Flood Inundation Mapping (FIM) is a real-time, operational tool that visually relates USGS streamgage data and NWS forecasts to flood risk for the primary purpose of public safety, but also has significant benefits of:

- Understanding changing natural processes that produce hazards
- Development of hazard mitigation strategies and technologies
- Effectively reduce vulnerability and repetition of loss to infrastructure
- Promotion of risk-wise behavior
Flood Inundation Maps (FIM)

- Translate a hydrograph into operational maps that communicate risk and consequences.

[Diagram showing a graph and map related to flood inundation maps]
Flood Information – from a point on the landscape to geospatial products

- USGS Real-time streamgage data
- National Weather Service flood forecasts
- FIM
- USGS 04180000 Blanchard River near Findlay, OH
- High-water marks
- Lidar and hydraulic model
- Flood-Inundation Map
Inundation Mapping becomes a tool for flood...

- **Preparedness**
  - “What-if” scenarios

- **Response**
  - Tied to streamgage and forecast data

- **Recovery**
  - Damage assessment

- **Mitigation and planning**
  - Flood risk analyses

- **Environmental and ecological assessments**
Creation of Flood Inundation Maps

Chose Reach and Data needed

- Critical infrastructure, populations, escape routes needed
- Streamgage and flood forecast
  - Stable high-end rating, peakflow analyses
  - Can also do with stage-only
- Elevation data availability
  - Topography - lidar
- Recent survey
  - Hydraulic structures and x-sections
- High-water marks
  - Recent or historic flood
Creation of Flood Inundation Maps

Calibrated Hydraulic model
- FEMA approved hydraulic model (typically using HEC-RAS, 1-D, steady state)

Stage increments
- 1 or 2 ft increments from bankfull to 0.2 percent chance flood
- Associated with peakflow annual exceedance probabilities (AEPs) such as 50-, 10-, 4-, 2-, 1-, 0.5-, and 0.2-percent (2-, 10-, ... 500-year flood)
Creation of Flood Inundation Maps

Delineation of inundation

- Data for incremental stages are combined with Lidar – based DEM
- Spatial grid of where flooding occurs based on stages

Inundation depth

- Depth grids are determined for stage increments
Creation of Flood Inundation Maps

Hydraulic Modeling

Geospatial Processing

Series of sequential maps showing probable areas of flooding

Digital Elevation Model
FIM Mapper – more than just maps

Flood Library + USGS Real-time streamgage + NWS Flood Forecast =

http://wim.usgs.gov/FIMI/
FIMs Studies in New England

Published and on USGS FIM mapper

- Suncook River at North Chichester, NH
- Winooski River above Crossett Brook at Waterbury, VT
- Hoosic River near Williamstown, MA
- Deerfield River at Charlemont, MA
- Deerfield River near West Deerfield, MA
- North River at Shattuckville, MA
- St. John’s River below Fish River near Fort Kent, ME
- Fish River near Fort Kent, ME
FIMs Studies in New England

On USGS FIM review mapper
- Green River near Colrain, MA

USGS FIM studies on going
- Lake Champlain – Vermont and New York

USGS FIM studies to start soon
- Pawtuxet River at Cranston, RI

Proposed USGS FIM studies
- Deerfield River at Buckland/Shelburne Falls, MA
- Green River at Greenfield, MA
- Deerfield River at Greenfield/Deerfield, MA
Watershed’s with river reaches studied in detail

- Discovery meetings for Merrimack Watershed (MA and NH) in July 2015
  - Provisional list of NH sites – not final version
    - Spicket River (streamgage)
    - Suncook River
    - Beaver Brook (streamgage)
    - Dalton Brook
    - Hasells Brook

- Discovery meetings for Nashua Watershed – tributary to Merrimack River in late April - early May 2016
FEMA – NH Riverine Studies

FEMA RiskMAP Studies
Merrimack and Nashua Watersheds
– Selected river reaches will be studied in detail using:
  • Lidar
  • HWMs for model calibration
  • Surveyed hydraulic structures (bridges and dams)
  • Updated flood flows
  • New hydraulic models

– From here FIMs could be created for river reaches studied in detail and with a USGS streamgage
Possible FIMs in New Hampshire

- Any river reach with a USGS streamgage (stage-only also)
- Possible river reaches:
  - Ashuelot River
  - Connecticut River
  - Contoocook River
  - Merrimack River
  - Pemigewasset River
  - Pitcataquog River
  - Saco River
  - Souhegan River
  - Spicket River
FIM Web Mapping Application

http://wimcloud.usgs.gov/apps/FIM/FloodInundationMapper.html
FIM Benefits

• Helps with preparedness, response, recovery, and mitigation and planning

• Interactive tools give users a better understanding of flood risk areas

• Data can be shared by many users simultaneously to make decisions to reduce flood losses *(before, during, and after)*

• Help assess cost and damages of floods *(HAZUS)*

• USGS report documenting flood flows, hydraulic model, calibration, lidar, mapping, and map libraries

• Potentially helps communities with their NFIP community rating, and consequently lower flood insurance premiums
Questions

http://water.usgs.gov/osw/flood_inundation/
Example of Flood Inundation Mapping

Stage = 14.00 ft
Example of Flood Inundation Mapping

Stage = 16.00 ft
Example of Flood Inundation Mapping

Stage = 18.00 ft
Example of Flood Inundation Mapping

Stage = 20.00 ft
Example of Flood Inundation Mapping

Stage = 22.00 ft