Outline

• Flood inundation projects completed in Kentucky
• Overview of general steps involved in flood inundation projects
• Closer look at the Falmouth, Kentucky flood inundation project
• Live demo of USGS Flood Inundation Mapping website
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Flood Inundation Projects Completed in Kentucky

Hopkinsville, Kentucky

Frankfort, Kentucky

http://pubs.usgs.gov/sim/3242/

http://pubs.usgs.gov/sim/3278/
Flood Inundation Project Objectives

• **Develop** detailed libraries of flood inundation maps for a river reach of interest.

• **Use** the flood inundation maps in conjunction with the National Weather Service (NWS) Advanced Hydrologic Prediction Service flood warning system to show predicted areas of flood inundation.
  – Helps with preplanning **flood response** and early flood warning

• **Provide** online portals for the public to view USGS flood inundation study information and interact with the flood inundation map libraries.

The flood inundation maps, along with online information regarding current stages from USGS streamgage and forecasted stages from the NWS, provide emergency management and local residents with critical information for flood mitigation and response activities.
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Flood Inundation Project Phases

**Phase 1** – Project Scoping and Planning

*Site selection, modeling approach, and data collection*

**Phase 2A** – Hydraulic Analyses

*Build and calibrate hydraulic model*

**Phase 2B** – Mapping

*Create flood inundation map products*

**Phase 3** – USGS Flood Inundation Mapping Science (FIMI) and NWS Advanced Hydrologic Prediction Service (AHPS) Web Implementation

*Make maps public by publishing on the web.*
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USGS Streamgage (s) within study domain
Phase 1 – 2A: Scoping/Approach, Data Collection, Modeling

Study Area

Digital Terrain/Elevation Model

FEMA Flood Insurance Study

Bathymetry and/or survey data

Hydraulic Model and Calibration
Phase 2B: Flood Inundation Depth Grid
Phase 3: Mapping and Web Implementation
USGS Flood Inundation Mapper
Phase 3: Mapping and Web Implementation
National Weather Service Mapper
Flood Inundation Project – Falmouth, KY
Silver Jackets

Silver Jackets teams are collaborative state-led interagency teams, continuously working together to reduce flood risk at the state level.

Through the **Silver Jackets program**, the U.S. Army Corps of Engineers, the Federal Emergency Management Agency, additional federal, state, and local agencies provide a **unified approach to addressing a state’s priorities**.

Through partnerships, **Silver Jackets optimizes the multi-agency utilization of federal resources** by leveraging state/local/Tribal resources, including data/information, talent and funding, and preventing duplication of effort.

http://www.nfrmp.us/state/index.cfm
Phase 1: Study Area
Phase 1: Study Area
Phase 1: Study Area
Phase 1: Study Area

USGS 03253500 LICKING RIVER AT CATAWBA, KY (daily)

mean = 4172.52
max = 104000.00
min = 2.9
Phase 1: Study Area

USGS 03253000 SOUTH FORK LICKING RIVER AT HAYES, KY (daily)

- mean = 1433.45
- max = 25600.00
- min = 14.00

Discharge, cubic feet per second (Mean)

South Fork Licking River
Phase 1: USGS collected bathymetry data
Phase 2A: U.S. Army Corps built hydraulic model

* U.S. Army Corps used and updated a previous model developed by URS.
Phase 2A: U.S. Army Corps calibrated model
Phase 2B: USGS created flood inundation maps
Phase 3: USGS utilizes maps online

http://wim.usgs.gov/FIMI/FloodInundationMapper.html
USGS Bathymetry: Data Collection
USGS Bathymetry: Data Processing
USGS Bathymetry: Data Processing
USGS Bathymetry: Data Processing
USGS Bathymetry: Data Processing
Sample Cross Section

- Raw Points – Blue
- Projected Points – Green
- Smoothed Points - Red
USGS Bathymetry: Data Processing Interpolation
USGS Bathymetry: Data Processing
Merge with LiDAR
USGS Bathymetry: Data Processing
Include structures
USGS Bathymetry: Data Processing
Final DEM
USGS Bathymetry: Data Processing
Sample Cross Section
USGS Bathymetry: Data Processing
Sample Cross Section

Raw LIDAR

Processed Bathymetry
USGS Model Calibration: Stage Discharge Rating

- Criteria: Water surface profiles are to be within +/- 0.5 ft. of the established USGS stage discharge rating.
USGS Model Calibration: Stage Discharge Rating

- Criteria: Water surface profiles are to be within ±0.5 ft. of the established USGS stage discharge rating.

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USGS Model Calibration

Flood Event with High Water Marks

• Criteria: Water surface profiles are to be within ± 1.0 ft. of the measured high water marks.
USGS Flood Inundation Mapper Demo

http://wim.usgs.gov/FIMI/FloodInundationMapper.html
Next Steps

1. Prepare maps for USGS Flood Inundation Mapper.
2. Work with FIMI on putting maps on USGS Flood Inundation Mapper.
3. Open source model calibration code and bathymetry processing code to share with flood science community.
   a. create a command line interface (CLI), a graphical user interface (GUI), and a web application.
Thank you!

Email: jlant@usgs.gov
GitHub: https://github.com/jlant-usgs