Sea Grant
Woods Hole
# Focal Points
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# Cape Cod Coastal Erosion: A Case Study

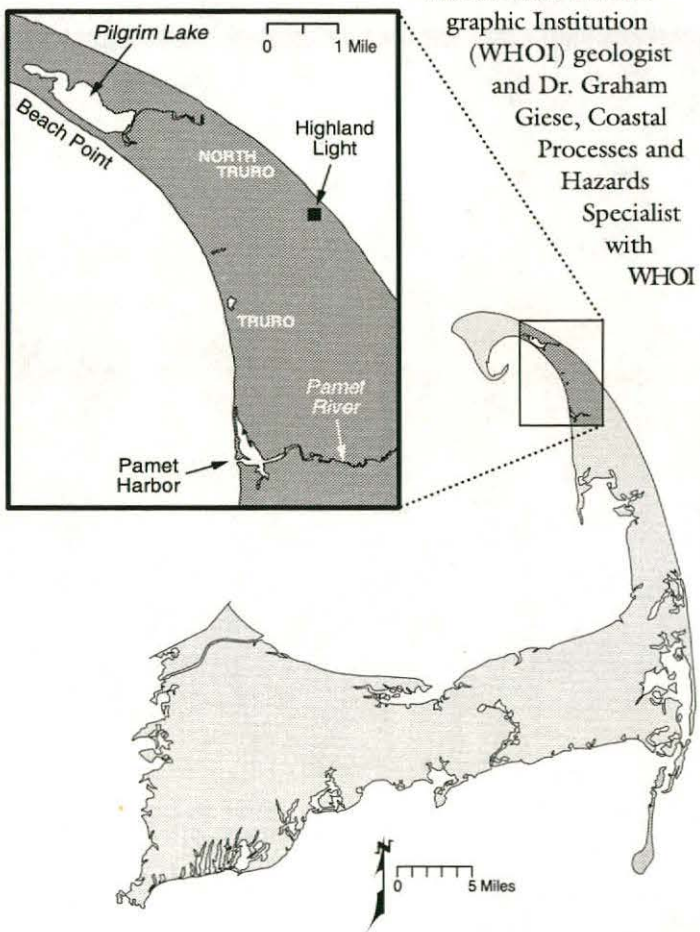
***Problems***

Coastal erosion is a natural geological process. It may take place slowly over thousands of years or it may occur dramatically, as in a landslide near Highland Light in Truro, Massachusetts, in early 1996. Sea level rise accelerates the process of coastal erosion, and relative sea level is rising at the rate of 10-12 inches per century in this area. Coastal areas of Cape Cod are dynamic systems: barrier beaches and dunes migrate inland as sea level rises, bluffs erode and supply sediment for barrier beaches.

Historically, homes and other constructions have been built on dynamic systems which naturally migrate as sea level rises or as wave action erodes the coast. Coastal engineering structures built to protect threatened homes can impede the movement of sand. As a result, coastal dunes and barrier beaches are lost and can no longer buffer coastal areas from storms. The Beach Point area of Truro was built on a barrier beach. This beach, where the majority of commercial businesses are located in Truro, is dependent on erosion from coastal bluffs to the south for nourishment. Without sand deposition from the eroding bluffs to the south, many properties on Beach Point would be lost.

***Sea Grant Involvement in Evaluating Truro Coastal Erosion***

Dr. Elazar Uchupi, a Woods Hole Oceanographic Institution (WHOI) geologist and Dr. Graham Giese, Coastal Processes and Hazards Specialist with WHOI Sea Grant, have recently been studying the geologic depositional and erosional history of the bluff area between the north side of the Pamet River and Beach Point, the source area for most of Beach Point sand.




The study has shown that the long term erosional rate for the bluffs in the area between the Pamet River and Beach Point averages less than 0.5 foot/year or less than 50 feet/century. Many residents and summer home owners develop a sense of security when property they have owned for decades has not eroded significantly. They are unprepared for sudden erosional events. However, when the bluffs *do* erode, they erode much more than 0.5 foot/year. The work of Uchupi and Giese suggests that the bluffs may erode 10-15 feet over a two to seven year period and then remain relatively stable for another 40-50 years. Not all of the bluffs are eroding at any given time. If the timing and severity of these erosional events could be predicted, homeowners could be given information

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on which to base decisions regarding their property; for example, moving structures back from a bluff which is likely to erode in the near future.

In the course of measuring erosional rates of the Truro bluffs facing Cape Cod Bay, Uchupi and Giese have been able to distinguish non-eroding areas from areas which are eroding or cutting. The cutting areas have lower bars in front of them (in Cape Cod Bay) than the non-eroding areas. Non-eroding areas have dune terraces protecting them. If scientists can understand where erosion is cutting away the bluffs and why it is cutting, information may be available to help property owners predict the timing and reduce the economic costs of losses.

***Future Needs***

If relative sea level continues to rise and if global warming leads to increased severity of weather patterns and storms, coastal residents of Cape Cod can anticipate more rapid erosion of coastal bluffs and shorelines, including locations where homes presently stand. Considering changes in coastal geology on a geological time scale it becomes apparent that coastal systems, including bars, beaches, barrier beaches, dunes, and bluffs are dynamic landforms. For example, erosion in one place will produce accretion, or a build-up of sand, in another place.

There is both an obligation to protect our coastal ecosystems and to maintain their sustainability and an obligation to assist coastal homeowners in protecting their homes in ways that are compatible with coastal processes. By minimizing the number of homes sited in the "danger zone" in the future, costs to society can be reduced. The present work on Truro's Cape Cod Bay shore may provide the basis for evaluation of erosional and depositional patterns in other locations.

Cooperation among federal, state, and local regulatory bodies is required to address the complex issues of coastal erosion and coastal hazards. WHOI Sea Grant can assist these agencies in evaluating coastal hazards and can provide technical assistance to address the problems of coastal erosion.

***Citizen Involvement***

Understanding that erosion is a natural process and that erosion of bluffs is required to nourish the beaches of Cape Cod is critical to living with our coastal landforms in a sustainable way. Education about coastal processes such as erosion are the key to better management of these dynamic systems now and in the future.

Individuals can help maintain coastal ecosystems by not contributing unnecessarily to erosion. Walking over coastal dunes or sliding down marine bluffs accelerates erosion. Places where vegetation has been destroyed by foot or vehicular traffic become subject to "blow-outs," where large amounts of sand are blown away in high winds.

WHOI Sea Grant has a number of publications and videos on coastal processes which are available on loan to educators and community groups. WHOI Sea Grant is currently developing school programs to help our young people understand coastal hazards and become better stewards of our coastal resources in the future.

For more information about the research or outreach projects profiled in *Focal Points*, contact WHOI Sea Grant at the address listed above.