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Mitigating Erosion Along Sheltered Coasts

A report of the National Academies

Susan Roberts
Study Director for the
Committee on Mitigating Erosion Along Sheltered Coasts

Study Sponsors



Environmental Protection Agency

U.S. Army Corps of Engineers

**Cooperative Institute for Coastal
and Estuarine Environmental
Technology**

NOAA Coastal Services Center

Statement of Task

The study will examine the impacts of shoreline management on sheltered coastal environments (e.g. estuaries, bays, lagoons, mud flats, deltaic coasts) and identify conventional and alternative strategies to minimize potential negative impacts to adjacent or nearby coastal resources. The study will provide a framework for collaboration between different levels of government, conservancies, and property owners to aid in making decisions regarding the most appropriate alternatives for shoreline protection.

Committee

JEFF BENOIT, *Chair*, Restore Americas Estuaries

C. SCOTT HARDAWAY, JR., College of William and Mary, Virginia

DEBRA HERNANDEZ, Hernandez and Co., Isle of Palms, South Carolina

ROBERT HOLMAN, Oregon State University, Corvallis

EVAMARIA KOCH, University of Maryland, Horn Point Laboratory,
Cambridge

NEIL MCLELLAN, Shiner Moseley and Associates, Houston, Texas

SUSAN PETERSON, Teal Partners, Rochester, Massachusetts

DENISE REED, University of New Orleans, New Orleans, Louisiana

DANIEL SUMAN, University of Miami, Rosenstiel School of Marine and
Atmospheric Science, Miami, Florida

Staff

SUSAN ROBERTS, Study Director

AMANDA BABSON, Christine Mirzayan Science and Technology Policy Fellow

SARAH CAPOTE, Senior Program Assistant



Report Organization

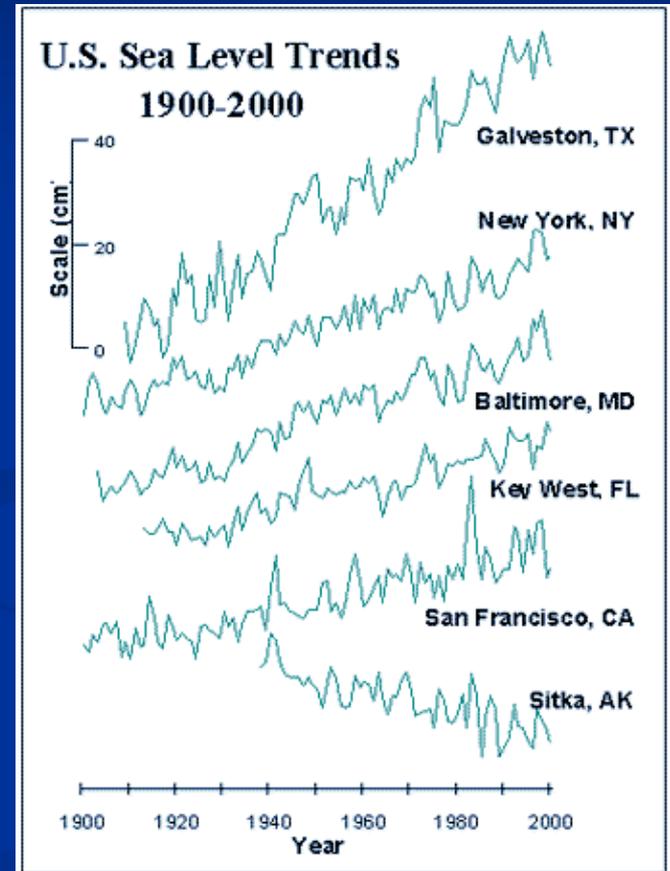
- Understanding Erosion On Sheltered Coasts
- Methods For Addressing Erosion
- Mitigating Eroding Sheltered Shorelines: A Trade-off In Ecosystem Services
- The Existing Decision-making Process For Shoreline Protection On Sheltered Coasts
- A New Management Approach For Sheltered Shorelines

What *Is* A Sheltered Coast?

- Typically bays, harbors, and estuaries
- Generally smaller bodies of water with limited fetch and water depth
- Protected from the full force of ocean energy by an island, peninsula, or reef
- Irregular “compartmentalized” shoreline compared to linear open coasts
- High diversity of resources and conditions, unique habitats, ecologically productive

The Problem

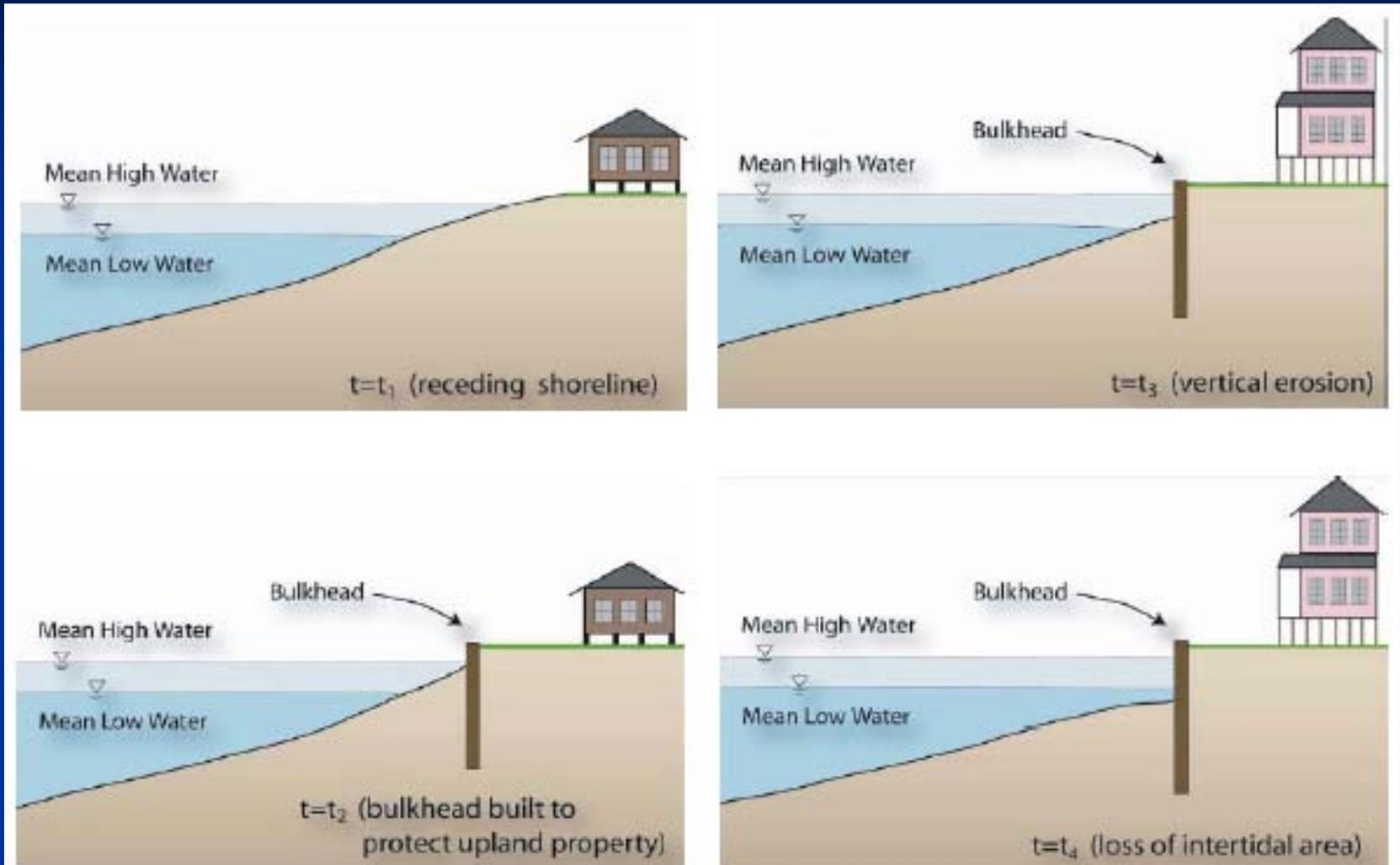
- Sheltered coasts are sites of increasing development, with many people moving to the coast
- Sheltered coasts are vulnerable to chronic land loss from erosion and sea level rise
- Landowners typically select hardening technologies such as bulkheads, revetments, and groins to prevent land loss even when “softer” alternatives are available.



IPCC, 2007

- “Most low-lying coastal areas are vulnerable to sea-level rise and climate change. Coastal wetland ecosystems, such as salt marshes and mangroves, are especially threatened where they are sediment-starved or constrained on their landward margin [very high confidence].”

Beach Loss after Installation of Bulkhead



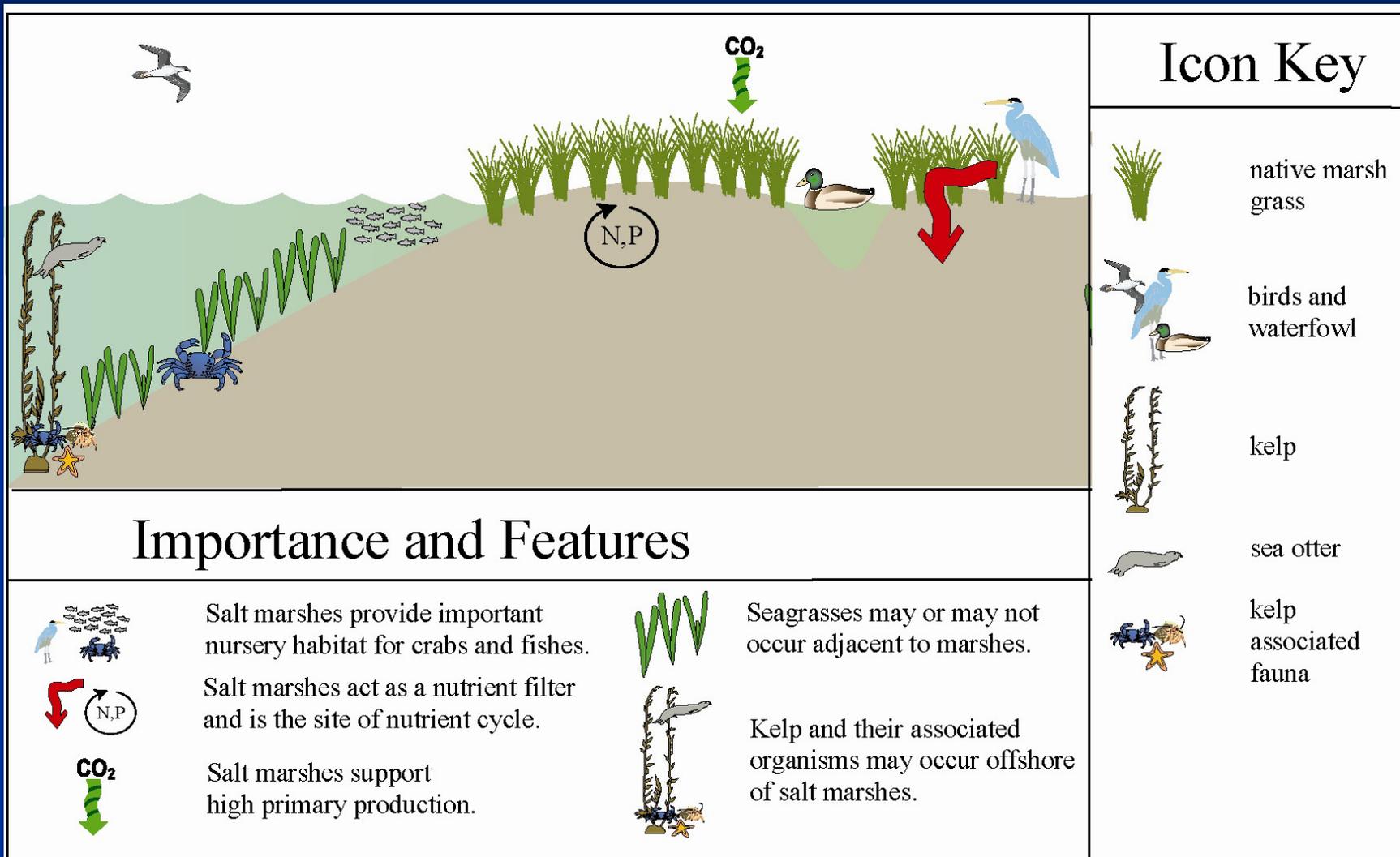
Source: After Tait and Griggs (1990) and Douglass (2005)

Geomorphic Settings

Three major categories:

- Beaches and dunes
- Mudflats and vegetated communities (marsh, macroalgae, seagrasses, etc.)
- Unconsolidated bluffs

Ecosystem Services - Marshes



Strategies for Addressing Erosion

- Harden
- Vegetate
- Trap and/or add sand
- Manage Land Uses
- Combination of one or more

Report Summary

- Information on shoreline change is insufficient for sheltered coasts
- Decision makers (landowners, contractors, local and state authorities) are generally unaware of alternative erosion mitigation strategies and their effectiveness
- Individual decisions lead to cumulative impacts
- All mitigation measures affect ecosystem services
- Local, proactive shoreline management plans could prevent unintended consequences of site-by-site permitting
- Permitting systems should promote mitigation approaches that maintain more natural shorelines

Findings and **Recommendations**

- **Cumulative Effects**
- **Erosion Mitigation and Permitting**
- **Shoreline Management Planning**
- **Information Needs**

CUMULATIVE EFFECTS

FINDING:

- The cumulative impact of the loss of many small parcels will at some point alter the properties, composition, and functioning of the ecosystem. In addition, the economic, recreational, and esthetic properties of the shoreline will change with potential loss of public use, access, and scenic values.

RECOMMENDATION:

- Shoreline management plans need to address potential cumulative effects of shoreline hardening. Hardening projects could then be limited to areas unsuited to non-structural alternatives or sites where structures are predicted to have less impact.

EROSION MITIGATION AND PERMITTING

FINDINGS:

- Compared to open coasts, a greater variety of techniques are available to address erosion in sheltered areas
- New techniques (or structural materials) require a rigorous process of testing and evaluation to determine their effectiveness and evaluate their environmental impacts
- The current permitting system discourages the use of alternatives to shoreline hardening

EROSION MITIGATION AND PERMITTING

RECOMMENDATIONS:

- The major federal agencies involved in permitting activities (EPA, USACE, and NOAA) should initiate a national policy dialogue on erosion mitigation for sheltered coasts
- The national dialogue should be used to develop guidelines for mitigating erosion on sheltered coasts that give deference to ecologically beneficial measures.
- State and federal regulatory programs should establish a technical assistance function to provide advice on permitting issues and information on types of erosion mitigation approaches and their effectiveness under various site conditions.

A New Shoreline Management Framework

Overcoming the obstacles associated with the current regulatory environment will require a number of societal and institutional changes in the following areas:

- Improving knowledge of sheltered shoreline processes and ecological services,
- Improving awareness of the choices available for erosion mitigation,
- Considering cumulative consequences of erosion mitigation approaches,
- Revising the permitting system, and
- Improving shoreline management planning.

Outcomes

CICEET Awards \$1,212,000 to Evaluate Different Approaches to Erosion Control along Sheltered Coasts

- As part of its Living Coasts Program, The Cooperative Institute for Coastal and Estuarine Environmental Technology (CICEET) has awarded \$1,212,000 to researchers working in North Carolina and New York who are evaluating the costs and benefits of different approaches to erosion prevention in sheltered coastlines. Each project is focused on understanding the environmental and economic tradeoffs of alternative erosion control measures.

“Between low water and the flotsam and jetsam of the high-tide mark, land and sea wage a never-ending conflict for possession.”

Rachel Carson, “Undersea” The Atlantic Monthly, September 1937, the article that launched her career as a writer.