The Great Sand Event and Our Changing Coast

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Over the past several years, researchers from Boston University have been studying the history of the Westport coastline to better understand how it formed and how it functions today. Supported by funding from the Buzzards Bay Coalition through the Rathmann Family Foundation, this work combines field data collected in 2022 with modern geophysical tools and sediment sampling to reconstruct changes that occurred thousands of years ago. The goal of the study was to better understand the natural processes that shaped the Westport River estuary and surrounding shoreline.

If you stand on Horseneck Beach and look out over the Westport River marshes, the landscape feels steady and familiar. The shoreline, dunes, and marsh appear as though they have always existed in their current form. In reality, this coastline is the product of dramatic natural changes.

Following the last Ice Age, glaciers left behind large deposits of sand and gravel offshore. As sea level rose, waves and tides began transporting that material back toward land. Between about 4,000 and 3,000 years ago, this process intensified. Nearly 20 million cubic meters of sand moved onshore during what researchers call the "**Great Sand Event**," reshaping the coastline in a relatively short period of time. This influx of sand built many of the features we recognize today, including Horseneck Beach, the barrier beaches near Allen's Pond, and the dune systems along the coast. At the same time, sand was carried into the Westport River estuary, where it began to accumulate and alter the system from within.

At that time, the estuary was more open to the ocean and likely contained multiple tidal inlets. As sand filled portions of the estuary, water depths decreased and tidal flow was gradually reduced. One of these inlets eventually closed (this is the Let), and the system transitioned toward the configuration we see today.

To understand how these changes occurred, researchers used a combination of subsurface imaging and sediment sampling techniques. One of the primary tools was **ground penetrating radar** (GPR). This system works by transmitting high-frequency radio waves into the ground and recording how those waves reflect back from different layers below the surface. In this study, researchers collected more than 11 kilometers of GPR data across the barrier beaches and marshes. The system allowed them to "see" several meters below the surface and identify buried features such as former tidal inlets, beach ridges, and layers of sand deposited over time.

In addition to GPR, researchers collected **sediment cores** from the marsh using a hand-operated auger. These cores are narrow columns of sediment that preserve a vertical record of environmental change. By examining the sequence of layers within each core, scientists can determine how conditions at a given location have changed over time. The cores revealed a consistent pattern across the study area. Beneath the marsh is a thick layer of sand, and above that sand is organic material formed by marsh vegetation. This sequence shows that sand was deposited first, followed by the development of marsh as conditions became calmer and more stable.

Together, the GPR data and sediment cores provide a detailed picture of how the landscape evolved. They show that the coastline has not remained fixed, but has changed in response to shifting sediment, rising sea levels, and evolving tidal conditions. This research highlights an important point. The coastline we see today represents just one stage in a long-term natural process. Understanding that history helps provide context for present-day conditions and supports informed stewardship of the Westport River watershed.

This information is from "Geomorphological Development of Western Buzzard's Bay Coast through Onshore Reworking of Glaciofluvial Deposits" by Matt Giess, Duncan FitzGerald, Zoe Hughes, Alice Staro Department of Earth and Environment, Boston University, 675 Commonwealth Avenue, Boston, MA 02215