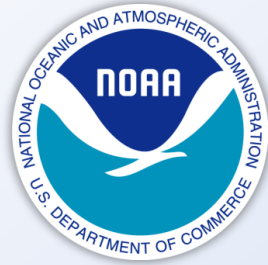


National Oceanic and Atmospheric Administration (NOAA)



Plans and Planning in Uncertain Times

Terry and Carmen Tarbell Lecture

Paul A. Hirschberg

Deputy Director Strategic Planning and Implementation

NOAA Office of Program Planning and Integration

September 22, 2011

Outline

- **NOAA 101**
- **Trends Driving Strategy**
- **Strategic Priorities**
- **Dealing with Change and Uncertainty**
- **How this Applies to You**

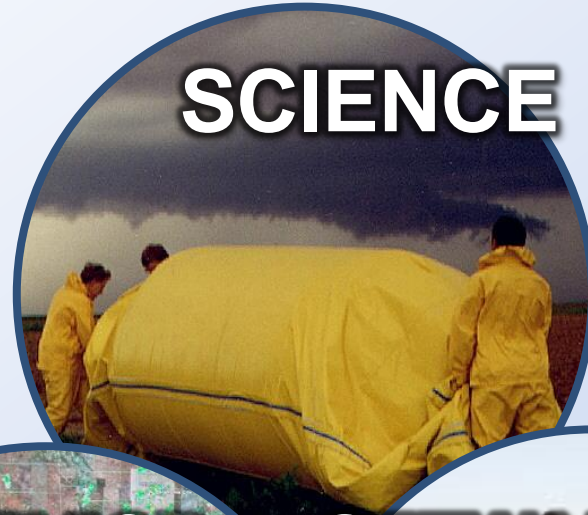


NOAA 101

Mission

- To understand and predict changes in climate, weather, oceans, and coasts,
- To share that knowledge and information with others, and
- To conserve and manage coastal and marine ecosystems and resources.

SCIENCE



SERVICE



STEWARDSHIP



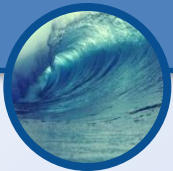
NOAA 101

Organization

**NOAA FY2011
Enacted Budget = \$4,597M**



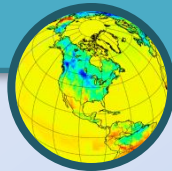
**National
Ocean
Service
(\$495M)**



**National
Environmental
Satellite, Data,
& Information
Service
(\$1,444M)**



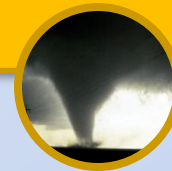
**Oceanic &
Atmospheric
Research
(\$427M)**



**National
Marine
Fisheries
Service
(\$845M)**



**National
Weather
Service
(\$977M)**



**Office of
Marine
and Aviation
Operations
(\$186M)**



NOAA 101

Core Assets

➤ NOAA professionals

- 21,000 staff (13,500 FTE and 7,500 contractors)

➤ Observing Systems

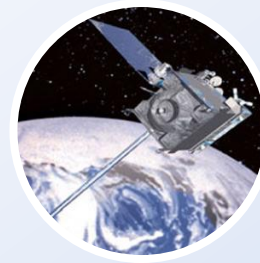
- ~250 weather and ocean radars
- 10 satellites
- 9 buoy networks
- 208 tide gages

➤ Ships and Aircraft

- 18 ships
- 12 aircraft

➤ High Performance Computing

- 5 supercomputers



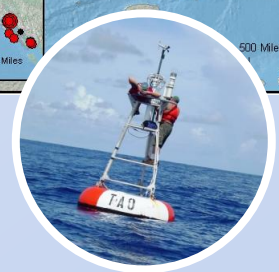
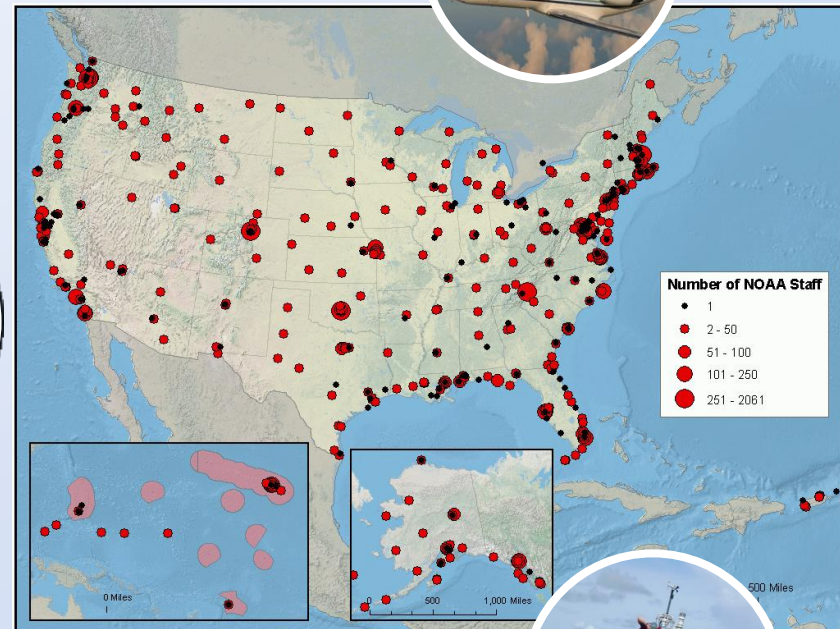
GOES



NOAA G4 and P3



Okeanos Explorer



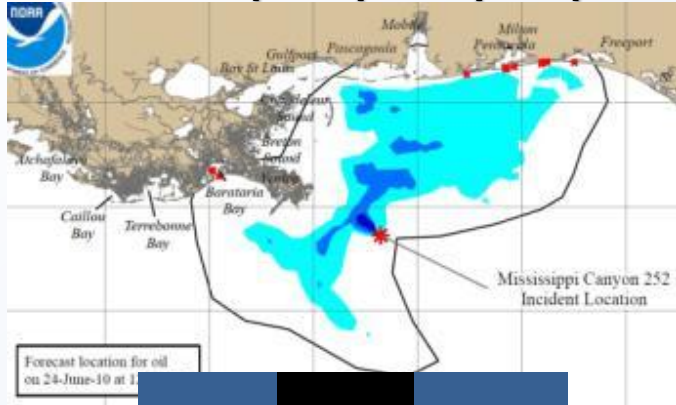
TAO Buoy

NOAA 101

Cross-Agency Collaboration – One NOAA Approach

Responding to a crisis: Deepwater Horizon

Released Daily Oil Spill Trajectory



Ocean Service	Fisheries Service	Weather Service
Research	Satellite Service	Ships and Airplanes

NOAA is able to put together the right pieces to address specific challenges



Monitored Water Quality

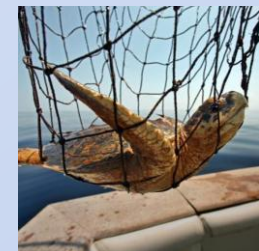


Ocean Service	Fisheries Service	Weather Service
Research	Satellite Service	Ships and Airplanes

Tested Seafood Safety and regulated fishing



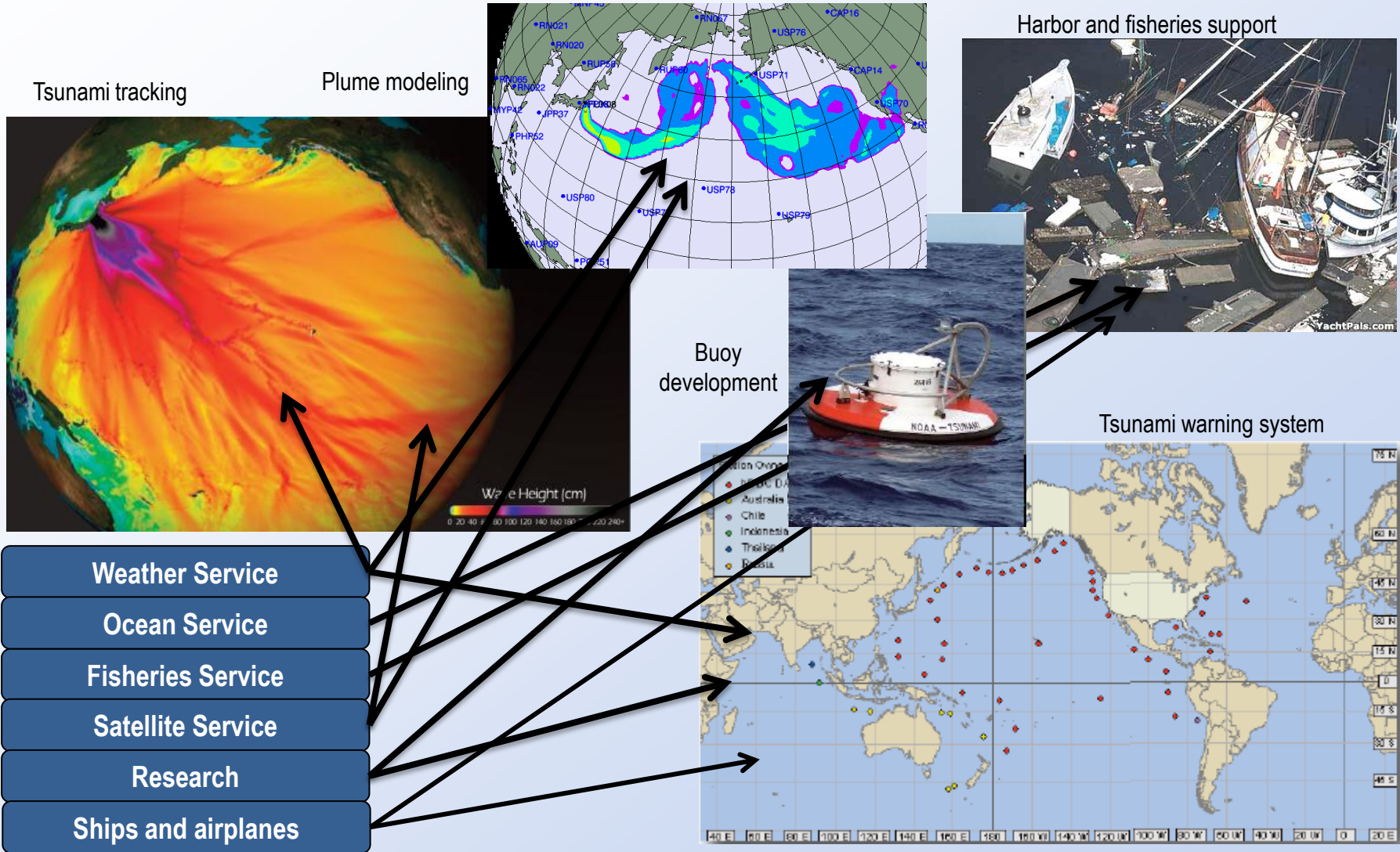
Ocean Service	Fisheries Service	Weather Service
Research	Satellite Service	Ships and Airplanes



NOAA 101

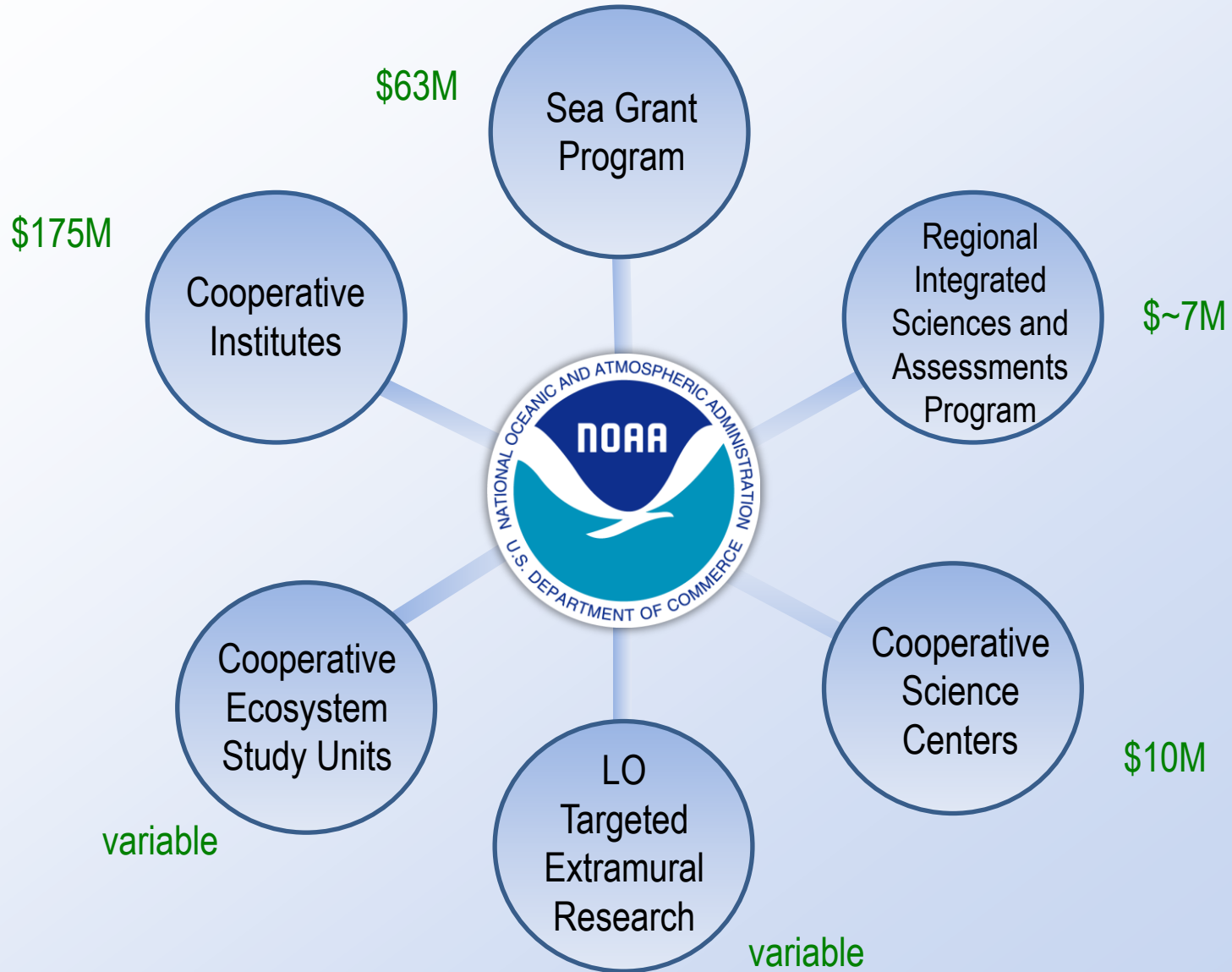
Cross-Agency Collaboration – One NOAA Approach

Responding to a crisis: Japanese earthquake, tsunami, and nuclear disaster



NOAA 101

University Partnership Mechanisms

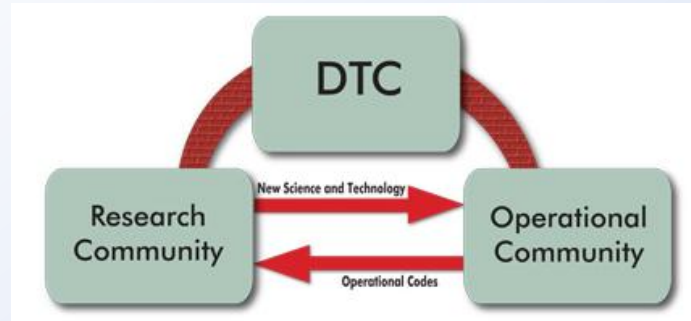


NOAA 101

Testbeds

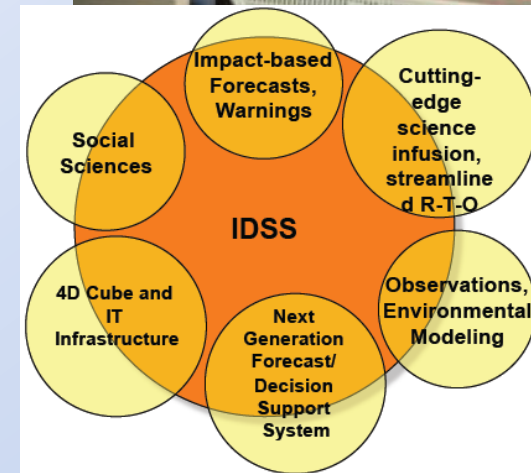
CURRENT

- Climate Testbed
- Aviation Weather Testbed
- Hazardous Weather Testbed
- HydroMet Testbed
- Developmental Testbed Center
- Joint Hurricane Testbed
- Unmanned Aerial System Testbed
- Joint Center for Satellite Data Assimilation



IN PLANNING STAGE

- Operations and Services Proving Ground
- Forecaster Applications Testbed
- OSSE Testbed
- Space Weather Testbed
- Impact Decision Service Support (IDSS) Testbed



Strategy

- **Strategy explains, at the highest level:**

- *What an agency intends to do and why it intends to do it*
- *Relates a mission statement (functions) to a vision statement (Goals)*
- *Succinctly conveys an organizations' fundamental purpose, strategic direction, and value to society.*

- **Defined strategic priorities (strategic plan) enables:**

- *Preparation for the future*
- *Anticipation and management of change*
- *Alignment and Collaboration*
- *Policy, programmatic, and investment decisions*
- *Stakeholder support*
- *Basis for monitoring and evaluating performance management*

- **Three questions drive strategy:**

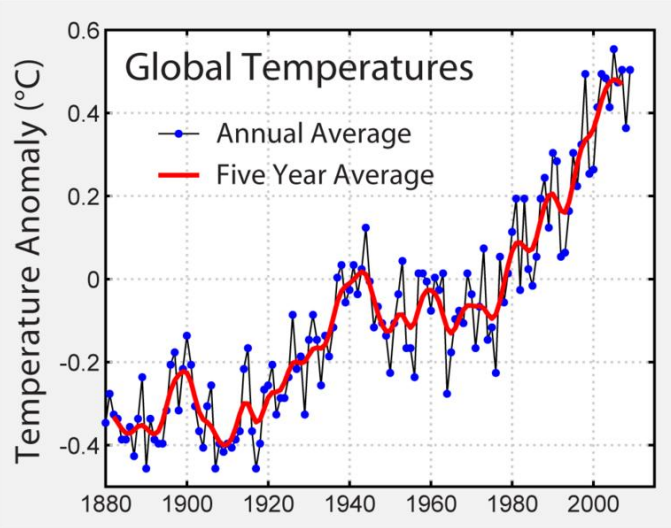
- *What long-term trends will shape the future?*
- *What challenges or opportunities will be faced?*
- *What should be accomplished?*



Failing to Plan is Planning to Fail
-- attributed to Alan Lakein

Trends Driving Strategy

Climate Change / Variability and Demand for Climate Information



Transportation



Coasts



Health



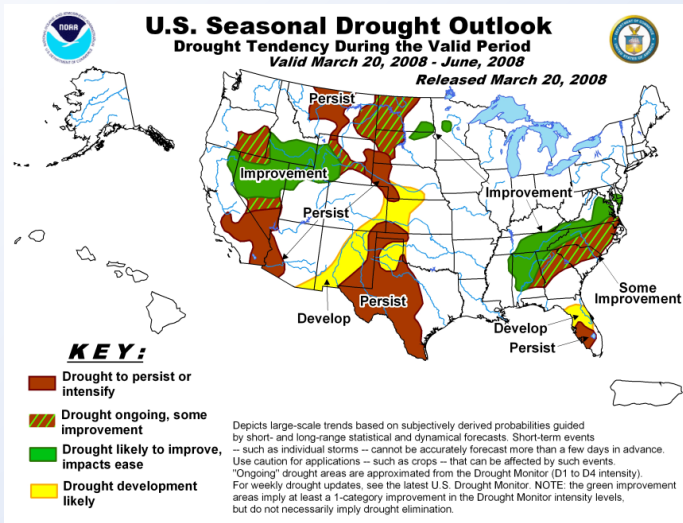
Water



Agriculture



Energy



Society



Private Sector



Ecosystems

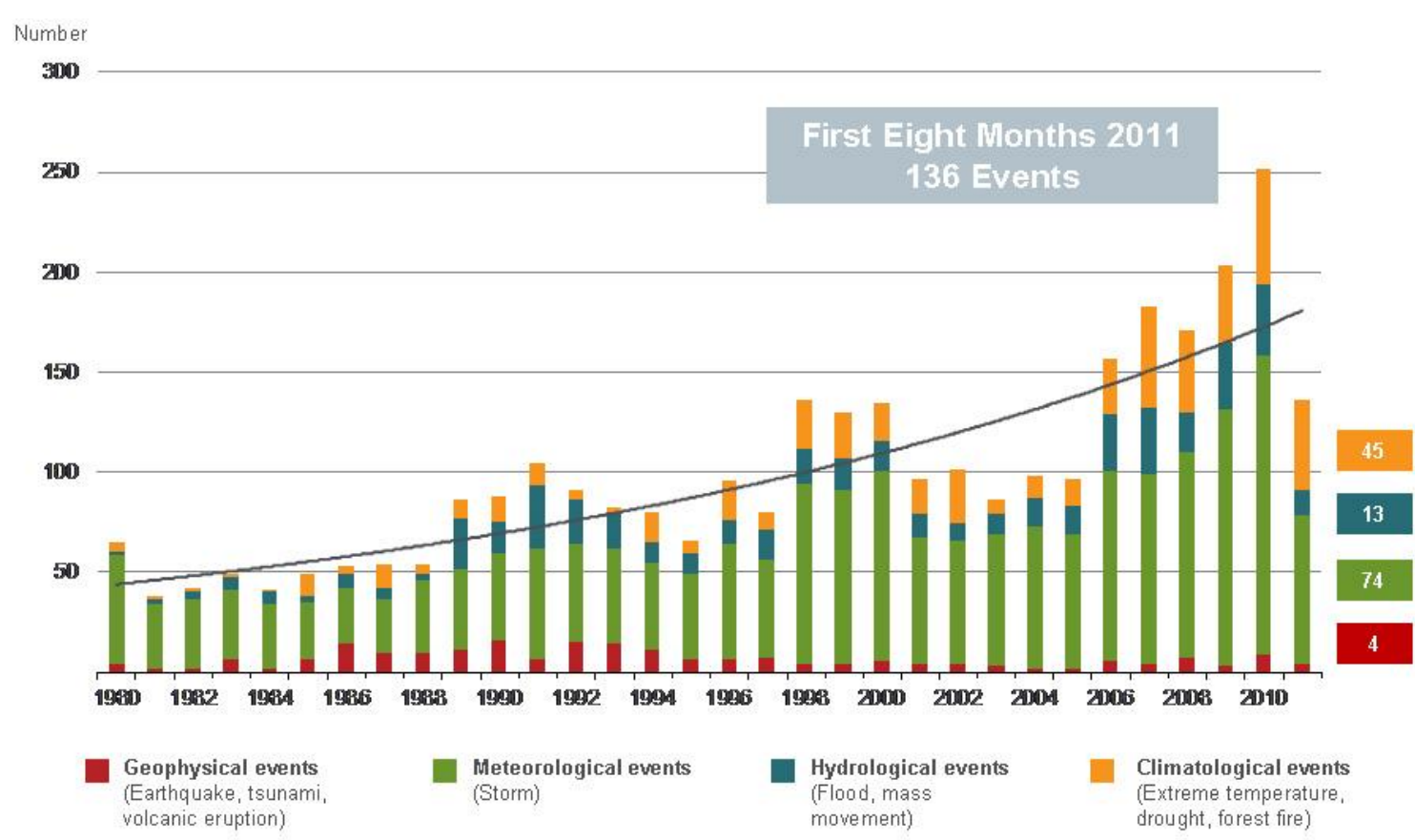
Trends Driving Strategy

Increased Vulnerability to High-Impact Weather

NatCatSERVICE

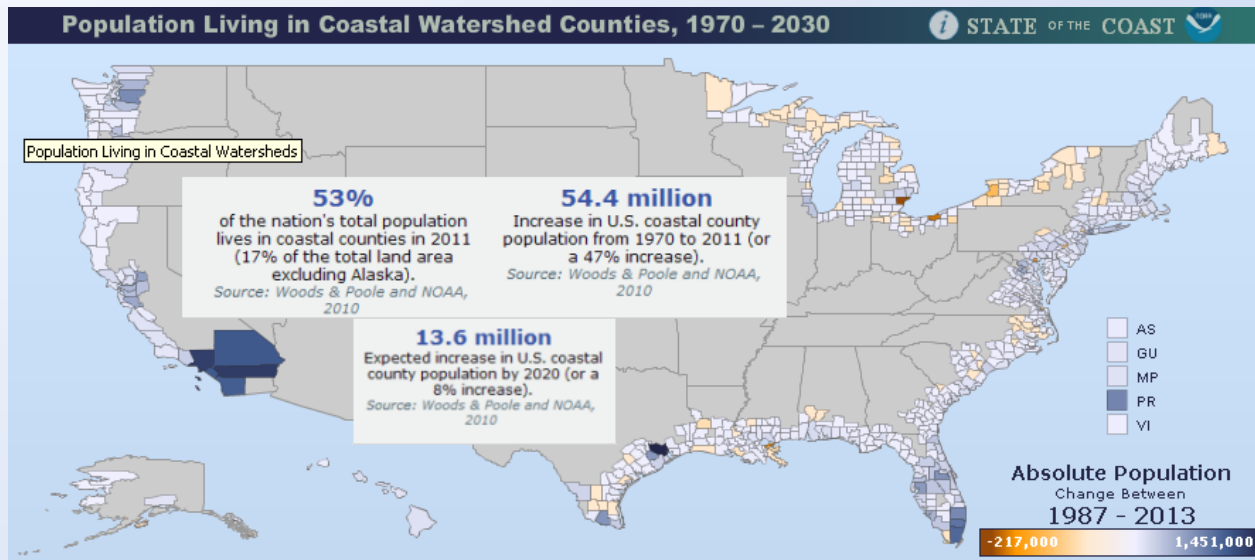
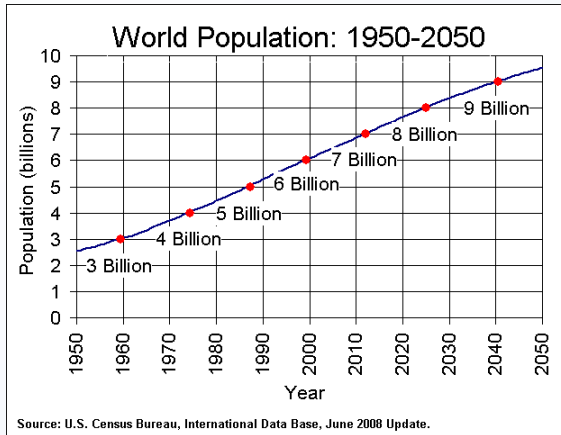
Natural Disasters in the United States, 1980 – 2011

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



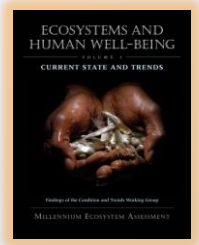
Trends Driving Strategy

Population Increases and Continuing Movement to the Coasts



Trends Driving Strategy

Loss of Ecosystem Services



Oil spills



Dead zones



**Harmful
algal blooms**



**Coral
bleaching**



**Polluted
beaches**



**Endangered
species**



**Depleted
fisheries**



**Diseases
& pests**



**Seafood
safety**



**Loss of top
predators**

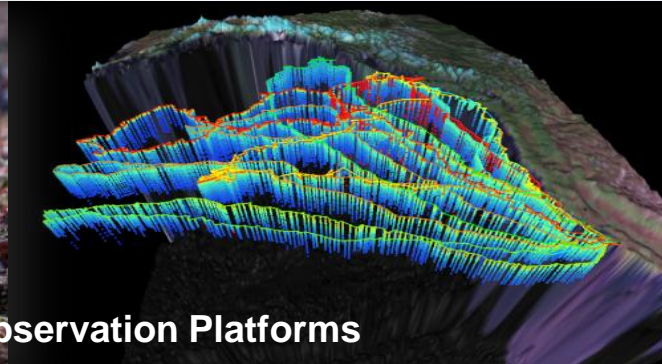
60 % of ecosystem services have been lost or are at risk

Trends Driving Strategy

Advance of Science and Technology



Biological Observation Platforms

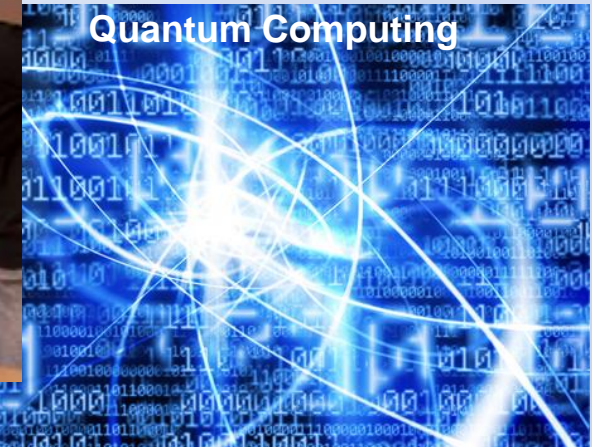
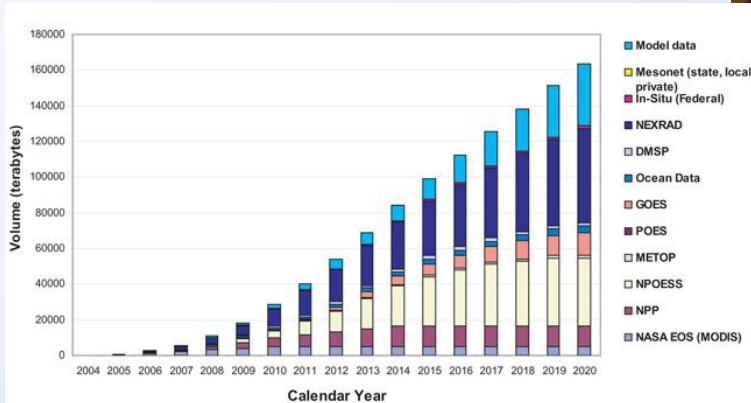


Nano Technology

Instant Communications



Data Growth



Quantum Computing

Trends Driving Strategy

Science Challenges

- **Overarching Grand Challenge:** Develop and apply holistic, integrated Earth system approaches to understand the processes that connect changes in the atmosphere, ocean, space, land surface, and cryosphere with ecosystems, organisms, and humans over different scales
- **Topic-specific Challenges:**
 - Acquire and incorporate knowledge of **human behavior** to enhance our understanding of the interaction between human activities and the Earth system
 - Understand and quantify the interactions between atmospheric composition and **climate variations and change**
 - Understand and characterize the role of the **oceans in climate** change and variability and the effects of climate change on the ocean and coasts
 - Assess and understand the roles of **ecosystem processes** and biodiversity in sustaining ecosystem services
 - Improve understanding and predictions of the **water cycle** at global to local scales
 - Develop and evaluate approaches to substantially **reduce environmental degradation**
 - Sustain and enhance atmosphere-ocean-land-biology and human **observing systems**
- **Cross-Cutting Challenges:**
 - Characterize the **uncertainties** associated with scientific information
 - **Communicate** scientific information and its associated uncertainties accurately and effectively to policy makers, the media, and the public at large

NOAA's Strategic Goals

Outcome Oriented

CHART THE
future

WWW.NOAA.GOV/NGSP

CLIMATE ADAPTATION AND MITIGATION

An informed society anticipating and responding to climate and its impacts

CHART THE
future

WWW.NOAA.GOV/NGSP

HEALTHY OCEANS

Marine fisheries, habitats, and biodiversity are sustained within healthy and productive ecosystems

CHART THE
future

RESILIENT COASTAL COMMUNITIES AND ECONOMIES

Coastal and Great Lakes communities are environmentally and economically sustainable

CHART THE
future

WWW.NOAA.GOV/NGSP

WEATHER-READY NATION

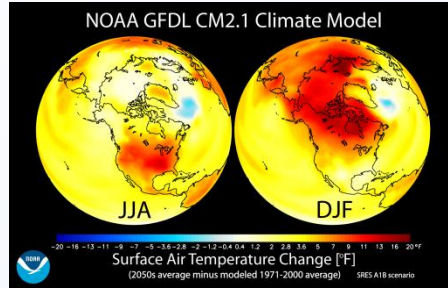
Society is prepared for and responds to weather-related events

NOAA's Next Generation Strategic Plan (NGSP)



Selected Strategic Priorities

Enhance Climate Services



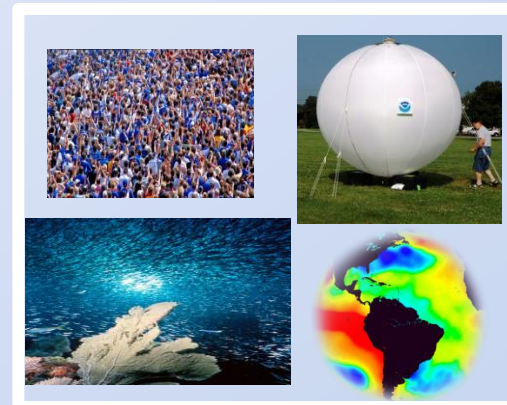
Support Renewable Energy

Support the National Ocean Policy



Define the Future of NOAA's Weather and Water services

Strengthen Arctic Science and Service



Strengthen S&T

Selected Strategic Priorities

Enhance Climate Services

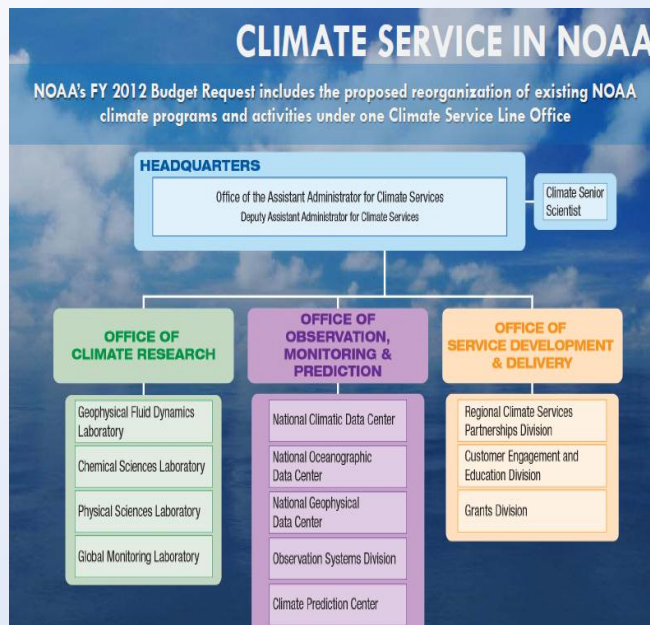
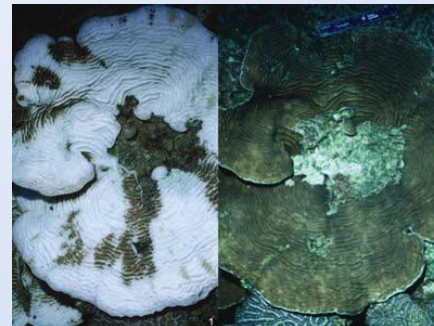
Changes in Extreme Weather



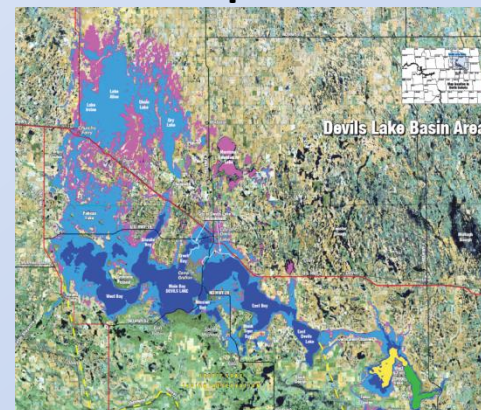
Coastal Resilience



Living Marine Resource and Ecosystem Sustainability



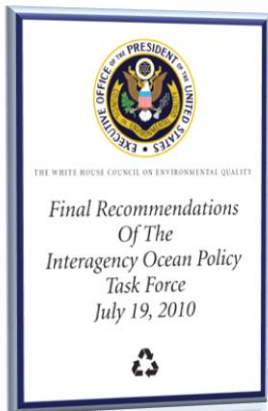
Water Resource Impacts



Selected Strategic Priorities

Support the National Ocean Policy

- Healthy Oceans Matter
- Holistic, ecosystem-based coastal and ocean management



**Resiliency & Adaptation
to Climate Change
& Ocean Acidification**



**Coastal and
Marine Spatial
Planning**

**Nine Priority
Objectives**



**Ecosystem-based
Management**



**Observations,
mapping, &
infrastructure**



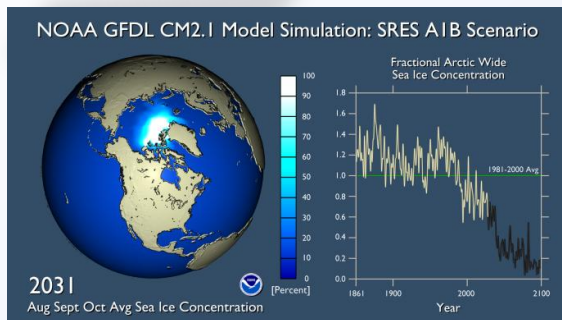
**Inform Decisions
& Improve
Understanding**

Selected Strategic Priorities

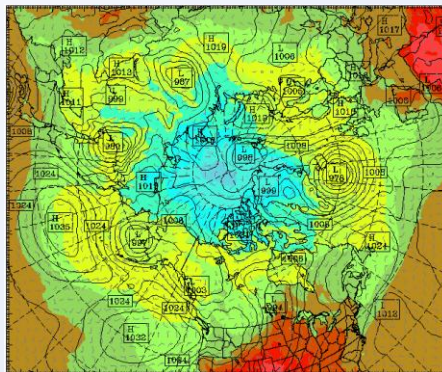
Strengthen Arctic Science and Service



Forecast Sea Ice



Improve Weather and Water Forecasts and Warnings



Strengthen Foundational Science to Detect Arctic Climate and Ecosystem Changes



Improve Stewardship and Management of Ocean and Coastal Resources in the Arctic



Enhance International and National Partnerships



Advance Resilient and Healthy Arctic Communities and Economies

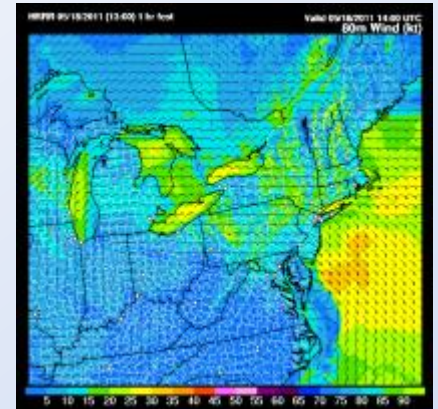
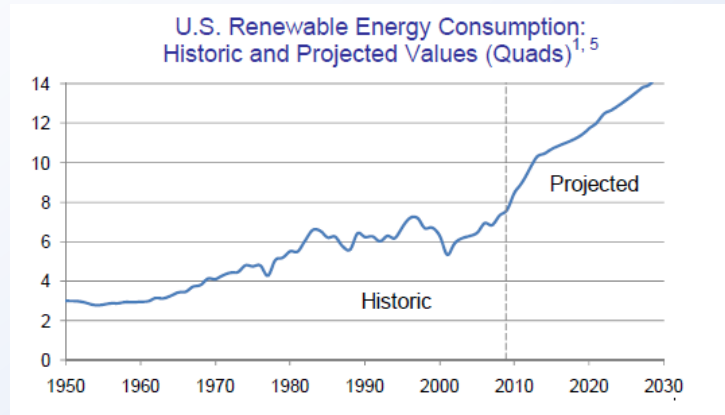


Selected Strategic Priorities

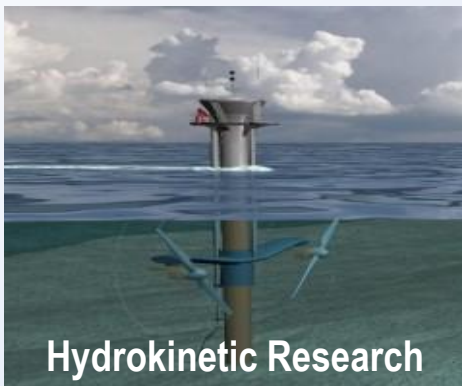
Energy



Turbine Wake Research



Utilizing High Resolution Models



Hydrokinetic Research



Ecosystem Stewardship & Marine Planning



Boundary Layer Research

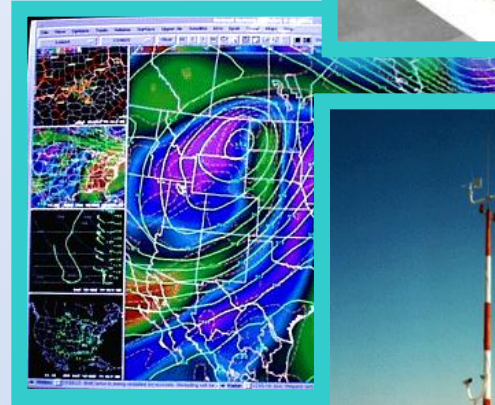
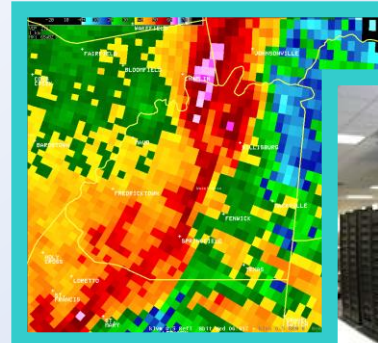
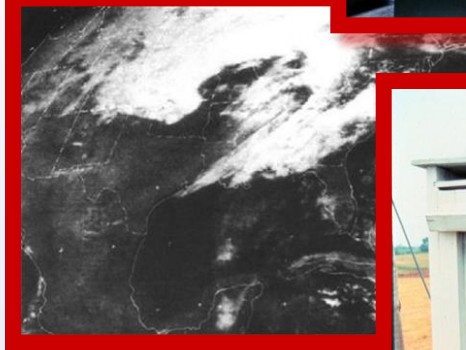
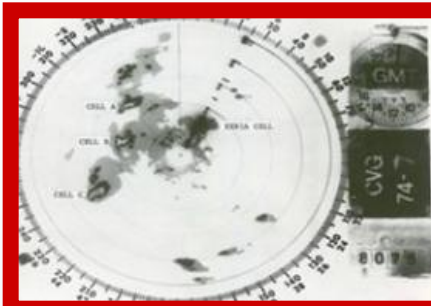
Selected Strategic Priorities

Future Weather and Water Services

NWS Modernization Enabled Successes

1970s...

1990s-Present

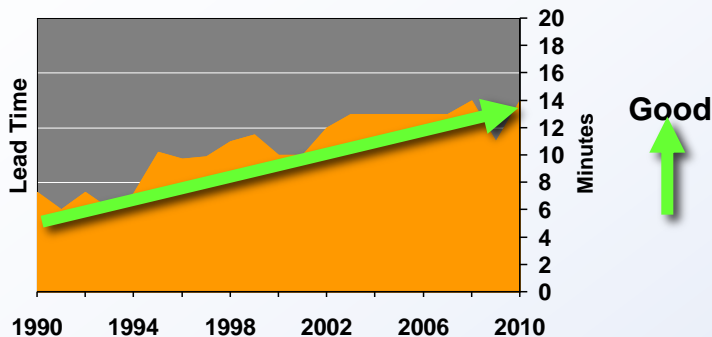


Selected Strategic Priorities

Some Services Improved Others Have Not

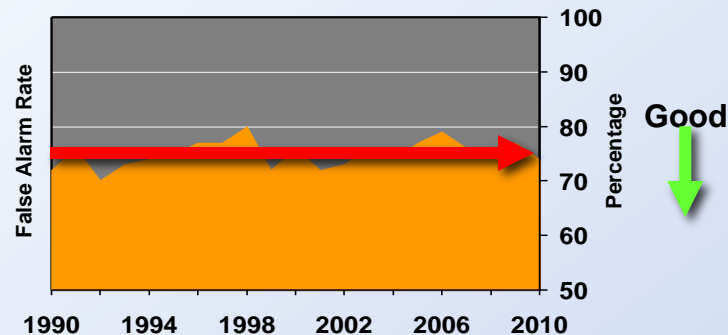
Improved

Tornado Warning Lead Time

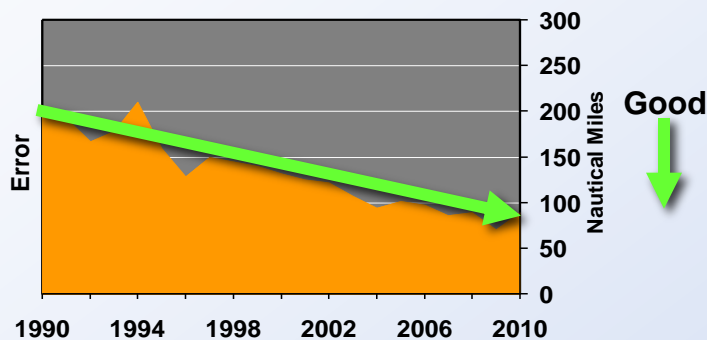


Not Improved

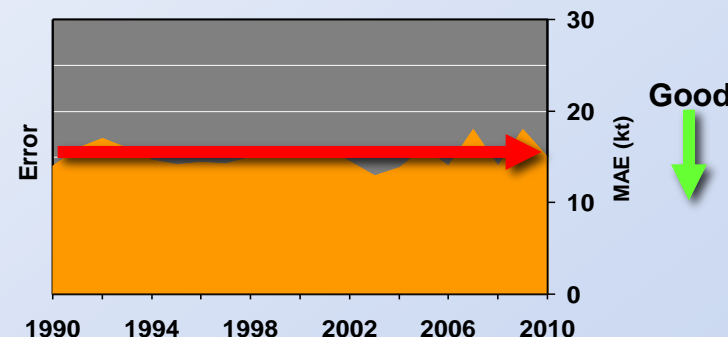
Tornado Warning FAR



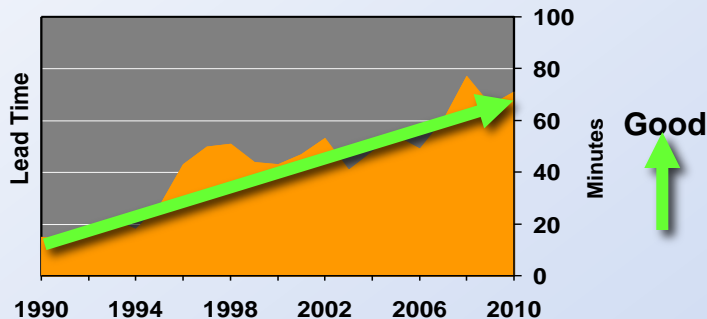
Hurricane Track Forecast



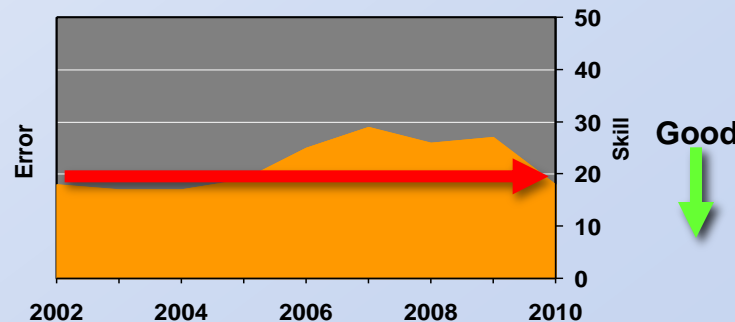
Hurricane Intensity Forecast



Flash Flood Warning Lead Time



Seasonal Temperature Forecast



Selected Strategic Priorities

Building a Weather-Ready Nation

NWS Strategic Plan:

- Improve **weather**, **water**, and **climate** decision services for events that threaten lives and livelihoods
- Deliver a broad suite of improved **water forecasting services** to support management of the Nation's water supply
- Support **climate services** to help communities, businesses, and governments understand and adapt to climate-related risk
- Improve **sector-relevant information** in support of economic productivity
- Enable integrated **environmental forecast services** supporting healthy communities and **ecosystems**
- Sustain a **highly-skilled, professional workforce** equipped with the training, tools, and infrastructure to meet our mission



Selected Strategic Priorities

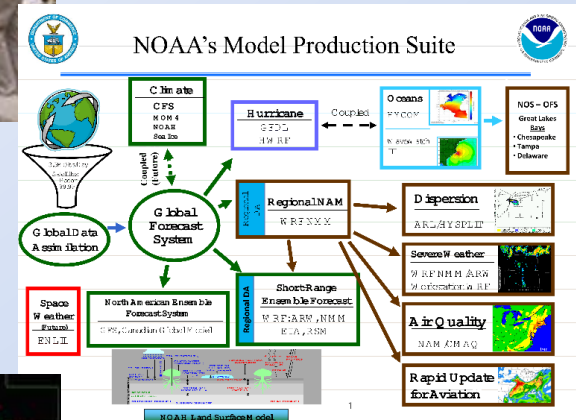
Building a Weather-Ready Nation

Improve weather decision services for events that threaten lives and livelihoods

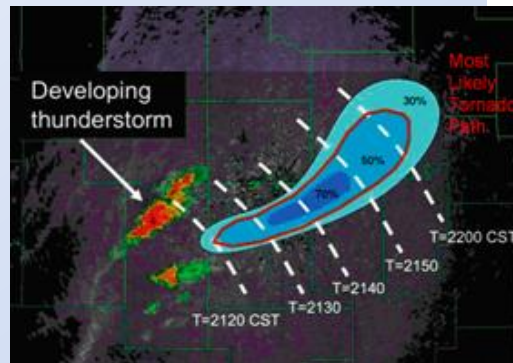
- Improve community emergency preparedness and response
 - *Impact-based Decision Support Services (IDSS)*



- Improve warning accuracies and lead times for high-impact weather and water events



- Exploit probability information to communicate uncertainty



AMS Ad Hoc Committee on Uncertainty in Forecasts

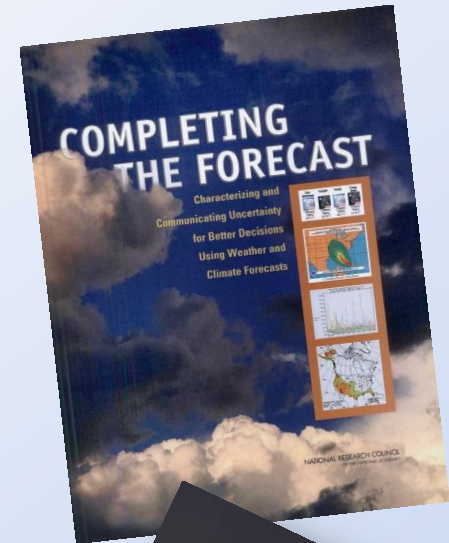
- 2006 NRC Report - Completing the Forecast

“... confluence of compelling reasons for Enterprise to transition to a new paradigm ... in which uncertainty is integral and essential component of all forecasts.”

- 2011 A Weather and Climate Enterprise Strategic Implementation Plan for Generating and Communicating Forecast Uncertainty Information
(<http://bit.ly/gbkcc1> and Dec. 2011 BAMS)

Enterprise must build capabilities in four key, interrelated strategic areas to meet challenges of increasing focus probabilistic forecasting:

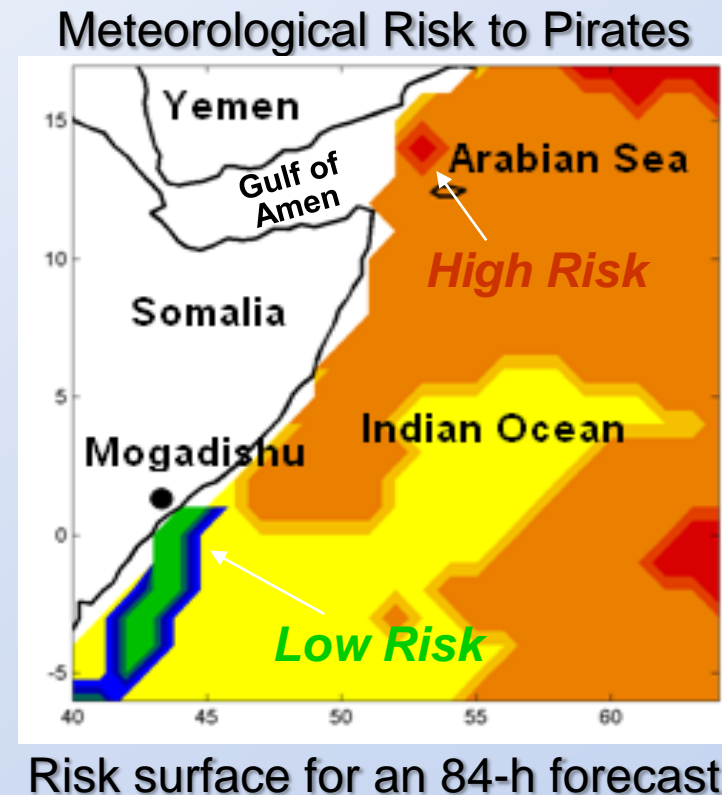
- Understanding the nature of forecast uncertainty
- Generating a reliable foundational suite of uncertainty information
- Communicating uncertainty information effectively, and assisting users
- Enabling forecast uncertainty processing and communication systems with computational, telecommunications, and other infrastructure.



Forecast Uncertainty Information

Uses and Benefits

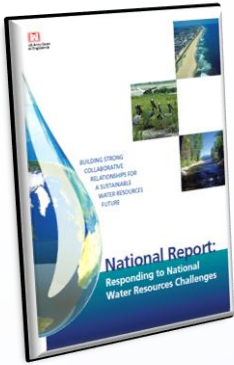
- Piracy around Horn of Africa costs U.S. maritime industry up to \$16 billion/year
- U.S. Navy developing capability to use “Operational Risk Management” techniques to translate objective weather uncertainty guidance to piracy risk
- Probability of exceeding severity thresholds for surface winds and seas estimated from ensembles and used to populate a Risk Matrix
- Based on pattern of risk, decision makers can take action:
 - *moving naval assets to areas that are favorable for piracy activity*
 - *providing divert recommendations to shipping*



Selected Strategic Priorities

Building a Weather-Ready Nation

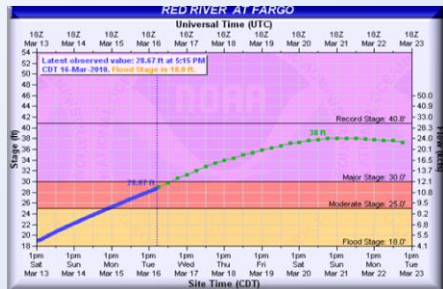
Deliver a broad suite of improved water forecasting services to support management of the Nation's water supply



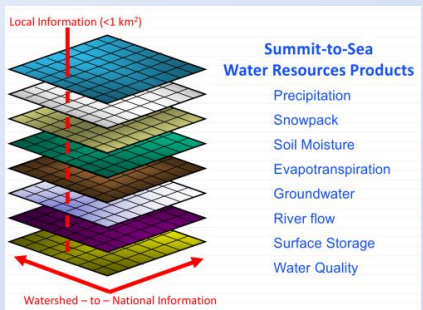
- Develop and implement Integrated Water Resources Science and Services (IWRSS) with partners
 - *Establish National Water Center*



- Provide maps linked to river forecasts



- Increase digital information products

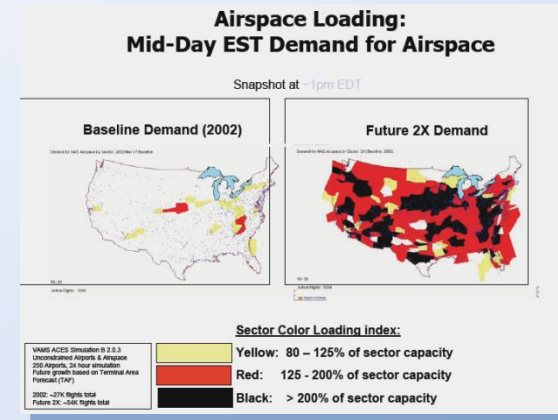
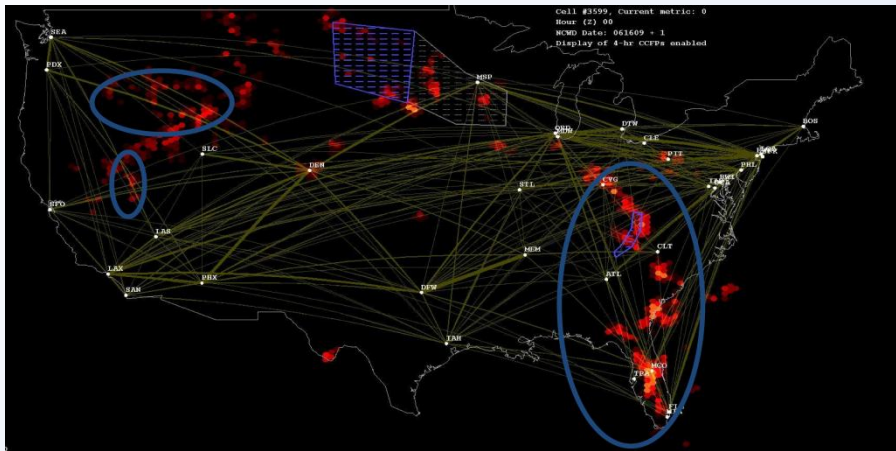


Selected Strategic Priorities

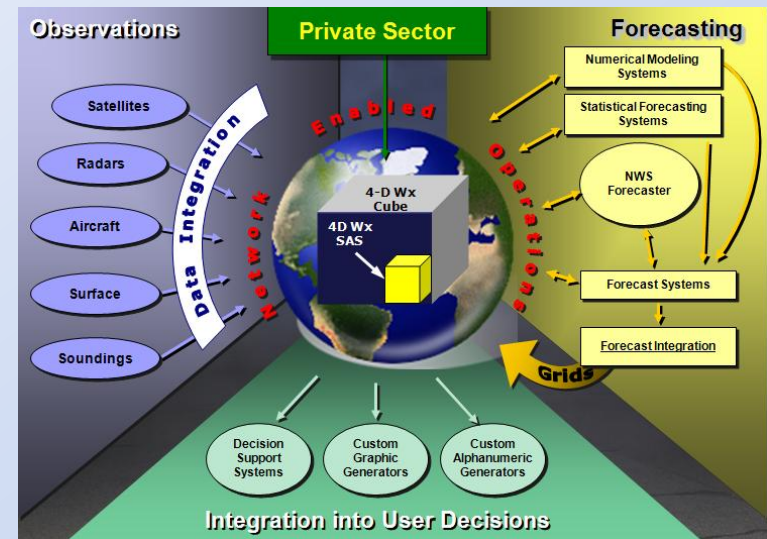
Building a Weather-Ready Nation

Improve sector-relevant information in support of economic productivity

- Deploy NextGen Weather Products & Services



- Develop 4-D environmental database to support all NWS missions and America's Weather Industry



Selected Strategic Priorities

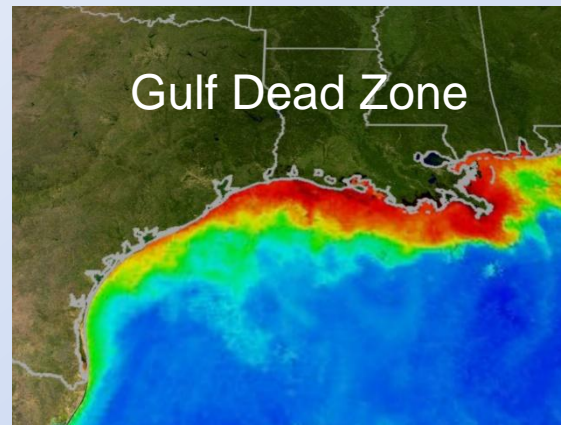
Building a Weather-Ready Nation

Extend weather, water, and climate forecasts to provide with partners ecological and health-based information and services

- Health-based Forecasts



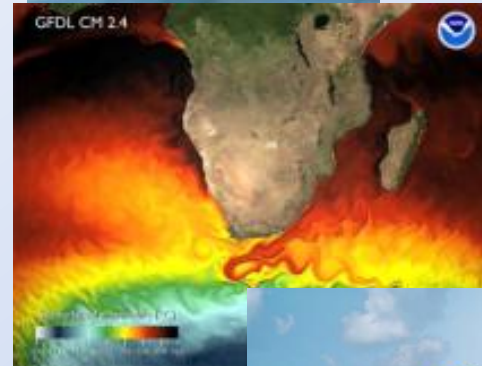
- Ecological Forecasts



Selected Strategic Priorities

Strengthen Science and Technology

- Strengthen core observational capabilities in satellites and ships, while exploring creative use of new technology and partnerships to improve efficiencies.
- Integrate environmental modeling across NOAA and across the government.
- Improve holistic understanding of the earth to advance innovative modeling and observation systems -- particularly in the domain of ecosystem research.



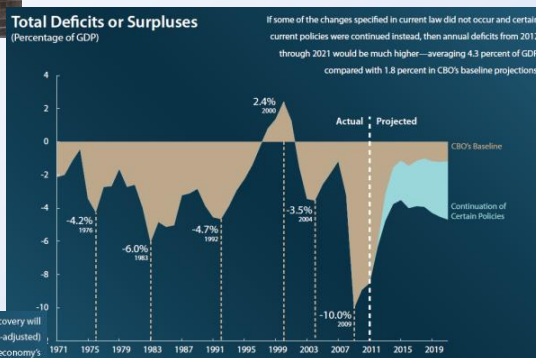
Dealing with Change and Uncertainty

Declining Federal Budgets

Big National Debt



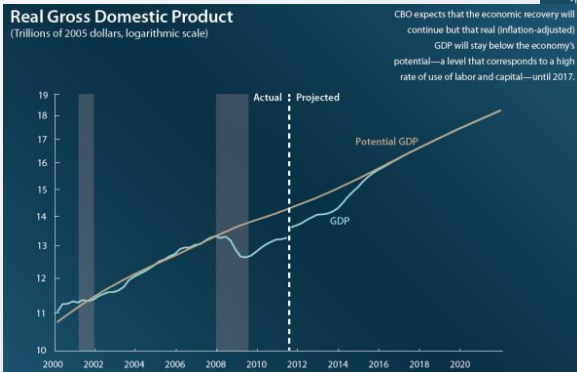
+ Continuing Budget Deficits



+ Political Priority



+ Poor Economic Outlook



= Budget Decreases and Uncertainty

After debt deal, agencies face budget uncertainties

By SEAN REILLY | Last Updated: August 7, 2011

Dealing with Change and Uncertainty

Headlines

Blind Eye In The Sky: Weather Satellites Lose Funding

by JON HAMILTON

Budget Cuts Kill New NOAA Climate Agency

by Brian Merchant, Brooklyn, New York on 04.12.11

Proposed GOP budget cuts target tsunami warning centers

By Lucy Madison Topics Economy , Domestic Issues

Budget Cuts Threaten NOAA's Weather Forecasts

STEVE INSKEEP and ANDREA SEABROOK

Tomahawks Over Turtles: Congress and Obama Administration Move To Slash NOAA Budget

Published 1, July 7, 2011 Bizarre , Environment , Politics , Society

OMB to agencies: Cut 2013 budgets 5-10 percent

Dealing with Change and Uncertainty

NOAA Budget



Dealing with Change and Uncertainty

Organizational Response

- Communicate mission importance
 - *Quantify impacts*
- Increase relevancy
 - *To communities, sectors, families, and individuals*
- Increase efficiency
 - *Integrate stovepipes*
 - *Innovate/apply new ways of doing business*
- Strengthen strategic alliances and form new partnerships
 - *Other federal agencies; international institutions*
 - *Local, state governments; colleges and universities*
 - *Private enterprise; non-profit organizations*
- Prioritize and make the tough decisions based on:
 - *Core mission; distinctive competencies*
 - *Stakeholder needs; Administration priorities*
 - *Greatest opportunities; highest potential value*



Dealing with Change and Uncertainty

Questions to Consider When Prioritizing

Required? Does the program fulfill a statutory mission requirement that is exclusive or shared? Does the requirement compel to act, or permit to act?

Substitutability? If a specific program or function was not executed, would other organizations be able to provide similar capabilities at comparable levels of quality, timeliness, and utility?

Strategic? Is the program or function central to the ability to achieve long-term strategic goals and objectives?

Impact on Society? What is the scale and scope of the impacts on customers / end users? How quickly would the impacts be realized?

Impact on Organization? How severe are the organizational risks if the specific program or function no longer is provided? How severe are the political risks if the specific program or function no longer is provided?

Dealing with Change and Uncertainty

Some NOAA Challenges

- Balancing Science, Service, and Stewardship Missions
- Capital-intensive infrastructure requirements:
 - Satellites are 31% of current budget
 - Fleet -- how big?
 - Facilities -- how big a footprint is needed?
- Climate -- what combination of observations, research and service?
- National Ocean Policy -- what combination of data integration and local support?
- Weather – are new business practices needed?
- Research -- what research portfolio is required for future mission success?



Opportunities

Approximately
2600 (20%) of the NOAA
workforce will be eligible
to retire by 2012



How this Applies to You

Questions That Should Drive Your Planning

- What trends will shape my future as a scientist?
 - *Changing climate; increasing number of extreme events*
 - *Increasing environmental impacts on society*
 - *Increasing impacts on ecosystems -- environmental and societal*
 - *Economic stagnancy; tight federal budgets*
 - *Increasing questioning of scientific integrity and results*
- What do these trends mean to me as a scientist?
 - *Holistic, integrated earth-system approaches needed to solve complex problems*
 - *Social science needed to understand/link societal/people dynamics to this problems*
 - *Acquiring funding will be challenging/competitive -- premium will be put on socio-economic value*
 - *Clear understandable communication of facts and limitations needed to instill public confidence*
- How will I respond and best position myself for the future?
 - *Stay relevant – not only in S&T, but in what society needs*
 - *Think holistically and with the people part of the equation in mind*
 - *Network -- look for cross-disciplinary partnerships to tackle problems*
 - *Look for socio-economic value -- Design and execute research with applications (outcomes) in mind*
 - *Learn to communicate scientific information, its associated uncertainties and possible effects accurately and effectively*



Thank You!

