



Collaborating to Support Science-based Decisions

How One Geomorphologist Re-invented his Research to Help Protect Coastal Communities

Early in Dr. Norbert Psuty's career, a future colleague with a gift for professional matchmaking introduced him to Sandy Hook. Jutting out conspicuously from coastal New Jersey, Sandy Hook is an undeveloped, narrow peninsula that boasts barrier beaches, wetlands, and a rare old-growth maritime holly forest, one of only two such forests remaining in the world. A ferry from lower Manhattan gets there in 30 minutes. Six miles long and less than a mile across from its interior bay shore to its Atlantic shoreline, Sandy Hook looks on a map like the top of a cattail.

When Dr. Psuty first visited Sandy Hook, he was an assistant professor of Geography at the University of Wisconsin-Madison, interviewing for a new position at Rutgers University. The Rutgers faculty were prepared to summon every persuasive resource to recruit Psuty to their faculty, so the head of the search committee drove him to Sandy Hook.

That future colleague supposed a tour of the site might inspire in Psuty some vision of his future: a recognition of Sandy Hook as a promising research site. He supposed

right. Psuty had trained as a doctoral student at the Coastal Studies Institute of Louisiana State University (LSU), and he was taken in by the prospect of returning to a coastal research institution and to the sort of coastal research that had shaped his earliest experiences as a graduate student. He took the job.

Now retired and a professor emeritus at Rutgers, Psuty is a highly influential coastal geomorphologist who has developed unparalleled long-term data sets on the evolution of the physical geography of Sandy Hook.

Collaborating to support science-based decisions

Psuty's research for the National Park Service (NPS) began in earnest sometime around 1975, when park managers at Fire Island National Seashore solicited his help. They wanted to understand what was happening to the beaches and dunes there. They had observed changes, but they didn't have the resources to pin down reliable answers about the long-term effects of change, or even to detect from among a plethora of possible factors which conditions were most influential—and how—in transforming the physical features of the shoreline.



Norbert Psuty surveys the waves at Gateway National Recreation Area. Tanya Silveira photo.

Dr. Mary Foley, then chief scientist for NPS's Northeast Region, advised Psuty to orient his research around a fundamental question of consequence to scientists, park managers, policymakers, and coastal communities alike: what are the vectors of change. This means discerning causes of change as well as quantifying the direction and magnitude of change. To this day, Psuty credits Foley's influence with catapulting his career into the realm of science that has immediate applications for public decision-making—something that was far afield of what he had imagined for himself, and also incredibly gratifying.

He recalls feeling a bit thunderstruck. Reflecting on his work with NPS, Psuty says that it's quite rare for a scientist "to have someone at the user end who is actually interested in what you're saying, who is applying what you're saying. Normally, we publish our papers, we put them in the journals, and ten years later somebody says, 'Oh, that's really good.' But working with the Park Service, we produced reports, and the reports resulted in a decision within a few months. You knew immediately that you either had an influence or you didn't. That's very rewarding for a scientist."

And to Psuty, conducting research in cooperation with NPS affirmed that his work had value. "My goodness," he exclaims, "my knowledge of how dunes form was being

used to generate the equivalent of an ordinance to limit the destruction of dunes. And I thought that was really great."

In 1972, NPS established Gateway National Recreation Area, which incorporates Sandy Hook, Psuty's home base for coastal research. At first, the priority for park management at Gateway was to attract visitors, but in time park managers at Gateway, as at Fire Island, began to prioritize and to recognize scientific knowledge as critical to effective resource management. When they did, they solicited Psuty's expertise, a move that marked the start of a decades-long relationship.

Since then, the lion's share of Psuty's research has dealt with the changing physical geography of shorelines across Fire Island and Gateway. The studies he conducts in collaboration with NPS help people understand the capacity for shorelines to sustain vital ecosystems and to support coastal infrastructure and coastal communities, even in the midst of large-scale changes caused by powerful storms and climate change. With the information these studies generate, people can make informed decisions about how to plan for the future, how to adapt to change on the coast, and how, where, and with what consequences they might build or maintain public infrastructure.



Psuty talks park staff in the dunes. Tanya Silveira photo.

The vast effects of Hurricane Sandy, which struck the U.S. east coast in October of 2012, are by now well-known and well-documented. The storm wrought significant changes across coastal communities in New York and New Jersey, and across the beaches, dunes, roads, boardwalks, and other structures of Gateway and Fire Island. Lesser known is the fact that Hurricane Sandy also triggered the mobilization of valuable scientific data that NPS, in collaboration with Psuty and other scientists, had been collecting for years through the Northeast Coastal and Barrier Network's (NCBN) Inventory and Monitoring (I&M) Program. NCBN is one of NPS's hubs of long-term park research and monitoring. Its I&M studies provide essential baseline information about the condition of natural resources in eight coastal parks in the northeast. NCBN partnered with Psuty and other scientists across the region following Hurricane Sandy to launch dozens of federally-funded post-storm recovery and mitigation projects, many of which are drawing upon I&M data to enhance understandings of the immediate and long-term consequences of Hurricane Sandy for parks in the region and for coastal communities.

Psuty uses Real Time Kinematic (RTK) GPS equipment in the field. Tanya Silveira photo.

Recognizing the need to understand shorelines

Precise measurements of shoreline position; accurate coordinates of the location, width, and elevation of beaches and dunes; and 3D models that show the volume of sediment on a beach: at first blush, these data might not seem very charismatic, but they can mean the difference between decisions that amplify or that mitigate risk.

Psuty never had any illusions about the glamour of his science. He never even expected anyone outside of his field to care much about his research. But, in time, good will and collegiality, combined with a growing practical urgency for understanding shoreline change, and Psuty's own impeccable approaches to long-term geomorphological research, coalesced to define his career and bring recognition to his work.

Not surprisingly, it was a literal sea change that stimulated this transformation. Not long after he put down roots at Sandy Hook, a good friend and colleague from LSU wrote him a letter. The friend, a coastal geomorphologist like Psuty, referred to a study that used tide gauge data to show how sea level was rising almost universally along the entire coast of the United States. "What do you think that means?" the friend asked.

From Florida to Maine, 62 tide gauges are positioned along the Atlantic shoreline. They provide baseline information about Mean High Water level (MHW)—the average of all high water heights observed at a particular location in a 24-hour period. Curious, Psuty looked at data from tide gauges at Sandy Hook, at Atlantic City, and in New York Harbor, each of which has collected sea level measurements every six minutes, for nearly a hundred years, and they, too, showed sea level rising consistently (then, as now). Psuty recognized a need. “Ever since,” he says, “I’ve been looking at how I can create data sets to help understand sea level rise.”

More specifically, Psuty joined fellow scientists and park staff to help NCBN design one of the foundational documents of its I&M studies: procedures for systematically monitoring the physical geography of coastal areas and for tracking long-term shoreline change. With support from the Park Service program, he implemented a study at Gateway that monitors the geographic positions of shorelines, beaches, and dunes. This research also incorporated methods for identifying the forces that drive change along the coast, whether those drivers of change were sea level rise, the presence or absence of sediment, coastal development, artificially maintained inlets, or the construction of coastal structures like jetties, groins, or seawalls.

Knowledge drives decisions.

A primary objective of Psuty’s research is to reduce the exposure of people and things at-risk. Shorelines are highly dynamic. They change constantly in response to long-term climate change impacts, sea level rise, regular seasonal fluctuations, sporadic storm events, diverse human interventions, including coastal development, and other drivers of change. All of these dynamic changes have consequences for natural, structural, and cultural resources along the coast and in NPS coastal park sites, as well as for people who live on the coast.

Thinking back to the perspectives that Mary Foley articulated, Psuty says that what coastal communities need most is a full understanding of how shoreline dynamics can provide for a general protection of inland coastal communities. And, rather than attempt to coax dynamic dunes and shorelines to obey potentially misguided decisions, the point of his research is to bring science to bear on management decisions. As Psuty says, “Conditions are changing in the parks, and the parks have to adapt.” With sea level rise comes greater change, with less and less stability over time, and every storm will cause some readjustment. Under these conditions, Psuty says, an “understanding of shoreline systems and processes should be driving all subsequent decisions, rather than vice versa.”



Psuty at Gateway's Sandy Hook Unit. Tanya Silveira photo.



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