THE VIEW FROM GREAT BAY BOULEVARD: A PATH FROM THE PAST TO THE FUTURE

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Figure 1.

Much of what we know about Great Bay Boulevard has been chronicled in the trail guide prepared by Terry O'Leary and the Tuckerton Seaport but we continue to broaden our understanding of the meadows and the intervening waterways. Great Bay Boulevard, or Seven Bridges Road to many, has seen numerous changes in the past and is likely to see further changes in the future. This is why I am revisiting aspects of this path to allow us to think about the future. This is particularly relevant to its current status as the means of access to the Sheepshead Meadows peninsula. The road approximates a dividing line through the NJDEP Great Bay Wildlife Management Area, and, as such, provides access to a relatively undisturbed piece of nature that is used frequently and in all seasons by hunters, fishermen, bird watchers, artists, and scientists.

The Past

In the distant past, the marshes on the peninsula were formed thousands of years ago after the glaciers receded, when the climates were warming. During this time, the marshes collected large amounts of sediments that allowed them to keep ahead of sea level rise. During this period, the local Lenni Lenape used the area along the road to forage and then dump the shells of mostly hard clams, but also oysters, whelks, and bay scallops. This area, now known as the Tuckerton Mound, is actually much larger than evident because the marshes have grown over it during the period of sea level rise. Advanced dating techniques suggest it is over 1500 years old.

More recently in 1928, the State of New Jersey proposed a road connecting Tuckerton near Little Egg Inlet to the nearby barrier islands with an "Ocean Highway" through the Sheepshead Meadows. This connection was known as the "Tuckerton Cutoff" and is depicted in a 1932 painting by Morris Shriver that lives in the Tuckerton Historical Society ***(Fig. 1)***. The painting indicates the planned, but never completed, road from Tuckerton, down Great Bay Boulevard to a traffic circle where the road would split to go to Long Beach Island to the north and Brigantine and Atlantic City to the south. Evidence for implementation of this plan occurs in a 1930 aerial photograph that shows the construction activity for the road ***(Fig. 2)***. The white signature along the road is likely the result of sediments trucked in to build the road. This is most obvious at the sites where elevated bridges were being constructed over the five major thorofares or creeks through the peninsula. This road and accompanying bridges have a higher elevation than the rest of the marsh.

Figure 2.

At about the same time that the road was being constructed the meadows were extensively ditched, at least closest to Tuckerton, for mosquito control as part of the Works Progress Administration, and Civilian Conservation Corps projects during the Depression. In the 1950s, a portion of the marshes were dredged and filled to provide lagoon developments ***(Fig. 3)*** for Mystic and Osborne Islands and along parts of Tuckerton Creek. Additional details of the history of the road are captured in my history of RUMFS, Station 119 (Able 2015 Down the Shore Publishing).

The Present

Great Bay Boulevard provides, on a daily basis, access to a natural part of the Jersey shore. While there are lots of resident animals that can be observed from the road, especially at night, such as fox, raccoons, mink, and occasionally river otters, there are a host of migrants that appear in certain seasons. The easily seen ones include the summer visiting birds such as a variety of gulls, herons, and egrets, as well as osprey and, more frequently in recent years, eagles. The road, due to its higher elevation, also provides an appropriate nesting place for female diamondback terrapins to lay their eggs, a common occurrence in early summer. In fact, on one day I counted 53 of them on the road during my commute into RUMFS. Evidence, of their egg-laying, if one looks carefully, the one to one and a half inch hatchlings can be seen first in the fall and again in spring and early summer as they are crossing the road. Unfortunately, the road can also be a source of mortality when the increasing traffic on the road causes the death of these egg-laying females and the hatchlings.

The visitors that most people don't know about are the fish that swim under the bridges. The local ones are, for example, mummichogs (minnows),

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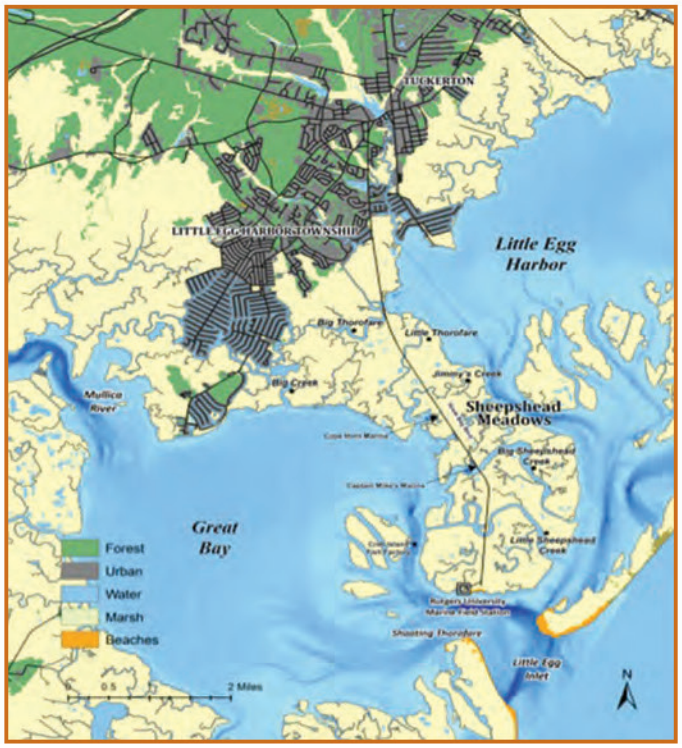

Figure 3.

black sea bass, bluefish, and weakfish. But we also get visitors, especially larvae and juveniles of fishes that were spawned far away including the east coast of Florida (gray snapper, ladyfish), North Carolina (speckled worm eel, butterflyfish, gag grouper, spot) and Massachusetts (pollack, cod). We know about these because we have been sampling them with small mesh (1/25th of an inch) nets off the bridge over Little Sheepshead Creek, once a week on night flood tides, for the past 28 + years. The greatest travelers are the young stages of American and Conger eels that come all the way from the Sargasso Sea, east of the Bahamas.

Where beaches occur along the road, such as at the end of the road at Shooting Thorofare, under Little Sheepshead Creek Bridge, and on the beach near the bridge over Little Thorofare, horseshoe crabs deposit their eggs in the early summer. At the same time many fishes such as striped killifish and mummichogs, as well as laughing gulls, gather to feed on their eggs.

In the last couple of decades there have been many changes along Great Bay Boulevard, but by and large, the meadows have not changed, even after Superstorm Sandy. As a result, they continue to produce plants (largely salt-marsh cordgrass), in vast quantities that are the basis for the estuarine food chain. In addition, these marshes and associated pools, creeks, and embayments provide the habitats for fishes, shrimp, and crabs that reproduce and grow in the system and are critical to many of the local fisheries.

The creeks that wind through the peninsula, especially those that go under the five bridges, are as diverse as the marsh surface is uniform ***(Fig. 3)***. All of them have deep holes, ranging from 13 feet in Jimmy's Creek to 25 feet in Little Thorofare, but their average depths are much shallower from 2.5 feet in Big Sheepshead Creek to 4 feet in Jimmy's Creek and Big Thorofare.

Both Little and Big Sheepshead creeks flood from Little Egg Harbor into Great Bay. The remaining creeks (Jimmy's Creek, Little and Big Thorofare) typically flood in the opposite direction. When we compared the kinds of baby fish caught in small mesh plankton nets between Little Sheepshead, Jimmy's Creek, and Little Thorofare they were approximately the same suggesting the larvae are sloshing and swimming back and forth with the tides from Little Egg Inlet and between Little Egg Harbor and Great Bay. The deep column of water and fast flows in Little Sheapshead Creek may be responsible for the large (2-3 feet in height) yellow sponges that occasionally get caught in our nets fished along the bottom.

There are changes occurring. There is increasing frequency of flooding of the road and the adjacent marshes. We have been tracking this regularly since 2002 when a U.S. Geological Survey tide gauge was installed in the RUMFS boat basin. This so-called "nuisance flooding" has become so frequent that it influences when we can get into and leave RUMFS, sometimes on a daily basis. The most frequently flooded portions of the road are evident from the roadside vegetation. Those areas most frequently flooded have salt marsh cordgrass growing right to the edge of the road and no Phragmites (which does not like to be frequently covered with full strength seawater as occurs on new and full moon tides and during some storms). Another prominent change is the loss of marsh at the end of the peninsula at Shooting Thorofare. This is occurring at the rate of about one foot per year over the last 30 years. The former, now cut-off, telephone poles in the water at the end of the road are evidence of this.

Figure 4.

Other changes along Great Bay Boulevard have occurred to reduce mosquito breeding. In recent years, an alteration known as Open Marsh Water Management (OMWM) has been used to spread marsh peat with a rotary ditcher ***(Fig. 4)*** to fill in lower areas where mosquitos lay eggs while creating pools that will retain fishes, such as mummichogs and their relatives, to eat the mosquito larvae that live in the water. This type of alteration is evident from a helicopter above Great Bay Boulevard ***(Fig. 5)***, closest to Tuckerton, where OMWM areas with created ponds and connecting ditches provide mosquito-eating fish habitat. Marsh pools of increasing size, as in the upper portion of the photo, are evident, due to higher sea levels in recent decades.

The combination of relatively unaltered marshes and waterways and the human "experiments" with marshes such as lagoon development and mosquito control make the Sheepshead Meadows along Great Bay Boulevard an exceptional place for research and teaching. As a result the number of research publications based on these meadows continue to grow (over 120 at last count) with a number of ongoing and proposed

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Figure 5.

projects that will further our understanding of how this ecosystem functions and how to make it more resilient to sea level rise and flooding. These same advantages provide an exceptional baseline for education of students and teachers. Other users are naturalists and scientists including those located on Great Bay Boulevard such as RUMFS, the Jacques Cousteau National Estuarine Research Reserve, and others who are working there such as NJDEP, Stockton University, Barnegat Bay Partnership, Georgetown University, and University of Denver, all in an effort to understand these unique marshes.

The Future

The increased flooding of Great Bay Boulevard may threaten many of the activities of a variety of users or at least control their timing. This is obvious in the reduced number of marinas since Superstorm Sandy. The effects of sea level rise are also increasingly evident there because of major storms such as Sandy, winter nor'easters, or simply regular moon tides. Future predictions suggest that given 1 foot of sea level rise almost the entire peninsula, including Great Bay Boulevard, will be under water on average high water conditions. The limited exceptions will be the bridge approaches and bridges, some dredge disposal sites, the fish factory site and a fringe of slightly higher dunes in the vicinity of the Big and Little Sheepshead creek mouths near Little Egg Inlet. Thus a progression from "nuisance flooding" to "obnoxious flooding" is likely.

Unfortunately there are many uncertainties about the timeline for this flooding that hamper planning for a response. Fortunately, however, the ongoing research by the institutions mentioned above will provide some insight into the effects. In addition, these places may help to evaluate how the beneficial use of clean dredged sediments can decrease the effects of flooding and make the marshes more resilient to sea level rise. Thus, Great Bay Boulevard and the Sheepshead Meadows could become a center for sea level research and teaching and help us to understand the effects and how to deal with the future.

Acknowledgments

Several institutions and individuals contributed background materials including the Tuckerton Seaport and Tuckerton Historical Society. RUMFS personnel helped prepare the text and maps.

Figures

1. Painting from 1932 of proposed Ocean Highway from Tuckerton to Long Beach Island and Atlantic City including the Tuckerton Cutoff, now known as Great Bay Boulevard.
2. Aerial image of Great Bay Boulevard under construction during 1930s.
3. Map of Great Bay Boulevard in the Sheepshead Meadows with location of former fish factory, marinas, and major thorofares.
4. Rotary ditcher modifying the marsh along Great Bay Boulevard for mosquito control.
5. Helicopter image of altered (lower, open marsh water management for mosquito) and unaltered (upper, extensive ponding on marsh surface due to sea level rise) marsh along Great Bay Boulevard.

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