

A photograph showing a man in a blue shirt hugging a woman in a blue shirt amidst a scene of destruction. The background is filled with debris, including wooden planks, twisted metal, and damaged structures, suggesting a severe weather event like a tornado or hurricane. The man is holding a large, patterned bag or bundle. The overall scene is one of devastation and human resilience.

***Weather-Ready Nation:  
Imperatives for Severe Weather Research***

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**Chair, WRN Workshop Executive Committee**

Photo Credit: Associated Press

## 2011: Year of the Tornado



- Deadliest tornado year since 1953: **593 fatalities**
- Deadliest single tornado since 1947: **Joplin, Missouri, 155 fatalities**
- Most observed tornadoes in a month: **875, April**
- Largest number of tornadoes in a day: **226, April 27**
- Most EF5 Tornadoes in a year: **6** (tied for first with 1974)
- Five insured billion-dollar outbreaks
- Two thunderstorm outbreaks each caused insured losses of about \$5 billion
- Late April (Alabama) outbreak is among top 10 largest natural catastrophe losses in U.S. history

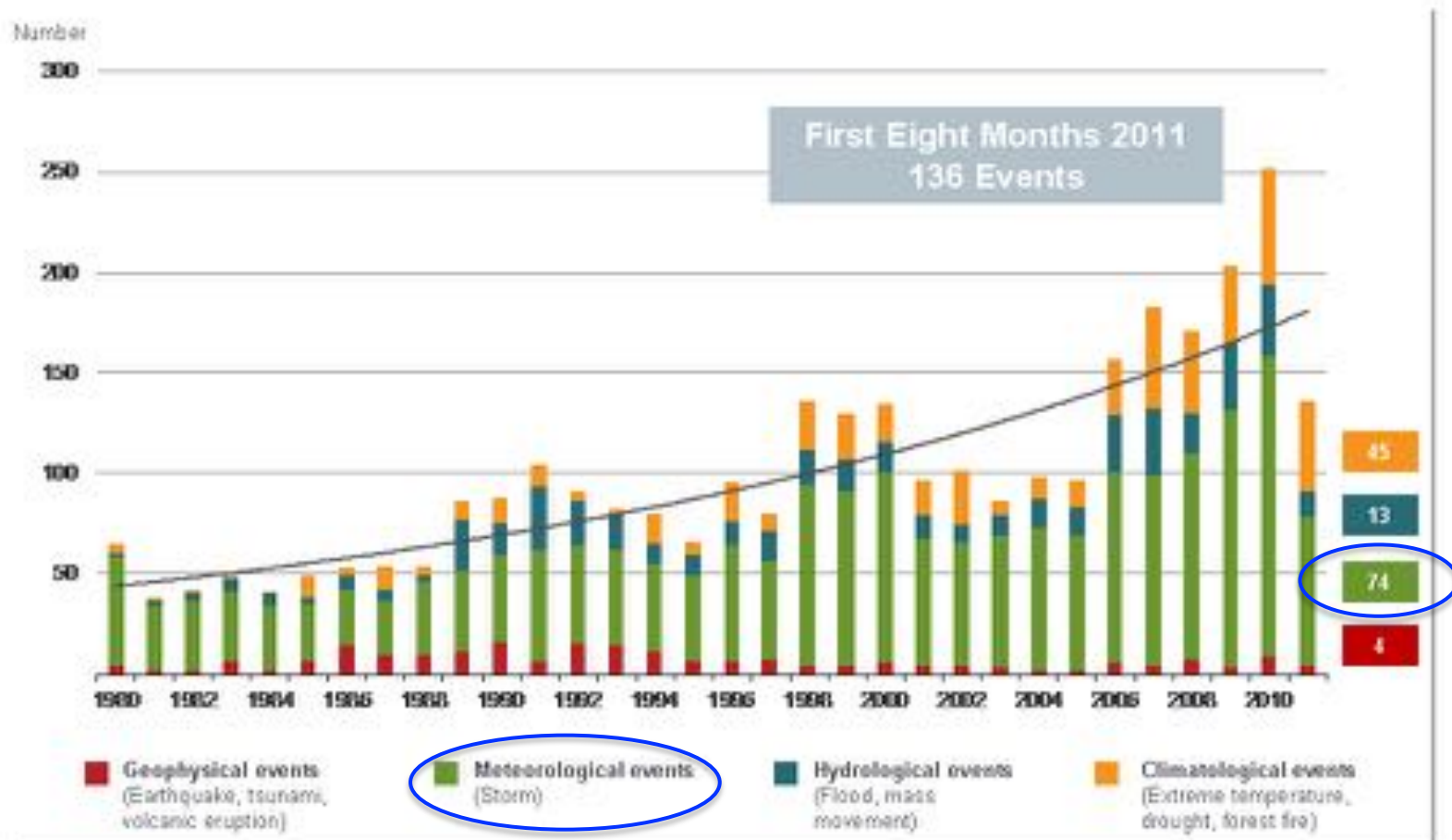


# Much Increased Vulnerability to High-Impact Weather – even before 2011!

NatCatSERVICE

## Natural Disasters in the United States, 1980 – 2011

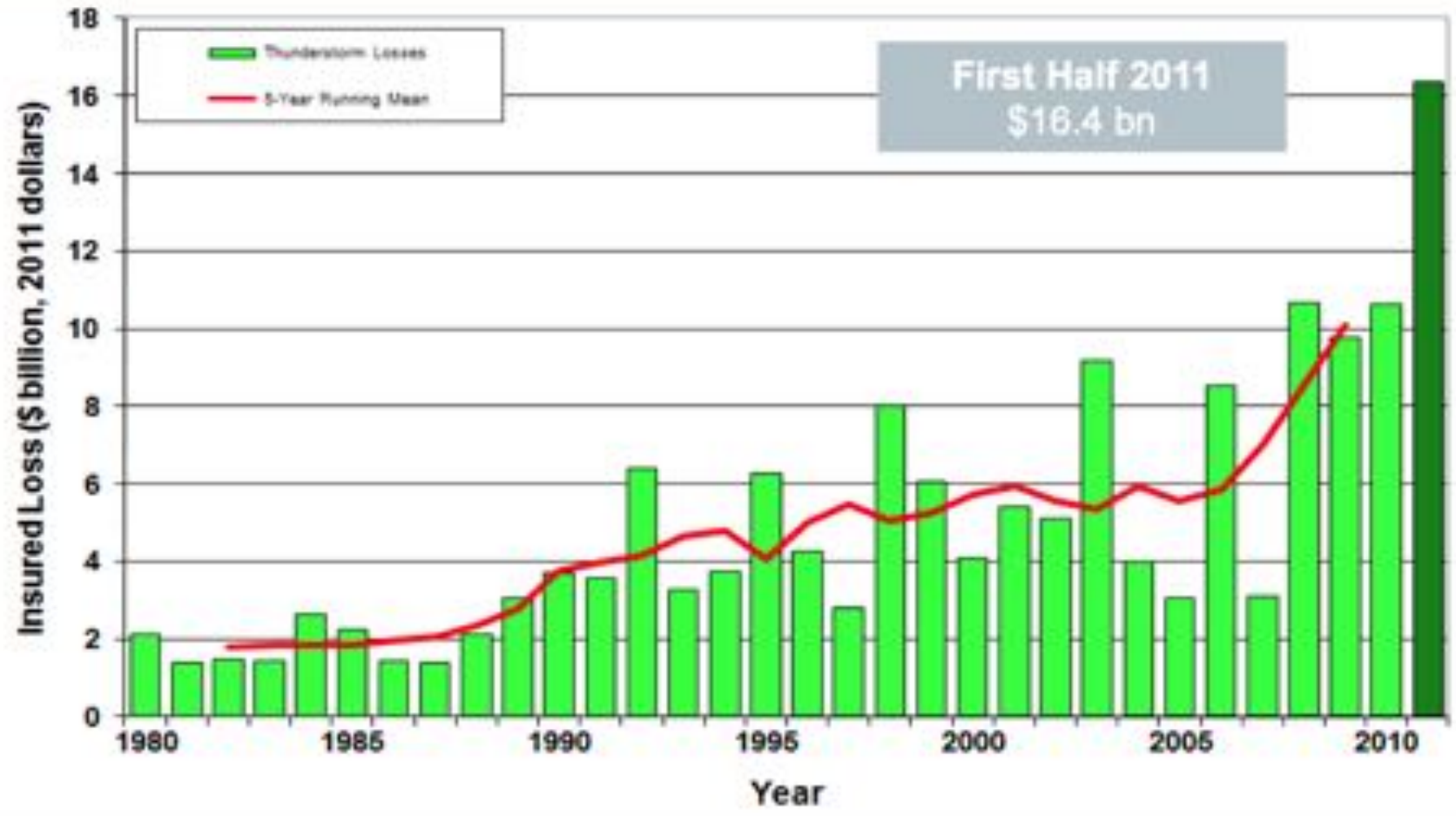
Number of Events (Annual Totals 1980 – 2010 vs. First Eight Months 2011)



# U.S. Thunderstorm Loss Trends

## Annual Totals 1980 – 2010 vs. First Half 2011

Average thunderstorm losses have increased fivefold since 1980.





# Meeting the Nation's Needs

## *Building a Weather-Ready Nation*

- ✧ Purpose: by increasing the Nation's weather-readiness, the U.S. will be prepared to protect more lives and livelihoods, better mitigate, respond to and recover from weather-related disasters.
- ✧ To better prepare the Nation, NOAA must:
  - ✧ Develop scientifically improved, more responsive and meaningful forecast and warning products and services to society
  - ✧ Provide more efficient delivery of those products and services in a technologically changing world
  - ✧ Effectively communicate risk and forecast confidence levels
- ✧ But, being “weather ready” is not something NOAA alone can make happen. It is a collective effort requiring a National Dialog with the public, partners and stakeholders to reduce risk and increase community resilience.



# Weather Ready Nation: A Vital Conversation

December 13 - 15, 2011  
Norman, OK



**Goal:** to identify, prioritize, and set in motion actions to improve the nation's resiliency against severe weather, especially tornadoes, to protect lives and property



# Breakout Discussions

## 7 Community Groups of Expertise

1. Senior Management
2. Risk Reduction & Community Resilience
3. Emergency Decision Makers
4. Communications
5. Physical Scientists
6. Weather Operations
7. Policy Specialists



# Breakout Discussions

7 Cross-cut groups

**Members of the 7 community groups were then randomly assigned to 7 cross-cut groups.**





# Breakout Discussions

## 7 Cross-cut group key themes

1. **Strongly integrate social and physical science** into the future end-to-end weather forecast and warning process – from research to operations. Public understanding of warnings and their perceptions of risk are important gaps.
2. **Carefully review warning false alarms** to determine physical science improvements and other strategies that can be used to reduce false alarms without decreasing threat detection and warning lead-time.
3. **Assess and update warning dissemination strategies**. New wireless technologies can improve the speed and effectiveness of severe weather warnings. An effective strategy must include those with disabilities or who do not use modern technologies.
4. **Advance physical modeling of severe weather** to provide the improved lead-time, accuracy and precision necessary to enable tornado warnings based on weather forecast model output (“Warn on Forecast”).

# Breakout Discussions

## 7 Cross-cut group key themes

5. **Improve outreach and education to supported agencies and groups.** Preparation requires credible communication of threat. Need to better communicate the scientific certainty and uncertainty inherent in extreme weather forecasting and warnings.
6. **Evolve the NWS Assessment process following major severe weather outbreaks to include external, independent experts alongside NWS staff.** Increased participation and visibility would trigger broader national action.
7. **Build coalitions with corporate America** to enhance the effectiveness of government severe weather issuances.



# Continuing the Conversation

## Completed WRN Meetings and Discussions

- 1) Weather Ready Nation - A Vital Conversation  
Norman, OK 13-15 December 2011
- 2) AMS Town Hall report on Norman workshop outcomes  
New Orleans, LA 23 January 2012
- 3) National Severe Weather Workshop  
Norman, OK 1-3 March 2012
- 4) National Emergency Management Association (NEMA) Mid-Year Conference  
“Extreme Weather – Is it the New Norm”  
Alexandria, VA 28 March 2012
- 5) AMS Washington Forum “Towards a Weather, Water, and Climate Ready Nation”  
to describe upcoming WRN actions to the community  
Washington, D.C. 10-12 April 2012





# Continuing the Conversation

## Upcoming WRN Meetings and Discussions

- 6) Weather Ready Nation: Imperatives for Severe Weather Research  
Birmingham, AL 23-26 April 2012
  
- 7) Working Together Today to Save Lives Tomorrow" – Two high level, half day report out sessions  
Washington, D.C. May 2012
  - Executive Branch Focus (Federal Agencies, Chamber of Commerce, etc.)
  - Capitol Hill Focus (Members of Congress, Relevance to District)
  
- 8) Annual Natural Hazards Research and Applications Workshop  
Broomfield, CO 14-17 July 2012
  
- 9) AMS Summer Community Meeting  
Weather Ready Nation theme with focus on social media and messaging with the broad public/private academic sector  
Norman, OK August 13-16, 2012



# Continuing the Conversation

## Proposed WRN Meetings and Discussions

- 10) Annual Interdepartmental Severe Weather Community Conference jointly held with the Office of the Federal Coordinator for Meteorology (OFCM)
- 11) National Weather Association: “Social Sciences and the Weather Ready Nation: Collaboration Leading to Impact Based Decision Support Services”  
Madison, WI 6-11 October 2012
- 12) International Association of Emergency Managers (IAEM) Annual Conference  
Orlando, FL 26 October - 1 November 2012
- 13) AMS Conference on Severe Local Storms  
Nashville, TN 5-8 November 2012



## **NSF Hazards SEES (formerly SEES-CaMRA)** **“Creating a More Disaster Resilient America”**

- **An interdisciplinary program** involving several NSF Directorates to catalyze basic research and education in hazard-related science, engineering, risk assessment, and decision making in order to improve prediction of natural hazards, mitigate their effects, and prepare communities to respond to, and recover from disasters.
- Consistent with some of the objectives of NOAA’s “Weather Ready Nation”





## SEES' Mission and Goals

### Mission Statement:

*To advance science, engineering, and education to inform the societal actions needed for environmental and economic sustainability and sustainable human well-being.*

- **Goal 1:** Support interdisciplinary research and education that can facilitate the move towards global sustainability.
- **Goal 2:** Build linkages among existing projects and *partners* and add new participants in the sustainability research enterprise.
- **Goal 3:** Develop a workforce trained in the interdisciplinary scholarship needed to understand and address the complex issues of sustainability.



# Weather Ready Nation: Imperatives for Severe Weather Research

## Framework for the Birmingham Workshop

**Goal of the Workshop:** “to identify, prioritize, and set in motion *an actionable and fully integrated physical and social science research plan* to enhance our nation’s *readiness for, and responsiveness and* resiliency to severe local weather, especially tornadoes, to protect lives and property.”

**Participation:** We have very strong social and physical science representation from highly respected leaders in the fields of geography, economics, sociology, communications, media research, disabilities and aging, community planning, wind engineering, computer and information systems, emergency management and public health, and meteorology.



# Weather Ready Nation: Imperatives for Severe Weather Research

## Outcomes and Outputs of the Birmingham Workshop

**Expected Outcome:** An agreement on *the top research questions* that are *critical* to advancing the principals of a Weather Ready Nation and that fully integrate the social and physical sciences.

**Expected Output:** A documented *process and schedule* for developing executable action plans for the key research questions identified during the workshop leveraging outcomes from the Norman Severe Weather Symposium and previously completed needs assessments.

Plans to be developed must include a well-defined *scope*, potential *collaborations*, and identified *metrics* on societal impacts and performance measures.





# Weather Ready Nation: Imperatives for Severe Weather Research

## Guiding Principles of the Birmingham Workshop

1. **Create white paper reports** summarizing the state of current knowledge in the meteorological and social science communities, gaps and opportunities.
2. **Integrate** as much as possible social and physical sciences throughout the discussion of the research and development needs and plans.
3. **Quantify** socio-economic impacts of research results.
4. **Define** both short-term (~12 months) and longer-term research initiatives.
5. **Manage expectations** within fiscal and technical resource constraints.
6. **Focus on Research-to-Applications and Applications-to-Research transitions.**  
NOAA requires that future research needs be framed within an operational setting via NOAA testbeds and proving grounds, in particular for:
  - Weather forecast and warnings operations
  - Communications (e.g., broadcasters)
  - Emergency management response
  - Utilization of new technologies



# Weather Ready Nation: Imperatives for Severe Weather Research

## Prioritization Guidelines for the Birmingham Workshop

1. First, **frame** the most important and critical research questions.
2. Then, **identify** the key challenges in addressing those research topics.
3. Finally, **formulate** the most promising research agenda. How to prioritize:
  - Time required to complete research vs. societal urgency
  - Practicality of being completed – not just as actionable, but that will lead to outcomes having a meaningful and measurable impact on society
  - Resource requirements (partnerships, funding,...)
  - Potential for transitioning from research to NOAA operations
4. NOAA and NSF program managers requested workshop participants to make an effort to **prioritize** actions that could capture the key research areas.
5. They asked that the prioritized actions **clearly communicate** to NOAA and NSF the potential payoff of selected research topics, needed resources, and the process to accomplish the stated goals.
6. Recommend new innovative **partnerships** needed to accelerate research efforts, perhaps including new Centers of Expertise.
7. Put aside **pet rocks**. What research needs to be done now because it is so important, then recommend how this this research will be done.



Best wishes to you all on a  
productive and successful workshop!

