Interactive Flood-Inundation Mapping Application: An Example from the Suncook River

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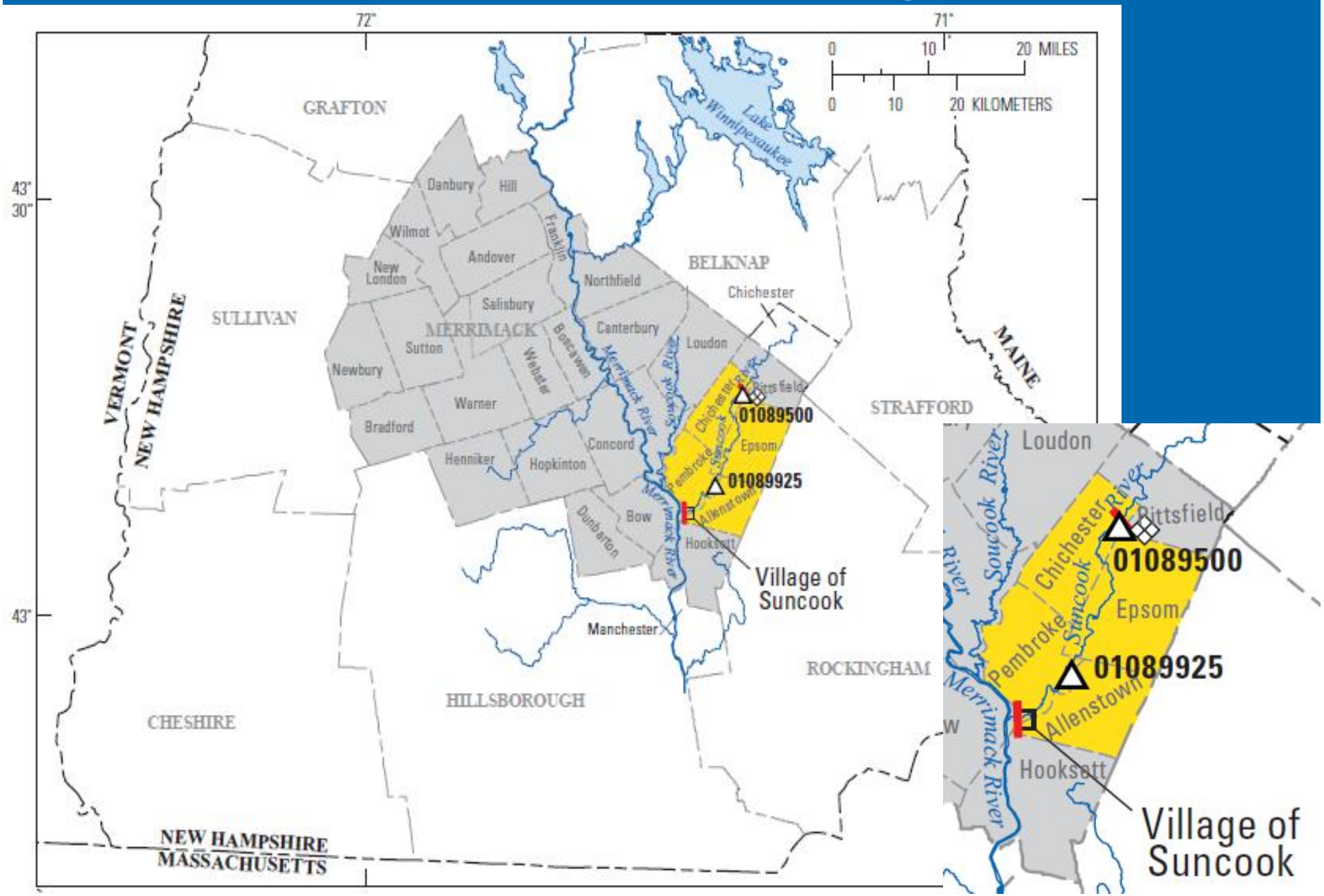
Sixth Annual Lamprey River Symposium
University of New Hampshire
January 11, 2013

Suncook River Study Area



Suncook River Flood Mapping Study, Sediment Characterization and Inundation Study

- FEMA funded the USGS to create updated flood mapping due to the avulsion and to assess characteristics and movement of sediments in the Suncook River from Epsom to the Merrimack River confluence so that predictions of riverbed stability and sediment movement could be made.
- USGS Suncook River Flood Inundation Pilot Study was conducted in cooperation with the New Hampshire Department of Safety, Division of Homeland Security and Emergency Management

USGS science for a changing world

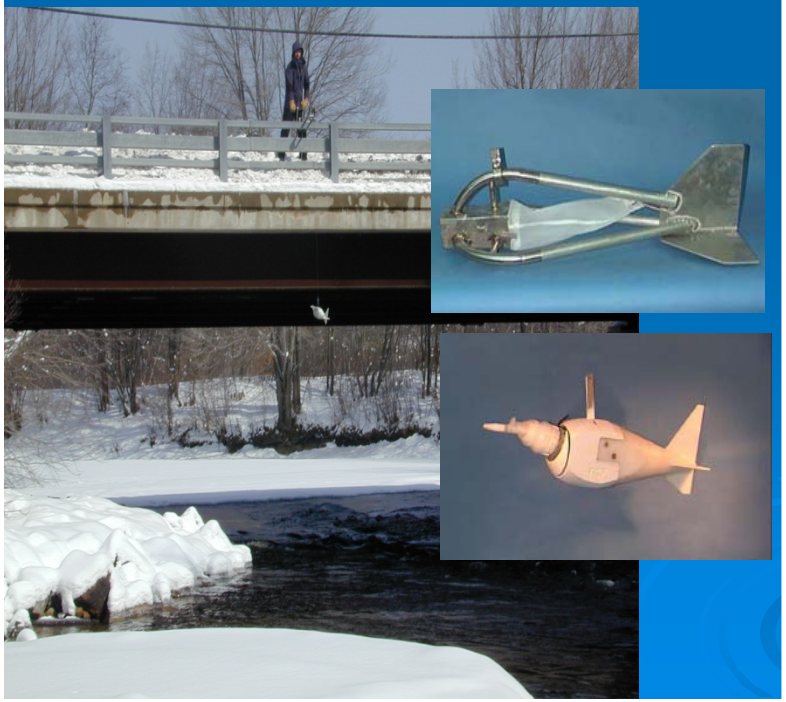
FEMA

Data collected for Suncook River Flood, Sediment and Flood Inundation Studies

USGS Streamgaging

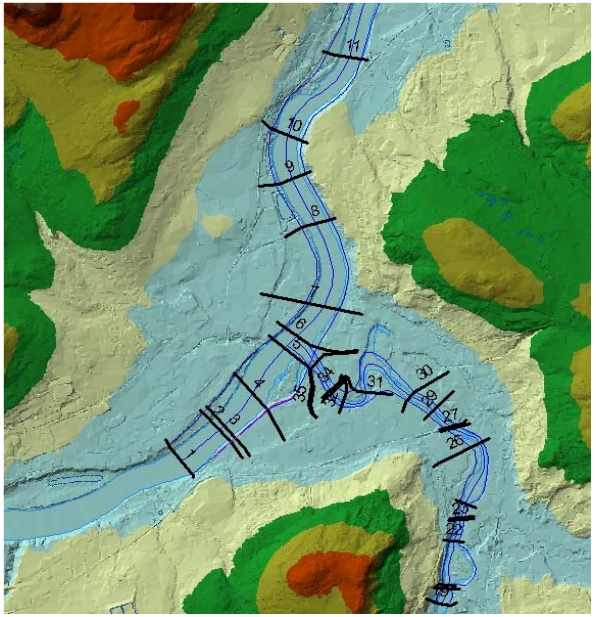
ADCP Profiling of Underwater Depths

Sediment Data

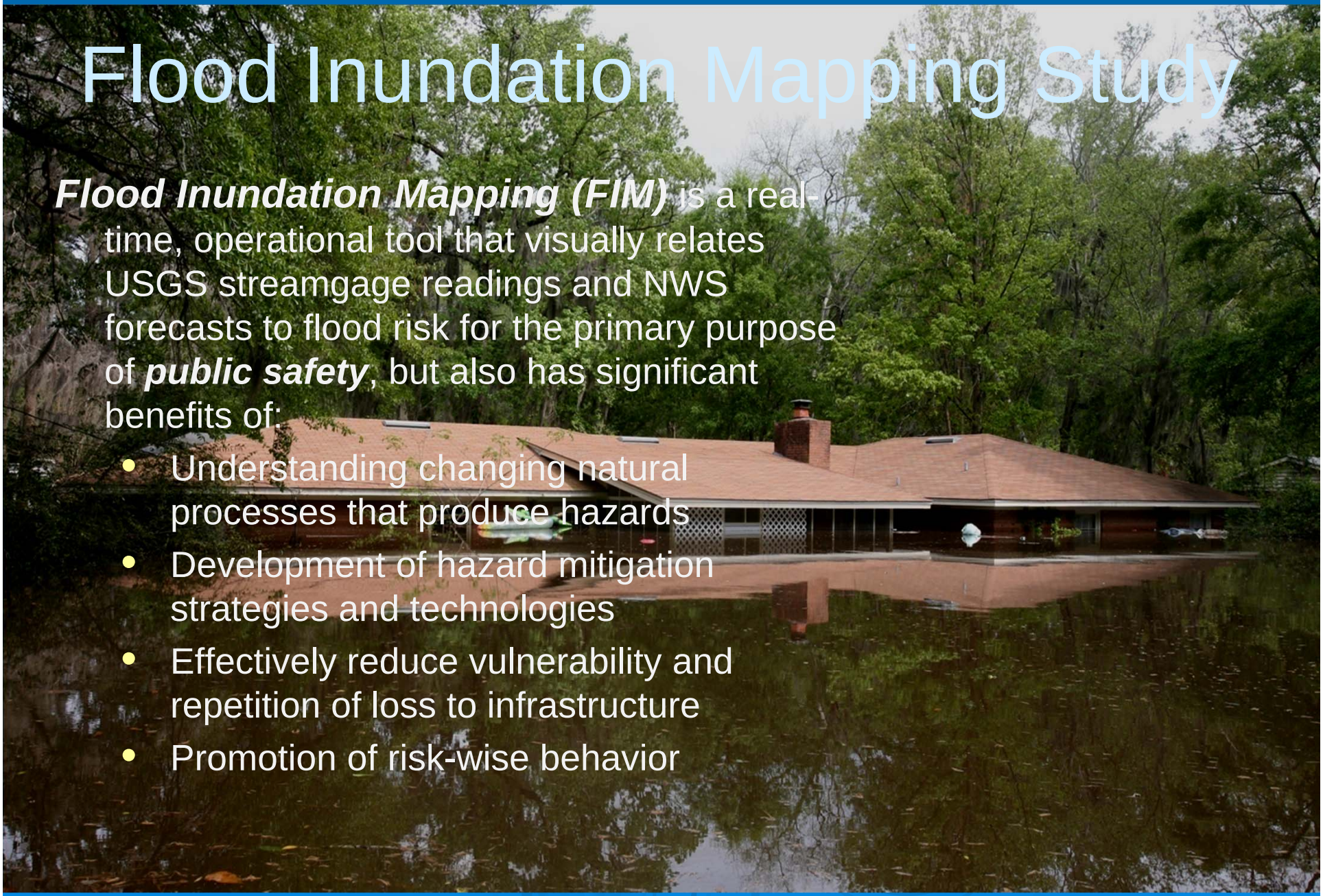


Field Surveys

LIDAR and contour data from aerial imagery



Flood Inundation Mapping Study

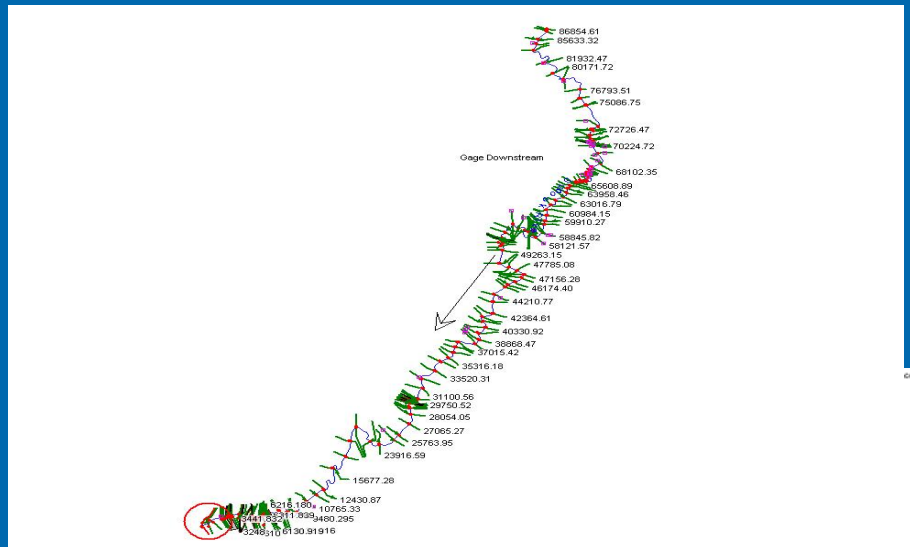


Flood Inundation Mapping (FIM) is a real-time, operational tool that visually relates USGS streamgage readings and NWS forecasts to flood risk for the primary purpose of ***public safety***, but also has significant benefits of:

- 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

Suncook River Flood Inundation Study Objectives

- Develop a flood information system for the Suncook River and adjacent floodplain as a pilot project for the northeastern region of the U.S.
- Project objective is to provide state and local officials and the general public with a means of obtaining detailed information on the extent of actual or forecasted flooding.

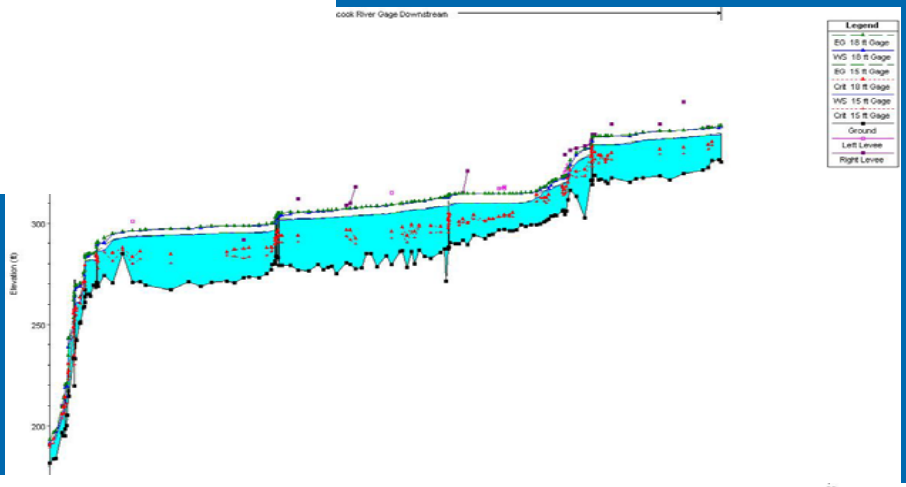


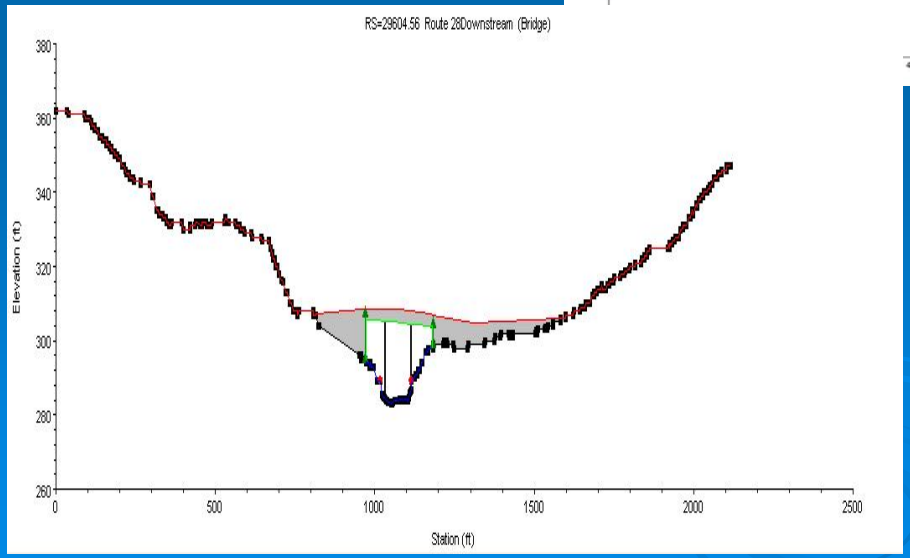
Hydraulic Model

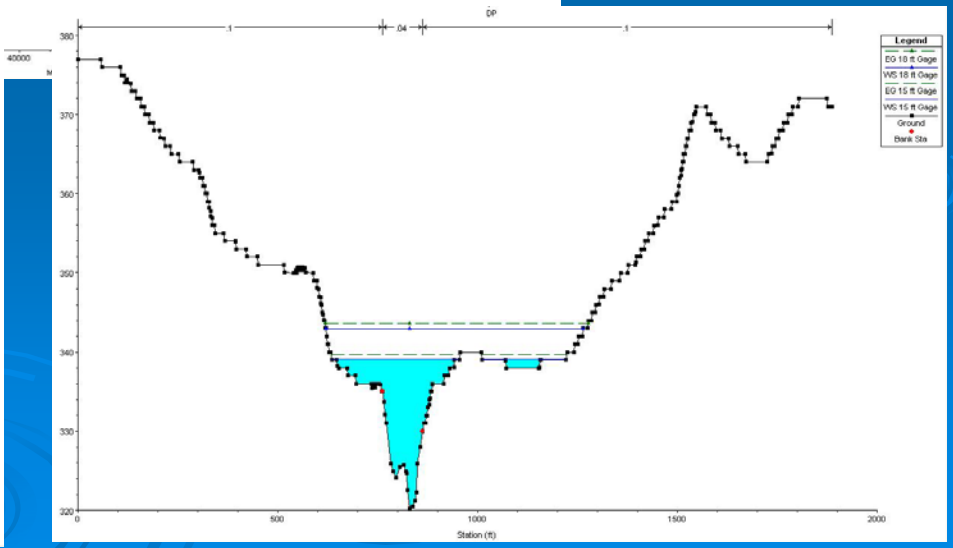
- 62 years of flow data at Suncook Streamgage
- Calibrated to April 2007 flood
- Hec-GeoRAS for inundation mapping

HEC-RAS

US Army Corps of Engineers®







Suncook River Flood Inundation Study Scope

- Library of 10 flood inundation maps in increments and depths to provide detailed information on flooding that is occurring or is forecasted to occur by NWS.
- Inundation maps are available on a USGS public web page with digital map images.

Suncook River Flood Inundation Map

- Delineation of flood inundation maps accomplished using a combination of high accuracy/high resolution LiDAR elevation data along with 1- and 4- foot contour interval data (May 2007, April 2008, April 2010) referenced to NGVD29.
- Vertical datum for flood inundation maps is referenced to NAVD88.
- Grids of flood water depths (using HEC-RAS) generated for each of 10 flood profiles ranging from 7’ to 18’ at USGS Suncook streamgage in North Chichester, NH.
- Base maps in SIM report are a combination of digital ortho-photos collected by Eastern Topographics (2007, 2008) and 1-ft resolution color aerial imagery of southeastern NH (NHDOT, 2006)

FIM: How does it work?

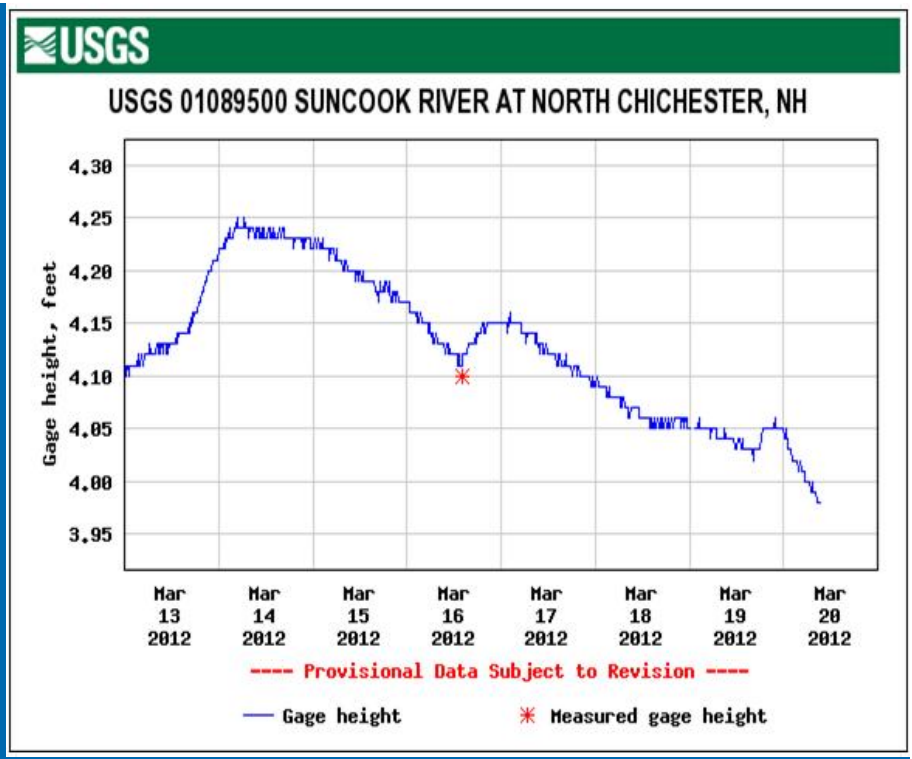
Current Approach

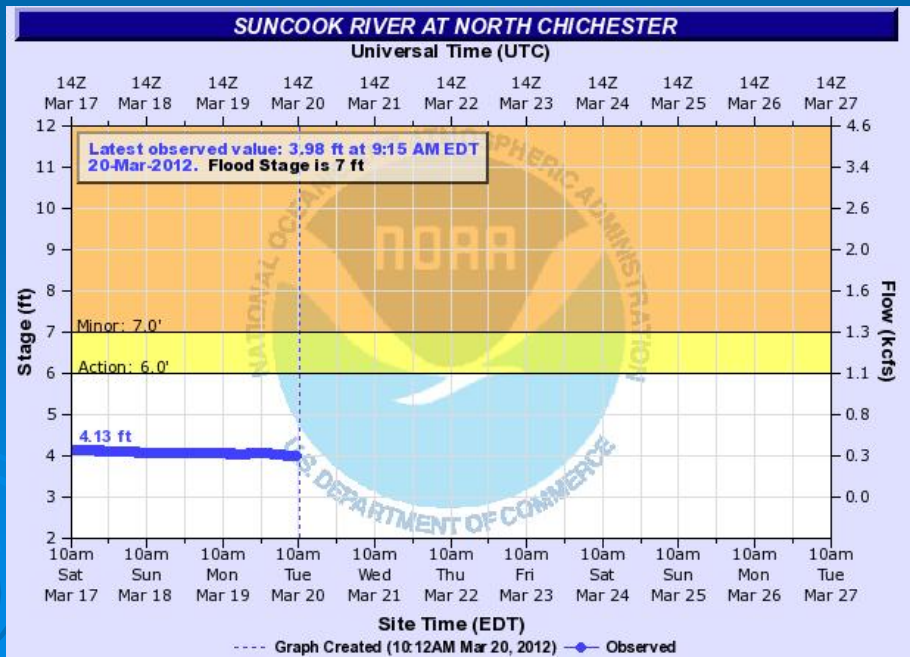
Current flood products focus on:

- Real-time USGS streamgage data
- NWS forecasts

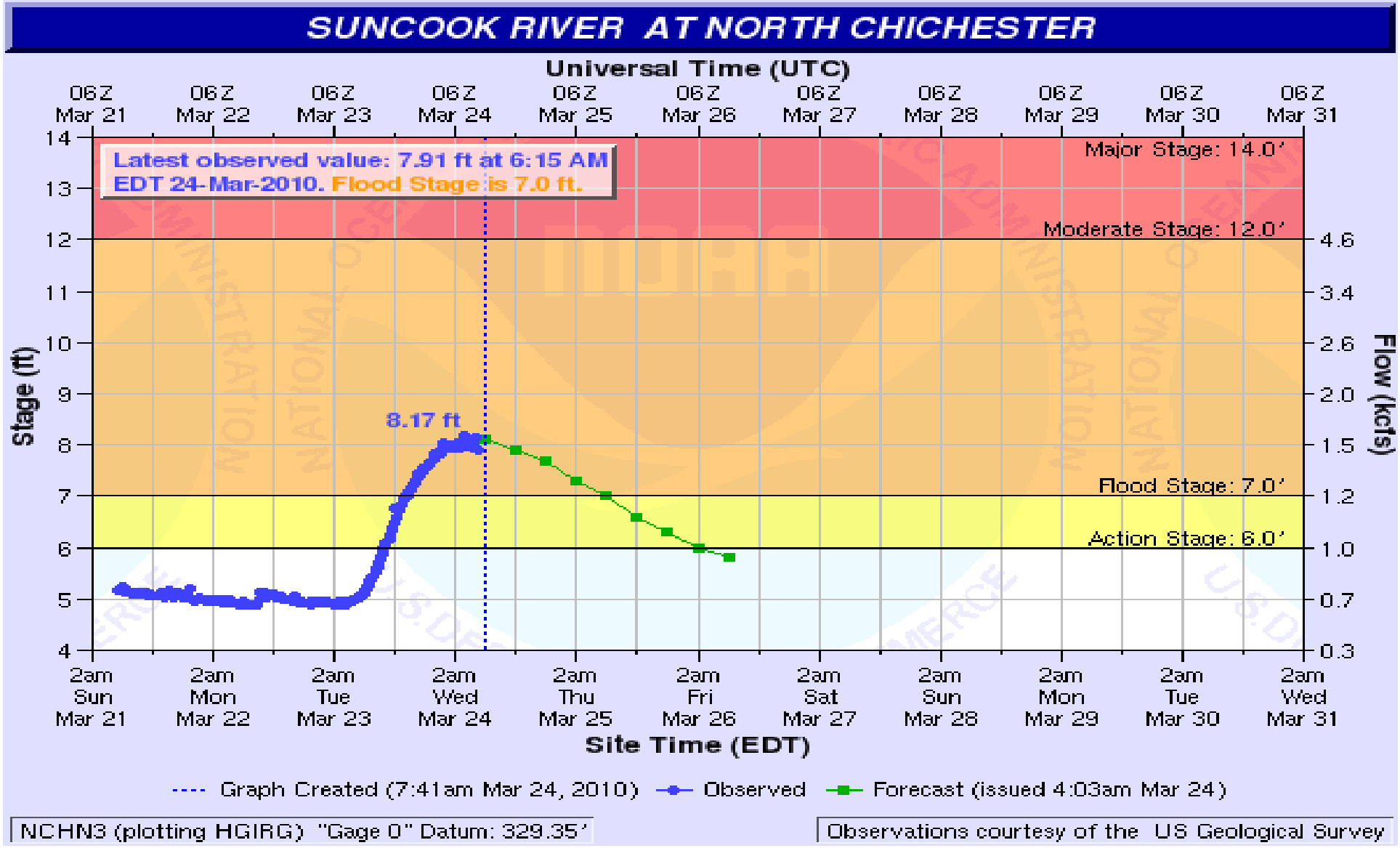
Difficult for someone to relate a "point" data value to their front step a block or a mile away from the gage

Have to rely on memory of past events to relate personal risk





NWS NRFC Forecast Hydrograph
http://water.weather.gov/ahps/



Suncook River Flood Inundation Map: Online Application

These maps are available at a USGS Web portal (**http://water.usgs.gov/osw/flood_inundation/** and **http://wim.usgs.gov/FIMI/FloodInundationMapper.html**) in conjunction with the real-time stage data from the USGS streamgage at Suncook River (station 01089500) and National Weather Service flood-stage forecasts to help to guide the general public in taking individual safety precautions and provide local officials with a tool to efficiently manage emergency flood operations and flood-mitigation efforts.

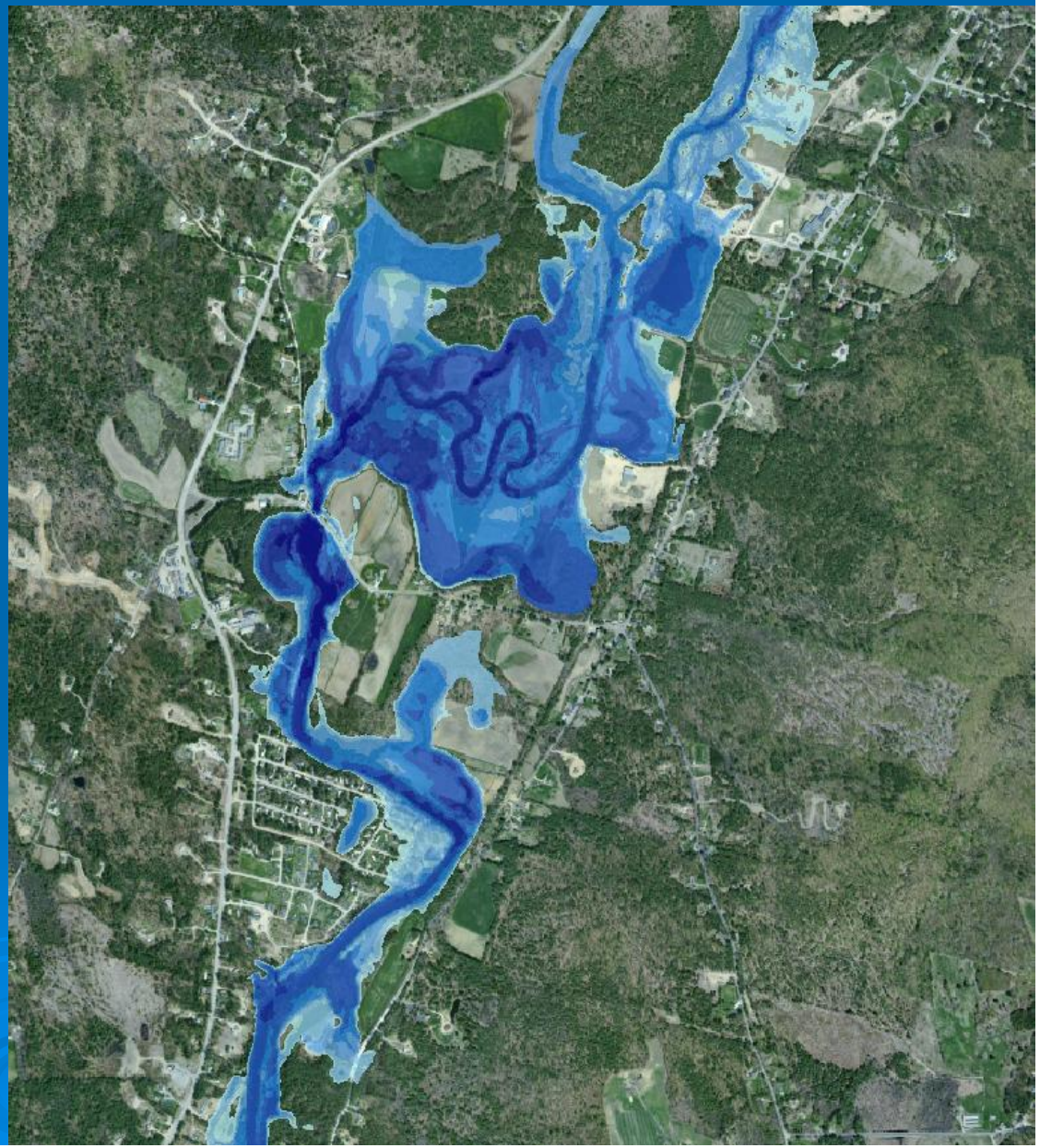
Flood Inundation Map: How does it work?

New Approach

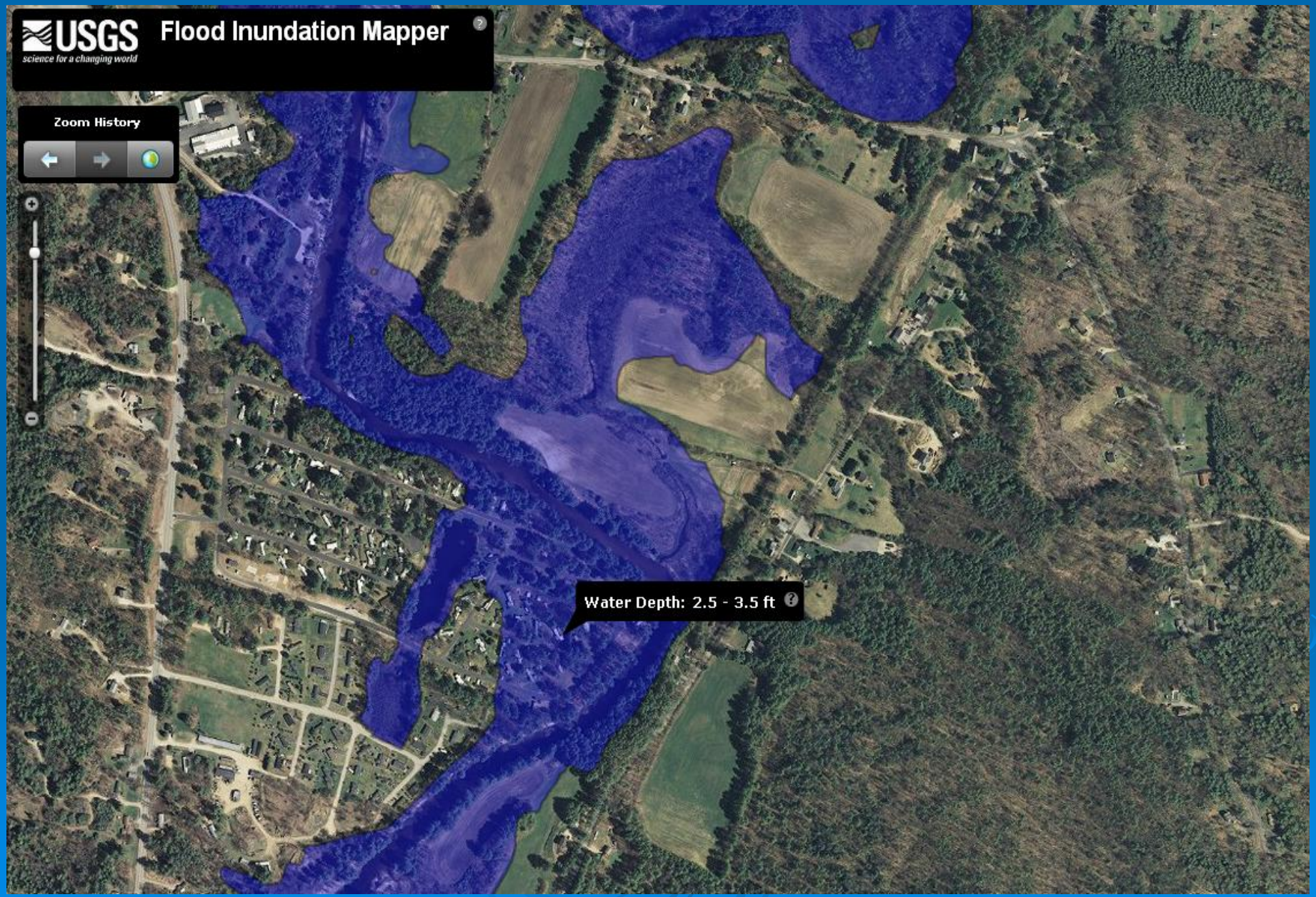
An aerial view of inundated areas directly linked to USGS streamgage and NWS forecast information

Static map library of 10 intervals starting at NWS flood stage and going up to (and beyond) historic flood levels

Related to Minor, Moderate, and Major flood NWS classifications



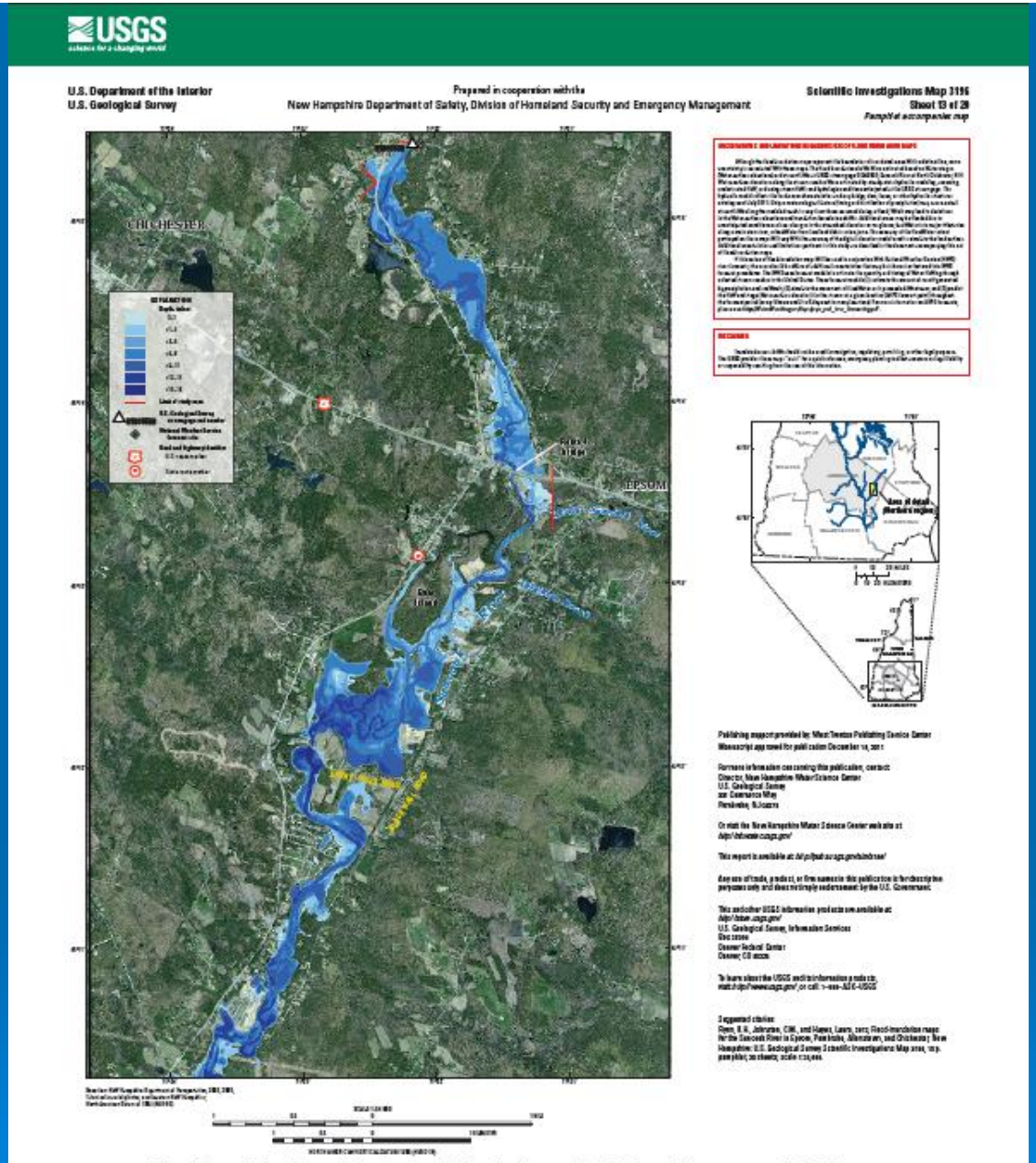
Flood Inundation Map: Online Application



Who Benefits?

- Emergency responders
  - Position equipment
  - Evacuate those in harms way
- Political Entities
  - Rapid, early damage estimates
- Those in the floodplain
  - Depth and location of flooding
  - Access/Egress

USGS



U.S. Department of the Interior
U.S. Geological Survey

Prepared in cooperation with the
New Hampshire Department of Safety, Division of Homeland Security and Emergency Management

Scientific Investigations Map 3196
Sheet 13 of 28
Pamphlet accompanies map

CHICHESTER

EPSOM

Flood-Inundation Map of the Suncook River in Epsom, Pembroke, Allenstown, and Chichester, New Hampshire, for a Flood Corresponding to a Stream Stage of 15 Feet at the U.S. Geological Survey Streamgage at Suncook River at North Chichester, New Hampshire (Station 01089500)—Northern Region

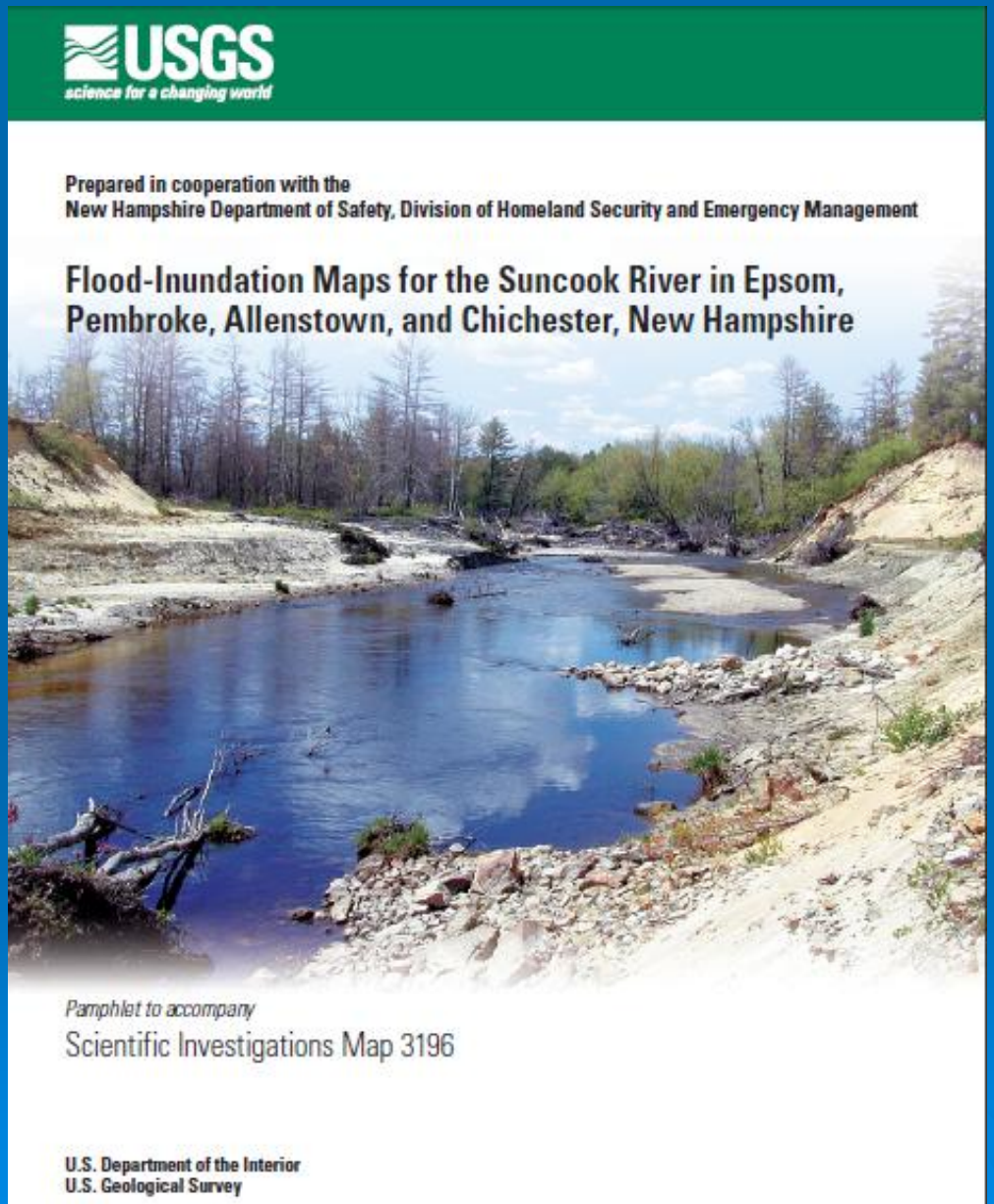
By

Robert H. Flynn, Craig M. Johnston, and Laura Hayes

2012

[Example map sheet from Suncook River SIM report 3196]

Suncook River Flood Inundation Study



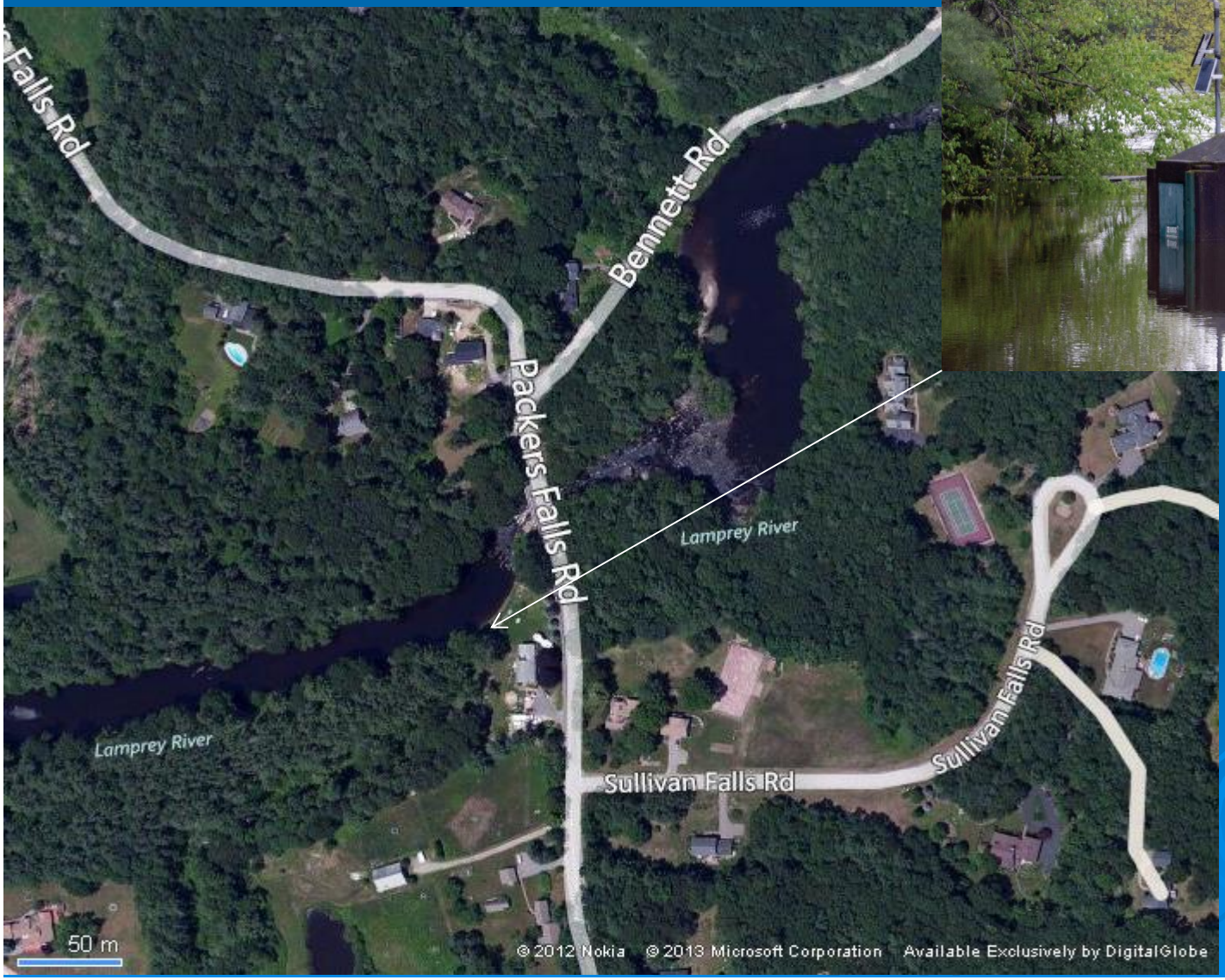
Report available online at :
http://pubs.usgs.gov/sim/3196/

Or via a link at :
http://suncookriver.org/
(CNHRPC website)

Online application available at :
http://wim.usgs.gov/FIMI/FloodInundationMapper.html

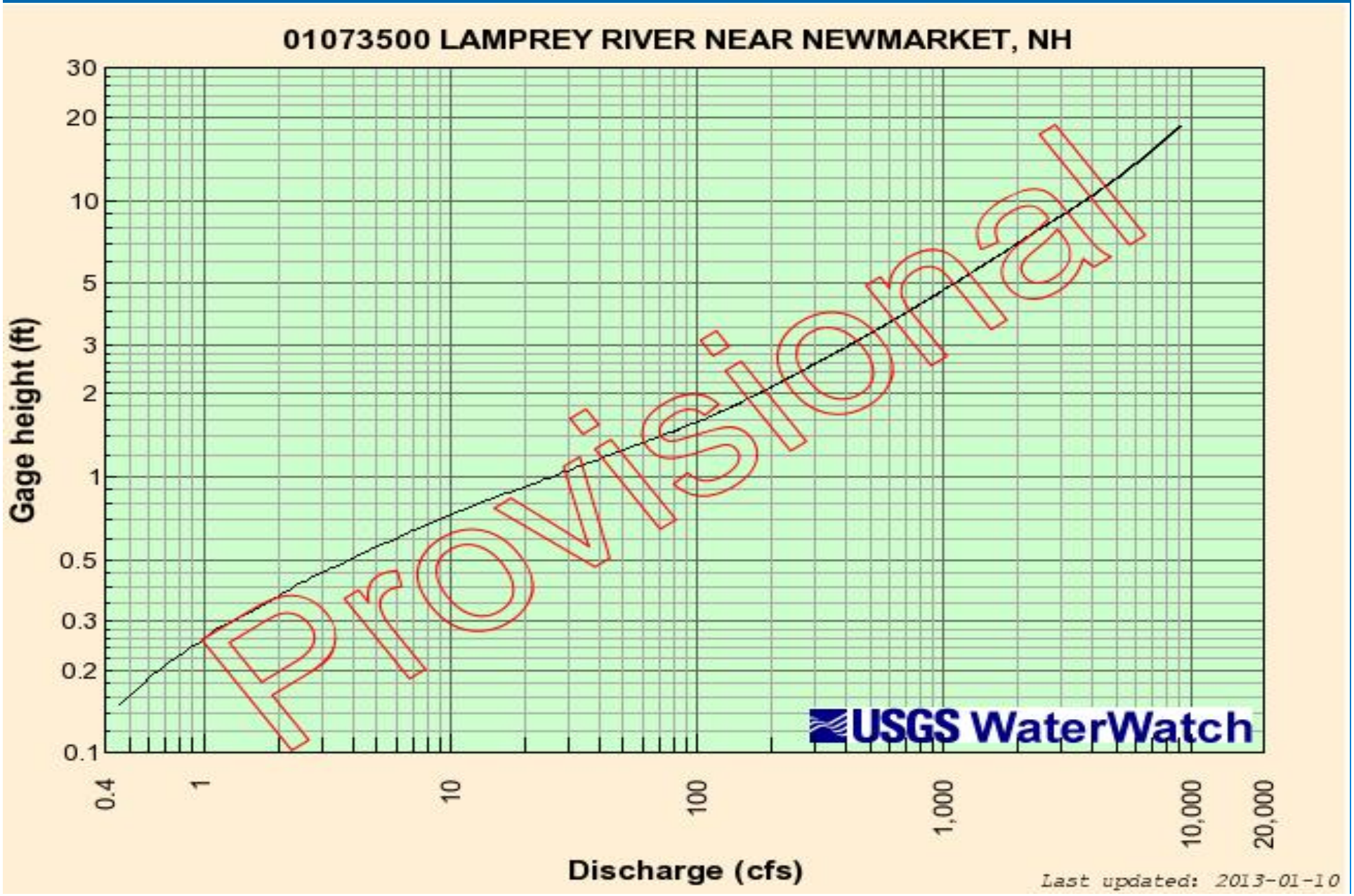
Or via a link at :
http://water.usgs.gov/osw/flood_inundation/

USGS Lamprey River Streamgage 01073500

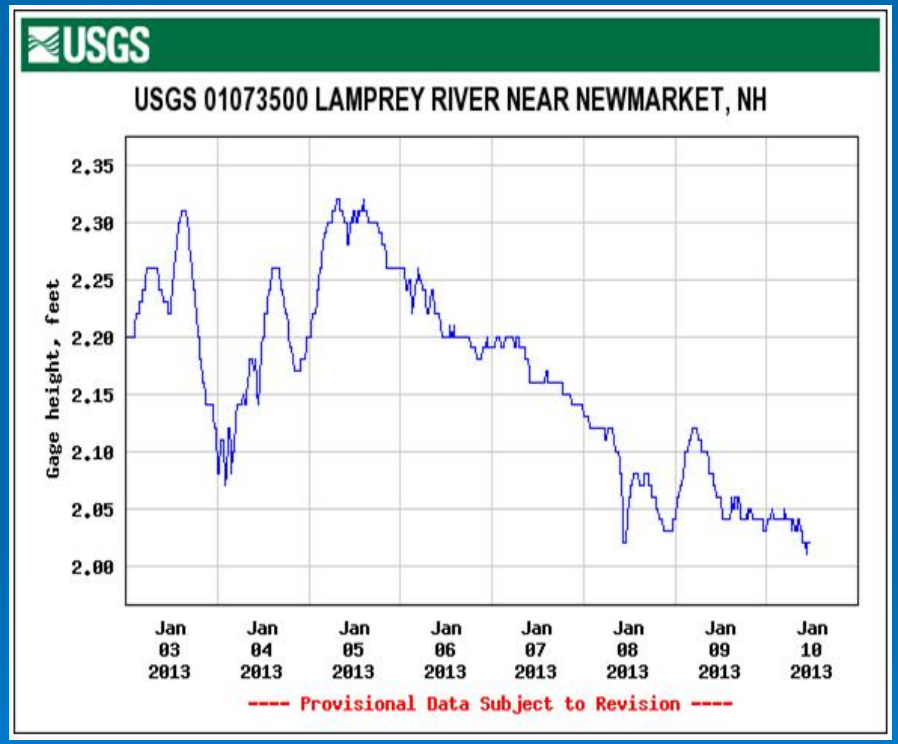


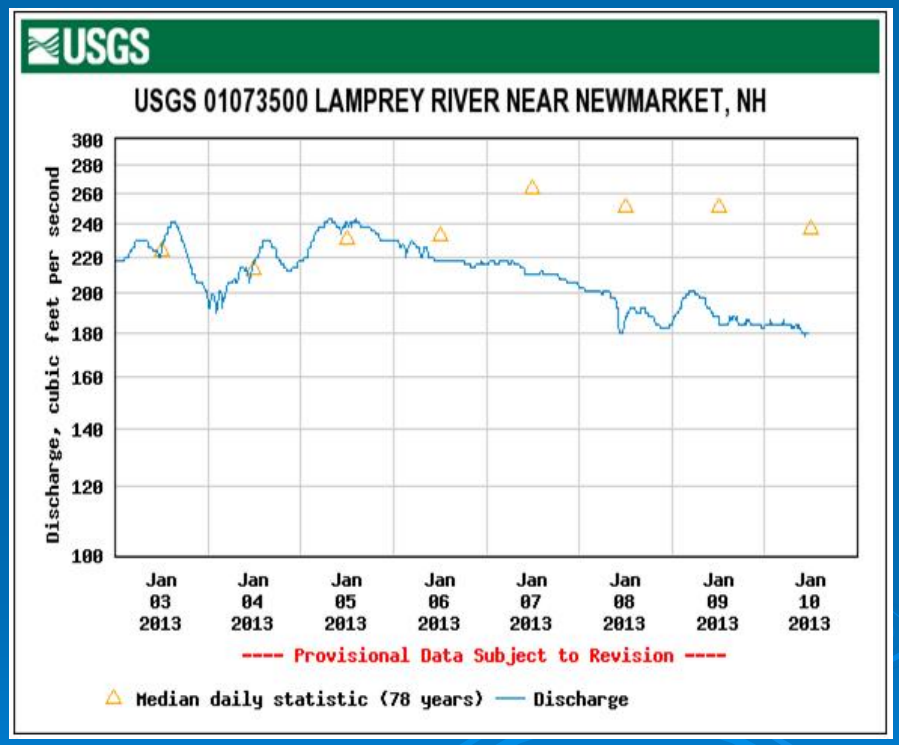
May 2006 Flood

Stage – Discharge Relation (Rating Curve)

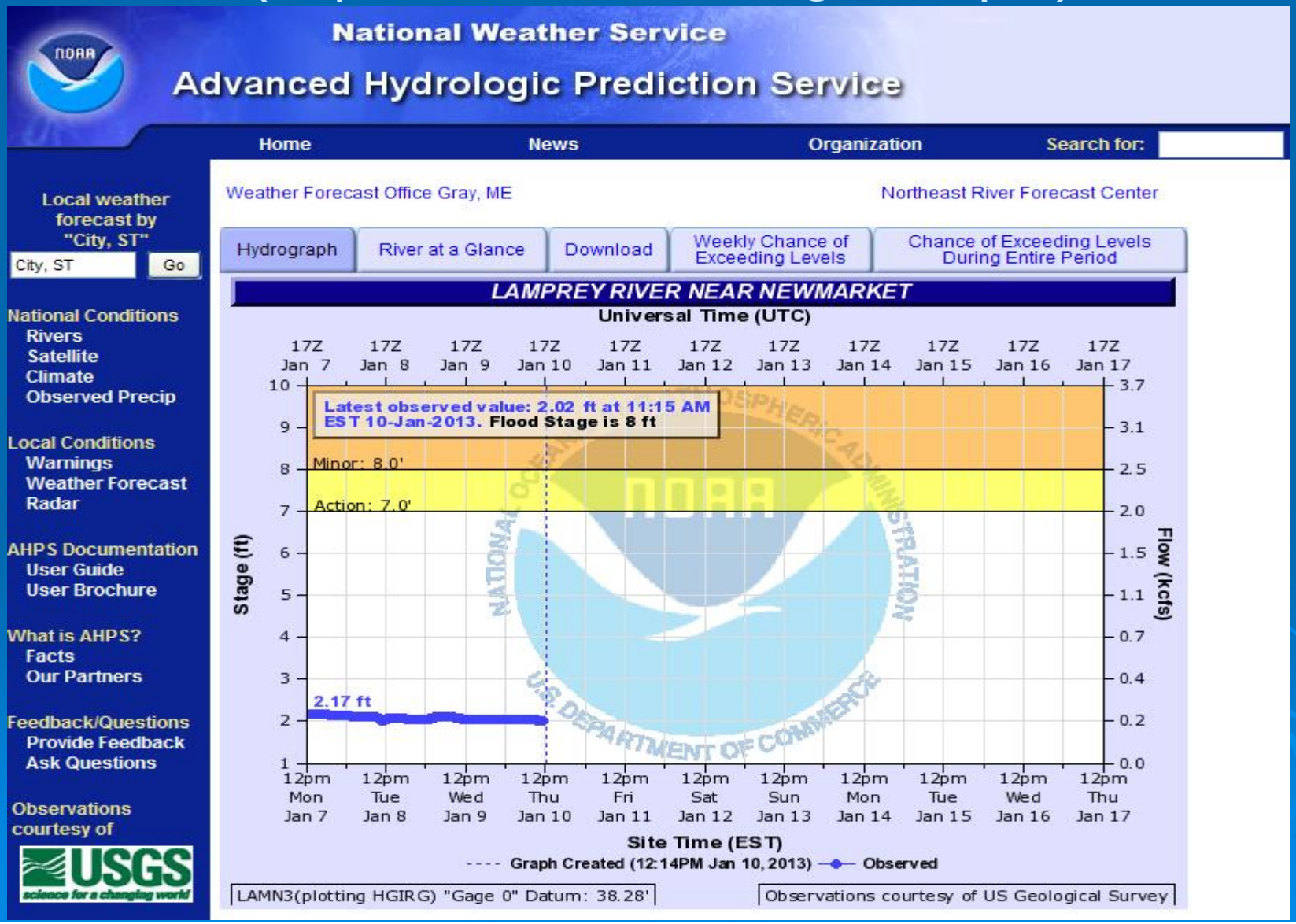


USGS Waterwatch (http://waterwatch.usgs.gov)

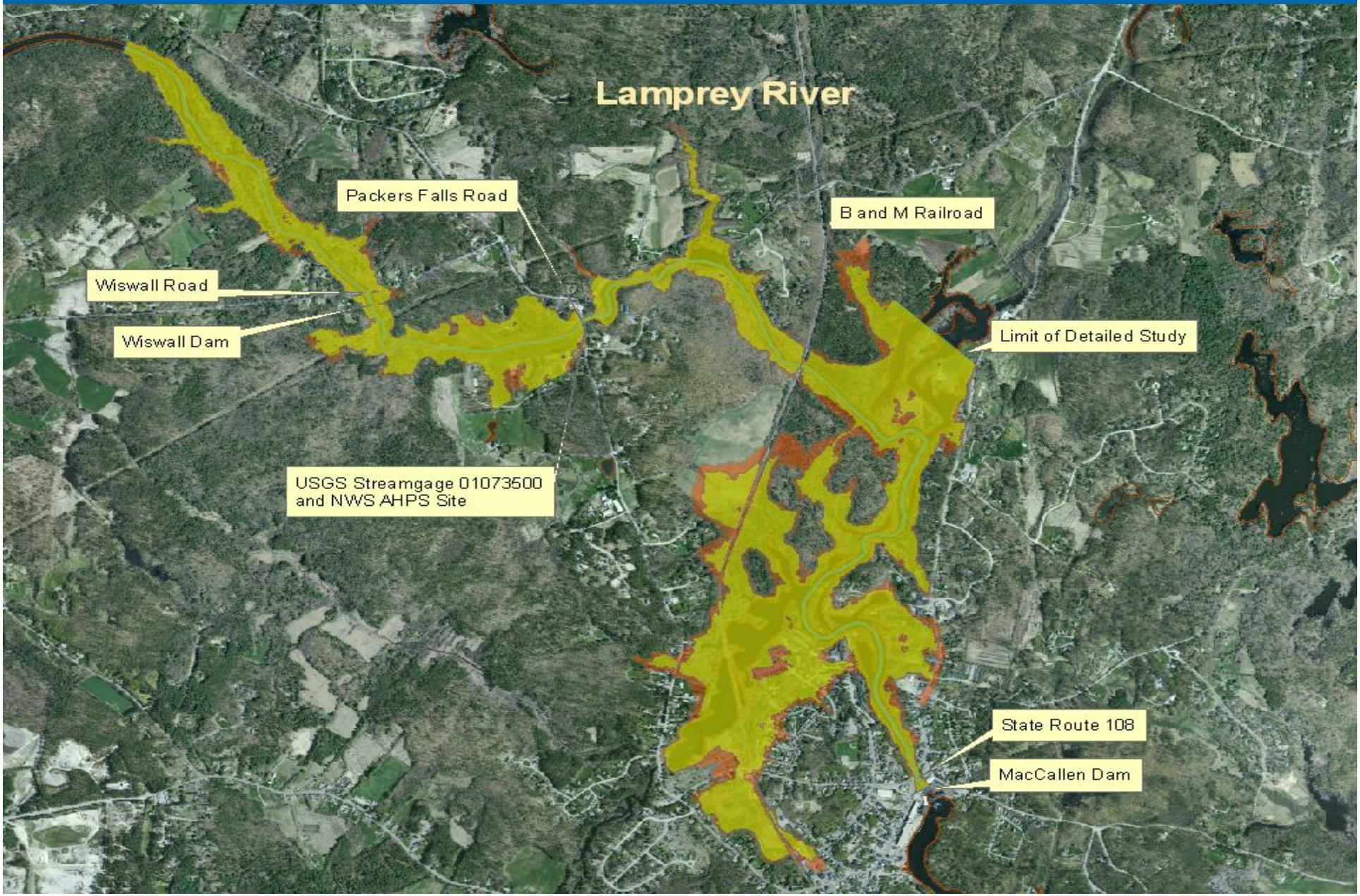




National Weather Service – Advanced Hydrologic Prediction Service Site (http://water.weather.gov/ahps/)



2013 USGS Produced Flood Maps – 1% (100-Year) and 0.2% (500-Year) Exceedence Probability Floods




State Route 108
MacCallen Dam

Questions?