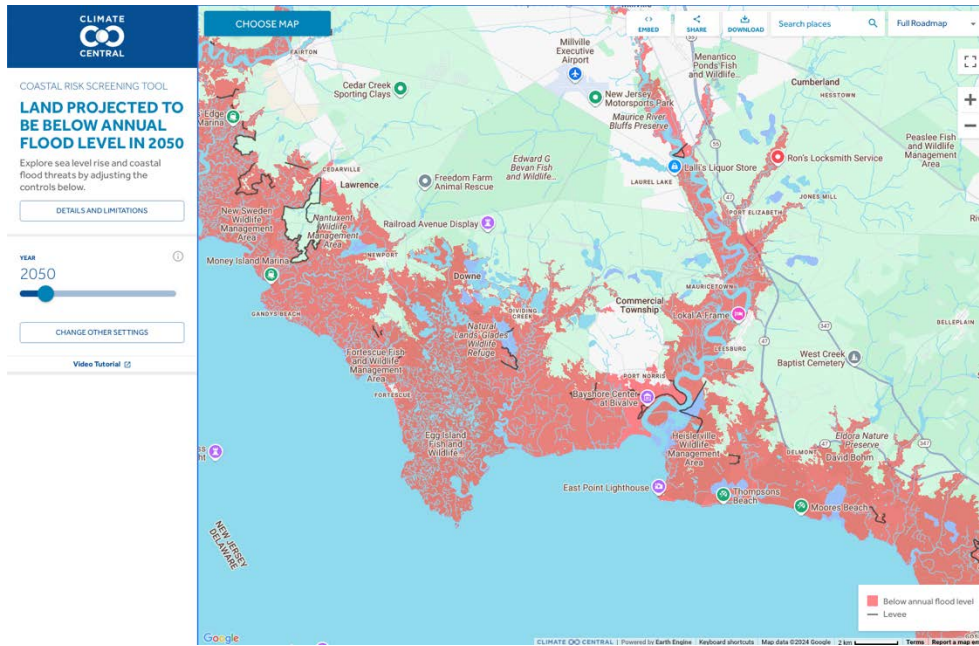


THE GREAT OUTDOORS



There are many predictive flood mapping tools available on the internet. Here is the Maurice River on an interactive map hosted by Coastal.climatecentral.org. After setting a future date you can zoom in and out on coastal environs along the U.S. Eastern Seaboard. These maps have limitations in terms of what can accelerate sea level rise. But are never the less useful planning tools.

Sea Level Rising

Sea level rise and marsh retreat maps out a troubling road ahead for Delaware Bay ecosystems and homeowners.

By J. Morton Galetto, CU Maurice River

The world's coast lines are in retreat and encroaching on uplands. Delaware Bayshore scientists who study our coastal marshes are concerned by the accelerated rate of their loss. In the 2010's Dr. Danielle Kreeger, then

Director of Science at the Partnership for the Delaware Estuary, presented multiple times about the diminishing marshes of the Bay – and how they were disappearing by an acre a day. For the general public this was considered a new concept, possibly even conjecture. Today it is recognized as irrefutable fact.

Let's discuss sea level rise and how it is playing out locally. A marsh is a type of wetland, a place where the ground holds water for long periods of time or at the very least seasonally. Swamps are generally forested wetlands, but coastal wetlands are dominated by grasses and other herbaceous plants while some high marsh may offer islands of trees.

The predominate "native species" in the Delaware Bayshore is salt marsh cordgrass or *spartina alterniflora*. The coastal marshes of the Delaware Bayshore were created by an ice age that pushed glacial deposits of sand and other fine soils onto the coastal plain. The nearly flat landscape facilitates poor drainage and promotes the holding of water on the top layer of mucky soils, while sandy soils beneath allow water to percolate through to the aquifer or drain to surface waters.

The marsh is formed when sediments from streams and rivers collect where rivers and oceans meet. Plants take root and hold soils, then die off, creating dead and decaying matter or "detritus" that is decomposed by bacteria and algae. The decaying layers of plants create the top layer of organic soil – muck or peat. Fish, shrimp, crabs, worms, and invertebrates eat the detritus. Microorganisms then consume the feces of these creatures, and this becomes a circle of life, which in turn builds the marsh plain.

It's similar to dying trees in a forest being broken down by insects into soil, which will support new trees that support the animals of the forest; in other words they are producers, consumers, and decomposers – the circle of life.

The gradual accumulation of layers of decayed matter is called accretion. When accretion is unable to keep up with sea level rise the result is loss of marsh plain – or retreat of the bayfront toward the upland, often to forested areas.

The coastal marsh habitat is considered one of the most productive ecosystems in the world, a place where fisheries are born. The tidal interchange of inundation and draining twice a day washes nutrients over the marsh plain. Think of it as a nursery. Many aquatic

creatures need to start their lives in the fresher waters of an estuary rather than the saltier waters found in the ocean. They also seek the shelter of grasses to avoid larger predator fish species. Conversely lower tides condense fish into guts and pools on the marsh plain, making them more vulnerable to be preyed upon by wading birds and mammal species. Surface feeders like skimmers, gulls, and terns make use of this opportunity as well.

Global warming causes sea levels to rise. Two main factors are at play: the melting of ice sheets and glaciers adds to water to the oceans, and water expands when it warms – called “thermal expansion.” NASA reports that the sea level mean change since 1993 is four inches. NASA, NOAA, U.S. Department of Environmental Protection, Rutgers University, and U.S. Geological Survey have a mapping instrument online called the Interagency Sea Level Rise Scenario Tool, for which the baseline year is 2000. The data show that waters on the Jersey Coast and Delaware rose 6 inches from 2000 to 2020, and a 3.5-inch difference is anticipated by 2030. On a flat landscape that’s a great deal, and added to a full moon flood tide it is even more consequential.

Sea level rise is especially acute in New Jersey. Since the early 1900s waters have

risen at the Jersey Shore by 18 inches, more than twice the global mean of 8 inches (Rutgers New Jersey Climate Change Resource Center). In addition to climate change New Jersey is affected by a “geologic seesaw, the mid-Atlantic region is subsiding, or sinking, while land to the north once covered by Ice Age glaciers rises up (Rutgers 2020).” The pumping of large amounts of water from aquifers to support communities also adds to the diminishment of New Jersey’s coastline.

Residents’ major concerns are the loss of property, roads, contamination of wells by salt water intrusion, and in many cases the need to relocate. One farmer told me that he has had to dig his wells deeper in order to access fresh water for his crops.



*Numerous roads to the Delaware Bayfront now flood on monthly full and new moon tides. Maurice River Township.
Photo: J. Morton Galetto*

The Cumberland County coastal towns of Sea Breeze, Bay Point, Thompson's Beach, Moore's Beach, and portions of Money Island have already been abandoned. Other beachfront villages have been shrunk greatly. The effects of coastal flooding, astronomical tides, storm surges, and hurricanes have already been made worse by sea level rise. These events act as a glimpse into a future, where there will be an increased number of such incursions. The total of high tide flood days has jumped dramatically since the 1950s. Atlantic City averaged less than one flood day per year during that period, and experienced an average of 8 per year in the 2000s.





The village of Thompson's Beach was destroyed by a flood in 1950. There were 107 homes and only 7 remained on their foundation. The book "Tidal Wave, The Great Appalachian Storm of 1950," documents the impact of the storm on the Delaware Bayshore. There was a smaller resurgence in the 1960s. By the late 1990s the township abandoned the road to the waterfront. Today the village is completely gone. Photo: Thompson's Beach Postcards. Bayshore Center Bivalve collection.

As waters migrate further inland there is less of a buffer between inhabited properties and the advance of the bay. People look to structure to remedy the onslaught of water – seawalls, bulkheads, rip rap, gabions etc. However, human-made barriers impact animals and so do habitat changes caused by rising waters. The forested buffers of the Bayshore are critical for rare and common species of wildlife. Where the habitats touch and/or overlap these are considered ecotones that are rich in biodiversity. If one type of habitat is lost, the adjacent area is also diminished in value. Most animals make use of different habitats, sometimes seasonally or even at particular stages of maturation, so all are important for survival.

Some ecological requirements will match up with retreat and support the existing species while some will not. Beachfronts and marine nurseries can't creep further inland and still maintain the same available habitats. Beach-nesting birds like skimmers don't use forested swamp. Horseshoe crabs don't lay viable eggs in marshy wetland soils or in a dying woodland, but rather on sandy beachfront. There will also be conflicts between existing development and the need for natural changes.

Initially some houses and roads may be raised up, but since people can't simply back up onto neighboring properties many residents will be forced to relocate. This scenario is going to be played out in coastal communities around the planet and in fact it is already happening.

(please scroll down)



November Nor'easter 2009 flooded roads, homes and businesses on the Delaware Bayshore. Beaver Dam, Downe Township. Photos by J. Morton Galetto

It is not uncommon to hear Bayshore residents joke that they will soon be living on beachfront property– but they know it is no laughing matter. Access to clean water will require deeper wells. Roadways that once led to villages will be pathways to waterfront, if they even continue to exist.

Politically, addressing global warming is not popular. I remember that during one administration N.J. Department of Environmental Protection employees were not allowed to use the words “climate change” or “global warming” in their reports. How do planners plan for a future when politics prohibit even speaking about its challenges?

The best outcomes will result from proper emergency preparedness and efforts to curtail greenhouse gasses. Some solutions will come from technology. Administrations that support green solution-based economies will have the most positive impact on reversing global warming. We can't be sold on a "no change" answer; we must seek innovative solutions. The good news is that scientists have proven irrefutably that global warming is caused by human activity and therefore the solutions can also lie in human hands.

Sources

Sea Level Rise in New Jersey: Projections and Impacts, Rutgers New Jersey Climate Change Resource Center, May 2020.

Sea level rise and resulting impacts is due to melting ice and thermal expansion and increases the risk. NOAA Climate.gov,