Recent and Emerging Improvements to the NWS Hydrologic Services Program

Illinois Association for Floodplain and Stormwater Management Annual Conference
March 15, 2012

Steve Buan NOAA/NWS Chanhassen, MN
President Obama Announcement

• January 13 Announcement
  – Seeking Congressional authorization to reinstate power to reorganize government
  – First reorganization proposal would be to move DOC and other business related departments/agencies into a new department.

• What does it mean to NWS?
  – If authority granted President would request moving NOAA to DOI as part of the first proposal
A Changing World

Society Increasingly Vulnerable

- Extreme impacts from weather, water, climate events
- Population growth and demographic changes
- Technological dependence
- Water Availability—too much, too little, quality

Weather Ready Nation
Miss Ohio’s lightning safety message resonates with judges

Pageant judges recognized the impact Ellen has made advocating for lightning safety by placing her among eight finalists the Quality of Life scholarship.

Recently Updated Content
Miss America hopeful shares compassionate lightning safety story at national pageant
To 2011: Goodbye and good riddance

WRN Social Media
NOAA Youtube
NOAA’s Facebook
NWS Actions

*What is the weather service doing?*

- Improved precision of weather and water forecasts
- Effective communication of risk
- Improved decision support services
- Innovative science and technological solutions
- Strengthened partnerships
Meeting the Nation’s Needs

Building a Weather-Ready Nation

GOAL 2: Deliver a broad suite of improved water forecasting services to support management of the Nation’s water supply

• Develop Integrated Water Resources Science and Services with partners
  – Establish National Water Center
• Deploy Community Hydrological Prediction System
GOAL 5: Enable integrated environmental forecast services supporting healthy communities and ecosystems

• Establish enhanced weather-dependent health decision support services
  – Partnerships: other NOAA offices, federal agencies, and private sector

• Develop new weather and water forecast capabilities to enhance NOAA ecological prediction and ecosystem decision support services
Engaging the Challenge

The Extreme Impacts

• Threat: The Extreme Impacts
  – Extreme impact events across the country in 2011
    • Blizzards affecting up to 100 million people
    • Weeks of tornado outbreaks
    • Months of floods
    • Months of heat, drought, and wildfires
    • Deepwater Horizon requiring 400 NWS staff deployments

• Goals: Improved forecasts and adaptable community presence

• What We’re Doing:
  – New Science and Technology
    • Unmanned Aircraft Observation
    • Dual polarization radar
  – Focusing on Collaboration
    • Deployable Emergency Response Specialists
    • Improving quantitative precipitation forecasts
    • Community Hydrologic Prediction System (CHPS)
  – Improve Service Delivery
    • Inundation Forecast
    • Uncertainty Quantification
    • Economic/Environmental Forecasts
New Technology
Unmanned Aircraft Systems

- Inundation
- Levee Breach
- Ice/Debris Jam
- Impoundment Integrity
UAS Operations

Aircraft In Hangar

Operations Control Room
OPERATION: Flood Watch-ND-FY11-SAR
TARGET: Road Bridge/Railroad Bridge
SNSR/RES/Mode: Lynx SAR/6 " Dwell Spot/SOS overlay on EO image
AREA: Oslo, MN
TOT: 30 Mar 2011
UAS Capabilities

US - View from East

UNCLASSIFIED

TIED DTV RATE

10 - 15C

60

120

NO LASER INSTALL

22:22:06

N48°17'13"

W101°27'26"

BRG 228

RNG 14.919M

RNG 9.06NM

TWD 1890CH

ELV

13 Apr 11

22182/1819L

NASOC-GF

GEO: 482123N1013248W MGRS: 14LUU 11346 59069

MSN: Grand Forks - 13 Apr 11 14:45
Radar Upgrade

• What Changed?
• New Capabilities
• What do you mean “Dual Polarity”? 

![Conventional Radar vs Dual-Polarization Radar](image)
Monitor the Playground

What games are they playing?  
Doppler

Where are the 1st graders?  
Dual-Pol
Improved Detection of Rain & Hail

Size distribution analysis = Better quantity estimate

• Discriminate between heavy rain and hail
• Predict hail size
Precipitation Data Access

Real-Time Storm analysis
Real-Time Precipitation

National Weather Service Enhanced Radar Image

Chicago, IL Radar

Base Reflectivity
Dual-Pol Installation Schedule

- Installed: March 19
- Installed: October 1
- Installed: February 2013
- Installed: January 2013
Collaboration & Partnership
24 Federal Agencies have roles in fresh water, including NOAA:

- Monitoring
- Prediction
- Protection
- Regulation
- Management
- Mitigation
- Conservation
- Science
- Response
- Recovery
- Restoration
- Education
IWRSS Roadmap and MOU

Framework to align agencies with complementary water-related missions to accomplish operational goals.

MOU Signed May 11, 2011

Signatories
- Dr. Jane Lubchenco, Director of NOAA
- Rock Salt for the Honorable Jo-Ellen Darcy, Assistant Secretary of the Army for Civil Works
- Dr. Marcia McNutt, Director of the U.S. Geological Survey

Initial Focus Areas
- High-Resolution Water Resource Forecasts and Flood Inundation Maps
- System Interoperability and Data Synchronization
Integrated Water Resources Science and Services (IWRSS)

Design Principles:

- Embody “good government” to leverage existing resources
- Share technology, information, models and best practices
- Be comprehensive, systematic and scalable

National Water Center (NWC) – Catalyst for enhanced water forecasting operations, applied research and inter-agency collaboration

Objectives:

- Leverage multi-disciplinary skills to formulate effective solutions
- Deliver interoperability of key systems and data synchronization
- Implement new products and services based on enhanced geospatial information and visualization
- Address stakeholder needs and recommendations for new and enhanced water resources information
Seamless Data Access Prototype

Use ZoomBox Tool: Hold down the Shift key while dragging a box.

Legend
- Stream Gage
- USACE Reservoir
- USACE Lock and Dam
- Other Reservoir

Other Links:
- Missouri Basin River Forecast Center
- HPC Precip Forecast (GFS)
- DFC 2-Month Forecasts
- USGS Iowa Streamgages
- NARR Mountain Snowpack
National Water Center

University of Alabama
Community Hydrologic Prediction System
Community Hydrologic Prediction System

Old Way - Propriety System

Open System - CHPS
Decision Support Services

- Joplin Tornado 2011
- Marion EOC Flood 2011
- Harrisburg EOC Tornado 2012
- Michigan Oil Spill 2010
- Minot, ND Flood 2011
- Deepwater Horizon 2010
Products for the Digital Age
Evolution of Hydrologic Forecasts

1800s – Early 1900s

Observe Flood

Send Telegram

Downstream folks get a better viewing position
Mid 1930s - 1997

- Limited forecast
- No future rainfall
- Levee breaks
- Rainfall distribution issues

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**NORTH CENTRAL RFC STAGE FORECASTS**

<table>
<thead>
<tr>
<th>STREAM AND STATION</th>
<th>for</th>
<th>today</th>
<th>forecasts</th>
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</thead>
<tbody>
<tr>
<td>COTTONWOOD R</td>
<td>11</td>
<td>8.9</td>
<td>CREST 16.0 6/19</td>
</tr>
<tr>
<td>NEW ULM MN</td>
<td></td>
<td></td>
<td>MINOR RISE</td>
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<tr>
<td>MINNESOTA</td>
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<td>19</td>
<td>16.6</td>
<td>CREST 74.5 6/24</td>
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<td>HENDERSON MN</td>
<td>729</td>
<td>731.5</td>
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<tr>
<td>JORDAN MN</td>
<td>20</td>
<td>23.2</td>
<td>CREST 74.5 6/24</td>
</tr>
</tbody>
</table>

NOTE.. FORECASTS BASED ON PCPN UP TO 7AM TODAY.

.. FORECAST FOR REDWOOD R SENT EARLIER THIS AM.

..PN..
1997

- Advanced Hydrologic Prediction Service Is Launched For The Des Moines River
Latest observed value: 31.94 ft at 6:15 PM CDT 24-Mar-2009. Flood Stage is 18.0 ft. Forecast data shown here are guidance values only. Please refer to your local NWS office for the latest official public river forecasts.
Water Forecasting Challenges

Benefits

- Protection of Life & Property
- Hydropower
- Recreation
- Ecosystem
- State/Local Planning
- Environment

- Flood Mitigation & Navigation
- Agriculture
- Reservoir Control
- Health
- Commerce

Forecast Uncertainty

- Weeks
- Months
- Seasons
- Years

Forecasting challenges are marked by uncertainty, which varies in terms of time scales:

- Days
- Hours
- Minutes

Chances of Exceeding Flood Levels in the U.S. Reaches 46% in 2018-2019

- Major Flooding
- Moderate Flooding
- Minor Flooding
Complete the Continuum

Probabilistic information to support risk-based decisions

Seamless short- to long-term Hydrologic Ensemble Forecast Service

Incorporates both atmospheric and hydrologic uncertainties
Multiple Rainfall Forecasts

THE Rainfall Forecast

“Reasonable” Maximum
Multiple River Predictions

NCRFC Ensemble QPF River Scenarios - Includes 48 Hour QPF
MNT2 -- Sangamon River -- Monticello (River), IL

River Model Output: **(1)
 Issued 2011-05-24 10:10:06 GMT
- NO QPF **(2)
- with 48-hr Max **(3) QPF
- with 24-hr QPF
- with 48-hr Min **(3) QPF

River Forecast:
 Issued GMT
- RFC certified Forecast

River Stages:
- Observed Values

FCST Issue Stage = 11 ft.
Flood Stage = 13 ft.
Minor Stage = 12 ft.
Moderate Stage = 17 ft.
Major Stage = 20 ft.

Footnotes:
**(1) River Model Output is now model data: not quality controlled
**(2) QPF = Quantitative Precipitation Forecast
**(3) QPF minimum (Min) and maximum (Max) are determined through Confidence Interval statistics (95% Min/95% Max)

About this graph
Graph Creation Date: Tue, 24 May 2011 12:19:39 -0500
Digital Information Age

Static Flood Inundation Mapping
Digital Information Age

Dynamic Flood Inundation Forecast

Conventional Flood Forecast
Runoff Risk Advisory Forecast
Wisconsin Manure Management Advisory System
Recipe For Success

• Weather Ready Nation
• Teaspoon of Technology
• Pinch of Partnerships
• Dash of Digital Products
• Plenty of People
Thank You

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