



NWS Flood Inundation Mapping Program

Carson River Floodplain Management Forum

April 22, 2015

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NWS Hydrologic Services Program Mission:

- (1) Provide Timely, Accurate Flood Forecasts and Warnings, Regardless of the Flood's Origin**
- (2) Provide Basic Hydrologic Forecast Information for the Nation's Economic and Environmental Well-Being**





WHY DO THIS?

NOAA STRATEGIC PLAN/NWS INITIATIVE

- **Weather-Ready Nation:** Society prepares for and responds to weather-related events.
- **Deliver comprehensive impact-based decision support services** for environmental, economic productivity, or homeland security for weather related events.
- **Measures of Success:** Fewer annual fatalities resulting from high impact events; more people take preventative actions based on forecasts; less economic losses from unnecessary evacuations and property losses.



River Flood Watches & Warnings

NWS issues river flood watches and warnings as appropriate when river is forecast to exceed flood stage.

Text of flood watches and warnings contains information about expected impacts of flooding when river reaches crest.

Flood Warnings are used by Emergency Managers and Law Enforcement Officials to plan flood mitigation activities.

FLOOD WARNING
NATIONAL WEATHER SERVICE BOISE ID
950 AM MDT WED APR 19 2006

...THE NATIONAL WEATHER SERVICE HAS ISSUED A FLOOD WARNING FOR THE BOISE RIVER IN ADA AND CANYON COUNTY IDAHO...

The Bureau of Reclamation and the Army Corps of Engineers have indicated that releases from Lucky Peak Dam will be increased and that flows downstream will reach 7000 CFS by Thursday afternoon. The Current Flow at at Glenwood Bridge was measured at 6300 CFS at 9 AM Wednesday morning. The flow will reach 6800 CFS by Wednesday afternoon. And 7000 cfs by noon on Thursday.

At 7000 CFS...large sections of the greenbelt path will be submerged. Erosion of river banks will also become a significant problem. Debris in the river...including small trees and logs may begin piling up at bridge crossings. Minor flooding will be observed on sections of Eagle Island and in other low spots near the river. Minor flooding will spread downstream to low areas near the river in Star and Caldwell by Friday morning.



Flood Warning

Emergency Management

Flood Mitigation Efforts

weather.gov

NOAA National Weather Service



Enhancing the Communication of Flood Risk



Tennessee - Kentucky Floods
April 30 – May 4, 2010

Issue: NWS, USACE, and USGS were not able to share information and communicate in an effective manner during the peak of the event

Action: Facilitate improved access to data and ensure common operating picture

Issue: City officials and the public were not aware of devastating impacts until they occurred - severity and extent of inundation not communicated effectively

Action: Implement comprehensive flood forecast inundation mapping system

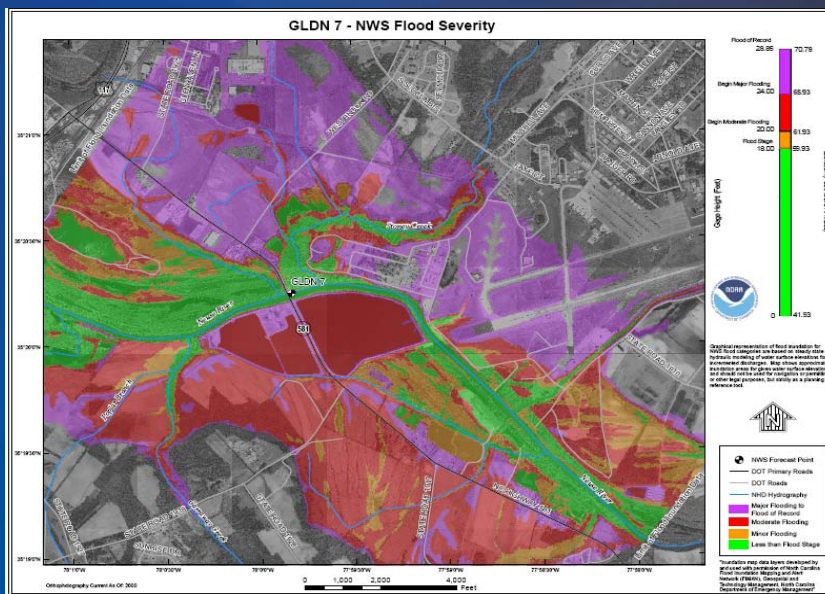
weather.gov

NOAA National Weather Service

Enhancing the Communication of Flood Risk

Partners and Users are telling us that they....

- ✓ are familiar with NWS flood severity categories
- ✓ find them useful
- ✓ do not want changes to the existing flood severity indices
- ✓ **need the communication of flood risk to be enhanced by use of inundation graphics (maps)**





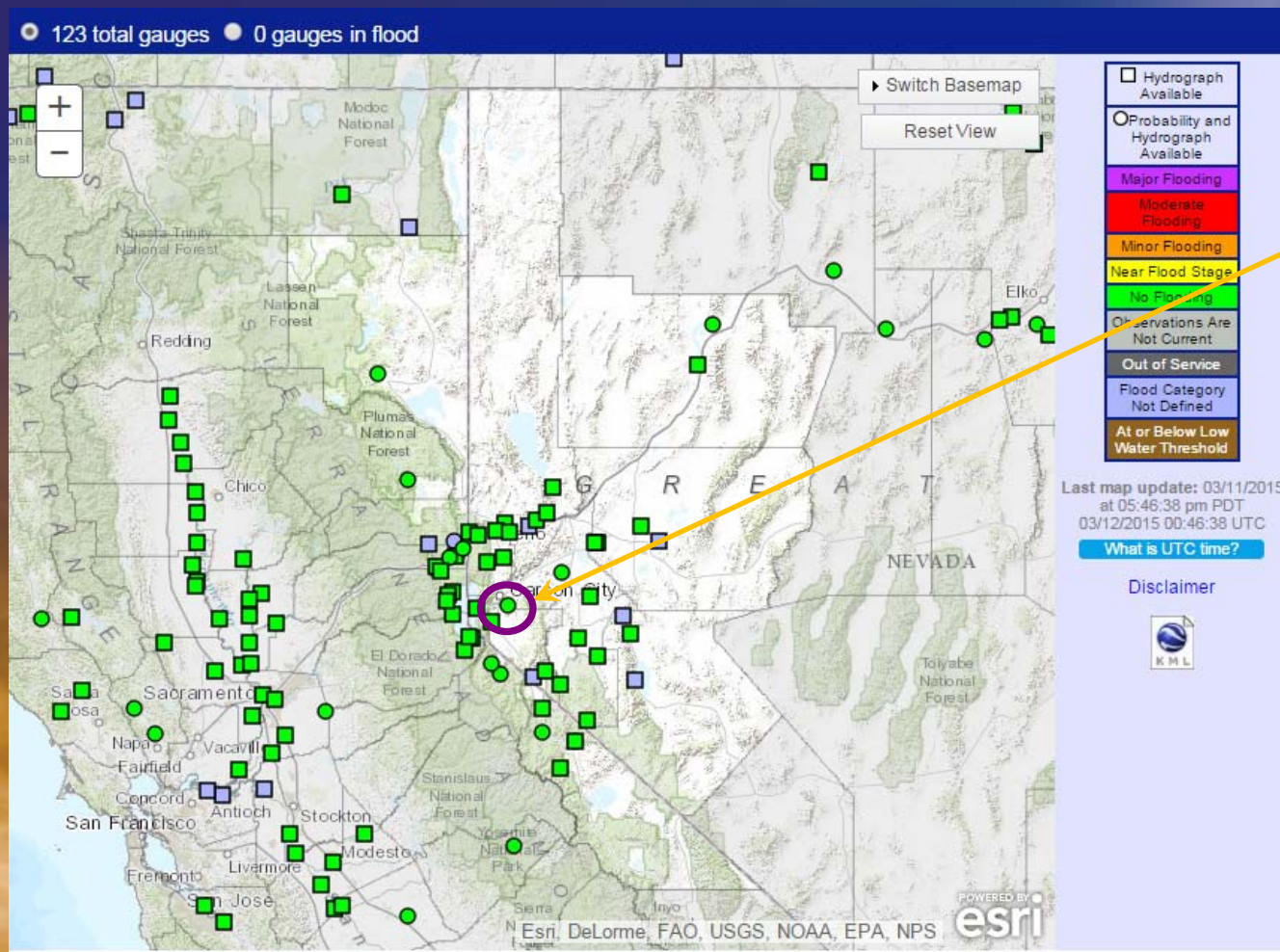
Advanced Hydrologic Prediction Service (AHPS)

- Provide enhanced water availability and flood warning information by leveraging NOAA's infrastructure and expertise
- Modernize services through infusion of new science and technology
 - Flash-flood to seasonal freshwater forecasts
 - Quantification of forecast certainty
 - More accurate and timely forecasts and warnings
 - **Partnered flood inundation mapping**
 - Visually-oriented products
- Provide consistent access to standardized graphics via web interface



WFO Reno AHPS Website & Area of Responsibility

<http://water.weather.gov/ahps2/index.php?wfo=rev>



Possible Flood Inundation Map Site:
Carson River at Carson City

Hydrologic Modeling & Forecasts by CNRFC

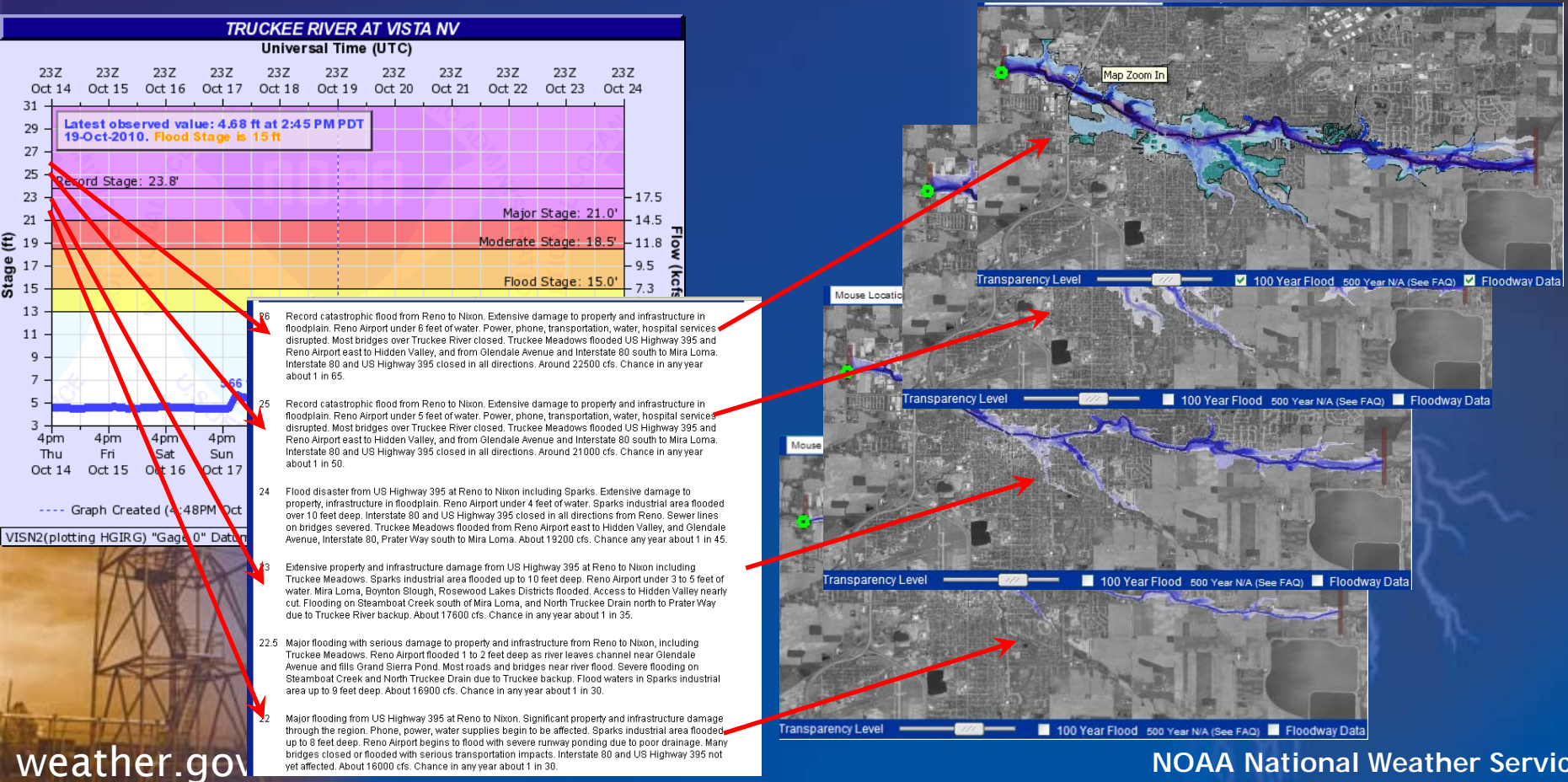
Hydrologic Watches, Warnings & Advisories by WFO Reno



Display of Flood Hazards for Additional River Levels through AHPS Web Page

AHPS offers ability to display detailed inundation maps linked to specific river levels. (Implemented at over 100 locations nationwide...only one in western U.S.)

Emergency Management Community has expressed strong desire to see hazards associated with a given river reach and river level mapped geographically





Essence of AHPS FIM

At or near NWS river forecast locations...

- Develop a library of inundation maps and link them with observed/forecast river stages
- Include water-depth, the boundary of expected flooding, NWS flood severity categories, and FEMA flood frequency events





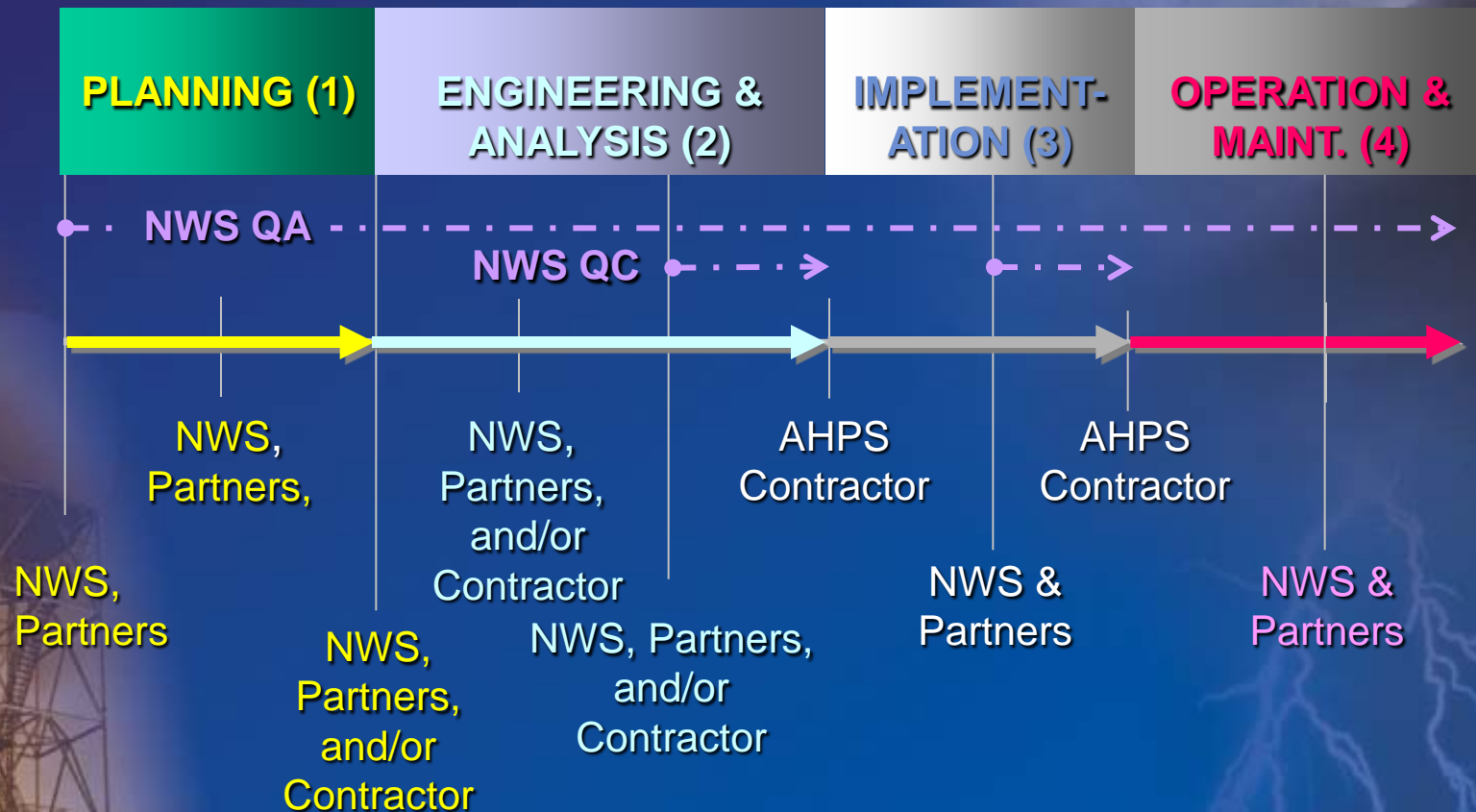
Ingredients and process of making flood AHPS inundation map libraries

- Interagency/government effort with goal to improve flood warning decision making
- Stake holder partner approach: Working in other parts of the county have involved a coordinated effort between NOAA, FEMA, USGS, USACE, USDA, USBR, Academia, and State and local government.
- Want program initiated in west.





AHPS Flood Mapping Process





Planning Phase

Partner with Detailed Flood Insurance Studies

FEMA approved Hydraulic Models (1D, 2D, Steady vs. Unsteady)

10M DEM for scoping

LIDAR 1.2 ft. vertical accuracy (2 ft. contour equiv)

Hydroconditioning of LIDAR Derived DEM

Resource funds

Partner without Detailed Flood Insurance Studies

Find mapping, modeling, and more funds

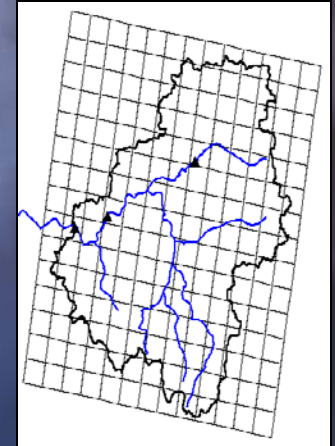
Methods and Standards for National Weather Service Flood Severity Inundation Maps

Submitted to:
National Oceanic & Atmospheric Administration
National Ocean Service
Coastal Services Center
2234 South Hobson Avenue
Charleston, SC

Submitted by:
Watershed Concepts
A Division of Hayes, Seay, Mathem, and Mathem
3333 Regency Parkway, suite 120
Cary, NC 27511

May 18, 2006

This report is the final deliverable for
NWS Flood Severity Inundation Mapping Standards and Methodologies,
Contract # EA133C-05-CQ-1051 Task Order #2



For more info, see USGS Scientific Investigations Report 2007-5032



Analysis Phase

Obtain FEMA Flood Insurance Studies, H&H analyses for 10, 25, 50, 100, 500 yr. levels, Floodway Data, etc..

FEMA, Regional, and State Contacts.

Partner obtain available high resolution topography (digital elevation models – DEM's and LIDAR Surveys)

FEMA, Regional, and State Contacts.

Partner verify HSA locations appropriate for Static Flood Inundation Mapping

Review list with WRH, NWSH, and field.

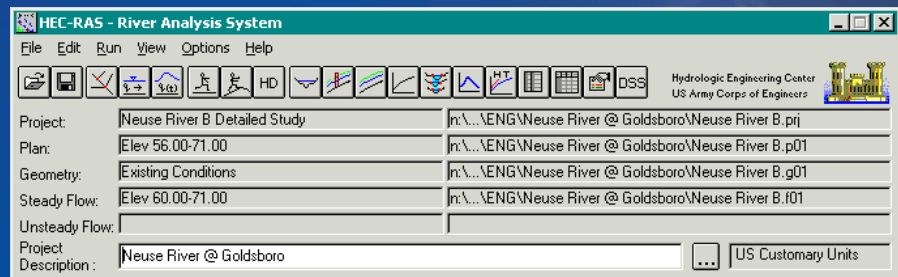




Analysis Phase

Assess Collected Info and Determine How to Run the Hydraulic Model.

- Determine the specific vertical intervals for each location.
Below bankfull to record flood stage?
- Determine study reach.
- Utilize collected information to build new or revise existing hydraulic model
- Must utilize FEMA approved models for FIS.

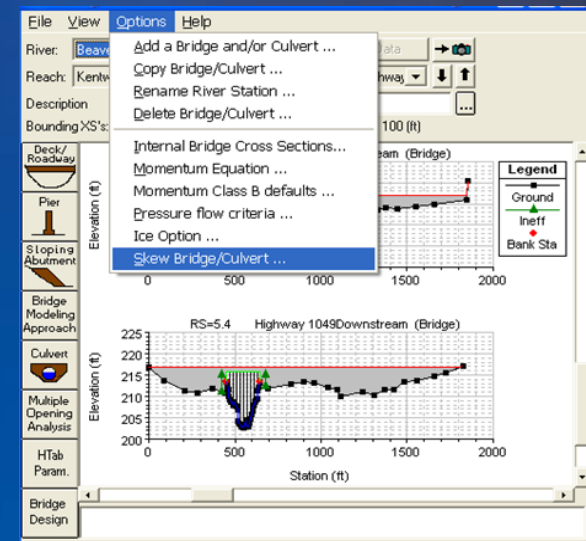
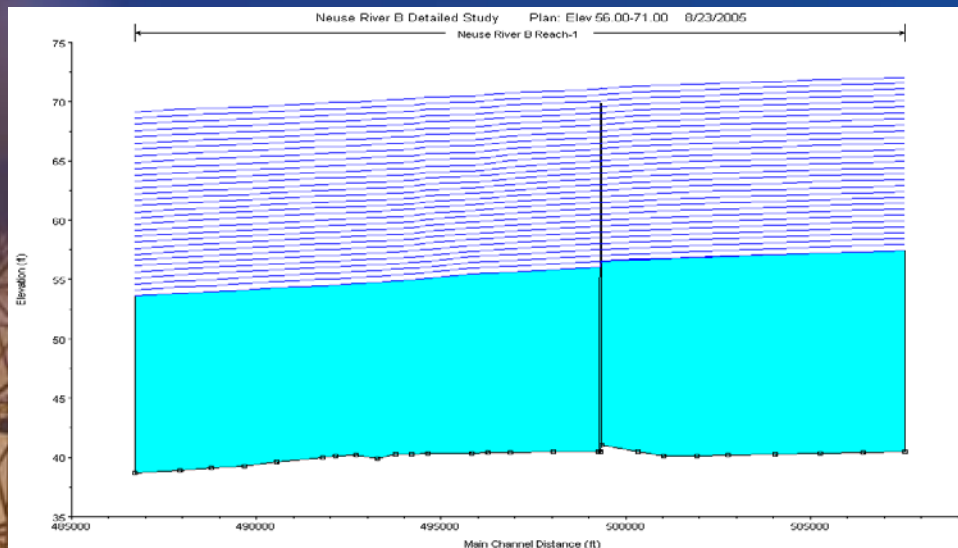




Analysis Phase

Utilize rating curve for the NWS forecast point.

- Develop flows that will match rating curve stage for the mapping intervals at the gage and use these as hydraulic model input.
- Create water surface profiles that include Flood Stage; minor, moderate, major levels. **Evaluate these with historic data.**





Analysis Phase

GIS Work – Inundation Library Creation

- Use FEMA approved techniques to map the model water surface profiles to a shapefiles.
- Edit polygons according to DFIRM standards.
- Edit to remove unconnected polygons (ponds).
- Shapefiles need attributes for water surface elevations.
- Collect meta data 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.



QA/QC in the Flood Mapping Program

Purpose:

Assure consistency of NWS AHPS Flood Mapping.

Assure Flood Mapping looks hydrologically and hydraulically reasonable.

Ensure a reduction of oversights (mistakes).

Ensure a reduction in the need to reprocess Flood Maps within a year of its release.

Stage 1 QC, Stage 2 QC

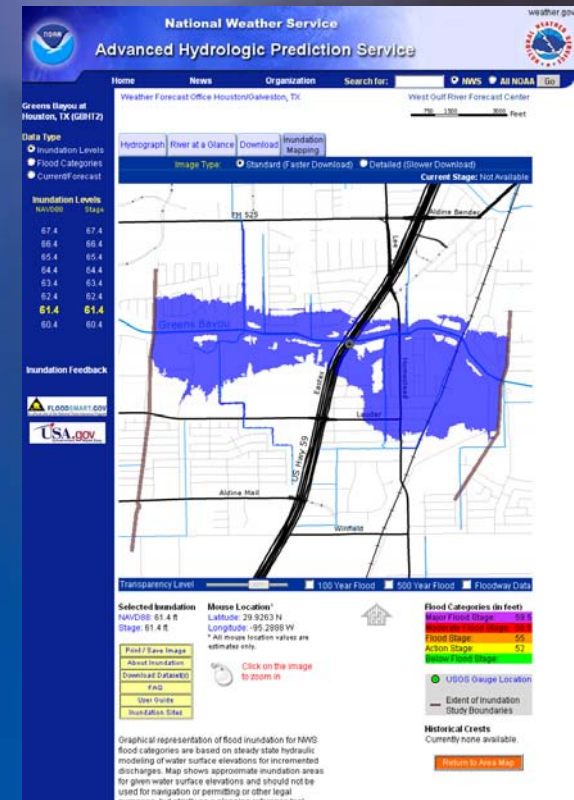
... increase trust, confidence, and reliability



Implementation Phase

- **AHPS contractor receives Deliverables from NWS Partner performing H&H, 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 AHPS graphics.
- Changes identified in Stage 2 QC are made as needed.
- QCed AHPS FIMs are made available





Summary: NWS goal for hydrologic warnings

- 1) Receive Warning
- 2) Understand Information Presented
- 3) Believe Information
- 4) Personalize Risk
- 5) Make Correct Decisions
- 6) Respond In A Timely Manner

❖ We believe that making flood inundation maps available will help improve #2, 4, 5