MANAGEMENT PLAN
FOR
MECOX BAY

October 2019

Prepared by:

Trustees of the Freeholders and
Commonalty of the Town of Southampton
and
Town of Southampton
Department of Land Management

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ACKNOWLEDGEMENTS AND FORWARD

This report could not have been prepared without the hard work and dedicated effort of Town of Southampton Chief Environmental Analyst Martin E. Shea and Senior Environmental Analyst C. Theresa Masin, and Coastal Science & Engineering Inc. (CSE), who were the primary authors of the early drafts of this document. Credit is likewise due to Aram Terchunian and First Coastal Corporation and the Stony Brook University School of Marine and Atmospheric Sciences (SoMAS), who assisted generously in completing the necessary scientific review, providing guidance with respect to needed water quality monitoring data, and addressing the challenges inherent in writing this plan.

The objective of this Management Plan is to create a state-of-the-art adaptive science-backed plan for maintaining Mecox Bay and its inlet. It represents the institutional knowledge of the Trustees coupled with scientific research and data and the input of various regulatory agencies, researchers, land managers and various stakeholders including freeholders, residents, farmers, and baymen on how to best conserve this resource, as well as to provide a model and foundation for wise long-term joint coastal zone management by Trustees of the Freeholders and Commonalty of the Town of Southampton.

This Management Plan represents years of hard work and the collective efforts of countless individuals. The Trustees wish to extend their thanks to all of their staff who have worked on this plan, including James Duryea, Lisa Dunlap, Martha F. Reichert, Kara Bak, and our Coastal Stewards. Thank you to Jim Walker and his staff at Interscience for all of their work. Thank you to our elected representatives, Fred W. Thiele, Jr., Kenneth P. LaValle, Lee Zeldin, and their staff for attending and facilitating conversations between all the involved regulatory agencies at every level of government. Thank you to the Farm Bureau, John v.H. Halsey and Peconic Land Trust, and Cornell Cooperative Extension. Finally, a hearty thanks is also due to the many residents of our Town who attended the several public hearings and meetings, provided constructive comments, and helped the Trustees cross the finish line to adopt this Plan.

October 7 2019
Southampton, New York

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EXECUTIVE SUMMARY

Mecox Bay is a unique coastal recourse. It is the largest salt pond on the South Fork of Long Island, consisting of approximately 1,100 acres of brackish water and home to millions of shellfish, myriad fish and wildfowl, including two bird species that are listed as endangered or threatened. On its shores are lands that have been farmed for centuries and approximately 300-plus family homes.

Mecox Bay is fed by fresh water draining from the surrounding region. It is separated from the ocean by a sand bar that connects Flying Point and Scott Cameron Beaches. Natural processes open a temporary channel between the bay to the ocean, which allows the bay drain and be refreshed with seawater from the incoming tide, fish go back and forth (and, more recently, pollution gets flushed out to sea) until those same natural forces close the channel.

Starting long before the arrival of the first European settlers in 1640, the indigenous peoples of Southampton had a bay management plan—whenever the water level got too high in the bay, a channel was dug by hand to the ocean (later, by machinery), and left open until nature sent storms or tides to close it up. In recent times, this process has been complicated by regulatory constraints at multiple governmental levels coupled with a greater frequency of weather events that fill the bay faster than in the past. As a result, Mecox Bay has been confronted dying oysters, starving clams, unsheltered wildfowl, swampy fields, drowning fruit trees, agricultural loss, structural damage to residences, flooded roads, basements, and septic systems, and a rising water table.

The Trustees of the Freeholders and Commonalty of the Town of Southampton (the “Town Trustees” or “Trustees”) provide their plan for the future management of Mecox Bay and its ephemeral inlet, together with the history, science and environmental and social considerations underlying the plan.

Our plan sticks with what has what worked for centuries, but within a broader scientific content. These are the key elements:

1. Monitor bay water levels, salinity and other water quality metrics regularly.
2. Open the inlet whenever the trigger water height or salinity level is reached.
3. Allow the inlet to remain open until closed by nature, unless there is a showing of material harm from its continued opening.
4. Take steps to mitigate possible negative effects from openings of the inlet.
5. Take steps to reduce land-based pollution flowing into the bay.
6. Implement a dredging program to ensure proper water flow and depth within the bay.
7. Plan for beach renourishment and coastal resiliency in light of long term climate change.

The Town Trustees will implement this plan in consultation with the US. Army Corps of Engineers, the US Fish & Wildlife Service and the New York State department of Environmental Conservation. Issuance of a 10-year dredging permit from the Army Corps will make possible a parallel long-term permit from the New York State Department of Environmental Conservation.

As a requirement for granting the ten-year dredge permits, USACE and NYSDEC required the Trustees to prepare this management plan. Under the permits, the Trustee will be permitted to open and close the Mecox Bay Inlet pursuant to the parameters and thresholds set forth in the Plan as well as dredge once a year a longer central channel through the sand flats and back bay shoal to ensure successful water flow when the inlet is opened.

The goals of this Management Plan for Mecox Bay are to improve water quality, restore aquatic habitat, protect shellfisheries, mitigate human health issues and property damage caused by a high bay, and reduce storm damage. These goals are coupled with the Trustees' overarching vision of protecting and sustaining the outstanding ecological and economic values of this unique coastal resource. This plan implements strategies for maintaining the bay and the inlet using an adaptive management approach based on the best science available.

INTRODUCTION

The Trustees of the Freeholders and Commonalty of the Town of Southampton

The Trustees of the Freeholders and Commonalty of the Town of Southampton (the "Trustees" or "Town Trustees") have adopted this management plan for Mecox Bay, the largest barrier pond on the South Fork of Long Island which is located in the hamlets of Water Mill and Bridgehampton, in the Town of Southampton, Suffolk County, New York. Mecox Bay is coastal estuarine pond with an ephemeral inlet to the Atlantic Ocean known as the Mecox Inlet or the Mecox Cut, and the bay itself is marked by approximately 7,500 linear feet of southerly sand bar or barrier, inclusive of dunes and beaches, along the Atlantic.

The Trustees of the Freeholders and Commonalty of the Town of Southampton are a corporate body politic and the owners of all of the underwater lands located within the Town of Southampton, including Mecox Bay and the Mecox Inlet. The source of their ownership and authority to regulate Mecox Bay are the colonial-era charter known as the Dongan Patent of 1686 and several acts of the New York State Legislature including Chapter 155 of the Laws of 1818, Chapter 283 of the Laws of 1831, and Chapter 133 of the Laws of 1902. New York courts have time and time again upheld the Trustees' authority pursuant to the Dongan Patent and these laws.

It is believed that the Shinnecock Indians practiced the opening of the Mecox Cut, known as the *seapoose* or little river in the Shinnecock language, in order to keep the salinity of the bay optimal for shellfish, which they harvested there. The first recorded opening of the "seapoose" by the colonial settlers took place in 1644.

Since then, the Trustees have continued to manage Mecox Bay for more than 300 years by opening the Cut from time to time in order to maintain the health of the bays and the creatures it supports, and also to balance the sometimes competing needs of baymen, farmers, summer residents, and recreational boaters, with respect to the water levels of the bay.

In addition to their authority pursuant to the Dongan Patent to manage Mecox Bay, the New York State Legislature has also passed Chapter 257 of the Laws of 1892, Chapter 872 of the Laws of 1896, and Chapter 403 of the Laws of 1907, all of which specifically grant the Trustees, *inter alia*, the authority to order and secure an inlet or inlets from Mecox Bay to the Ocean "*from time to time, whenever in their judgement it shall be necessary.*" Copies of these legislative acts are included as Appendix D to this Plan.

Figure 1: Location of Mecox Bay within the Town of Southampton.

This Management Plan represents the consolidation of 300 years of Trustee institutional knowledge coupled with the best available scientific research and data in order to provide a blueprint for the management of Mecox Bay.

Although the Trustees have currently agreed to work with all of the involved state and federal permit issuing agencies, no part of this Plan shall be construed as a waiver of the Trustees' rights, jurisdiction, and authority to manage Mecox Bay pursuant to the Dongan Patent and the several Acts of the New York State Legislature.

Overview of Mecox Bay

At nearly 1,100 acres, Mecox Bay and its tributaries rank as the largest of the back barrier ponds on Atlantic Ocean beaches on the south fork of Long Island. The bay is marked by approximately 7,500 linear feet of southerly sand bar or barrier, inclusive of dunes and beaches, along the Atlantic.

Mecox Bay is valued for its natural beauty and biodiversity and is one of Southampton's greatest natural assets. Blessed with a wide variety of aquatic and terrestrial habitats, the region is recognized as significant coastal fish and wildlife habitat by both the U.S. Fish and Wildlife Service and the New York State Department of State. A center for migratory and wintering shorebirds and waterfowl, the area also boasts abundant shell fisheries, including prime American oyster *(Crassostrea virginica*) grounds, ribbed mussel *(Geukensia demissa)*, soft shell clam *(Mya arenaria)*, and blue craw crab *(Callinectes sapidus)*. Documented indigenous finfish include inland silverside *(Menidia beryllina),* sheepshead minnow *(Cyprinodon varigatus),* atlantic silverside *(Menidia menidia),* white perch *(Morone americana)* and striped killifish *(Fundulus majalis)*.[1] Shorebirds of note include federally threatened piping plover *(Charadrius melodus)* and state threatened least tern *(Sterna antillarum)*, as well as potential occurrences of federally endangered roseate tern (*Sterna dougallii)* and federally threatened red knot (*Calidris canutus rufa).* Among the area's more significant raptors are state threatened northern harrier (*Circus cyaneus)*, osprey *(Pandion haliaetus),* federally endangered peregrine falcon *(Falco peregrinus),* bald eagle *(Haliaetus leucocephalus)* and snowy owl *(Bubo scandiacus).* Migratory waterfowl include, among others, Canada goose *(Branta canadensis)*, American black duck *(Anas rubripes),* mallard *(Anas platyrhynchos),* red-breasted merganser *(Mergus serrator)* and greater scaup *(Aythna marila).* In recent years, occurrences of federally threatened seabeach amaranth (*Amaranthus pumilus) and* rare state protected seabeach knotweed *(Polygonum glaucum)* have also been documented.

A vibrant destination for wind surfers, sailors, bird watchers, photographers and artists, the bay likewise offers irreplaceable open space and unique recreational experiences and is, for that reason, treasured by residents and visitors alike. Ice boating is synonymous with Mecox, as the area is one of the few areas on Long Island, where this unique historic pastime can still be enjoyed. A haven for commercial and recreational baymen, Mecox Bay also abounds in natural scenery and is widely acclaimed as one of the most important coastal resources on Long Island's East End. Without question, the bay is an integral part of the Town's culture and identity, and is inextricably linked to the environmental and economic health of the town.

THE HYDROLOGY OF MECOX BAY

Planning for good management and stewardship of Mecox Bay is predicated upon a better understanding of the dynamic natural forces and hydrology that shape this coastal ecosystem, which evolved precariously within the coastal outwash plains along the edge of the greater Atlantic.

Periodic connections to the ocean, as a consequence of storms, seasonal high water, wave action, or mechanical openings, drive the system by allowing salt water to frequently enter the shallow bay, raising salinity levels and maintaining brackish conditions. During periods when the bay is closed to the Atlantic, groundwater seepage and freshwater from rainfall and runoff accumulate cause water levels to raise thereby lowering the salinity and increasing the input of nitrogen and contaminants.[2] There is conclusive historical evidence that the Mecox Inlet has been subject to human management since pre-colonial times (the first Europeans arrived in 1640). According to a host of accounts, the Shinnecock people, now the federally recognized Shinnecock Indian Nation, periodically dug by hand the seapoose or "little river" connection to the Atlantic, in order to maintain bay quality and enhance its shellfishery, which were vital to the tribe.

Nearly the entire margin of Mecox Bay is low-lying and includes mostly residentially developed land, active farmland and protected open space. Consequently, high water levels cause flooding and property damage to residences, valued agricultural lands, and local roads and lead to lower salinity levels which impact shellfish health. High bay water levels also impact natural shorelands and intertidal habitat utilized by threatened or endangered species along the shoals and margins of the bay.

Today, in order to mitigate the adverse impacts of high water levels and improve water quality, the Trustees periodically open Mecox Inlet by mechanical excavations across a narrow barrier spit, thus allowing the bay to drain and be flushed with ocean water. In the absence of natural openings, these mechanical openings become critical to restoring normal water levels, flushing the bay of contaminants, and increasing salinity rates, thereby protecting both human health and property, as well as aquatic habitats.[2]

Typically, each manmade opening involves excavation of a narrow pilot channel across the sand spit, including cutting of the surf berm. Elevated waters in the bay tend to drain seaward and cut a channel to some limited dimension, then subsequent tidal action breaks through the surf berm, introducing ocean water into the bay. After a number of tidal cycles, littoral sands tend to accumulate along the ocean entry point and cause shoaling and closure of the inlet.[2] Mechanical closures, when deemed necessary as a consequence of excessive channel migration and/or severe storm threats, are completed utilizing dredged compatible sand.

Preparation of this plan considered the alternative of leaving the fate of Mecox Bay, inclusive of the Inlet, in the hands of unimpeded natural barrier processes, without human intervention. This alternative was rejected, for these reasons: first, there is no evidence that four or more centuries of human intervention have had adverse consequences on the bay, or its surrounding ecosystem, or on the plants and animals inhabiting therein; second, hurricanes, nor'easters and other major storm events have a demonstrated impact that is orders of magnitude greater than anything observed as a result of periodic Inlet opening or closing or other bay management activities; and third, to the degree that human management activity has observable consequences, numerous strategies and practices exist today to mitigate or eliminate those consequences. This plan expressly acknowledges that further study is needed to more fully understand how natural Inlet openings affect the sediment budget and littoral system and whether closure can be essential to maintaining the integrity of the beaches and protecting the barrier island and mainland from damaging storms.

Concurrently, the continued health and integrity of Mecox Bay is, without question, at risk. Development of the Mecox Bay flood plain and residential crowding of the shoreline, together with septic effluent, road runoff, pesticides, fertilizers, herbicides and household chemicals, have undoubtedly altered, the natural features and dynamics of Mecox Bay. These changes have resulted in both environmental and economic costs, including: threats to biological productivity, loss of aquatic habitats, water quality degradation, disruption of estuarine fisheries, hazards to human welfare and property, and diminished recreation - all of which present challenges for even the ablest of stewards of sea and land to solve.

Fortunately, a wide variety of technical and institutional means exist for mitigating these impacts, including restoration of wetlands and watershed vegetative cover; adherence to environmentally sound building practices; landward relocation, elevation and hurricane flood proofing of structures; continued ocean beach re-nourishment; construction and maintenance of emergency sand stockpiles, requirements for septic system upgrades; and periodic opening and closure of the inlet.

Support for exploring other water control strategies, such as building of armored jetties, tidal or sluice gates, weirs, ocean-bay water exchange pipes, use of hydraulically driven sheet piles to create temporary or permanent walls, or other structures, has been voiced by some. However, the hydrodynamics of the inlet corridor, the likelihood of storm damage, sand and sediment accumulation, and negative effects on aquatic organisms and habitats are all anticipated to be high. Construction, maintenance and repair of engineered water flow management structures would obliterate the flood shoal and sand flats, thereby destroying habitat for listed species. Sediment inputs to the bay would likewise be blocked. Perhaps more importantly, inlet stabilization and associated shoreline armoring would conflict harshly with natural coastal and barrier island processes. In sum the economic and environmental costs of these other water control strategies would be undoubtedly exceedingly high.

The Mecox Bay Management Plan comprises a strategy and a plan of implementation to address urgent ongoing environmental and economic impacts. The plan's anticipated time frame is ten years. Should there occur prior to that time material change in the environmental or other circumstances that frame the plan, or evidence of need to modify provisions of the plan, this plan calls for the Southampton Town Trustees to work with the relevant local state and federal agencies to modify the plan to effectively address those changed circumstances.

SETTING OF MECOX BAY AND ITS INLET

With nearly 1,100 acres of open water, Mecox Bay and its tributaries represent the largest coastal back barrier pond on the south fork of Long Island. A product of the Wisconsin glacier, this estuary originated as an outwash stream and plain nearly 20,000 years ago[6] with early land and water contours being later shaped by the rise of sea level and the action of oceanic waves.

During this period, Long Island's south shore evolved into a series of linear barrier islands, sand spits, mainland strands, and bay-mouth bars between Montauk Point and New York Harbor.[7] As sea levels approached their present position around 5,000 years ago, smaller drainage ways, such as Mecox Bay, became enclosed and isolated by bay-mouth bars. These narrow, sandy barriers were built by waves and littoral sand transport, which in the case of Mecox Bay is predominantly east to west.[8]

In general, the smaller ponds on Long Island's South Fork have insufficient area and tidal volume to maintain a permanent inlet and connection with the ocean. However, storm tides occasionally breach the barrier and provide a temporary inlet for tidal exchange. These breach channels tend to close soon after opening, due to deposition, accumulation and shoaling of littoral sediments across the entrance.[2]

Periodic breaches at the mouth of Mecox Bay serve two important purposes:

1) They drain the bay and restore water levels closer to mean tide levels in the ocean.
2) They flush bay waters of contaminants and pathogens, increase dissolved oxygen levels, enhance water clarity and add salinity to create brackish conditions favored by shellfish, as well as by aquatic and wetlands floral and faunal species.[1,2]

Tidal flushing also helps to reduce excessive buildup of nitrogen laden nutrients and harmful algal blooms (HABs), which buildup is exacerbated by runoff from fertilized lawns, farmland, groundwater seepage from septic systems, increased water temperatures and periods of low dissolved oxygen.

Historically, Mecox Bay has been drained when water levels are 16–20 inches above normal low bay.[2] Differences in water levels between the bay and ocean facilitate opening, by natural cutting of a channel as the bay drains. Thus, relatively small-scale dredging or excavations may initiate the inlet connection, tending to minimize deposition of littoral sands in the bay. Notwithstanding this process, each opening can temporarily affect longshore sand transport at the entrance channel and produce varied yet typically minor localized impacts to the adjacent ocean beaches.[2]

According to historical records maintained by the Trustees going back some 300 years, Mecox Bay is generally opened 6–8 times annually. Each opening tends to persist for several days to a week or two weeks before the entrance shoals and closes naturally. On average, 1,200 cubic yards (cy) of sand are excavated for the purposes of mechanical opening, with 500-1,500 cy temporarily stockpiled, as a consequence of dredging, and 800-1,000 cy typically re-used, when necessary, for mechanical closure.

Between 1971 and 2018, there were a reported 382+ events in which the Mecox channel was open.

Some events lasted only a few hours while the maximum duration was 128 days. Table 1 (from Town Trustees records) shows the channel was open an average of ~74.96 days per year based on 8.13 openings annually. The average number of days per opening is 9. About 20.8 percent of the openings were natural (i.e. – ~1.4 per year) and the balance man-made. Only 17 events are listed as man-made closures, whereas 94.5 percent of events naturally closed. The number of events per year ranged from 2 (1971) to 16 (1998).

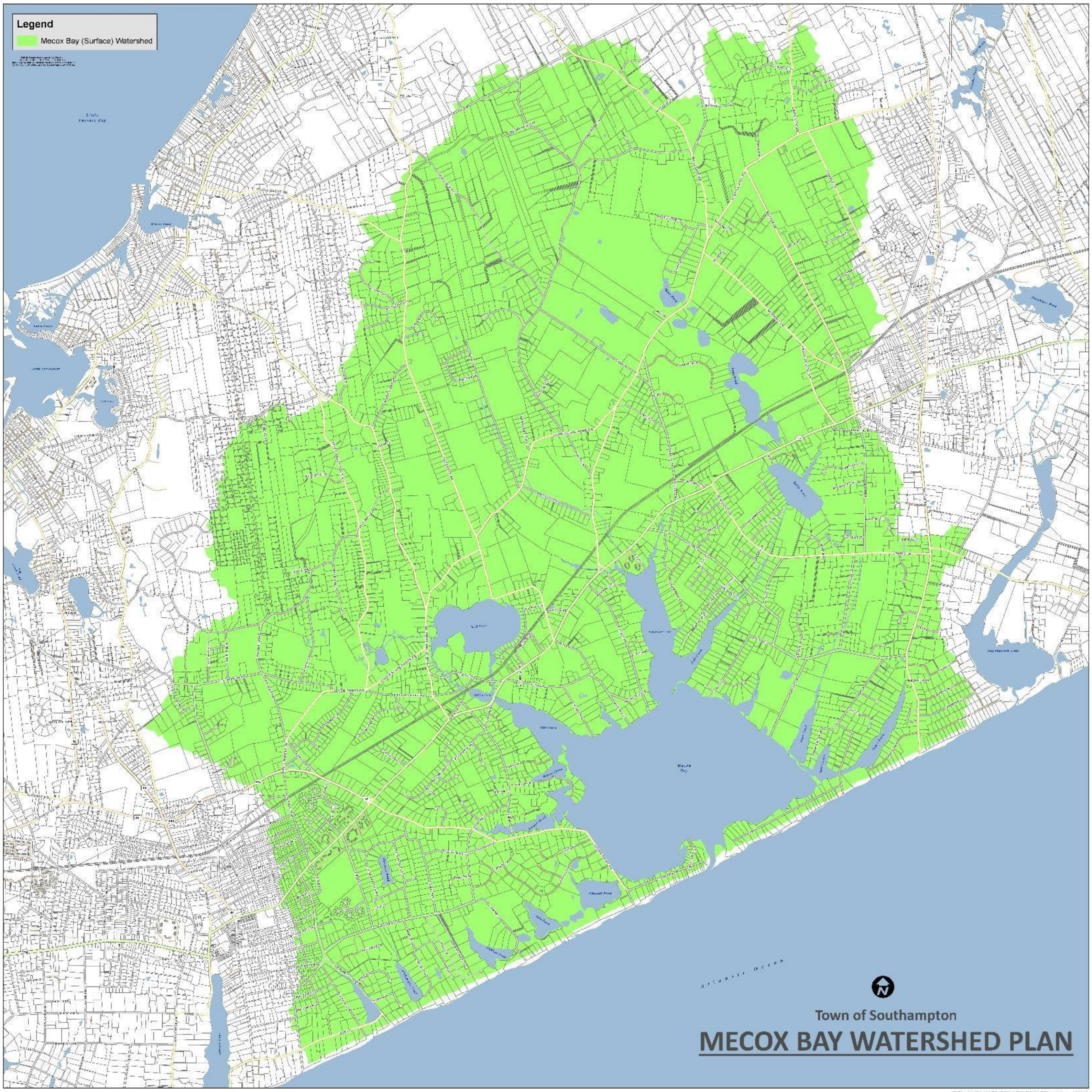


Figure 2 - Mecox Bay Watershed

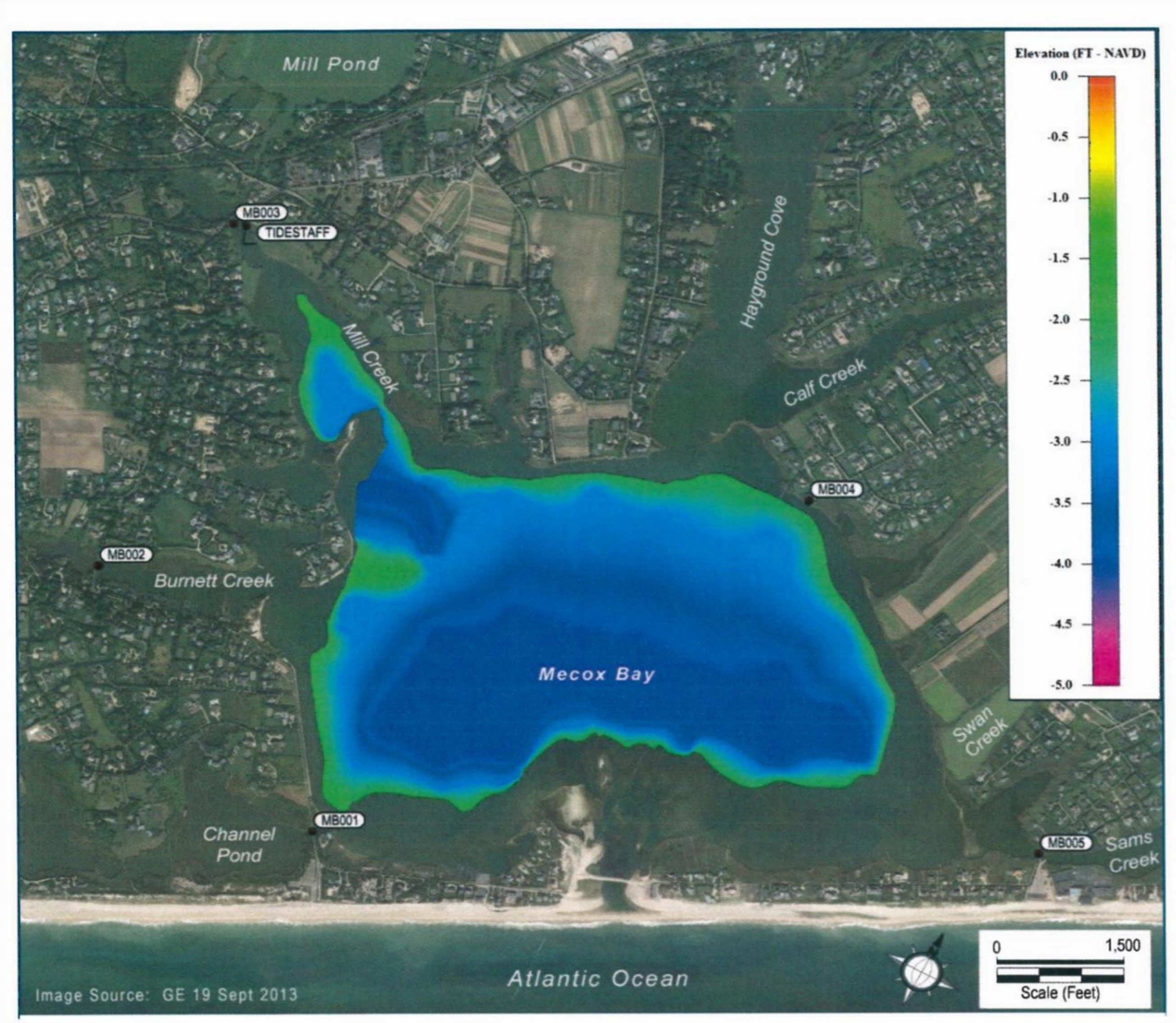


***Figure 3:** Mecox Bay encompasses ~1,100 acres of open water and wetlands, and periodically drains via an ephemeral inlet within a 1,000-foot (ft.) floodway between Flying Point Road (to the west) and Dune Road (to the east). Average water depth in the bay is ~3.5 below mean sea level. Rough contours in ft. NAVD based on limited bathymetry data collected by CSE in June 2014. Stations (MB### series) are local benchmarks for measuring water level. "TIDESTAFF" is located where Town Trustees have monitored bay water levels for many years. The maximum floodway at the entrance is ~1,000 ft. wide. Typical planned channel openings are confined to a 150-200 ft. wide floodway. The narrow dike following the alignment of Dune Road was constructed after Hurricane Sandy (27 October 2012) and used to reduce the thread of an unplanned breach prior to a beach nourishment project (15 October 2013 to 21 February 2014) along Bridgehampton and Sagaponack beaches. [Image Source: Google Earth 2013]*

Figure 4: Mecox Inlet- open.

Storms also periodically open an inlet to Mecox Bay with five major events recorded by Town Trustees: January 1978, Halloween 1991, December 1992, March 1993, and October 2012 (Hurricane *Sandy*).

Storm openings, however, differ from mechanical openings in terms of inlet dynamics and hydrology. Storms surges raise ocean tide levels and wave heights, which lead to overtopping of the barrier spit, a breach of the berm or inlet channel, and connection with the bay. Because surges are generally associated with much higher waves than normal, the initial conditions of a breach can capture large volumes of sand and drive washover deposits into Mecox Bay. Storm breaches can draw off sand from the adjacent beaches and can lead to some accelerated erosion near the entrance.[2] As storms subside and ocean tides return to normal, high water in Mecox Bay will typically create a prolonged outflow through the breach and generate a shoal on the ocean side of the entrance.[2] When conditions return to normal, the breach channel will allow tides to flow in and out of the bay for a number of tidal cycles until shoaling rebuilds the bar across the entrance.[9] Upon closure of the inlet, the littoral movement of sand is typically fully restored.

The process of inlet closure is controlled by the balance between tidal flows (tending to keep the channel open) and wave action (tending to build up the beach and move sand across the entrance).[10] Tidal flows in the inlet are strongest during spring tide conditions (two week intervals when the tide range is higher than normal). Flows are weakest during neap tide conditions when tide range is lower than normal. The combination of neap tide conditions and higher-than-normal wave heights is considered optimal for inlet closure.

Table 1: Mecox Bay Openings [Source: Town of Southampton Trustees 2019] See Note (Page 1 of 2)*

Year	Openings (Event Reported)	Total Number of Days Open	Average Days Open Per Event	Openings Exceeding 24 Hours	Opening Naturally	Opening Manmade	Openings During Plover/Tern Nesting Season	Days Open During Plover/Tern Nesting Season #	Reported Closed Naturally	Closed Manmade
1971	2	148	74	2	0	2	1	60	0	2
1972	8	137	17.1	7	2	6	4	32	5	2
1973	6	73	12.2	5	1	5	3	16	6	0
1974	5	261	52.2	5	2	3	1	35	5	0
1975	5	77	15.4	5	1	4	1	29	5	0
1976	7	135	19.3	7	2	5	2	64	7	0
1977	5	178	29.7	4	2	3	0	0	3	1
1978	13	294	21	14	4	9	6	62	13	1
1979	5	28	5.6	5	0	5	1	4	5	0
1980	5	72	10.3	7	1	4	1	17	6	0
1981	7	34	5.7	5	0	7	2	19	6	0
1982	5	64	12.8	5	0	5	2	21	5	0
1983	6	131	21.8	6	1	5	1	12	4	2
1984	10	72	7.2	9	2	8	7	42	7	3
1985	9	57	6.3	7	0	9	1	5	7	0
1986	8	35	4.4	8	0	8	1	2	8	0
1987	15	56	3.7	12	0	15	6	19	12	0
1988	16	82	5.1	10	1	15	9	15	10	0
1989	12	67	5.6	11	1	11	5	37	11	1
1990	7	106	11.8	8	2	5	1	44	8	0
1991	9	102	11.3	8	4	5	3	35	7	1
1992	10	156	15.6	8	2	8	4	41	8	0
1993	7	89	12.7	7	1	6	3	11	7	0
1994	6	122	20.3	6	1	5	1	11	6	0
1995	7	98	10.9	7	0	7	1	19	7	0
1996	9	38	2.7	8	0	9	5	18	8	0
1997	9	18	2	2	6	3	3	ID	2	0
1998	0	ID		4	0	0	1	ID	ID	0
1999	6	42	7	3	0	6	1	22	3	0
2000	5	114	22.8	4	0	5	3	36	4	0
2001	5	6	1.2	1	1	4	2	85	2	0
2002	6	5	0.8	1	1	5	1	ID	1	0
2003	10	32	3.2	2	3	7	5	ID	6	0
2004	12	25	2.1	2	0	12	3	ID	12	0
2005	8	1	0.1	1	0	8	3	ID	8	0
2006	11	105	10.5	4	0	11	4	ID	11	0
2007	8	50	6.3	4	3	5	3	ID	7	0
2008	12	21	1.8	7	1	11	6	ID	9	0
2009	13	60	4.6	7	2	11	4	ID	9	0
2010	10	62	6.2	9	0	10	2	10	9	0
2011	7	22	3.1	1	1	6	3	ID	5	0
2012	8	12	1.5	4	1	7	4	ID	5	0
2013	9	45	5	3	4	5	4	ID	3	1
2014	14				5	9	5	ID	4	0
2015	3	14	3.5	4	1	2	1	ID	3	1
2016	9	37	4.11111111	10	4	5	2	26	6	0
2017	10	44	6.3	7	3	7	2	31	6	1
2018	6	140	23.3333333	6	1	5	1	9	4	1
2019	2	128	64	2	1	1	1	64	0	2

Year	Openings (Event Reported)	Total Number of Days Open	Average Days Open Per Event	Openings Exceeding 24 Hours	Opening Naturally	Opening Manmade	Openings During Plover/Tern Nesting Season	Days Open During Plover/Tern Nesting Season #	Reported Closed Naturally	Closed Manmade
	***Events**	**Reported Days**	***Average Days Open**	***Events**	**Opened Naturally**	**Opened Manmade**	**Openings During Plover/Tern Nesting Season**	**Days Open During Plover/Tern Nesting Season**	**Closed Naturally**	**Manmade**
Totals	387	3695	10	274	68	319	136	953	295	19
Per Year	8.23	78.62		5.83	1.45	6.79	2.89	20.28	6.28	0.40

*****_NOTE: Trustees records list some events without corresponding days open or other information regarding whether they were natural or man-made. The reported "days open" total underestimates the true number of open days (i.e. – yields an average >9.0 days per event). Conversely, the reported events (245) with corresponding "days open" omits numerous short-lived events, likely skewing the average days open (13.6) higher than actual._

Notes Insufficient Data

THREATS TO MECOX BAY

Evidence suggests that Mecox Bay and its headwaters are under threat from a range of impacts, including, among others, water quality impairment, HABs, loss of wetlands and naturally vegetated buffers, shoreline erosion, inundation of farmland, shore hardening, road construction, residential development, severe storms and climate change. The effects of sediments, nutrients, fertilizers, pesticides, septic effluent and storm water runoff are of particular concern, as these contaminants affect surface water quality, oxygen levels, algal blooms, the health of wetlands and aquatic habitats, biodiversity, recreational use, and the sustainability of commercial American oyster beds and other shellfish resources. Human health and welfare can also be threatened when water quality is adversely impacted.

Measures must be taken to reduce pressures on the bay, with particular emphasis on eliminating land-based sources of water pollution and restoring habitat. The ability to address these needs lies largely outside the authority of the Trustees. Responsibility here is shared by the Town of Southampton, the Suffolk County Department of Health Services, the New York State Department of Environmental Conservation, the U.S. Fish & Wildlife Service, and the U.S. Army Corps of Engineers — and by those stakeholders who own land on or near the bay or who use the bay and its surrounding lands for residential, commercial, or recreational purposes. This Management Plan commits the Trustees to inform these authorities and stakeholders of threats to Mecox Bay, to propose remedial actions, and to work closely with these authorities and stakeholders to implement remedial actions.

MANAGEMENT CHALLENGES IN MECOX BAY

Littoral Drift and Sand Transport

Figure 4:Mecox Inlet- closed

When Mecox Bay is closed, sand transport along the ocean beach is uninterrupted. The rate of sand movement is relatively uniform up coast and down coast of the bay entrance and the ocean shoreline remains relatively straight.

When the inlet is open, tidal currents form small deltas at the ocean and bay ends of the channel, potentially drawing off sand from the breach way and adjacent beach.[2,9] As the breach inlet evolves, the channel meanders and may be deflected down coast (to the west) by longshore transport. This condition can temporarily interfere with the littoral drift and sand transport processes and create minor localized zones of erosion and accretion until the beach readjusts upon inlet closure. Thus, the first management issue relates to potential interruptions of sand transport along the oceanfront when Mecox Inlet is open and whether excessive channel meandering, as well as sand shoaling and trapping, can impact ocean beaches.

Conversely, the development of flood shoals and bay flats, as a consequence of breaches, is crucial with respect to the creation of foraging and breeding habitat for wading birds, shorebirds and other wildlife, both within the channel and on the back side of the inlet. Ocean overwashes also contribute sediments to the bay and aid in the formation of land and marsh, thereby helping to stabilize the barrier. The role that these natural sediment transport processes play therefore needs to be acknowledged.

High Water Levels

The second management issue is high water levels in Mecox Bay. When the inlet is closed, runoff and groundwater seepage gradually raise the bay level above normal high tide. Low areas around the bay—including foraging habitat used by endangered species, developed landscapes, septic systems, some buildings, local roads and agricultural fields—can be subject to flooding and be impacted until water levels return to normal. High water conditions can also accelerate shoreline erosion, loss of farmland and increase bay sedimentation rates, particularly when accompanied by severe storms and nor'easters. Conversely, inlet openings produce a rapid drop in water levels and can help to quickly mitigate these impacts.

Water Quality Degradation

The third management issue is water quality degradation. When the inlet is closed, runoff and groundwater seepage gradually concentrate nutrients and reduce salinity and oxygen levels, which lead to conditions unfavorable to shellfish, finfish, aquatic habitats, recreation and human health. [1] A closed system receiving nutrients in the form of higher nitrogen loads may experience elevated bacterial counts, algal blooms, and high biological oxygen demand (BOD). At an average depth of only ~3.5 ft., Mecox Bay also sustains greater temperature and dissolved oxygen fluctuations than adjacent oceanic waters. Inlet openings, under ideal conditions, tend to restore water quality and oxygen levels rapidly, by turning over nearly the entire volume of the bay within a period as short as a few days[2].

Endangered Species Management

The fourth management issue relates to endangered species management. The ocean beach and overwash area of Mecox Bay is a nesting area for federally threatened state endangered piping plover and state threatened least tern. These species utilize both the ocean wrack line and nearby intertidal sand flats for feeding habitat. Activities related to the opening, closing, and management of the inlet can therefore potentially impact rare species. The endangered and threatened shorebirds nest, and raise their young between the beginning of April and the end of August each year. Consequently, variability in the height, slope, and width of the beach, back beach, sand flats and overwash areas, are viewed as especially important parameters, in determining whether or not listed species populations are sustained.

A primary goal of the Mecox Bay management plan is to address each inlet and bay management issue, in a timely manner, before there are material adverse impacts to the overall system, as well as to balance flood mitigation with maintenance of water quality and habitat protection. The basic approach of the plan is consistent with current practices and calls for periodic short-duration mechanical openings to mitigate high water levels and water quality impacts, while monitoring weather, coastal storms and ocean beach conditions, so as to avoid any potential for undue interference with natural processes and littoral drift. The plan further specifies a particular corridor over which the channel should be excavated, while allowing natural shoaling and closure, as much as is practicable. Certain tools are discussed in this plan for monitoring the system and determining the timing of inlet openings, with mechanical cuts to be completed outside of the restricted plover season, except in cases, where there is an immediate threat to life, health, property or natural resources or other bona fide emergencies exists.

WATER QUALITY MANAGEMENT

Overview

Both water quality and management of the inlet and watershed catchment areas, including land based inputs of sediments and pollutants, affect the health of Mecox Bay and its public values and benefits, as well as its ability to recover from storms and resiliency to long term climate change. The bay, and its tributaries, including Sams Creek, Swan Creek, Calf Creek, Hayground Cove, Mud Creek, Mill Creek, Mill Pond (Lake Nowedonah), Burnett Creek, Channel Pond and Jule Pond, which take in roughly 1,100 acres or roughly 2 square miles, receive runoff from roughly 19.8 square miles. Within the watershed, residential development is the dominant land use (49%) (low density 37%, medium density 9% and high density 3%), followed by agricultural (28%) and open space (15%).

Primary sources of nutrient and nitrogen inputs to bay waters include septic system effluent, fertilizer application, and potentially waterfowl waste. Excessive loads of organic matter, nutrients, nitrogen and phosphorous can cause eutrophication, low dissolved oxygen and ammonia toxicity, triggering algal blooms, which adversely impact aquatic plant growth and benthic habitat, as well as shell and fin fisheries. Fine sediments contained in road and agricultural runoff likewise reduces the light available to submerged aquatic vegetation, affecting aquatic habitat growth and health. Related turbidity interferes with fin and shell fish spawning.

Both naturally occurring toxins and persistent toxicants, such as herbicides, pesticides and mercury, can accumulate and concentrate in the aquatic food web, creating health issues for finfish, shellfish, wildlife and humans. Additionally, toxic materials can amass in bottom sediments in bays and creeks, where they can harm benthic organisms and aquatic habitats.

Excessive nitrogen and other pollutants, as well as cyanobacteria and other harmful algal blooms, can also threaten human health and adversely affect bathing beaches. Acid rain can alter pH, which negatively impacts the exoskeletons of crustaceans and mollusks. Atmospheric deposition as a consequence of rain, snow and fog is responsible for a major portion of the nutrient load. Windblown and runoff derived plastics, together with fishing lines, can pose an additional menace, as they can directly harm seabirds and other wildlife, due to ingestion or entanglement. Introduction of pharmaceuticals poses additional issues, including risks of health impacts to marine life, wildlife and the public.

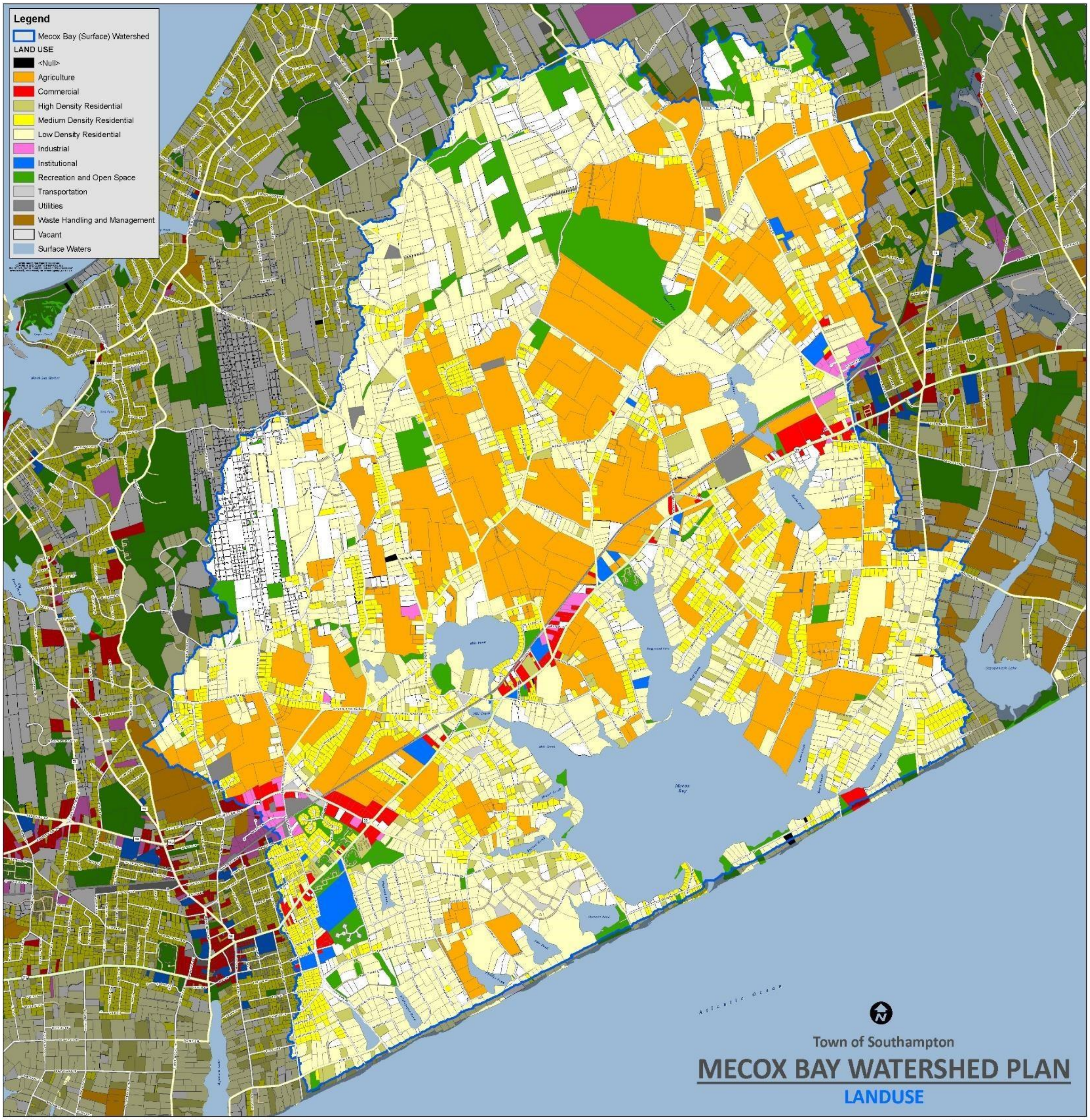


Figure 5:Mecox Bay watershed land use map

Suffolk County Monitoring of Harmful Algal Blooms ("HABs") and Swimming Closures

Suffolk County Department of Health Services (SCDHS) Office of Ecology's Bureau of Marine Resources regularly collects water quality samples for both tidal and freshwater public beaches, in order to ensure compliance with New York State Department of Health (NYSDOH) mandates (10 NYCRR, Part 6-2.15). Tidal beaches, such as town-owned Scott Cameron, Mecox Beach and Flying Point Beach, are monitored for only fecal coliforms and enterococcus. Tidal beach closures occur when the upper value of density of bacteria samples equal 104 enterococci/100 ml. Freshwater beach closures occur when the upper value of density of bacteria samples equal 61 enterococci/100 ml or 235 E. coli/100 ml. The NYSDOH mandates closure of both tidal and freshwater beaches if the upper density of fecal coliforms exceeds 1,000/100 ml.

Although the SCDHS routinely monitor's for HABs, the County does not collect samples for analysis. If HABs are suspected, the SCHDS will collect samples for analysis by Dr. Christopher Gobler at SUNY Stony Brook's School of Marine and Atmospheric Sciences (SoMAS).

An emerging issue with respect to HABs, is blue-green algae called cyanobacteria. Cyanobacteria are photosynthetic nitrogen fixing prokaryotes, which are able to easily convert excess nitrogen into other molecules needed for survival. As nitrogen fixing organisms, they can adapt to live in extreme environments and are found in both freshwater and marine environments. Generally, concentrations of cyanobacteria are low enough so that they are unlikely to have impacts to the environment. However, increases in nutrient loads are fueling recent cyanobacteria blooms in local lakes, bays and ponds, as evidenced by blue-green algae public health warnings posted by the NYSDEC at Mill Creek in 2016 and at Mill Pond in 2017 and 2018.

Suffolk County has begun monitoring and studying several area lakes and ponds for cyanobacteria. Of the water bodies being studied, the County has determined that Mill Pond, a major tributary to Mecox Bay, also owned by the Trustees, shows levels that pose a moderate to high risk to human health on an annual basis. Providing adequate tidal flushing, through the opening of Mecox Bay, as well as addressing upland sources of non-point pollution, can be beneficial, with respect to ensuring that conditions within the bay do not become favorable for excessive growth of cyanobacteria.

The Town of Southampton commissioned a comprehensive limnological assessment of Mill Pond in March 2018 conducted by Princeton Hydrotech, to monitor water quality and identify, quantify and prioritize the factors responsible for eutrophication of the pond and the re-occurrence of cyanobacteria blooms. The scope of work includes historical data review, field sampling and data collection, and preparation of a draft and final report. As part of such effort, the use of combined in-pond and watershed management measures will be evaluated, as a means of addressing Mill Pond's water quality impairments. A means for quantitatively tracking the water quality improvements and ecological benefits achieved through implementation of mitigation actions, as recommended by a Mill Pond restoration and management plan, will also be identified. Water quality data collection is nearing completion, with the U.S. Geological Survey

(USGS) providing assistance with respect to modeling groundwater inputs. The study is expected to be completed by January 2019.

Agricultural lands

The interaction between the waters in Mecox Bay and the immediately adjacent agricultural lands is not sufficiently understood. Fertilizers and pesticides applied to agricultural lands can have a harmful effect on bay waters, particularly when high water levels more closely connect the two. High water levels can harmfully raise water tables to the detriment of field crops and orchard trees, and can also transport pollutants that have elsewhere entered the bay. The Town's historical aerial photograph data base also shows that high water levels, when acted upon by storms or strong wind patterns, have led to erosion of the northerly bay shoreline and to loss of protective tidal wetlands and vegetated buffers. This can lead to greater sedimentation and pollution of bay waters. Because the nature of these issue occur beyond the Trustees' jurisdiction and authority, the Trustees will recommend to the Town the need for collaborative projects to evaluate these concerns and to determine future best practices and policies with respect to land use.

Roads

Area roads appear to be less affected by bay flooding. Therefore, excepting for the need for continued maintenance, cleanout, and, where necessary, replacement and upgrade of existing road drainage structures, no significant road redesign actions, such as road elevation or road realignment, would appear to be necessary to improve water quality. As part of an ongoing stormwater abatement program, the Town continues to strive to comply with all MS4 requirements, including identification and remediation of any outfalls and direct discharge. Road sweeping efforts are ongoing.

Road drainage improvements were completed by the Town at Mill Pond in 2015, including consolidation and replacement of former failed outfalls, along with development of storm water swales with check dams. In 2017, 44 leaching basins and 5 catch basins were installed.

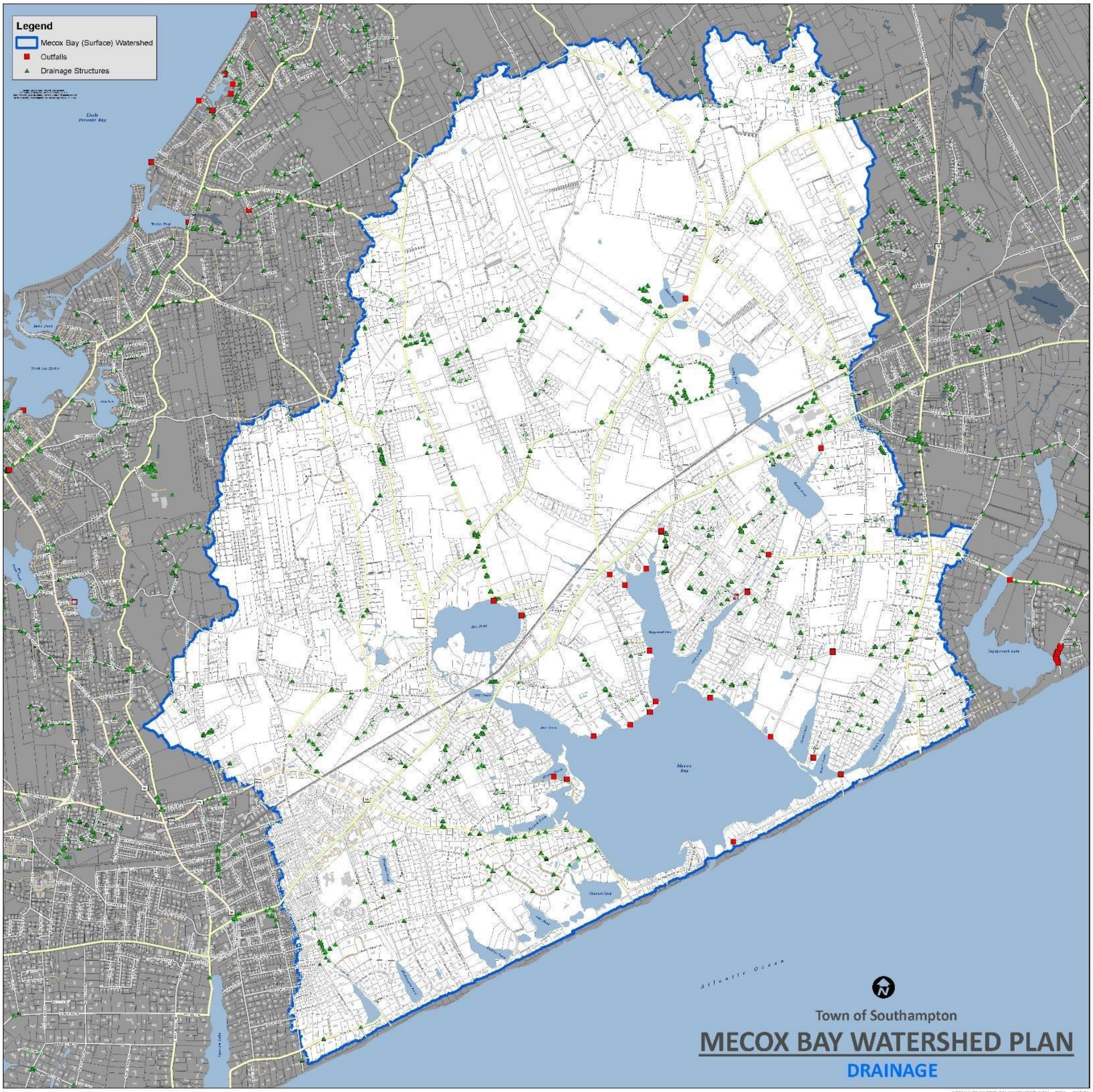


Figure 6: Mecox Bay watershed outfall and drainage structure map.

Climate change

Climate change makes the task of improving water quality in Mecox Bay and its tributaries even more challenging. The greater frequency of extreme weather events, such as Superstorm Sandy, can result in increased rates of erosion from the land into the open water, as well as well as significant overwash of sand from the Atlantic Ocean through Mecox Inlet. Increased high intensity rain events, which have likewise been correlated with global warming and climate change, translate into a greater amount of pollutant laden runoff entering surface waters, as well as more extensive flooding of waterside chemically dependent residential lawns and landscapes, agricultural fields and septic systems.

Actions to maintain and enhance water quality can mitigate climate change impacts. For example, restoring and protecting naturally vegetated buffers along waterways and adjacent wetlands reduces runoff, soil erosion, storm damage and surge related flooding, and affords opportunity for landward migration of wetland boundaries. Improved water quality and increased natural cover also better enable the bay ecosystem to recover from catastrophic events.

Guiding principles for water quality management

Water quality improvement is an important goal of this Management Plan, even though many of the causes of water quality degradation are beyond the Trustees' jurisdiction. The following principles will guide the Trustees deliberations:

1. **Emergencies do not wait:** Extreme weather events will, typically occurring several times a year, create circumstances that require immediate action, most often by opening, closing or modifying Mecox Inlet. These emergency actions may have an effect, positive or negative, on the longer term processes guided by the principles that follow. By the Management Plan, the Trustees establish the circumstances under which such emergency action will be taken.

2. **Best available science:** All decisions with respect to water quality protection, including, among others, management of inlet openings to better water quality improvement, need to made, based upon the best available knowledge and scientific data, including studies of hydrology, hydrodynamics, flushing, environmental water quality, ecosystem characteristics and biodiversity, as well as upon agreement with regards to priorities, in terms of bay levels, water quality maintenance and enhancement, salinity and oxygen levels, natural resource conservation, endangered species protection and recreational needs.

3. **Partnerships:** All levels and sectors of government, business, scientific institutions, private landowners, stakeholders and community groups should be involved in the

realization of management recommendations and actions, including timely permitting, funding, and implementation of priority projects.

4. **Best Management Practices:** Sustainable and innovative best management practices (BMPs) that will result in significant documented decreases in runoff and input of nutrients, sediments, fertilizers, septic effluent, pesticides and herbicides, without imposing significant financial burdens, should be identified and implemented.

5. **Ecosystems approach:** Recommended management actions need to be based upon understanding and acknowledgement of the natural dynamic forces at work within the inlet area and need to be advance solutions, which are compatible with protection, maintenance and restoration of natural ecological functions and processes.

6. **Target priority pollution sources:** Priority sources of pollution that pose the highest risks from land based activities should be identified and addressed.

7. **Comprehensive water quality monitoring:** Improved water quality sensor technology needs to be utilized, in order to provide continuous real time data. Salinity, temperature, dissolved oxygen, total algae (chlorophyll and blue green algae), turbidity, pH, nitrate and phosphorous parameters need to be measured. Ongoing collection of weather data, including wind speed, wind direction, air temperature, water temperature, humidity, barometric pressure, rainfall, and solar radiation (UV index) would also be beneficial, together with monitoring of water depth/bay levels.

8. **Water quality improvement targets:** Utilizing baseline water quality monitoring data, the plan should seek, in the long term, to set a quantitative target or put in place a process for setting a quantitative target, for % nitrogen, phosphorous and contaminant load reductions.

9. **Public education and stewardship:** The management plan should create public awareness, understanding and appreciation for Mecox Bay and the connectedness of its water quality issues with inlet opening and land use practices, in order to encourage implementation of BMPS, as well as to foster needed stewardship, support and better community custodianship of its surface waters, wetlands, watershed lands and natural resources.

10. **The health of both the bay and ocean matters:** The plan should recognize that *"the solution to pollution is not dilution"*, by steering away from management actions that seek to use inlet openings as a sole means of addressing the problem of bay water pollution and needed aquatic habitat restoration, at the expense of the health of the ocean. Rather, the first priority needs to be identification and remediation of land based sources of

nutrient and contaminant inputs into the bay, thereby lessening the amount of polluted water entering the ocean.

11. **Funding:** Funding sources should be identified for water quality improvement actions, with monies allocated based upon prioritization, consensus building, scientific support, proposed technology, cost benefit analyses, and likelihood of success.

12. **Use of adaptive management approaches:** Management actions should be regularly monitored, in order to assess how well priority actions are working, so that current and proposed practices can be modified and improved upon, where practicable.

Responding to the challenge: *Water Quality Improvement Practices Currently Being Implemented by the Town of Southampton and the Trustees within the Mecox Bay Region*.

Improvement of water quality, both within Mecox Bay and region wide, is essential to the transformation of the Town of Southampton to a green economy, as well as to sustaining our ecology and unique way of life. Given what we know is happening to our surface waters, the transition to clean water has become a moral imperative, a new sea ethic, on part of the Trustees and the Town which calls for leaving a legacy of restored living bays, oceans, watersheds and coastal ecosystems, for future generations to come.

This urgency and commitment to change is embodied in a host of local initiatives, which have been implemented by Southampton over the last 25 years, to achieve the town's water quality protection goals. These efforts have been, without question, invaluable with regards to maintaining and enhancing the integrity of surface waters and wetlands in the Mecox Bay system. Nonetheless, we recognize the need to go further, with respect to developing a much more comprehensive water quality improvement plan. To that end, the Mecox Bay management plan seeks to fill in some of the gaps of current water protection efforts, by launching new initiatives to complement those already underway.

<u>Town of Southampton Community Preservation Fund</u>

The Town of Southampton Community Preservation Fund (CPF), which was established in 1999, has provided a great tool for preserving open space, natural habitat, farmland, historic resources, recreational parks, public access, and community character, both within the Mecox Bay region as well as town and village wide. Water quality has also benefitted, as setting aside large contiguous tracts of land, reconnecting fragmented habitats, and linking natural areas has been crucial, with respect to restoring and maintaining ecological integrity and hydrological functioning of our watersheds, wetlands, aquifers, aquatic habitats and surface waters. Since the 1999 inception of the CPF program, nearly 1,000 acres of natural open space and farmland have been protected through fee simple purchase and acquisition of development rights within the Mecox Bay watershed. Critical wetlands, shorelands, floodplains, beaches, agricultural lands, aquifer protection areas and bay watersheds will continue to be purchased and conserved, using 2% land transfer monies, thereby further supporting other water quality actions taken by the Town.

CPF Water Improvement Protection Initiatives

Notwithstanding the success of the Southampton Town's land preservation program, the State Legislature amended the CPF law in order to provide new avenues for improving water quality, including creation of innovative financing mechanisms to achieve water quality objectives. The amended CPF law allows for the utilization of a maximum of twenty (20) percent of the annually collected 2 % real estate transfer monies to fund local water quality improvement projects, an action which was overwhelmingly approved by the voters in a public referendum held Election Day, November 8, 2016.

The Town's *CPF Water Quality Improvement Project Plan*[40] is integral to identifying the town's envisioned water quality improvement initiatives. According to the CPF WQI Plan, appropriated monies can be earmarked towards wastewater treatment, non-point source pollution abatement, aquatic habitat restoration, and pollution prevention. The CPF Water Quality Improvement Plan was shared with the public, prior to the holding of the required referendum, and has since been formally adopted by the Town Board. Implementation of the plan is being guided by a Town CPF Water Quality Advisory Committee, with project expenditures authorized by the Town Board.

I/A OWTS Installation

Companion legislation was subsequently adopted by the Town Board. On July 25, 2017, the Town Board enacted Article VIII of Town Code Chapter 123 entitled "Innovative and Alternative On-Site Wastewater Treatment Systems" or "I/A OWTS". By this law, the Town required the installation of nitrogen reducing innovative alternative on-site wastewater treatment systems (I/A OWTS) for new and/or substantial residential construction (an increase of 25 % or more of the floor area of a building) within town designated high priority areas, identified in the SWPP or CPF Water Quality Improvement Project Plan (WQIPP) and/or for any new septic system or septic upgrade required by the Town Conservation Board and/or the Environment Division, pursuant to Town Code Chapter 325 (Wetlands). The entirety of the immediate Mecox Bay watershed, inclusive of its tributaries and associated flood plains, lie within the bounds of the designated High Priority Water Quality Improvement Area.

To facilitate I/A OWTS installation, the Town has also instituted an income level based septic rebate program, whereby residential landowners, with yearly incomes of $1,000,000 or less, are eligible for re-imbursement of costs up to $20,000 related to abandonment of non-conforming septic systems, as well as for expenditures associated with surveying, engineering, permitting, installation, monitoring, and maintenance of an I/A OWTS. Where I/A OWTS is strictly voluntary, eligible landowners can seek additional financial assistance amounting to $11,000 for I/A OWTS costs from the County of Suffolk, therefore providing for a potential overall septic rebate incentive amounting to $31,000. Additionally, the county offers low interest rate loans for the term of 15 years, in order to finance the installation of an I/A OWTS. Reimbursements are available not only for owners of property within the designated high priority zones, but also within secondary medium priority areas, as well as in any cases, where I/A OTS installation is required as a condition of Town Conservation Board or administrative wetland permit issuance. The identification of high priority and medium priority zones, at the town level, was based upon both groundwater contribution data obtained from the Suffolk County Department of Health Services and mapping of watershed hydrology.

Since the September 2017 inception of the Town I/A OWTS rebate program, 93 applications have been received, encumbering $1,600,000. $187,985.25 in re-imbursements have been paid out. Only $60,000 in letters of credit have been issued so far by the Town for properties within the Mecox Bay watershed. However, this figure does not account for I/A OWTS installations completed, pursuant to town wetland

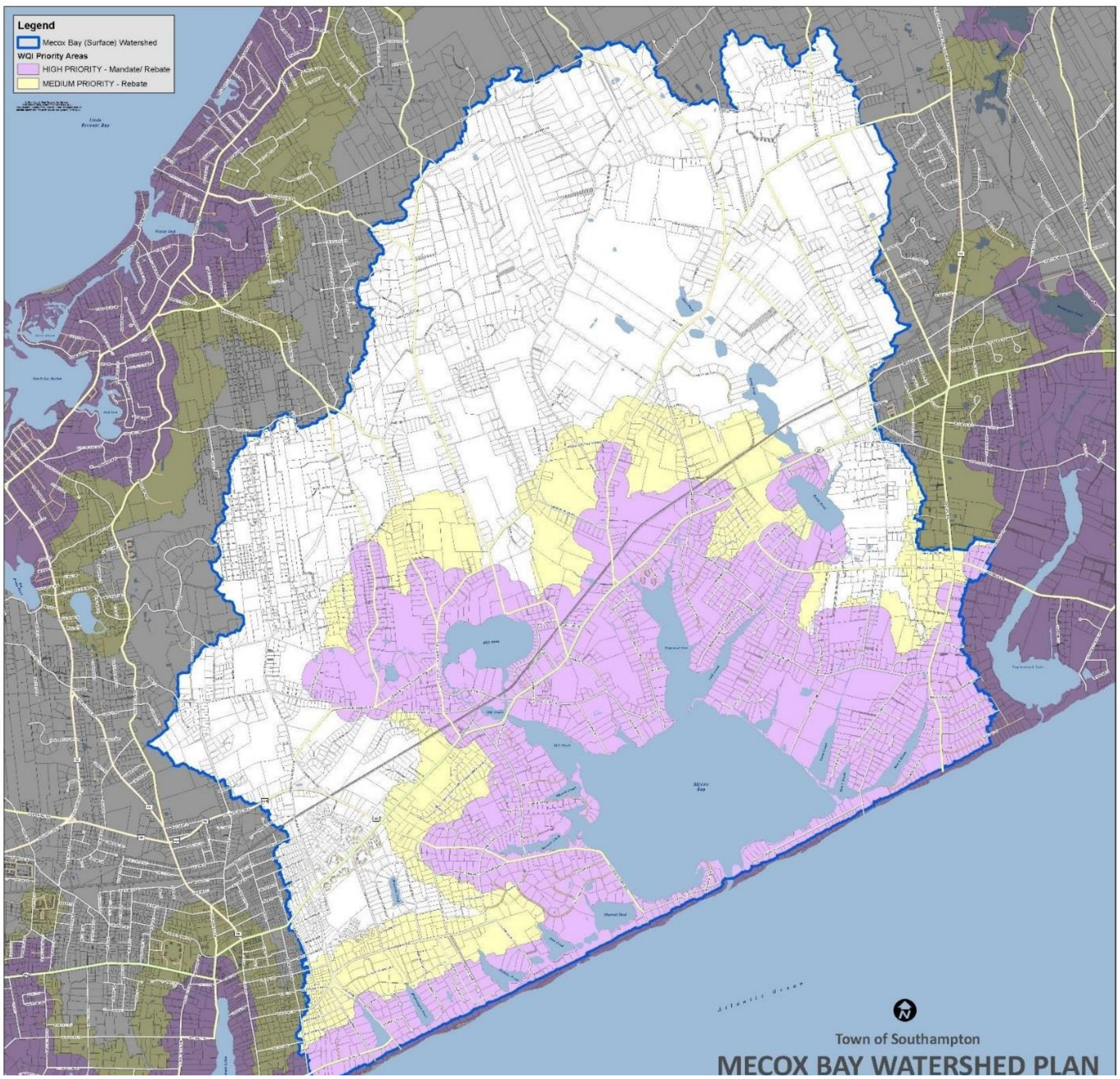


Figure 7: Mecox Bay Watershed Water Quality Improvement Zones.

and building permit requirements, where landowners exceed the income eligibility thresholds and/or choose not to seek financial assistance from the Town.

Aquatic Habitat and Watershed Restoration Initiatives

The aquatic habitat and watershed restoration component of the CPF water quality improvement projection plan is designed to maintain, improve and increase aquatic and coastal terrestrial habitats, as well as to restore ecological and hydrological functions, in order to enhance water quality and support biodiversity. The thrust of the effort is to restore natural processes associated with filtration of contaminants, bay flushing, watershed functions, floodplains, and clean recharge to the town's bays and drinking water aquifer. *"Pilot projects that…improve estuarine hydrodynamics and improve and maintain water quality are" …* described by the CPF Water Quality Improvement Project Plan (WQIPP), as being *"high priority initiatives."* Moreover, the report notes that: *"Actions that develop, test and evaluate estuarine wetland and aquatic habitat restoration and water quality improvement techniques, will also be emphasized. Likewise, important is scientific and regional support for projects…Inlet widening/tidal exchange"* approaches to habitat rehabilitation, biodiversity maintenance, water purification and nitrogen/pollutant reduction are specifically called for by the WQIPP.

Implementation of the CPF aquatic habitat restoration program over the 35-year term of the CPF will be guided by an ecosystem-based approach. Goals and objectives are designed to produce measurable and progressive improvements to water quality. The pursuit of the CPF aquatic habitat restoration goals and objectives will complement and support implementation of the goals and actions advanced by the Mecox Bay Management Plan. To this end, the participation of all stakeholders, including government agencies, private sectors, academia and the public, will be sought and encouraged, both in the formulation of CPF water quality improvement priorities and in carrying out CPF aquatic habitat restoration projects.

In 2019, the Trustees received a CPF Water Quality Improvement Program grant to cover the costs of opening and closing the Mecox Bay Inlet for a period of two years and to monitor water quality for the purposes of aquatic habitat restoration, in response to real time water quality data obtained through two (2) in situ water quality sensors (shore and moored floating stations) fabricated, installed and maintained by the State University of New York (SUNY) at Stony Brook School of Atmospheric and Marine Sciences (SoMAS). The data gathered from these station will enable the Trustees to not to have precise real time data with respect whether an opening of the inlet is required due to deteriorating water conditions but to also monitor and learn how the water quality of the bay changes during the period where the inlet is open and the bay is draining and being flushed with fresh ocean water.

2016 Town of Southampton Coastal Resources and Water Protection Plan

In 2016, the Town completed a comprehensive strategic environmental assessment of its water resources and coastal zone, setting forth new policies, strategies and implementation techniques for improving water quality. The 2016 Town of Southampton Coastal Resources and Water Protection Plan, which was adopted by the Town Board on May 3, 2016, as part of the Town's Comprehensive Plan, builds upon many years of water protection efforts by the Town and Trustees, and guides how these agencies will use, conserve, enhance and manage water resources, inclusive of Mecox Bay, in the future.

Town of Southampton Wetlands Law

Several complementary local laws have been enacted to preserve wetlands and surface waters, while allowing for development in an ecologically responsible and sustainable manner. The principal statute relevant to protection of Mecox Bay and its tributaries was the 1993 enactment of Chapter 325 (Wetlands) of the Town Code, which put into law stringent local wetland permitting requirements, including mandated wetland sanitary, construction and natural buffer setbacks. Approvals for land development within 200 feet of wetlands are subject to a host of mitigative measures, including, among others, removal of lawns and chemically dependent vegetation, native landscaping, reclamation of natural land and I/A OWTS installation. Minimum wetland setbacks of 150 feet, 125 feet and 100 feet are mandated for sanitary system installation, building and land disturbance, respectively, for undeveloped land, whereas setbacks of 150 feet, 100 feet, and 75 feet are required for same on existing built out lots. Setbacks of 175 feet, 125 feet and 100 feet are required for wastewater disposal, construction and clearing, where rare wetland communities or species are present, inclusive of endangered shorebird habitat, whether the subject parcel is developed or not.

Vegetated buffers and native landscaping restrictions are imposed, as a means for lessening excessive irrigation and chemically dependent landscaping and providing for adequate separation between fertilizer/pesticide laden lawns and surface waters and wetlands. Required installation of deep rooted native cover can be especially effective in the filtration and uptake of contaminants. Natural shoreline stabilization and storm damage reduction are added benefits, along with protection and maintenance of critically needed wildlife habitat, including animal movement and dispersal corridors along the shore. Covenants are required to ensure the perpetuity of designated wetland preservation areas and naturally vegetated wetland non-disturbance non-fertilization buffers.

Septic upgrades, together with retreat and relocation of pre-existing non-conforming buildings and structures, are routinely imposed. The law is also used as a vehicle for restoring habitat for wetland dependent wildlife species, and as a means for prohibiting the use of treated wood for building structures and decks in proximity to wetlands, thereby complementing the Trustees Rules & Regulations for Management & Products of Town Waters (the "Blue Book") which prohibits the use of treated lumber whatsoever for marine structures such as bulkheads, docks, floats, catwalk, stairways and landings. The Town and Trustees also require light penetrable decking for catwalks, stairways, landings. Alternatives to shore hardening structures are sought, wherever practicable. Pervious surfaced driveways and patios/walks, subsurface drainage structures, and vertical groundwater buffers and drywells for swimming pools are key elements for all project design.

<u>Best management practices for homeowners and landscapers</u>

One of the important tenets of continued water quality improvement is using best management practices (BMPs) to build upon other actions being taken by the Town and Trustees. That being said, work to strengthen the resilience of Mecox Bay to adverse impacts related to land based pollutants must take into account the significant lag time in groundwater contribution and natural system recovery, as a consequence of improved land use management practices.

Building upon current wetland regulations, as well as investments in upgrading septic systems to alternative nitrogen reducing on-site wastewater treatment technology, homeowners and landscapers need to be better educated with respect to additional BMPs, which can be employed to lessen runoff, as well as to reduce input and groundwater seepage of nutrients, pesticides, herbicides and other contaminants. Such practices, which are applicable to Mecox Bay and its tributaries, include the following:

- Installation of trenched-in wire-backed silt fence barriers, at the downslope edge of the limit of any planned ground disturbance or construction, to avoid erosion, siltation and sedimentation.
- Maintenance, repair and replacement of the silt barrier, as often, as necessary, to ensure proper function, until all disturbed areas are suitably vegetated, mulched and/or otherwise stabilized.
- Abatement of runoff from roofed or impervious surfaces, by attachment of gutters and leaders that empty into subsurface drywells or other alternative drainage structures, including drainage chambers and trench drains in shallow groundwater areas.
- Elevation of swimming pools at least two feet above maximum groundwater tables, as verified by on-site test hole data, referencing tides and dates of inlet openings.
- Installation of drywells for new and renovated swimming pools, at least 100 feet landward of wetlands, for handling of direct discharge and immediate on site recharge of pool water, in accordance with town pool drywell size specifications and standards.
- Installation, operation and maintenance of a no chlorine or low chlorine pool filtration system, within 200 feet of wetlands.
- Use of native plants for landscaping purposes, as an environmentally friendly alternative to fertilizer/chemically dependent ornamental lawns and landscaping.
- Construction of pervious stone driveways or if paved, installation of drainage structures sufficient to prevent runoff from being discharged onto the road or offsite.
- Sufficient elevation of temporary construction access ways at their site access location with existing roads, to prevent runoff of water, silts, sediments, and contaminants from being discharged onto the road, along with placement of non-loam based materials, such

as crushed stone, gravel or recycled concrete base, across temporary earthen driveways or construction access ways at the access point along the road.

- Requirements for town approval of a storm water pollution prevent plan (SWPPP) for any projects resulting in direct discharges or disturbance of one acre of land or more.
- Use of pervious paver stone as an alternative to impermeable materials for the purposes of patio construction.
- Use of alternative native grass or sedge lawns.
- Discontinuance of mowing and allowance for natural vegetative succession and recovery, as an alternative to native landscaping, wherever practicable, within disturbed portions of required natural buffers and natural vegetation protection areas.
- Recording of covenants and/or easements to ensure perpetual preservation of wetlands and required wetland buffer areas.
- Use of term conservation easements for tax abatement.
- Use of non-treated wood or alternative non-toxic building materials for the purposes of bulkhead, dock, catwalk, float, and waterside deck/stairway construction.
- Construction of docks and elevated catwalks using light penetrable deck boards supported by untreated wood posts.
- Installation of drywells for exterior showers.
- Stringent limitation on fill deposition within flood zones.

MECOX BAY INLET MANAGEMENT CONSIDERATIONS

Tidal Inlet Dynamics

Fundamental to development of the Mecox Bay management plan is an understanding of tidal inlet dynamics. In that regard, the physical processes that control the size and persistence of tidal inlets have been well established and documented, based on empirical measurements and analytical equations dating back to the 1920s (eg[12,13,14]). Studies show that the size of unstable sandy inlets, as measured by their mid-tide channel cross section, is proportional to the tidal prism of the bay.[13,15] Tidal prism is the volume of water entering or exiting an inlet over the tidal cycle. In general, the maximum tidal prism for any inlet will be approximately equal to the ocean tide range times the average area of the bay it drains. Thus, the largest inlets (as measured by channel cross-sectional area) drain large bodies of water. For bays of similar areas, a high ocean tide range will maintain a larger inlet than a setting with a low tide range.

Natural inlet channels are maintained by tidal currents, which propagate into or out of bays, as a result of differences in water levels between the ocean and the bay. A rising tide in the ocean precedes the water level in the bay, generating a “flood” flow through the channel, the speed of which is related to the difference in water levels and size of the channel.[11, 13] The bay will continue to fill until the ocean starts to fall. When the ocean water level drops below the bay level, flow reverses and the bay waters “ebb,” generating seaward currents in the channel. If the system is perfectly efficient, the bay tide and ocean tide will rise and fall by nearly the same height. However, along coasts like Long Island’s south shore, the bays generally cannot fill fast enough to keep pace with changing ocean water levels. Thus, there are differences between the ocean and bay tide ranges as well as differences in the time of high water or low water. Bay tide range is lower than the ocean tide range, thereby reducing the observed tidal prism.

Many natural inlets develop a self-maintaining equilibrium flow cross-section.[11] The inlets remain open and will respond to variations in ocean tide range in a stable manner.[11, 14] During neap tide conditions (a tide just after the first or third quarters of the moon when there is the least difference between high and low water), for example, peak current velocities in the channel decline and some shoaling occurs, which in turn constricts flow and increases peak velocity. During spring tide conditions (a tide just after a new or full moon, when there is the greatest difference between high and low water), greater tidal volumes generate higher peak velocities, leading to scour which in turn broadens the channel and decreases the peak velocity. Inlet channel dimensions are largely controlled by peak velocities rather than average velocities, because sediment transport is proportional to the cube of velocity.[16]

Inlets which respond systematically to variations in ocean tide range tend to be stable.[11,14] However, small inlets, such as the occasional channel opening at Mecox Bay, generally have insufficient tidal prisms to be self-maintaining. Peak velocities tend to be lower or of shorter duration, and scouring is less effective for moving sand through the channel. During much of the tidal cycle, velocities fall well below the threshold for sand transport. The small size of the channel relative to its length produces a natural tendency for closure. As researchers have found, “The flow cross section of a small inlet is much more susceptible to changes in the flow regime than a large inlet.”[17] The other factor that promotes shoaling in the Mecox Bay inlet is wave action and longshore transport along the ocean beach. Barrier island settings with low tide ranges and high wave energy maintain fewer inlets than high tide range/low wave energy settings.[18]

Application to Mecox Bay

A relatively small body of water like Mecox Bay has a maximum potential tidal prism, T_p, calculated by:

$$T_p = A_b \bullet 2a_o$$

[Where “A_b” is the area of the bay and “a” is ocean tidal amplitude (i.e. – 0.5 times ocean tide range). The ocean tide ranges measured at a nearby gauge in Shinnecock Inlet are 2.9 ft. [mean tide range: mean high water (MHW) to mean low water (MLW)] and 3.64 ft. (spring tide range: mean higher high water (MHHW) to mean lower low water (MLLW)] (source: NOAA–NOS)]. Mecox Bay area, A_b, is ~1,100 acres (= 47.916 million square feet—ft^2). Thus the maximum potential tidal prism, Tp, is ~174.4 million cubic feet (ft^3) (spring tide condition). Reference 15 evaluated Atlantic coast inlets with one or no jetties and developed a best-fit relation between mean tide level flow cross-section (A_c) and tidal prism as follows:

$$A_c = 5.37 \times 10^{-6}\, T_p^{1.07}$$

Applying this equation, maximum potential Tp for Mecox Bay yields Ac ≈ 1,344 ft^2. However, as is characteristic of Long Island’s south shore, bay tide ranges are typically a fraction of the ocean tide range. Mean tide range in Moriches Bay, for example, is less than half the ocean tide range (NOAA– NOS).

Assuming a more realistic maximum tide range for Mecox Bay at 1.5 ft. yields $T_p \approx 72$ million ft^2 and $A_c \approx$ 520 ft^2. This simply confirms that if Mecox Bay inlet could maintain itself naturally, its equilibrium flow cross-section would be small. Moriches Inlet and Shinnecock Inlet, for example, have flow cross sections of the order ten times greater than the above estimates for Mecox entrance.[19,20] Longshore transport (the general east to west movement of sand parallel to the ocean shore for waves arriving from the southeast to easterly directions and west to east under waves arriving from the south and west) at the Mecox Bay entrance can rapidly clog the channel with sand and lead to channel constriction, which in turn reduces the volume of water that enters or exits. Research has shown that certain ratios between tidal prism and longshore transport can be used to predict inlet behavior and whether an inlet is likely to shoal and close.[21, 22]

Stony Brook Study

A 1986 Stony Brook study[2] for the Town of Southampton attempted to analyze the processes controlling flows in Mecox Inlet. Therefore, it is an important document in support of the Mecox Bay management plan. The full document is reprinted in Appendix A and will be referred to herein as the Stony Brook study.

Following a planned channel opening in September 1985, Stony Brook researchers measured daily flows in the channel and the resulting changes in the channel and adjacent beach until shoaling closed it within eight days.

The Stony Brook study monitored a channel-opening event which was implemented by mechanical excavations when bay water levels reached the elevated range (i.e. – 16–20 inches above normal) that triggers action. The initial channel section (A_c) was less than 200 ft^2.

Initially, currents were directed seaward (ebb) with speeds up to 2.7 meters per second (m/s) (≈9 ft. /s). These speeds were driven by the relatively large difference between the initial bay water level and the ocean level. During the first day, the channel widened to nearly 70 feet and increased in cross-section to ≈400 ft^2.[2] Widening continued between Day 1 and Day 4 of the opening, reaching a cross-section of ~500 ft^2 (Fig 2). Velocities through the channel varied over the tidal cycle but remained ebb-directed through Day 2.

By Day 3, velocities began to reverse and alternate between ebb flows and flood flows for the remainder of the opening. Current speeds diminished to a maximum of ~1 m/s (~3.3 feet/s) with slightly higher peak velocities during the ebb cycle (Fig 3). Flows were of shorter duration and weaker during the flood stage on Days 2–5.

On Day 5, wave heights increased from ~0.5 m (~1.5 feet) to over 1.2 m (~4 feet) and remained higher until closure on Day 8. During the last two days of opening, peak velocities during the flood stage nearly doubled while ebb velocities remained fairly constant at 1 m/s (~3.3 feet/s). The maximum flow cross-section reached ~550 ft^2 on Day 6.[2]

As the channel evolved during one week of opening, it initially remained straight and more than doubled in width as Mecox Bay quickly emptied. The jet of water through the entrance formed a small "ebb" delta across the beach, building it with sands scoured from the channel. By Day 4, the scoured channel had meandered through its floodway and developed an "s-curve" from bay to ocean with a marked deflection to the west along the ocean beach. During this time, waves approached mainly from the southeast and generated longshore currents to the west, which produced a deflection of the channel and ebb shoal to the west and formed the nucleus of a small spit on the east side of the entrance.

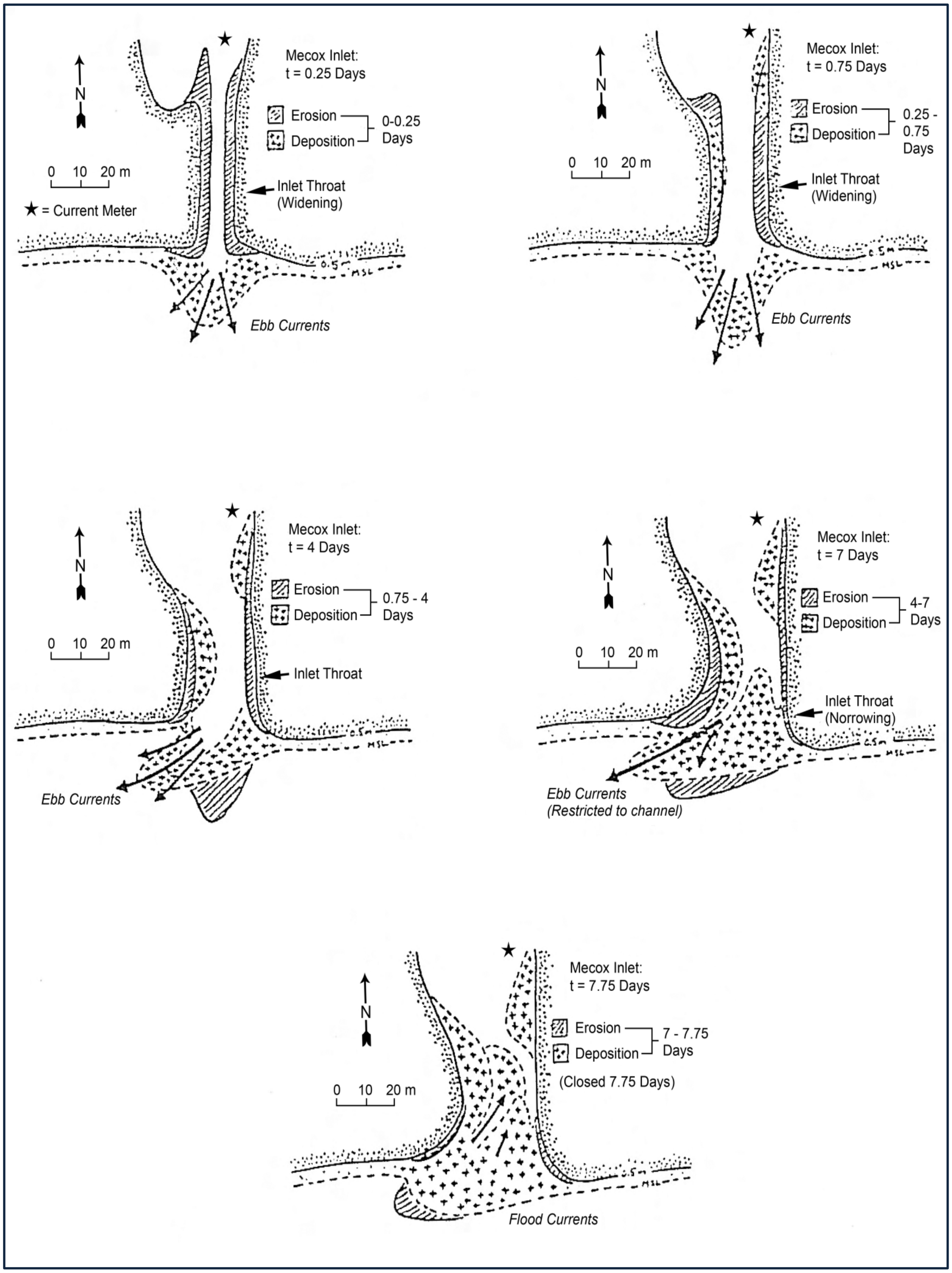


Figure 8: Sequence of changes at Mecox entrance following a planned opening. The initial excavation quickly widened as Mecox Bay drained, depositing sand in an "ebb" shoal along the beach. By Day 4, the channel meandered with in its floodway and was deflected west by longshore currents. Natural closure occurred on Day 8 as a result of higher waves building up the outer beach above MWH. [From Reference 2, Fig 8 – scale in meters].

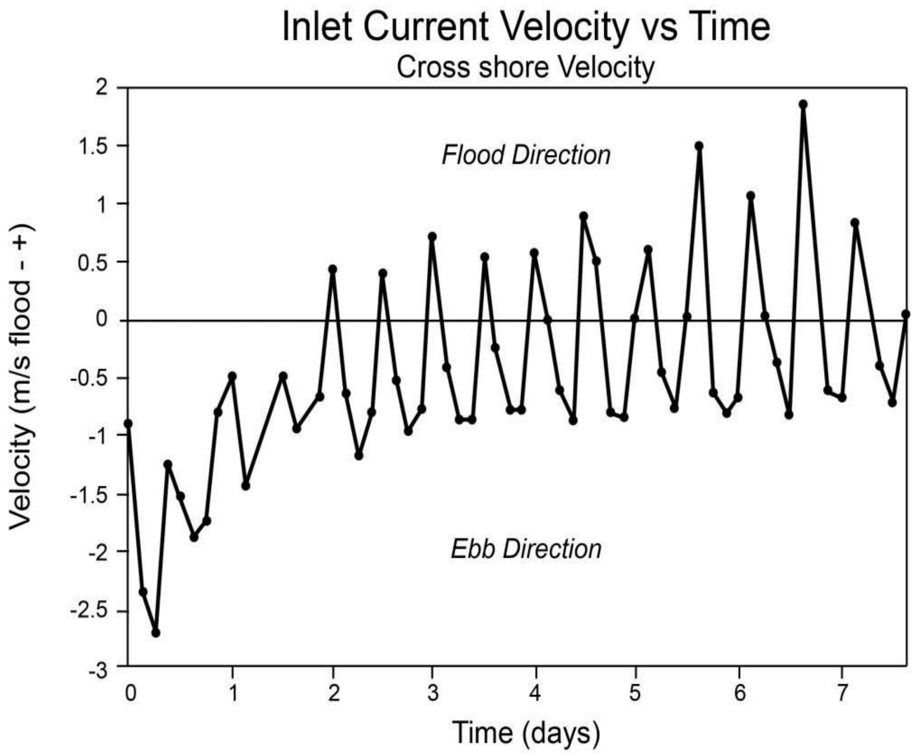


Figure 9: Current variation in Mecox entrance after a planned opening through natural closure after eight days. Negative velocities are in the ebb direction. Oscillations reflect the semi-diurnal (twice daily) ocean tide cycle. Peak velocities control sand transport in the channel. Note ebb flows dominated over the first half of the period while flood flows dominated the last two days. [From Reference 2, Fig 7].

As flood currents became stronger than ebb flows on Day 5 and Day 6, shoaling occurred at the ocean end of the channel while sand started to accumulate in the flood delta just inside the inlet. Flood velocities reached a maximum of 1.8 m/s (6 feet/s) on Day 6 while maximum ebb velocities remained ~1 m/s, confirming strong flood dominance in the late stages of the opening. The maximum floodway for the event was ~150 ft.

On Day 8, the channel closed from the seaward end by the buildup of a beach profile at the entrance.

The Stony Brook study reported that long-period breaking waves [height ~1.9 m (6.2 feet) and period = 9 s) moved sand from the ebb shoal into the throat of the inlet. This created a “sand plug” at the entrance which built up above the MHW level. Subsequent tides and waves were not high enough to overtop the “berm” (the nearly horizontal or landward sloping portion of the beach formed by the deposition of sand and sediment) created by waves.

The Stony Brook study documented the typical sequence of events after a mechanical opening of Mecox channel under high water levels in the bay:

1) A small pilot channel makes the initial connection and the head of water in the bay drains seaward and scours the channel.
2) Ebb flows dominate for a couple of days, producing a small ebb delta along the oceanfront, drawing sand from the widening channel and adjacent beaches.
3) Tidal flows equilibrate after several days, providing new ocean water into the bay while flushing bay waters.
4) The channel equilibrates at a cross-section of ~500 ft^2, close to the estimated flow cross section for a bay tide range of ~1.5 feet and tidal prism of ~72 million ft^2.
5) As the channel equilibrates, it begins to meander across its floodway, being deflected at the seaward end by longshore currents (east to west for waves arriving from southeast to easterly directions and west to east under waves arriving from the south and west).
6) During periods of higher-than-normal waves, flood flows increase and shoaling at the entrance occurs by landward transport generated by breaking waves. Sands accumulate in flood shoals inside the bay.
7) Waves push up a berm or higher sloping plateau or ridge of sand above MHW which plugs the entrance.
8) Once closed, the sands accumulated on the ebb shoals are reincorporated into the beach to continue developing the profile and be transported alongshore.

Impact of Controlled Channel Openings

For events such as the opening documented in the Stony Brook study, there is an interruption of longshore transport, albeit typically relatively minor and short-lived. During the initial breach, the bay drains and transport is directed offshore; therefore, beach sand around the entrance moves to an ebb shoal in shallow water. Any sand in the ebb shoal upon channel closure is then reincorporated into the normal longshore transport system and remains in the active littoral zone usually without significant impact. The sand loss of concern is the volume that may shift into the bay shoal as the system evolves.

The Stony Brook study noted a reversal to flood dominance and flood shoal buildup in the bay around Day 5. Transfer of volume to flood tidal deltas produces a net loss to the littoral system. However, absent strong nor'easters and hurricane or tropical storm events, the loss of sand in many cases appears to be largely ephemeral, due to rapid natural closure of the inlet, with disruptions to the littoral conditions re-achieving an equilibrium in a relatively short period of time. That being said, where interference with the littoral drift appeared to be severe, the Southampton Trustees had historically managed the losses by permitting excavations of the flood shoal and trucked mechanical transfer back to the beach/dune system along the Atlantic coast.

No data are available to confirm the typical sand volume temporarily shifted to the ebb shoal or more permanently shifted to the flood shoal during each channel-opening event. Quantitative calculations, with respect to the total sediment budget for the Mecox Bay littoral system are similarly lacking. However, absent such research, it appears that a rough approximation of the initial ebb shoal can be made based on the channel dimensions. Assuming the channel length is of the order of 800 feet and the channel is an average of 75 feet wide and 6 feet deep (with respect to the pre-channel beach surface), the ebb shoal would accumulate 10,000–15,000 cubic yards (cy). Upon equilibration and a reversal to flood-dominant flows, the flood shoal is likely to accumulate volumes of this same order, but are likely to be lower than this range.

The volume of sand shifted into the flood shoal during each breach is event specific and thus unknown. However, if it is assumed that the flood shoal withdraws ~10,000 cy from the littoral zone, volume of this magnitude is roughly equivalent to an average erosion loss of ~2–4 cubic yards per foot (cy/feet) per event spread over a 1-mile length of beach adjacent to the entrance. While additional information is undoubtedly needed, an event that withdraws twice the scenario volume (i.e. – ~20,000 cy) could therefore potentially result in a 4–8 cy/ft. loss from the oceanfront. Locally, if upon further analysis of littoral conditions and the sand budget, these potential orders of magnitude are indeed verified, such an event would represent a significant deficit that typically can only be replaced in the short term, by sand inputs from adjacent areas of the beach/dune system, mechanical restoration by borrowing and trucking sand from the flood shoal, or nourishment of the beach using an external dredged or trucked in off-site source of sand.

Notwithstanding this formula, the scope of disturbance associated with manmade inlet openings is, in reality, actually considerably less, as the Trustees typically seek to minimize flood shoal excavation, by utilizing a small crane to excavate a three feet deep ten feet wide cut, with the length and duration of dredging confined to only that which is necessary to relieve hydrostatic pressure and allow natural flows to take hold and widen the channel on its own. Approximately 400 linear feet of channel typically needs to be mechanically dug. A cut is initially made in the surf berm, while leaving the more landward portion of the channel intact, as the higher mounded sand immediately landward of ocean mean high water typically inhibits natural opening. Similarly, a partial cut is likewise initially made on the bay side, again leaving the channel midsection intact, so as to ensure sufficient flow of bay water towards the ocean, as well as to facilitate natural opening of the remaining unexcavated channel.

Once sufficient natural flow is achieved, the “newly formed inlet” is monitored to ensure that a strong ocean connection is established, thereby negating the need for further mechanical excavation. Ocean beach conditions, including average high water, both west and east of the inlet, are also documented. That being said, in some cases, the inlet will naturally close quickly, due to unanticipated changes in weather or surf patterns, and several renewed attempts at mechanical initiation of a "natural" inlet opening may become necessary. However, the dredging operations rarely exceed two days, even where repeated attempts at inlet opening become necessary. Table 1 provides data with respect to documenting openings whose duration exceeded 24 hours, during 1971-2018, as compared to the total number of opening events, thereby shedding light on the frequency and regularity of unsuccessful openings.

Seasonal Decision Factors for Management of Mecox Bay and Inlet

The overarching goal of the Mecox Bay Management Plan is to ensure that the system as a whole retains the values contributing to ecosystem health, improved water quality, abundant shellfisheries, avid recreational pursuits, public access, biodiverse aquatic and shore land habitats, sustainability of endangered species, public health and resilience to climate change. The Trustees wish to maintain their historically strong record of managing the inlet in a manner, which complements natural barrier island processes, without adverse environmental or economic impact. Inherent in the Trustees' decision making is acknowledgement of variable seasonal factors, which provide a basis for setting of priorities and implementation of management actions.

Tangible outcomes, objectives and measurable targets have been identified, in order to develop a science-based management framework that draws from the findings of tidal inlet studies and data collection that will result in greater agency and public coordination and efficiency in achieving community goals. The cornerstone of the plan is a framework for identifying those issues and seasonal events that need to drive local and regional decision making, including implementation of actions to address significant resource threats.

Management of Mecox Bay needs to be guided by those environmental attributes, seasonal processes, water levels and natural phenomena, which contribute to good decision making, with respect to when the inlet should and can be mechanically opened and closed. In the 500 + years that the Trustees and the Shinnecock Nation have managed the inlet, the Southampton community has marveled at the inlet's geomorphology along with the need to appreciate and respect its close ties to weather, coastal storms and the dynamic forces of the Atlantic Ocean.

The Trustees have assessed the immediate system-wide risks of water quality impairment, endangered species impacts, harmful algal blooms, impacts to aquatic habitats, effects on shellfisheries and public health, severity of inland flooding and storm damage to property and agricultural interests, and recreational pressures, as well as the long term system risks of climate change in developing goals and objectives for the region. Achieving continued improvement of water quality and coastal resources health not only requires a weighing and integration of these factors, but an adaptive management process that responds to changing priorities year round.

The principal seasonal events relevant to decision making and priority setting are as follows. The Trustees and the Town recognize that these seasonal decision factors will be need to be periodically re-visited, in order to take into consideration changing variables as a consequence of long term climate change.

- Tropical storm/hurricane threats (generally mid-August through October)
- Nor'easter periods (November to March)
- Lunar and astronomical tide cycles, including neap tides and spring tides.
- Seasonal transformation from summer to winter ocean beach conditions.
- Increased freshwater inputs and related lowering of salinity in spring, due to greater rainfall, less vegetation uptake and larger runoff volumes.
- High intensity rainfall events (variable)
- April 1-August 31 restricted rare shorebird breeding period
- May 1-November 1 seabeach amaranth growing season
- May 1-November 30 red knot spring and fall migration periods.
- Oyster and clam spawning periods (June and July)
- Seasonally certified shellfish period (December 1 through April 30)
- June 1-September shellfish and finfish spawning period
- Peak threat of harmful algal blooms (July to August)
- Lower dissolved oxygen as correlated to warmer bay waters (July to September)
- Annual precipitation levels
- Seasonal occupancy of homes (Memorial Day to Labor Day)
- Summer bay and ocean beach recreational pressures
- Anadromous fish reproductive cycles (marine fish that use fresh waters for spawning)
- Waterfowl/duck hunting season (mid-late November, December -January)

The inlet management framework that is presented by the plan, to the degree it affects the shorebird protection window of April 1 – August 31, will take into account any advice provided by U.S. Fish and Wildlife Service and will be governed by permits issued by the U.S. Army Corps of Engineers and the New York State Department of Environmental Conservation. Outside the restricted shorebird season, protection of shorebird habitat is of lesser conservation concern, as both plovers and least tern winter in the southeastern and southern parts of the United States.

Letting the bay open when it achieves a specific height in order to alleviate flooding and damage to residential properties, basements, septic systems and agricultural land is the paramount trigger in deciding to opening the intel anytime the year. Openings triggered by harmful algal blooms ("HABS") and harmful bacteria are more likely to occur during the warmer summer months, however, real time data sampling will drive decisions based on HABs and bacteria whenever they occur during the year.

Maintaining appropriate salinity levels for sustainability of oyster populations is crucial in triggering inlet openings throughout the year, and the need to open the inlet is most pressing in spring, due to higher amounts of rain and runoff, greater freshwater/groundwater seepage, and less vegetation uptake of precipitation and the need to ensure a high salinity level in order to trigger spawning in June and July.

Every effort needs to be made to time inlet openings to allow for spring spawning and migration by anadromous fish species, including river herring. Both alewife and blue-backed river herring spend the bulk of their life cycle in saline waters, but seek to move into freshwaters for reproduction. The first to arrive are alewives, followed by blue-backed herring. These species begin spawning mid to late March, and remain in their freshwater breeding grounds for 8 to 10 weeks, before returning to the ocean.

Any large scale movement of pelagic species, such as bluefish and menhaden (bunker), into Mecox Bay likewise needs to be monitored, as large fish die-offs can occur, if prolonged inlet closure blocks their passage back to the Atlantic. Further research is needed to better understand local finfish migration patterns and use of Mecox Bay, with attention given to restoring barriers to fish runs within the bay's freshwater tributaries and Mill Pond.

Recreational demands are both seasonal and varied, with water skiers and sailors lobbying for higher bay levels during summer, and duck hunters favoring low water, during the late fall-winter waterfowl hunting season, as such conditions tend to attract birds to areas proximate to permitted blinds. There are approximately 25 duck blind locations within Mecox Bay and its larger tributaries, with about 5 additional blinds permitted at Mill Pond.

Owners of ocean fronting homes along Dune Road and Flying Point Road have expressed concerns about potential down drift beach erosion and interference with littoral drift when the inlet is open. This plan seeks to mitigate those concerns during openings by monitoring real time conditions that would warrant closure of the inlet such as whether the location of the inlet has migrated or weather, tides, and oncoming storms. Concerns have also been expressed from beach driving permit holders, fishermen and the general public when access to the inlet is restricted and fenced during active inlet openings and during restricted shorebird periods. The Trustees Coastal Steward Piping Plover Monitoring Program is essential in monitoring the activity of protected shorebirds and so that the Trustees, in consultation with U.S. Fish and Wildlife Service can act accordingly to both protect the shorebirds and reopen public access to beach and inlet once those activities no longer pose any threats to the birds.

Explicit consideration of these seasonal factors in letting of the bay must continue to be standard practice. Addressing the interplay between environmental, social and economic factors through improved decision making, will contribute not only to a healthier bay ecosystem, but also provide for better public transparency, with respect to the basis for inlet openings and closures, thereby fostering broader community and agency support.

MANAGEMENT POLICIES FOR MECOX BAY AND ITS INLET

Storm Breach Policies

Natural breaches of the spit across the entrance to Mecox Bay occur during storms, a process different from planned openings in several respects. Breach channels are initiated by storm waves and surges that overtop the bay-mouth bar and drive sand into the bay. The ocean surge raises water levels, and storm waves produce much higher run-up than normal waves. Areas of low topography, such as gaps in the dune line, elevated nearly horizontal sand plateaus, narrow backshore ridges, or landward sloping beach "berms", which are characteristic of the Mecox Bay entrance, will be overtopped before adjacent high-dune areas. Once breached, the washed-out dune provides a pathway for the surge to enter Mecox Bay. If ocean water levels in storms are higher than the water level in the bay, flows will be directed toward the bay and will deposit beach sand in the flood shoal. The amount of sand which is deposited is generally a function of storm duration, surge, and wave heights.[19]

As storms progress, surges will propagate through breach channels until the water level in the bay equals the ocean tide (plus surge) level. When the ocean tide falls below the surge level in the bay, flows reverse and ebb currents continue cutting the breach channel. Much of the channel cutting during natural breaches is accomplished during the receding tide, accounting for large-scale sand deposition in the ebb shoal as tides return to normal.[23] The surge volume added to the normal tidal prism, in a small drainage system like Mecox Bay, will have limited capacity to sustain a large seaward directed flow, as storms subside and water levels return to normal. This lessens the volume of sand likely to shift back offshore from the flood shoal to the ebb shoal during the waning stages of the storm.

Policy #1 — ***Because of the uncertainty of the net losses or gains of sand to the flood shoal in each channel-opening event, the Trustees will monitor and periodically survey bathymetry in the bay shoals and develop estimates of volume changes. The width of the dry beach along proximate ocean beaches should also continue to be monitored, particularly just prior to and after manmade mechanical openings. Both average high water and dune toe locations, 1500 linear feet west and east of the designated inlet corridor are to be GPS mapped in order to assess any changes in dry beach width.***

Major storms have impacted eastern Long Island every 25 years or so, with notable events occurring in September 1938, March 1962, October 1991, December 1992,[4,5] August 2011, and October 2012. Town Trustees report there were 66 natural openings of Mecox Bay between 1971 and 2018 (~1.4 per year), but only ~5 were specifically noted as storm breaches. The most recent major storm was Hurricane *Sandy* on 27 October 2012.

Figure 11: Post-Hurricane Sandy aerial photograph (4 November 2012) showing breach channel and extensive flood shoal deposited by the storm on 27 October. The entrance was nearly closed one week later by natural recovery of the beach. Emergency excavations to move sand from the flood shoal back to the beach/dune system were underway at the time of the photo. [Source: NOAA Remote Sensing Division].

Aerial photos illustrate the impact of *Sandy* at the Mecox Bay inlet. The storm breached the inlet and deposited a flood delta of sand upward of 20 acres in area just inside the bay (Fig 11). Photos taken on November 4th, one week after the storm, show land-based equipment excavating the deposit for use in emergency dune restoration.

A typical washover/delta deposit such as the one shown in Figure 11 can raise the substrate 2–6 ft.[2,24] Therefore, assuming the average thickness of the ~20-acre delta was 4 feet, as much as 130,000 cy moved from the beach to the bay shoals in the event. This quantity is likely to be more than ten times the volume of sand shifted into the bay or ocean shoal during mechanical breach events as

Figure 12: Breach inlet formed across Westhampton Beach during the 6-8 March 1962 storm. Note extensive flood shoal deposited and flanking erosion along the adjacent beach. Breaches produce large permanent sand losses from the littoral zone which increase the erosion rate and lead to sand deficits along the adjacent beach. [Reference 27, Fig 11].

documented by the Stony Brook study. As a point of comparison, a breach near Moriches Inlet in 1980 shifted upward of 750,000 cy into Moriches Bay.[25] The Moriches breach channel drained a much larger bay and expanded rapidly upon opening.

While major storm events such as *Sandy* or the March 1962 storm are infrequent, they draw off many times more sand than the planned breaches of Mecox Bay. Assuming most of the sand volume moving into the bay during a storm is derived from the breach channel and adjacent ~1 mile of beach, an event involving ~130,000 cy potentially accounts for average beach volume losses around 25 cy/ft. This represents a permanent loss to the littoral sand budget and can account for locally accelerated erosion (upward of 5–10 times the average annual volume loss[26]) along the flanks of a breach. Figure 12 from the March 1962 storm breach at Westhampton illustrates a similar, but larger-scale, shift of sand from the oceanfront to the bay shoals.[27]

Breaches of Mecox Bay entrance and flood shoal corridor during major storms tend to produce greater adverse impacts to the littoral budget. Such events draw off more sand from the oceanfront and cause extra shoaling at the mouth of the bay. Based on the available data, it appears that major storms move upward of ten times more sand than a typical maintenance opening. It is also likely the storm breach removes an even higher proportion of the sand from the active littoral system and deposits it in the flood shoal. Maintenance openings generally discharge more sand into the ebb shoal where it will be retained within the beach zone and redistributed down coast upon channel closure. Sand losses to the bay shoals after a scheduled opening appear to occur only after several days when the channel begins to equilibrate and flood flows become dominant.

When openings occur, either as a consequence of manmade cuts or natural overwash, the configuration of the inlet is mapped weekly by the Board of Trustees, using hand held GPS units. High water lines, as well as scour, are typically recorded, both on the ocean side of the inlet, as well as along the shore armored ocean beaches running west for approximately 1000 linear feet and approximately 1000 linear feet along unarmored town beach and residential ocean fronting homes to the east. The ocean and bay shoreline positions of the inlet are recorded, including any shifts in the inlet location and width.

These efforts need to be expanded upon, by using hand held GPS units, or GPS equipped drones, to document and map average high water and seaward dune toe lines, for a distance extending 1500 linear feet to the west and east of the designated inlet corridor, both prior to and approximately 14 days after manmade inlet openings. This data is needed, in order to document dry beach width, as well as to any evaluate possible changes in beach conditions or littoral drift during inlet openings. GPS map records would be shared with partnering government agencies, as well as with the general public, to aid in decision making regarding timing of needed inlet openings and closures. GPS data needs to be supplemented by periodic surveys and bathymetry, in order to better understand short and long term inlet behavior and shoreline dynamics.

Between October 2013 and February 2014, approximately 5.6 miles of ocean beaches extending from Water Mill to Sagaponack, inclusive of the Mecox Bay barrier and Inlet, were re-nourished with over 2.5 million cubic yards of compatible sand (project volume) dredged from off shore borrow sites, with the cost borne by the two recently established beach erosion control taxation districts (BECD) of Bridgehampton-Water Mill and Sagaponack.

According to the *"2017 Beach Monitoring/Monitoring and Analyses of the 2013-2014 Sagaponack & Bridgehampton-Water Mill Beach Erosion Control Districts Nourishment Project"* report, as prepared for the Town by Coastal Science & Engineering (CSE), the project has far exceeded the design expectations. In fact, natural gains associated with post Hurricane/Superstorm Sandy have resulted in a retention of 118 percent of the project volume in Bridgehampton-Water Mill. Beach monitoring efforts have tracked sand volumes between the foredune and visible recreational beach to low tide wading depth, as well as seaward to an underwater depth of -6 feet to -19 feet, thereby accounting, in large part, for the total sand budget available for movement*" from the surf zone to the dry beach in summer and back to shallow water in winter."*[41] According to CSE, the beaches, which were re-nourished in 2013/2014, are anticipated to have a life term of ten years, with little to no maintenance required, absent the occurrence of severe storms.

Notwithstanding the success of the BECD re-nourishment, the successive strong nor'easters of the early 1990's and their erosive effects on the Mecox Bay barrier, are yet a reminder that beach conditions can change dramatically as a consequence of future storms. In fact, erosion "hot spots" have recently since developed along ocean beaches approximately 0.5 miles west of the Inlet. Causative factors likely include the occurrence of successive nor'easters in March 2018, and temporal changes in offshore sand bars. While recent observations have revealed some seasonal/summer beach recovery, continued monitoring is warranted. Privately funded dune restoration projects are currently underway, at ocean front residences proximate to the inlet, which will aid in recovery of the area.

Policy #2 — ***Because of the likelihood of a greater volume of losses to the flood shoal during major storms, the Trustees and Town should anticipate, when possible and practicable, the potential for greater-than-normal sand losses along the adjacent oceanfront during these events. The Trustees will evaluate the possibility of replacing any documented significant losses, with compatible sand from available sources, in order maintain the health of the beach/dune system in the inlet adjacent area. If the Trustees lack sufficient financial resources to undertake such a restoration, then the Trustees will consult with the Town Board about alternative means of restoring the beach after a major storm.***

Inlet and Channel Policies

The historical floodway for the Mecox Bay entrance channel is ~1,000 feet wide, bounded by Flying Point Road to the west and Dune Road to the east. The majority of the ~7,500-ft-long bay-mouth bar fronting Mecox Bay is developed with private residences and established infrastructure. Some properties, particularly those extending ~1,500 feet west of the entrance channel, are protected by a steel sheet-pile seawall (dating back to the 1980s). This shore protection was installed in response to local erosion at the flanks of the channel. When the seawall has been exposed and directly impacted by waves, it has reportedly led to extra scour and erosion in the vicinity of Mecox entrance whether or not the channel was open.[1]

Owners of properties extending upward of 2,500 feet east of the entrance channel installed emergency geotextile sand cubes or geo cubes after Hurricane Sandy and built protective berms atop the emergency sand cubes, using sand excavated from the Mecox entrance channel. Properties within ~½ mile of the entrance channel can be impacted by channel openings and breach events, because any sand drawn into

[1]M. Shea, Chief Environmental Analyst, Town of Southampton, pers. comm., 10 November 2014.

the bay shoals is replaced naturally by erosion along the flanks of the channel, until the shoreline straightens (upon channel closure) and normal longshore transport resumes. Such draw-off of sand during hurricane and severe storm related breach events can increase the likelihood of exposure of existing shore-protection structures and possible secondary erosion exacerbated by seawalls and exposed geotextile cubes.

Planned channel openings generally involve a narrower corridor (floodway) than storm breaches. As Figures 13a-b and 14 a-b show conditions on four dates between 1994 and 2011. In each case, the main channel way is roughly 150–250 feet wide, consistent with the measurements in the Stony Brook study.[2]The 1994 image (Fig 13a) shows well-developed meandering of a ~75-ft-wide channel within the active floodway. The 2001 image shows a ~200-ft channel way draining north to south along the marsh on the east side of the entrance, then discharging east of the midpoint between Flying Point Road and Dune Road. The 2004 image (Fig 14b) shows a closed eastern channel (remnant from 2001) and a recently active western channel with a ~200-ft floodway.

The 2011 image (Fig 14b) shows a ~150-ft-wide channel positioned near the midpoint with a sharp westerly deflection at the mouth. Westerly spit growth is common for this setting because of the dominant east to west transport along the beach. As Figure 6d illustrates, the mouth of the channel can, in rare cases, shift more than 600 feet west. However, westerly migration tends to be accompanied by shoaling and narrowing of the channel, a precursor to closure.

Unplanned channel openings in severe storms tend to involve a wider impact corridor as indicated by the general lack of vegetation in the 1,000-ft-wide breach way (see Fig 11). A storm breach will initiate across the lowest part of the barrier, then widen from that point. In major storms, the entire floodway is likely to be impacted. However, in smaller storms, the breach point can be controlled by managing the location of the lowest elevation of the beach.

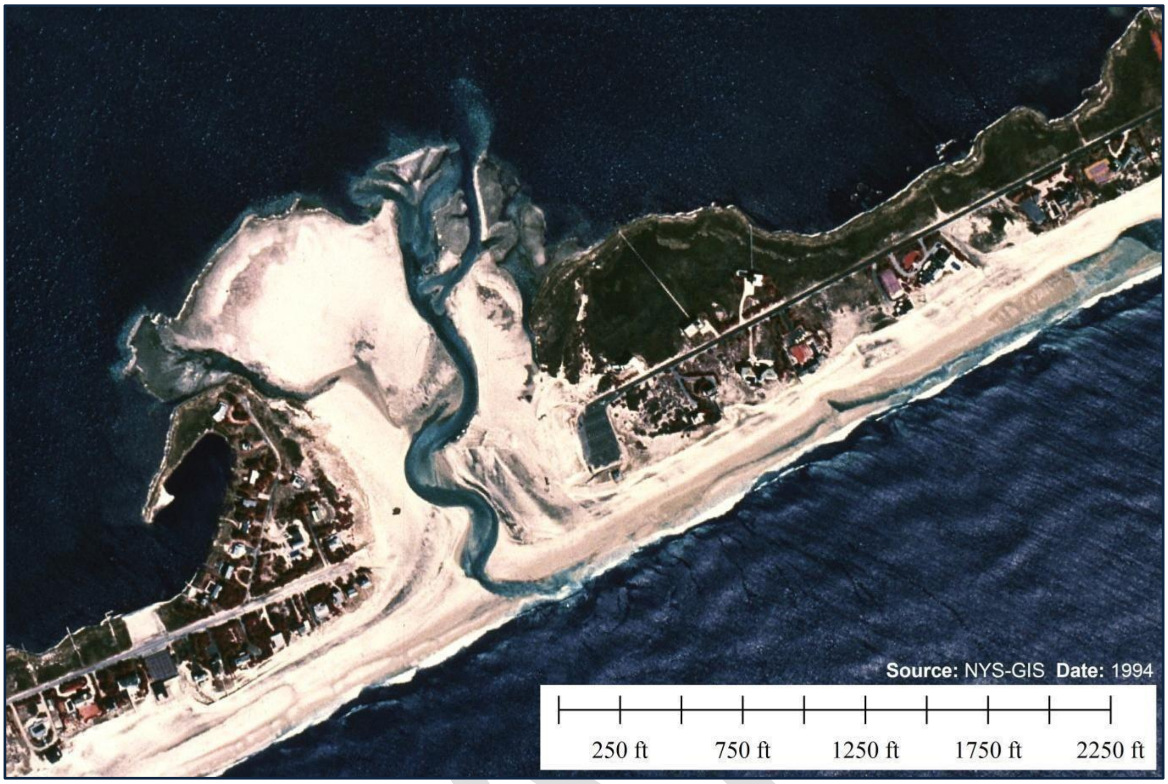


Figure 13a-b: Sequence of aerial images illustrating conditions near the time of planned channel openings.
(a) 1994 showing ~75 ft. wide inlet meandering within a ~200 ft. wide floodway midway between Flying Point Road and Dune Road.
(b) 2001 showing an easterly 200 ft. channel way draining along the marsh adjacent to Dune Road, then discharging near the center of the floodway.

Figure 14a-b: Sequence of aerial images illustrating conditions near the time of planned channel openings. (a) 2004 showing the closed eastern channel (see b on previous page) and a recent active "western" channels (~200 ft. side). (b) 2011 showing a ~150 ft. wide channel positioned near the midpoint of the floodway, then sharply deflected ~600 ft. at the mouth.

On February 21, 2006, the NYSDEC issued to the Trustees an Article 25 Tidal Wetlands Permit, an Article 15 Title 5 Protection of Waters, and 6 NYCRR 608 Water Quality Certification Permit (Permit # 1-4736-03009/00005), which allowed for ten-year maintenance dredging of a centrally located 200-feet wide, 2408 linear feet long and 6-feet deep channel from Mecox Bay, through the sand flats, to the Atlantic Ocean, with approximately 30,000 cubic yards of dredged compatible sand material to be placed on ocean beaches, to the west and east of the inlet. Notwithstanding the prior NYSDEC allowance for re-use of the dredged overwash material for re-nourishment of area beaches, the Stony Brook study suggests that inlet interference with littoral drift processes is generally short lived.

Future dredging permits, including the anticipated dredge permits that are the impetus for this Management Plan, must include the continued maintenance dredging of this centrally located channel. The dredging of this central channel through the sand flats and back bay shoal is to accomplish an effective connection between the ocean and Mecox Bay during the periods when the inlet is open. The dredging of this longer channel should be a top priority because the back bay shoal is currently impeding the effective exchange of water between the ocean and Mecox Bay. Unless that longer channel is dredged on a regular basis, i.e., once a year, future openings of Mecox Bay may not be effective with respect to exchange of water between the ocean and bay. This channel should be dredged and maintained outside of the endangered shorebird nesting season, and the dredged sand used to re-nourish the ocean beaches that have eroded within proximity to the inlet and to restore any eroded dunes. The long centrally located channel is also likely to minimize channel meandering during planned openings. The Trustees and Town should avail themselves of any ability to operate under a county contract, for the purposes of excavating the back bay shoal and re-nourishing the ocean beaches, including any documented hot erosive spots proximate to the inlet, in the interest of lessening public costs.

Policy #3 — ***Because planned or unplanned breaches can impact the adjacent beaches by drawing off sand, the Trustees will establish a minimum buffer of high, dry-sand beach to either side of the channel and a defined central corridor for planned breaches. The Trustees will limit planned breaches to a 250-feet corridor midway between Dune Road and Flying Point Road, subject to the recommendations of the Army Corps of Engineers.***

Policy #4 ***- At the suggestion of the NYSDEC, material dredged from the proposed central channel should be used to close the currently existing "S" channel on the eastern side of the inlet. Reasons for considering this action include the potential reduction of erosion in the area of the "S" turn as well as a decrease in the likelihood that the newly dredged channel will quickly meander back to the east.***

The filling of the "S" channel would also allow for creation of additional habitat to replace the mud flats/plover foraging habitat affected by the dredging of the central channel.

During periods when the channel is closed, a minimum back-beach elevation of 5 feet above mean sea level (MSL) (i.e. – the approximate natural elevation of the dry-sand beach in this setting) should be maintained across the central section of the entrance (alongshore), where channel excavations are initiated. A 25-ft-wide beach "berm" (minimum cross-shore width) or nearly horizontal to landward sloping plateau of sand should be maintained at 5 feet above mean sea level (MSL), with gentle side slopes to existing grade on the seaward and landward sides when the channel is closed. This will help direct unplanned breaches toward the center of the floodway while leaving a low area to facilitate mechanical openings. These berm construction and maintenance activities, inclusive of sand deposition and grading, as well as any vegetative clearing or management, need to be completed outside of the restricted shorebird breeding season. Berm grade elevations need to be set at a slope of 1 on 15 or less, with a vegetative cover maintained, as much as is practicable, to less than 10 percent. The "berm" or higher plateau of sand would generally be aligned with the center line of Dune Road, on the easterly side of the channel corridor., in order to avoid interference with existing and potential ephemeral pools and bay tidal flats, as much as is practicable. However, the exact position of the berm would need to remain somewhat flexible depending on overwash conditions. Berm construction would be accomplished, only when necessary, and in a manner which minimizes changes to the morphology of natural washover deposits, flats, shoals, and dune. Areas of un-vegetated sand flats would be conserved, with any vegetation control activities accomplished by selective hand cutting, without the use of herbicides, and outside of the piping plover breeding season.

Policy #5 — *Planned openings and subsequent channel evolution should be managed proactively to ensure the active floodway remains within a limited central corridor (~250 feet) and does not migrate or meander excessively to the east or west.*

According to records maintained by Town Trustees, Mecox Bay was opened mechanically 316 times between 1971 and 2018. There were a total of 66 unplanned breaches during the same period. An estimated 5 events occurred during major storms impacting the area (source: unpublished records, Town of Southampton Trustees). Historic data collected just after completion of the Bridgehampton/Sagaponack beach nourishment project[28] initially showed volume changes in a portion of the flood shoal (Fig 15).

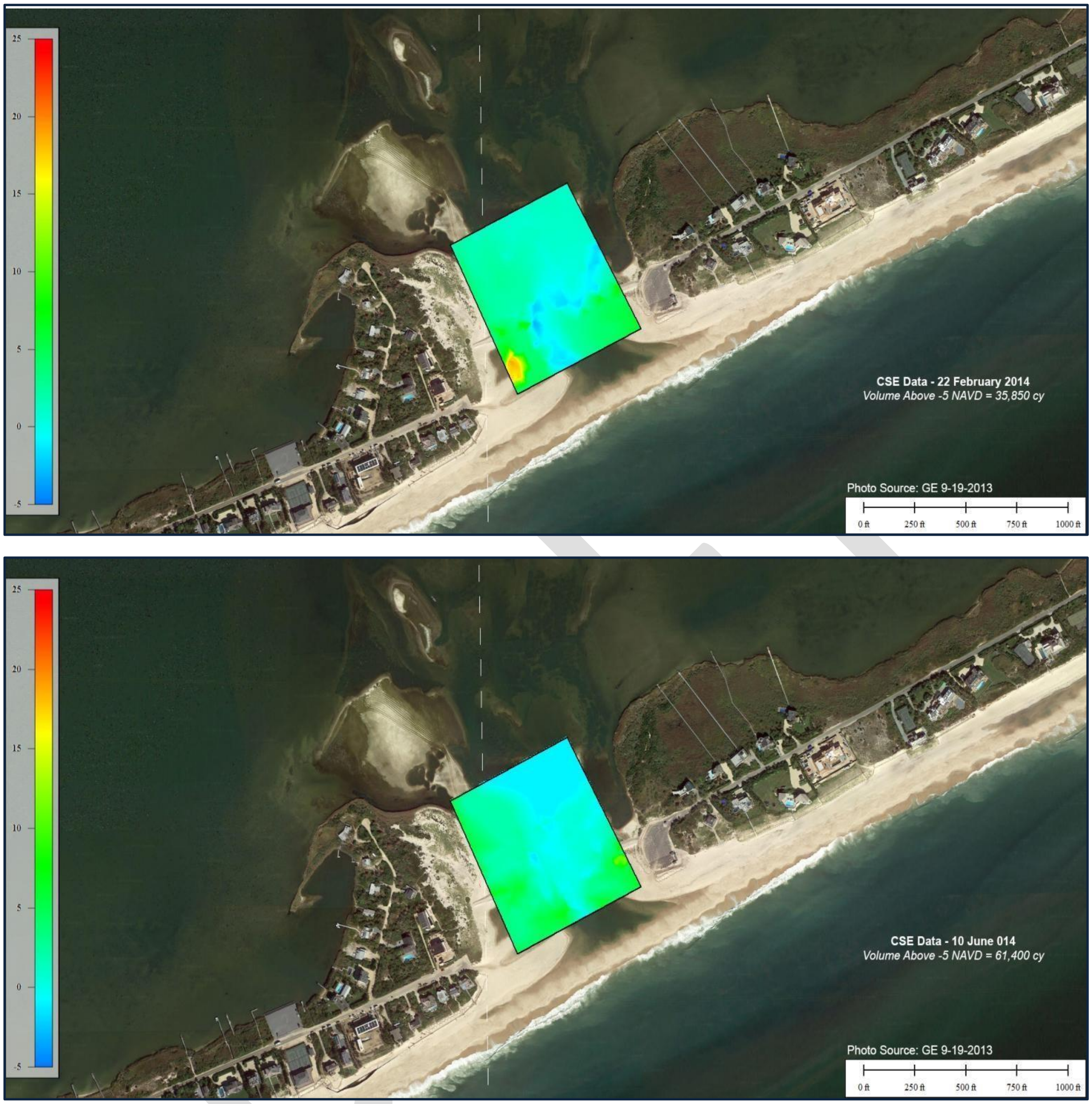


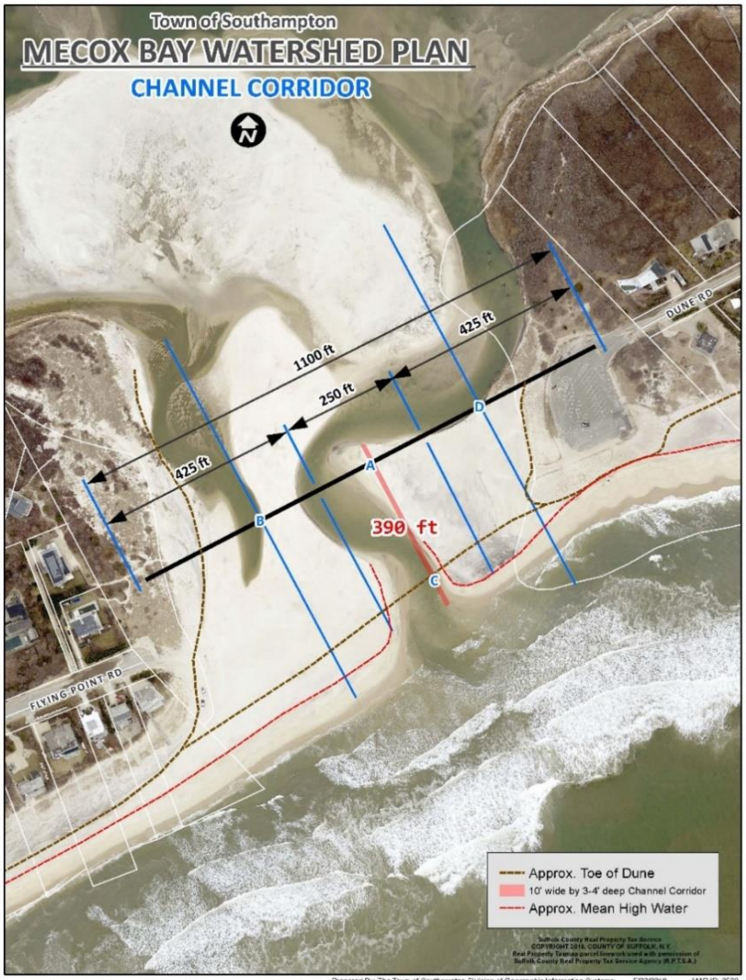
Figure 15: A portion of Mecox Bay flood shoal landward of the entrance channel was surveyed on 22 February 2014 (upper) and 10 June 2014 (lower) after completion of the 2014 nourishment project. The control area shows a gain of ~25,000 cy between surveys and provides evidence of significant draw-off of sand from the oceanfront. Note the common alignment of the channel closure berm and adjacent beach in the aerial image (19 September 2013) obtained one month before start of nourishment along Bridgehampton Beach.

On 22 February 2014, the control area highlighted in Figure 15 (upper) contained ~36,000 cy above the −5-ft NAVD contour. A subsequent survey on 10 June 2014 showed the same area contained 61,400 cy, a gain of ~25,000 cy. Some of this increase is likely associated with natural buildup of the beach and dunes following nourishment. However, a significant portion of this volume increase is associated with channel infilling and flood shoal development after the channel was opened naturally on 26 March and artificially on 2 April (unpublished records: Town of Southampton Trustees). The 2014 winter experienced higher-than-normal wave energy[28] and possibly produced greater sand losses to the flood shoal of Mecox Bay. Such losses exacerbate erosion along the beach and, therefore, proactive management may be needed to mitigate potential sand losses during unplanned breaches in storm events.

Policy #6 — ***The frequency of unplanned openings during minor storms should be reduced by maintaining a continuous dry-sand beach across the floodway of at least +5 ft. NAVD with a minimum beach "berm", sill or nearly horizontal plateau of sand width of 25 feet at +5 ft. NAVD elevation and gentle slopes in the cross-shore direction to existing grade. The landward edge of the berm or mounded high point of the plateau should incorporate a gently sloping profile similar in character to a natural overwash deposit (~+5 feet to 6 feet at the crest) extending across the floodway, with its low point positioned near the center of the Mecox channel corridor. This action would reduce the incidence of unplanned breaches, direct initial breaches and reduce sand volumes lost to the flood shoals during minor storms, as well as encourage the channel to form in the desired central location. All berm construction and maintenance activities would occur outside the restricted piping plover breeding season, unless emergency authorization is otherwise granted by the NYSDEC and USFWS. Natural vegetation on the berm needs to be managed, so that total cover does not exceed 10 % of the area, as excessive vegetation could preclude piping plover nesting.***

After planned breaches and natural closure of the channel, as well as any planned dredging of the flood shoal, a back-beach corridor should be rebuilt mechanically to minimum natural washover elevations (i.e. – ~+5 feet to +6 feet MSL). A recommended alignment for the back beach is the centerline of Dune Road so as to provide and maintain a barrier beach/washover ~200 feet landward of the strand (seaward vegetation line of the adjacent dunes). Figure 16 illustrates the recommended opening corridor and back-beach section to maintain under normal conditions, with recent profiles superimposed on the section. Figure 17 illustrates three cross-shore transects over the Mecox channel corridor with and without a channel opening. The upper part of Figure 17 illustrates the recommended channel closure sections in true (1:1) scale with no vertical exaggeration. The lower part of Figure 17 shows sections <u>at 20:1 vertical exaggeration</u> to better highlight subtle variations in elevation.

Any grading or re-building of the back-beach corridor, as well as proximate stockpiling of dredged material, needs to be accomplished, outside of the restricted piping plover breeding season, using flood shoal sand, in a manner which matches and /or ties in with the topography of existing natural beach, shoal and dunes. The creation of any artificial aberrations, such as excessive mounds, ridges, ruts, or depressions needs to be avoided, with all natural grade restoration completed prior to the start of the emergency species window. Any snow fence installation should be confined to the outer perimeter of the canal corridor beyond the designated channel corridor. Because the slopes of the berm would be built



and maintained at 1 on 15 gradations or less, on both the bay and ocean sides of the berm, no erosion impacts are anticipated to occur on either side of the berm. The volume of sand needed for berm construction would be entirely dependent upon the width and the elevations of the existing shoal. It is likely that creation of the berm along with stockpiled sand in the vicinity of the berm may even create additional habitat on the Flying Point Side of the inlet area for protected shorebirds, however if deemed necessary, mitigation measures could also be implemented elsewhere such as the S-curve on the eastern side of the channel (as recently suggested by the NYSDEC), to address any potential losses of habitat for listed species, in close coordination and community with NYSDEC and USFWS created by the berm.

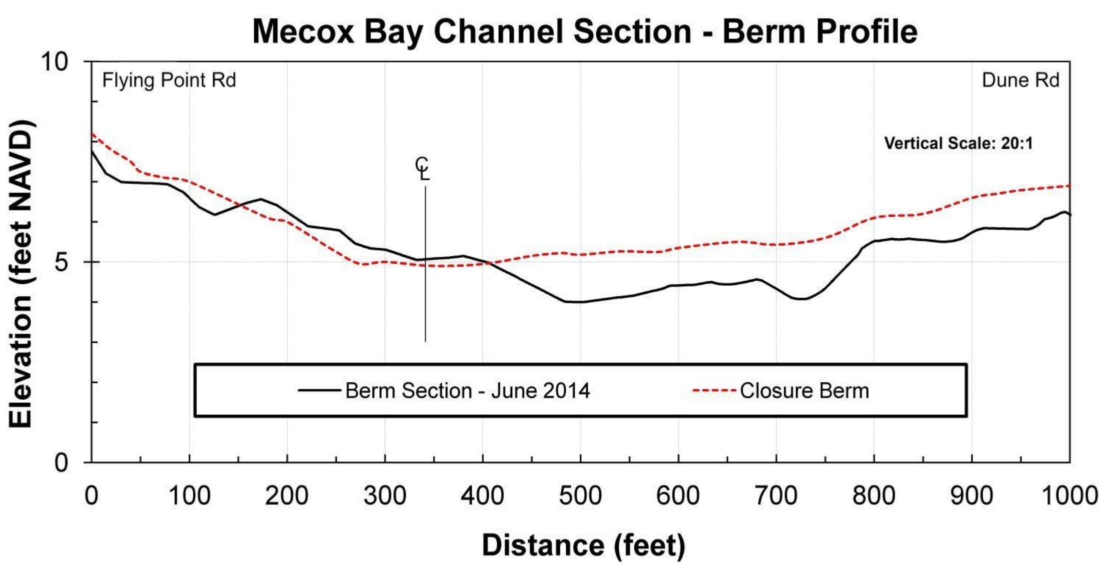


Figure 16: Recommended channel corridor 250 feet wide centered between Flying Point Road and Dune Road. A closure berm should be positioned with crest approximately along alignment 'A-A'. The lower image shows June 2014 surveyed berm profile versus the recommended closure berm. See Figure 17 for anticipated typical sections B, C and D.

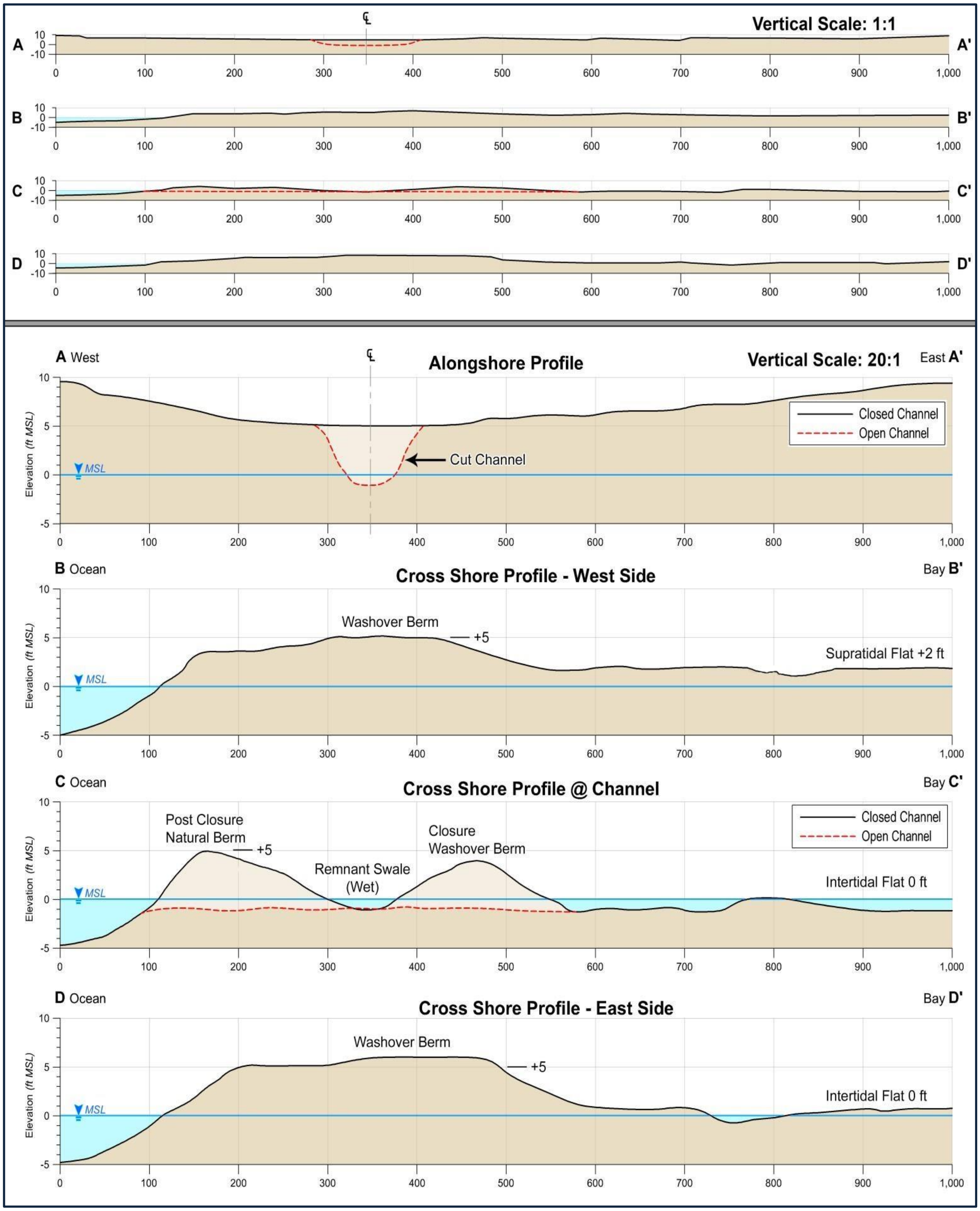


Figure 17: Anticipated profiles and cross-sections at Mecox Inlet showing closed and open conditions in the central channel (upper) at true 1:1 scale and (lower) at 20:1 vertical exaggeration. Sections B and D are in the washover floodway adjacent to the channel (see Fig. 16 for general location). Note: The bottom set of cross-sections is vertically exaggerated at 20:1 to fit the page. All man-made slopes should be gentler than 1 on 15.

Figure 18: Proposed centrally located gently sloped "berm" modeled after ephemeral natural washover conditions.

Water Quality Policies

Mecox Bay bears many of the characteristics of an estuary - *"a semi-enclosed coastal body of water which has a free connection with the open sea and within which sea water is measurably diluted with fresh water derived from land drainage."*[29] The key phrase— *"free connection with the open sea"*— means Mecox Bay is an estuary in the classical sense only when the entrance channel is open. Yet, despite its intermittent nature, the bay acts much like an estuary in terms of its freshwater inputs, brackish salinities, and suite of organisms (such as oysters, crabs, mussels, finfish, and a host of oceanic plankton) commonly found in sheltered coastal waters.[1] Species that live in estuaries are generally adapted to wide ranges in salinity, where extreme values can range from 0 ppt (fresh water) to hyper-saline conditions exceeding values in adjoining ocean water (i.e. – >33 ppt). Optimal salinities for shellfish are considered to be >10 ppt, so low salinity periods place stress on certain organisms.[1]

Waters circulate and mix within estuaries under the influence of tides and "density" flows, which are produced by differences between the weight of salt water and fresh water. Wind also provides an important mixing process, particularly in shallow bays, by generating waves, creating turbulence, and pushing water to higher levels at the downwind end of a basin. All of these processes work to some degree in Mecox Bay and help circulate water. With mean sea-level depths averaging only ~3.5 feet (see Fig 3) and no excessively deep areas within the bay, mixing is relatively efficient, reducing daily variations in salinity or temperature from top to bottom.[1]

Mecox Bay is generally considered well mixed, but because of extended periods of channel closure, salinity decreases significantly during times of high freshwater runoff into the bay.[1,2] Water quality parameters also fluctuate with the season, with temperatures varying through a wide range, including some winter periods when the bay is completely frozen. During summer conditions, shallow bay waters will be warmer than the ocean waters, particularly during periods when the entrance is closed.

Dissolved oxygen (DO), on which marine organisms depend, varies with the season and is limited by temperature. As waters in the bay warm, the maximum (i.e. – "fully saturated") DO concentration declines. DO is typically recorded in units of milligrams (mg) per liter (ℓ). Normal levels of DO in surface ocean waters are around 5–6 mg/ℓ. Fully-saturated cold waters can have DO levels >10 mg/ℓ. DO levels below ~3 mg/ℓ are generally considered hypoxic and lethal to organisms if concentrations persist below this level.[30] Many factors beyond physical circulation and temperature impact DO levels. Oxygen can be taken up by sediments as well as by respiration processes of organisms. Organic matter entering the bay generates microbial decay processes, which sequester oxygen and lower DO levels in the water column.[31]

Coliform bacteria levels are used as an indicator of estuary health. Total coliforms (TC) and fecal coliforms (FC) are measured in terms of most probable numbers (MPNs) of bacterial colonies per 100 milliliters (mL) of water. These non-conservative constituents found in all natural waters are living organisms, which are taken up by filter feeders such as shellfish, diluted by mixing with cleaner waters, or reduced by normal decay processes. Their concentration peaks in areas where circulation is poor and where effluent from existing non-conforming residential septic systems is entering the bay and its tributaries, through groundwater discharge or overland runoff, and/or as a consequence of flooding and inundation. The US Environmental Protection Agency (EPA) establishes standards for drinking water (i.e. – zero colonies per 100 mL) or recreational contact (i.e. – ≤200 colonies per mL) with numerous classifications and criteria established by individual states.[32]

In general, ocean waters will have lower concentrations of TC and FC than estuarine waters, because the sources tend to first enter the estuary and remain concentrated to a degree, before mixing with ocean waters. Unlike a conservative water-quality parameter (generally a physical constituent of the water such as salinity), coliform counts can fluctuate by many orders of magnitude, spiking near events, such as failing or flooded cesspools and significant septic effluent inputs, then returning to low levels, if flooding recedes or the source is eliminated or rapidly diluted.

Other conservative constituents of concern are nutrients entering the estuary. Nitrogen and phosphorus (the building blocks of fertilizer) promote algal growth and can lead to eutrophication, as a consequence of an increase in the rate of supply of organic matter to the estuary.[33] Some level of nutrients is necessary for maintenance of ecosystems; however, excessive levels lead to overproduction of plant matter, which loads the system as plants die and decay. Decomposition of dead organic matter depletes oxygen, leading to lower concentrations of DO. In the extreme, eutrophic conditions can produce a sudden die-off of shellfish and finfish, further taxing the system and producing even greater oxygen demand. Such conditions are more likely to occur in summer when waters are warm and the saturation level of DO is lowest. Reports of fish kills are more common in sheltered waters, where excess nutrients may produce eutrophication.[34,35] A bluefish die-off was documented at Mecox Bay in November, 2013; however, cold temperatures rather than low oxygen levels, appeared to be the cause of their mortality.

Phytoplankton are minute plants which form the base of the food chain and take up nutrients by varying degrees. Among the thousands of species are the diatom group, dinoflagellates, coccolithophorids, and cyano bacteria. Some species are better equipped to take up nutrients which can lead to imbalances in the distribution of species.[36] In the extreme, one species may come to dominate a system and produce a harmful algal bloom, particularly if the species is toxic. It is estimated that 50 percent of all marine and freshwater algal blooms may be toxic and a principal cause of fish kills as well as a potential cause of illness in humans.[37] Algal blooms are primarily controlled by circulation and dilution of natural waters and limiting excessive inputs of nutrients. There have been no documented incidences of human mortality or serious illness related to algal blooms in the Mecox Bay area or within the Town of Southampton (M Shea, pers. comm., 10 November 2014).

Southampton College Study

A 2003 study by Southampton College[1] provides the most detailed evaluation of the biology and water quality in Mecox Bay. The study looked at conditions in the bay during periods when the entrance channel is closed, as well as open. The Southampton College study notes that Mecox Bay supports a thriving population of the American oyster, soft shell clam, and blue claw crab. All are commercially important and thrive in brackish water where salinity is >14 parts per thousand (ppt). Prior management efforts for Mecox Bay have focused on opening the inlet when water levels become too high or when salinities fall below optimum levels for shellfish. Because of its relevance to the site-specific issues of water quality and habitat protection, the Southampton College study is reprinted as Appendix B to the plan.

Researchers at Southampton College sampled five stations weekly or biweekly in 2002. Three stations were located in Mecox Bay, one in the ocean near Shinnecock Inlet, and one in Mill Creek, the largest freshwater tributary to the bay. Salinity, temperature, nutrients, coliform bacteria, and chlorophyll (a proxy measure for phytoplankton) were monitored using standard methods. Benthic organisms that live in the sediments or on the bottom (such as clams, mussels, and oysters) and pelagic organisms that live in the water column (such as crabs and finfish) were also sampled during the spring harvest season. The Southampton College study (Appendix B) contains numerous graphs and charts illustrating the seasonal variations of these parameters, including changes associated with openings and closings of the entrance channel. Healthy shellfish populations of the bay are attributed to higher-than-normal (i.e. – compared with open bays and sounds) nutrient concentrations which promote phytoplankton growth.[1] The study also estimated the residence time of Mecox Bay waters.

The Mecox inlet was mechanically opened three times and reopened twice by fall storms in 2002 and closed naturally after each event. It was opened on 8 February and remained open through 6 March. The Town opened the channel on 29 May, and it closed by early July. The third opening was 23 September with closure by early October. The entrance was opened by tidal washover between 16 and 22 October, and reopened between 9 and 12 November. This frequency of opening is representative of most years.

The Southampton College study does not provide datum-based water levels. However, the researchers report the minimum depth at one station was 1.2 m (~3.9 feet) on 10 June (inlet open) and the maximum depth was 2.2 m (7.2 feet) on 17 November (inlet closed). Thus, bay water levels fluctuated by over 3 feet in 2002.

Salinity at the ocean station was relatively constant over the year, averaging 32.1 ppt (±1.1 ppt). By comparison, Mecox Bay salinities ranged from a low of 6 ppt (7 February, inlet closed) to a high of 26.6 ppt (7 March, inlet open). Between the first and second planned openings (spanning approximately 7 March through 29 May) and subsequent closure period (early July to 23 September), salinities remained above 14 ppt. The last two closure periods in the fall exhibited similar salinities around 13–16 ppt.[1]

Policy #7 —*Salinity in Mecox Bay should be continuously monitored. Salinity should be used as a trigger for channel openings if the average level (sampled from several areas in the bay) falls below ~12 ppt for longer than 48 hours and there is the requisite amount of water in the bay, i.e. a high bay, to ensure a successful opening lasting long enough to ensure an adequate exchange of water to raise the salinity levels.*

Oysters spawn when water temperatures reach coupled with a salinity of at least 10ppt, however the success of that spawning depends on continued optimal levels of salinity in order for the oyster larvae to have a successful set and growth. If the bay is to remain closed during the late spring and summer months, then it is imperative to achieve an optimal salinity of 20 ppt prior to any extended period of bay closure in order to ensure successful spawning and setting of oysters and other shellfish during the summer months.

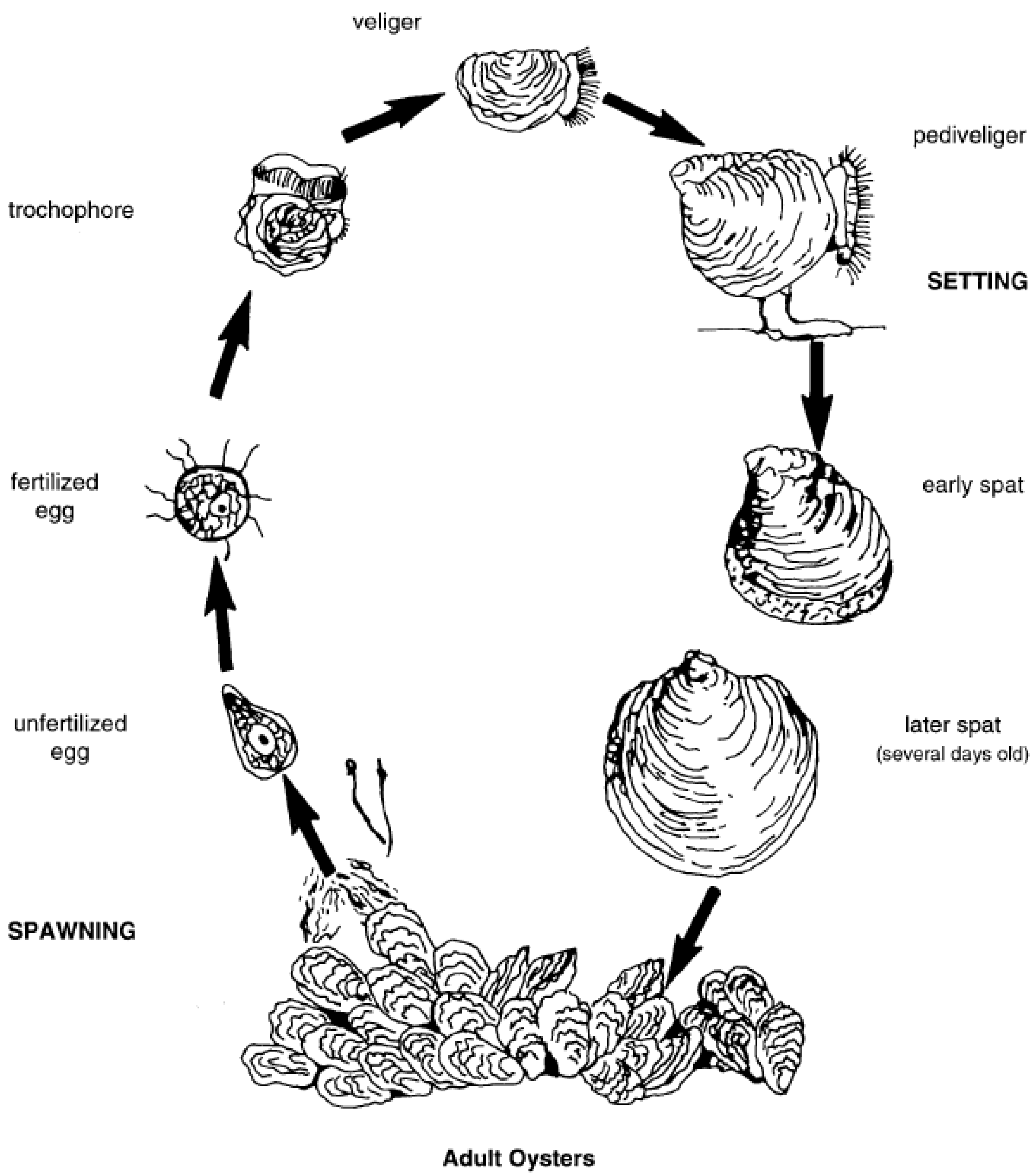


Figure 19 - The life cycle of the Eastern Oyster (Crassostrea virginica).

Policy #8 —*Because of its critical importance for sustaining the ecosystem of Mecox Bay, DO should be monitored, particularly during summer months and used as a trigger for channel openings if data shows more than 48 hours of declines below 3 mg/ℓ.*

Temperatures in Mecox Bay ranged from <40°F in January/December to 77°F in July/August. Highest ocean temperature was ~71°F on 1 August. DO ranged between 8.0 mg/ℓ and 10.0 mg/ℓ in the spring but fell to a low of 2.7 mg/ℓ on 2 July (inlet probably closed). Low DO did not persist, rising to 6.9 mg/ℓ by 16 July (inlet closed) and remaining around 5.5 mg/ℓ in August. DO peaked at 12.8 mg/ℓ in December.[1]

Using three methods, the Southampton College study estimated that the residence time of bay waters ranged from 5 to 26 days over the year, depending on the method (see Appendix B, Table 1). During the June opening, estimated residence times ranged from 19 to 26 days (using three methods). During a short-lived opening in November, current measurements (i.e. – discharge through the channel) indicated rapid turnover of bay waters in ~5 days. This latter result is close to the residence time of a few days predicted in the Stony Brook study (Appendix A).

Measurements of nutrients showed marked seasonal patterns. Dissolved inorganic nitrogen (DIN) was high during cold months and low in summer, whereas phosphate levels were low in winter and high in summer. Dissolved organic nitrogen (DON) levels peaked in summer, offsetting low levels of inorganic nitrogen.[1] Certain tributaries to the bay were found to be the largest contributors of various nutrients including Burnett and Sam's Creeks (nitrate), Swan's Creek and Channel Pond (dissolved organic nitrogen), and Hayground Cove and Mill Pond (silicate). (See Appendix A for locations.) Higher nitrogen concentrations in ground water were found in the eastern side of Mecox Bay. Highest phosphate concentration was measured in the northeast corner of the bay.[1]

The Southampton College study concluded that large nutrient concentrations promoted phytoplankton growth and healthy shellfish populations within Mecox Bay. The study also found that the lower flushing rate of the bay, relative to open estuaries like Peconic Bay or Great South Bay, *"creates a phytoplankton community with higher net growth."*[1]

While closure periods appear to help maintain healthy nutrient levels, coliform bacteria counts spiked between some openings, particularly in summer. Highest recorded bacterial densities (MPN or most probable number of organisms) in Mecox Bay were ~570 with a margin of error of ±484 colonies per 100 mL (August, inlet closed). The largest point sources for coliform bacteria were Sam's Creek, Hayground Cove, and Burnett Creek[1] (see Appendix B, Figs 14 & 15).

The monitoring results in the Southampton College study led the researchers to conclude that intermittent periods of opening and closure are beneficial for Mecox Bay in several ways:

- Brackish salinities are lower than open bays and promote quicker oyster growth.
- Nutrient levels become concentrated and are retained for extended periods, promoting phytoplankton growth which supports filter feeders.
- Periods of closure reduce currents in the bay and allow fine-grained organically rich sediments to settle and provide nutrients to benthic organisms.
- Shallow depths of the bay keep waters well mixed with less stratification, limiting zones of low DO.

Mecox Bay has developed a diverse and prolific suite of species under conditions of extended closure combined with shorter-duration openings. Reference 2 monitored an eight-day opening and concluded that a duration of this order is generally sufficient to fully exchange the waters of the bay. Reference 1 found residence times ranging from a low of five days to a high of 26 days when the entrance was open.

Policy #9 — ***Although data indicates that Mecox Bay drains relatively quickly and that littoral sand losses are likely to increase the longer the channel remains open, planned openings need to be long enough in order to raise salinity to levels that ensure the viability of the bay's shellfish populations. Barring a compelling reason to close the inlet (discussed below), the inlet should remain open long enough to reach minimum critical salinity threshold of 14-16 ppt and when possible left open long enough to reach 20-22 ppt.***

In order to prevent significant littoral sand losses, the mechanical closure of the inlet should occur if any of the following conditions should arise: a) if there is excessive meandering of the inlet beyond the designated corridor; or b) if there is the threat of a major storm or weather event such as hurricane, tropical storm or nor'easter; or c) if the inlet has been open for a period in excess of 25 days, provided that the parameters of salinity and dissolved oxygen are at acceptable levels.

Mechanical closures would be achieved using sand utilized from designated emergency sand stockpile sites. If excavated/dredged sand is left within the channel corridor, it will be graded in a manner which mimics the natural morphology of the overwash area and which facilitates continued use of the overwash, flood shoal and flat area, as shorebird breeding and foraging habitat, including movement and dispersal of plover chicks between the ocean and the bay. Sand/snow fencing would not be installed within the inlet corridor.

Openings are important for flushing contaminants and reducing the buildup of coliform bacteria. However, periods of closure create conditions which reduce salinities which can negatively impact shellfish while also concentrating nutrients which benefits shellfish. During the 2002 Southampton

College study, nutrient loadings and water quality parameters were apparently within acceptable ranges and exhibited no adverse impacts for Mecox Bay. These data offer a set of benchmarks for future comparison and should be utilized in establishing thresholds. Excessive nutrient loadings are known to trigger eutrophication in estuaries. Therefore, monitoring of levels and identifying sources which may elevate parameters beyond safe limits is advisable. Wave action, tides and storm activity can hinder the ability to open and close the inlet, and thus needs to be factored into decision-making.

Endangered Species Policies

History, Inventory and Management

Mecox Bay and its surrounding beach are listed as significant coastal fish and wildlife habitat by the New York Department of State because they provide nesting and foraging habitat for several endangered species.

Figure 20: Least tern at Mecox Inlet.

The sand flats of Mecox Bay, as well as the surrounding ocean beach, provide both suitable nesting habitat and food foraging areas for nesting shorebirds, including the piping plover and the least tern, as well as roseate tern and red knot in migration. In addition, the subject area provides habitat for seabeach amaranth and seabeach knotweed. Town Trustees have conducted and published yearly monitoring surveys of rare endangered shorebirds occurring within the Town of Southampton and specifically the Mecox Bay region since 1998. All shorebird monitoring has and will continue to be undertaken by the Trustees consistent with USFWS and NYSDEC guidelines.

The threatened and endangered shorebird monitoring program, at the local level, is administered by the Trustees within the Mecox Bay area. Trustees efforts include yearly training, annual monitoring during the endangered bird season of April 1 to August 31, symbolic and predator exclusion fencing, posting, documentation, and restrictions on driving, pets and kites, and public outreach and education. In addition to the Trustees' Environmental Analyst who oversees the program, four full-time seasonal coastal stewards are employed each year to monitor endangered species activity. The monitoring program also includes daily updates to a GIS map showing which beaches throughout the town are closed to certain activities.

Monitoring by the Town Trustees for the Mecox region has been separated into three distinct areas of the barrier island fronting Mecox Bay. These areas from west to east are Flying Point Beach (spanning from the Flying Point Beach parking area on the west side of Mecox Bay to the eastern terminus of Flying Point Road), Mecox sand flats (the overwash fan and associated back-bay shoals), and Scott Cameron Beach (spanning from the western terminus of Dune Road to Jobs Lane).

Recreational off-road-vehicle (ORV) driving and pedestrian access are highly restricted within the Mecox inlet and flood shoal area during the endangered shorebird breeding season. Prior to April 1, symbolic fencing is installed in a west-east direction, running from the vehicular access point at the easterly terminus of Flying Point Road, across the inlet corridor, to the vehicle access point and southwestern corner of the Town owned Scott Cameron Beach parking lot. ORV use is permitted on the ocean side of the symbolic fence, between 6PM-6AM. In the event that a plover nest is documented, the nest is immediately symbolically fenced, whether it occurs on the bay or ocean side of the main west-east symbolic fence line. Five (5) days prior to the estimated hatch date, all areas within 1000 feet radii of the nests are closed off to vehicles, by installing fence barriers at both vehicle access points at Flying Point Road and Scott Cameron Beach and as perpendiculars, running from the westerly and easterly dune lines down to mean high water at the ocean surf line. The fence barriers to vehicles and the west-east pedestrian exclosure string fence within the inlet corridor remain in place, until the plover chicks fledge (as evidenced generally by the ability of the young plovers to fly at least 15 meters). Least tern, seabeach amaranth and seabeach knotweed colonies are likewise symbolically fenced.

Policy #10*: The Trustees will conduct mechanical openings and closings of the inlet, during the endangered bird season (April 1 – August 31) as permitted by the US Army Corps of Engineers and the New York State Department of Environmental Conservation.*

Mecox Sand Flats

The Mecox sand flats are of considerable value for shorebirds, especially the piping plover and least tern that have historically nested in this area. These latter species prefer open, un-vegetated dry sand beaches in close proximity to intertidal flats. Eggs are laid on bare sand and therefore are vulnerable to overwash, as well as predators. The type of habitat preferred by the piping plover and least tern is inherently unstable such that vegetation cannot take root or tends to remain sparse. The habitat viability is inherently problematic because once formed, there is a natural tendency for stabilization by vegetation. These species tend to seek actively evolving barrier spits in the early stages of formation or newly formed wash overs produced by storms in close proximity to intertidal sand and mud flats.[38]

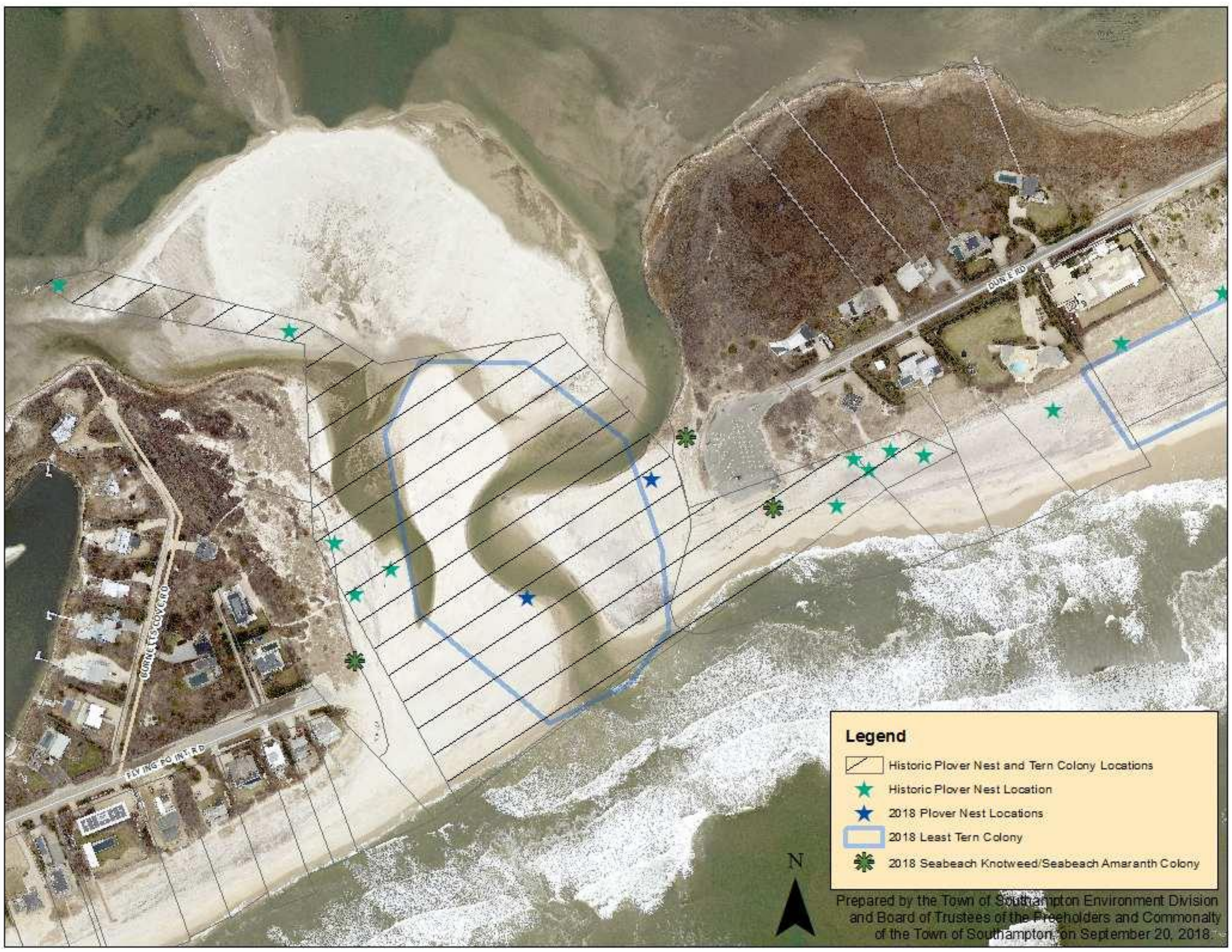


Figure 21: Principal nesting area for the piping plover and least tern (2002-2018). [Source: Town of Southampton Trustees Annual Endangered Species Reports].

Figure 22: Nesting area for piping plovers and least terns along the westerly portion of Mecox Bay (2018). [Source: Town of Southampton Trustees Annual Endangered Species Reports].

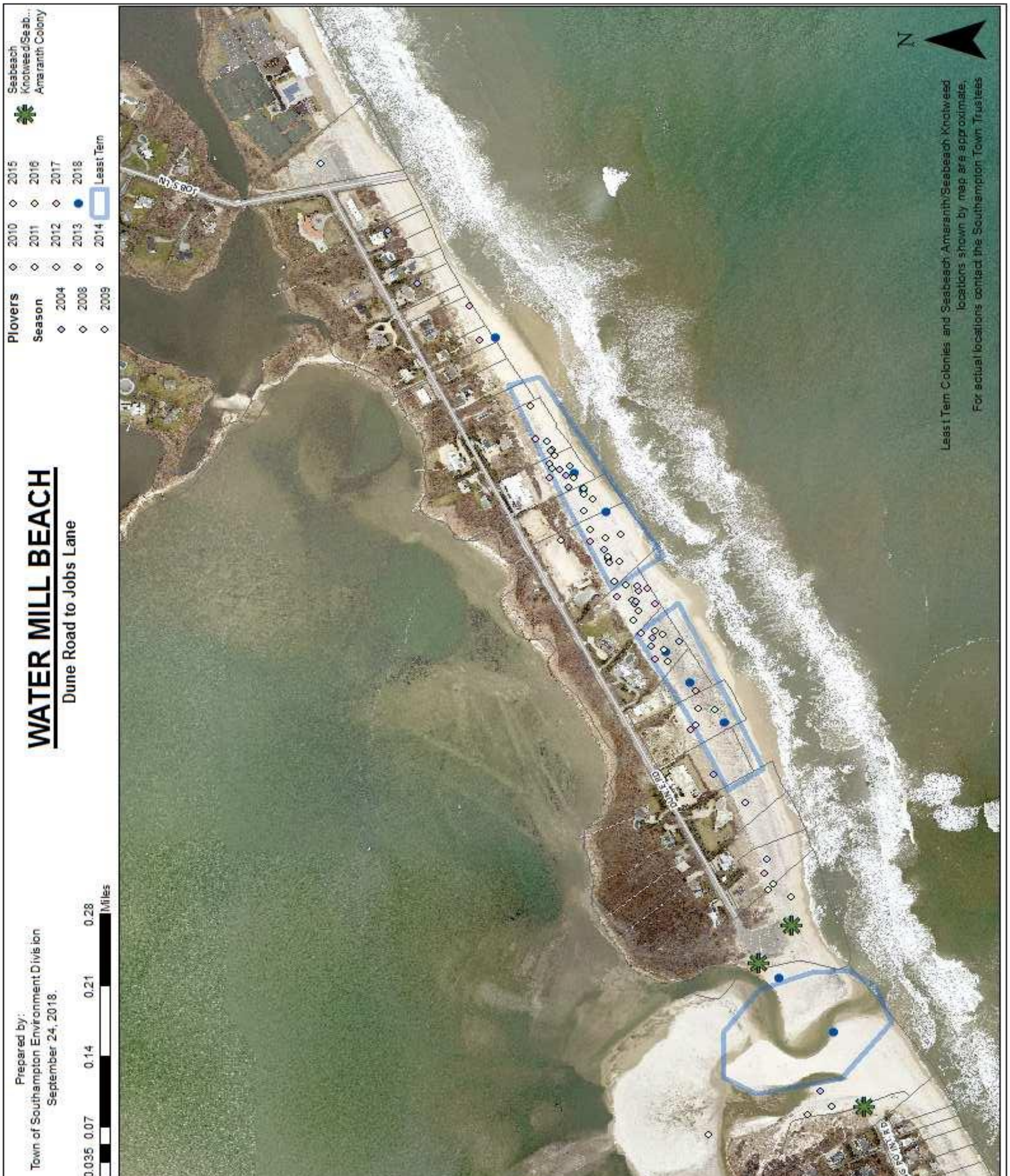


Figure 23: Nesting area for piping plovers and least terns along the easterly portion of Mecox Bay (2018). [Source: Town of Southampton Trustees Annual Endangered Species Reports].

The Mecox sand flat area, which is made up of the overwash fan and associated back bay sand flats and flood shoals, is a prime foraging area for piping plovers and least terns. The entire shoreline in this region is available for foraging, according to the maps of nesting pairs of piping plovers and least terns published in the Town of Southampton Trustees Annual Endangered Species Reports 2002–2018. In 2018, both piping plovers and least tern nested where inlet openings are proposed to be managed (Fig 20). However, in prior years, the birds have tended to favor the northwesterly sand flats and the ocean beaches just south and east of town-owned Scott Cameron Beach, as well as the north end of the terminus of Flying Point Road, often within 500 feet of the inlet channel alignment. Some of these nest sites are vulnerable to flooding, as bay water levels rise when the channel is closed. Foraging grounds, inclusive of newly hatched plover chicks, can also be at risk, as they often utilize the overwash fan, as well as the back bay sand flats.

Piping Plovers (Charadrius melodus)

A detailed look into the Town of Southampton Trustees annual reports for piping plover activity shows that there are data on the number of nesting pairs spanning from 2002 to 2018 (no data available for 2007) for the Mecox sand flats area of Mecox Bay (Figure 23). In that timeframe, the largest number of piping plover pairs that nested in the area, during that period was eight (9) in 2018 and eight (8) in 2017. There were no pairs that nested in the Mecox sand flat area in 2004, 2008, 2009, 2010 and 2012. A single pair nested at the site in 2011. Recent site conditions have been favorable enough to allow for a resurgence in piping plover nesting activities. During the past six (6) years 31 pairs have nested at the site, with an average of 5.1 pairs per year; whereas, only 11 pairs had nested at the site the ten (10) previous years, for an average of 1.1 pairs per year. Controlled opening and closing of the inlet should allow for maintenance of favorable site conditions for plover nesting.

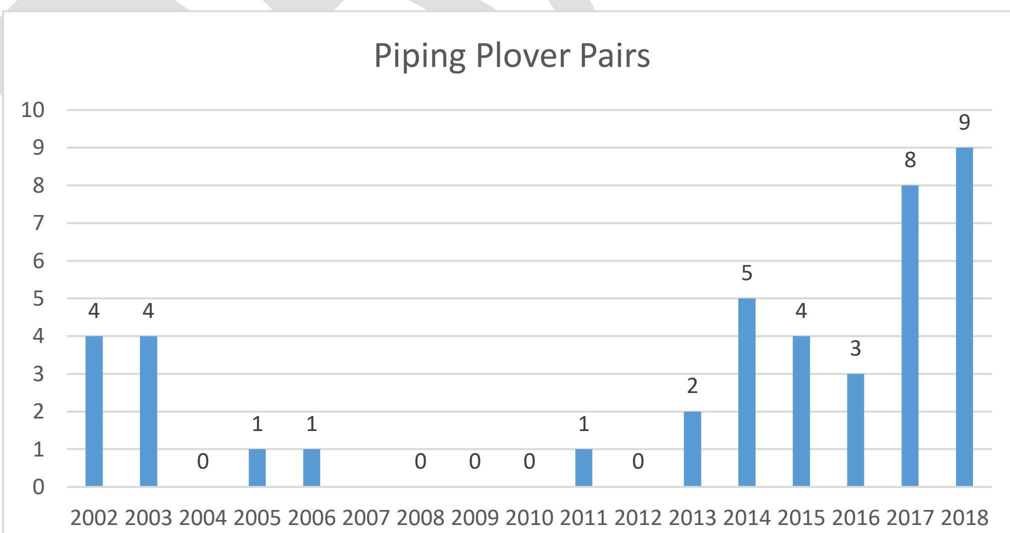


Figure 24: Piping plover nesting pairs in the Mecox Sand Flat region between 2002 and 2018 (no data for 2007). [Source: Town of Southampton Trustee Annual Reports for Piping Plover Activities].

Critical habitat and/or physical or biological features essential to the conservation of piping plovers within the Mecox area include adequate beach, sparsely vegetated back beach, overwash areas and undisturbed space for courting and territory establishment; sufficient foraging grounds, cover or shelter; sites for breeding, nesting and rearing of offspring; and habitats where disturbance or threats of disturbance are minimal. The availability of sand or mud flats above high tide, natural beach wrack, sparse vegetated back beach and overwash areas is particularly important.

Threats include sea level rise, coastal storms and flooding; unregulated use of off-road motor vehicles; leashed and unleashed dogs; human disturbance; noise associated with construction, fireworks and other activities; predation by feral cats, fox, gull, crow, birds of prey, and other predators; and changes in beach macro-invertebrate wrack communities, as a consequence of beach cleaning, as well as excessive sand deposition and grading.

<u>Least Terns (Sternula antillarum)</u>

In addition to the monitoring of piping plovers, the Town of Southampton Trustees also monitored least tern activity for the Mecox sand flats for the same period of time (Fig 24). During monitoring of least tern activities, the highest number of least tern pairs was 150, which was observed in 2002. The second highest number of pairs, 110, was observed in 2017. As with the piping plovers, there was a significant drop in the number of nesting pairs during the period between 2008 and 2012, with only six to nine (6 -9) total pairs nesting at the site. Beginning in 2013 site conditions have become more favorable for least tern activity.

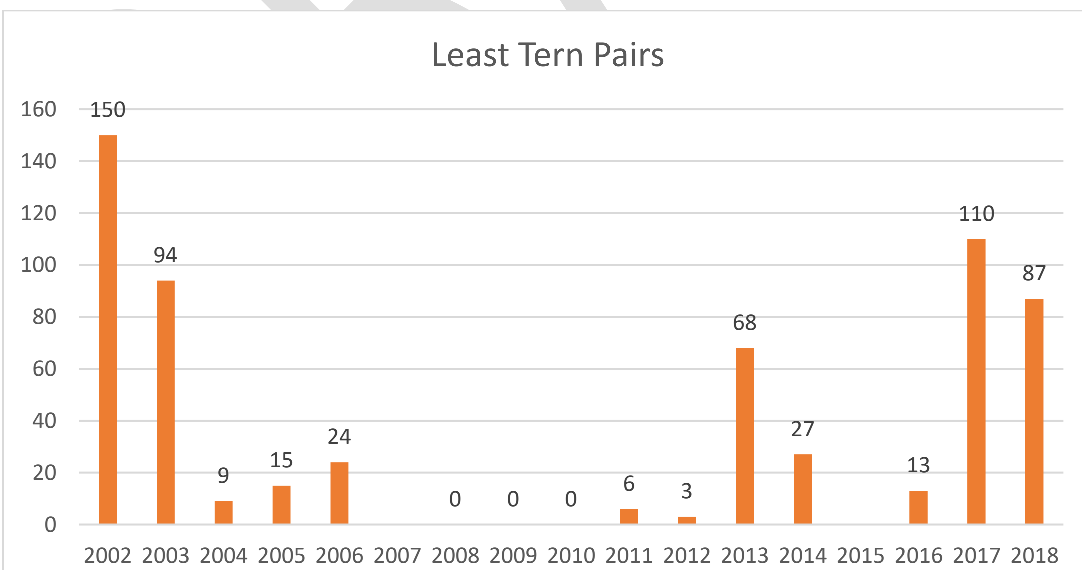


Figure 25: Least tern nesting pairs in the Mecox Sand Flat region between 2002 and 2018 (no data for 2007 and 2015). [Source: Town of Southampton Trustees Annual Reports for Least Tern Activities].

While numerous factors affect the number of piping plovers or least terns in any area, a principal factor is the availability of ephemeral washover habitat. New washovers after storms often provide the type of fresh, un-vegetated habitat favored by these species. But over a short period of time, vegetation including salt-marsh grasses, will propagate and transform the character of the washover to alternative habitat unfavorable for nesting by birds. The annual fluctuation in least tern and piping plover populations (Figs 23, 24) were likely influenced to some degree by the condition of the habitat. Storm overwash, in effect, resets the clock on natural evolution of these features, adding a new layer of sand and burying emergent vegetation.

Red Knot (Calidris canutus rufa)

Red knots, a species of sandpiper, are known for their extraordinary long-distance migrations. Due to these long migration patterns, these shorebirds need to have access preferred prey, such as horseshoe crab eggs, invertebrates and juvenile clams and mussels during stopovers. Due to the rich biodiversity, Mecox Bay, inclusive of the sand flats and flood shoal, has the potential to offer an abundant supply of these critical food sources. The red knot migration patterns generally coincide with piping plover/least tern nesting season, with the spring migration generally running from April through June and the fall migration extending primarily from July through September.

In response to the recent listing of red knot as a federally threatened species, the Board of Trustees has begun monitoring Mecox Inlet for the presence of these migrating shorebirds. Historic records indicate that red knot have been observed within the vicinity of the Mecox Inlet (Sullivan *et al. 2009)*, with as many as 17 individual birds observed over the last five years, according to USFWS. Occurrences of red knot have so far not been documented prior to or during authorized mechanical inlet openings.

Notwithstanding this infrequent occurrence, annual red knot surveys need to be completed by a qualified biologist, both between April through June and from July to September 1, with some birds potentially occurring as late as November 30. Field surveys for red knot are especially critical four (4) days prior to commencement of any inlet opening, closure or grading within the canal corridor and flood shoal area, with field observation data forwarded to the U.S, Fish and Wildlife Service and NYSDEC. When red knots are spotted, no work should be performed within 300 meters of any red knots. Flood shoal excavation needs to be minimized to the maximum extent practicable to avoid adverse impact to red knot foraging grounds.

***Seabeach Amaranth** (Amaranthus pumilus)*

Seabeach amaranth has recently been documented in the project area. See latter note regarding an observed occurrence of the plant near the Mecox inlet in summer 2014 following nourishment of the area. Accordingly, seabeach amaranth occurrences need to be documented each summer through

November 30, and reported to USFWS and NYSDEC. Symbolic project limiting fences need to be erected and maintained within a 3 meter radius of observed amaranth individuals and colonies.

Seabeach Knotweed (Polygonum glaucum)

In 2018, the Town of Southampton Trustees identified and documented the presence of state rare seabeach knotweed at two (2) locations in the project site. Both colonies are small with less than ten (10) individual plants. Based upon the site assessment, the stability of these colonies is vulnerable to threats from both vehicular and pedestrian traffic, as well as beach raking. Continued monitoring of seabeach knotweed needs to be completed each year, in order to evaluate population stability and potential adverse impacts related to inlet opening.

Policy #11 — ***Mechanical openings and closings of Mecox entrance should seek to maintain the morphology of natural washover deposits, inhibit excessive dune building, and stabilization or colonization by vegetation, and conserve areas of unvegetated sand flats, in order to retain and enhance habitat for listed species.***

Endangered Species Influence on Management Plan for Mecox Bay

Piping plovers are listed as an endangered species by the US Fish & Wildlife Service ("USFW"). Least terns are listed as an endangered species by the NY State Department of Environmental Conservation. Both species build their nests, lay their eggs and raise their young on open beaches, during some portion of the period between April 1 and August 31 each year. The southern shore of Long Island, including the beaches within the Town of Southampton, provides preferred habitat for these species during this period.

The Endangered Species Act requires, prohibits or discourages various actions on the part of the beachfront landowners and beach managers and those who use the beaches during the relevant five-month period.

The Trustees hold a historic easement from the crest of the primary dune to the highwater mark across all of the ocean beaches within the Town which thereby grants the Town's inhabitants the right of pass and repass in order to access and use the beach for traditional purposes such as fishing, the gathering of seaweed, bathing, and recreation. In In conjunction with this priceless easement, the Trustees monitor beaches within the Town each year for protected plover and tern activity and other endangered species through their Coastal Steward Piping Plover Program, which deploys a team of qualified stewards or monitors who continuously monitor endangered species activity on the beach in consultation with USFW following the USFW's guidelines for beach management. These activities include restricting pedestrian and vehicular access to likely nesting areas with the use of signage, stake-and-cord barriers, and to block automotive access entirely in areas where chicks have hatched until the fledge. Monitors record mating pairs, clutches, losses due to predation and storms, hatched chicks, and successfully fledged chicks. The cost of these actions is borne by the Town Trustees.

If USFW perceives a violation of its standards with respect to the Trustees' management of the Mecox Inlet, it has the power to so advise the relevant permitting authority (US Army Corps of Engineers); to work with the local agency (Town Trustees) to correct deficiencies; or to ask the US Attorney for the Eastern District of New York to prosecute if in their opinion a "take" has occurred.

The permits relevant to mechanically opening and closing the inlet and to conducting dredging operations are issued by the US Army Corps of Engineers and the NYSDEC. In considering an application to open or close the channel, the Army Corps is required to seek and to take into account the factual input and recommendations of the USFW relating to endangered species, in this case the piping plovers. But the Army Corps is not required to accede to those recommendations; it may also take into account information relating to opening/not opening and closing/not closing the channel and other actions on environment, habitat, fish and shellfish, non-endangered birds and wildfowl, shores, farms, fields, water tables, and all forms of human activity. The issuance of an Army Corps permit enables, but does not require, the NYSDEC to issue a parallel permit to the Town Trustees.

In some years, the five-month endangered species exclusion window (April through August) coincides with periods of intense rainfall and significant groundwater flows, which can cause Mecox Bay to reach extremely high levels rapidly during and after heavy rain events, thunderstorms and tropical storms. At such times, endangered species can be negatively impacted by a high bay which results in flooding of sand flats and limitations on available habitat and food supply. Improved management of bay water levels would better protect active shorebird breeding and feeding areas, and thereby reduce bird mortality coupled with the potential to used dredged sand to create additional attractive habitat for the shorebirds.

Historically, at the direction of the Town Trustees, there have been inlet openings during the five month endangered species exclusion window, when such opening was warranted based on water levels, salinity, and threats to human health. An opening during the exclusion period can be beneficial, and sometimes essential, in order to improve water quality and protect the public welfare and health. For example, when inlet openings are delayed, dissolved oxygen can be depleted and coliform bacteria can increase. Salinity levels can markedly decrease, threatening oyster populations. High bay and ground water levels can lead to flooding of basements and septic systems, contamination of surface waters, erosion of bay shores and harm to farm field crops and fruit trees.

Conversely, an opening during the restricted period can have negative effects on the foraging, courtship, incubating and brood-rearing behaviors of beach-nesting birds. Human activities—especially the use of heavy equipment, can disrupt these behaviors. These activities, together with the stockpiling and re-use of dredged sand, can also damage beach habitat and foraging space, crush or bury nests, eggs and chicks, and bury plover prey items. These negative consequences exist on a smaller scale at all times and the negative consequences are relevant only to the degree that plover activity is taking place in or near the location of the bay-ocean channel. In most years this activity is either minimal or non-existent.

Openings of the bay-ocean channel during the restricted period is at present governed by an emergency-permit procedure that involves the Town Trustees, the NY State Department of Environmental Conservation, the US Army Corps of Engineers, and the US Fish & Wildlife Service. Under this procedure, from the time the Mecox Bay water level reaches the depth that requires channel opening, obtaining an emergency permit can take more than a month. The harm caused by an overfill bay begins at the day the danger level is reached, and increases day by day thereafter, particularly if the water level continues to rise. The current emergency-permit procedure is simply not workable.

A better procedure is available, beginning with the adoption of this Management Plan. The US Fish & Wildlife Service can, in certain circumstances, accept local actions that are potentially negative to an endangered-species program, provide that, in mitigation, the local entity takes or continues voluntary actions that are positive for the same endanger-species program. The US Army Corps of Engineers, which actually issues the permits for bay/ocean openings, is empowered to take into consideration all consequences of its permitting decisions — not just endangered-species, but also other species, natural environments and habitats, agriculture and fisheries, residences and normal human activities. The NY State Department of Environmental Conservation is also empowered to take into consideration the full range of consequences of is permitting activities.

Adoption of this Management Plan would enable the Town Trustees to immediately begin working with these three important regulatory bodies to develop a structure under which the Town Trustees would manage the opening and closing of the bay/ocean channel all year long, without any need for incident-by-incident permitting, subject to mutually agreed standards, monitoring, reporting and supervision.

Policy #12 — ***Establish and maintain well-defined procedures and protocols, in coordination with the NYSDEC and U.S. Fish and Wildlife Service, to allow for emergency inlet openings during the endangered species exclusion window (April 1 to August 31). Inter-agency communication and coordination would ensure that the physical action of the opening event will have minimal negative effect on endangered species.***

The NYSDEC had advised the Trustees that it is unlikely that it will be able to authorize all cut openings requested during the majority of the period from April 1 -August 31 without an Incidental Take Permit issued pursuant to ECL §11-535 and 6 NYCRR Part 182. Because the piping plover is a federally listed species, a Federal Incidental Take Permit will also be required if it is determined that opening of the cut during the breeding season would result in a "Take." The Federal permit must be obtained before a DEC Incidental Take permit can be issued.

As such, even though the Trustees intend to mitigate any impact that opening the inlet would have on endangered species to the extent practicable when an opening is required under this Plan, the Trustees will seek to obtain applicable Take Permits from the Federal and State governments so as to have authorization to perform work under the plan as necessary.

Mecox Bay Closure Berm and Endangered Species

Following adoption of this Management Plan, the Trustees will seek approval from the US Army Corps of Engineers and the Town of Southampton to establish and maintain a washover berm, nearly horizontal sand plateau or mound aligned with Dune Road, that would extend across the overwash fan, in order to avoid (but not completely prevent) unplanned opening events associated with minor storms. The berm, plateau or mounded portion of the overwash zone of the inlet should provide a gently sloping transition, from high ground to a low central corridor about 100 feet wide, with a crest elevation near the natural overwash elevation of (~)+5 feet NAVD) (~MSL datum) and slopes of 1 on 15 or gentler. The low central corridor at elevation (~) +5 feet NAVD will facilitate planned and unplanned openings more aligned with the center of the overwash fan.

Figure 17 previously illustrated some typical sections for the channel area and its flanks. The plan for the closure berm, sand plateau or gently sloped mound includes front and back slopes of ~1 on 15 or gentler to allow for easy migration of endangered species between bay and ocean foraging grounds. A 1 on 15 slope matches the natural slope of the beach while the elevation of the berm is typical of overwash features along the oceanfront. The back-barrier section would slope gently to the existing grade of the bay sand flats. If ground covering vegetation becomes prevalent within the plateau or mounded area, the plan calls of management of growth, by mechanical or hand removal, without the use of herbicides, to maintain the habitat character preferred by endangered species. Any re-grading of the area to beneficially remove vegetation and preserve open washover-type habitat would be performed in close coordination with state and federal wildlife officials.

Recreation

Mecox Bay attracts various stakeholder groups that use the bay or the adjoining beaches for recreation. The most intense recreational pressure occurs between Memorial Day and Labor Day, when the majority of the property owners along Mecox Bay are occupying their secondary homes and area beaches are being heavily utilized by resident and visitors alike.

During the summer months, the bay used for recreational activities, such as swimming, sailing, kayaking, wind surfing, water skiing, and paddle-boarding, and in winter it is used for ice boating.

Maintenance of sufficient water levels is a fundamental concern among avid recreationists and various other stakeholder groups, as bay levels need to be adequate to support these activities. That being said, if bay levels reach excessive heights, such conditions can result in inundation of residential property resulting in damage to property, buildings, septic systems and landscaping, as well as agricultural land and local roads, within the greater Mecox Bay complex, inclusive of its tributaries.

Increased water levels can also affect water quality and salinity. During the summer months, water quality declines attributed to lowered salinity and DO concentrations, as well as increased coliform bacteria levels, adversely impact shellfish, and wildlife. Public use of the bay, including swimming at proximate ocean beaches, can also be affected. These conditions will continue to challenges for the Trustees, as the seasonal endangered species restrictions generally prohibit, except in the case of emergencies, mechanical opening of the Mecox Inlet during the summer months.

Recommended Measurements and Thresholds to Trigger Action

The available studies and previous experience with channel openings at Mecox Bay demonstrate that certain physical and water-quality parameters are straightforward measurements of the health of the system. Specifically, it is possible to monitor a range of water-quality indicators with in-situ instruments and to transmit data in real time to the Trustees for the purpose of determining when to open Mecox Bay. Salinity, water temperature, and dissolved oxygen data are currently monitored weekly by the Trustees at three separate locations in Mecox Bay. However, the following broader water parameters and thresholds should be monitored, preferably with instruments placed at moored floating and shore based fixed stations, where the data is unlikely to be influenced by local runoff effects from tributaries. Sensors placed in the bay by SoMAS pursuant to a Community Preservation Fund Water Quality grant received by the Trustees will provide real time measurements of conductivity, salinity, water temperature, dissolved oxygen, total algae (chlorophyll and blue green algae), turbidity, and pH in 30 minute intervals.

Water Level — The Trustees currently have two depth gauges located around Mecox Bay, which have been historically used to determine when to open the inlet. (See Fig. 26). Openings are triggered when the water level reaches the upper orange line, i.e. a high bay. The water level at this height has historically meant the presence of sufficient water for a successful flushing of the bay before severe flooding occurs. It is recommended that these depth gauges be surveyed to correspond their height above NAVD.

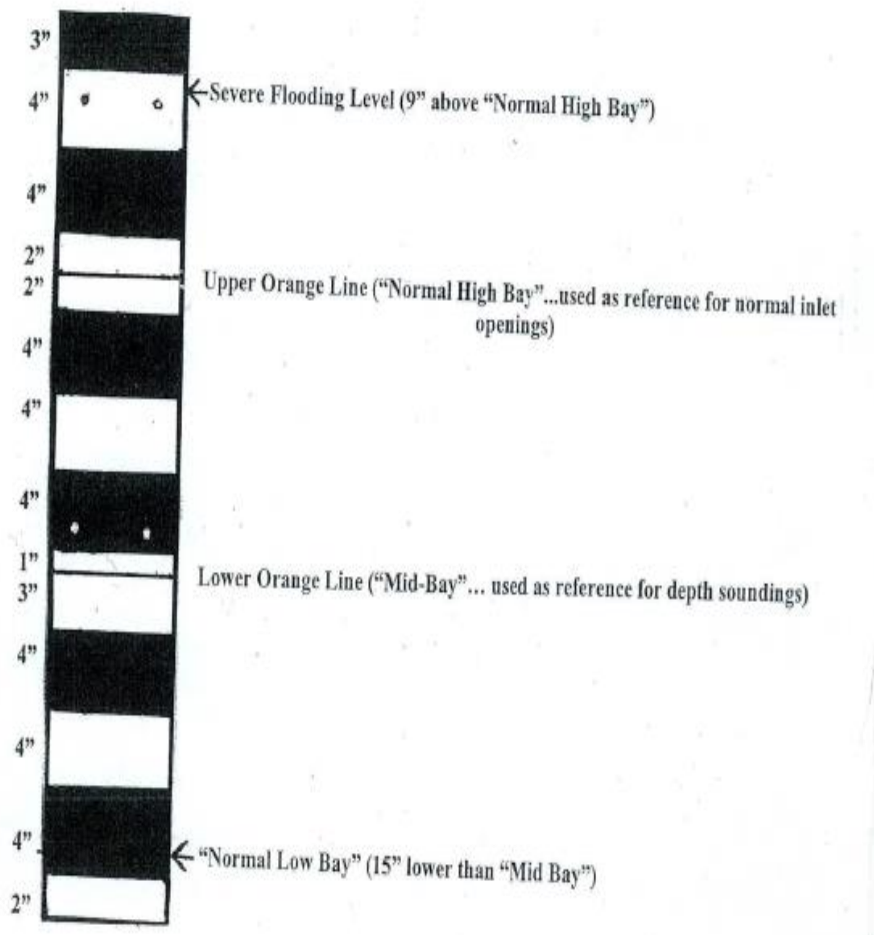


Figure 26: Historic Mecox Bay Depth Gauge used at Villa Maria Bulkhead.

- **Salinity** — Typically derived from measurements of conductivity (C) and temperature (T), salinities <12 ppt (parts per thousand) persisting for two consecutive days should trigger a channel opening.
- **Dissolved Oxygen (DO)** — IF DO drops below 3 mg/ℓ and remains under this value 50 percent of the time over a three-day period, the channel should be opened.
- **Chlorophyll** — A chlorophyll sensor should be incorporated into the primary water quality instrument, in order to record levels of primary productivity (phytoplankton), as well as to maintain a database, which could potentially be correlated with observed impacts to marine organisms (no trigger recommended).
- **pH** — Because of its importance as a basic measure of the degree of acidity and alkalinity in water and its ease of measurement with instruments, pH should be monitored (no trigger recommended).

Other parameters such as coliform bacteria, nitrogen, and phosphate, can be monitored periodically, but involve more complicated sampling and laboratory procedures. NYSDEC samples waters of the state on a regular basis and uses the results to establish shellfish closure zones and post warnings to avoid public contact at certain times and localities. Currently, Mecox Bay is classified as a seasonally certified area, with the bay area closed to shellfishing during May 1- November 30 of each year. Its tributaries, including Channel Pond, Burnett Creek, Meyers Pond, Mill Creek, Mud Creek, Hayground Cove, Calf Creek, Swan Creek, Jobs Creek and Sam's Creek, are closed year round.

Continued water quality monitoring is essential to tracking the health of Mecox Bay, as the real time availability of this data, particularly coliform bacteria, is crucial for decisions on when to open Mecox Inlet. Accordingly, in summer 2019 the State University at Stony Brook School of Marine and Atmospheric Sciences (SoMAS) will install two sensors in Mecox Bay and an environmental observatory station at Scott Cameron Beach for the purposes of monitoring shellfish, coliform bacteria, nutrients, and overall water quality. The sensors will include an ultraviolet sensor for measure nitrate, and nitrate samples will be analyzed by the SoMAS Analytical Laboratory which is ELAP certified for nitrate. Coliform bacteria levels are currently tested by NYSDEC, during the winter months, when Mecox Bay is seasonally open to shellfishing.

The Mecox Bay management plan calls for inlet opening decisions to be made based on easily measured water level and quality parameters, with the assumption that each opening flushes bay waters and provides for: (1) dilution of contaminants (such as coliform bacteria); (2) an increase in salinity; (3) lower bay water levels; (4) introduction of seawater with higher DO levels; and (5) restoration of aquatic habitats. Each opening, in effect, is expected to "reset" the hydrology and ecological processes of Mecox Bay, with the overall goal of maintaining healthy estuarine conditions.

MANAGEMENT PLAN SUMMARY

This plan sets forth criteria and rationale for periodic opening of the Mecox Bay inlet, drawing on historic and existing inlet maintenance practices, site-specific studies by researchers at Stony Brook University and Southampton College, and observations of sediment dynamics following major storms such as Hurricane Sandy.

In accordance with the plan, Mecox Bay is to continue to be managed by the Trustees of the Freeholders and Commonalty of the Town of Southampton, in communication with federal and state agencies, based upon real-time scientific data and consistent with the goal of maintaining the entrance channel for short durations, as much as is practicable, to maintain aquatic habitats and a healthy estuarine system and to avert any potential for significant adverse impacts to littoral processes. The primary goals of the management plan are:

- Prevent flooding around the bay and within bay tributaries when freshwater runoff accumulates and raises water levels above normal tide levels, as higher water levels can increase runoff inputs and inundate residential septic systems, resulting in effluent contamination and risks to public health.
- Prevent the excessive concentration of pollutants in the bay.
- Prevent or mitigate interference with littoral drift and potential sand loss along ocean beaches, west and east of the inlet, associated with planned and unplanned channel openings, as well as with excessive inlet meandering.
- Provide for extended periods of inlet closure which typically allow for favorable concentrations of nutrients and phytoplankton, and enhanced shellfish growth, provided water levels and salinity are maintained within acceptable ranges.
- Maintain un-vegetated washover type habitat with gentle slopes in close proximity to sand flats, in the interest of protecting and enhancing habitat for rare, threatened and endangered species.
- Maintain and improve water quality, including sufficient salinity and oxygen levels, to restore aquatic habitat and protect shell and fin fisheries.

Implementation of this Plan requires real-time measurements for purposes of tracking certain physical and water-quality parameters in the bay, so that decision-making and the timing of channel openings can be made in response to scientific data. The following measurements constitute the basic parameters which need to be recorded and tracked via in-situ gauge(s) or sensors.

- Bay water level
- Conductivity (C) (which combined with temperature yields salinity)
- Water temperature (T)
- Dissolved Oxygen (DO)
- Total algae (chlorophyll and blue green algae)
- pH (a general measure of acidity)
- Salinity
- Turbidity
- Nitrate
- Phosphorous

Weather parameters also need to be measured, including the following:

- Wind speed and direction
- Air temperature
- Humidity
- Barometric pressure.
- Rainfall
- Solar radiation (UV index)

These measurements can be taken by establishing a secure shore station, potentially on a dock or bulkhead, and can be electric or solar powered.

The shore station would operate 12 months per year. The moored water quality station would need to be removed in mid-December and deployed in early March to prevent ice damage. The installation, operation and maintenance of the shore station and moored floating water quality station could be financed using Town CPF water quality improvement funds, in accordance with an inter-governmental agreement between the Town/Trustees and Stony Brook University School of Marine and Atmospheric Sciences (SoMAS).

THRESHOLDS FOR OPENING & CLOSING MECOX INLET

This plan prescribes the following thresholds for the primary action of channel dredging or opening and the secondary actions of channel closure, if necessary, and where practicable, recycling of sand losses to the flood shoal or mitigation of erosion along the adjacent ocean beaches.

Inlet Openings

Mecox Bay is to be opened when the following measurements are reached, unless other factors may adversely impact the timing and likelihood of the success of an opening.

- ***Bay water level*** – when bay water level reaches upper orange line on the depth gauges (Fig. 26) (which lines will be updated correlated to NAVD measurements), or where there is evidence of flooded roadways or flooding of residential septic systems or basements or flooded agricultural fields, each of which pose emergency threats to human health, safety, and welfare, and property.
- ***Salinity*** — when bay salinity falls below 12 ppt and persists at or below this level for a minimum of 48 hours – provided the bay height is high enough to support a successful opening that will remain open long enough for the exchange of water that raises the salinity levels of the bay to at least the minimum levels of 14-16 ppt and when possible left open long enough to reach 20-22 ppt.
- ***Dissolved Oxygen (DO)*** — when average daily bay DO falls below 3 mg/ℓ and persists at or below this level for a minimum of 48 hours.

Mecox Bay should be opened (planned or unplanned) at least once per quarter, if practicable. Every effort will be made to schedule at least one of the channel openings and closures just prior to the restricted April 1-August 31 endangered shorebird nesting period, to avoid, as much as practicable, the need for letting of the bay during this period.

A planned opening may be postponed if circumstances indicate such opening would result in adverse impacts or conflicts with endangered species rules and windows for construction activities. For example, an opening before an approaching storm could potentially exacerbate bay water levels by facilitating propagation of a storm surge and result in greater littoral sand losses to the bay shoals or flooding of property around the bay. Similarly, planned openings (i.e. – thresholds met) during periods when endangered species are present will, if deemed necessary, due to a finding that an emergency exists, require close coordination with resource managers and agency officials and may require endangered species observers or other mitigation measures

All openings should be performed by land-based equipment as efficiently as possible, in order to minimize the time heavy equipment is operating on the beach. In order to avoid disturbance to the natural beaches and shoal, as much as is practicable, mechanical dredging should be accomplished by excavation of a ten feet wide 3-4 feet deep cut, within the center of channel corridor, with dredged material removal confined to that which is necessary to allow for natural processes and sufficient flow to occur. The duration of needed mechanical excavation can vary, ranging from approximately 6-8 hours under ideal conditions to two days (6-8 hours each day), dependent upon tidal cycles. Approximately 1500-1600 cubic yards of sand typically needs to be dredged. Excavated sand should be left in-situ near each cut and stockpiled and graded to mimic natural contours, in a north-south linear orientation against the higher ground west and east of the cut, to the southwest or southeast of the channel corridor, in order to re-nourish the ocean fronting beaches, or trucked off-site, for re-use during subsequent construction of the recommended closure berm. The public needs to be prohibited from entering the inlet opening and closure area.

Multiple emergency stockpile locations need to be established for off-site off-season (October 1- May 15 of each year) storage of dredged materials at locations at town owned Scott Cameron Beach and Mecox Beach on the east side of the inlet and at Flying Point Beach and the easterly terminus of Flying Point Road, on the west side of the inlet, in coordination with Town Parks and Recreation and the Highway Department. Any dredged materials which are winter stored in formal parking areas, would need to be removed prior to the start of Memorial Day, to avoid interference with needed beach vehicular parking spaces. Stockpiled sand would be utilized, when needed, for emergency mechanical inlet closure and/or be used for re-nourishing beaches to the west and east of the inlet or channel corridor outside of the restricted shorebird nest season. Any permitted use of stockpiled sand will be restricted to inlet closure, berm construction or re-nourishment of town-owned ocean beaches along the Mecox Bay barrier. Transport of the sand for use at locations outside of the Mecox system, would be strictly prohibited.

However, in the event that inlet openings are completed during the April 1-August 31 restricted shorebird season, excavated/stockpiled sand will be temporarily placed and graded for future re-use, in a manner which does not obstruct or interfere with the movement of plover chicks. Pilot channel excavations should generally be limited to no deeper than mean low water and a minimal width sufficient to produce scour flows from the bay to the ocean. Openings will generally be more efficient when the final cut is made near the time of low tide in the ocean.

Inlet Closure and Erosion Mitigation

Based upon a review of Trustees records, between 1971 and 2018, the inlet closes on average within 9 days of opening, whether natural or manmade. Notwithstanding the average, the inlet recently remained open for a period of 20 days (August 22, 2018-September 11, 2018) after a mechanical opening. A natural opening of the Inlet occurred on April 7, 2019 and remained open for 89 days until closing naturally on July 4, 2019. All told, the inlet remained open on average for a period of 32 days for three opening events in 2018. Prior to 2018, the average number of days that the inlet remained open has not exceeded 15 days since 2000.

The following are circumstances under which the inlet should be closed in order to facilitate return to pre-opening conditions:

- ***Inlet Channel meandering*** which has either exceeded 150 feet from the centerline of the recommended designated 250 feet wide inlet corridor (i.e. – midpoint between Flying Point Road and Dune Road), or where there is a determination after consulting with USFWS and NYSDEC that migration of the inlet channel threatens nesting shorebirds.

- ***Post-Storm events*** in which the breach channel has migrated far beyond the prescribed corridor for the 250 feet wide planned openings.

- ***Significant loss of dry ocean beach***, not related to severe storms or shore hardening structures, where GPS mapping of average lines of ocean high water and the seaward toe of the dune reveal a decrease in dry sand beach width of 50% or more within 1500 feet west and east of the inlet. Such GPS mapping is to be completed prior to a planned inlet opening and approximately 14 days after all inlet openings, unless storms or other events warrant more frequent monitoring.

Following unplanned breaches in storms, which can result in measureable volumes of sand shifted to the flood shoal and/or measureable sand losses along the adjacent beach/dune system within ~0.5 mile of the inlet, consideration should be given to excavating the flood shoal and returning sand back to the adjacent beaches seaward of the natural vegetation line within the designated channel corridor and/or used for beach and dune re-nourishment purposes along the ocean barrier for Mecox Bay.

Closure operations should include redistribution of stockpiled sand to form a backshore berm, nearly horizontal sand plateau or gently inclined mound at grades and slopes previously illustrated in Figure 17. Closure should be performed by land-based equipment as efficiently and expeditiously as possible in order to minimize vehicle time on the beach. The closure berm and work area should be back-bladed or raked to eliminate furrows.

Occasionally, especially after major storms, it may be necessary to transfer lost sand from the flood shoal back to the ocean beaches, in the interest of beach reclamation and stabilization. Such excavations should be designed to minimize impacts to existing habitat and should avoid removal of any halophyte vegetation or sediments below the active zone of deposition. Excavations and sand transfers should be accomplished via land-based equipment (e.g., off-road dump trucks, similar to existing practice). Quantities should be tracked by a combination of truck counts and surveys to the extent practicable. The flood shoal will not be dredged nor will dredge material be placed for beach re-nourishment purposes, during the restricted shorebird nesting season, unless specifically authorized by USFWS and NYSDEC.

Implementation Guidelines

Mecox Bay is to be opened within a limited 250-ft channel corridor generally centered between the end of Flying Point Road and the end of Dune Road [i.e. – entrance to Scott Cameron (Town) Beach parking area], or as depicted on approved plans pursuant to the permits issued by the NYSDEC. The initial cut for the channel should be no more than 10 feet wide. The opening should be made around the time of low tide in the ocean so as to promote seaward-directed flows and efficient scour of the channel. Under such conditions, the channel could potentially enlarge to about 150 feet wide under typical conditions and achieve a cross-section around 500 ft^2 before natural closure. If channel widening after opening exceeds the 250 feet channel corridor, it should be reduced, as much as is practicable, by mechanical means using stockpiled sand or other sources, in order to infill the channel and to maintain its position within the designated corridor.

The Trustees or their designee should be present during each opening to check that the alignment and scale of the cut is consistent with the management plan. The cut needs to be monitored each day while open to confirm that its location remains within the designated corridor for the channel. Officials should note any conditions which are potentially adverse to the management plan objectives, including excessive buildup of sand in the bay shoal, re-exposure of the steel bulkhead on the ocean beaches to the immediate west of the inlet, as a consequence of inlet meandering, or excessive narrowing (greater than 50%) of the GPS surveyed dry sand beach width, as compared to pre GPS mapping completed prior to inlet opening, within 1500 linear feet to the west and east of the inlet. If natural or authorized openings occur during the restricted shorebird season, monitoring of inlet conditions needs to be undertaken in coordination with endangered species monitoring to avoid adverse impact to any endangered species.

Following natural or mechanical closure, the floodway between Flying Point Road and Dune Road should be surveyed to ensure that the minimum beach dimensions are achieved, as follows.

- The dry-sand beach along the closure alignment should preferably be at least 100 feet-wide (in the aggregate) with elevations typical of a post-storm washover beach [i.e. – (~) +5–6 ft. NAVD].
- The backshore area across the floodway (aligned with Dune Road) should be rebuilt, if practicable, and deemed necessary, within 15 days after closure to a minimum 25-ft-wide washover berm, sand plateau or mound at (~)+5 feet NAVD with a bay-ward slope of ~1 on 15 (or gentler) and a seaward slope of 1 on 15 (or gentler). The berm or land form grade at the center of the floodway should be the lowest section of the closure berm. Berm construction pursuant to this plan will be implemented by the Trustees, in coordination and communication with the Town of Southampton, NYSDEC, Army Corps, and USFWS.

Figure 10: Mecox Inlet - closed.

Each cut should be documented using a standard data sheet, which provides basic information on the timing of events, estimates of dimensions, predominant direction of flows each day, observations of shoal buildup, any erosion of the backshore storm berm flanking the channel, and erosion (e.g. – scarping) along adjacent properties. The cut and adjacent beach conditions needed to be GPS mapped, using hand held GPS units or GPS equipped drones, both four days before and within 14 days after the inlet cut. The data sheet will be provided to the Town and Town Trustees, as well as other partner agencies, in a timely manner each week or more frequently during every opening event.

Twice per year, the floodway and bay shoal adjacent to the cut should be surveyed with sufficient detail and precision to estimate the volume of sand landward and seaward of the closure berm (alignment with Dune Road). The seaward control volume may terminate between mean tide level and mean low water along the ocean beach. These volumes should be tracked each year and used to calculate sand volumes shifted to the flood shoal.

The need for and practicality of excavating sand from the flood shoal for transfer back to the adjacent bay barrier beaches, needs to continue to be evaluated, with the sand volumes by truck count recorded for each event. The re-nourishment area and estimated volumes placed (by truck count or otherwise) for sand excavations needs to be recorded, along with the reach receiving the sand.

Post-Storm Action

Following unplanned large inlet openings in major storms, where there is excessive overwash, Trustees and Town officials should take immediate steps to close the channel and restore the floodway to normal conditions (i.e. – the minimum beach width and elevation and the minimum backshore-berm dimensions outlined herein), in coordination and communication with NYSDEC and Army Corps. A post-storm survey should be made of the floodway, bay shoals, and adjacent beach after major storms for purposes of determining how much sand shifted into the bay. These data are to be used as a basis for emergency restoration plans, whereby sand washed into the bay is recycled back to the ocean beaches flanking the channel. Priority should be given to restoring the floodway and immediate adjacent bay barrier beaches within 0.5 mile of the channel by moving sand onto these beaches to maintain a minimum 50-ft-wide dry-sand beach.

Consistent with current inlet management practices, following unplanned small openings in minor storms, Trustees and Town officials should assess conditions daily, in coordination with NYSDEC. If the criteria for closure after a planned opening are triggered, then monitoring data and professional judgement would be used to decide whether or not to initiate closure and/or take action to restore the floodway, with exact details of closure and channel remediation expected to vary, based upon inlet location, configuration and size.

Permitting

In recent years, inlet openings and closures have been conducted under permits and/or emergency authorizations issued by NYSDEC and the Army Corps of Engineers. (See Appendix C). Upon adoption of this Mecox Bay Management Plan, ten year tidal wetlands dredging permits for channel maintenance dredging, as well as a 6 NYCRR 608 Water Quality Certification, will be sought from federal and state agencies, consistent with the parameters and inlet maintenance criteria set forth in the plan. A letter will also be sought from NYSDEC, noting that the plan is consistent with state coastal policies. The Army Corps may need to complete a Section 7 of the Endangered Species Act (ESA) consultation with USFWS, as part of their permit authorization process. Compliance with the State Environmental Quality Review Act (SEQR) and the National Environmental Policy Act (NEPA) will be required, prior to funding, approving, permitting or undertaking any actions.

Future inlet openings would be completed consistent with prior practices and/or as otherwise permitted by NYSDEC and the Army Corps, but be restricted to the limited corridor prescribed, with the closure berm reshaped, as needed, to direct unplanned breaches toward the center of the floodway. The plan will be implemented by the Trustees, in communication and coordination with the NYSDEC, the Army Corps, and the USFWS.

Fire Island to Montauk Point Reformulation Plan (FIMP)

The Mecox Inlet lies within the bounds of the Fire Island to Montauk Point Reformulation Plan (FIMP) study area, an 83-mile stretch of ocean beaches and barrier islands, extending from Fire Island to the Montauk Point headland. Within this reach, engineered storm damage reduction and erosion mitigation plans are being developed, including a cost benefit analysis. A FIMP Tentative Federal Selected Plan (TFSP) has been prepared, however, there are, at present, no specific inlet management, breach response, beach nourishment or non-structural recommendations for Mecox Bay. Notwithstanding this absence, continued communication and coordination with the Corps New York District, is both desirable and necessary, in order to ensure the FIMP TFSP objectives is consistent with the Mecox Management Plan.

Funding

Providing sufficient funding and other resources to support implementation of the actions and recommendations contained in the plan is critical. Designated and dedicated funds need to be established to be sufficient to (1) cover the cost of annual inlet dredging and closure; (2) fabricate, install and maintain water quality monitoring instrument(s); (3) implement quarterly or more frequent openings; (4) implement closure/berm maintenance (as needed); and (5) monitor sand losses around the floodway and adjacent beaches (up to 0.5 mile from the channel) following major events.

As already indicated, a potential source of local funding includes the Town CPF Water Quality Improvement funds, but sources of permanent funding need to be developed outside of the grant procurement process; Mecox is too important to the local economy and way of life to leave its management to chance.

Record Keeping

Records of each opening and daily bay parameters recorded in situ would be maintained. An annual report summarizing each opening event and including appendices of recorded data and standard sheets for each event should be prepared and made available to Town and Trustees officials, as well as the general public, through the town's web site.

Many of the actions, targets, objectives and outcomes of this plan are built upon partnerships and consultation with federal and state agencies, which are already in place to manage and protect the resources of Mecox Bay. Arrangements with research institutions, including an intergovernmental agreement between the Town and SoMAS, are likewise integral to implementation of the plan.

PLAN IMPLEMENTATION AND MODIFICATION

Implementation, reporting and review and of the plan will be based upon transparency, accountability and responsiveness to the public. As further scientific data becomes available and emerging issues are better understood, it may be necessary and advisable to modify the Mecox Bay Management Plan.

For example, the criteria for maximum bay water level may have to be amended (lowered) if there are indicators of excessive saltwater intrusion into groundwater under high water level conditions. Similarly, if insufficient sand is readily available for mechanical closure, it may be necessary to maintain additional nearby stockpiles.

If conditions along the oceanfront deteriorate due to chronic sand losses, the adverse impacts of inlet openings to adjacent properties may be more acute and may require more substantial mitigation, such as a large-scale re-nourishment of the bay barrier beaches, or reconstruction of protective dunes to the west and east of the inlet. With considerable Town infrastructure and private property at risk, it is essential that a healthy beach and dune be maintained along the ~7,500-ft-long "bay-mouth" bar or barrier fronting Mecox Bay, so that breach channels are more likely to initiate within the 1,000-ft historical floodway.

The plan anticipates that yearly data will be evaluated and used as a basis for any needed plan revisions, on a five-year cycle, in order to improve upon the recommended bay and inlet management strategies, including, among others, modifications, as deemed necessary, to the recommended inlet opening thresholds. Planning for resiliency to long term climate change impacts will also need to be an integral part of any plan revisions. Any plan amendments would be developed in consultation with the NYSDEC, Army Corps and USFWS, as well as shared with all stakeholders and the general public.

Amendments to the Plan

Any amendment to this Plan shall require that a duly noticed public hearing be held to hear any and all comments on said amendment followed by a majority vote of the Trustees to adopt the amendment.

LOOKING AHEAD

Figure 27: Mecox Inlet- closing naturally.

The Trustees are looking to create enduring solutions to address the need for responsible environmental management that acknowledges the many challenges and threats facing Mecox Bay. The long history of stewardship by the Trustees of our waters and wetlands, together with knowledge gained from scientific study of the region, has provided a reliable and multifaceted foundation for effecting favorable future management decisions for Mecox Bay. It is with such promise that the Trustees will continue to reach out to all stakeholders for their valued feedback, as it is only with the support of the broader diverse community, that we can truly achieve the goals of this Plan.

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