



# Shifting Sands

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## Strong Forces Confront Our Coastlines By Peter H. Taylor

AS FAR BACK AS I CAN REMEMBER I HAVE ENJOYED watching huge, storm-driven waves bash the coastline. There's something thrilling and beautiful about mountains of ocean water hitting sand and rock. Slower-paced forces of coastal change, such as tides, currents, and seasonal shifts in sea life, are just as exciting. The meeting of land and sea is defined by ceaseless change, and that's what makes coastal ecology and oceanography so interesting to me.

Last summer, my wife, five-year-old daughter, and I took a vacation to Chatham, at the elbow of Cape Cod. I woke early one morning and walked to the lighthouse, which sits on a bluff perhaps a hundred feet above Pleasant Bay.

In the morning sunlight, I got a spectacular bird's-eye look across to the sturdy sand barrier of Nauset Beach, which used to shelter Pleasant Bay from the open ocean – until waves carved a gash through it. Gazing at the breach where ferocious currents now ripped into the bay, I marveled at how the ocean had completely re-sculpted the coastline, shifting huge volumes of sand to create a new beach and peninsula that jutted from the base of the bluff. I watched as two fishing boats navigated

the treacherous channel, passing an exposed ledge where a crowd of grey seals lounged. Not far away, I could see where property owners had installed bulwarks of large rocks in an attempt to safeguard their shorefront homes.

This “Chatham Break” is fairly old – it happened 20 years ago – but it offers a glimpse of the future along the Massachusetts coast. Just a few months before our visit, waves had punctured another hole through Nauset Beach, north of this old one; summer cottages there have since fallen victim. Also in 2007, storm waves broke through Norton Point on Martha's Vineyard, creating a new link from Katama Bay to the ocean. At Crane Beach in Ipswich, the shoreline has retreated 100 feet since 2001. Impressive events like these are normal along the ever-shifting coastline, but climate change will soon cause them to happen more frequently and more dramatically.

According to the Intergovernmental Panel on Climate Change, sea level could rise two feet or more by 2100. Climate change will also cause coastal storms to hit harder and more frequently. Barrier beaches and other coastal lands will be radically reconfigured, and salt marshes will disappear under the quickly rising ocean.

It's fascinating to anticipate how these changes will affect people, geography, and wildlife. And how do we prepare? For many people, building seawalls and adding dredged sand seem like obvious solutions to protect properties. But when you look at the performance of these structures, it's clear they create more problems than they solve.

I suspect that, as the years go by, we will find ourselves adjusting to the new shape of the coastline, rather than trying to win an impossible fight.

But birds, fish, and other creatures will feel the impact more directly. I'm especially concerned about the loss of salt marshes, vital sources of food and shelter for many animals, including commercially and recreationally important fish. Salt marshes thrive in the daily ebb and flow of tides. During periods when sea level rises slowly, salt marshes accumulate sediment and build up peat fast enough to stay above water. But when the ocean is rising comparatively rapidly, such as now, some salt marshes cannot keep pace and eventually disappear.

Today, we cannot predict how much salt marsh will disappear, but it will come on the heels of huge losses over the last four centuries due to other human impacts. I fear that while fish, birds, and other species might adjust to some other climate-related changes, the compounded loss of salt marshes might be a critical blow to the ecosystem. The implications for all of us are profound.

One afternoon during our Chatham vacation, our family explored the marshy and sandy edge of the lighthouse peninsula. We scooped up tiny fish in our hands and returned them to the shallow water, where they nibbled on bits of marsh grass. Nearby, horseshoe crabs crawled, and shorebirds skittered along the surf line. Kneeling on the sand, we built castles that were flooded and crumbled into heaps by the rising tide. And I found myself wondering: What will our ocean and coast look like 20 years from now when my daughter builds sandcastles with her own children?

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Since an ocean storm breached Norton Point last spring, changes to Katama Bay have been dramatic.