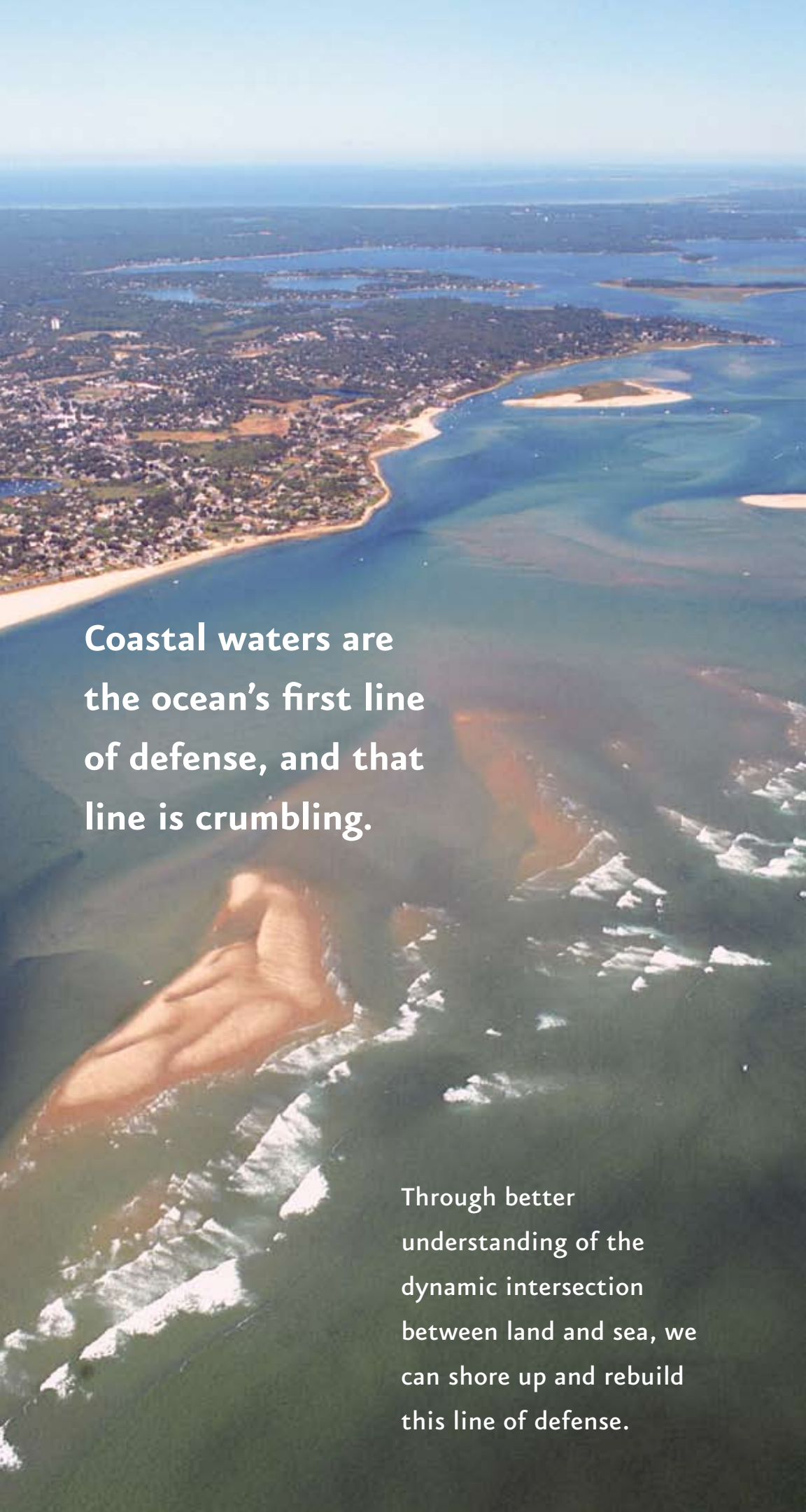
WOODS HOLE OCEANOGRAPHIC INSTITUTION

Coastal Ocean Institute



Coastal waters are the ocean's first line of defense, and that line is crumbling.

Through better understanding of the dynamic intersection between land and sea, we can shore up and rebuild this line of defense.

More than half of Americans live in coastal counties, and the coastal population grows by 3,600 people every day. This population growth along the water's edge—coupled with inland development, industrial activity, and fertilizer use—poses significant threats to coastal waters.

The Coastal Ocean

The coastal ocean is a precious, narrow strip of water extending from the edge of the continental shelf to the estuaries where salt and fresh water meet. Whether we live in a seaside community or a land-locked state, our actions affect this most sensitive portion of the oceans.

Scientists have an important role to play by providing the data and analysis needed to protect the coastal zone. Government officials and managers are hungry for information when they make decisions. Cutting-edge technologies and new approaches to coastal science—particularly collaborations among scientists from different disciplines—are setting the stage for scientifically based management of the coastal zone.

"The value of the oceans and coasts to the nation is immense and their full potential remains unrealized... However, there is widespread agreement that our oceans and marine resources are in serious trouble, increasingly affected by rapid growth along our coasts, land and air pollution, unsustainable exploitation of too many of our fishery resources, and frequently ineffective management."

James D. Watkins
Admiral, U.S. Navy (Retired)
Chairman, U.S. Commission on Ocean Policy

Pollution can cause red tides and harmful algal blooms that sicken or kill wildlife and humans.

In addition to visually spectacular oil spills and associated wildlife mortalities, many harmful compounds are delivered to coastal waters in small, but significant amounts.

In 60 years, one in four houses within 500 feet of the shoreline is likely to be destroyed.

In most productive fishing grounds worldwide, fishermen catch more fish than these systems can sustain.

The Challenges

Pollution: *Domestic, agricultural, and industrial wastes are delivered to, and accumulate in, coastal waters.*

- Fertilizer usage has increased at an alarming rate, and much of it ends up in the coastal ocean. The result? Waters blooming with so many plants that oxygen is depleted; noxious piles of rotting seaweed on beaches; and more frequent blooms of toxic and harmful algae.
- Sewage and chemicals also enter coastal waters. Some can be directly toxic to marine organisms and humans, while others are transferred through the food web as poisons and carcinogens.

Shoreline Change: *Coastal regions have undergone unprecedented development, much of it incompatible with the dynamic nature of the shoreline.*

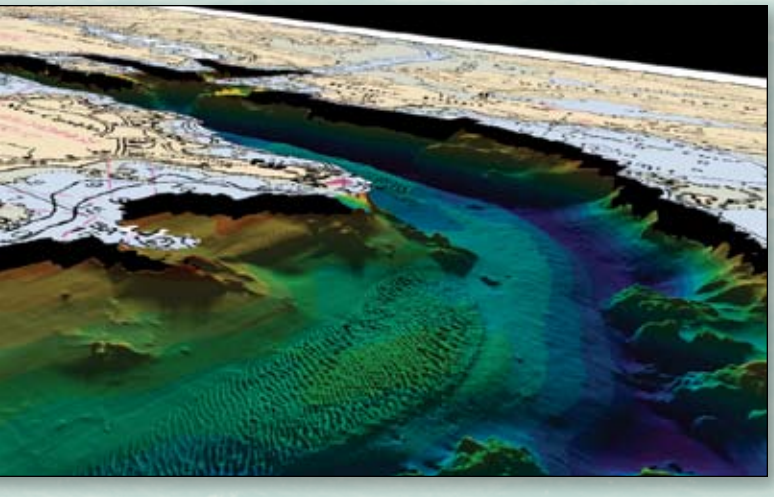
- More than $3 trillion is invested in dwellings, resorts, infrastructure, and other real estate along the Atlantic and Gulf Coasts of the United States alone. Beach erosion and the projected acceleration in sea-level rise over the next century puts much of this property in jeopardy.
- Tidal marshes are a critical component of the coastal ecosystem. If the rate of sea-level rise doubles (or even quadruples, as some predict) over the next 100 years, marshes and coastal ecosystems will undergo unprecedented changes. Some may disappear altogether.

Other Coastal Problems:

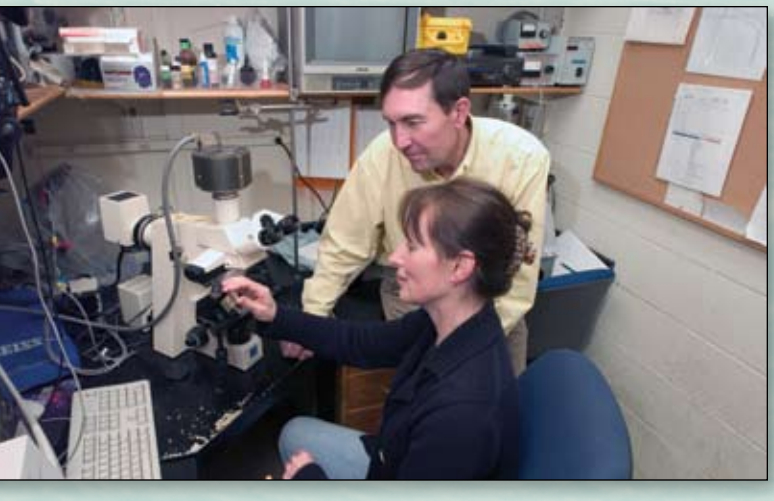
- Invasive species: Thousands of species are moving from one location to another in ships' ballast tanks every day. When discharged in a distant port, they invade and colonize, often with devastating consequences.
- Coastal development: Dredging, filling, and coastal modifications have destroyed vast areas of sea grasses and wetlands, the critical nurseries for ecologically and commercially important fish and crustaceans.
- Commercial applications: From wind power or other energy production schemes to the development of aquaculture operations, human activities are dramatically altering the coastal zone.

More than 60% of coastal rivers and bays in the U.S. are moderately to severely degraded by nutrient pollution.

Coastal Ocean Institute fellowships provide talented scientists and engineers much-needed independence from growing funding pressures.



New technologies can accurately and rapidly map bottom topography and shoreline configuration.



COI scientists train and mentor young investigators who will meet tomorrow's challenges in coastal science.

WHOI's new coastal research vessel, *Tioga*, supports COI's science with state-of-the-art capabilities.

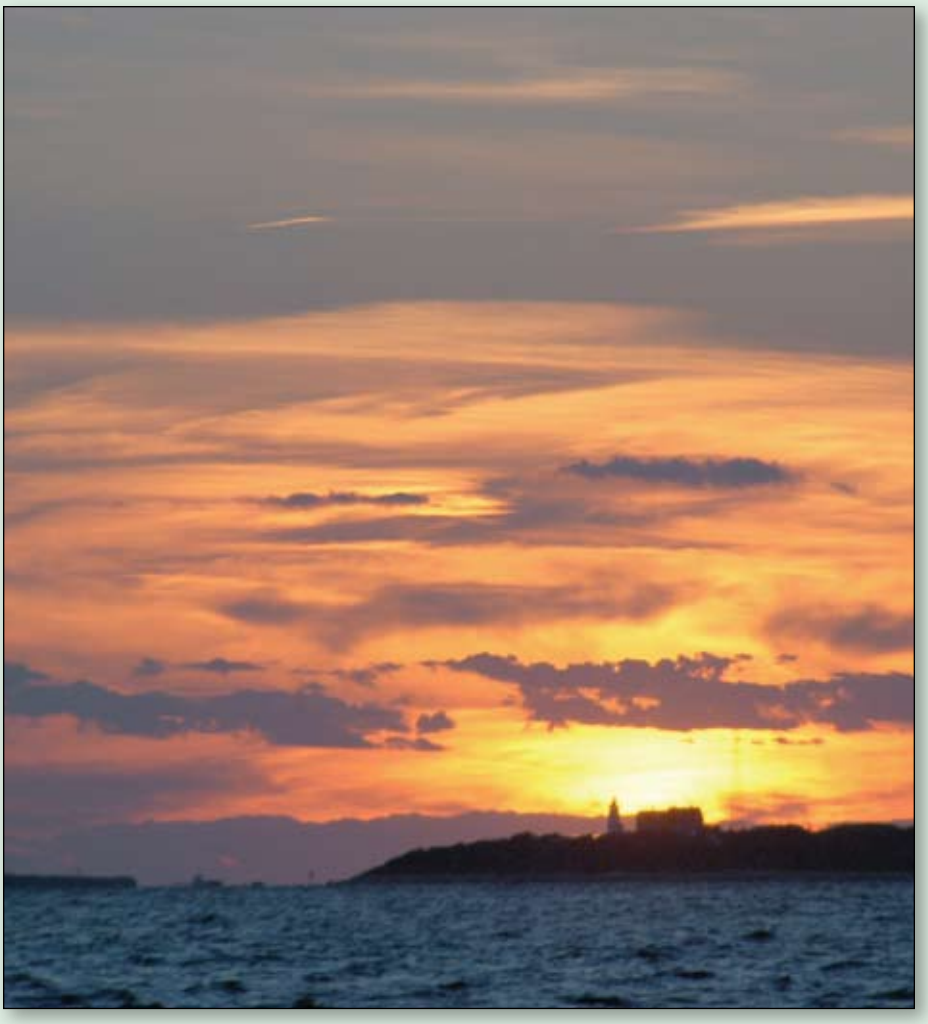
What the Coastal Ocean Institute Can Offer

The Coastal Ocean Institute (COI) is a center for action for coastal scientists to have the understanding and tools to address these challenges. These scientists can play an important role in protecting and managing the coastal zone.

The Coastal Ocean Institute fosters coastal research:

- **Grants, scientific gatherings, and state-of-the-art facilities** encourage innovative, interdisciplinary research and high-risk technology development.
- **Support of Research Fellows** selected for scientific leadership and ability to communicate results to the public and policymakers.
- **Education** of the next generation of scientists and policy leaders through its graduate students and postdoctoral scholars. They are our promise for the future of coastal oceanography.
- **Outreach and communication efforts,** informing resource managers, the public, and students of the complexities and solutions to the problems we face on our coasts.
- **New tools and technologies** that help COI's scientists build a deeper understanding of the complex mechanisms at work in the coastal zone. These tools include:
  - Automated sensors to detect toxic algae or microbial pathogens and alert public health officials;
  - Ocean bottom sensors to detect earthquakes and resulting tsunamis in time to alert coastal communities;
  - Instrumentation to "fingerprint" oil and chemical spills and help assess impact and liability;
  - Moored buoys and seafloor observatory systems to continuously measure algal blooms, shifting currents, and fish migrations;
  - Computer models of coastal water movements and associated chemical, biological, and geological processes.

> We have identified and documented many of the problems in the coastal zone. We must now advance the science needed to reduce or eliminate our impact on the coast and its impact on us.



Never before has coastal research been more relevant to our country's well-being.

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