

# THE MULLICA RIVER

## Great Bay is a Unique Estuary

This estuary, as for others, is a location where freshwaters from the land meet and mix with the salty waters from the ocean. The Mullica River – Great Bay estuary is an exceptional body of water, not just by New Jersey, but also by east coast of the US, standards. This drowned river valley, which was formed over the last 1,000 years is unusual and unique for several reasons. The greatest overwhelming influence is that it has relatively few people living in the watershed. Further, this watershed is likely to remain that way into the future because of numerous federal and state holdings that provide protection from development. Much of the upstream portion, both land and water, is part of the Pinelands National Reserve. As you come downstream, and the water becomes saltier, there are state protected properties such as the Wharton and Bass River state forests (Fig. 1). Further downstream, near the mouth of the Mullica River where it joins Great Bay, the salinity is even higher and many of the surrounding marshes are part of the Forsythe National Wildlife Refuge. These holdings in the Refuge, and the Great Bay Boulevard Wildlife Management Area, continue down to the saltiest part of the estuary where water from the ocean comes into Little Egg Inlet.

This estuary and its watershed is a moderately large system, about 365,000

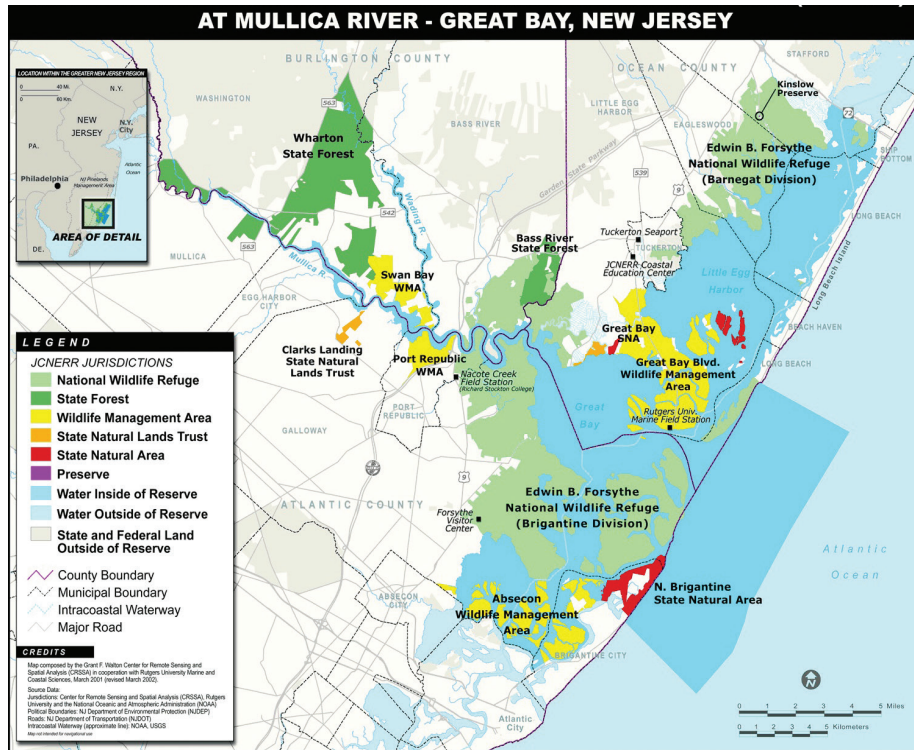


Figure 1: Map of watershed with protected holdings and location names

acres, and of this, approximately 115,000 acres are protected as part of the above holdings. This combination of protected watershed, low human population density and general lack of extensive development makes this the cleanest estuary in the northeastern U.S. and one of the cleanest estuaries along the east coast of the U.S. This is often hard for many people to believe because it is embedded in the most densely populated state in the U.S. with hundreds of years of development in the state's history. But once people have seen the system and understood the connectivity of protected waters, from freshwaters to the ocean, they appreciate its unique nature. All of this has been substantiated because the Mullica River – Great Bay is a central part of the Jacques Cousteau National Estuarine Research Reserve. Many of the unique attributes of this

estuary were first generally realized in John McPhee's book on the Pine Barrens. Subsequently, many have contributed to our understanding of this estuary, but the focus has often been on the forests and marshes. Less is known about events beneath the surface of the waters of the estuary.

One of the other unique features beneath the surface of this estuary is that it has naturally low pH (acidic) waters in much of the Mullica River. This results from leaching of tannins from the oaks and pines in the upper watershed that, when mixed with the water, create tannic acid and give the system its acidic, tea-colored water. In addition, these waters are unique because they typically have very high levels of dissolved oxygen that many animals such as fishes and crabs rely on, yet are lacking in many other estuaries. This estuary is also exceptional because of the diversity of its aquatic habitats. A bird flying over the watershed can see that the watershed is dominated by numerous tributaries from Hammonton Creek, Nescochague Creek, Sleeper Branch and Atsion River in the upper portion, to larger ones, such as the Wading and Bass rivers in the lower portions. Elsewhere, large islands, such as the Hog Islands, near where freshwaters first meet saltwaters, and the waters are most turbid in most years, provide more shallow edges. Low-

er down the Mullica River, extensive salt marshes surround the watershed (Fig. 2). Lower in Great Bay, there are extensive salt marsh islands and adjoining sand bars that were formed as sediment coming in from the ocean was deposited on flood tides during a prior period of sea level rise (Fig. 3). Even more extensive and unaltered salt marshes occur on the peninsula known as Sheepshead or Tucker Meadows (Fig. 4). This peninsula, especially, is cut by several thorofares such as Little and Big Sheepshead creeks. Some of these are relatively deep (more than 15ft) and have immense (2-3ft tall) yellow sponges attached to the bottom. Some of the deepest portions of the estuary are in Shooting Thorofare (40 ft) as it passes by the Rutgers University Marine Field Station. The mouth of the estuary is the most dynamic, with inlets coming and going over the years, with names like New Inlet and Beach Haven Inlet. (Some of this is detailed in a book-length history of the region by this author – Station 119: From Lifesaving to Marine Research.)

Additional underwater habitats provide even more diversity and range from large mats of broken down plant material and numerous stumps of ancient white cedar trees, especially in the vicinity of Hog Islands, to deeper channels joined by extensive continuously flooded marsh creeks and other creeks that are only flooded on high tides. Further downstream, especially in the meandering, deeper portions of the lower river down to Graveling Point, there are accumulations of oyster shell and living oysters. In the central portions of Great Bay there are few hard bottom habitats such as these, and the bottom consists of muddy sand or sandy mud, and becomes even sandier as you enter the lower portion of the bay. Closer to the inlet, in the deepest (up to 30-40ft) habitats, where the currents are quite strong, the bottom is covered with extensive sand waves, with some up to 6ft in height. Also in these deep waters, adjacent to salt marshes such as in Shooting Thorofare, there are large chunks of marsh peat that have calved off the edge of the marsh and accumulate on the bottom as “peat reefs”. These provide rough bottom topography where they occur.

These unique combinations of diverse, clean habitats are reflected in the diversity of plants and animals that are resident or seasonal occupants of this estuary. The extensive and productive salt marshes, which provide for the overall productivity of the system, are central. These are supplanted by extensive macroalgae



*Fig. 2. Aerial photo of Mullica River where it is crossed by the Garden State Parkway*



*Fig. 3. Aerial photo of extensive sand flats at marsh islands near abandoned fish factory*



*Fig. 4. Aerial photo of extensive marshes around Great Bay Boulevard at Little Egg Inlet*

beds, like that of sea lettuce. All of these plants collect energy from the sun that is eventually conveyed to the animals in the system. This diversity includes some animals that only dabble beneath the surface (many kinds of ducks), others that skim the surface of the water (appropriately named Black Skimmers), penetrate the water only briefly and very shallowly (several kinds of terns), or more deeply (cormorants and loons), or stay under

for long periods of time (marine mammals such as harbor seals in the winter, bottlenose dolphins in the summer, and an occasional river otter). A diverse array of fishes are found in this estuary. Many of these occur most commonly along certain salinities (white perch in fresh or low salinity water, bluefish, weakfish and summer flounder or fluke from the inlet to the lower river, and tautog which are most typically found in the lower portions of the estuary near the inlet). Others such as striped bass use all portions of the estuary from the inlet to tidal freshwaters up in the Mullica River. Crabs also use the system in different ways. Rock crabs come into the lower estuary in the winter but leave as the waters warm in the spring. Blue crabs are found throughout the estuary, but where they are found differs somewhat by sex, with males more abundant upstream, in the lower salinity waters, and females more abundant downstream near the inlet, especially in the winter.

One of the reasons so much is known about this estuary is that it is home to several institutions whose job it is to understand it as much as possible. Several academic institutions (Rutgers University Marine Field Station located near Little Egg Inlet, Stockton University's Marine Lab on Nacote Creek) have been active for decades. Personnel at the federal facilities of the US Fish and Wildlife's Forsythe Refuge are actively engaged in management of their extensive holding and the same is true of the JC-NERR with its intensive monitoring in the aquatic portion of the estuary. Over the years, the NJDEP Bureau of Fish and Wildlife, which is also located in Nacote Creek, has contributed extensively to our understanding of the commercially and recreationally important fish and shellfish in this estuary.

All of these attributes and facilities make the Mullica River – Great Bay estuary an exceptional baseline to figure out how natural estuaries function and how these functions change in more impacted estuaries such as northern Barnegat Bay and New York Harbor.

*The aerial photos were provided by Pete McClain and Lisa Auermuller. Some of the bottom habitats are based on earlier work by Mike Kennish.*