

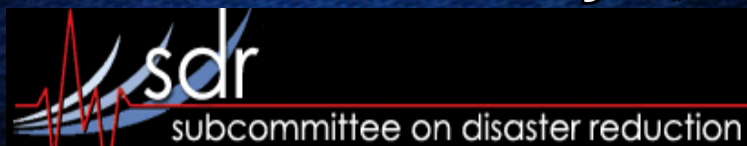


Decision Support Services and the 2009 Red River Flood

Mike Hudson

NOAA/National Weather Service
Central Region Chief Operations Officer

Briefing to the Subcommittee on Disaster Reduction
May 7, 2009



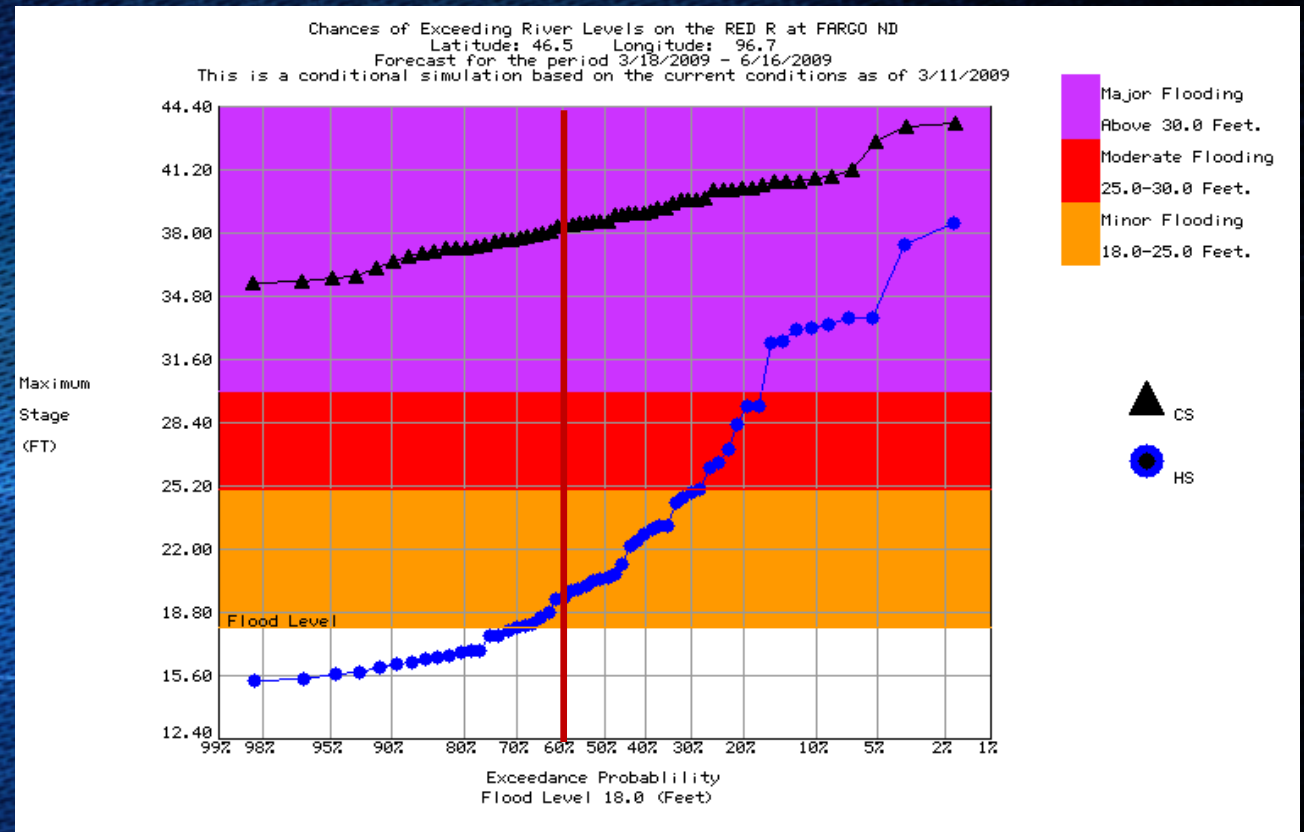
Flood event review

- Record flooding occurred on the Red River at Fargo with crest of 40.82' on March 28
- Antecedent conditions prime for record flood potential
- Outlooks highlighted likelihood of major flooding, and ultimately of record flooding, well in advance



Fargo flood probability outlook

- 60% chance of reaching 38 feet
- 25% chance of eclipsing the flood of record



Why the Fargo focus?

- **Social Impact**
 - **First in 12 years to mirror magnitude of '97 flood**
 - **~15 to 20% of the State's population in Fargo**
- **Economic Impact**
 - **Fargo represents ~30% of State's economy**
- **Communications and Transportation**
 - **Hub for much of the State's telecommunications**
 - **I-94/I-29 & railroads**

Multi-tiered support

- **On-site support provided at three State Emergency Operations Centers (SEOC)**
 - *Minnesota SEOC staffed by WFO Chanhassen from 3/24 to 4/3, and most mornings from 4/6 to 4/15*
 - *North Dakota SEOC staffed by WFO Bismarck from 3/25 to 4/17, and some mornings from 4/20 to 5/8.*
 - *South Dakota SEOC staffed by WFO Sioux Falls from 3/26 to 3/29*
- **On-site support to FEMA Region VIII in Denver, CO**
 - *Staffed by WFO Boulder from 3/24 – 3/30.*

Decision Support Services

Key Events

1/9/09-3/15/09:
WFO Grand Forks and
NCRFC engaged with
state/local EM's and
congressional about
RRN flood potential

3/24 -4/3; 4/13-16: On-site support at
 Fargo/Moorhead and Minnesota SEOC

3/25-5/1: On-site support at ND SEOC (*after 4/20: mornings only
with WFO Bismarck preparing daily hydro summary for decision makers*)



MARCH

APRIL

3/20-4/6: Daily DHS/FEMA/NOC briefings
from NWS Central Region Headquarters

3/26-31:
On-site at
SD SEOC

4/15-4/16: *Second Crest*
On-site support ends at
 Fargo/Moorhead and scales
 back at MN SEOC.



What was our role?

- NWS requested to attend numerous meetings/briefings
- Focus on Decision Support of observations and forecasts
 - *Utilization of NOAA web resources*
 - *Interpretation of probabilities*
 - *Being the purveyor of the “uncertain”*



What was our role?

- What did Decision Support mean to Fargo/Moorhead officials?
 - ***We were there*** – before, during and after the BIG events
 - ***“We” are “They”*** – a part of the community of locals and veterans of the flood fight
 - ***Communications and Trust*** – be open and honest
 - ***TEAM – Grand Challenge #1***



Typical Fargo/Moorhead schedule

- 7:00 am - Fargo city staff meeting @ City Hall
- 8:00 am - Fargo City Hall press conference
- 9:30 am - Fargo/Cass County EOC briefing
- 10:00 am - Moorhead, MN EOC briefing
- 11:00 am - Moorhead press conference
- NOON - Grand Forks Media conference call
- 1:00 pm - Fargo city staff meeting @ City Hall
- 2:00 pm - Fargo City Hall public mtg/press conf.
- 2:30 pm - Fargo/Cass County EOC briefing
- 6:00 pm - Moorhead, MN EOC briefing
- 9:00 pm - Fargo/Cass County EOC briefing

Difference makers

Technological improvements yielded much better data from which NWS and officials could make better decisions (**Grand Challenge #3**)...

1997 – Grand Forks

- River gage data latency ~ 12 minutes
- Average DCP data refresh 4 hours
- National network ~6000 locations
- Daily data values processed ~400KB
- Slow, limited communication links
- Limited access to collab. agencies
- Infancy of Internet

2009 – Fargo

- River gage data latency ~ 2 seconds
- Average DCP data refresh 1 hour
- National network ~ 13,800 locations
- Daily data values processed ~2.5MB
- Multiple communication networks
- Extensive access to collab. agencies
- Extensive distribution via Internet

Advanced Hydrologic Prediction Service

National Oceanic and Atmospheric Administration's
National Weather Service

Home > Water

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

River Observations | River Forecasts | Precipitation | River Download | Other Information

All Locations [Go] Click The Map To Zoom In.

3823 Total Gauges

Legend: Major Flooding

- <http://www.weather.gov/ahps>
- Provide improved water availability and flood warning information by leveraging NOAA's infrastructure and expertise
- Modernize services through infusion of new science and technology
 - Enhanced decision support
 - Quantification of forecast certainty
 - More accurate and timely forecasts and warnings
 - Flood mapping
 - Visualize information

National Weather Service
Advanced Hydrologic Prediction Service

Home News Organization Search for: [] NWS All NOAA

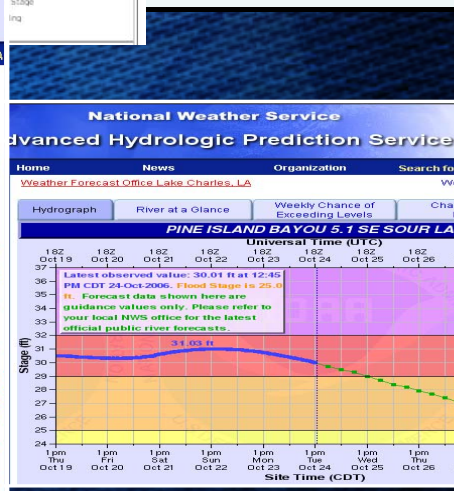
Weather Forecast Office Lake Charles, LA

Experimental National Precipitation Graphics Suite.

ALERT! A Flood Statement is in effect for portions of the area. View all valid statements/warnings or choose a specific point or river to get the details for that location.
Updated 02:44 PM CDT Oct 24 2006

Map Legend:

- Hydrograph Information Available
- Probability and Hydrograph Information Available
- Major Flooding
- Moderate Flooding
- Minor Flooding
- Near Flood Stage
- No Flooding
- Observation More Than 24 Hours Old
- Out of Service



National Weather Service
Advanced Hydrologic Prediction Service

Weather Forecast Office Raleigh, NC

House River near Goldsboro, NC (GLDN7)

Inundation Levels

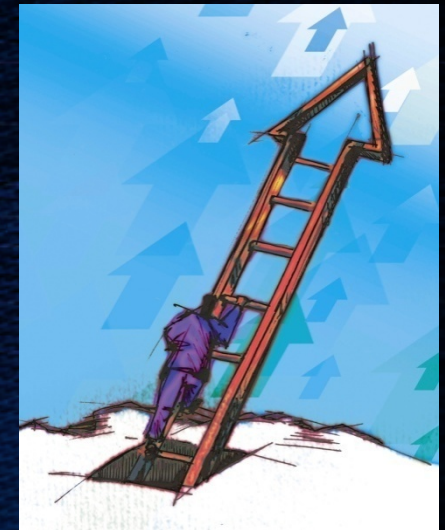
NAVD88 Stage	Stage
71	28
70	27
69	26
68	25
67	24
66	23
65	22
64	21
63	20
62	19
61	18
60	17
59	16
58	15
57	14
56	13

Inundation Feedback

Inundation in partnership with

Successes

- Excellent interagency collaboration involving federal, state and local government officials
 - *Face-to-face work in Fargo (and NCRFC) with USACE and the USGS*
 - *Border Patrol → use of UAS aircraft for snow/ice measurements*
- Strong internal collaboration
 - *Unprecedented use of extended precipitation and temperature forecasts into river models*
 - Facilitated by NWS local offices and national centers



Successes

- Presence at various city and oxbow meetings
 - *Being a part of the team*
 - *“Being there” went a long ways towards removing doubt*
- Early acceptance into the “team” on-site
- Up close with discussions amongst all the Federal agencies involved
 - *Agencies (USACE, USGS, DNRs, Border Patrol, Red Cross, FEMA, State EMAs, etc.)*
 - *Political figures (Governors, Senators, Representatives)*

Areas to improve

- **Successful decision support services require effective information management**
 - ***Science/technology advances → improved forecast process***
 - ***Data is interoperable, accessible, reliable and from all available sources***
 - ***Users depend on expert interpretation for effective decision making***
- **The message we intend to communicate is not always conveyed effectively**
 - ***Terminology can create confusion***
 - Outlook vs. Forecast
 - Probabilistic vs. deterministic



Areas to improve

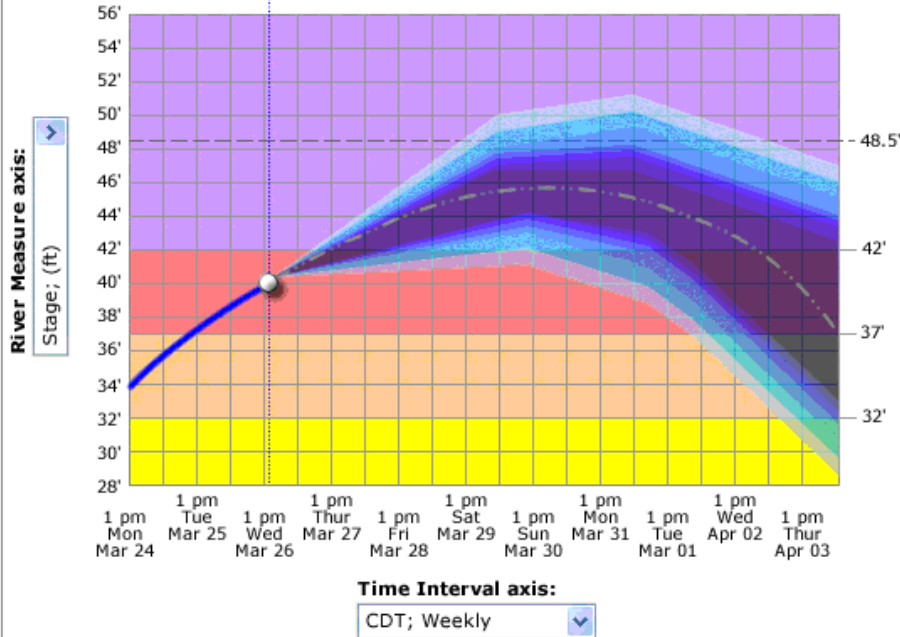
Mississippi River at Cape Girardeau

Conduct prediction models using:

- NOAA predicted ranges
 My and NOAA predicted ranges

Forecast data shown here are guidance values only. Please refer to your local NWS office for the latest official public river forecasts.

Latest observation: 40.05 ft at 2:33 PM CDT 26-Mar-2008



- + Local Conditions:
- + Near Upstream Conditions:
- + Far Upstream Conditions:

Date:

03/26/07

Flood Stage:

Moderate Flooding

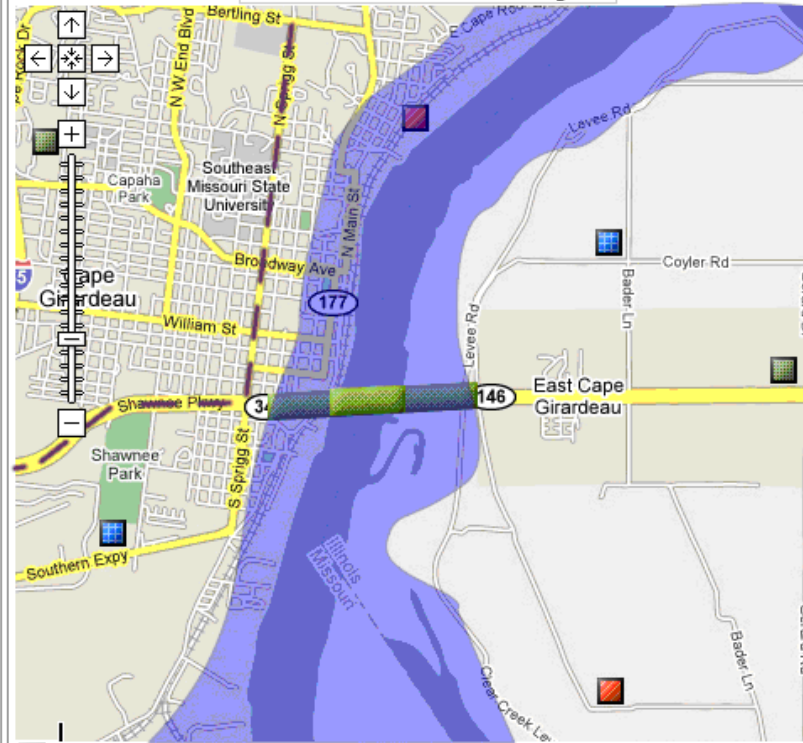
Likelihood:

100%

Time:

2:33

Confidence:



Hazardous Materials

Shelters

Bridges

Sick / Elderly

Evac. Route

Summary

- Various NOAA teams were deployed to various state/Federal locations to support the Red River flood effort
 - *Two teams on-site in Fargo/Moorhead, one for each crest*
- Decision Support activities address several of the Grand Challenges
 - *Excellent way for NOAA to help meet these needs*
- NOAA/NWS Forecast Offices and on-site Decision Support Specialists contributed greatly to hazard mitigation during the Flood of 2009



Questions?

