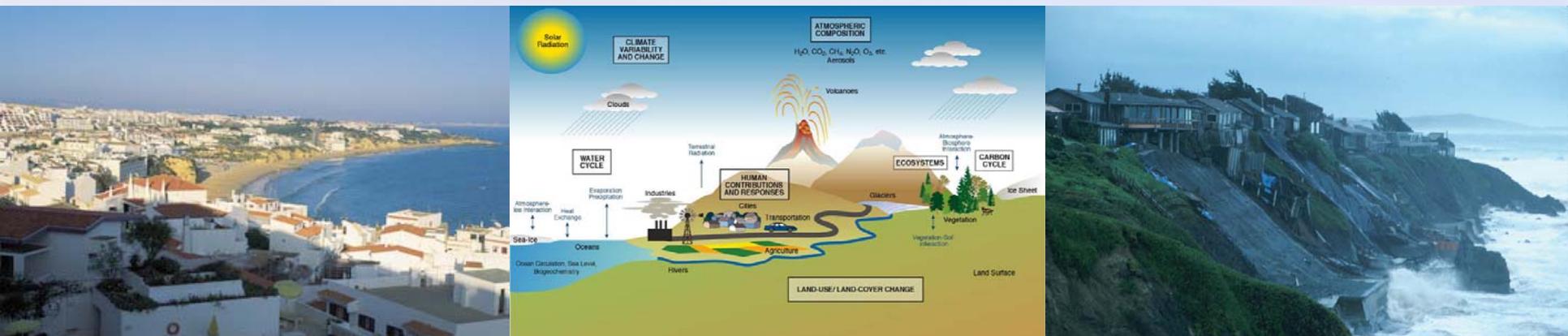




A NOAA Approach for Linking Climate And Coastal Resource Management



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Overview

- The evolving context: Increasing demand for climate information and services

- Climate and coastal resource management: A key challenge for NOAA

- Responding to demand
 - ✓ Current Climate Program activities addressing coastal resource mgmt
 - ✓ Toward the future:
 - Building a Climate Service
 - Integrating climate and resource management in NOAA

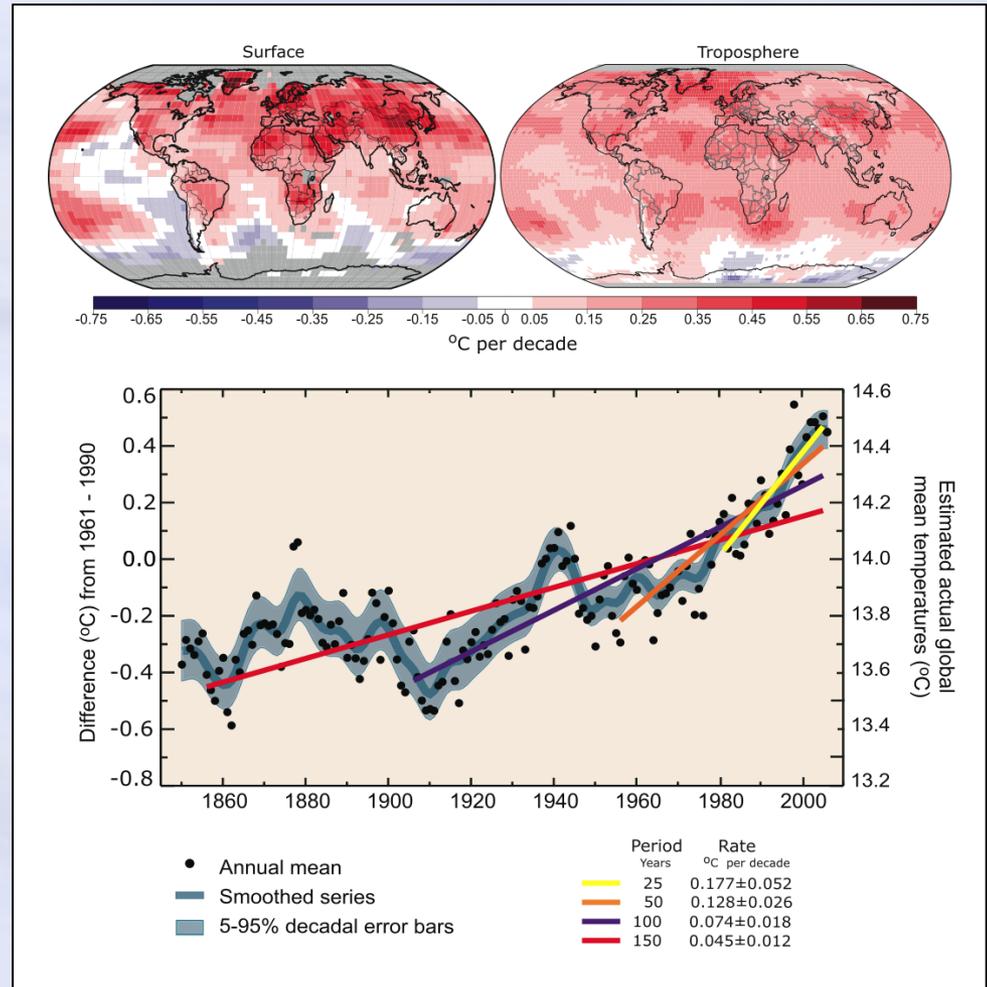
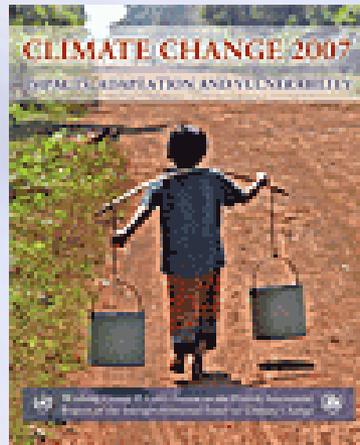
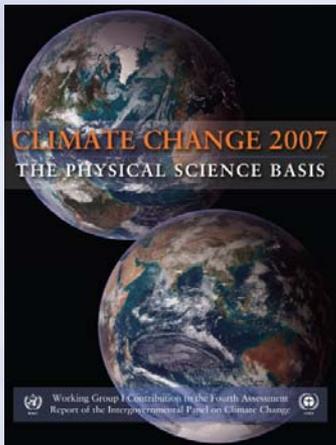
- Thoughts on role of regional efforts



IPCC Fourth Assessment Report

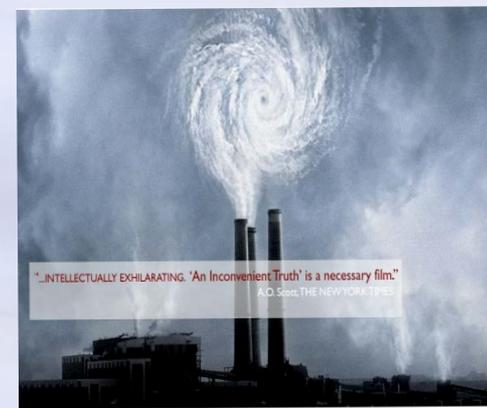
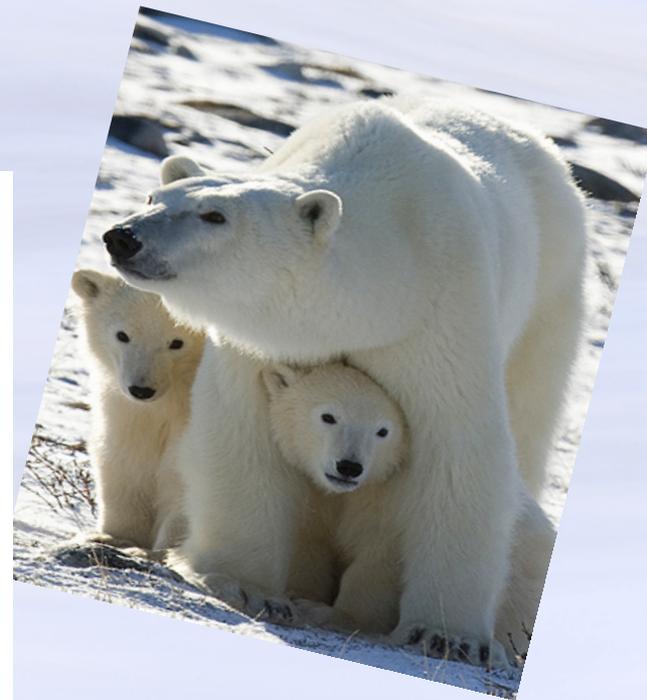
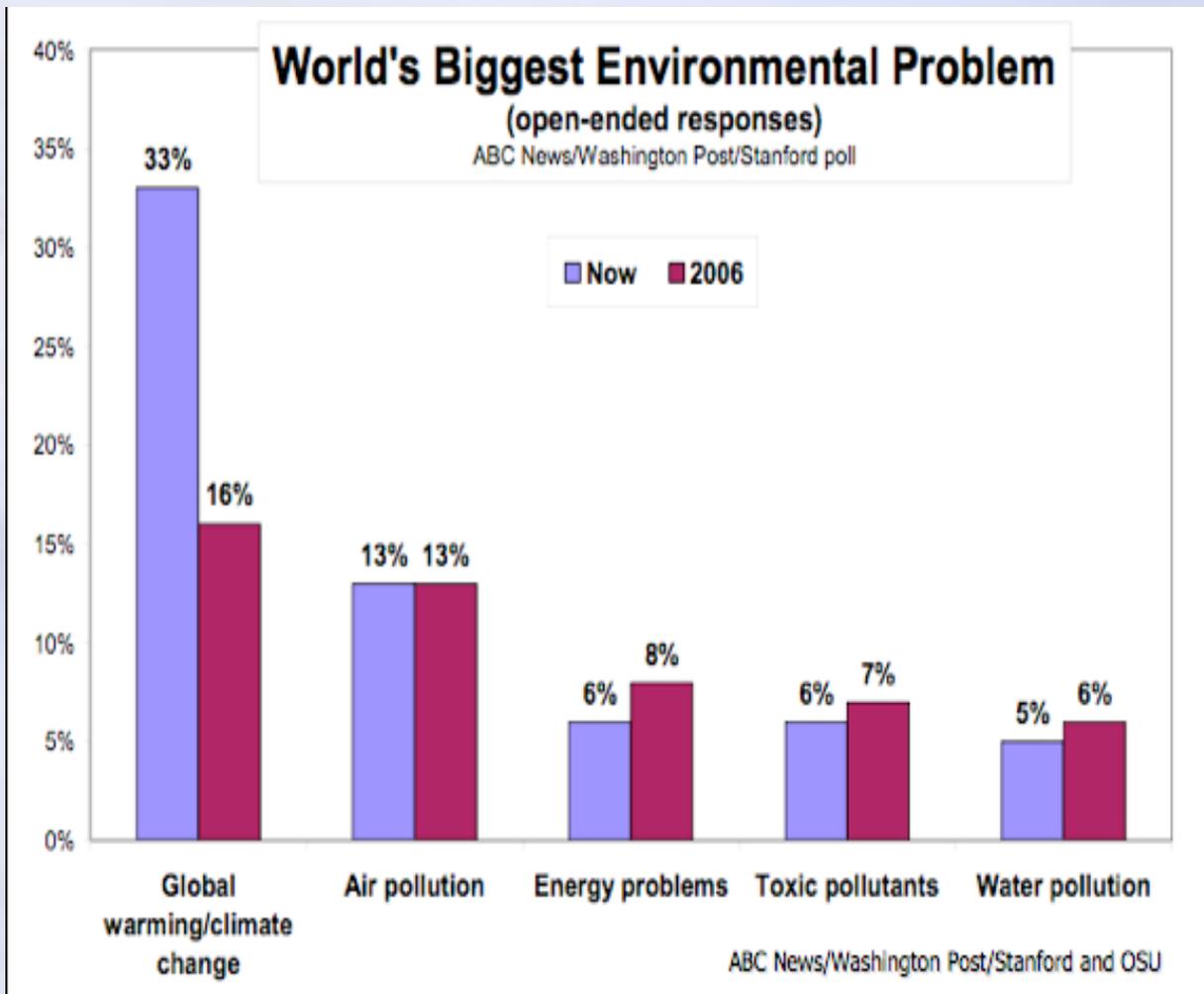
The Fourth Assessment report had a Profound Impact on demand for climate information.

“There is now higher confidence in projected patterns of warming and other regional-scale features, including changes in wind patterns, precipitation and some aspects of extremes and of ice.” WG1 SPM





Increased Public Awareness





Legislative and State Efforts to Address Climate Change

➤ A. 2355 -the **Climate Change Adaptation Act**-national strategic plan for adaptation; regional vulnerability assessments of coastal and ocean areas to climate-related hazards and ocean acidification

➤ S. 2307 - **the Global Change Research Improvement Act of 2007**-establish a National Climate Service in NOAA

➤ State initiatives

- ✓ e.g., Maryland, Virginia, Washington, South Carolina, North Carolina, New Jersey, California, Louisiana, Oregon, Massachusetts, North Carolina





Climate Change Impacts on Coastal Regions



Key Climate Drivers

Anticipated Changes

Impacts

Sea level

SLR up to .6 m or more by 2100

Population growth expected to continue, increasing human stressors on coastal regions

Sea surface temperature

Increase in SST by up to 3°C

Storm intensity

Storm frequency

More intense tropical and extra-tropical cyclones

Impacts likely to vary at regional and local scales, but...

Storm track

Larger extreme waves and storm surges

Wave climate

Run-off

Shifts in precipitation/run off

Overall impact “virtually certain” to be negative (if no adaptation measures taken)

CO2 concentration (ocean acidification)

Ocean acidification



Climate Affects Systems and Activities of Socio-economic Value in Coastal Areas

- Shorelines and developed areas
- Wetlands
- Estuaries
- Coral Reefs
- Ocean Margins and Fishery Resources



- Community growth and development
- Natural hazard preparedness
- Conservation
- Ecosystem health and restoration
- Energy
- Tourism
- Public health
- Fisheries





The Challenge: Integrating Climate Information in a Complex Management Regime

Federal agencies and legislation (NOAA, EPA, FWS, USACE, Coast Guard, MMS)

State and local statutes & regs.

Executive Actions and Commissions (US Commission on Ocean Policy, 2000; US Ocean Action Plan, 2004; MPA Executive Order)

Federal-state partnerships (e.g., Coastal Zone Mgmt. Prgm)

Regional coordination bodies and agreements (e.g., CBP, Gulf of Mex. Alliance, Gulf of Maine Council)

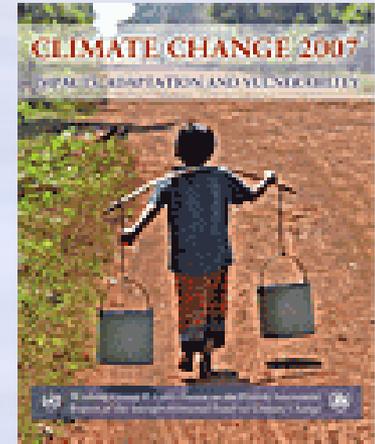


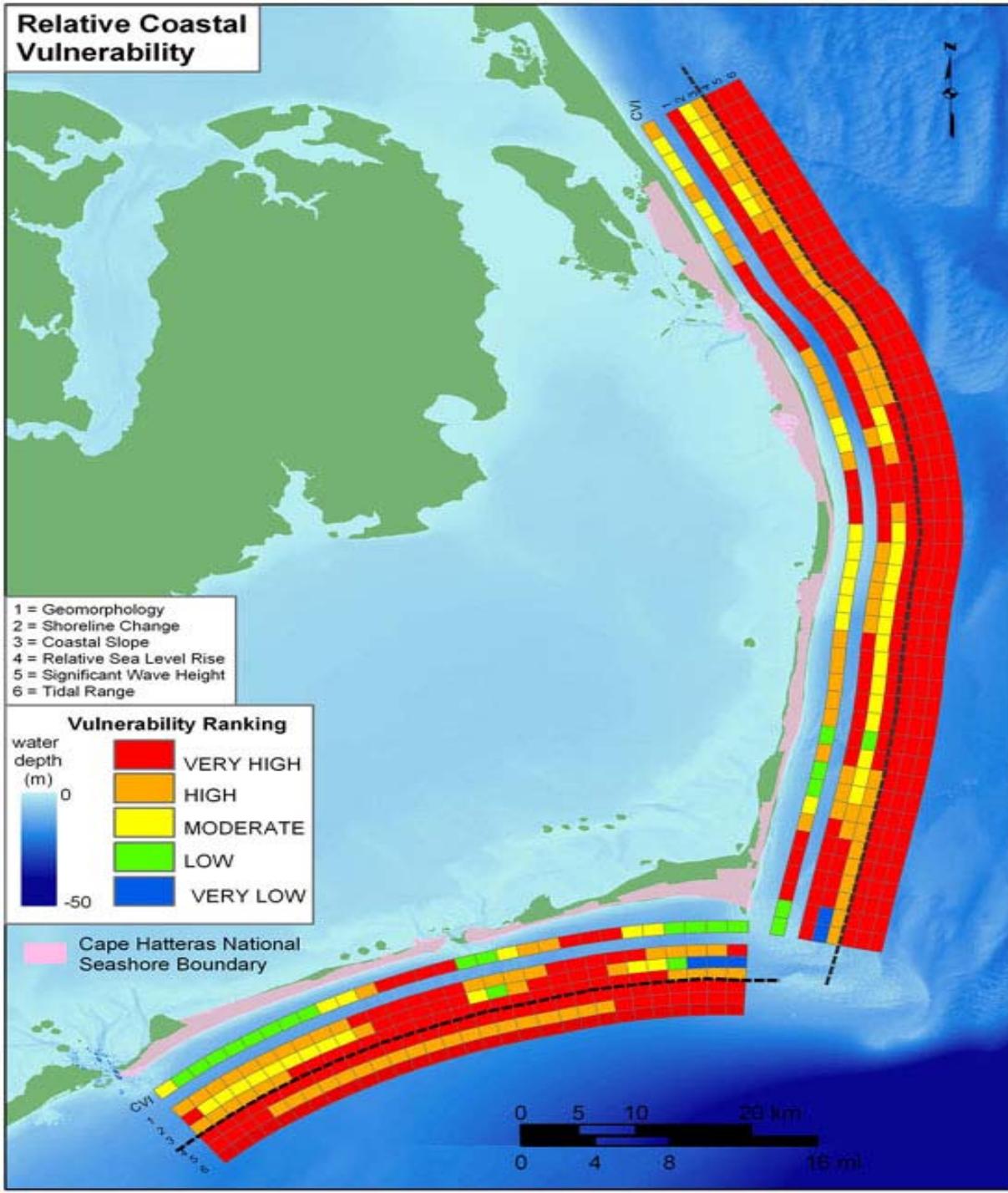
NOAA



Examples of Tools in Support of Coastal Adaptation and Risk Management

- ✓ SLR vulnerability indices
- ✓ Scenarios
- ✓ Community vulnerability assessment tool
- ✓ Flood simulator for flood and coastal defences
- ✓ Integrated Coastal Zone Management processes
- ✓ Evaluating and mapping return periods of extreme events





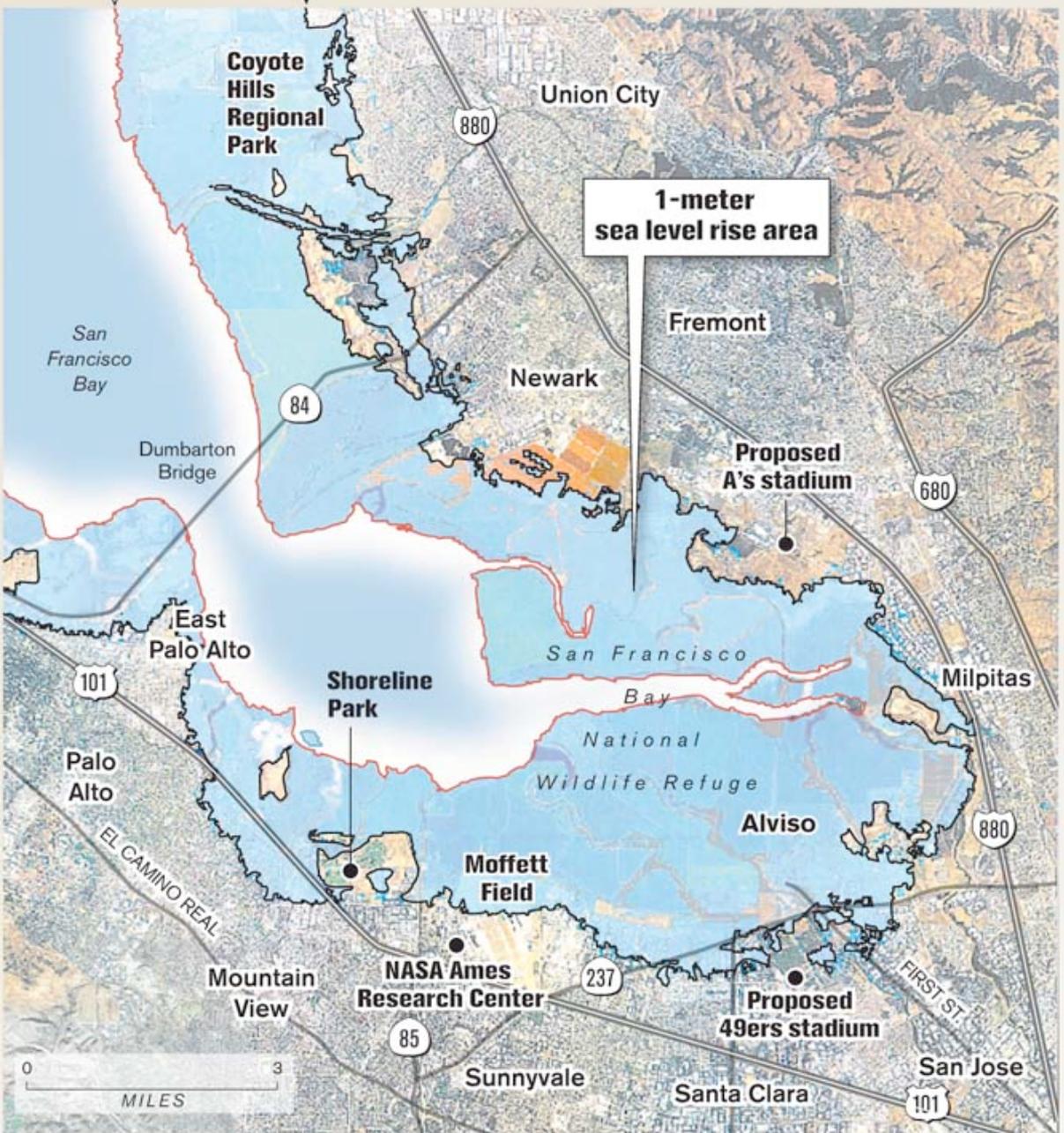
Relative Coastal Vulnerability Assessment of National Parks to Sea Level Rise

A USGS-National Park Service Partnership

Cape Hatteras, NC



Current shoreline **Future South Bay shoreline?**



San Francisco Bay Conservation and Development Commission



Sources: Bay Conservation and Development Commission, USGS, Chronicle research
JOHN BLANCHARD / The Chronicle



Research Needs for Coastal Adaptation and Risk Management

- Improved baselines of coastal changes (local factors, SLR, climate and non-climate drivers) through expanded observations and monitoring
- Enhanced predictive capability, including thresholds under multiple drivers of change
- Increased understanding of adaptation of human systems in coastal regions
- Improved impact and vulnerability assessments w/in an integrated, interdisciplinary assessment framework
- Development of methods for identifying and prioritizing adaptation options
- Initialization and expansion of networks to share knowledge and experience among scientists and practitioners



Coping with Climate Change in Coastal Regions: Select Research and Information Needs

- High Resolution Topography and Bathymetry (e.g., LIDAR)
- Training for coastal program managers in shoreline delineation, mapping, vertical and horizontal reference datums, and legal definitions
- Inundation Mapping vs. Shoreline Change Modeling
- Federal guidance on best practices, case studies, training, workshops, and/or software tools focused on vulnerability assessments and adaptation planning related to SLR
- Improved modeling capability for predicting coastal wetland and beach migration and vertical accretion in response to relative SLR, info on the costs of response options and consequences of no action
- Assessments of social, legal, and economic issues related to shoreline “retreat”, amoring, renourishment, and no-action alternatives across developed and urbanized coastlines



-From 2007 Coastal States Organization Report, “The Role of Coastal Zone Management Programs in Adaptation to Climate Change”



Coping with Climate Change in Coastal Regions: Select Research and Information Needs (con't)

- Information about invasive species, ocean acidification, ecosystem migration, freshwater resources, storm surge models
- Federal guidance for modeling local/regional-scale effects of storm events coupled with rainfall, river flooding and SLR projections
- Regional “Clearinghouse” for climate-oriented Federal, state, local programs/research/activities
- Regional scale SLR and climate projections, including coastal and ocean conditions



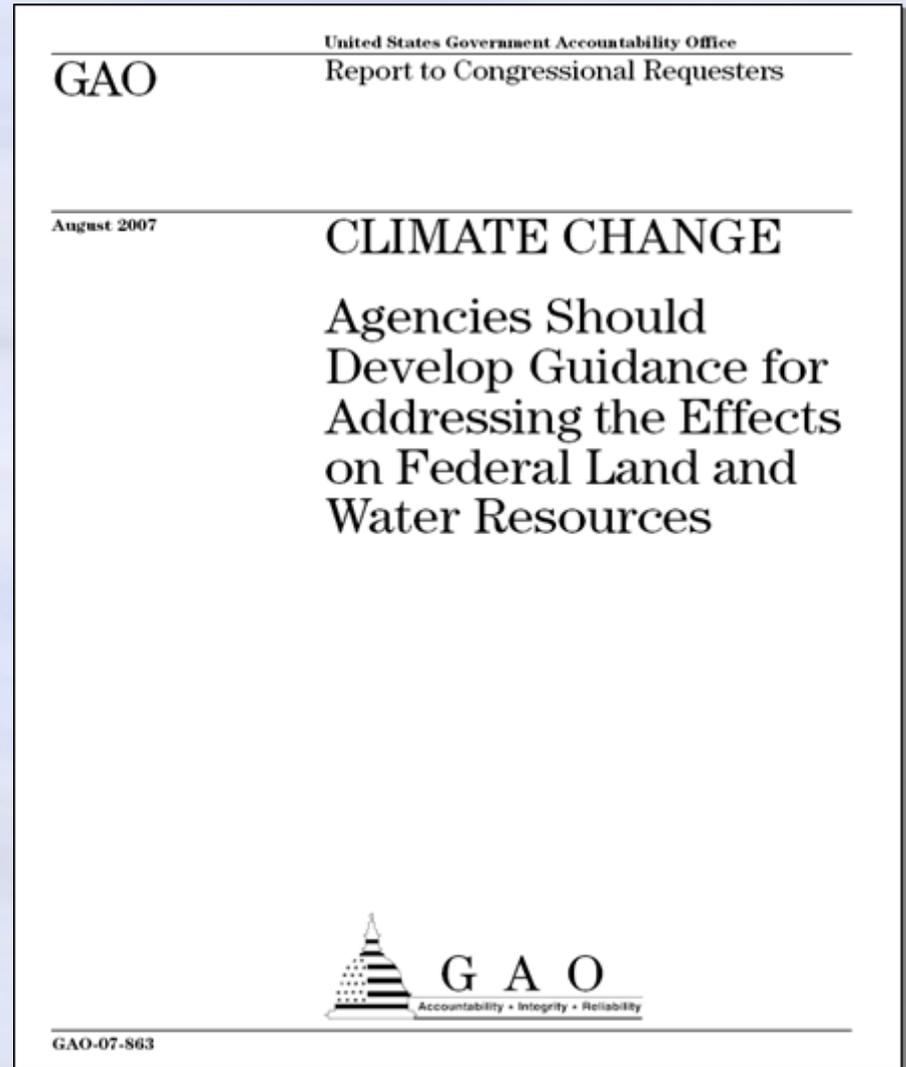
-From 2007 Coastal States Organization Report, “The Role of Coastal Zone Management Programs in Adaptation to Climate Change”



August 2007 GAO Report

“In general, resource managers lack specific guidance for incorporating climate change into their management actions and planning efforts.

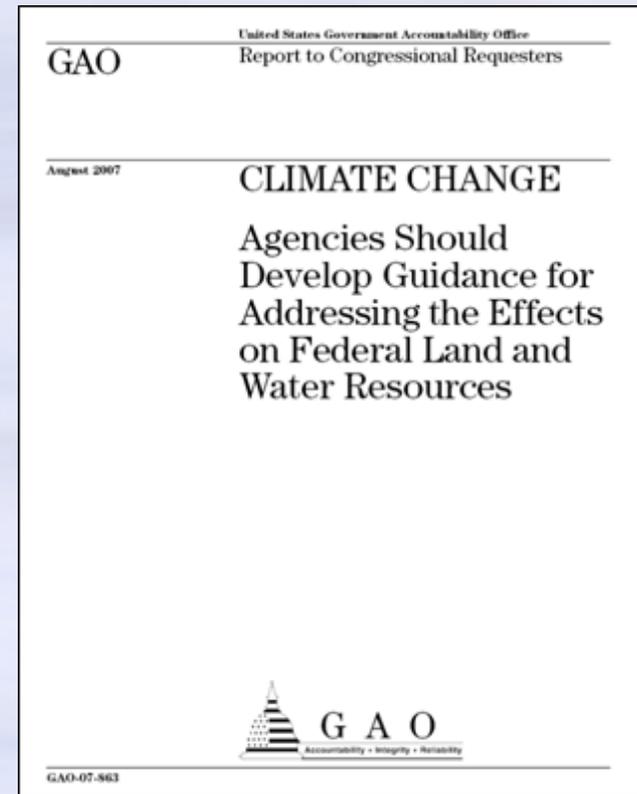
Without such guidance, their ability to address climate change and effectively manage resources is constrained.”





NOAA Response to 2007 GAO Report

- Valuable input to Climate Service development
- By December 2008...
 - NOAA will engage in consultations within agency to identify climate information needs and capacities
 - Written guidance will be provided to help resource managers address climate change effects (including where to go for site-specific information, best practices)
 - NOAA will enhance its interagency dialogue on climate and ecosystem management, contributing to identification of best practices





NOAA's Climate Mission

Understand Climate Variability and Change to Enhance Society's Ability to Plan and Respond

OUTCOMES

- A predictive understanding of the global climate system on time scales of weeks to decades with quantified uncertainties sufficient for making informed and reasoned decisions
- Climate-sensitive sectors and the climate-literate public effectively incorporating NOAA's climate products into their plans and decisions



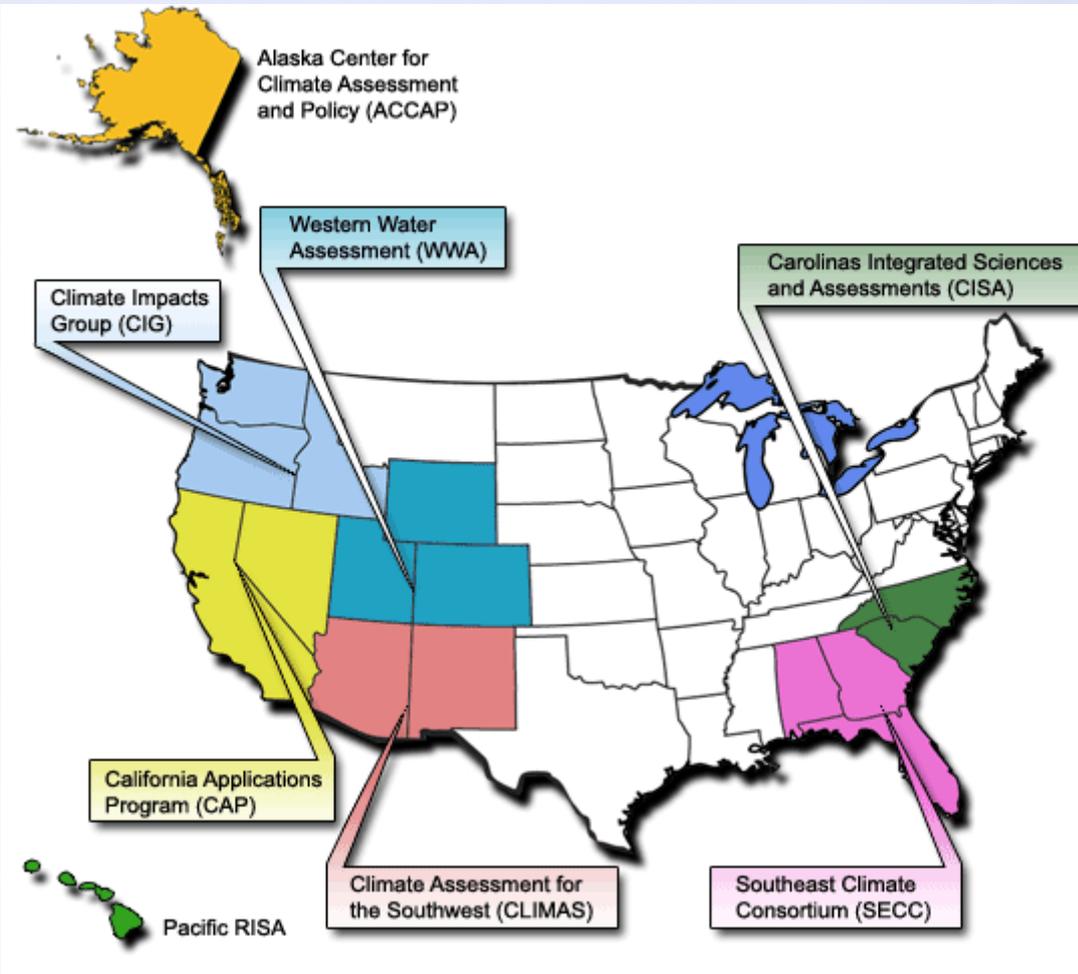


Climate Program Approach to Building Climate Services to Support Coastal Resource Management

- **Stimulate and Support Applied Research and Product Development**
 - Creation of a new focused, interdisciplinary research effort to address impacts, adaptation and decision support in coastal sector (SARP, est. 2005)
 - Continued support of RISA teams
 - Competitive grants awarded FY06, FY07, FY08
 - Address high priority issues (e.g., planning for SLR, building community resilience through the use of climate information, managing corals under changing climatic conditions)
 - Support the development of innovative products/methodologies (e.g., PRICIP)
- **Initiate and Participate in Stakeholder/Partnership Dialogues**
 - Exploratory Discussion on the Potential Implications of Climate Variability for Coastal and Marine Resource Management and Conservation, with The Nature Conservancy (2005)
 - Sea Level Rise Discussion (2005): Needs and Opportunities
 - Exploratory Dialogue on Climate and Coastal Resource Management (May 2006; convened by Office of Global Programs-SARP and NOS Special Projects Office)
 - Workshop on Climate Science and Services: Coastal Applications for Decision Making through Sea Grant Extension and Outreach (2007)
- **Participate in integrated strategic planning efforts across NOAA**



Regional Integrated Sciences and Assessments (RISA) Program and Coastal Issues



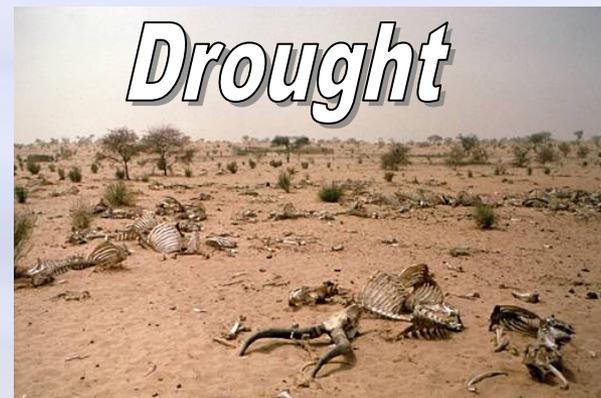
- RISA teams work on a variety of issues, including coastal and ecosystem management
- Topics include erosion, storm surge, sea level rise, fisheries impacts
- Carolinas Coastal Climate Extension Agent
- R&D for decision support tools (websites, workshops, databases, models)
- Clear need for growth in this area



Sectoral Applications Research Program (SARP)

Objective: Catalyze and support applied, interdisciplinary research, innovative outreach and education activities designed to enhance the capacity of key socio-economic sectors to respond to and plan for climate variability and change through the use of climate information and related decision support resources

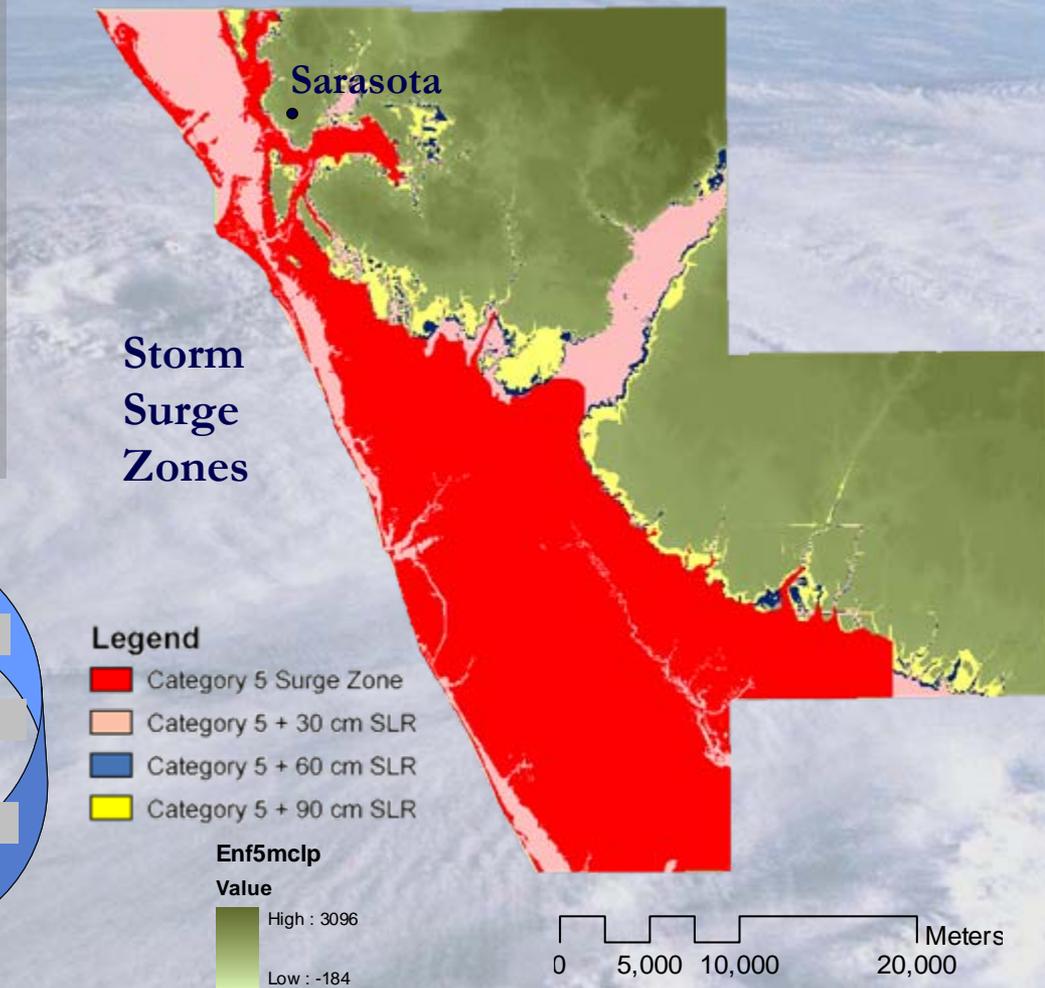
Methods: Competitive research funding for integrated projects in the physical, natural and social sciences, and focused partnerships with academia; NGOs; private sector; governments at the local, state and Federal levels

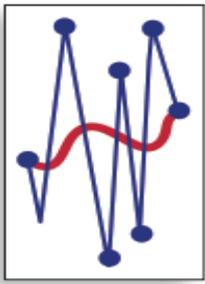


Increasing Community Resilience to Future Hurricane Storm Surge: Collaborative Decision Support in Sarasota, Florida

Goals

- Develop methodology to increase resilience to storm surge & SLR for coastal communities
- Help Sarasota incorporate scenarios of SLR & development into long-range planning





Climate Science & Services

Coastal Applications for Decision Making through Sea Grant Extension and Outreach



- Workshop convened in April 2007 to facilitate the use of climate information in Sea Grant extension
- Sponsored by CPO/SARP, OAR Sea Grant Program Office, NOS Coastal Services Center, Sea Grant Assembly of Extension Program Leaders
- Short-term Outcomes



<http://www.csc.noaa.gov/sgcw/index.html>

Increased understanding of coastal extension climate needs and priorities - climate impacts must be considered and presented in the context of existing extension activities focused on hazards, fisheries, development

Enhanced understanding of NOAA's climate research and services in SG network

Draft National Sea Grant Strategic Plan identifies climate as a priority

Establish a multi-institutional task team to explore requirements and implementation

Climate, NWS and Sea Grant extension agents convening state level meetings to build functional partnerships

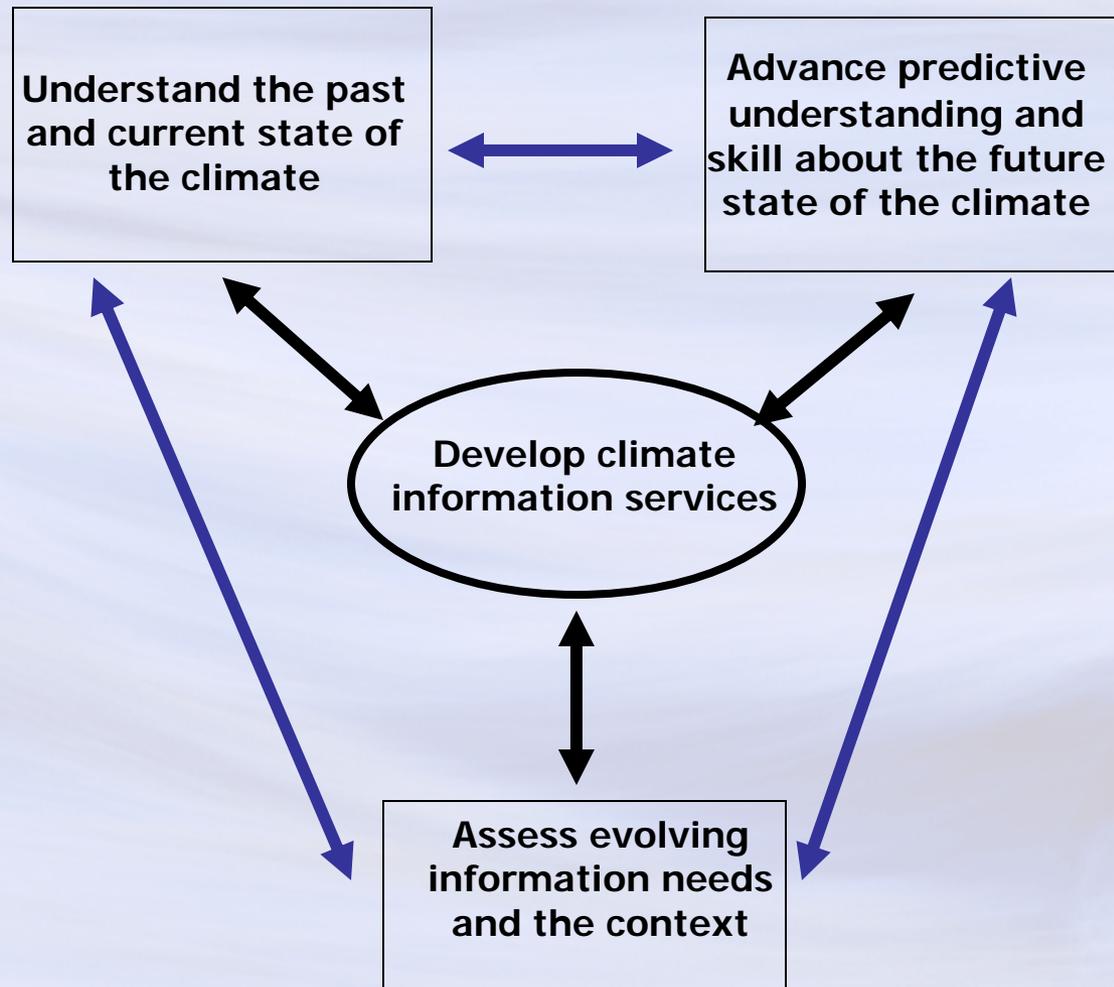


Developing NOAA's Climate Service Strategy

NRC Definition of Climate Services (2001): *"the timely production and delivery of useful climate data, information, and knowledge to decision makers"*

A comprehensive system that:

- Monitors, collects and integrates Information on the key indicators of climate and develops credible, usable, accessible and timely assessments and predictions of climate,
- Assesses climate trends, conditions, projections and impacts
- Works with user communities to develop and transfer information into planning and decision-making.





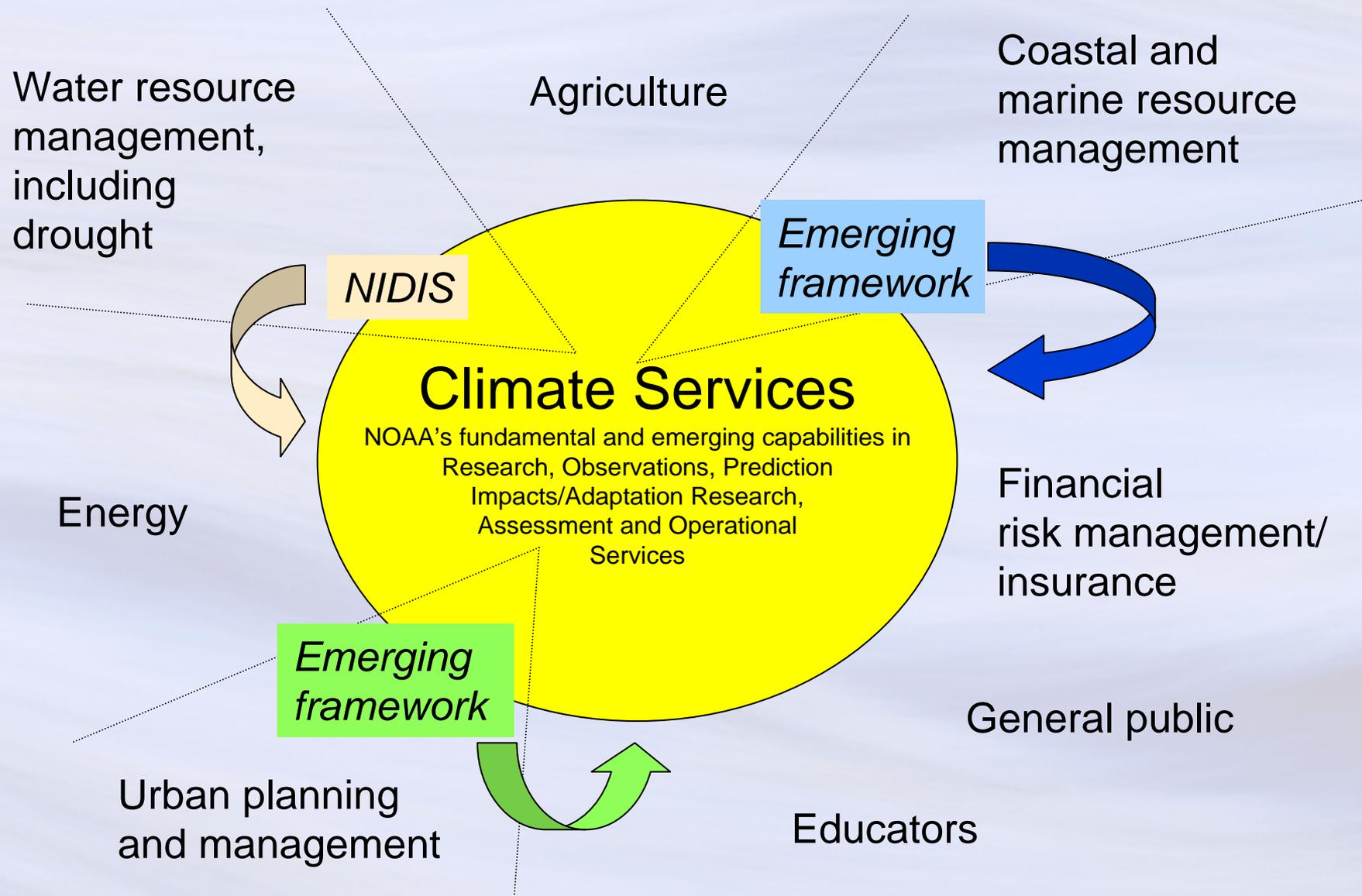
Developing NOAA's Climate Service Strategy

In response to the emerging demand for climate information and a need for a coordinated service, NOAA has established an internal working group with representatives from each line office to begin to:

1. Define climate services and a National Climate Service
2. Define NOAA's role for the provision of climate services
3. Assess evolving user needs for climate information
4. Assess other private and public sector involvement in climate services
5. Begin to develop a draft Climate Services strategy for NOAA
6. Engage external community



A Sectoral Perspective on Developing Climate Services



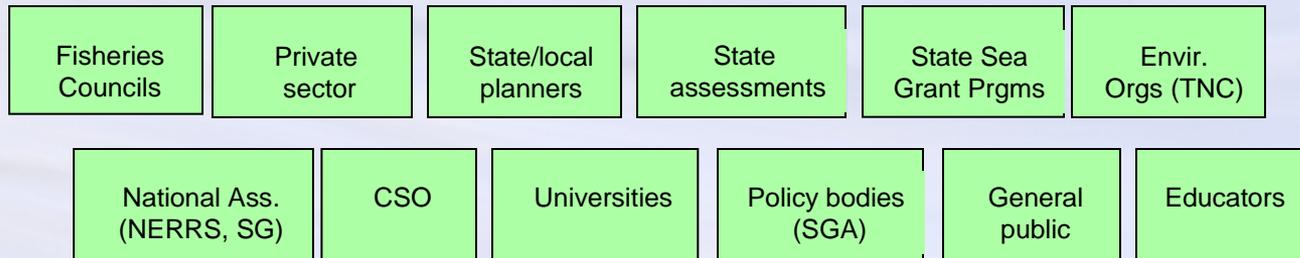


Strategic Partnership Framework: Linking Climate with Coastal and Marine Resource Management

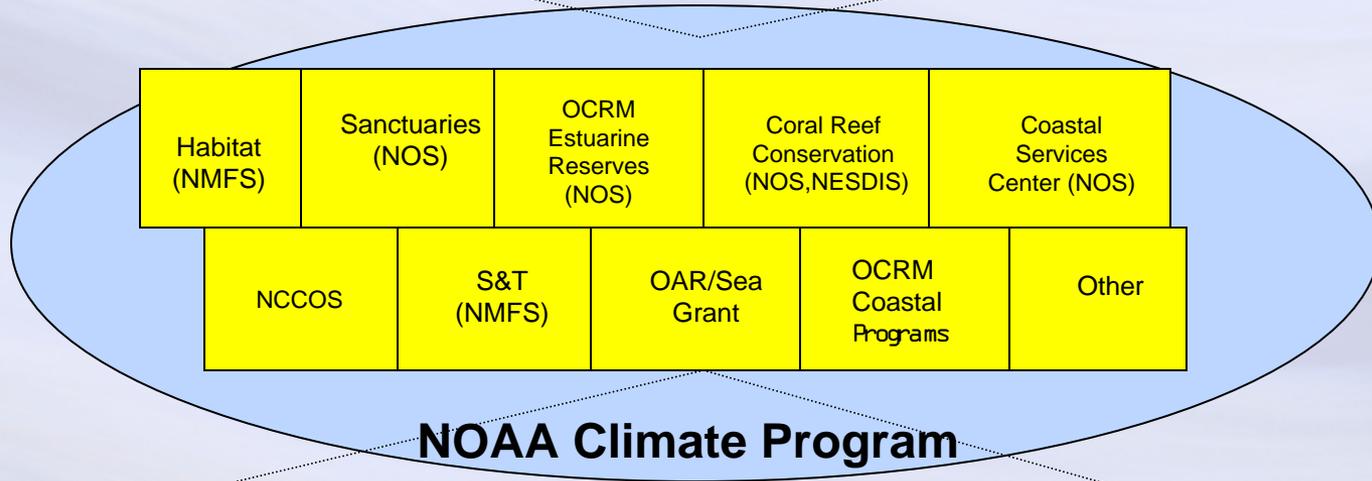
Climate-sensitive management decisions



Stakeholders & Partners



NOAA Technical research, stewardship & resource management capabilities





Responding to the Challenge: Toward a “One-NOAA” Strategy for Integrating Climate in Coastal and Marine Resource Management

- Climate and Ecosystem Goals will facilitate a dialogue, and the development of an agency strategy through series of workshops
 - Living marine resources (LMR)
 - Coastal communities and ecosystems
- Initiate NOAA seminar series on “Coastal and Ocean Resources In A Changing Climate: Risks, Impacts and Strategies”
 - Exchange information, best practices
- Develop response to GAO Report by December 2008



Potential Regional Roles in Climate Services

- **Challenge Identification and Assessment**
 - What type of information about climate and resource management are needed to fulfill NOAA's stewardship and management mandates in a particular region?
 - What are the information and decision support needs of the broader community of stakeholders served by NOAA in the region?
- **Decision Support**
 - Integrate NOAA's internal offices and programs and external partners to identify and address resource management needs (e.g., state Sea Grant programs, State Climatologists, Regional Climate Centers, RISA, State coastal mgmt programs, Fisheries Councils)
 - Develop and tailor useful tools and decision support resources to meet regional needs (e.g., climate and resource management portal, SLR vulnerability maps)



Background Slides



NOAA's Approach to Climate

- NOAA's Climate Program and climate service development (end-to-end, research to services to applications)
- Evolving efforts to generate and/or apply an enhanced understanding of climate impacts within the resource management portions of the agency (e.g., Coastal Services Center, Office of Coastal Resource Management, National Marine Sanctuaries, NOS study on ecosystem impacts in the Carolinas, Sea Grant, Fisheries, Coral Conservation Program)
- Increasingly, developing linkages across efforts in a systematic effort focused on partnership development and applied research



Developing NOAA's Climate Service Strategy

Next Steps...

Expand the dialogue and foster external engagement. How can NOAA's partners and the external community participate in this effort?

1. Summer Climate Working Group meeting (NOAA's external review board) will focus on climate services
2. Spring 2008 meetings and conferences where climate services will be discussed (e.g. Climate Prediction Applications Science Workshop (CPASW))
3. External review of the draft Climate Services strategy for NOAA



NOAA's Mission and Goals

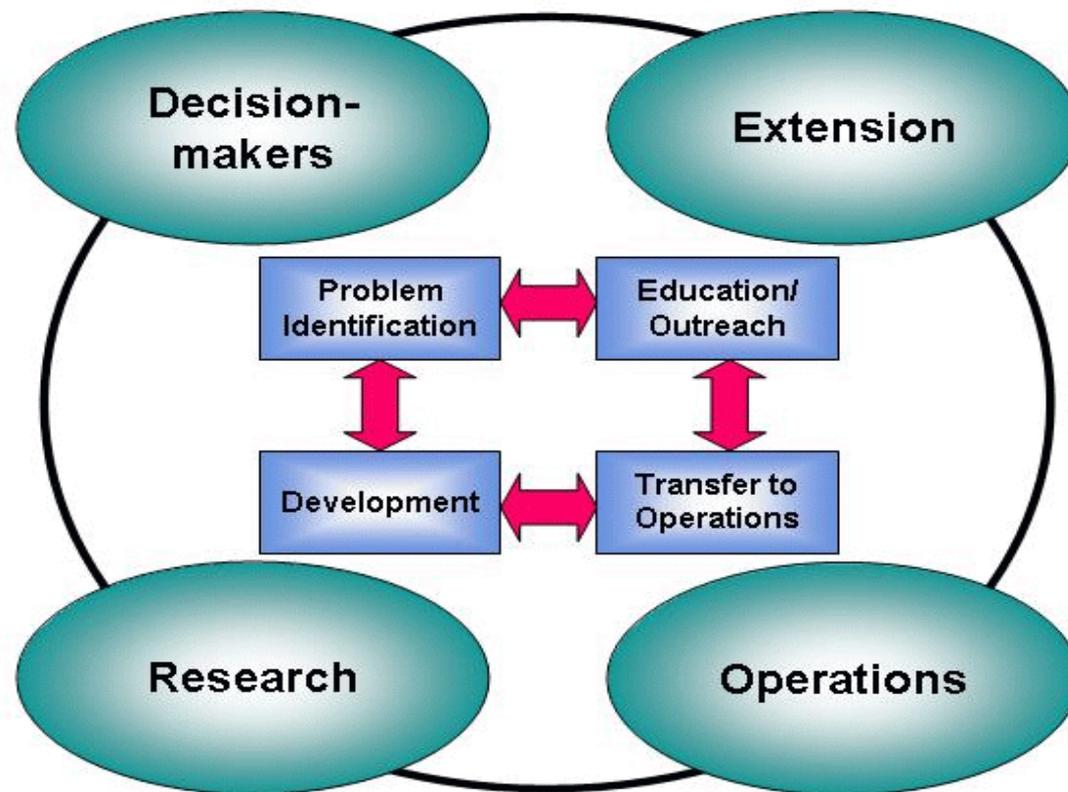
To understand and predict changes in the Earth's environment and conserve and manage coastal and marine resources to meet our nation's economic, social and environmental needs



- **Climate** 
- Commerce and transportation
- Ecosystems
- Weather and water
- Mission support



Transition of Research Applications to Climate Services (TRACS)





NOAA is a Key Institution in the Management and Stewardship of the Nation's Coastal and Marine Resources



NOAA Coastal Services Center



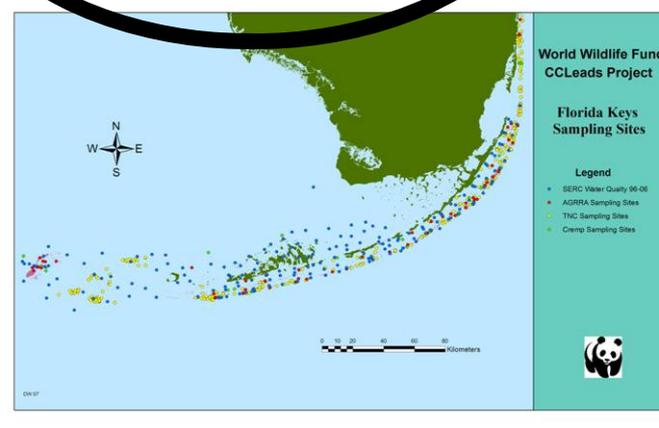
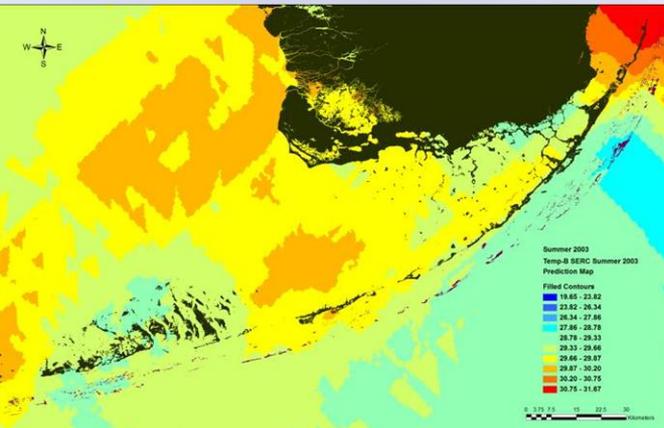
What are RISAs doing in coastal areas?

- Erosion
- Changing storm surge
- Sea level rise
- Impacts to fisheries
- Carolinas Coastal Climate Extension Agent
- R&D for decision support tools (websites, workshops, databases, models)



Climate Change LEADS: Linking Environmental Analysis to Decision Support

*Multi-level approach to solutions to sustain
south Florida's coral ecosystem*



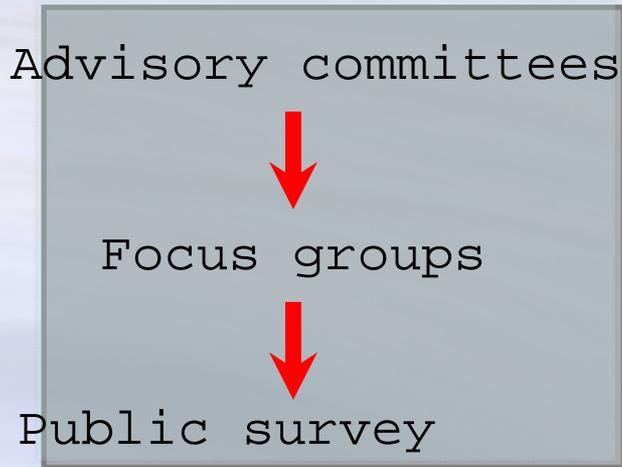
Funded by NOAA SARP



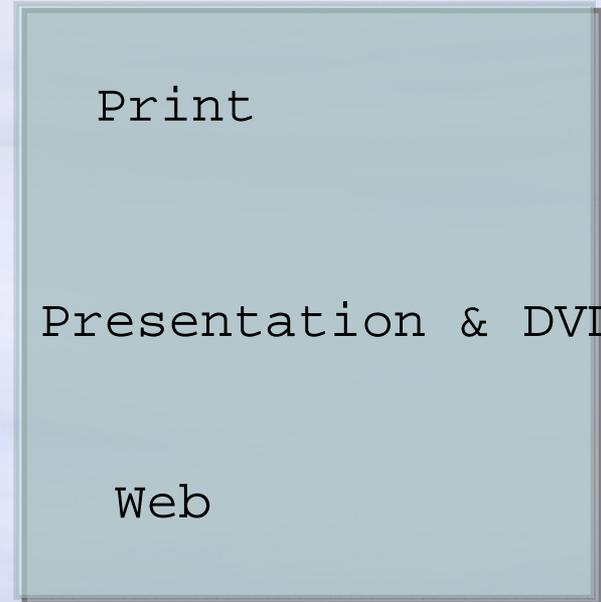
Climate Variability and Coastal Community Resilience Developing and Testing a National Model of State-based Outreach (2007-2009)

A Joint Project of Oregon Sea Grant and Maine Sea Grant, funded by NOAA/SARP

Plan



Produce



Assess Needs & Constraints Review/evaluate Develop Educational Materials