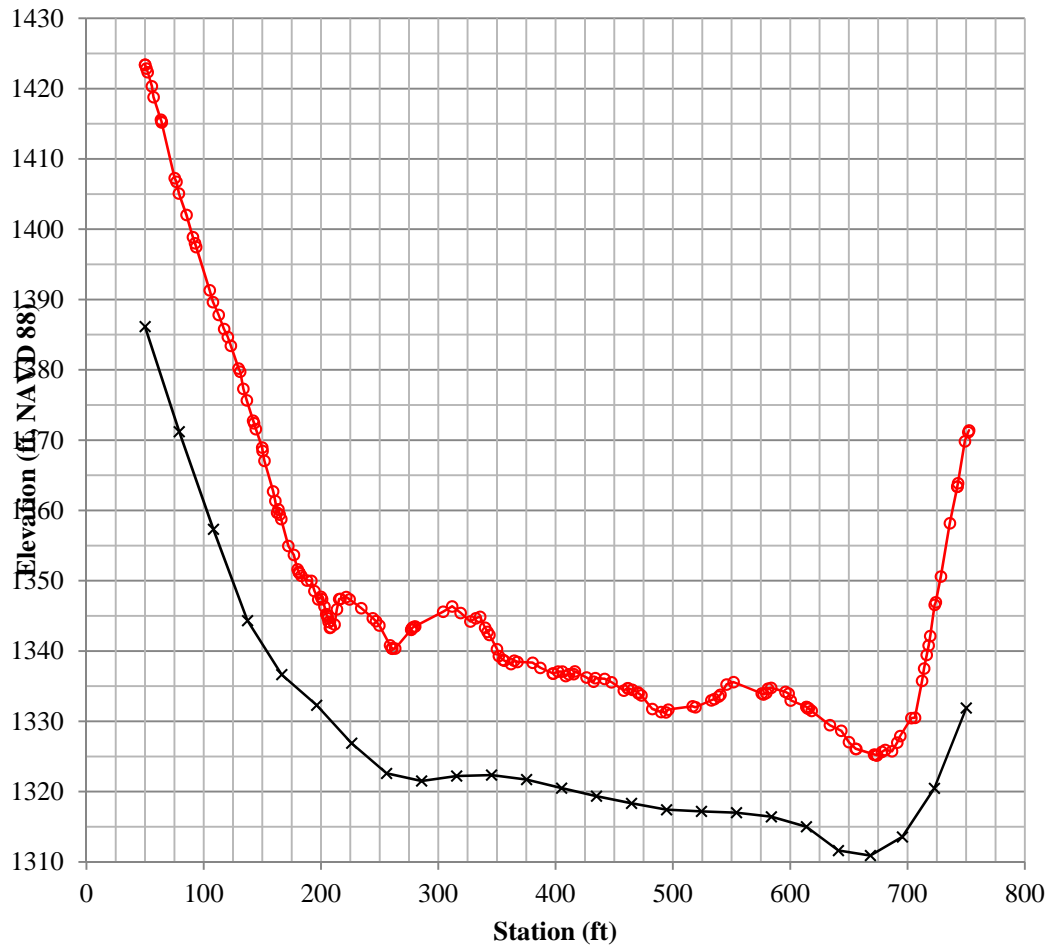
# Hydraulic Analyses

- Creation of modeling cross sections
- Identification of hydraulic structures
  - Bridges
  - Culverts



# Hydraulic Cross Sections

Cross-section profile of USGS 10-meter DEM and LiDAR-based TIN data



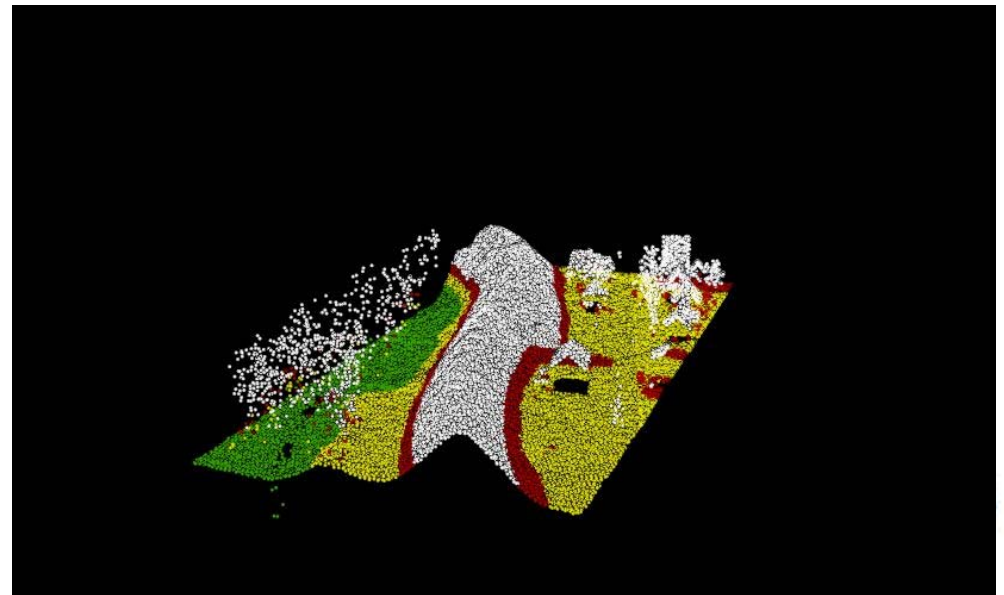
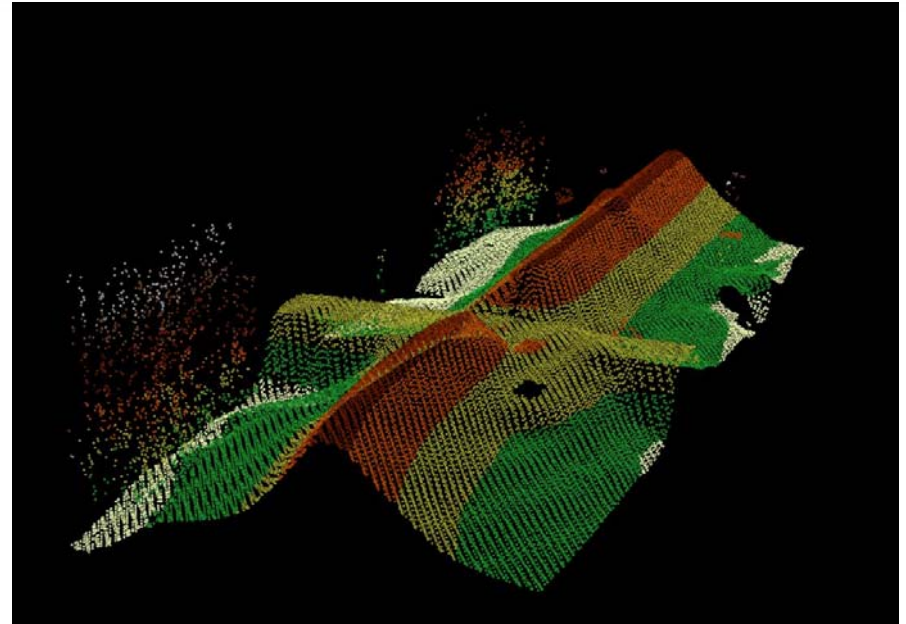
—x— USGS 10-meter DEM    —o— LiDAR TIN data





# Levee Analyses and Mapping

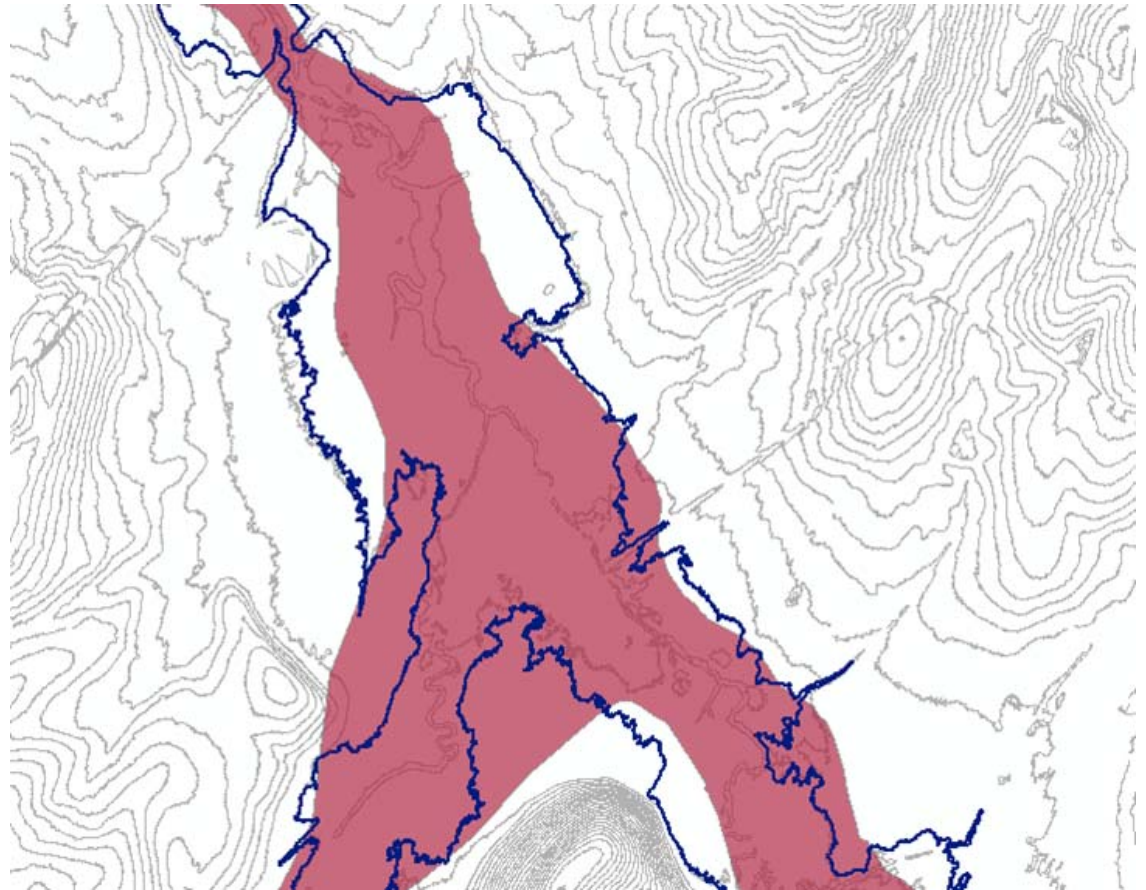
- FEMA Levee Analysis and Mapping Procedures pilot project
  - Condition of levee
  - Closures
  - Mapping





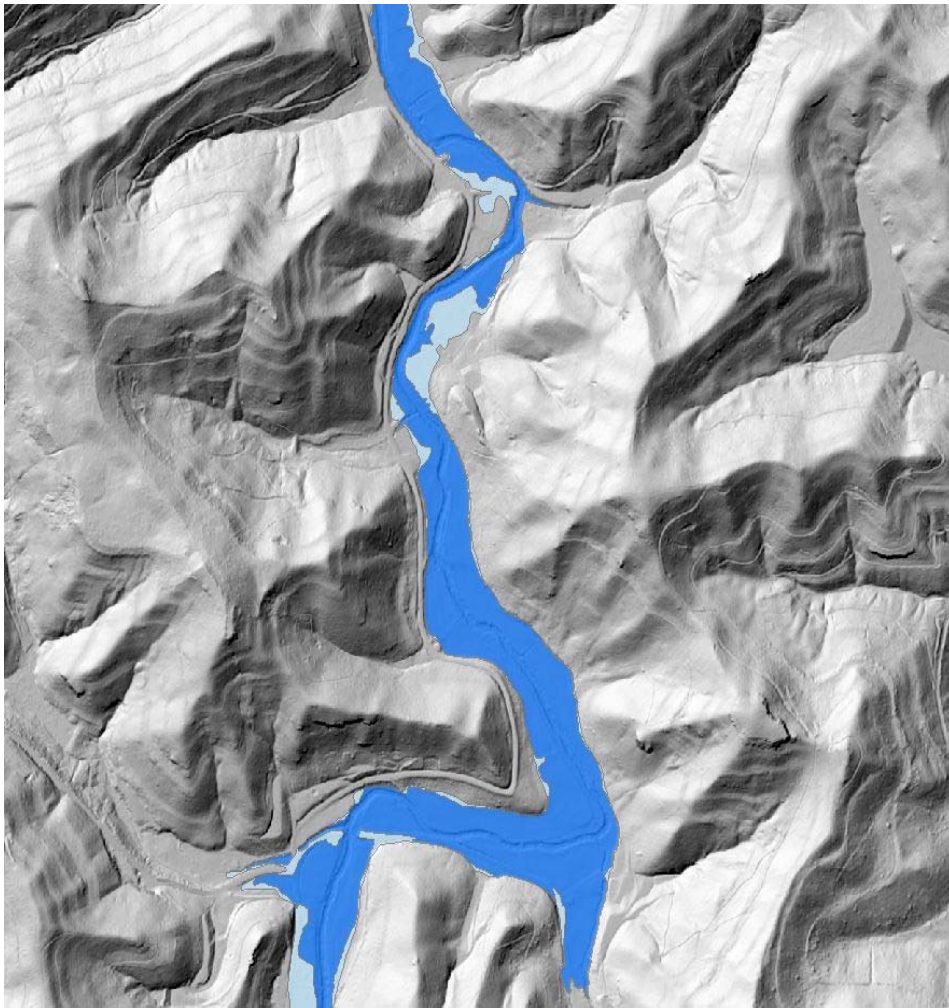
# Floodplain Delineation

- More precise identification of flood hazard areas
- Useful for
  - New studies
  - Redelineation of older studies
- LiDAR DEM
  - 15 cm RSME
- NED 10M DEM
  - +/- ½ contour interval

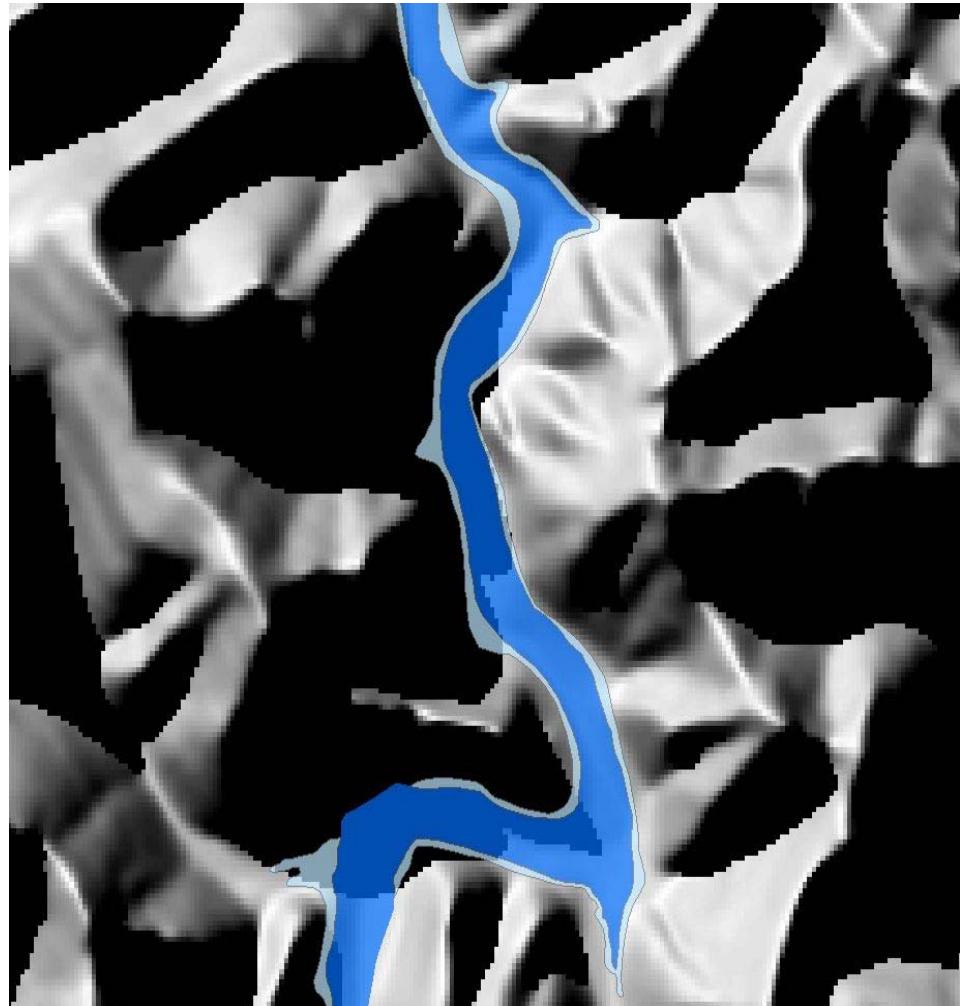


# Floodplain Delineation

## Poor Fork – Harlan County



LiDAR Floodplain (1% & 0.2 %  
annual chance floodplain)

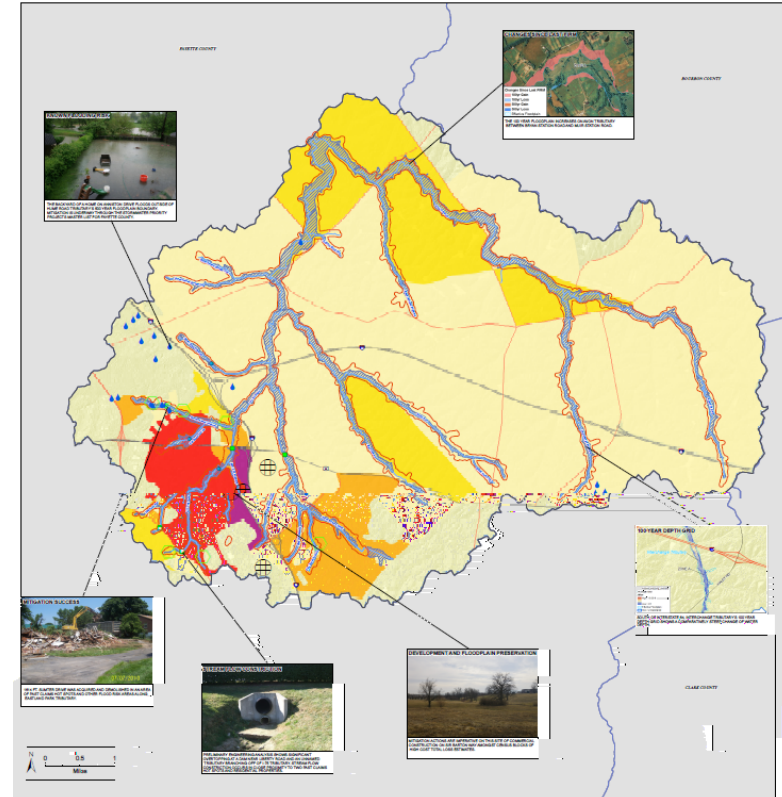


10M DEM Floodplain (1% & 0.2%  
annual chance floodplain)

# Risk MAP Datasets

- Non-regulatory datasets to better communicate flood risk
  - Changes Since last FIRM
  - Flood Depth and Analysis Grids
  - HAZUS risk assessment

Flood Risk Map: HUC - 051002050801, Fayette County, Kentucky



MAP SYMBOLS		WATERSHED LOCATOR	
Circle	Flood Data	Very Low	Flood Control Not Done
100-Year Flood	Hazardous Areas	Low	Flood Control Done
500-Year Flood	Flood Risk	High	Flood Control Planned
Interstate	Very High	Very High	Other Flood Risk Area
Other Roads	Very High	Very High	

**NATIONAL FLOOD INSURANCE PROGRAM**  
 FIRM FLOOD RISK MAP  
 HUC-051002050801 Fayette County, KY  
  
 HUC: 051002050801  
 051002050801  
 FOR MORE INFORMATION ON THE DATA  
 FROM THIS MAP PLEASE CONTACT  
 THE PROJECT TEAM AT 800-368-7688  
 RELEASE DATE  
 8/1/08, 8/8/08





# Changes Since Last FIRM

## Changes Since Last FIRM

- SFHA Decrease
- Floodway Decrease
- SFHA Increase
- Floodway Increase
- No Zone Change
- Non-SFHA Decrease
- Non-SFHA Increase



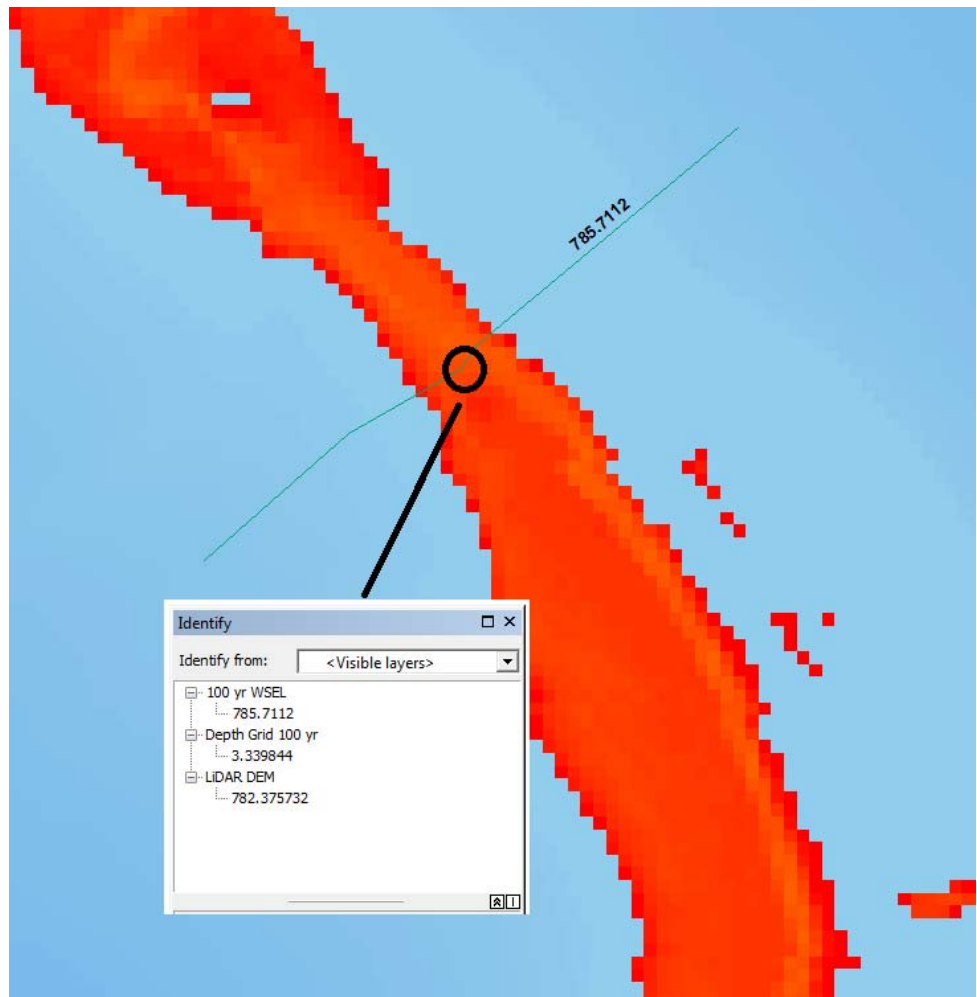
- Communicates areas that have changed since a communities' last FIRM





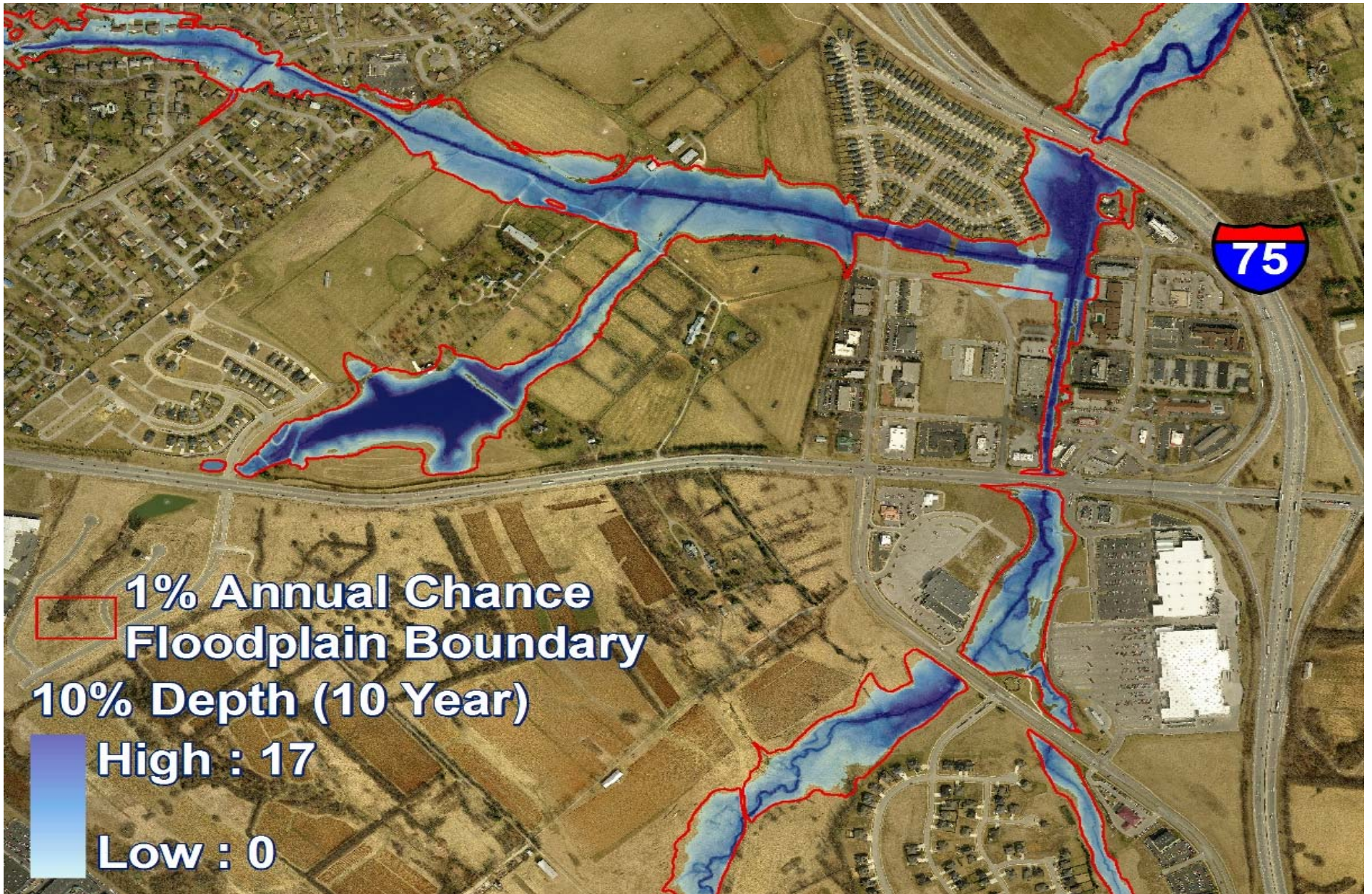
# Flood Depth Grids

- Create TIN from LiDAR based DEM
- Create TIN from Water Surface Elevations (WSEs)
- Subtract DEM elevation from WSEL to obtain flood depth grid





# Flood Depth Grids

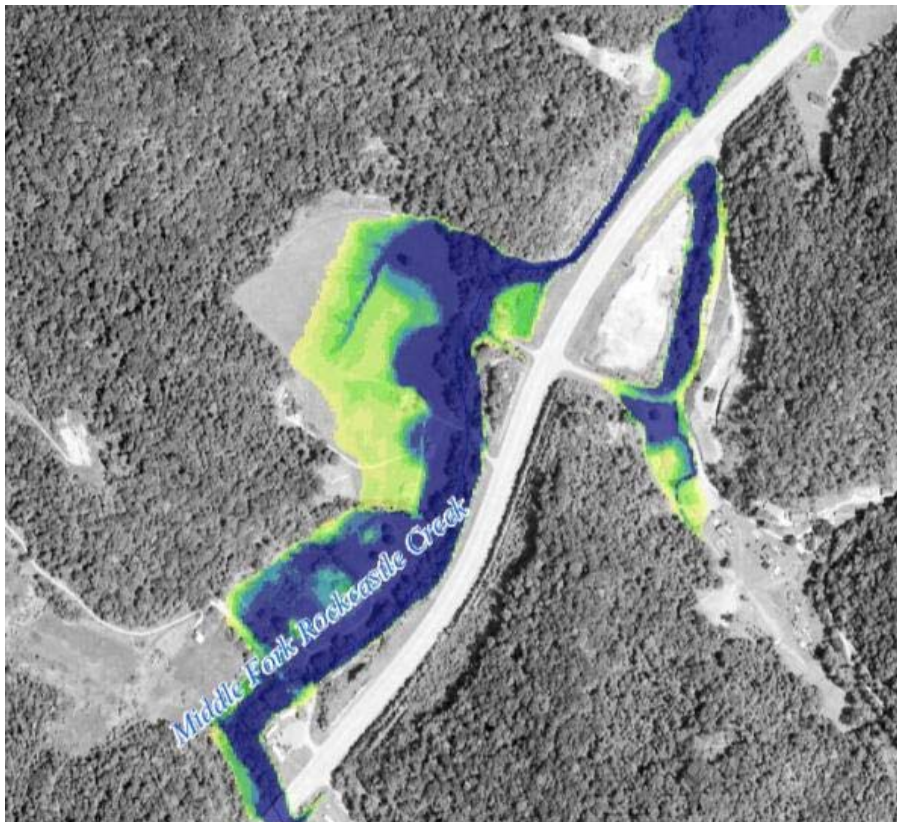
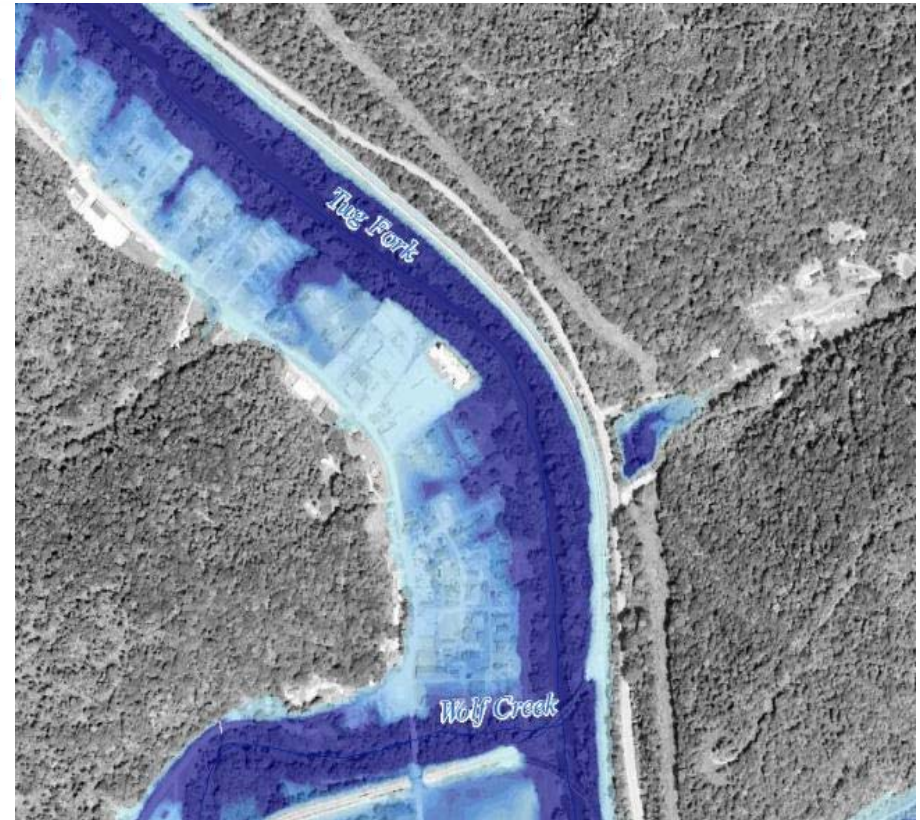




# Flood Analysis Grids

- Grids to depict
  - Probability of flooding in any given year
  - Probability of flooding in 30-year period

Percent Annual Chance Grid  
Value  
High : 10  
Low : 0.200076



Percent Chance Over 30 Years  
Value  
High : 0.957609  
Low : 0.0583292

# Questions?



Carey Johnson  
Kentucky Division of Water  
Phone: (502) 564-3410  
Email: [carey.johnson@ky.gov](mailto:carey.johnson@ky.gov)

