Flood Inundation Mapping Projects

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Outline

• Flood inundation projects in Kentucky
• Overview of general steps involved in flood inundation projects
• Closer look at the Frankfort, Kentucky flood inundation project

Acknowledgements

• Thank you Kentucky Geological Survey for the opportunity to present at the 2014 Annual Meeting.
Flood Inundation Projects 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 response activities**.
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 and submit map products to NWS and USGS Flood Inundation Mapping Program (FIMI)
- **Phase 3** – USGS Flood Inundation Mapping Science (FIMI) and NWS Advanced Hydrologic Prediction Service (AHPS) Web Implementation
  - Put maps on the Internet
USGS Streamgage(s) within study domain

- Discharge graph showing mean, max, and min values for cubic feet per second.
- Stage discharge rating graph with measured points.
- Gage height graph with mean, max, and min values for feet.

Scoping/Approach, Data Collection, Modeling

Study Area + Digital Terrain/Elevation Model + FEMA Flood Insurance Study

Bathymetry and/or survey data + Hydraulic Model and Calibration
Mapping and Web Implementation
Final Products – USGS Published Maps
Final Products – USGS Flood Inundation Mapper

http://wim.usgs.gov/FIMI/FloodInundationMapper.html
Frankfort, KY – Flood Inundation Project

Study Area

1978 Flood
Frankfort, Kentucky – Data Collection and Processing

**Raw bathymetry data**

**Processed bathymetry data and NLD data**

- Raw Points – Blue
- Projected Points – Green
- Smoothed Points - Red
Frankfort, KY - Modeling Approach

<table>
<thead>
<tr>
<th>Stage (ft.)</th>
<th>Elevation (ft.) NAVD88</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highest inundation Stage:</td>
<td>52</td>
</tr>
<tr>
<td>Major Flood Stage:</td>
<td>40</td>
</tr>
<tr>
<td>Moderate Flood Stage:</td>
<td>35</td>
</tr>
<tr>
<td>Flood Stage:</td>
<td>31</td>
</tr>
<tr>
<td>Action Stage:</td>
<td>29</td>
</tr>
<tr>
<td>Lowest inundation Stage:</td>
<td>27</td>
</tr>
<tr>
<td>Gage 0 Datum:</td>
<td>0</td>
</tr>
</tbody>
</table>

Mapping Interval (ft): 1.0

List of Modeled Stages (ft): 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52

FEMA Elevations for 10, 2, 1, 0.2 % Flood: 10% = 496.0 ft, 2% = 503.0 ft, 1% = 508.0 ft, 0.2% = 510.0 ft
Frankfort, Kentucky - Model Calibration
Stage Discharge Rating

• Criteria: Water surface profiles are to be within ± 0.5 ft. of the established USGS stage discharge rating.
Frankfort, Kentucky - Model Calibration
2010 Flood Event with High Water Marks

- Criteria: Water surface profiles are to be within +/- 1.0 ft. of the measured high water marks.
Phases 2B – 3: Frankfort, KY Web Implementation
USGS Flood Inundation Mapper

http://wim.usgs.gov/FIMI/FloodInundationMapper.html
Frankfort, Kentucky - NWS Flood Inundation Mapper

http://water.weather.gov/ahps2/inundation/inundation_google.php?g_datatype=depth&wfo=lmk&gage=fftk2