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Rainfall-River Forecasting: Overview of NOAA's Role, Responsibilities, and Services

**Rainfall-River Forecasting
Joint Summit II
October 19, 2008
St. Paul, Minnesota**



NOAA Integrated Water Forecasting Program



Strategic Goals

- Minimize losses due to floods and droughts
- Increase economic benefits from water forecasts and information
- Improve ecosystem management and enhance America's coastal assets
- Expand information for managing America's Water Resources

Reconfigured NOAA's water enterprise to assure strategic cooperation across line offices (NWS, NOS, OAR, NESDIS)





NWS Mission



NOAA's National Weather Service (NWS) provides weather, hydrologic, and climate forecasts and warnings for the U.S. for the protection of life and property and the enhancement of the national economy.





Water Forecasting Services

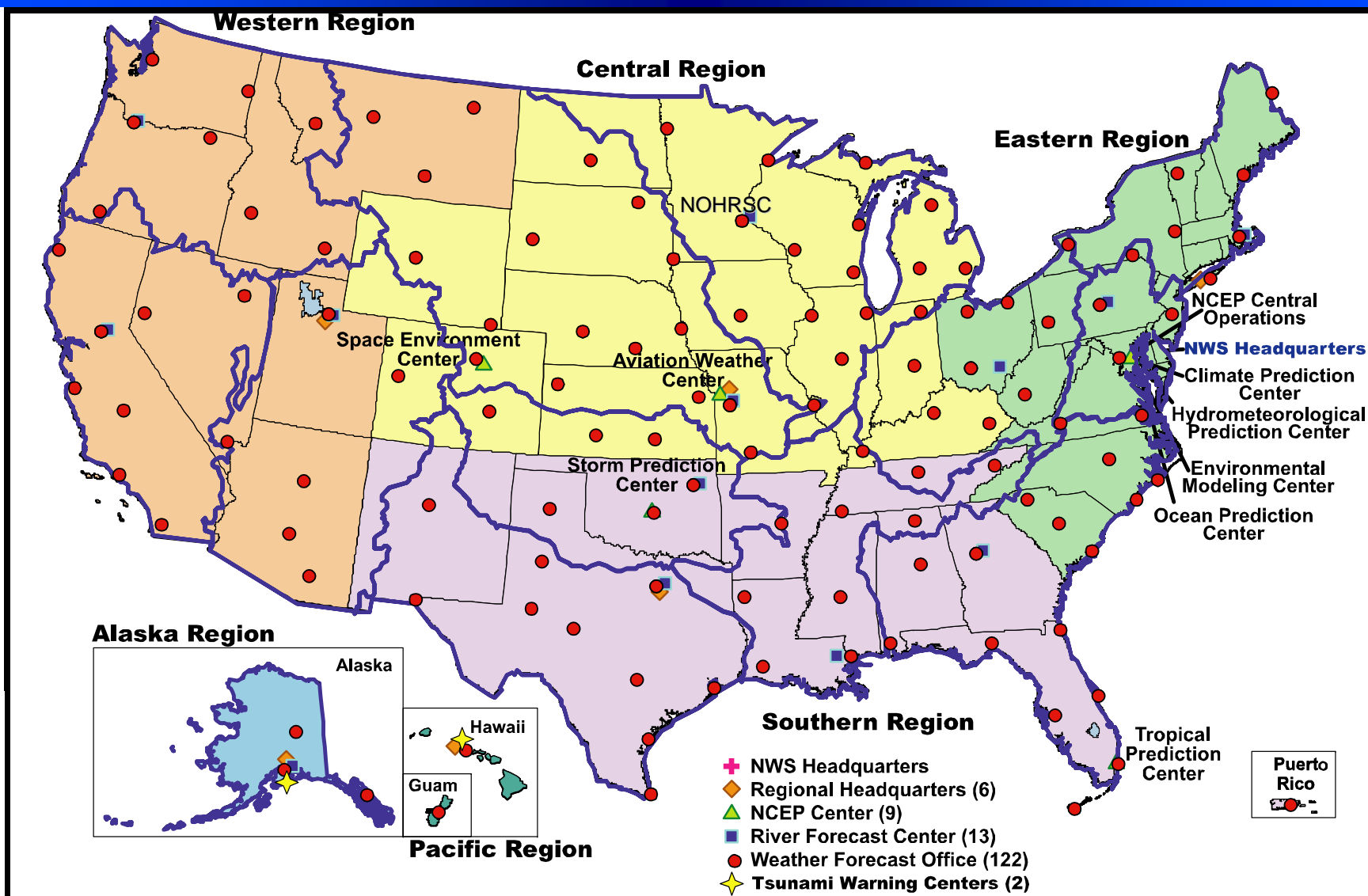


- **Snowpack Information (snow cover, depth, water equivalent, & temperature)**
- **Drought (Monitor & Outlook)**
- **Water Levels (Great Lakes, Coasts, & Ports)**
- **Precipitation Estimation and Forecasting (Rain & Snow)**
- **River/Stream Forecasting (Deterministic & Probabilistic)**
- **Hydrologic Outlooks, Watches and Warnings (Floods & Flash Floods)**





NWS Operational Infrastructure





Water Forecasting is a Partnership



NOAA's Forecasts Depend on:



USGS Streamflow, Groundwater, Precipitation and Water Quality Observations



USACE Reservoir Operation Information, Streamflow, Snowpack Observations



USBR Reservoir Operation Information, Streamflow Observations



NRCS Snowpack Observations





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-forecast area mapping*
 - *Visually-oriented products*
- Provide consistent access to standardized graphics via web interface





AHPS Services Modernization Program

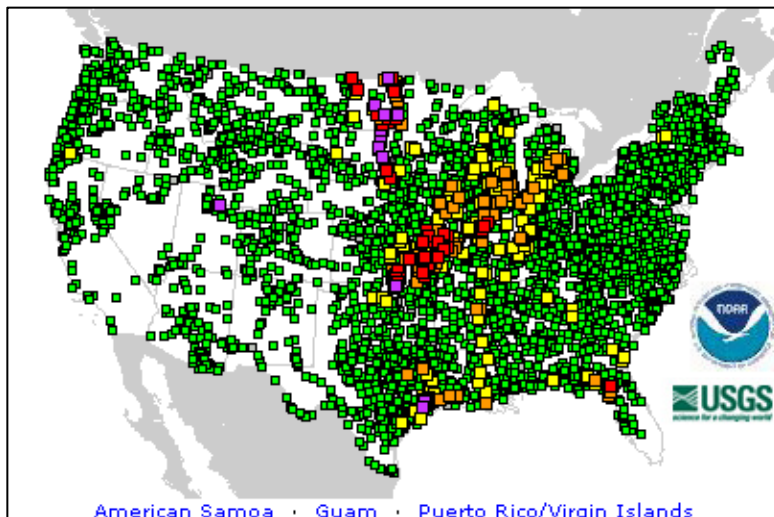


- **Implementation Accomplishments**

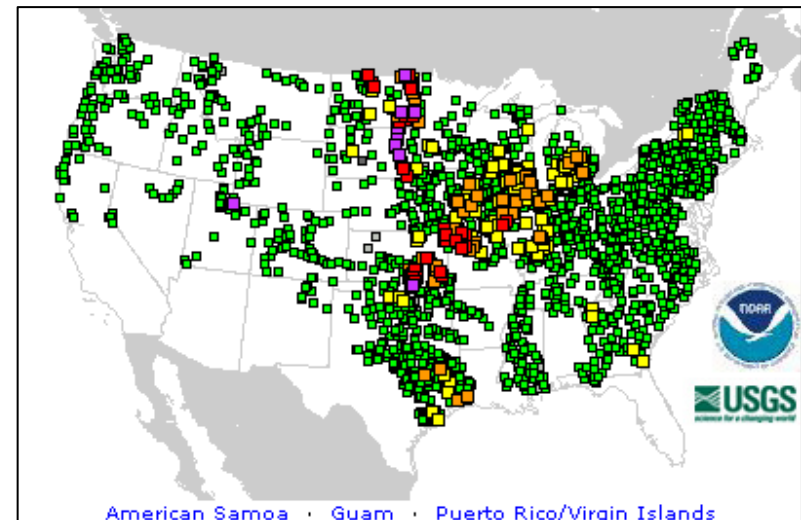
- Over 2,300 forecast locations enhanced with AHPS Probabilistic information through FY09 (more than 60% of current service locations)
- Significant investment in model calibration to improve forecast accuracy

- **Future Enhancements**

- 4,011 by 2014
- Continued model calibration where needed



Baseline Service Locations



AHPS Enhanced Service Locations



Accessing AHPS Information



<http://weather.gov/>

"click on" the water tab for current river conditions

National Oceanic and Atmospheric Administration's
National Weather Service

Site Map News Organization Search

Local forecast by "City, St"

XML RSS Feeds
Warnings
Current
By State/County...
UV Alerts

Observations
Radar
Satellite
Snow Cover
Surface Weather...
Observed Precip

Forecasts
Local
Graphical
Aviation
Marine
Hurricanes
Severe Weather
Fire Weather

Text Messages
By State
By Message Type
National

Forecast Models
Numerical Models
Statistical Models...

Climate
Past Weather
Predictions

Weather Safety
Weather Radio
Hazard Assmt...
StormReady /
TsunamiReady
Education/Outreach

...Potential For Significant Severe Weather Across The Mississippi Valley...
A strong cold front moving through the Mississippi Valley will trigger severe thunderstorms with large hail and damaging winds. Isolated tornadoes could also develop. The threat of severe weather extends from the Upper Mississippi Valley and Great Lakes to the Gulf Coast area. The greatest threat area will be in the Mid-Mississippi Valley from extreme northern Louisiana to central Illinois. Details...

Warnings & Forecasts Graphical Forecasts National Maps Radar **Water** Air Quality Satellite Climate

Warnings By State Click Below To Zoom In. Tabs At A Glance

Created: 05/02/08 at 20:10 UTC

American Samoa · Guam · Puerto Rico/Virgin Islands

Tornado Warning	Severe Weather Statement	Brisk Wind Advisory
Severe Thunderstorm Warning	Gale Warning	Lake Wind Advisory
Flash Flood Warning	Flood Statement	Wind Advisory
Blizzard Warning	Freeze Warning	Freeze Watch
Heavy Snow Warning	Red Flag Warning	Special Weather Statement
Winter Storm Warning	Snow And Blowing Snow Advisory	Marine Weather Statement
High Wind Warning	Winter Weather Advisory	Hazardous Weather Outlook
Flood Warning	Flood Advisory	Short Term Forecast
Tornado Watch	Coastal Flood Advisory	
Flash Flood Watch	Small Craft Advisory	

National Oceanic and Atmospheric Administration's
National Weather Service

Site Map News Organization Search

Local forecast by "City, St"

XML RSS Feeds
Warnings
Current
By State/County...
UV Alerts

Observations
Radar
Satellite
Snow Cover
Surface Weather...
Observed Precip

Forecasts
Local
Graphical
Aviation
Marine
Hurricanes
Severe Weather
Fire Weather

Text Messages
By State
By Message Type
National

Forecast Models
Numerical Models
Statistical Models...

Climate
Past Weather
Predictions

Weather Safety
Weather Radio

Home > Water

National Hydrologic Assessment is Now Available: Above Average Flood Risk in Nation's Midsection, Northeast and Parts of the West

Warnings & Forecasts Graphical Forecasts National Maps Radar **Water** Air Quality Satellite Climate

River Observations River Forecasts Precipitation River Download Other Information

All Locations Click The Map To Zoom In.

American Samoa · Guam · Puerto Rico/Virgin Islands

3810 Total Gauges
72 Locations in Flood

307 Gauges: Observations older than 24 hours	12 Gauges: Major Flooding
15 Gauges: Out of Service	20 Gauges: Moderate Flooding
	40 Gauges: Minor Flooding
	69 Gauges: Near Flood Stage
	3347 Gauges: No Flooding

Last map update: Fri, May, 02, 2008 at 03:52:47 pm EDT.



Hydrologic Service Priorities

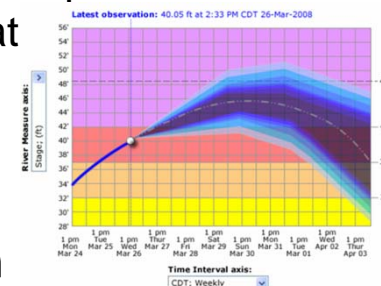


Community Hydrologic Prediction System (CHPS)

- **What:**
 - A software architecture to enhance collaboration across agencies and facilitate the use of data, models and software tools
- **Key Accomplishments**
 - Implemented prototype hardware and software capabilities at 4 RFCs (ABRFC, NWRFC, NERFC, CNRFC)
- **Implementation**
 - Parallel operations at 4 RFCs beginning Oct 2009, remaining RFCs Oct 2010
 - Retire legacy NWSRFS system and integrate CHPS within AWIPS II

Hydrologic Ensemble Forecast Service (HEFS)

- **What:**
 - End-to-end (seamless short-term to long-term) ensemble forecast service within CHPS
- **Key Accomplishments**
 - Demonstrating components of short-term capability at select basins in 6 RFC domains
- **Implementation**
 - Additional short-range prototype deployments during the next 2 years
 - Implement HEFS (integrated short- to long-term capability) via CHPS in 2012





Improving Flash Flood Services



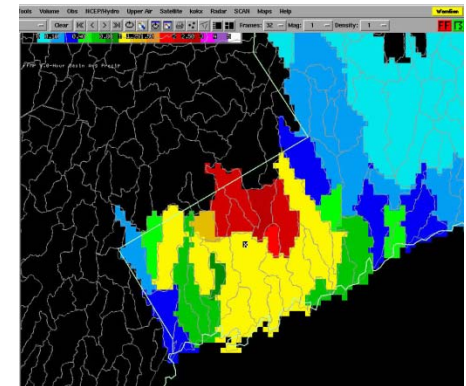
Increasing specificity, accuracy and timeliness of warnings

- **Key Accomplishments**

- Transition from county to storm-based warnings
- New Decision Assistance Tools
- Enhanced Precipitation Algorithms
- Gridded Flash Flood Guidance
- Over 45% increase in Flash Flood Warning Lead Time since FY02

- **Future Enhancements**

- Use spatially distributed models to enhance threat assessment
- Improve dam-break forecast tools
- Continue to Improve QPE and QPF



KOKX FFMP Threat BASIN Table

File ☐ Link to Frame Ending Time: Sat Aug 11 23:16:00 2001

☐ Display Rate Thresh Type: precip Sources: DHR

County: CT, FAIRFIELD Durations (hr): 1.00

Area_Id	Rate	Precip	FFG	Ratio	Diff
295	1.47	2.51	1.26	200	1.26
294	1.98	2.20	1.26	174	0.94
1132	0.72	2.19	1.26	174	0.93
1129	0.57	2.15	1.26	170	0.89
1131	0.49	2.03	1.26	161	0.77
1128	0.17	1.93	1.26	153	0.67
273	0.96	1.33	1.26	106	0.07
274	0.08	1.23	1.26	98	-0.03
275	0.08	1.23	1.26	98	-0.03
252	0.26	1.17	1.26	93	-0.09

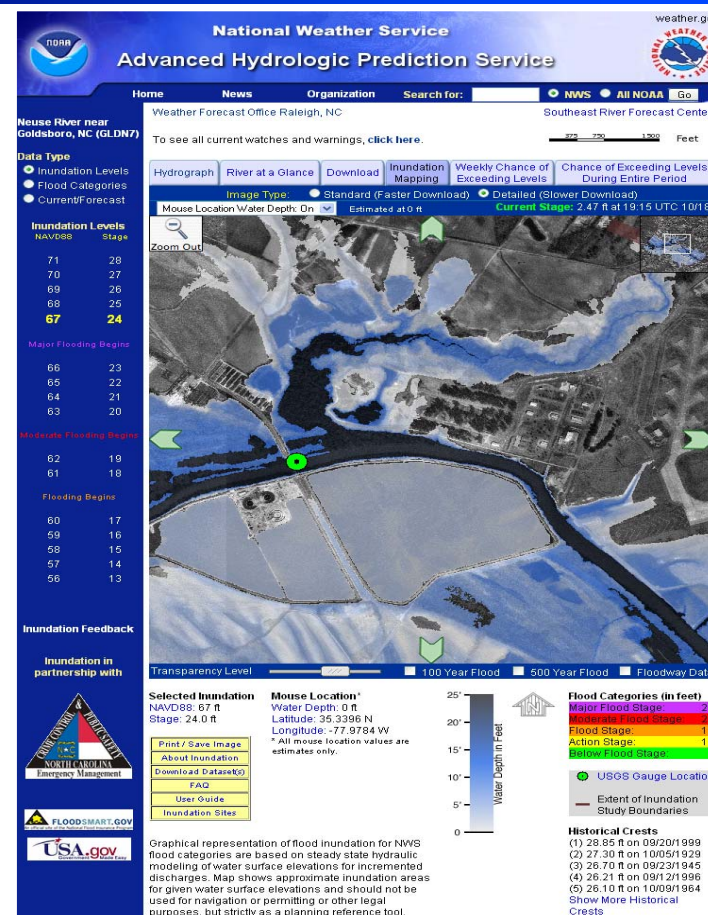


Enhancing the Communication of Flood Risk



Flood Inundation Mapping

- Provide information on the spatial extent and depth of flood waters in the vicinity of NWS river forecast locations
- Can display flood inundation maps for various levels ranging from minor flooding through the largest flood on record
- Enhance the communication of flood risk and provide information needed to better mitigate the impacts of flooding
- Each library includes NWS flood severity categories and regulatory FEMA flood frequency events



- Partnered effort with FEMA, USGS, States and other entities
- 47 libraries have been implemented in NC, Ohio, and the Gulf Coast Region



Information Dissemination

- **National Weather Service Controlled Methods – Text Products**

- ✓ NOAA PORT
- ✓ Weather Wire
- ✓ Emergency Managers Weather Information Network
- ✓ NOAA Weather Radio All Hazards – audio

- **Mobile Communication Devices**

- ✓ Cell Phones
- ✓ Personal Digital Assistants (PDA)

- **Internet**

- ✓ Graphical and text products

- **NWS disseminated products/information communicated by radio, TV, newspaper**





Alerting Stakeholders to 2009 Flood



One-Three Months Prior

- Jan 8, 2009 – Webinar for federal, state and local agencies describing major flood potential
- Mid Jan – Issued unscheduled AHPS web graphics and text outlook update (normally issued at end of month)
- Feb 18 – NWS/USACE/USGS coordination meeting
- Public Flood Outlook meetings
 - Feb 23 in Fargo
 - Feb 24 in Grand Forks





Alerting Stakeholders to 2009 Flood



- Feb 23/24 – Grand Forks Herald News and Fargo radio ran Outlook
- Feb 27 – Minnesota Public radio newscast and Star Tribune ran outlook; NWS posted National Hydrologic Assessment to www.weather.gov/ahps
- Mar 9 and daily through flood – Numerous radio, TV and news interviews/article



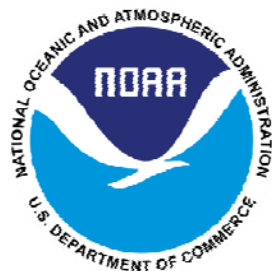


Improving Interagency Collaboration



IWRSS Consortium

National Oceanic and Atmospheric Administration
United States Army Corps of Engineers
United States Geological Survey



**US Army Corps
of Engineers®**





IWRSS Objective

Leap Ahead

- Implement a broad and integrative system to serve as a reliable and authoritative basis for next-generation adaptive water-related planning, preparedness and response activities from national to local levels.*

National Water Resources Information System

GOAL 1

Integrate Services and Service Delivery

GOAL 2

Increase Accuracy and Lead Time of River Forecasts

GOAL 3

Provide New Summit-to-Sea High-resolution Water Resources Information and Forecasts



Major Elements of IWRSS

- **Flow/Flood Forecasting and Water Management**
 - Implement infrastructure and tools to exchange information easily between partner agencies
 - Interoperable tools and databases
 - Joint Coordinated Forecasting and Decision Support
- **Levee and Dam Failures**
 - Implement advanced hydraulic models, levee-break scenario testing
- **Geospatial Intelligence and Enterprise GIS**
 - Integrate data sets to achieve *Common Operating Picture*
- **Additional Data and Observations**
- **Digital Services**
 - One-stop portal for water information



US Army Corps
of Engineers

