METROPOLITAN WASHINGTON
Council of Governments

"Responding to Extreme Weather-Climate Events Workshop"

(December 17, 2012)

COG Highlights for Air and Climate Public Advisory Committee

Tanya T. Spano *(1/14/13)*

Presentation - Overview

- Concept – workshop focus / audience
- NOAA – Highlights of key weather-climate data items *(select slides from presentation)*
  - Scope/tools/new science & models
  - Sandy – scope of analysis/ effort/coordination/focus on impacts/ weather summary
  - Trends
  - Resources *(see websites/NOAA presentation for details)*
- Key Water Resource Issues for Region

Adaptation Strategies and Information Needs in Response to Extreme Weather Events

A series of workshops focusing on water resources, led by the National Oceanic and Atmospheric Administration (NOAA), US Environmental Protection Agency (US EPA), Water Environment Research Foundation (WERF), Water Research Foundation (Water RF), Concurrent Technologies Corporation (CTC), and Noblis, with Metropolitan Washington Council of Governments (MW COG) and DC Water.

NOAA · EPA · WERF · WaterRF · CTC · Noblis · MWCOG · DCWater

AGENDA

Metropolitan Washington Council of Governments
777 North Capitol Street, NE, Suite 300
Washington, DC 20002

December 17, 2012

OBJECTIVES:

1. **Learn** what worked and did not in water/wastewater/ stormwater utilities' responses to extreme climate and weather events in the National Capital region
2. **Help** local, state, District and federal agencies and professional organizations better understand how to address local needs for improved/relevant information, forecasts, and services for supporting resource management and other related decision making
3. **Identify** emerging approaches to adaptation planning
4. **Discuss** current use of tools and knowledge – and related gaps – for coping with the next extreme event (e.g., new tools, data formats, relationships, etc.)

MONDAY, DECEMBER 17, 2012	
8:00 – 8:30	**Coffee and Registration**
8:30 – 8:45	**Welcome, Purpose, and Importance of Workshop** *Nancy Tosta, Ross Strategic, Facilitator* *Nancy Beller-Simms, NOAA, Karen Metchis, EPA* *Lauren Fillmore, WERF, Kim Linton, WaterRF* *Claudio Ternieden, CTC, Erica Brown, Noblis* *Tanya Spano, Metropolitan Washington Council of Governments*
8:45 –9:20	**Past, Current, and Future Climatology and Hydrology** – A focus on Hurricane Sandy, the Summer 2012 Derecho, and Snowmageddon Events Moderator: *Nancy Tosta, Ross Strategic* Speaker: *Wayne Higgins, Director, NOAA Climate Prediction Center* Q&A
9:20 – 10:20	**Adaptation Experiences Discussion:** Part I – Risks, Planning and Implementation Moderator: *Nancy Tosta, Ross Strategic* Speakers: *Jonathan Reeves, DC Water* *Gary Grey, Washington Suburban Sanitary Commission* *Randy Bartlett, Fairfax County* Q&A
10:20 – 10:40	**Break**

10:40 – 11:20	**Adaptation Experiences Discussion:** Part II - Risks, Planning and Implementation Moderator: *Nancy Tosta, Ross Strategic* Speakers: *Patty Gamby, Washington Aqueduct (US Army Corps of Engineers)* *Jamie Quarrelles , District of Columbia, Homeland Security and Emergency Management Agency* Q&A
11:20 - 12:00	**Large Group Discussion** – Risks, Impacts and Responses: • What are the implications for infrastructure and services provided before, during, and after these events? • What is the decision process when faced with an extreme event?
12:00 - 1:00	**Lunch** – Introduction - *Stuart Freudberg, Metropolitan Washington Council of Governments* Speaker - *Chris Voss, Montgomery County, representing the MWCOG Emergency Managers Committee*
1:00 – 2:15	**Breakout Sessions** – Planning and Adaptation • What are the challenges experienced in responding to extreme weather events? • What partnerships, technologies, approaches, information, services or tools were most helpful in the ability to respond?
2:15 – 3:30	**Directed Large Group Discussion** – Looking Forward: • Report out from breakouts • Discuss "findings" • What are the challenges? • What would help?
3:30 – 3:45	**Break**
3:45 – 4:15	**Summary Panel: What have we learned? Where do we go from here?** *Adrienne Fancher, Alexandria Renew* *Steve Gerwin, Howard County* *Steve Harrison, Water Environment Federation*
4:15 – 4:30	**Wrap Up** *Nancy Tosta, Ross Strategic*

http://www.mwcog.org/environment/water/water_workshops.asp

Advancing Prediction of Extreme Events

Dr. Wayne Higgins
Director, Climate Prediction Center

NOAA-EPA-WERF-WaterRF-CTC-Noblis
December 17, 2012

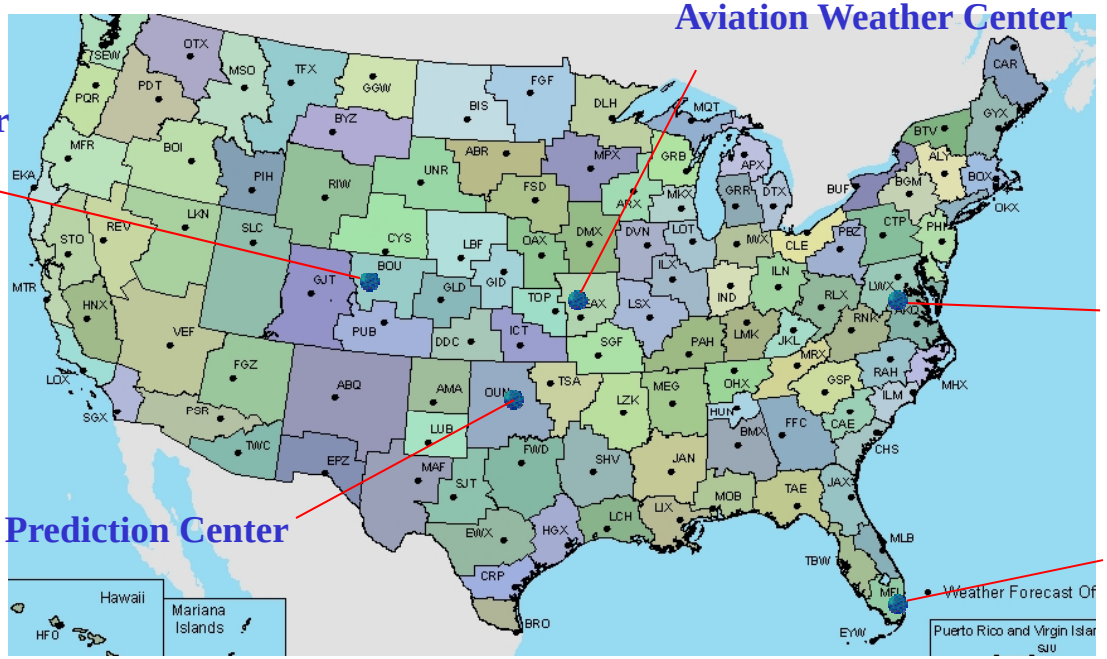
Outline

- National Centers for Environmental Prediction (NCEP)
- Recent Forecast Successes: Contrasting Then and Now
  - *East Coast Snowstorms*
  - *Severe Weather Outbreaks*
  - *Hurricanes*
- A First Look at Hurricane Sandy
  - Basic Characteristics
  - Collaborative Forecast Process
- Trends in Weather Extremes
  - Billion Dollar Disasters
  - Key Issue: Water Distribution
  - Hurricanes in the Atlantic Basin
- Extras
  - *NOAA Climate Products and Data*

NCEP Supports the NOAA Seamless Suite of Climate Weather and Ocean Products

Organization: Central component of NOAA National Weather Service

Mission: NCEP delivers science-based environmental predictions to the nation and the global community. We collaborate with partners and customers to produce reliable, timely, and accurate analyses, guidance, forecasts and warnings for the protection of life and property and the enhancement of the national economy.

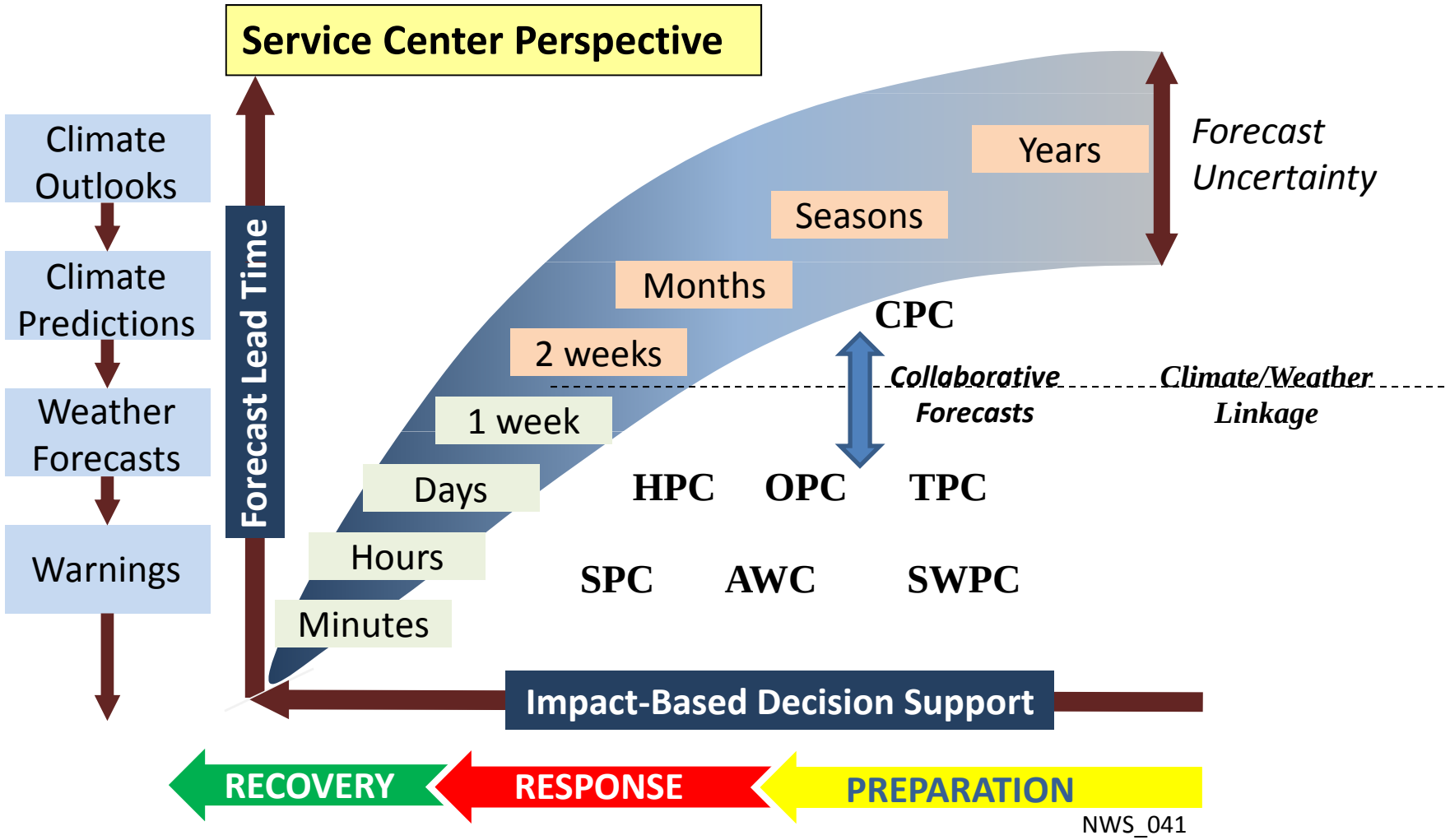


Vision: The Nation's trusted source, first alert and preferred partner for environmental prediction services

Three Major Components of Today's Operational Numerical Prediction Enterprise

- Observations
  - ~2 billion/day
  - 99.9% remotely sensed, mostly satellites
- Model
  - Earth System model; coupled
  - Global resolution (27km)
  - North American resolution (4km)
- Computer
  - 2012
    - Primary/backup15 minute switchover
    - 73 trillion calc/sec – IBM Power 6
  - 2013
    - 146 trillion calc/sec – IBM iDataPlex Intel/Linux

NOAA Seamless Suite of Forecast Products Spanning Climate and Weather

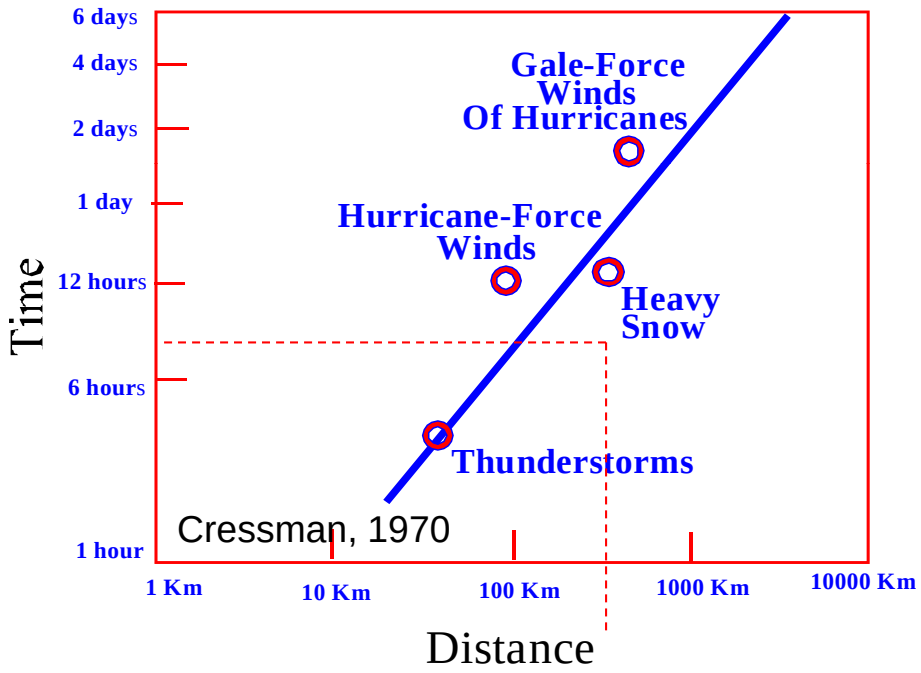


Recent Forecast Successes

Contrasting Then and Now

The Transformation from Subjective to Model-Based Forecasts

1970s Limits of Predictability



Numerical models were introduced in the 1950s; by the mid 1970s, frustration was rampant.

"…abandon research that uses "weather sequences" generated in a computer as bases for deduction about the real atmosphere." C.S. Ramage, 1976: Prognosis for Weather Prediction. *Bull Amer. Meteor. Soc.*, 57, 4-10.

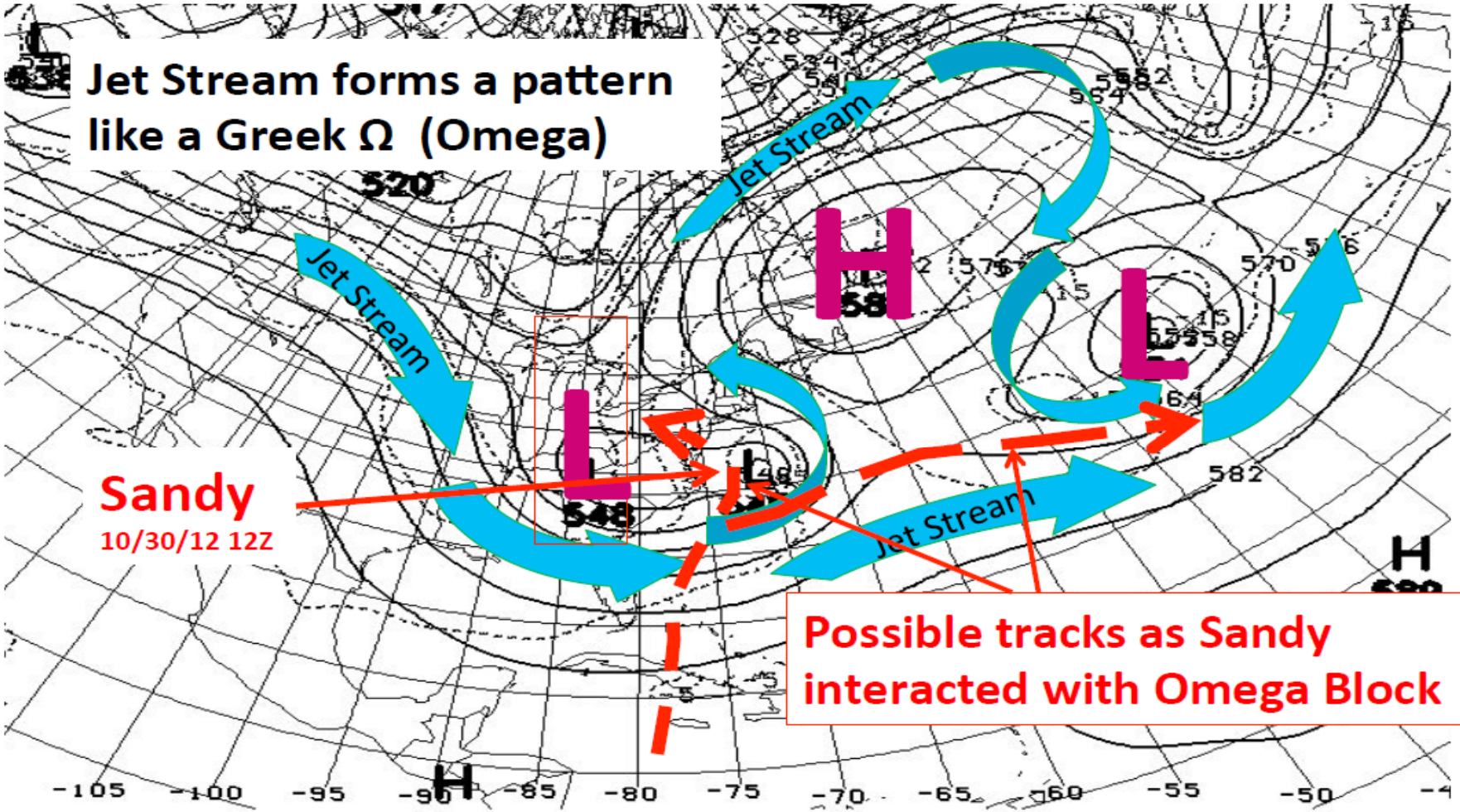
1970s → 1980s → 1990s

Despite this opinion, research continued on real-time numerical prediction models, which have now become the central core of the successful modern forecast process.
(Nate Silver, *The Weatherman is not a Moron*, NY Times, 2012

A First Look at Hurricane Sandy

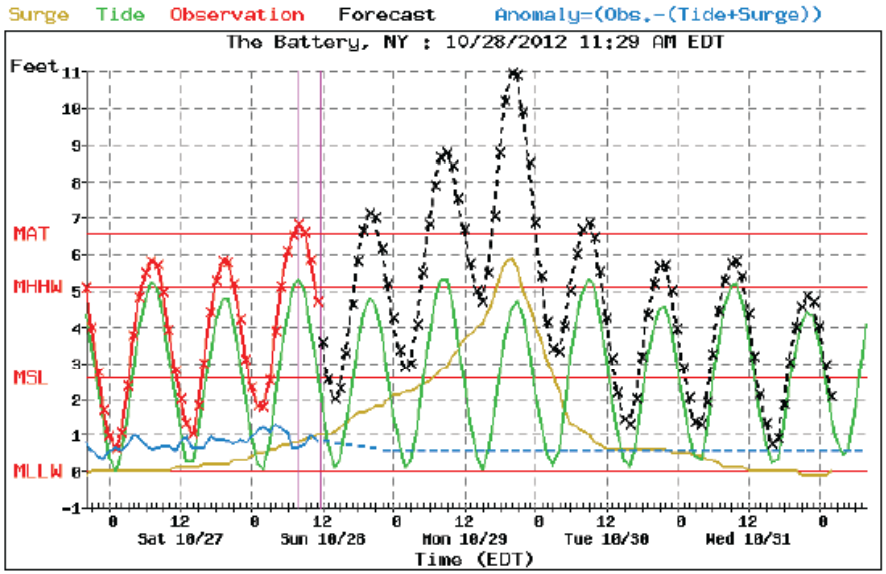
- Basic Characteristics
- Collaborative Forecast Process
- Forecasts & Verification

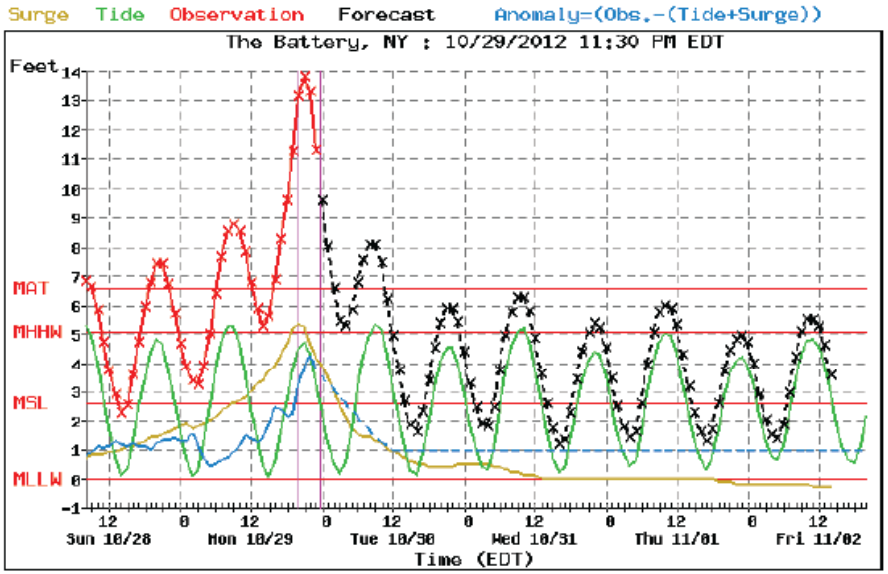
Jet Stream 10/30/12 12Z (Blue)
Uncertainty in Sandy's track



Hurricane Sandy: Collaborative Forecast Process

MDL NWS Surge Forecast:
Forecasts were coordinated among OPC, NHC, local WFOs





"Life Threatening" statements issued Sunday morning by NHC and called into NYC Emergency Operations Center;
NYC initiates evacuations and shut down of public transportation shortly thereafter

Hurricane Sandy: Collaborative Forecast Process

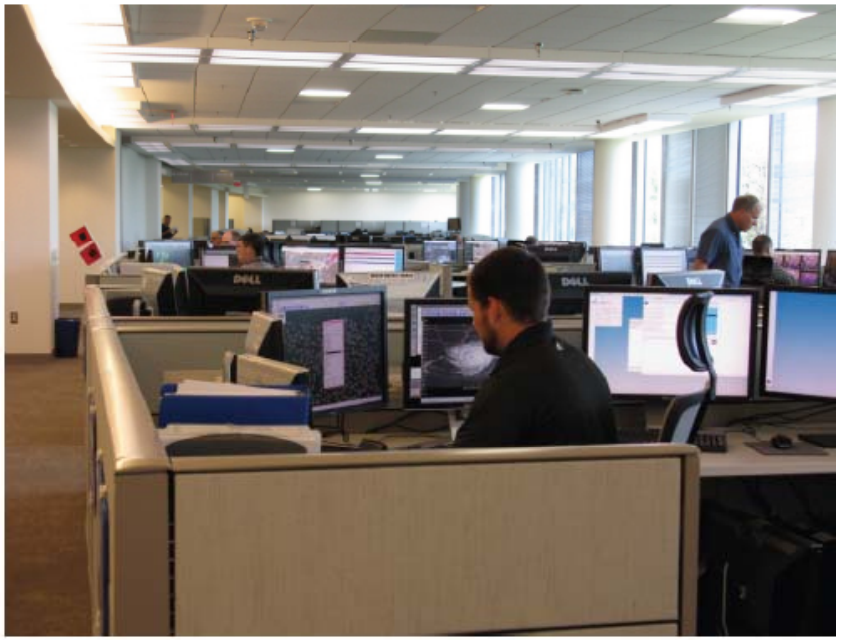
Communication Strategy

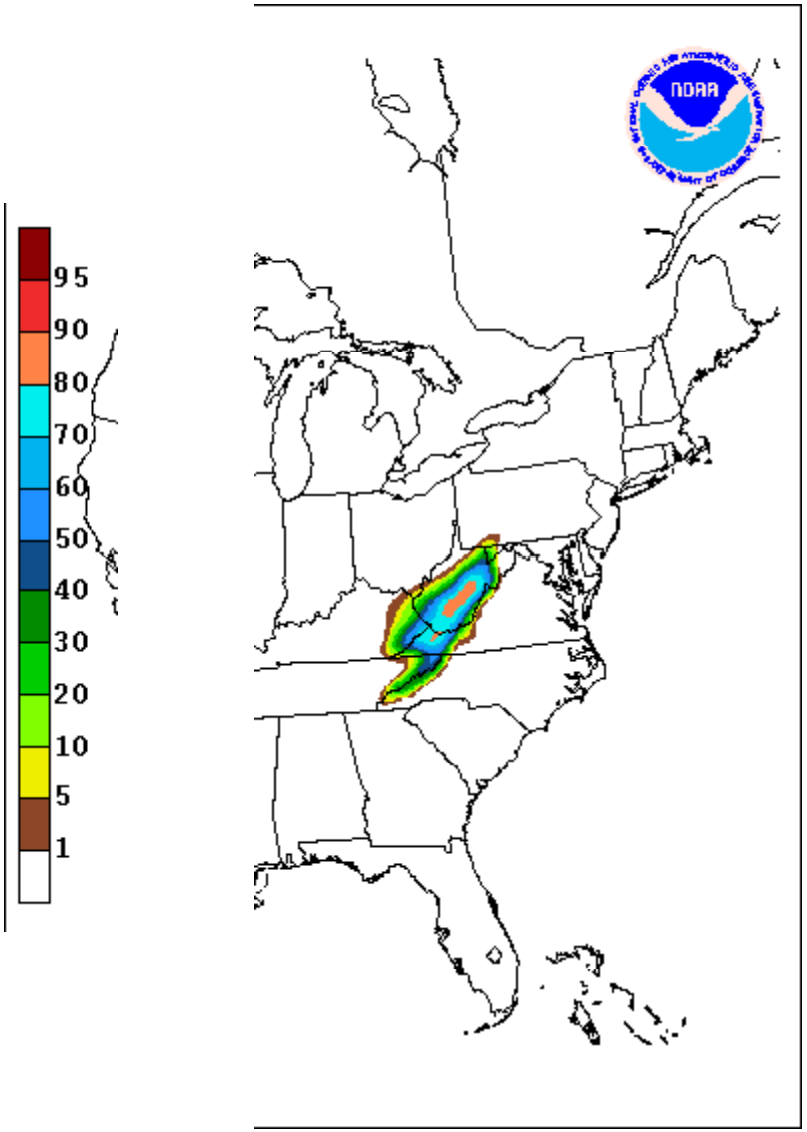
- Forecaster collaboration across All NCEP Centers, WFOs and Other NOAA LOs (NESDIS, NOS, OMAO)
  - Specific local forecasts issued by WFOs
  - All special messages and linkages to local emergency centers through WFOs
  - Seamless Consistent Message to Emergency Decision Makers and Public

Hurricane Sandy: Collaborative Forecast Process

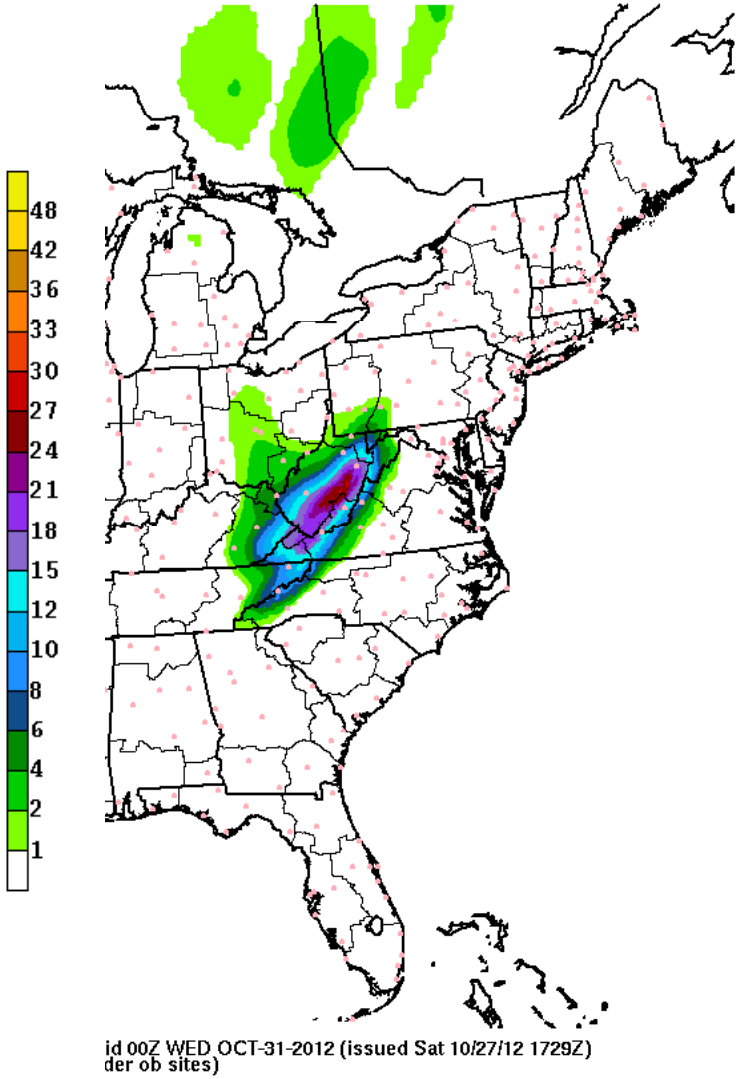
Communication Strategy

- Messaging Focused on ***Impact***-Based Decision Support Services
  - Unique nature of storm (tropical to extratropical transition
  - Large area affected by strong winds
  - East to west track toward NJ
  - Record surge/inundation in NJ→ NYC→ SE New England
  - Record blizzard in Appalachian Mountains & WV
  - Threats emphasized particularly dangerous storm – "worst case scenario" compared to the Perfect Storm





Probability of 48 hour snowfall > 12 inches
Issued 2PM, Saturday, Oct 27, 2012
Valid 8PM, Sunday Oct 28 – 8PM Tuesday Oct 30



3 day Snow Accumulation (inches)
Issued 2PM, Saturday, Oct 27, 2012
Valid 8PM Saturday Oct 28 – 8PM Tuesday Oct 30

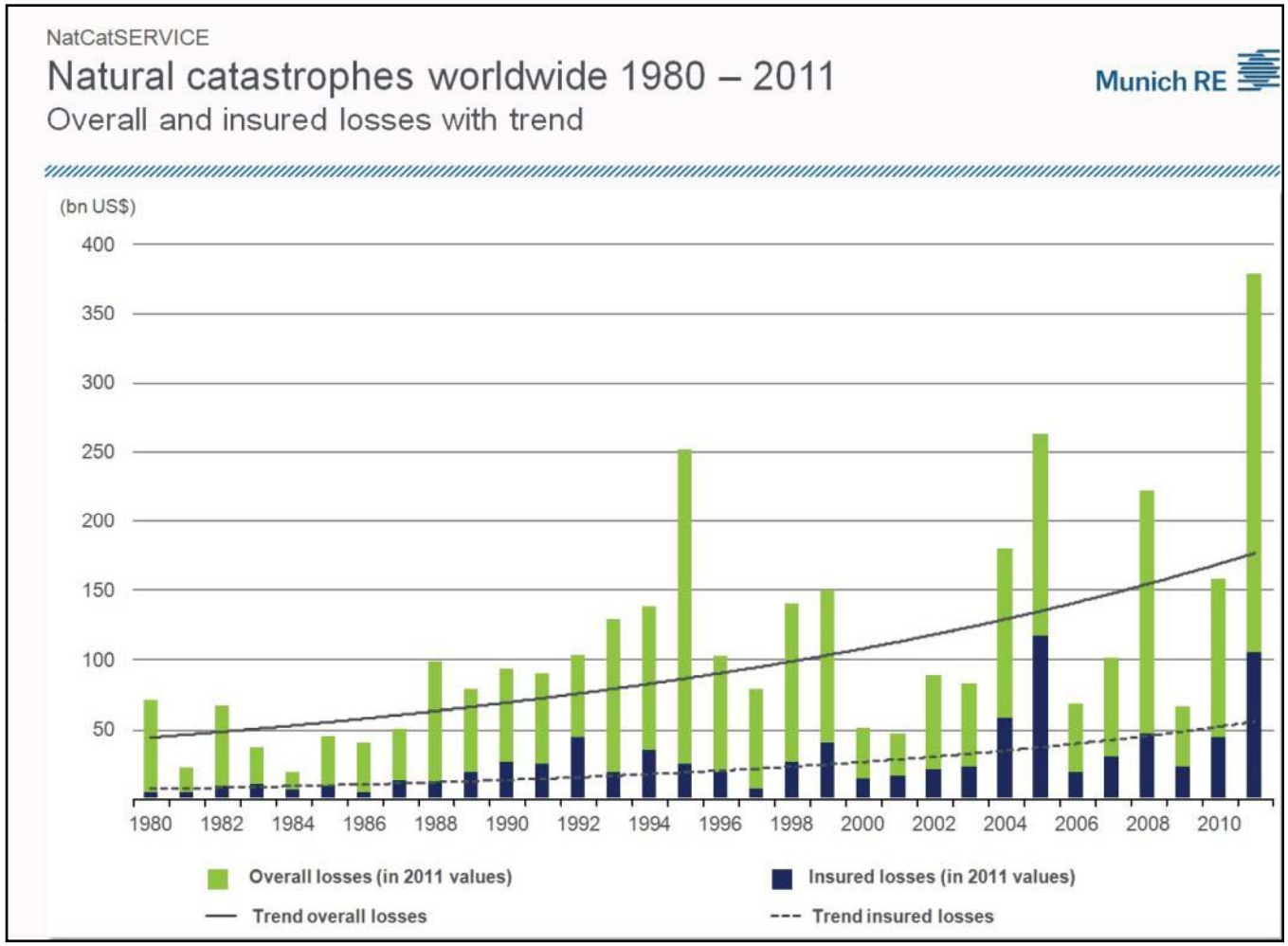
Hurricane Sandy

- Conveyed consistent forecast message on the historic nature and destructive potential for this storm.
  - Westward track
  - Large size
  - Destructive surge (historic levels)
  - Tropical-extratropical transition
  - Heavy precipitation
  - Record setting blizzard conditions
  - Evacuations initiated 60-72 hr in advance
- Beginning Thursday – Friday communicated/coordinated all forecasts with FEMA/emergency management community; NHC provided briefings to the White House
- Media coordination started on Friday and continued through the event
- The forecasts saved lives!

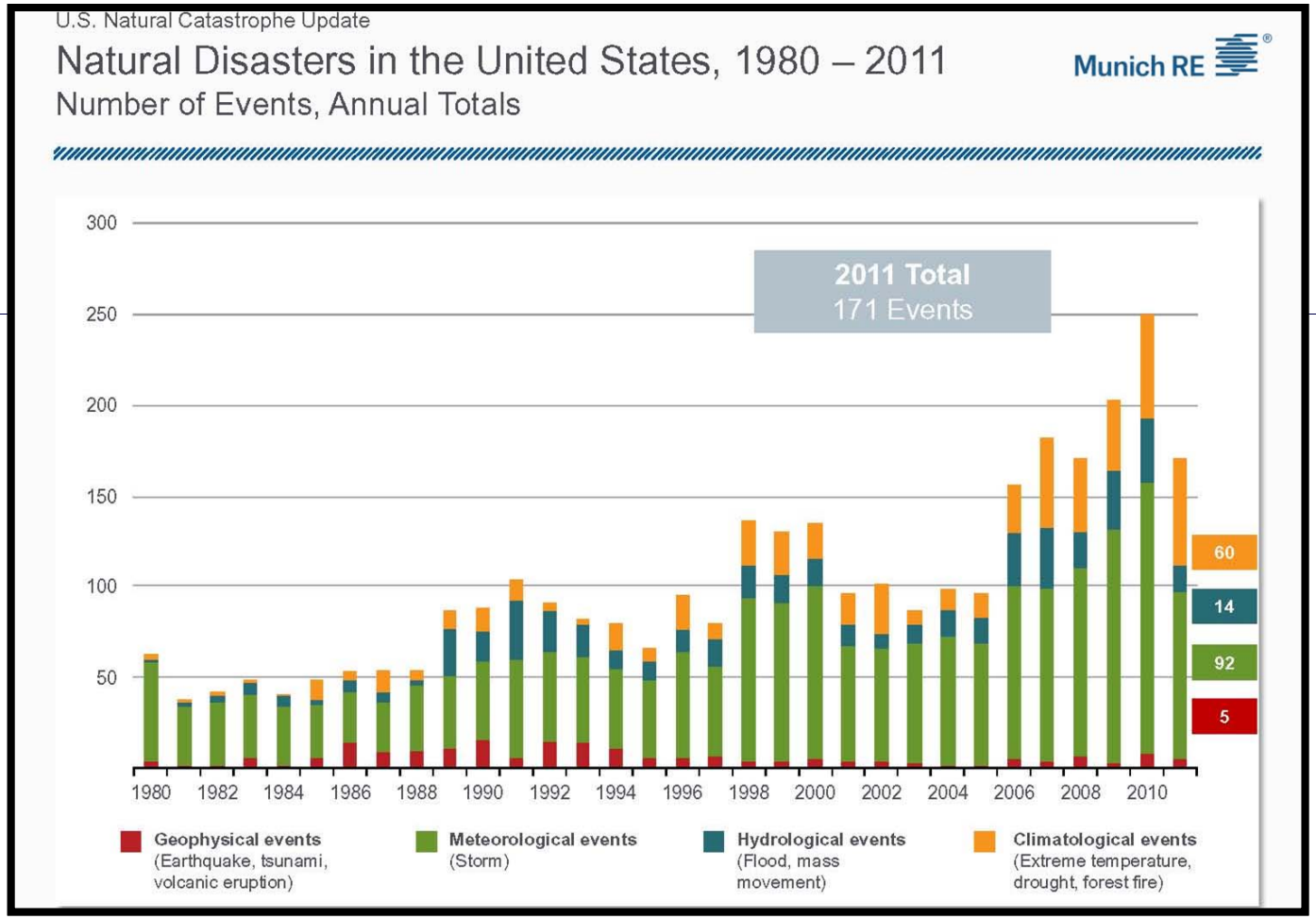
Trends in Weather Extremes

- Billion Dollar Disasters
- Key Issue: Water Distribution
- Hurricanes in the Atlantic Basin

Economic Losses Due to Natural Disasters



Increased Vulnerability to High Impact Events

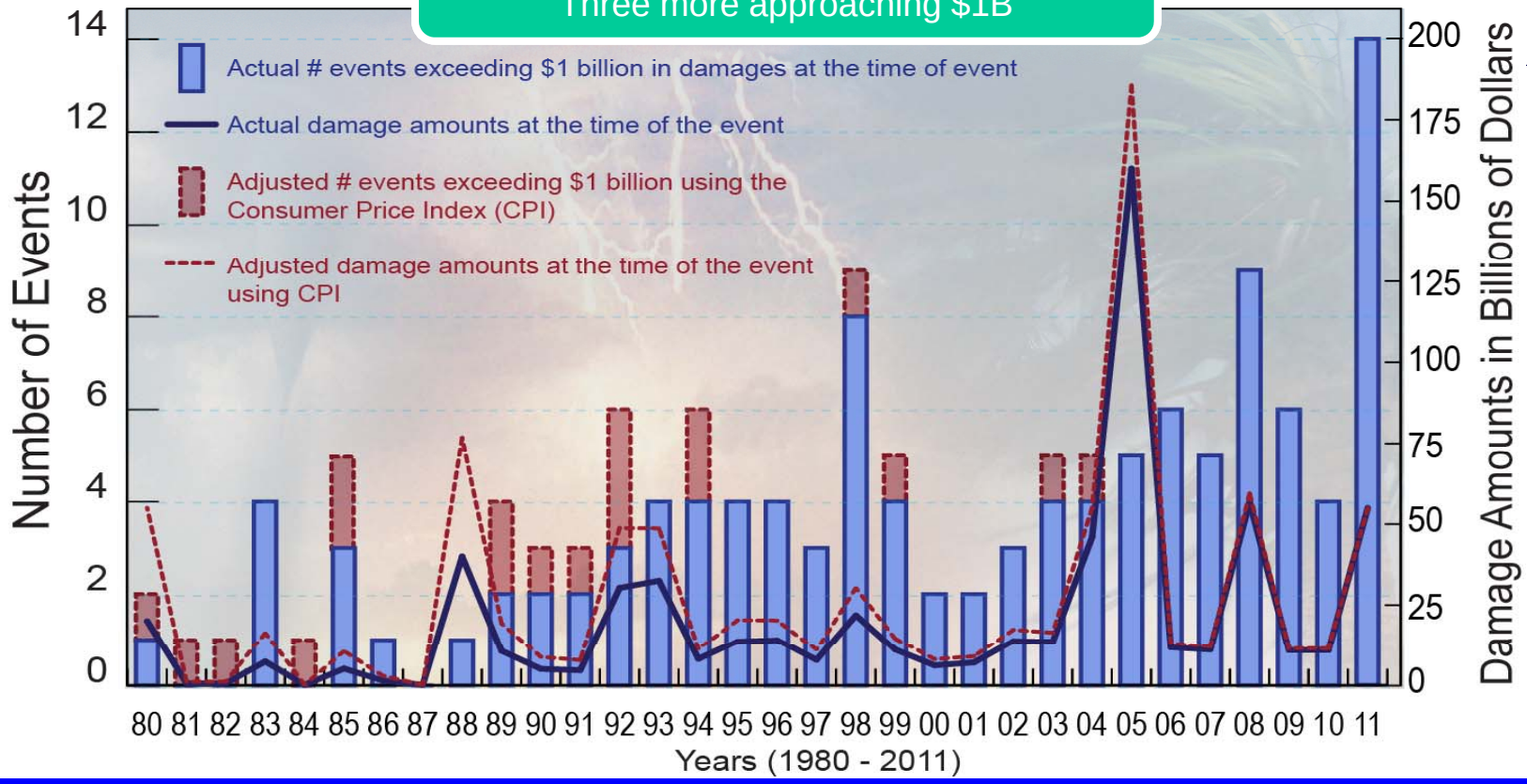


Source: http://www.munichreamerica.com/webinars/2012_01_natcatreview/munichre_iii_2011natcatreview.pdf

Billion Dollar Weather and Climate Disasters

- **Since 1980, 114 billion-dollar weather and climate disasters in U.S.**
- **Total losses since 1980 of billion-dollar disasters exceed $800 billion.**
- **Is the U.S. becoming more exposed and/or sensitive to severe events?**

A Record 14 Disasters in the U.S. in 2011
Three more approaching $1B

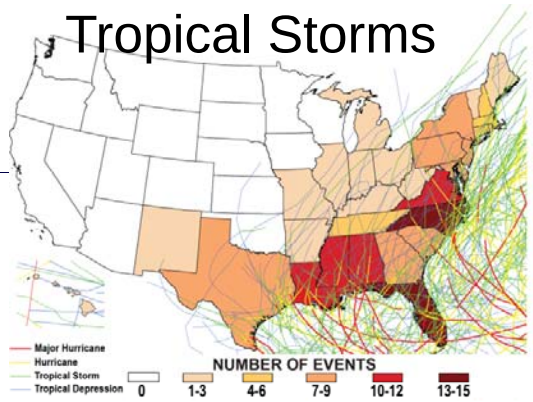


Source: http://www.ncdc.noaa.gov/billions/time-series

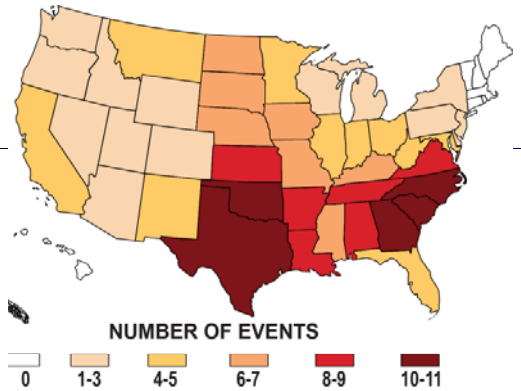
Status of Present Knowledge: *Economic Impacts*

U.S. Billion-Dollar Weather and Climate Disasters: 1980 – 2011

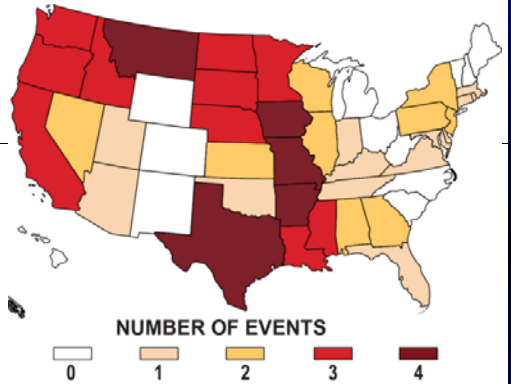
Hurricanes and Tropical Storms



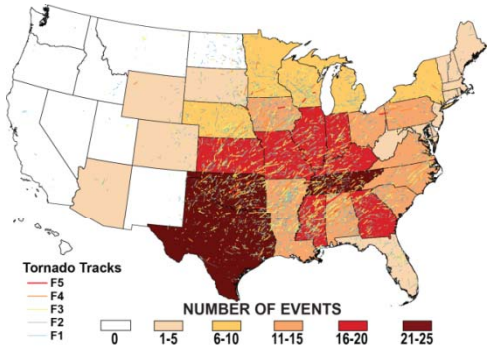
Drought and Heat Wave



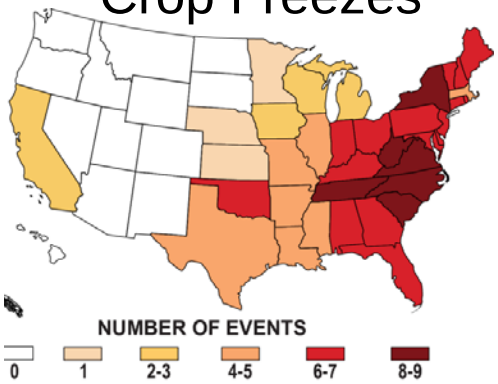
Flooding



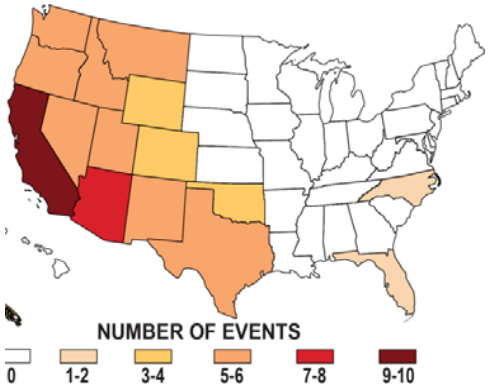
Severe Local Storms and Tornadoes



Winter Storm and Crop Freezes



Wildfires



Source: www.ncdc.noaa.gov/oa/reports/billionz.html

What is at Risk? What Can We Do?

Life and Property

Aviation

Maritime

Space Operations

Forests

Emergency Management

Commerce

Ports

Energy

Hydropower

Reservoir Control

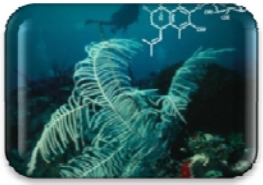
Infrastructure

Construction

Agriculture

Recreation

Ecosystems



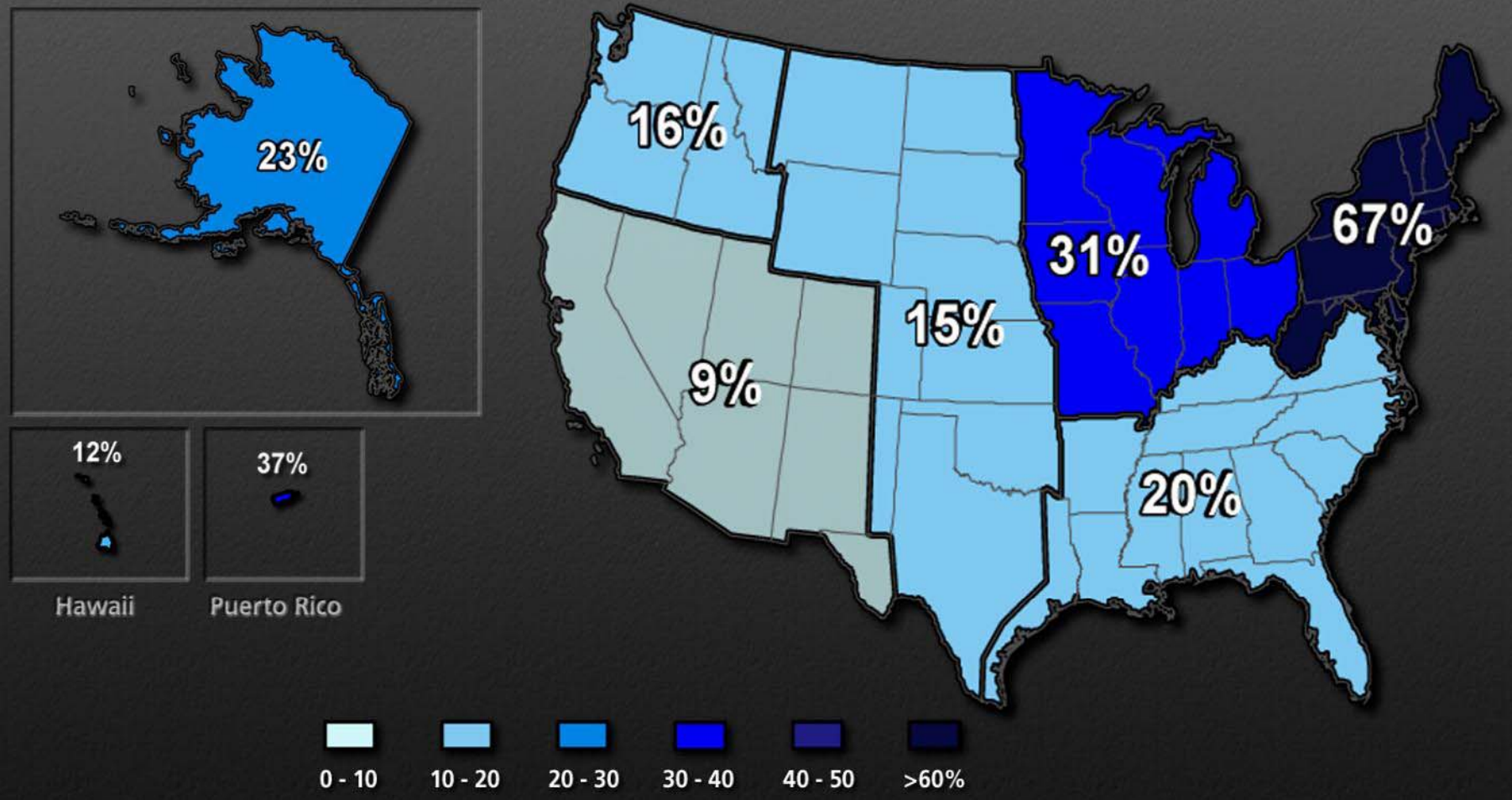
Health

Environment

Source: NOAA Climate Adaptation Portfolio

Increases in Amounts of Very Heavy Precipitation 1958 to 2007

Percent Change



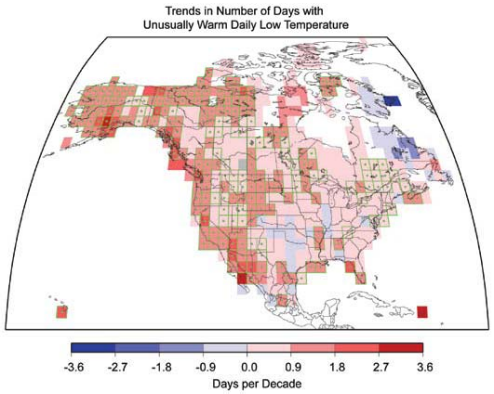
Should we really attribute every extreme event (heat wave, flood, hurricane) to climate change?

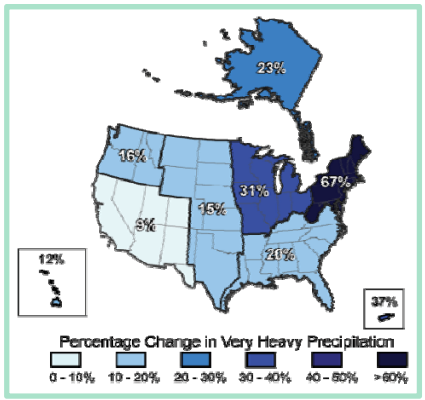
No individual weather event can be attributed to climate change.

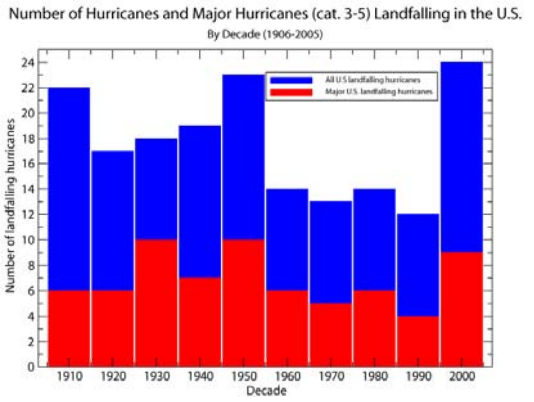
Changes in the number and intensity of some events (e.g. more intense rainfall; warmer winter nights) have strong links to climate change.

Changes in observing systems (e.g. introduction of satellites) have confounded attempts to document trends (e.g. hurricanes over the Atlantic).

Research is ongoing.







Summary

- The development and application of numerical prediction systems represents one of the top intellectual achievements of the 20th century.
- Making great strides in weather and climate prediction – useful skill out to Day 7 (and beyond), even for extreme events.
- Forecast success heavily dependent on global observing system linked to coupled numerical prediction models.
- Links between trends in green-house gas concentration and trends in weather extremes, including hurricanes, tornadoes, floods, droughts, cold waves, heat waves, etc. have not been fully established.
- Credible extrapolation of trends in extremes depends on future model improvements.

NOAA Climate Products and Data

Key Water Resource Issues for Region *(initial list)*

- Strong Coordination (internal & regionally) – though some gaps still noted
- Vulnerabilities:
  - Electrical grid critical
  - Employees (fatigue, continuity of operations, payroll, cross-training, etc.)
- Climatalogical Data:
  - Critical, need as much localized info. as possible
  - NOAA data much better now
- Costs – Planning for ($$$$) vs. Responding ($$) – In these two situations:
  - WSSC Example:
    - Derecho $ 75,000
    - Sandy $500,000
- **Addressing these issues doesn't directly address flooding or environmental/water quality issues (e.g., water resource infrastructure needs)**

SUMMARY THOUGHTS

- Need more data (cost implications, vulnerability assessments, potential impacts)
- Need better localized weather/impact prediction tools
- Need adaptation planning – or always responding to emergencies
- Need mitigation plans – or be willing to accept consequences/impacts