

## How a Strategic Goal of Building a Weather Ready Nation Is Transforming the NWS

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 NOAA Assistant Administrator for Weather Services

**April 26, 2018 – Federal Agency Leadership  
 AMS Washington Forum**

## What We Do

**NWS MISSION for Today**



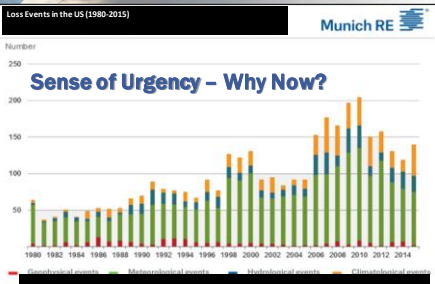
Provide weather, water, and seasonal data, forecasts and warnings for the protection of life and property and the enhancement of the national economy

**VISION for Tomorrow**



A Weather-Ready Nation where society is prepared for and responds to weather and water events; where communities are "Ready, Responsive and Resilient"

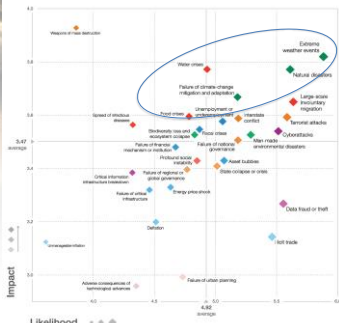
### Sense of Urgency – Why Now?



"Spending more than \$300 billion each year, in response to severe weather events that are connected to warming waters and producing strong hurricanes, is simply not a solution." – Senator Susan Collins

### Global Risks Landscape

World Economic Forum Deves



### Comparing Severe Weather Outbreaks

Super Outbreak :	April 3-4, 1974	April 27-28, 2011
Summary:	150 tornadoes across 13 states	~200 tornadoes across 16 states
Number and Strength:	6 F-5 tornadoes, 24 F-4	4 EF-5 tornadoes, 11 EF-4
Tornado Track Length:	2500 miles	2500 miles
Tornado Time:	50 hours	50 hours
Outbreak forecast:	"Indications" provided night before	4-6 days prior
Warning lead time:		~24 minutes
Fatalities:	316	314

### Building a Weather Ready Nation: "A Vital Conversation"

December 2011 Workshop in Norman, OK

- Focus on the "last mile": delivery of warnings
- Assess and update warning dissemination strategy
- Integrate social and physical science
  - Is the message delivered equal to the message received?
  - Design, develop impact-based Forecast and Warnings for a wide range of decision makers (from "organized" to "loosely coupled" to "individuals")
- Improved outreach and education




## Realizing the Intrinsic Value

**"First, it should be understood that forecasts possess no intrinsic value. They acquire value through their ability to influence the decisions made by users of the forecasts."**

**"What is a Good Forecast? An Essay on the Nature of Goodness in Weather Forecasting"**  
 – by Allan H. Murphy, *Weather and Forecasting* (June 1993)

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## Becoming a Weather-Ready Nation Relies on the NWS Connecting Forecasts to Decisions Based on Impact-Based Decision Support

Generating forecasts and warnings + Connecting those forecasts/warnings with partner decision-making process = Realizing Intrinsic Value and Mission Success



The best hydrometeorological forecasting in the world



Practice, practice, practice!



Embed



Develop relationships / know partner needs

**Impact-based Decision Support Services**


**Trust**

**"Ready, Responsive, Resilient"**

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## 2017 East New Orleans Tornado

	Date: February 7, 2017
Strength:	EF-3
Track Width:	1/3 mile
Tornado Track Length:	10 miles
Warning lead time:	~33 minutes
Injuries:	33
Fatalities:	0



- NWS local outreach and preparedness activities over a 4-year period
- Deep relationships with Emergency Managers/WRN Ambassadors
- Dissemination of forecasts and warnings
- Public awareness
  - Daytime event, visual confirmation, schools sheltered
- Collaborative forecast preparations within NWS and the larger enterprise a success
  - Over 100 meetings and table-top exercises held in the city in the years preceding event
- IDSS provided days in advance of the tornado

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## Impact Based Decision Support Services Improvements



**Andrew 1992**

- NHC connected with National/State EMs
- FEMA/National Recovery assets not prepositioned
- Slow to react
- National response tempo took 4 days to recognise impact and then rise up to meet the challenges



**Katrina 2005**

- NHC connection with National/State EMs vastly expanded
- Variable connectivity with local, state/parish EM community
- National pre-coordination of response was problematic at best
- Recovery, supplies overwhelmed



**Harvey/Irma/Maria 2017**



- Entire NWS connected to National, State, Local EMs and Water Resource Managers and impacts
- **CONSISTENT** messaging of forecasts and impacts
- Connected with EM community 7 days in advance; preposition assets
- Embedded NWS at every government level, especially at the local level; evacuation plans initiated
- All hands on deck to support field structure before, during, and after events  
~NWS surges resources where needed

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## Impact Based Decision Support Days Prior to Landfall

	HARVEY AUG 27 – SEPT 1	IRMA AUG 30 – SEPT 12	MARIA SEPT 10 – SEPT 20
External Partner Engagements: Briefings to Emergency Managers	7	11	5
Embedded with Emergency Operation Centers	7	6	3
"All Hands on Deck" – Internal Staffing Surge to Affected Offices	3	6	4
Internal Collaboration Calls (Centers, WFO, RFC, CWSU)	4	5	4
<b>US Deaths :</b>	<b>88</b>	<b>97</b>	<b>TBD</b>

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**No Lives Lost to Storm Surge**

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### January 2016 Blizzard & Coastal Storm: Connecting All of the Pieces

Jan 15 - 18	Jan 19	Jan 20	Jan 21	Jan 22
<p>Medium range products begin identifying snowstorm threat for the end of next week</p> <p>NWS offices begin briefing partners on potential storm</p>	<p>Confidence increasing</p> <p>Partner Coordination/ Briefings</p> <p>Media Interviews</p>	<p>Partner Coordination/ Briefings</p> <p>Blizzard Watches Issued</p> <p>Media Interviews</p>	<p>Fed./state/local govts make critical decisions <b>before</b> the snow begins</p> <p>Blizzard Warnings Issued</p> <p>1 pm: Press Briefing</p>	<p>Snow begins in the Mid-Atlantic</p> <p>Snow forecast adjusted to include NYC in Blizzard Warning</p> <p>Schools/Event Close Flight Canceled Roads Closed</p>

### Connecting All the Pieces

**2013 Snowstorm**

**The Past**

**2016 Snowstorm**

**Long Island Expressway**  
With NWS Decision Support

### Impact of Spatial Resolution on Fire Detection Sensitivity

GOES-13 Fire Hot Spot Channel - 6 March 1815 UTC (3.9µm central wavelength, 4km spatial resolution)

GOES-16 Fire Hot Spot Channel - 6 March 1812 UTC (3.9µm central wavelength, 2km spatial resolution)

GOES-16 Fire Hot Spot Channel - 6 March, 2017 (3.9µm central wavelength, 2km spatial resolution)

### Increasing Need for Local IDSS

There is an unmet need in every office

- Montana state EM could benefit from co-located fire expert
- Port Authority of NYC expressed need for additional support
- Additional opportunity to work with Flood Control & Water Districts
- CDC in Atlanta interested in additional support
- Additional need for IDSS beyond what is provided today
- Low additional IDSS need
- Extreme additional IDSS need

Every NWS office serves partners with additional IDSS needs

NOVA Analysis shows that local partners are local - in close proximity to current infrastructure

The level of need varies across offices

Maintain local presence through the current WFOC infrastructure

Partners will be better served by enhancing IDSS at all locations and levels of the organization

### Weather Research and Forecasting Innovation Act

**Sec. 101 – Directed toward the NWS Mission**

15 USC 85011. SEC. 101. PUBLIC SAFETY PRIORITY.

In conducting research, the Under Secretary shall prioritize improving weather data, modeling, computing, forecasting, and warnings for the protection of life and property and for the enhancement of the national economy.

- Reauthorize USWRP, HRP, Tornado Research
- 201 – Improving Sub-seasonal and Seasonal Forecasts
- 301 – Weather Satellite and Data Innovation
- 401 – Federal Weather Coordination
  - Using available resources... between Federal, State, Local and Tribal Nations
- 501 – Tsunami Warning, Education, and Research **Signed into law on April 18, 2017**

### Title IV (405-410)

- Addresses the increasing demands of IDSS
  - (1) IN GENERAL.—Subject to paragraph (2), consistent with the analysis described in section 409, and in order to **increase impact-based decision support services**, each warning coordina-
- “...collaborate with such weather forecast offices and State, local, and tribal government agencies”
- “NO ADDITIONAL EMPLOYEES AUTHORIZED.—Nothing in this section shall be construed to authorize or require a change in the authorized number of full time equivalent employees...”
- Points to the critical importance of the Warning Coordination Meteorologists (WCM) and provision of IDSS at local forecast offices

### Predominance of Decision Making at the Local Level Is NOT a New Concept!

- de Tocqueville 1835: Chapter 5 “Decentralization in America”
- de Tocqueville struck by the extraordinary decentralized character of public administrations down to local levels where most decisions affecting people’s lives were made.
- And then noted that Europeans, “accustomed to dominating central governments...” had to “reconcile himself **with difficulty** to the complex mechanisms of the administration of **townships**.”

### How Does That Translate Today?

- FEMA
  - Coordinates/prepositions assets 7+ days before an event
  - Supports state/locals when required/requested
  - Supports recovery during and after the event
- State to Local
  - State level: Coordinate state response
  - Local Level: Assess, Decide, Act!
  - For Harvey: Corpus Christi (evacuate) vs Houston (shelter in place)
- NWS
  - Provides IDSS to national, **state, local**, tribal nation.

### And Every State Is Different

Rhode Island: “Storm Ready State”  
39 Townships Make The Decisions



NWS has committed itself to serving the “complex mechanism” of decision makers that save lives

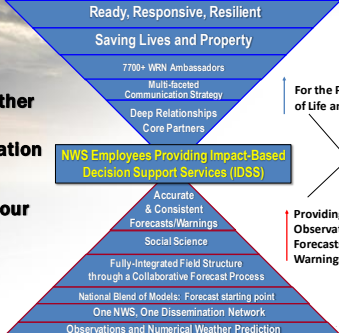
### How to Measure of Success?

One of the bigger challenges for those who hold us accountable to realize the intrinsic value of our forecasts and warnings.

**“Partnership with the NWS has revolutionized the EM community from one that reacts to events to one that proactively prepares and stays ahead of extreme events.” - Eric Waage**

Director of Emergency Management, Hennepin County Minnesota  
Northern Plains Winter Weather Workshop, November 2016

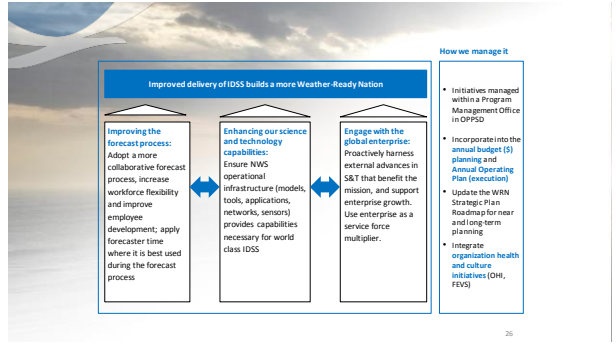
**Pulling it all together to build a Weather-Ready Nation and accomplish our mission**



## “Can’t Do It Alone”\*

- It will take the entire enterprise operating across the “value chain” to
  - Accomplish the NWS mission
  - Realize the intrinsic value
  - Build a Weather Ready Nation
- Updated National Weather Service Strategic Plan Recognizes the required partnerships – “3 Pillar” Approach

\* NAPA Review 2013



## Computer Status/ Model Implementation Supported through HFIP and Sandy Supplemental

Increased HPC capacity to 4.2 petaFLOPs (for primary and backup, respectively – for a total of 8.4 PF) Accepted January 2018

**Key Atmospheric FY 2018 Model Upgrades:**

- Q2: GLOBAL Wave Model
- Q2: Near-shore Wave Prediction System (NWPS)
- Q2: Real-Time Global Sea Surface Temperature (RTGSST)
- Q2: North American Ensemble Forecast System (NAEFS)
- Q3: Rapid Update/ High-Resolution Rapid Refresh (RAP/HRF)
- Q3: FY18GFS Beta (will run as a parallel with operational GFS)
- Q3: Hurricane WRF Phenomena in a Multi-scale Ocean-coupled Non-hydrostatic model (HWRF-MHON)
- Q3: Air parcel transport, dispersion, chemistry deposition (HSPUT)
- Q3: Air Quality Model (AQM)
- Q4: RTMA/URMA
- Q4: Real-time Ocean Forecasting System (RTOS)

Every model upgrade involves the larger weather-water-climate enterprise

## Summary

- Building a Weather Ready Nation is a developing success story involving the entire enterprise (public/private; operational/research-academic) **built upon:**
  - Better forecasts and warning
  - Consistent products and services
  - Actionable environmental intelligence
  - Connecting forecasts to decisions through IDSS
- New Service Delivery Document, Version 1.0, just issued
  - Focused on the provision of IDSS
  - Public safety is the top priority
  - Describes to whom NWS will provide IDSS
  - Describes overall approach and levels of service.
- Bottom line:**
  - What we will do
  - What we will not do
- Will continue to advance IDSS for all services area operating across the entire county at the Federal, State, LOCAL and Tribal Nation levels as specified in the 2017 Weather Act

# THANK YOU!