

United States Multi-Hazard Early Warning System



Saving Lives Through Partnership

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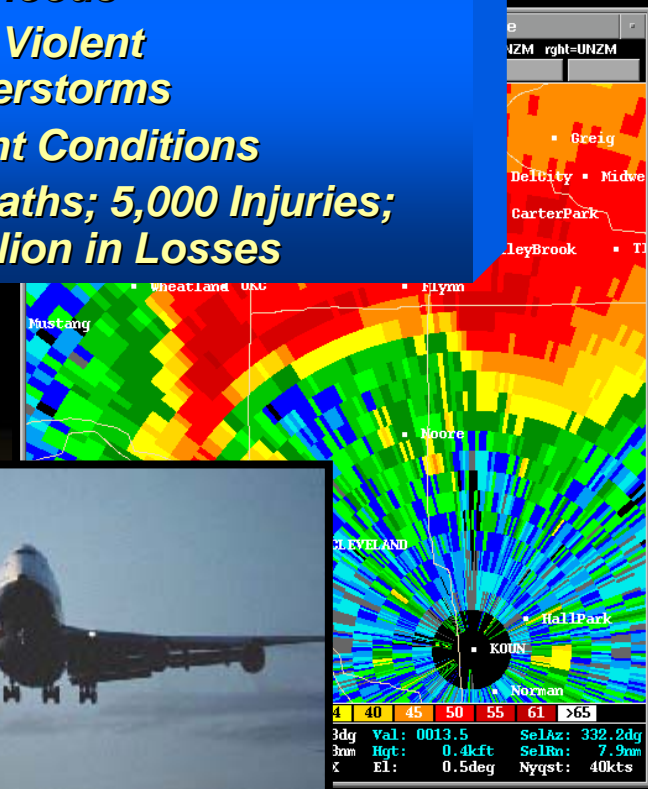
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U.S. Yearly Threats/Impacts

- **Climate, Water, Weather Forecasts and Warnings are used to protect life and property and enhance the economy**
- **76 billion observations**
- **1.5 million forecasts**
- **50,000 warnings**

A Typical Year Brings:

- *6 Hurricanes*
- *1,000 Tornadoes*
- *5,000 Floods*
- *10,000 Violent Thunderstorms*
- *Drought Conditions*
- *500 Deaths; 5,000 Injuries; \$14 Billion in Losses*



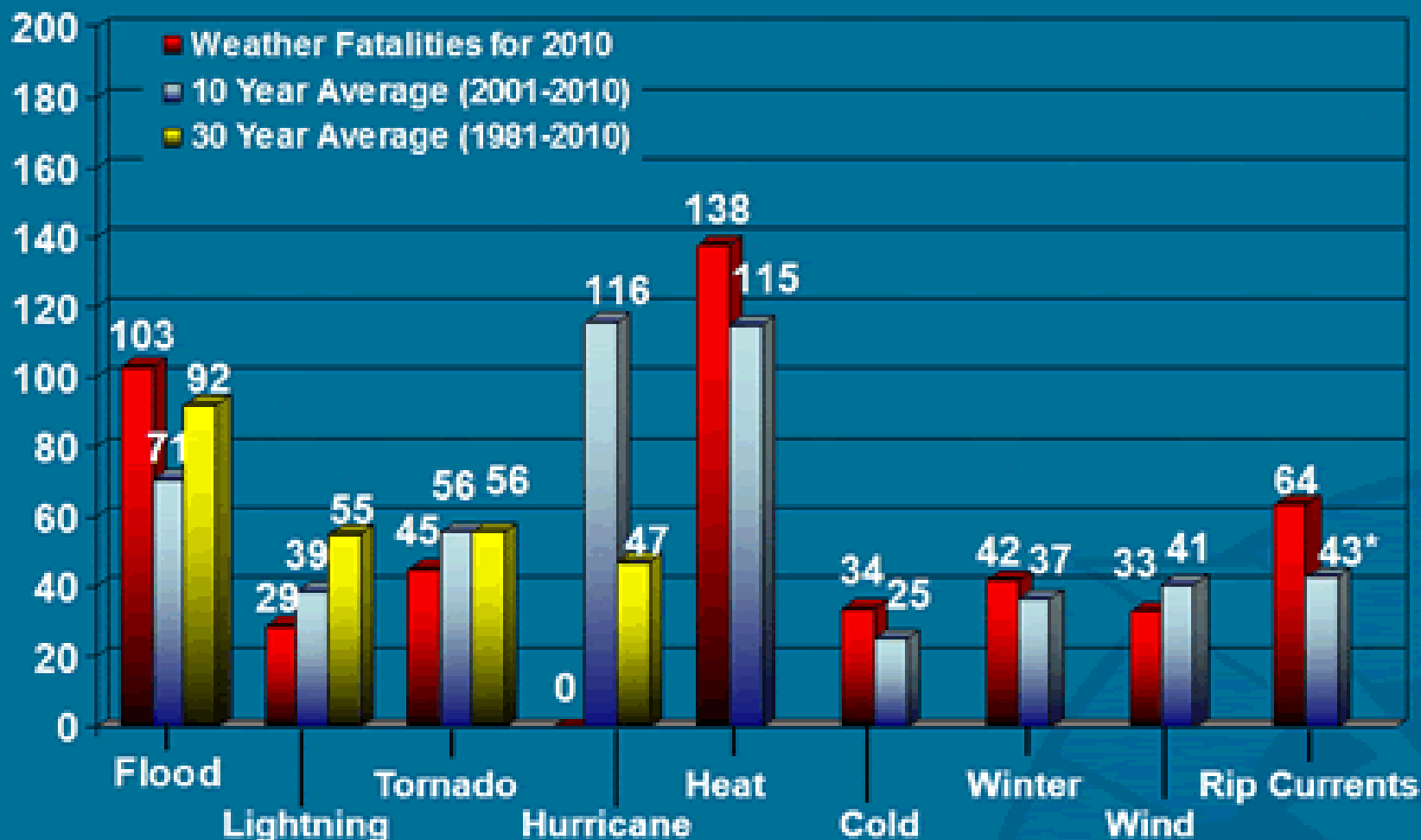
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2011 Major Weather and Climate Events in the United States





Weather Fatalities



*9 year average

U.S. Establishment of Early Warning System

- Prior to 1951 no method for the U.S. Government to broadcast warnings to citizens. A Government organized means of emergency broadcasting was developed.
- In 1963, the Emergency Broadcast System (EBS) was established
- In 1997, the Emergency Alert System (EAS) replaced the EBS



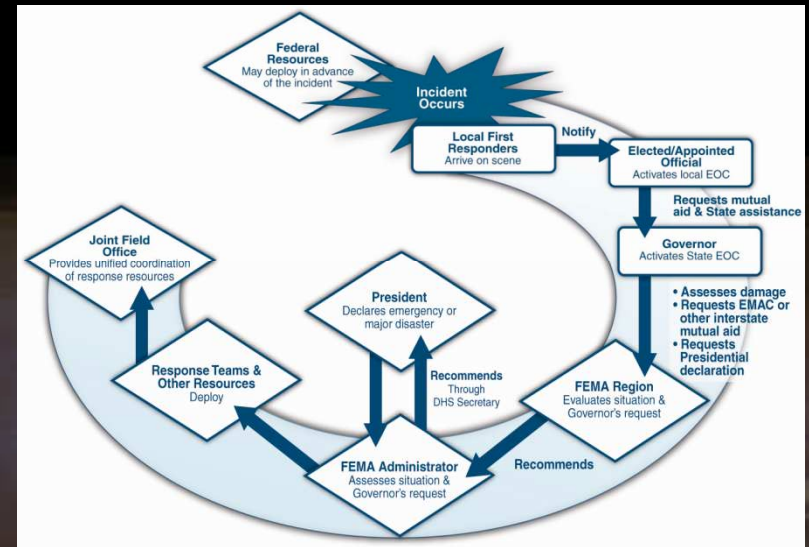
Policy, Institutional and Legal Frameworks

- The U.S. National Response Framework (NRF) provides the guiding principles that enable all response partners to deliver a unified national response to disasters and emergencies.
- Maintained by the U.S. Department of Homeland Security's Federal Emergency Management Agency (FEMA)



Policy, Institutional and Legal Frameworks cont...

- The NRF includes an overview of the Stafford Act Support to States which outlines actions Federal agencies are likely to take to assist state, tribal, and local governments affected by major disaster or emergency.



A list of national policies and legal documents as well as various agreements that govern the MHEWS

Name	Type	Date Enacted
Weather Service Organic Act	Law	1890
The Air Commerce Act of	Law	1926
The Communications Act	Law	1934
The Flood Control Act	Law	1938
The Federal Aviation Act	Law	1958
The Robert T. Stafford Disaster Relief and Emergency Assistance Act	Law	1974
Executive Order 12148, 44 Fed. Reg. 43239	Executive Order	1979
Executive Order 12656, 53 Fed. Reg. 47491	Executive Order	1988
The Homeland Security Act	Law	2002
Emergency Management: The American Experience 1900-2005	Publication	2006
Tsunami Warning and Education Act	Law	2006
The Post-Katrina Emergency Management Reform Act (PKEMRA)	Law	2007
Flood Control and Coastal Emergencies Act	Law	2007
Report for Congress The Congressional Appropriations Process: An Introduction	Congressional report	2007
Emergency Preparedness: Current Emergency Alert System Has Limitations, and Development of a New Integrated System Will Be Challenging	Report to Congressional Committees	2007
The US National Response Framework (NRF)	Policy	2008
300 Billion Served – Sources, Perceptions, Uses and Values of Weather Forecasts	Publication	2009



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National to Local Emergency Planning

- The National Incident Management System (NIMS) provides information to guide departments and agencies at all levels of government, nongovernmental organizations, and the private sector to work seamlessly during significant events.
- The components of NIMS work together to provide the national framework for incident management from Preparedness, Communications and Information Management, Resource Management, Command and Management to Ongoing Management and Maintenance.



U.S. EMERGENCY MANAGEMENT

- A national system comprised of Local, State and Federal E.M. agencies
- Responsible for coordinating the preparedness for, response to, recovery from and mitigation of disaster events
- Authority derived from statutes and chief elected officials at each level
- Local agencies primarily responsible for severe weather preparedness/warning



Federal, State, Local NGO Roles in Weather Warnings/Disasters

- **Pre-Event:**
 - *Decisional Support Services (DSS), FEMA, State and Local EM Agencies work with NWS field offices (chat, GoToMeetings)*
 - *Local EMs & NGOs (Red Cross) provide public awareness materials/presentations*
- **During the Event:**
 - *Local EMs coordinate directly with NWS*
 - *NWS and Local EMs activate numerous warning methods*



Federal, State, Local NGO Roles in Weather Warnings/Disasters

- **After an Event:**
 - ***Disaster Declarations: Local CEO, State Governor to the President (Through FEMA regional offices/HQ FEMA)***
 - ***State, Locals, FEMA and NGOs operate from a joint field office to provide resources & coordinate assistance to communities/citizens***



ESSENTIAL LOCAL “PARTNERSHIP”

- Continuing communication between local EM agency and local NWS Forecast Office (DSS activities...Chat, GoToMeetings, Phone)
- Based on mutual trust, respect and understanding
- Collaboration in preparing the public for severe weather events.
- Real-time interaction during events (on-site support, DSS activities)
- NWS Warning Coordination Meteorologists (WCM) a key element.



U.S. Emergency Management

- A national system comprised of Local, State and Federal Emergency Management agencies
- Responsible for coordinating the preparedness for, response to, recovery from and mitigation of disaster events
- Authority derived from statutes and chief elected officials at each level
- Local agencies primarily responsible for severe weather preparedness and warning



Responsibilities

- **Planning**

Hazard analysis completed to identify all natural hazards that impact jurisdiction. Mitigation strategies are created with emphasis on mitigating weather linked hazards.

- **Response**

Response protocols are developed for identified hazards for both pre event and during for responder and victim safety.



Responsibilities cont...

- **Warning**

Risk information coordinated with the NWS for sheltering, long term mass care and evacuation activities.

Warning times are crucial to allow local jurisdictions, states and the federal response agencies to alert citizens of impact, recommend protective measures, and to allow authorities to prepare response capabilities.



Emergency Preparedness And Response Activities (local to national)

- Actions taken once warning is issued
 - ***Weather warnings are issued for both potential impact and verified impact of event (i.e. Tornado Warnings)***
 - Local governments continue monitoring situation to determine impacts
 - State government response
 - Federal response

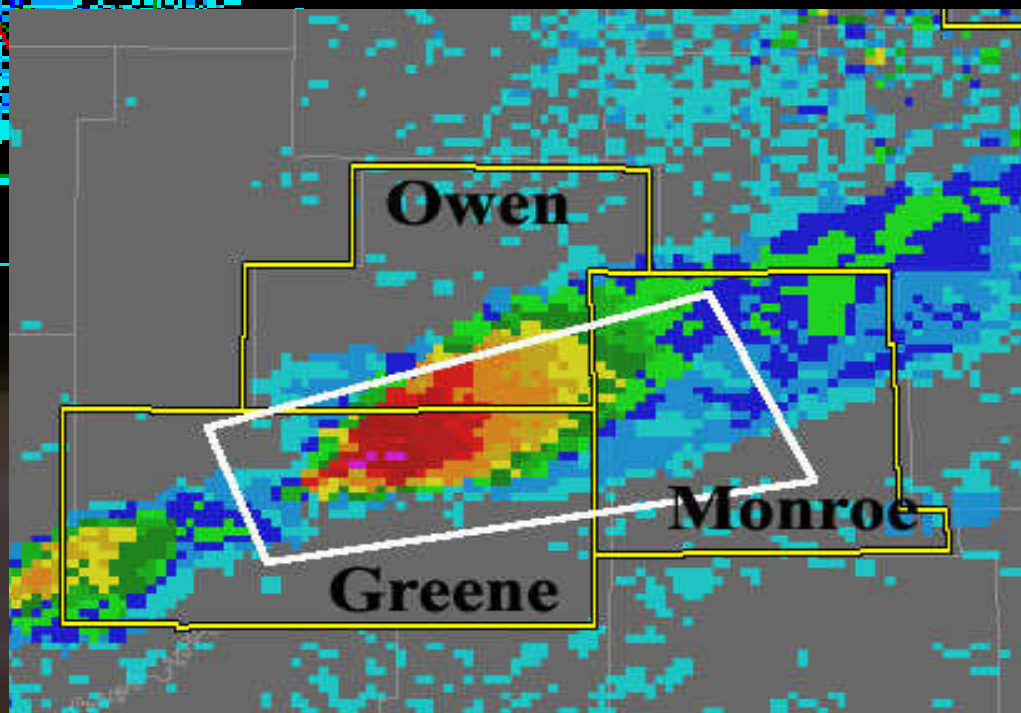
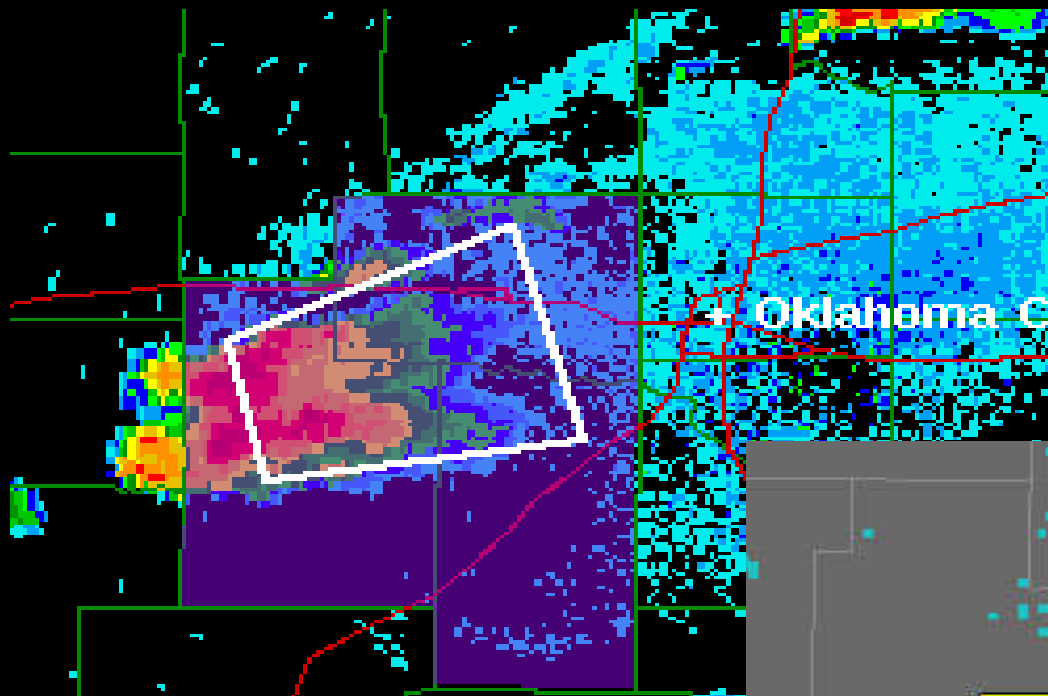


Improvement Examples In Preparedness And Prevention

- Integrated Warning Team – partnership of National Weather Service, local media representatives and local emergency managers
 - *Common communication protocols to public*
 - *Joint understanding of why warnings issued and local government response – led to better understanding by NWS, media and local governments of responsibilities to citizens*
- Warning polygons – NWS now issues warnings by defined geographic areas rather than by county as in the past. This allows local government to narrow its warning area and not alarm, unnecessarily, unimpacted citizens.



Warning Polygons



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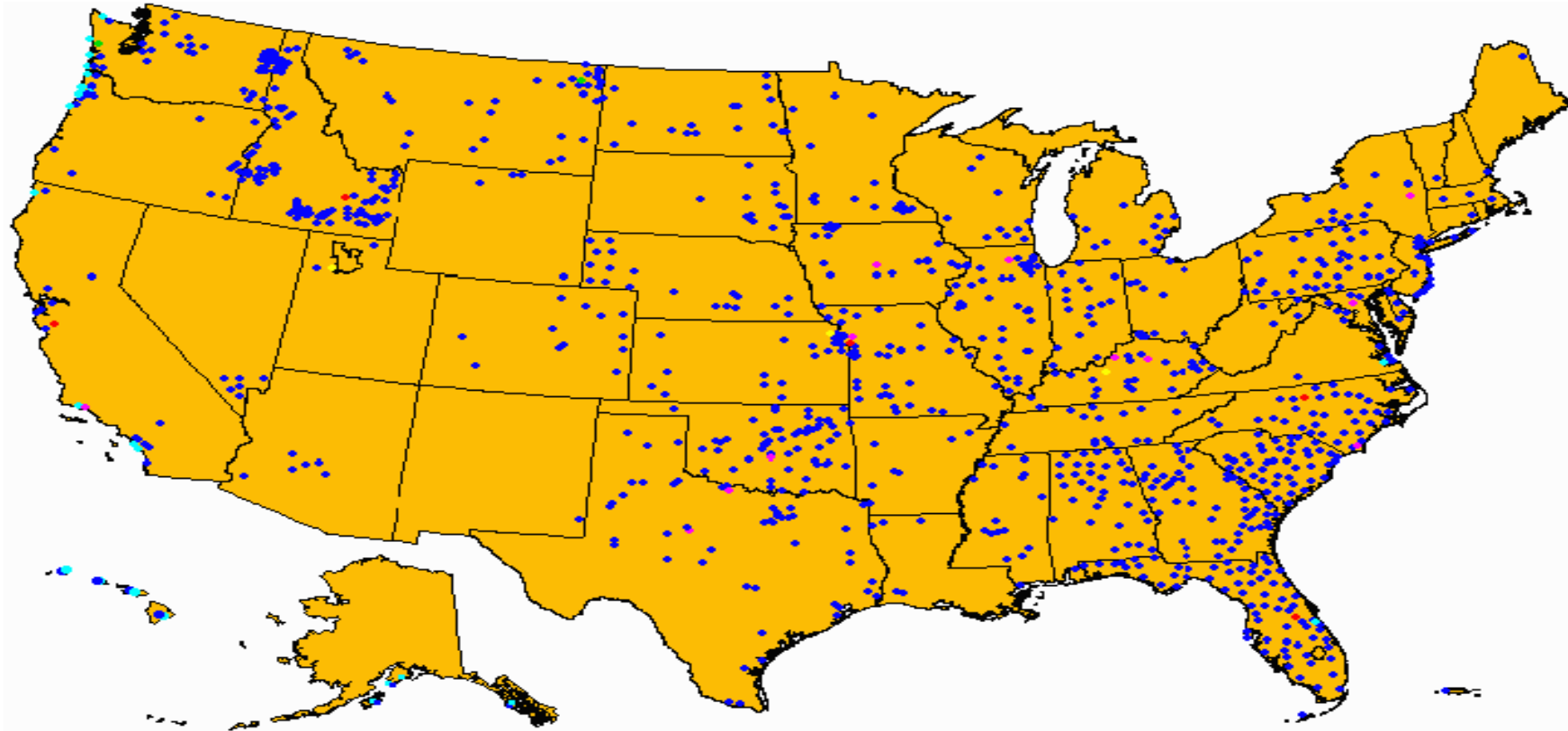
Overall Lessons Learned And Future Steps For Improving The System

- Continue to link warning areas to citizen notification systems (Text, S.A.M.E. Radios, Cell notification)
- Enhancement of the Integrated Warning Team concept to continue cooperation between local media, the NWS and local emergency managers
- Continue to use weather research to define hazards and use to justify education and training of citizens to mitigate known hazards.



StormReady/TsunamiReady Community Preparedness Program

~1850 StormReady Communities in 50 States
102 TsunamiReady Communities in 10 States



Legend

Gold states have StormReady® communities or counties
Light Blue dots are TsunamiReady communities
Blue dots are StormReady® Communities
Red dots are StormReady® Commercial Sites

Green dots are StormReady® Indian Nations
Purple dots are StormReady® Universities
Yellow dots are StormReady® Military sites



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Warning Coordination Meteorologist/Service Coordination Hydrologist

- Promote safety/preparedness
- Work with partners during events
- Provide storm surveys after significant events
- Provide spotter training



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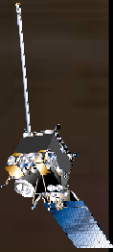
Our Goal

Saving Lives Through Partnerships

NOAA TEAM

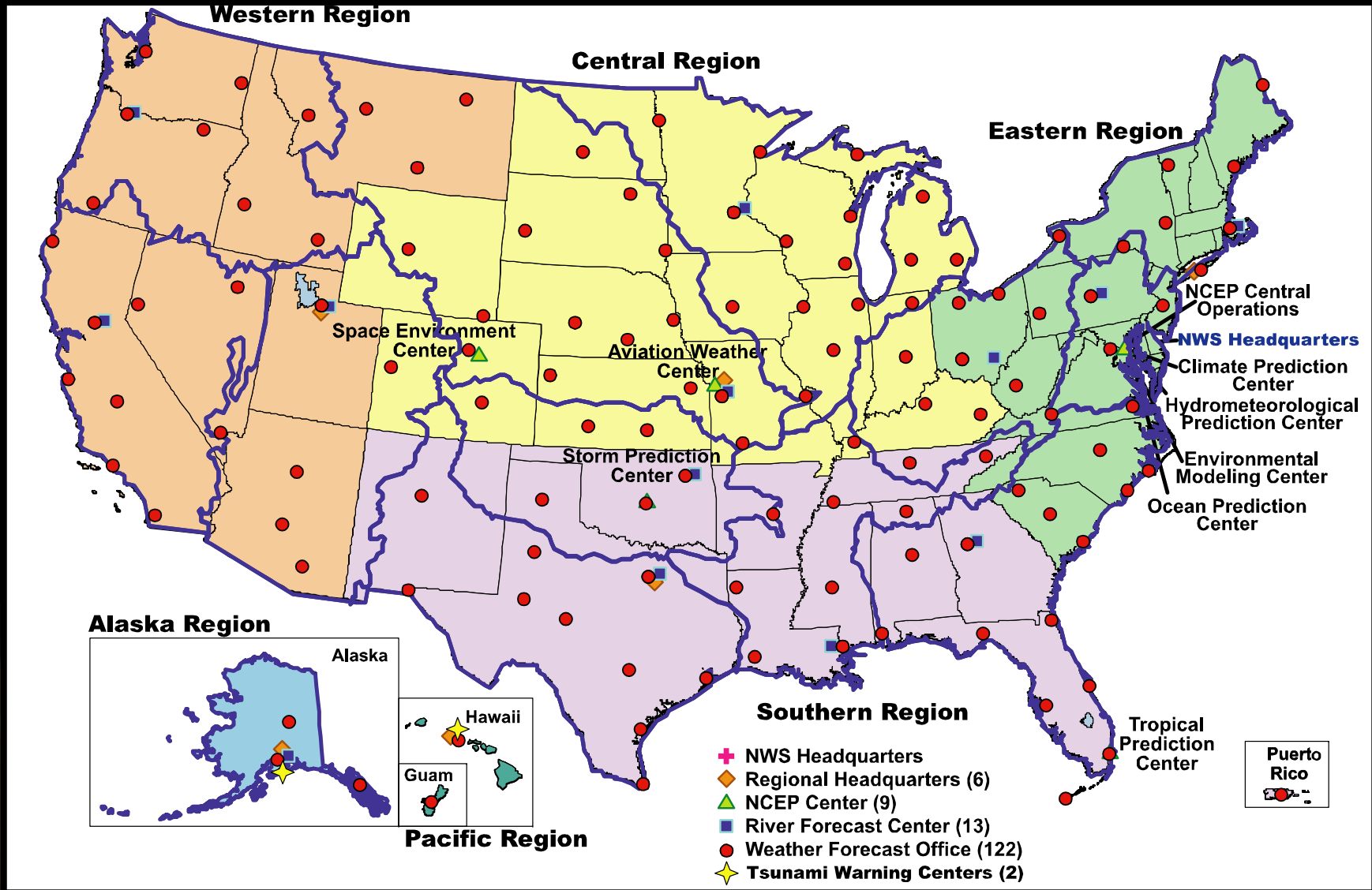
PARTNERS

END USERS



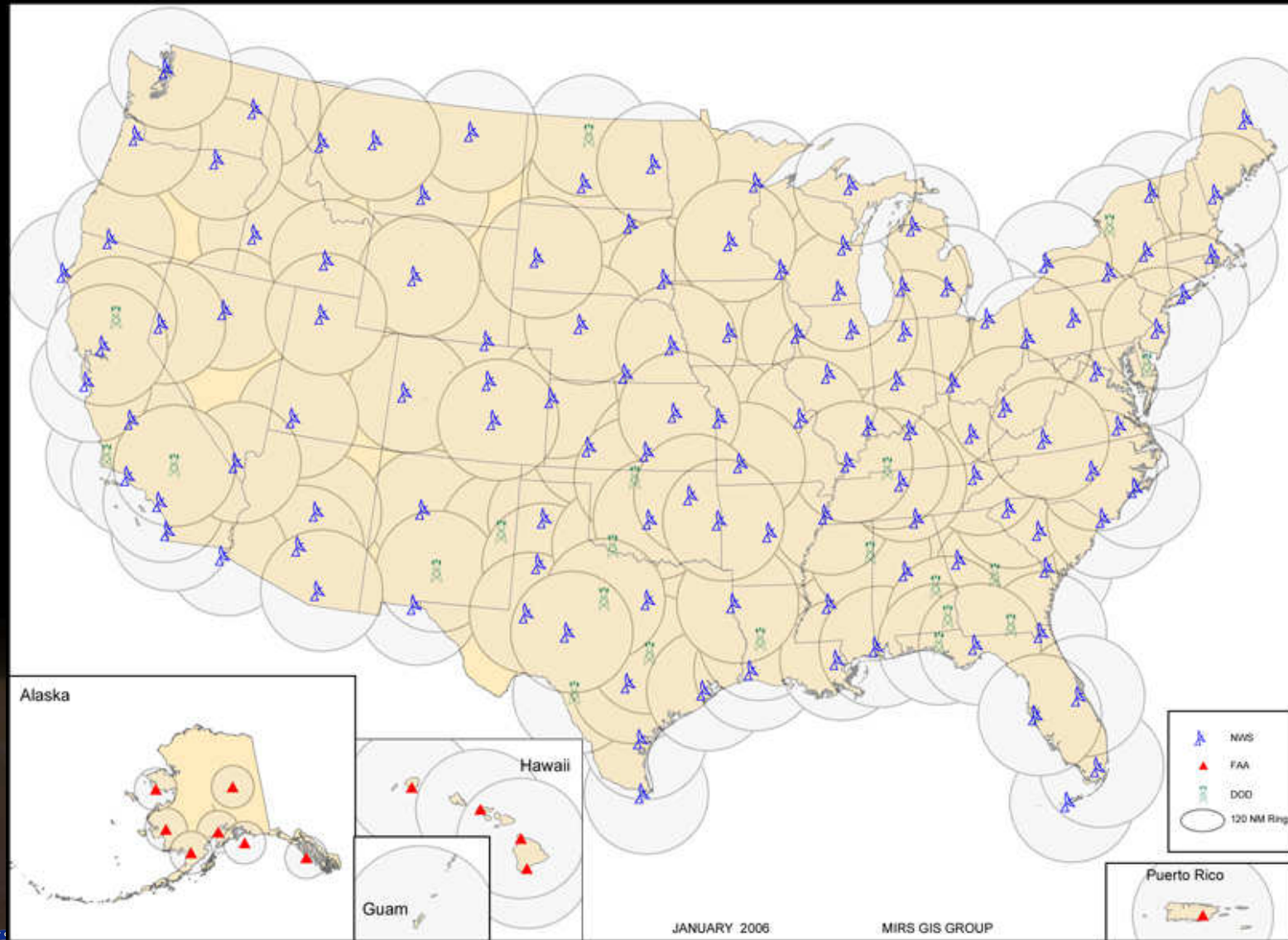
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NWS Facilities



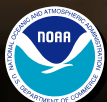
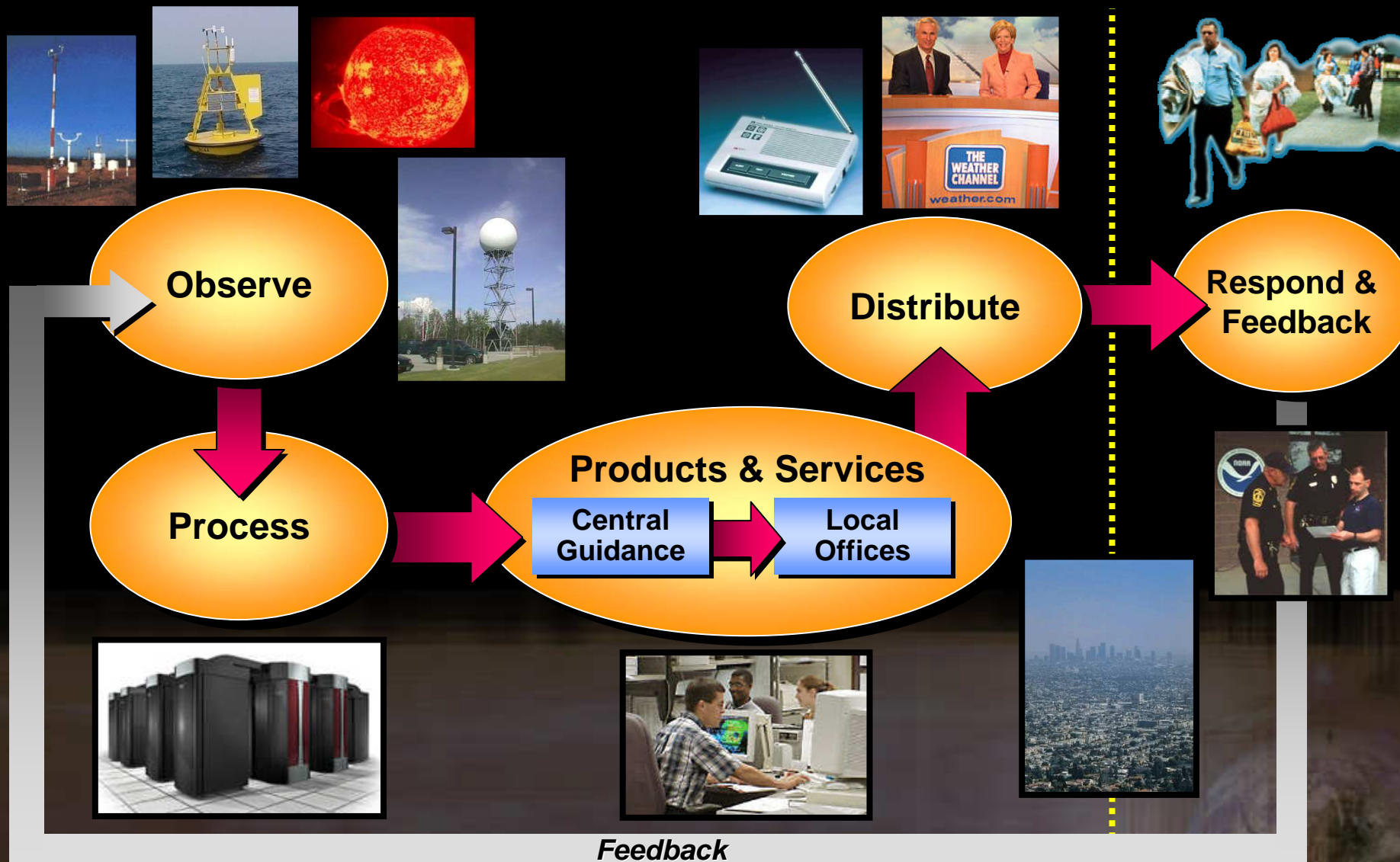
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NOAA's Doppler Radars



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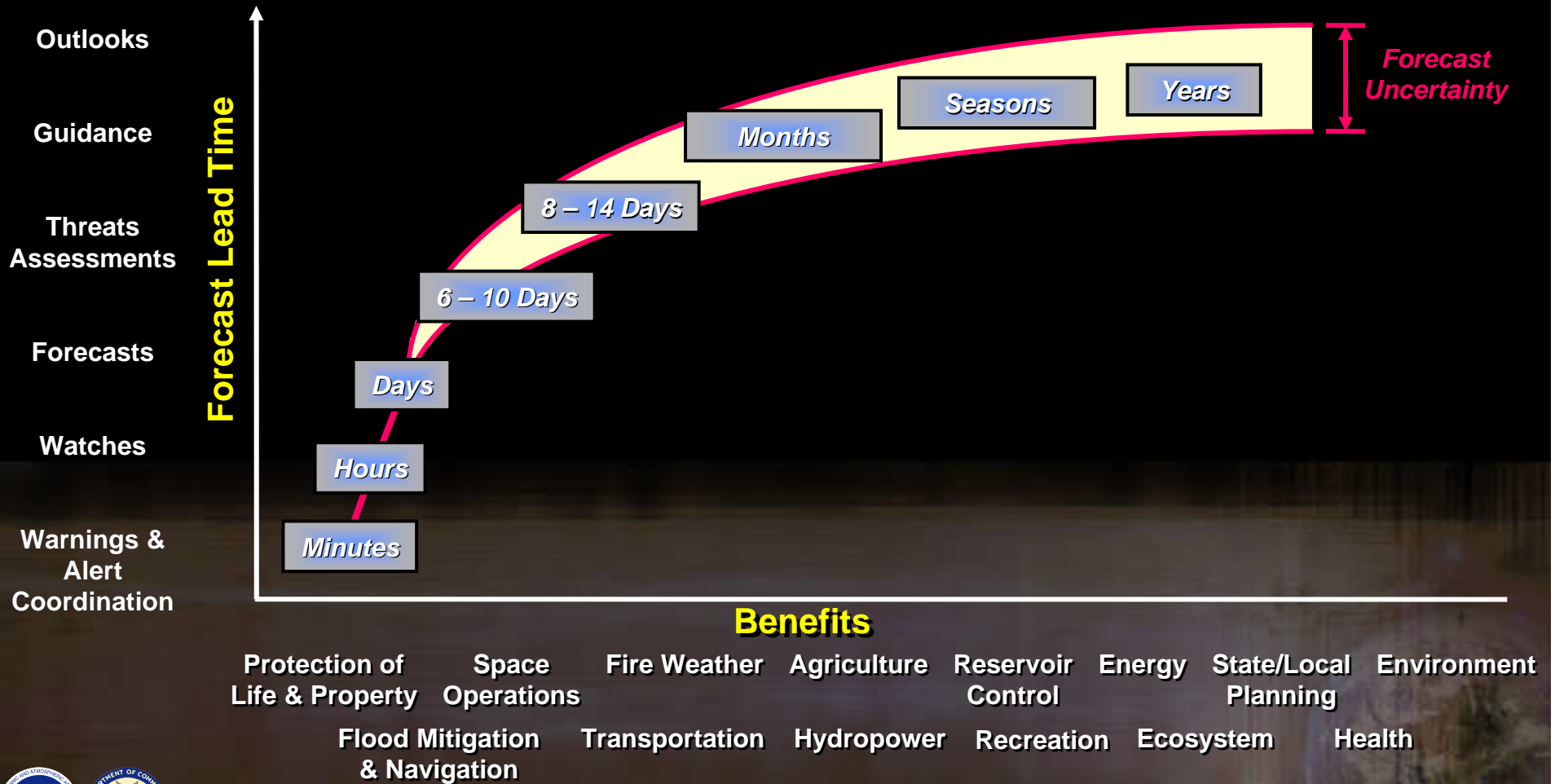
NOAA's NWS Overview



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NOAA's NWS Overview

Seamless Suite of Products



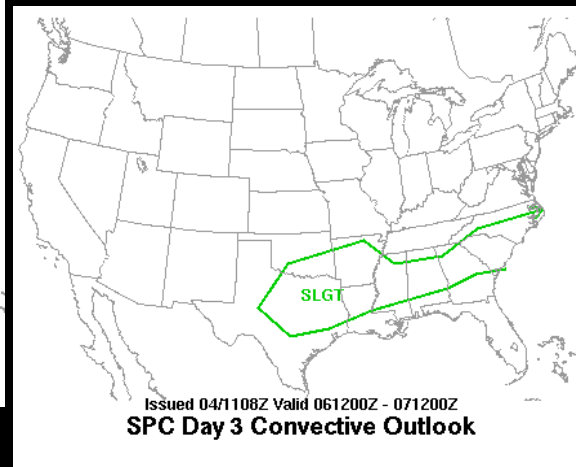
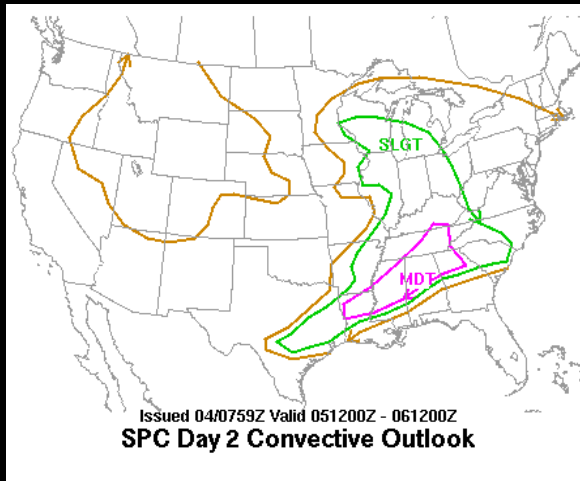
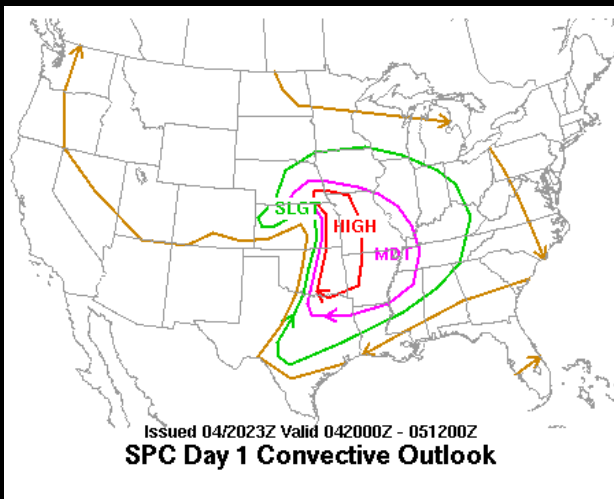
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NWS Watch/Warning Concept

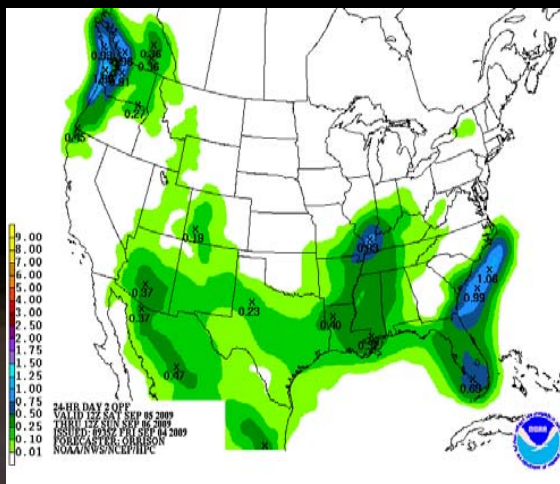
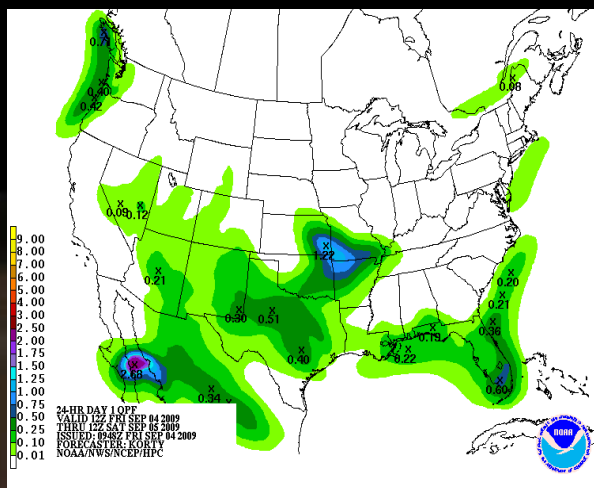


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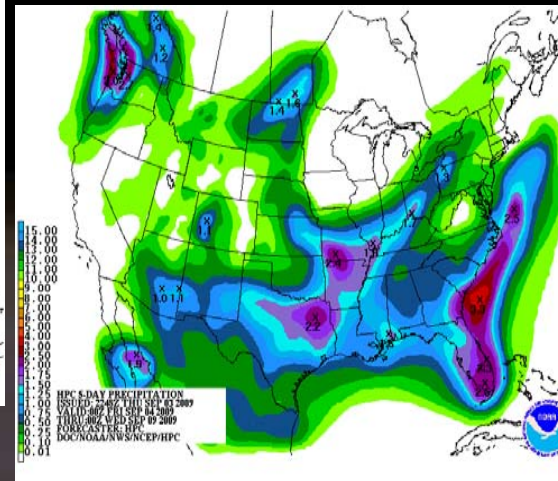
Outlook Products (READY)



Severe Weather

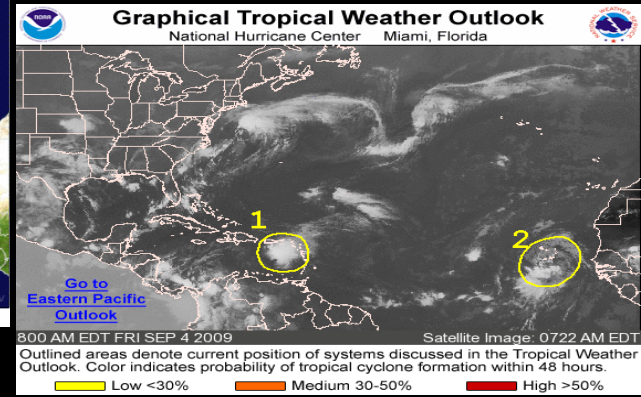
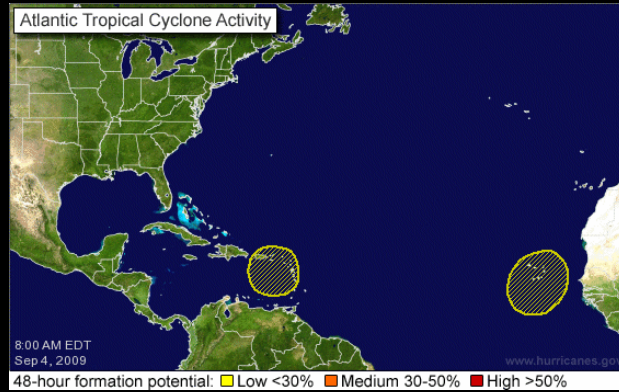


Precipitation

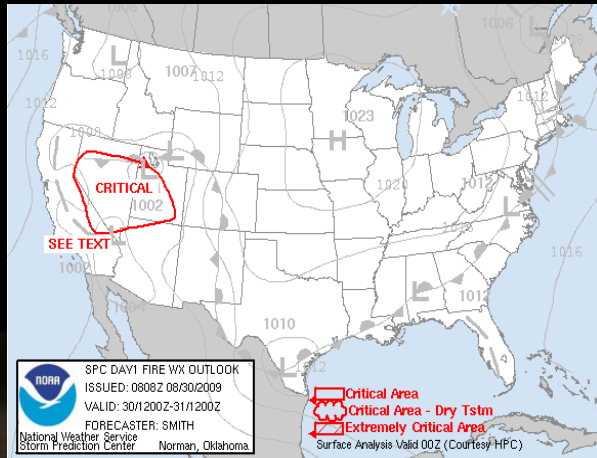


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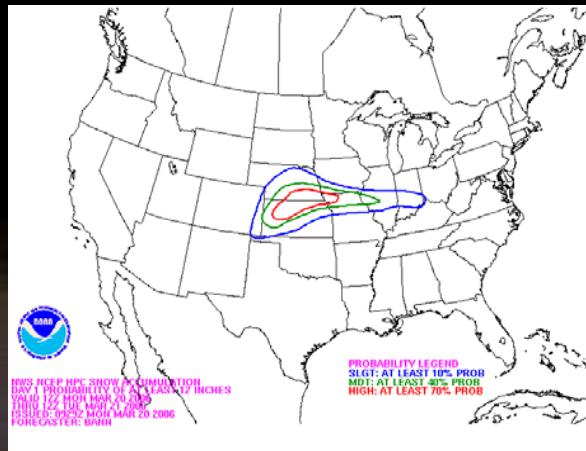
Outlook Products ...cont...



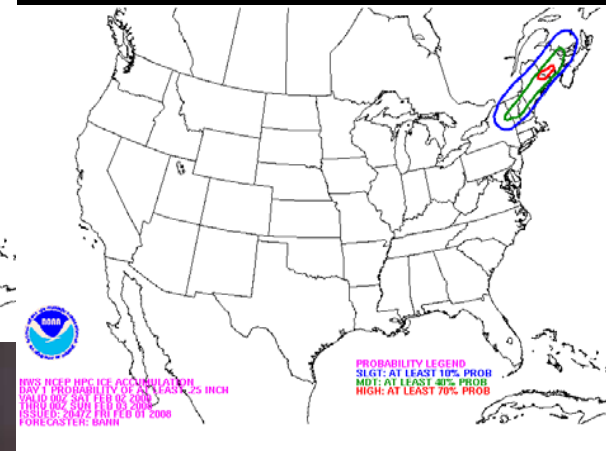
Tropical Weather



Fire Weather



Winter Weather (Snow)



(Ice)



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Watch Products (SET)



Tornado



Severe Thunderstorm



Tsunami



Fire Weather

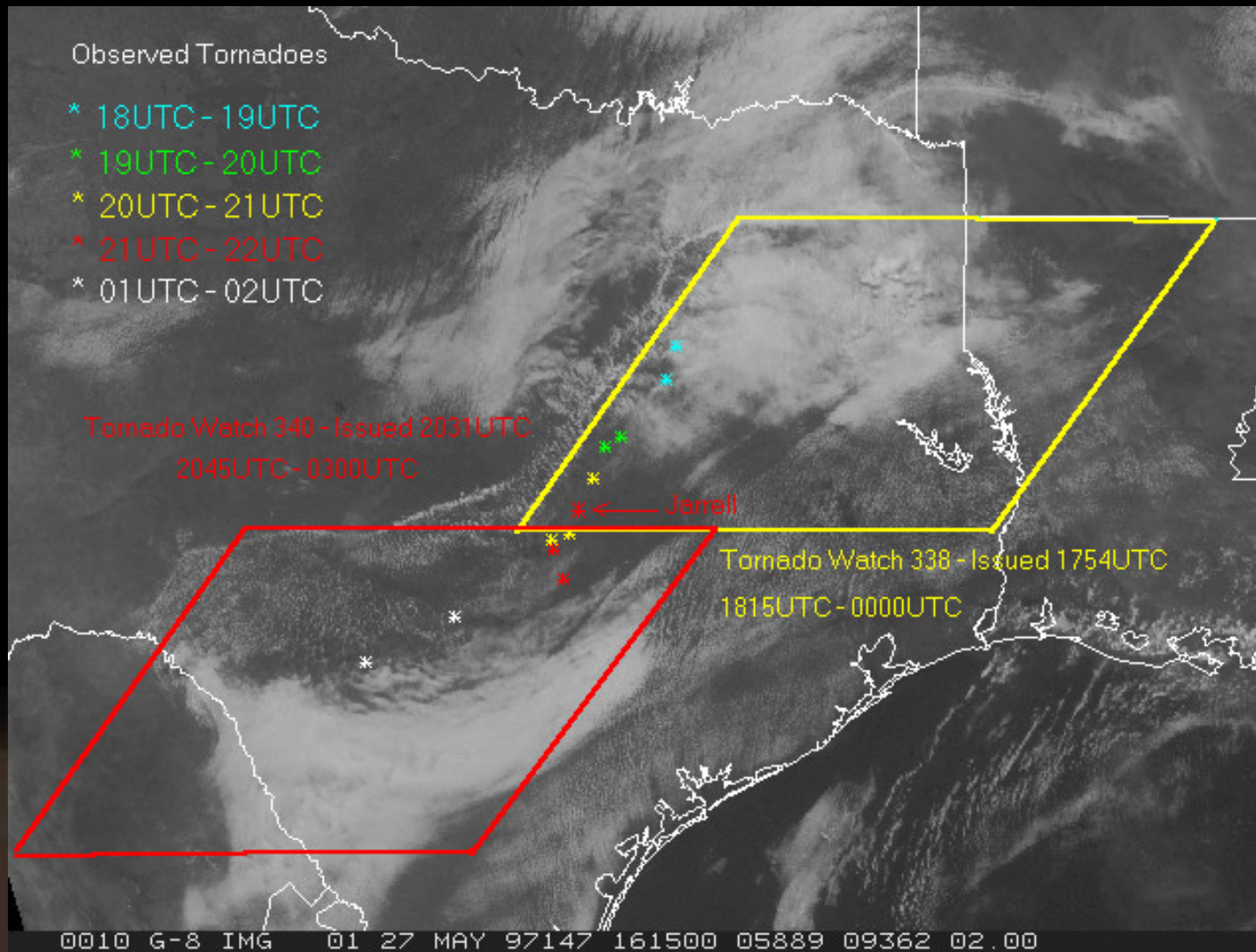
Winter Storm



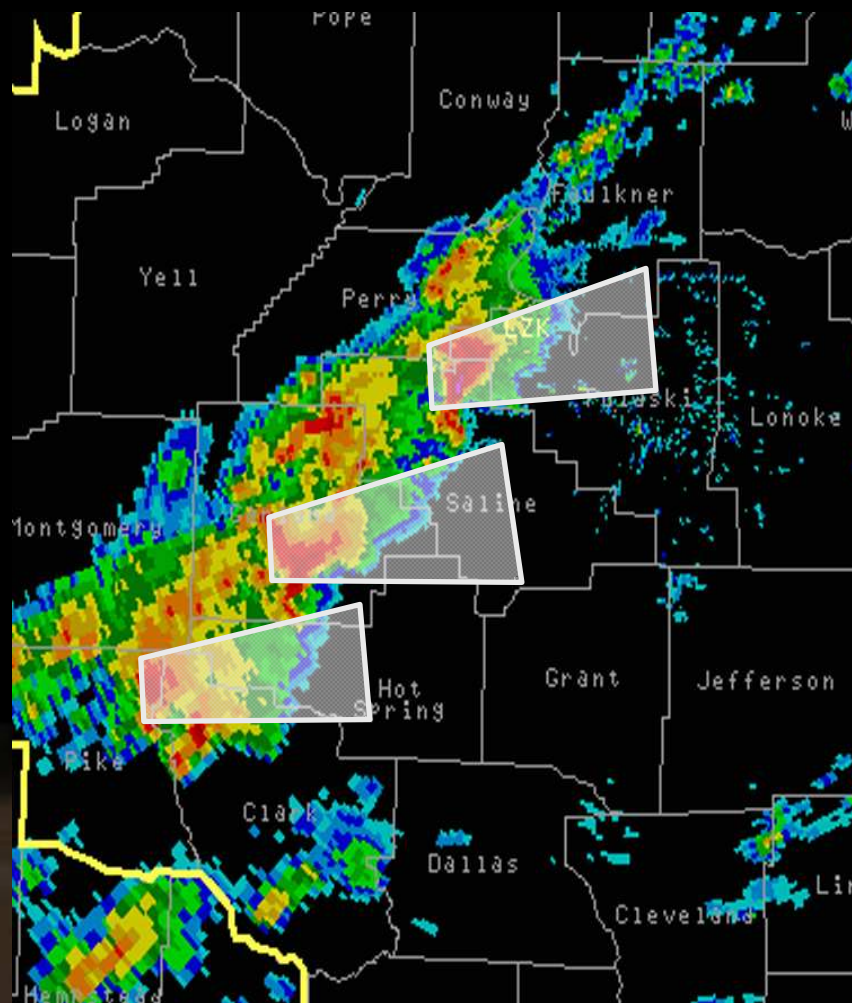
Flood/Flash Flood



Tornado Watch Display



Severe Storm Warnings (GO)



WUUS53 KBIS 010007
SVRBIS
NDC033-087-010100-
/O.NEW.KBIS.SV.W.0095.090701T0007Z-090701T0100Z/

BULLETIN - IMMEDIATE BROADCAST REQUESTED
SEVERE THUNDERSTORM WARNING
NATIONAL WEATHER SERVICE BISMARCK ND
607 PM MDT TUE JUN 30 2009

THE NATIONAL WEATHER SERVICE IN BISMARCK HAS ISSUED A

- * SEVERE THUNDERSTORM WARNING FOR...
SOUTHERN GOLDEN VALLEY COUNTY IN SOUTHWEST NORTH DAKOTA...
NORTHWESTERN SLOPE COUNTY IN SOUTHWEST NORTH DAKOTA...
- * UNTIL 700 PM MDT
- * AT 606 PM MDT...NATIONAL WEATHER SERVICE DOPPLER RADAR INDICATED A SEVERE THUNDERSTORM CAPABLE OF PRODUCING QUARTER TO GOLF BALL SIZE HAIL...AND DESTRUCTIVE WINDS IN EXCESS OF 70 MPH. THIS STORM WAS LOCATED NEAR BEACH...OR 10 MILES SOUTHEAST OF WIBAUX...AND MOVING SOUTHEAST AT 10 MPH.
- * THE SEVERE THUNDERSTORM WILL BE NEAR...
BEACH NOW.
GOLVA AROUND 645 PM MDT.

PRECAUTIONARY/PREPAREDNESS ACTIONS...

THIS STORM HAS EXHIBITED SOME WEAK ROTATION. TORNADOES CAN DEVELOP QUICKLY FROM SEVERE THUNDERSTORMS. ALTHOUGH ONE IS NOT IMMEDIATELY LIKELY...IF A TORNADO IS SPOTTED...ACT QUICKLY AND MOVE TO A PLACE OF SAFETY INSIDE A STURDY STRUCTURE...SUCH AS A BASEMENT OR SMALL INTERIOR ROOM.

VERY HEAVY RAIN...WHICH MAY FLOOD LOW LYING AREAS SUCH AS DITCHES AND UNDERPASSES...IS ALSO LIKELY. DO NOT DRIVE YOUR VEHICLE ON A FLOODED ROADWAY.

&&

LAT...LON 4688 10406 4700 10405 4697 10383 4687 10361
4665 10362 4654 10373 4654 10405
TIME...MOT...LOC 0007Z 309DEG 10KT 4687 10404

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River Forecasts

Weather Data

River Data



Doppler Radar



Rain Gage



Snow Measurements



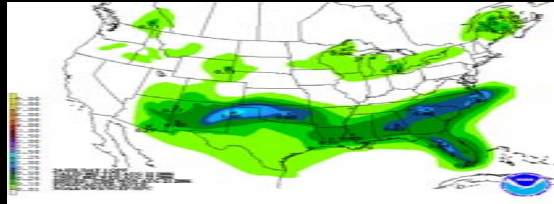
River Stage Measurements



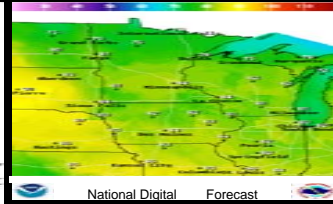
Reservoir Data / Locks and Dams



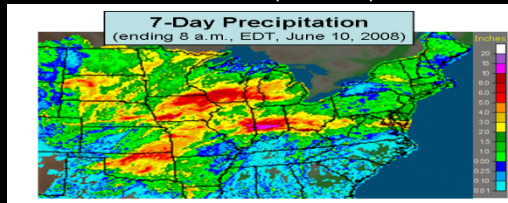
WATER CONTROL



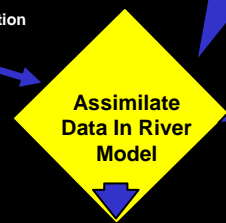
Future Rain (24-72 hours)



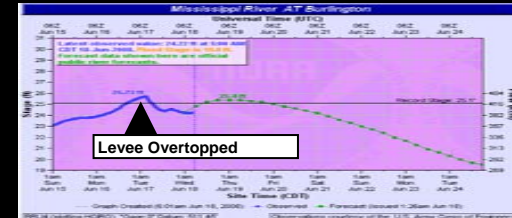
Temperature/Evaporation



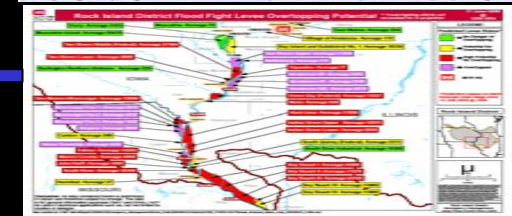
Doppler Radar Estimated Precipitation



Hydrologist Interaction With Model Tools Creates Forecast



Levee Overtopped



Levee Overtopping Status

Forecast Collaboration with Corps

Adjust Predicted Hydrograph for Non-Uniform Rainfall Distribution

Adjust Snow Cover Extent and Snow Melt Rates

Adjust Rating Curves Based on Real-time Stream Flow Measurements from USGS

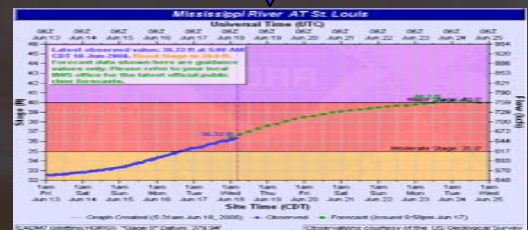


Adjust Soil Moisture Parameterization to Current Wetness/Dryness

Compare Current Flooding to Historical Events

Quality Control Observed River Stages and Rain Gage Reports

Forecast Disseminated to Customers



National Weather Service Official Daily or Flood Forecast: Available to you on the web at <http://www.weather.gov/ahps/>

Customers

- Local, State and Federal Governments
- Emergency Managers
- First Responders
- Private Sector Information Providers
- Broadcasters and other Media
- Academia
- General Public



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Dissemination Methods

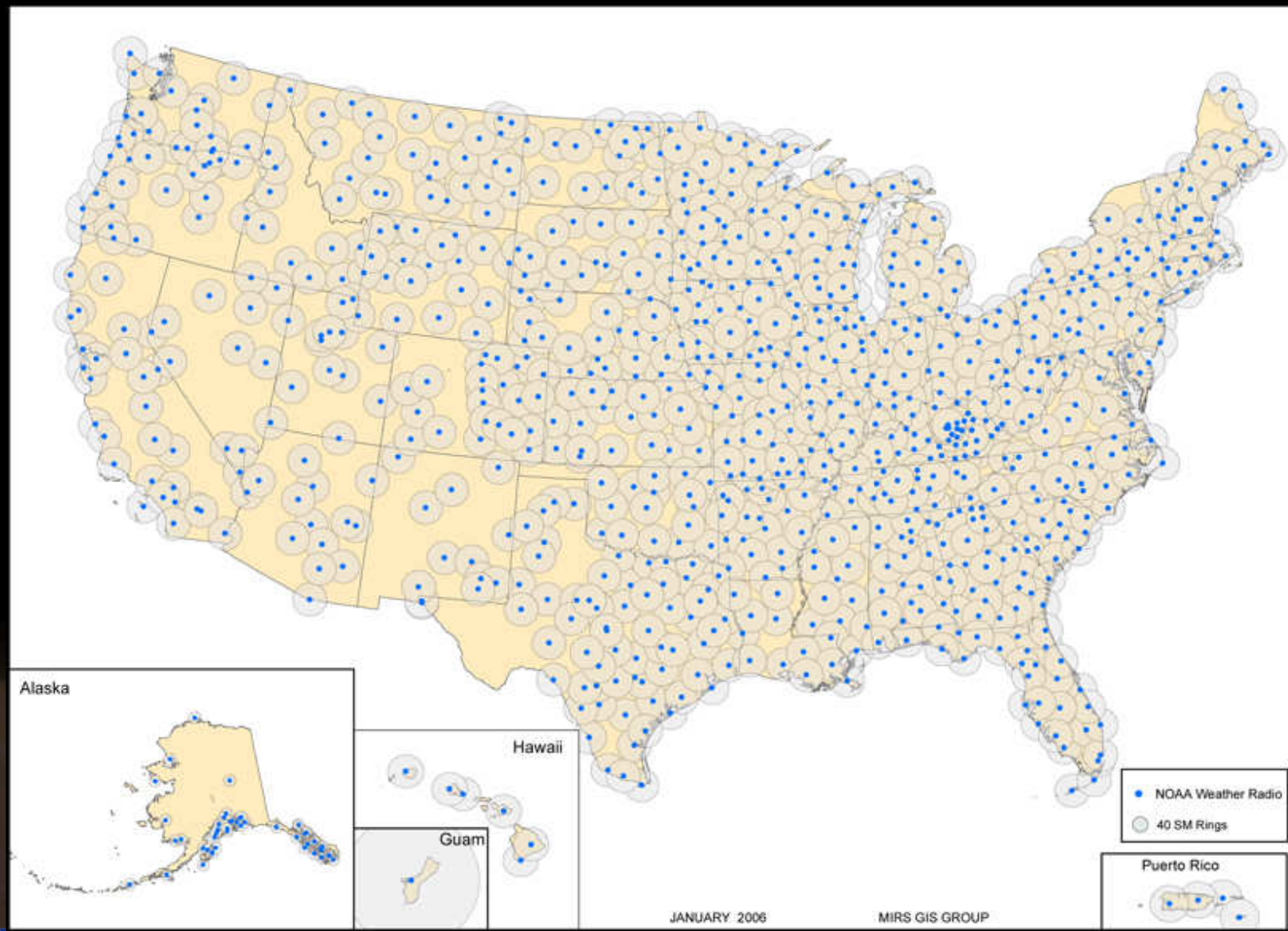
- National Weather Service Controlled Methods
 - ✓ NOAA Weather Radio All Hazards
 - ✓ NOAA PORT
 - ✓ Weather Wire
 - ✓ Emergency Managers Weather Information Network
 - ✓ Decisional Support Services
- Mobile Communication Devices
 - ✓ Cell Phones
 - ✓ Personal Digital Assistants (PDA)

• Internet



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NOAA Weather Radio All Hazards

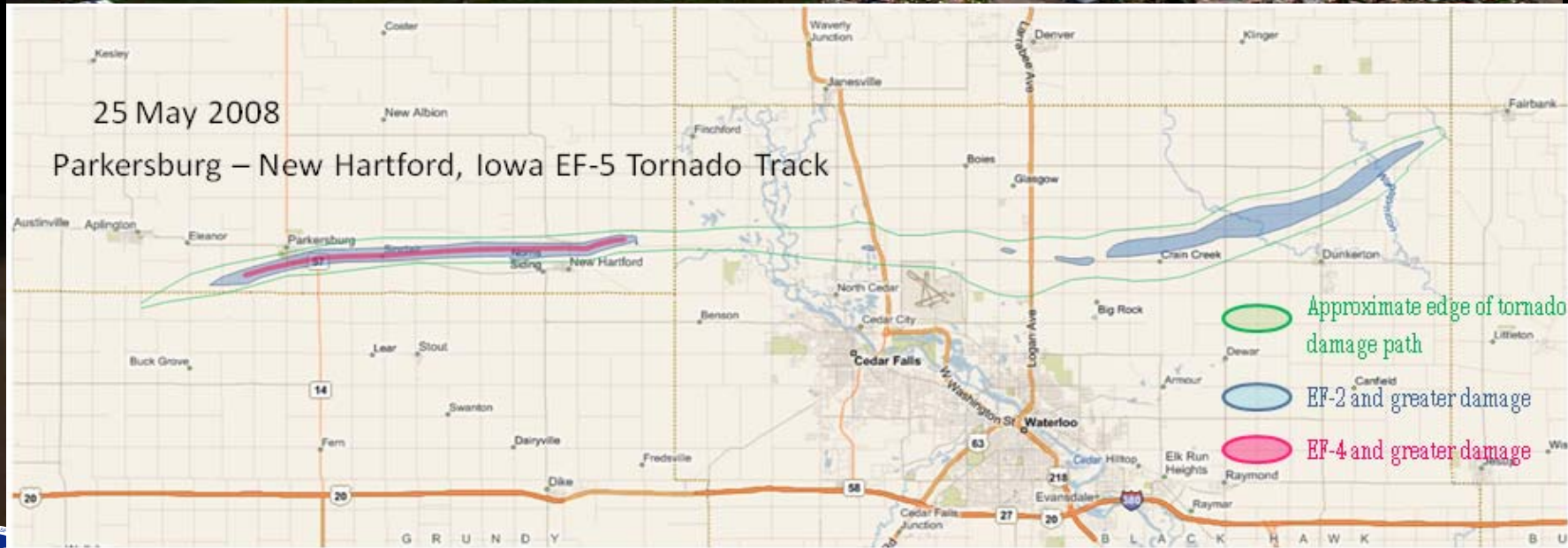


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Storm Surveys



Storm Surveys/Assessments



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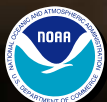
Contacts

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