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Tracking Beach Erosion Could Help Management

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Marine

EXTENSION

in action

TRACKING BEACH EROSION COULD HELP MANAGEMENT

The Problem

Although sandy beaches represent only about one percent of Maine's 3500-mile coastline, they are vitally important to the state's economy as recreational resources, provide crucial wildlife habitat, and buffer the coast against storms. However, many of Maine's beaches are threatened, mainly by erosion from coastal engineering and natural forces. Engineering structures-such as jetties and seawalls-built to create navigable harbors and protect beachfront property, may impact the recreational beach. They can interfere with the natural distribution of sand and cause beaches to erode more rapidly or sand to accumulate in unwanted places. Some towns try, often without success, to fix their beaches by dredging sand from one place and dumping it in another.

Research

In 1999, Joe Kelley and Dan Belknap, geologists in the University of Maine's Department of Earth Sciences and School of Marine Sciences, and Steve Dickson of the Maine Geological Survey (MGS) developed a program that helps to determine how beaches change over time, the rate at which they change, and how changes are related to waves and currents offshore. Their Sea Grant-funded project, Co-management of Maine's Beaches through Volunteer Monitoring and Annual State-of-Maine's-Beaches Meetings, combines scientific observation, data synthesis, and public outreach.

Researchers, graduate student Heather Heinze, and Sea Grant Marine Extension Associate Kristen Whiting-Grant worked to



Sanderlings at York Beach. Photo by Cheryl Daigle.



Marine Extension in action provides updates on Marine Extension Team activities for coastal communities. It was produced by Maine Sea Grant with programming support provided by University of Maine Cooperative Extension.



create a volunteer beach monitoring program in southern Maine. They recruited, trained, and coordinated groups of volunteers to make topographic profiles of beaches in order to study annual erosion and accretion cycles. After the first year, Whiting-Grant took over as coordinator of the volunteer effort. In 2005, more than 150 volunteers are using a simple surveying technique, called profiling, to measure monthly changes in the distribution of sand on 15 large beaches between South Portland and York, Maine. The data the volunteers gather is being used to create a long-term picture of coastal processes on Maine's sandy beaches.

Besides the profiling data collected by volunteers, current meters placed offshore measured the impact of waves and currents on the beach systems. Information obtained from these two sources provides solid baseline data, which could be invaluable in predicting the future shape of beaches, determining beach replenishment costs, and guiding future beach management decisions on beaches where chronic erosion threatens property and critical wildlife habitat.



Diverse beach stakeholders gather at the Maine Beaches Conference. Photo by Lynn Wardwell.

Public Outreach

The Kelley, Belknap, and Dickson research project proposed an annual meeting where profiling data could be presented. Since 2000, Whiting-Grant has coordinated the Maine Beaches Conference, which has provided a venue for shorefront property owners, monitoring volunteers, recreational beach users, municipal and state officials, scientists, environmentalists, and concerned citizens to discuss issues involving Maine's beaches. The Maine conference has been so successful that it has become a model for similar events elsewhere in the country. The First Annual Northeast Beaches Conference, held in Massachusetts in 2002, was based largely on Maine's event.



Steve Dickson, Maine Geological Survey and Kristen Whiting-Grant, Maine Sea Grant Extension, train volunteer monitors at Mile Beach, Reid State Park. Photo by Cheryl Daigle.



Demonstrating the profiling method at Laudholm Beach, Wells. Photo by Laura Lubelczyk.

Data Management

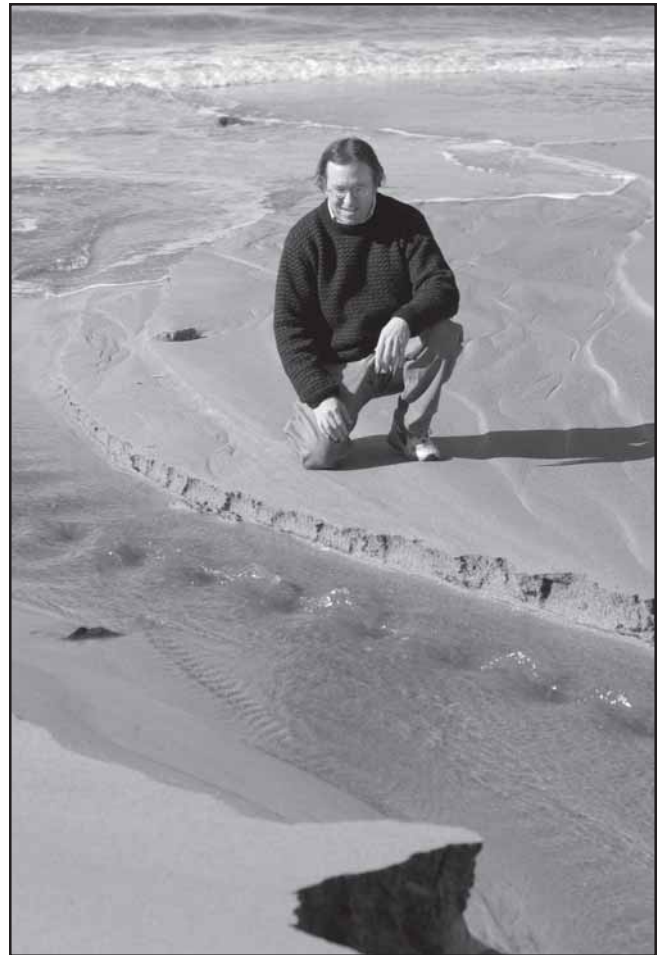
Beginning in January 2005, an online profile monitoring data entry system was implemented. The system allows authorized users to log into the site to enter their monthly profiling data electronically, and its automatic graphing feature provides a visual representation of their data. This provides a preliminary picture of the changes occurring on their beaches over time. Data are then analyzed and interpreted by Maine Geological Survey. In the next phase of the system, a Web site will be linked to the system that allows the general public to view the data.

Results

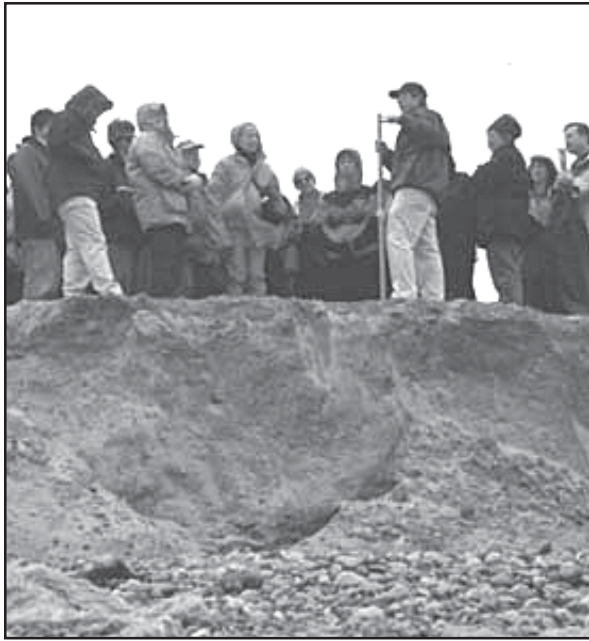
In geological time, five years cannot be considered a trend. But the first patterns to emerge from the monitoring program suggest that moderately and highly developed beaches experienced more change overall during these first years of beach profile monitoring, while undeveloped, or “natural,” beaches exhibited less change and appeared to be generally more stable. Heather Heinze, a University of Maine graduate student working with the research team, analyzed data collected by volunteers before and after the winter storms of 2001. She reported in her thesis that developed beaches lost sediment during these storms, and that sediment on moderately developed and undeveloped beaches was redistributed along the profile.

Impacts

The data generated by the profiling program is being used widely to enhance beach-planning efforts in Maine. MGS Marine Geologist Steve Dickson has used the data to determine the results of a 2000 harbor dredge and beach nourishment project in Wells. Dickson also used the beach profiling data to help the Town of Ogunquit develop a management plan for piping plover habitat. In addition, the first state beach nourishment policy being developed by MGS is relying on data from this project. This research also resulted in one master’s thesis and two scientific publications, as well as several presentations at national geological meetings. Finally, as the data set grows in duration, results will be used to evaluate the impacts of storms and sea-level rise on the recreational beach and coastal dunes.



University of Maine professor, Joe Kelley, a principal investigator on the beach profiling program. Photo courtesy of The University of Maine.



Stakeholders consider management options at a site of chronic erosion. Photo by Laura Lubelczyk.

The beach monitoring program is helping to change a traditionally confrontational mode of interaction to a more collaborative approach to solving beach management problems. By bringing together towns and beach communities with scientists and regulators to collect and analyze data, and by sponsoring conferences to discuss issues of concern, the program helps to promote a common understanding of beach behavior. The beach monitoring program has been so well received in Maine that it has been used as a prototype for similar programs across the country.

Publications

Heinze, H.W., 2001, Anthropogenic Influences and Meteorological Effects: How They are Changing the Sand Beaches in Southern Maine, Department of Geological Sciences, MS Thesis, University of Maine, Orono, 380 pp.

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Hill, H.H., J. T. Kelley, D. F. Belknap and S. M. Dickson, 2004, The Effects of Storms and Storm-generated Currents on the Sand Beaches in Southern Maine, Marine Geology Special Issue: Storms and their Significance in Coastal Morpho-Sedimentary Dynamics, 210: 149-168.

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Maine Sea Grant supports marine science research and outreach activities to promote the understanding, sustainable use, and conservation of ocean and coastal resources. The University of Maine Marine Extension Team is a collaboration of Maine Sea Grant and Cooperative Extension, providing educational and applied research programs in coastal communities, ecosystem health, fisheries, aquaculture, and tourism.



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