Developed by the U.S. Geological Survey
at the Request of the U.S. Congress

A Plan for a Comprehensive National Coastal Program

U.S. Department of the Interior
U.S. Geological Survey

EXECUTIVE SUMMARY

ISSUES AND GOALS

The House Appropriations Committee (House Reports 106-646 and 107-103), recognizing the impacts of population growth along the Nation's coasts, directed the U.S. Geological Survey (USGS) ". . . to begin the process of developing a comprehensive multidisciplinary coastal program within the Survey." The Committee further instructed the USGS to ". . . develop a coastal pilot program within the Southeast Region with a research agenda designed to address the most critical issues facing this region" and to report how it would allocate resources ". . . among the growing list of coastal problems." This report describes a comprehensive National Coastal Program that responds to critical regional needs while addressing national issues associated with coastal change, including:

- Nutrient enrichment, oxygen depletion, harmful algal blooms, chemical contamination, diseases in marine organisms, and fish kills;

- Shoreline erosion, the increasing susceptibility of coastal communities to natural hazards and sea level rise, increasing demands on non-living resources (including groundwater, sand and gravel, and energy resources); and

- Declines in living marine resources, habitat loss, loss of biodiversity, and invasions of non-indigenous species.

These issues reflect the growing impact of human activities on coastal systems and the increasing vulnerability of expanding populations to coastal change. The interdependencies of these issues in complex coastal systems requires multidisciplinary and integrated science to provide the information and tools essential to:

- Sustain the environmental health of coastal communities and resources;

- Maintain and enhance the contribution of coastal systems to the Nation's economy and well-being; and

- Ensure the safety of coastal populations threatened by natural hazards and human-driven change.

The overall goal of this Program is to provide the scientific information, knowledge, and tools required to ensure that decisions about land and resource use, management practices, and future development in the coastal zone and adjacent watersheds can be evaluated with a complete understanding of the probable effects on coastal ecosystems and communities, and a full assessment of their vulnerability to natural and human-driven changes.

The Program plan contains, as recommended by Congress, ". . . goals and objectives consistent with the discussion of Future Program Emphasis contained in the recently released National Academy of Science (NAS) review of the Survey's Coastal and Marine Geology Program." In particular, it provides for a systems-science approach utilizing the multidisciplinary expertise of the USGS and its partners. As a broad natural science and information agency, the USGS is unique in its ability to ensure that geologic, geographic, biologic, and hydrologic research and information are effectively coordinated

and integrated. The USGS has a fundamental role, as a Federal agency, to ensure the standardization of information required for broad national application and to provide that information consistently across jurisdictional boundaries. Providing the science base needed by managers and policymakers requires efforts that are consistent across the wide range of spatial and temporal scales that characterize coastal variability. The USGS has a proven capacity to provide research and information that is integrated, consistent, and persistent over time.

House Report 106-646, Department of the Interior and Related Agencies Appropriations Bill, 2001

The Committee has provided an increase of $1,000,000 above the enacted level for the Coastal and Marine Geology program to begin the process of developing a comprehensive multi-disciplinary coastal program within the Survey. As population growth expands along U.S. coasts, coastal ecosystems are impacted by urban, industrial, and agricultural development. These impacts have resulted in the degradation of Everglades coastal wetlands and Florida Bay, coral die-off, hypoxia and fish kills in the Gulf of Mexico, and imperiled marine mammals and sea turtle populations to name a few. The Committee directs that the Survey develop a coastal pilot program beginning with the Southeast region with a research agenda designed to address the most critical issues facing this region. The Committee recommends that this work be conducted towards the goals and objectives consistent with the discussion of `Future Program Emphasis' contained in the recently released National Academy review of the Survey's Coastal and Marine Geology program. The Survey should report back to the Committee as soon as possible detailing how it would allocate these funds among the growing list of coastal problems. In addition, the Committee also directs the Survey to develop a comprehensive national coastal program as part of the fiscal year 2002 budget.

House Report 107-103, Department of the Interior and Related Agencies Appropriations Bill, 2002

The Committee reiterates its position relative to the need to enhance and expand the Survey's Coastal and Marine Geology program, and therefore has provided an increase of $1,000,000 above the enacted level for the Coastal and Marine Geology program to continue the process of developing a comprehensive multi-disciplinary coastal program within the Survey. The Committee directs the Survey to continue in the development of a coastal program beginning with the Southeast region with a research agenda designed to address the most critical issues facing this region. The Committee recommends that this work be conducted with goals and objectives consistent with the discussion of `Future Program Emphasis' contained in the National Academy review of the Survey's Coastal and Marine Geology program. The Committee further directs the Survey to develop a comprehensive national coastal program as part of the fiscal year 2003 budget request.

PROGRAM STRATEGY

Developing effective solutions to coastal problems requires a thorough understanding of coastal settings and processes. The USGS, as the Nation's principal natural science and information agency and provider of science information for the U.S. Department of the Interior and other Federal agencies, is uniquely suited to address coastal problems that require:

- A comprehensive characterization of the geologic, hydrologic, biologic, geographic, and human elements that define coastal systems and drive coastal change.

- Long-term research and monitoring to document and understand natural and human-driven coastal change on the important time scales encompassing climate change; changes in human development, land use and influence; and sudden and extreme events.

- Regional 'system-scale' studies to provide an appropriate context for understanding coastal change across the linked elements of coastal systems and for evaluating local problems and solutions.

- Fundamental studies of coastal processes and the response of complex systems leading to improved predictive capabilities.

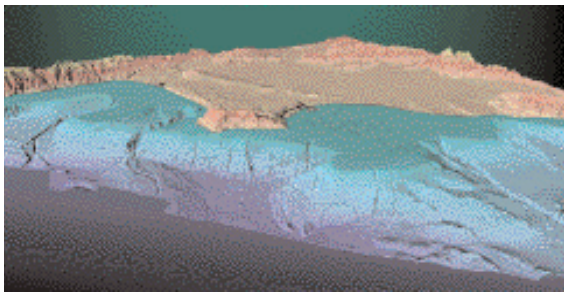


FIGURE 1: Perspective view looking northeast from the Pacific Ocear Angeles and Palos Verdes, California. The view was constructed fron mapping data collected in 1996, 1998, and 1999 by the USGS and its greater Los Angeles area is home to more than 10 million people, wh the adjacent offshore continental shelf and margin with activities suc disposal for dredged spoils, explosive disposal, wastewater discharge fishing that must be balanced against the demand for clean water, he and recreational uses. The data collected in 1996-1999 have been us first highly accurate maps of the continental shelf and slope to serve multidisciplinary research on the coastal environment.

The USGS has an unmatched capacity to integrate research and information across the scientific disciplines to address interdependent issues, to provide the regional context required to develop and assess local solutions and national priorities, and to maintain long-term research and monitoring efforts needed to identify and respond to critical and emerging issues. USGS efforts in South Florida, San Francisco Bay, Chesapeake Bay, and Tampa Bay have proven the value and impact of integrated system studies. The USGS alone has the ability to ensure that wise stewardship and development is based on sound scientific understanding of sufficient scope, scale, and breadth.

The proposed National Coastal Program will apply the multidisciplinary capabilities of the USGS to increase our understanding of coastal problems that are national in scope and to develop predictive capabilities needed to wisely manage and utilize the Nation's coasts. New and expanded efforts will build on the rich history of USGS programs providing the science foundation to address national issues within and beyond the coastal zone. Every region in the Nation suffers problems related to coastal erosion, climate change, and the increasing impacts of human development, land use, and alteration of natural systems. The proposed Program strategy is intended to provide the basic understanding of coastal systems required to address coastal issues broadly, while focusing on those issues and processes which are critical within specific coastal regions and systems. An effective program will provide science-based tools responsive to specific management needs while making needed information and understanding broadly available. To meet this challenge, the USGS proposes development of an integrated coastal program that effectively applies the breadth of USGS expertise towards the

objective of providing national and regional capabilities to characterize coastal systems and to measure, analyze, understand, and forecast coastal changes (natural and anthropogenic) that affect coastal economies, resource availability, recreational quality, and the integrity and sustainability of the Nation's coastal ecosystems.

The USGS will meet this objective through complementary and linked activities that include:

- Mapping, inventory, and monitoring to provide the essential characterization of coastal systems and documentation of change required to identify current and developing issues, support informed decisionmaking, and develop and validate predictive models of coastal change; and

- Research to provide the understanding of natural and human processes and coastal change required to develop predictive models and science-based management tools.

Coordinated mapping, inventory, monitoring, and research efforts will lead to:

- Consistent and comprehensive information resources providing access to information critical to coastal managers, policymakers, and researchers;

- Integrated assessments at national and regional scales of coastal character, vulnerability, and change for the development and assessment of policy and management decisions; and

- Predictive systems-scale models and decision-support tools to identify future stresses and design effective programs for the protection and restoration of coastal resources.

These products will provide coastal managers and policymakers the information, understanding, and tools required to ensure the environmental health of coastal communities and resources is sustained, the contribution of coastal systems to the Nation's economy is maintained and enhanced, and the safety of coastal populations is assured.

Program implementation to achieve these outcomes will include expansion of existing USGS efforts through five Centerpiece Activities (see final section for Timelines).

1) Establish a National Coastal Information Infrastructure to provide consistent and reliable information to support research and decisionmaking;

2) Establish an integrated monitoring network to document and understand change in complex coastal systems across all important time scales;

3) Expand and coordinate efforts to provide the environmental characterization essential to understanding, modeling, and managing all coastal systems;

4) Expand process studies to provide the science foundation for the development of broadly applicable tools and models; and

5) Expand regional 'system-scale' studies to integrate research and the Centerpiece Activities to address critical regional issues.

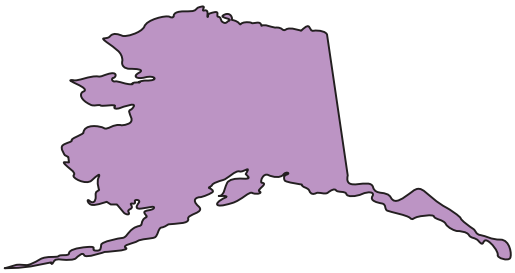
The activities of the proposed National Coastal Program will be prioritized to ensure they:

- Address critical and immediate regional needs and Federal obligations;
- Contribute to the overall objectives to provide broadly applicable information and understanding; and
- Result in the optimal use of resources through coordinated application of the capabilities of the USGS and cooperators, and fully exploit existing and new information.

Continued program planning will include active stakeholder and partner engagement to define critical concerns and needs and to maximize effectiveness through coordinated efforts. To ensure that these priorities are reflected in program planning and implementation, the National Coastal Program is structured to optimize responsiveness at a regional level.

A NATIONAL PROGRAM RESPONDING TO REGIONAL NEEDS

While the issues critical to coastal systems and the factors driving coastal change are national in scope, there are significant regional differences in coastal setting, climate, habitat, resources, and human impacts. Every region of the Nation faces a unique suite of issues and related societal costs. The assessment of critical issues and the development of appropriate responses requires engagement at the State and regional levels where problems are identified and solutions developed. The proposed Program will develop coordinated efforts in 10 coastal regions defined on the basis of oceanographic, geologic, political, and climatic boundaries. Program activities in each region will reflect the priority concerns and needs defined through stakeholder engagement. Figure 2 lists critical issues and priority studies for each of these regions. Throughout this report, brief examples are given illustrating some of the critical issues and science needs facing coastal regions. Program implementation will be designed to meet these regional needs while building the information and understanding required for broad application and policy development on a national scale.



ALASKA

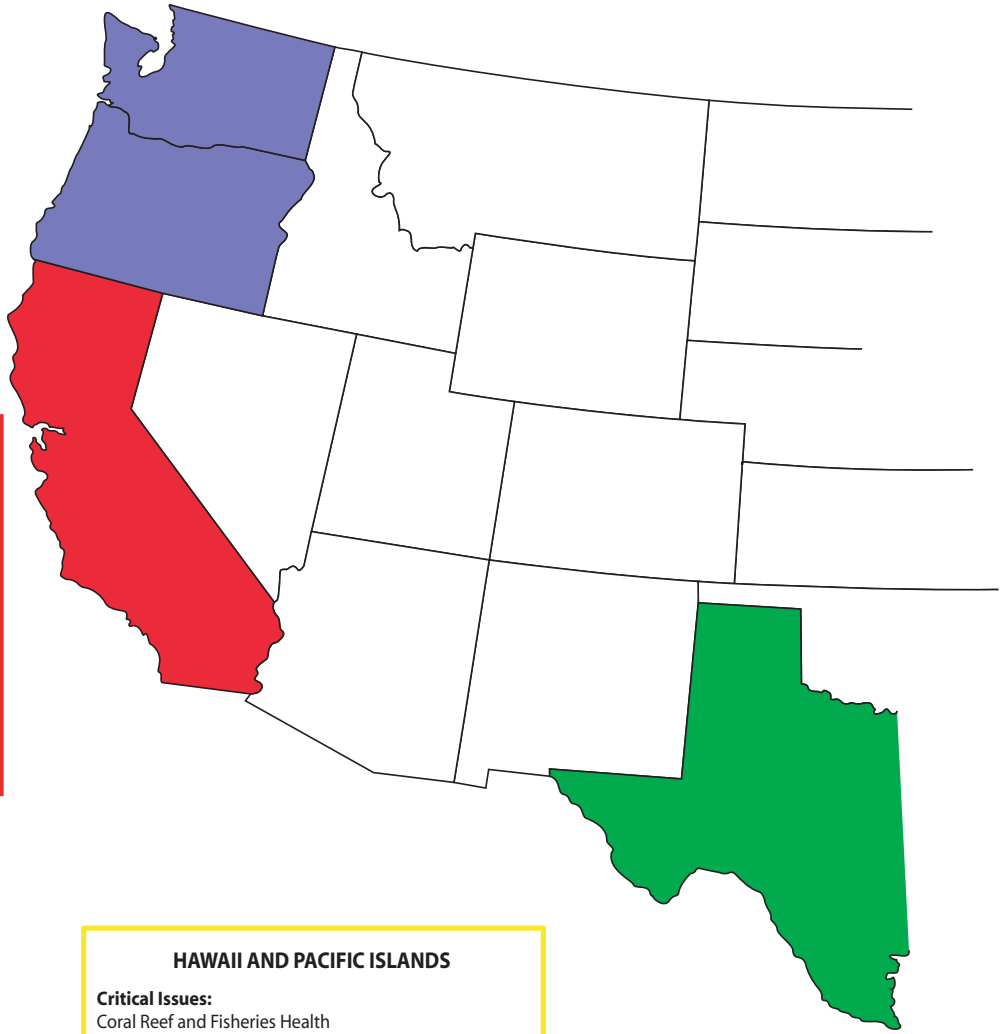
Critical Issues:
Fish and Wildlife Habitat
Earthquakes and Tsunamis
Threatened Wildlife (Seabirds, Marine Mammals, Salmon)
Wetlands Loss and Restoration
Erosion and Sand Resources
Climate Change Impacts

Priority Study:
Human and Climate Change Impacts on Coastal Habitats and Living Resources

PACIFIC NORTHWEST

Critical Issues:
Erosion and Landslides
Earthquakes and Tsunamis
Pollution
River and Watershed Modification
Fish and Wildlife Habitat (Coastal Salmon)
Invasive and Nuisance Species

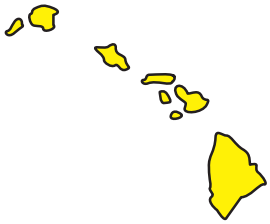
Priority Studies:
Columbia River Sand Resources: Impacts of Sand Supply on Shoreline and Habitats
Puget Sound: Ecosystem Health and Human Safety in an Urban Setting



CALIFORNIA

Critical Issues:
Groundwater Resources
River and Watershed Modification
Earthquakes and Tsunamis
Pollution
Erosion and Landslides
Threatened Wildlife (Sea Otters, Sea Birds)
Invasive and Nusiance Species

Priority Studies:
Southern California Water and Waste: Sustaining the Economy and Environment
San Francisco Bay Integrated Study

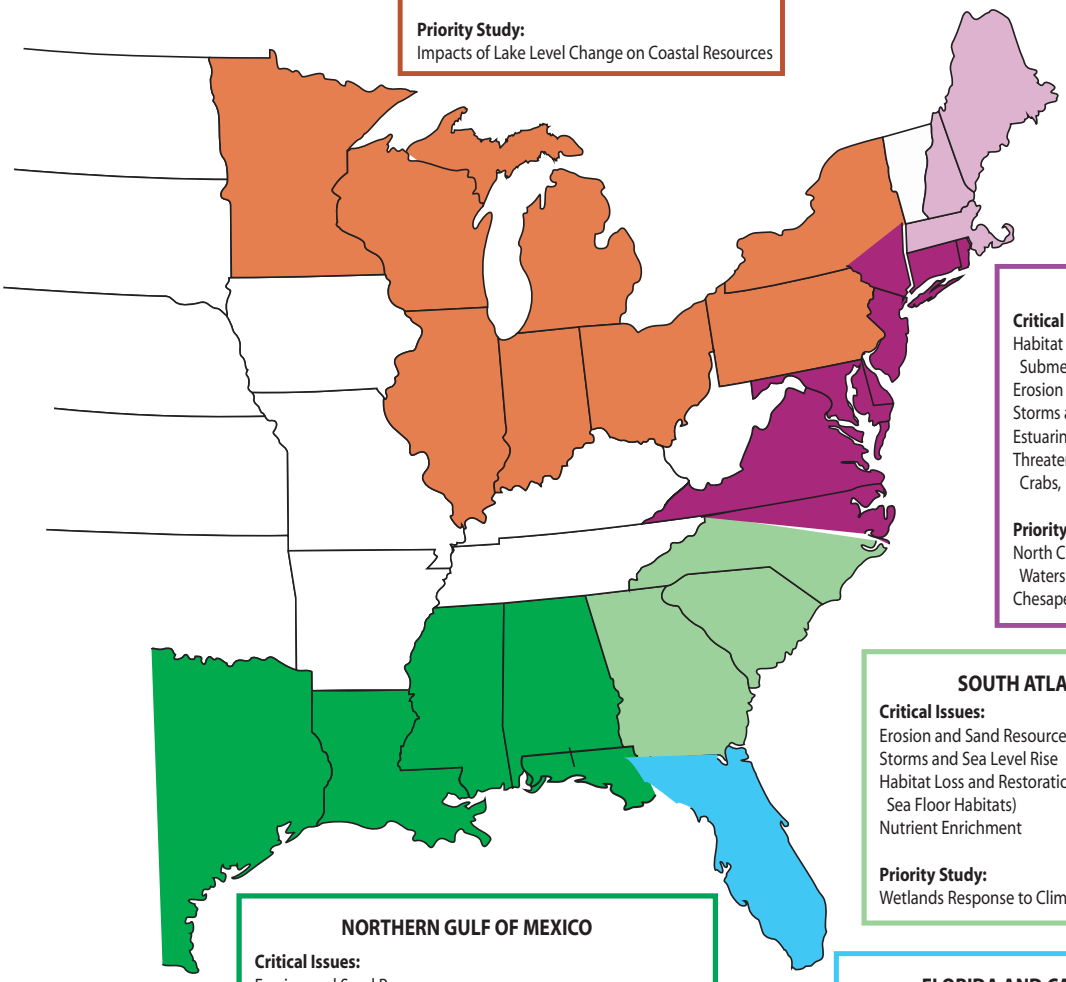


HAWAII AND PACIFIC ISLANDS

Critical Issues:
Coral Reef and Fisheries Health
Erosion and Resources
Pollution
Invasive and Nuisance Species
Coastal Hazards

Priority Study:
Climate and Development Impacts on Coral Reef Systems

FIGURE 2



GREAT LAKES

Critical Issues:
Pollution (Industrial Compounds)
Lake Level Changes
Erosion and Sand Resources
Habitat Loss and Restoration (Wetlands, Fisheries)
Invasive and Nuisance Species
Threatened Wildlife (Fish, Migratory Birds)

Priority Study:
Impacts of Lake Level Change on Coastal Resources

GULF OF MAINE

Critical Issues:
Fish and Wildlife Habitat
River and Watershed Modifications
Pollution
Atlantic Salmon Populations and Habitats

Priority Study:
Ecosystem Requirements for Healthy Fisheries

MID ATLANTIC

Critical Issues:
Habitat Loss and Restoration (Sea Floor Habitats, Submerged Aquatic Vegetation)
Erosion and Sand Resources
Storms and Sea Level Rise
Estuarine Eutrophication and Pollution
Threatened Wildlife (Fish Health, Horseshoe Crabs, Migratory Birds)

Priority Studies:
North Carolina Sounds and Barriers: Watershed/Ocean Interactions
Chesapeake Bay Integrated Study

SOUTH ATLANTIC

Critical Issues:
Erosion and Sand Resources
Storms and Sea Level Rise
Habitat Loss and Restoration (Wetlands, Sea Grass, Sea Floor Habitats)
Nutrient Enrichment

Priority Study:
Wetlands Response to Climate Change

NORTHERN GULF OF MEXICO

Critical Issues:
Erosion and Sand Resources
Habitat Loss and Restoration (Wetlands, Brown Marsh, Sea Grass)
Threatened Wildlife (Sea Turtles, Migratory Sea Birds)
Storms and Sea Level Rise (Subsidence)
Nutrient Loading and Hypoxia
Offshore Resources and Habitats
Transport, Fate, and Impact of Pollutants
Invasive and Nuisance Species

Priority Study:
Regional Influence of River Systems: Mississippi River to Mobile Bay

FLORIDA AND CARIBBEAN

Critical Issues:
Erosion and Sand Resources
Habitat Loss and Restoration (Sea Grass, Wetlands, Corals)
Threatened Wildlife (Manatees, Reef Fish, Migratory Birds)
Groundwater Resources
Storms and Sea Level Rise
Invasive and Nuisance Species

Priority Studies:
Climate and Development Impacts on Coral Reefs, Mangroves, and Sea Grasses
Tampa Bay Integrated Study