Flood Inundation Mapping

Wendy L. Pearson
NOAA’s National Weather Service
Central Region Headquarters
Kansas City, Missouri
Flood Inundation Mapping

Objectives:

Overview of the technical aspects of the map development process

Web demonstration
NOAA National Weather Service

- Flood Mapping depends on partnerships, diligence, dedication, and commitment to ensure consistency.
Flood Risk Communications

1. Map the Risk
2. Measure the Risk
3. Monitor the Risk
4. Manage the Risk

* Provide Decision Support Assistance to our key partners and the EM community
* Better quantify uncertainty and assessment of the risk.
Web Demonstration
Four Phases of Flood Mapping

1. Planning (Scoping, Partnering)
2. Analyses
3. Implementation
4. Operations & Maintenance

There is a need to provide clarity, consistency, and oversight to all four phases so that AHPS Flood Mapping growth is enabled, sustained, and maintained.
1. Planning (Scoping, Partnering)

Partner with Detailed Flood Insurance Studies

- FEMA approved Hydraulic Models (1D, 2D, Steady vs Unsteady)
- 10M Digital Elevation Mapping
- Lidar 1.2 ft vertical accuracy (2 ft contour equiv)

Partner without Detailed Flood Insurance Studies

- Find or create mapping and modeling data
1. Planning (Scoping, Partnering)

Suitable Static Flood Mapping Candidates

- Hydraulic Models (1D)
- Steady Flow Upstream Boundary or Unsteady Flow Upstream Boundary with FEMA profiles
- Downstream Boundary with Good USGS ratings
- Water surface is level across each cross section
- Well defined channels
- Detail Cross Sections and Streambed

For more info, see USGS Scientific Investigations Report 2007-5032
• NWS verifies locations appropriate for Static Flood Inundation Mapping
  – If dynamic effects (such as tides/significant backwater) are involved at a given forecast reach, static flood inundation mapping is not appropriate.

• Discuss Data and Production Resources with Potential Partners

• NWS and partners investigate available high resolution topography (digital elevation models – DEM’s and lidar data)
  – NSGIC State Contacts (http://www.gisinventory.net/summaries/)

• NWS and partners review FEMA Flood Insurance Studies, Flood Profiles, reanalysis of 100 yr, 500 yr levels.
  • FEMA GIS and State Contacts (https://hazards.fema.gov/contacts/statecontacts/contacts.asp?)
    Floodplain Managers (http://www.floods.org/StatePOCs/map.asp)
2. Analyses

- Create water surface profiles that include the Flood Stage, minor, moderate, major flood levels. Validate these with historic data.
2. Analyses

- **GIS Work – Inundation Library Creation**
  - Use FEMA approved techniques to transform the hydraulic model water surface profiles into shapefiles representing inundation area and rasters representing depth of flow.
  - Edit to remove unconnected polygons (ponds).
  - Shapefiles need attributes for water surface elevations.
  - Levees and bridges represented to NWS standards
  - Collect metadata records for all GIS files.

- **Delivery supporting data**
  - DEM, hydraulic model, stream centerline, roads, aerial photo for each location, etc.
  - Required for long term maintenance by NWS.
  - Complete project summary report.
Quality Assurance/Quality Control
in the
Flood Mapping Program

Purpose:

• Assure consistency of Flood Mapping.
• Assure Flood Mapping looks hydrologically and hydraulically reasonable.
• Minimize reprocessing

... increase trust, confidence, and reliability
2. Analyses

- Partner provides Shapefiles to a NWS Mapping Review Board
  - Board loads data for Review.
  - Board coordinates discussion on list of issues.
  - Deliverables are approved or returned for reprocessing.
  - Approved deliverables are issued to AHPS Web Contractor
  - Monthly Conference Calls.
3. Implementation

- **Web contractor receives Deliverables from Partner performing Modeling and Geospatial Analyses**

  - Shapefiles are processed to create the depth images.
  - All information is converted to pre-set transparent gifs/pngs so web images can be displayed quickly.
  - KMZ, shapefile formats are packaged for download tab.
  - Quick check to see if water surface/depths are reasonable.
  - Internal web site for QCing resultant web graphics.
  - Flood Inundation Maps are made available after loaded on NWS web farm.
Inundation Mapping Activities

**Iowa Flood Center**

Partnership among NWS and the Iowa Flood Center to develop flood inundation maps at NWS Forecast locations.

- Iowa Flood Center will provide technical guidance and local hydrologic expertise to help set-up, run, and validate the models.
Inundation Mapping Activities

Central Indiana

Partnership among NOAA, USGS, Polis Center, and Indiana to develop near real-time inundation maps based on NWS Forecasts and show the infrastructure at risks for 20 forecast points.

- USGS will develop the models, provide stream gage observations, cross sections, and rating curves needed to calibrate models.

- The USGS Water Science Centers provided technical guidance and local hydrologic expertise to help validate the models.
• **Flood Mapping depends on partnerships, diligence, dedication, and commitment to ensure consistency.**