

Dead Neck/Sampson's Island Wildlife Sanctuary Rapid Ecological Assessment

6/16/2011



THREE BAYS
PRESERVATION, INC.

Executive Summary

KEY MANAGEMENT AND MONITORING RECOMMENDATIONS

Recommendation	Responsible Staff	Cost	Frequency
Protect monitor and coastal nesting birds	Coastal Waterbird Staff in coordination with Long Pasture Sanctuary Director	Seasonal Field Staff, April-August	Monitoring 4-7 times per week, symbolic fencing, + predator management as necessary (Ongoing)
Protect and monitor migratory shorebirds and terns	Coastal Waterbird Staff in coordination with Long Pasture Sanctuary Director	Part of one field technician	Weekly monitoring from Mid-July through mid-Sept. (Ongoing)
Implement short term measures to maintain the integrity of the barrier beach in anticipation of long term management plan.	3 Bays Preservation Director, Long Pasture Sanctuary Director, and Coastal Waterbird Director	Marine Contractor and Project Supervisor (By 3 Bays)	(Ongoing)
Develop long term management plan for maintaining the integrity of the barrier beach	3 Bays Preservation Director, Long Pasture Director and Mass Audubon Coastal Waterbird Director	Coastal and Design / Permitting Engineers. (By 3 Bays)	2011
Begin Implementation of long term management plan for maintaining the integrity of the barrier beach by beginning permitting process	3 Bays Preservation Director, Long Pasture Director and Mass Audubon Coastal Waterbird Director	Design / Permitting Engineers. (By 3 Bays)	Summer 2011
Redo plant inventory and determine extent of invasive plants, and develop long term vegetation management / removal plan for invasive plants & habitat enhancement	SECI Regional Scientist, Seasonal Field Staff	One field day.	(Summer 2011)
Begin Implementation of long term vegetation management / removal plan for invasive plants & habitat enhancement	SECI Regional Scientist, Seasonal Field Staff	To Be Determined	(Fall 2012)
Begin dredging / nourishment for maintaining the integrity of the barrier beach	3 Bays Preservation Director, Long Pasture Director and Mass Audubon Coastal Waterbird Director	Marine Contractor and Project Supervisor (By Others)	(Winter 2012 / 2013)
Increase education and engagement of visitors to DNSI to increase sensitivity to coastal birds and barrier beach habitat	Long Pasture Sanctuary Director and Coastal Waterbird Staff	Seasonal Field Staff, April-August. Additional signage.	Contingent upon funding in field season 2012. (Ongoing)
Have annual meeting of Mass Audubon and 3 Bays staff to assess	3 Bays Preservation Director, Long Pasture Sanctuary Director, and	One morning of staff time	Once per year. (Ongoing)

management progress	Coastal Waterbird Director		
Evaluate current level of use of the island and the possible need for additional use restrictions	Long Pasture Director and 3 Bays staff		Summer 2011
Shoreline change surveys	3 Bays Staff	Monthly by volunteers	

1. Ecological Role of the Sanctuary

Dead Neck/Sampson’s Island (DNSI) is an island located along the south shore of Cape Cod (Figure 1). It borders Nantucket Sound in the town of Barnstable (the villages of Osterville and Cotuit, Figure 2). Mass Audubon has owned the western quarter of the island, called Sampson’s Island (approximately 37 acres) since 1954, and Three Bays Preservation, Inc. owns the eastern $\frac{3}{4}$ of the island, called Dead Neck (80 acres). Because of the dynamic nature of the coastline and these barrier islands, the area and the geomorphology of the island changes regularly. As an example, Sampson’s Island consists of 31 acres according to the Massachusetts Department of Environmental Protection’s (DEP) wetland data layer, however that does not include areas of sand that have accreted since 2000, the latest date of orthophotos that DEP used to delineate wetlands.

The two parcels have been joined and separated at various times throughout their history, which explains the existence of two names for what is now one island. Dead Neck was formerly attached to the mainland of Cape Cod at its eastern end, but a channel was dug in 1901 to make it easier for boats to pass into West Bay.

The primary wildlife conservation value of DNSI is that it provides critical barrier beach nesting habitat for coastal waterbirds of high conservation priority. These include state-listed coastal waterbirds: Piping Plovers (*Charadrius melodus*), Least Terns (*Sternula antillarum*), and Common Terns (*Sterna hirundo*) and American Oystercatchers (*Haematopus palliatus*), the latter listed as a Species of High Concern in shorebird conservation plans for the Eastern and Gulf Coasts. DNSI also serves as a pre-migration fall staging area for Common Terns and sometimes Roseate Terns (*Sterna dougallii*, federally-listed) as well as many shorebird species. Its entire area is BioMAP Core Habitat, according to the Massachusetts Natural Heritage and Endangered Species Program (MNHESP). The island and surrounding waters are classified as priority habitat for rare and endangered species by MNHESP. It has had the most dense population of Piping Plovers of any property monitored by Mass Audubon’s Coastal Waterbird Program in recent years (e.g.,

2006, 26 pairs), and supports a more diverse array of nesting waterbird species than any other site Mass Audubon owns or monitors.

Other values of DNSI are that it is a barrier beach that provides storm surge protection for the bays and estuaries to the north. This was particularly evident in Hurricane Bob, for example, when those resources were spared the brunt of the storm surge during that event. The eastern end of the island, however, was heavily damaged as a result of that storm.

As a recreational beach DNSI has few equals. The island layout provides access to the Seapuit River which has warm and also relatively calm waters on the north side of the island. This is particularly popular with families that have young children. The south side of the island offers almost two miles of a more exposed beach on Nantucket Sound which is very popular with walkers and bird watchers. DNSI is only accessible by boat. Visitation is currently limited to those with permission to land (i.e. members of Mass Audubon or Three Bays or those having paid an admission fee).

DNSI serves to protect land containing shellfish. The fact that DNSI shoulders the entrance channels to West Bay, Cotuit Bay and North Bay has helped create a relatively shallow coastal estuary that is ideal habitat for all species of shellfish, including commercially grown quahogs and oysters, and native mussels and soft shell clams, as well as a variety of other benthic animals.

DNSI helps protect fisheries habitat. For the same reasons it protects shellfish, DNSI also protects potential eelgrass habitat in the aforementioned bays. Unfortunately, in recent years anthropomorphic inputs of nitrogen into this valuable estuarial ecosystem have greatly reduced the areas of eelgrass habitat in the three bays. Planning is underway to reduce all sources of this pollution and water quality will improve as a result. Increasing the flushing to the south Cotuit Bay area by restoring the channel on the west end of the island to its historic limits is one option being considered.

2. Natural Communities

DNSI is dominated by coastal dune and barrier beach communities (Table 1, Figure 3). 100 of its 111 acres are classified as a barrier beach system by the Massachusetts Department of Environmental Protection. This indicates that these 100 acres are subject to migrations or shifts landward in response to ocean currents and coastal storms and associated overwash events. For environmental regulatory purposes, the entire area is considered wetland resource areas.

Table 1. Acreages of different natural communities of DNSI

Natural Community	Sampson's Island	Dead Neck	Total
BARRIER BEACH SYSTEM	0	19.3	19.3
BARRIER BEACH-COASTAL BEACH	5.8	14.7	20.5
BARRIER BEACH-COASTAL DUNE	23.8	35.1	58.9
BARRIER BEACH-MARSH	0.2	0.6	0.8
BARRIER BEACH-SALT MARSH	0	0.4	0.4
COASTAL BEACH	0	0.3	0.3
ROCKY INTERTIDAL SHORE	0	0.2	0.2
SALT MARSH	2.0	7.6	9.5
TIDAL FLAT	0.3	1.1	1.5
Total Acreage	32.0	79.4	111.4

The two most extensive communities, coastal beach and coastal dune, are equivalent to the maritime beach strand and maritime dune communities of the MNHESP (Swain and Kearsley 2000). These are ranked S3 and S2 respectively by the MNHESP, indicating a relative degree of rarity on the state level. The beach community occurs between the wrack line (the upper limit of the intertidal zone) and the “toe” of the dunes. It is largely un-vegetated except for isolated plants, such as sea rocket (*Cakile edentula*) and seabeach sandwort (*Honckenya peploides*). The dune community consists of a mixture of vegetation and bare sand. Abundant plant species include beach grass (*Ammophila breviligulata*), beach pea (*Lathyrus japonicus*), bayberry (*Morella pensylvanica*), and poison ivy (*Toxicodendron radicans*).

The 19.3 acres that are classified as “barrier beach system” (Table 1) is slightly higher in elevation, but is also subject to occasional overwash during severe storms. This area has been built up by compatible sand dredged from the channels and deposited on the island. The last major deposition of dredged material occurred in 1998-9 when 286,000 cubic yards of material was dredged from portions of the harbor channels and deposited on the eastern 2000 feet of Dead Neck. Since that time a number of smaller projects have added 114,600 cubic yards of compatible material to DNSI. As a result of these projects, the barrier beach at the eastern end of Dead Neck has fluctuated in its function for flood water protection, wildlife habitat enhancement and as a recreational area. Without periodic nourishment, the island and its conservation values would have ceased to exist.

Also in 2004, 7000 cubic yards of sand was placed on Sampson’s Island 1200 feet from its western tip in an area of about $\frac{3}{4}$ of an acre to enhance nesting habitat on that end of the island. This new sand provided excellent tern habitat for a number of years but has since filled in with beach grass and other plants. This

area had limited success for nesting Piping Plovers as the direct access to the feeding areas on the shoreline was limited. However the bird counts for the years 2004 and 2005 show that the terns colonized the new sand habitat immediately and it remained viable habitat for several seasons.

The central portion of Dead Neck has more width and is a natural community of this barrier beach system that more resembles that of a back dune, being heavily vegetated with pitch pine, oaks, bayberries, and poison ivy. This area was identified by Department of Agriculture field agents as a possible hiding area for coyotes and any eradication effort for that species should key on this area.

Several pockets of salt marsh occupy the lee side of the island. These contain typical salt tolerant plants, such as salt marsh cord grass, salt marsh hay, and Sea lavender. Salt marshes are ranked S3 by Swain and Kearsley (2000).

3. Rare Species and Species of Special Interest

From 1986-2010, DNSI supported between 6-26 pairs of breeding Piping Plovers, up to 378 pairs of Least Terns, and 200 pairs of Common Terns. A single pair of American Oystercatchers nested on the island from 2008-2010; through banding we know that these nesting attempts represent at least 5 different individuals. In addition, at least 5 pairs of Spotted Sandpipers (*Actitis macularia*) and Willets (*Catoptrophorus semipalmatus*) have been observed to breed at the site annually, as well as multiple pairs of Horned Larks (*Eremophila alpestris*), Savannah Sparrows (*Passerculus sandwichensis*) and Song Sparrows (*Melospiza melodia*), though none of the five species are monitored by CWP staff. Green Herons (*Butorides virescens*) and Mourning Doves (*Zenaida macroura*) are observed regularly during the breeding season and likely breed at the site. Until 1991 the island supported a significant wading bird rookery, including Black-crowned Night Herons (*Nycticorax nycticorax*), Snowy Egrets (*Egretta thula*) and Great Egrets (*Ardea alba*); however, after Hurricane Bob (and subsequent loss of old trees), these areas were abandoned as a breeding site. In addition, Great Black-backed Gulls and Herring Gulls also used to nest at the site, but this has not occurred since the mid-1990s (e.g., 769 pairs of Herring Gulls and 147 pairs of Great Black-backed Gulls nested on the island in 1994 according to MNHESP records). Mallards (*Anas platyrhynchos*) have also been observed breeding at the site on a roughly annual basis.

In late summer, DNSI has served as a staging area for Common and a few Roseate Terns (up to 50 total terns, based on counts in 2008-2009).

4. Past and Current Inventories and Monitoring Activities

The major focus of monitoring activity on DNSI has been on the coastal nesting birds. Staff from Mass Audubon's Coastal Waterbird Program monitors nesting activity and success of Piping Plovers, Terns and Oystercatchers regularly from April through August.

78 species of plants were recorded during a plant inventory in 1989. Most of these are species typical of beach and dune communities. The list includes no rare species and does not distinguish between those occurring on Sampson's Island from those on Dead Neck.

Information on forage and/or larval/juvenile fish in the waters off the island has been collected by the MA Division of Marine Fisheries through their annual winter flounder surveys and by Mass Audubon and Antioch University (2006-2009) through foraging observations of breeding adult Least Terns. Observations from 2006-2010 on foraging Least Terns show that sand lance (*Ammodytes americanus*) has been the dominant forage fish (>50%), while herring (clupeids, including Atlantic menhaden, Atlantic herring, and river herring), killifish/mummichogs (*Fundulus spp.*) and silversides (*Menidia menidia*) are also important foods. Other documented species include anchovy (*Anchoa spp.*), hake (*Urophycis tenuis*), sticklebacks (*Gasterosteus spp.*) and northern pipefish (*Syngnathus focus*).

Sanderlings (*Calidris alba*), Least Sandpipers (*Calidris minutilla*), Dunlins (*Calidris alpina*), Semipalmated Plovers (*Charadrius semipalmatus*), Whimbrels, (*Numenius phaeopus*), Semipalmated sandpipers (*Calidris pusilla*), Black-bellied plovers (*Pluvialis squatarola*), Ruddy Turnstones (*Arenaria interpres*), and other migratory shorebirds are known to use Dead Neck / Sampson's Island. There has not (to our knowledge) been any attempt to quantify use of the site as a migratory stopover for shorebirds.

Observations of individuals and/or signs of the presence of Great Horned Owls (*Bubo virginianus*), American crows (*Corvus brachyrinchos*), Northern Harriers (*Circus cyaneus*), Red-tailed Hawks (*Buteo jamaicensis*), Ospreys (*Pandion haliaetus*), Herring Gulls (*Larus argentatus*), Great Black-backed Gulls (*Larus marinus*), and Laughing Gulls (*Larus atricilla*) are frequently made throughout the breeding season, however, no formal inventories of these species have been conducted. All these species are potential predators on eggs, chicks, or adults of Piping Plovers, Least Terns, Common Terns and American Oystercatchers.

There are mammals that also pose a significant threat to breeding coastal birds. Eastern coyotes (*Canis latrans*), Virginia opossums (*Didelphis virginianus*)

and red foxes (*Vulpes vulpes*) have been present on the island over the past 23 years.

A variety of other non avian species are present at DNSI. Tracks from snapping turtles (*Chelydra serpentine*) were recorded in 2007 through 2009.

Horseshoe crabs (*Limulus polyphemus*) have been observed spawning at least on Sampson's Island. Fiddler crabs (*Uca* spp.) use the intertidal areas in Pirate's Cove/Cupid's Cove, as well as on the Dead Neck marsh.

5. Invasive Species

23 of the 78 plant species recorded on DNSI are non native. These include 5 that are considered invasives by the Massachusetts Invasive Plant Advisory Group (Table 2). Oriental bittersweet, multiflora rose, and common reed are subject to removal attempts at other Mass Audubon sanctuaries, but have not been managed yet at DNSI.

Codium fragile ssp. *tomentosoides* (dead man's fingers) is an invasive green algae frequently found along the shoreline of the island, particularly along the eastern ocean side beach. It can be a problem in shallow water marine communities where it overgrows native species, including shellfish. On the other hand, it could potentially represent an important food source for foraging Piping Plovers, who often forage for invertebrates found in the wrackline of decaying codium.

Another invasive group of seaweeds that frequently wash up on DNSI beaches is collectively referred to as "mung." These represent a number of species of filamentous red and brown algae, some of which are native and others not.

There is a small community of phragmites that has started in the Pirate's Cove area of the island.

Table 2. Invasive plants recorded at DNSI.

Species	Common Name
<i>Lonicera tartarica</i>	Tartarian honeysuckle
<i>Celastrus orbiculata</i>	Oriental bittersweet
<i>Rosa multiflora</i>	Multiflora rose
<i>Bromus tectorum</i>	Drooping brome
<i>Phragmites australis</i>	Common reed

6. Climate Change Effects and Adaptation

The mid Cape area is classified as of relatively low vulnerability to the impacts of sea level rise in a 1999 assessment by the USGS (Thieler and Hammar Klose 1999) and in a more recent assessment by Titus and Richmond (2000). These assessments are based on modeled elevations in the region, thus reflecting the susceptibility of a broad section of coastline rather than individual areas. Because it is low lying with much of its elevation in the flood plain, and due to patterns of littoral drift, DNSI is likely more vulnerable to future sea level rise than the immediately surrounding "mainland" coastline.

Under climate change scenarios described under IPCC (2007), sea levels are anticipated to rise about 0.5 m by 2100¹ and the coast will likely be subject to more intense coastal storms. The periodicity of the erosion cycle at DNSI will likely become shorter in the future, requiring more frequent re-nourishment in order to maintain the overall form, function and quality of the eastern side of the island.

Warmer average temperatures, particularly in the winter, will likely increase the occurrence of some southern species to DNSI. Increases in water temperatures will change the composition of sea life, which could impact terns.

7. Threat Assessment

a. Erosion of the island

The greatest current and long-term threat to DNSI is the ongoing naturally occurring and storm caused loss of sand from the total barrier beach system. The island's future, the future of the coastal water birds that nest there and the functions of the barrier beach are all dependent upon re-nourishment.

The shoreline change project carried out for the Massachusetts Office of Coastal Zone Management by the U.S. Geological Survey indicates that the current position of DNSI in relation to the adjacent mainland has not changed much since the mid 1800s. Since 2000 the movement of the DNSI shoreline has been monitored annually by shoreline line surveys and cross-shore profile measurements completed by Applied Coastal Research and Engineering Inc. of Mashpee. Their 2010 report is an attachment to this Assessment.

The eastern end of DNSI is bounded by a public navigation channel from Nantucket Sound into West Bay. The channel is bounded by two stone jetties both of which were installed by the State and both sit on State property. These jetties and other structures to the east create a barrier which inhibits the westward flow of

¹ Many scientists think that 0.5 m is an underestimate since it does not take melting of ice sheets into account.

sand and results in an annual loss of material (erosion) at the east end of the system of approximately 12,000 cubic yards and a gain at the west end of the DNSI system due to the predominant east-to-west sediment transport along this shoreline stretch. Habitat for Piping Plovers, Least Terns and American Oystercatchers is degraded by this erosion.

At the present tidal regime and level of storm activity, dredging is needed to keep the public navigation fairways on both sides of the island open to boat traffic and to maintain overall water quality within the 3-Bays estuary system.

Dead Neck has been continuously eroded by hurricanes, northeasters and the consistent westerly movement of sand (long shore transport). As a result Dead Neck has required re-nourishment many times in the past 70 years. It is anticipated that at the present erosion rates and without re-nourishment it will take 5 to 8 years for the island to breach. However it should be noted that the island could be breached at any time with a significant storm occurring under the right conditions.

Past re-nourishment efforts have been completed by both public and private entities. The re-nourishment material has been composed of primarily clean sand legally dredged from the surrounding public navigation channels, fairways and bays. Finding a viable source of the needed nourishment has always been a challenge. Alternatives previously considered among stakeholders for source sand are; continued channel/fairway dredging, off-shore sand mining, an upland supply and delivery to DNSI and developing a closed loop program within the system.

Continued maintenance of the existing channel/fairway locations by dredging has a limited source of material and can not meet the required sand demand. Recent efforts to permit sand mining by the state (e.g. Winthrop Beach) and private entities (e.g. Sconset Beach on Nantucket) has not been successful. On shore mining of sand and delivery to the island is cost prohibitive.

The sand back-pass program is the most viable alternative according to coastal geologists who have studied sedimentation processes around DNSI (John Ramsey, P.E, Applied Coastal Research and Engineering, pers. comm. February 24, 2011) . Viewing DNSI as a closed loop system, the back-pass program proposes to maintenance dredge sand from the western end of Sampson's Island from the historically permitted channel limits and place the majority of the material at the east end of Dead Neck where it can continue to flow westerly. Due to the construction of the jetties at the West Bay entrance, the littoral system is bounded by the limits of DNSI. Material placed along the eastern portion of Dead Neck migrates to the west, causing the observed accretion of Sampson's Island. In addition to this observed accretion and migration of the island to the west, the material loss along the eastern portion of Dead Neck causes erosion of the shoreline, with substantial narrowing of the barrier island (see Figure 4 and 5 below for conditions both pre and post nourishment). The purpose of the back-pass program is to return the material that migrated from Dead Neck to the western end

of Sampson's Island. There is no adverse impact to down drift shoreline, since the DNSI system is a closed littoral cell and Sampson's Island represents the down drift end of this cell.

b. Incompatible recreation use

DNSI is a popular destination for boaters, most of whom are respectful of the restrictions meant to protect coastal nesting birds. Staff from Mass Audubon's Coastal Waterbird Program and Three Bays Preservation is present during nesting season to educate boaters and to enforce regulations. However, there are issues with disturbances to tern and plover nests areas by people and their dogs (see Coastal Waterbird Program Annual Reports for details of incidents with vandalism, dogs entering fencing, etc.). CWP and TBP staff keep track of the number of people, dogs, and boats present on the island each day (e.g., on July 5, 2009 it was estimated that at least 200 people and 100 boats were using the island).

c. Predators

Predators are a threat to the nesting success of Piping Plovers and Least Terns. In some years, known and/or suspected predation on eggs has surpassed 68% of all nest attempts. Known predators of eggs, chicks and adults include eastern coyote, American crow, Great Black-backed and/or Herring gulls, opossum, ants (*Lasius neoniger*), and Great Horned Owls. Predation by certain species (i.e. American Crow, eastern coyote, gulls) varies from year to year, but tends to be high on the island (e.g., 24% nest attempts lost to crows and 10% lost to coyotes in 2009; in 2010 at least 67% of the known predation events on nests were attributed to crows [8 out of 12]).

Beginning in 2004, Mass Audubon started using electric fencing at Sampson's Island in response to coyote predation on Least Terns. Its use continued, and expanded to the Dead Neck portion of the island in 2007. In total, we have erected roughly 1600-4000 ft of electric fencing/year to protect nesting coastal birds from coyotes, though its effectiveness has been questionable in some years. Exclosures for Piping Plovers have been used occasionally (up to 1/year) however the habitat does not favor the use of exclosures, and there are concerns about adult mortality. In 2010, an attempt was made to trap an opossum that was photographed within the Least Tern colony, though trapping efforts were not successful.

8. Key Management Recommendations and Priority Management Needs

- **Protect and monitor coastal nesting birds.** Mass Audubon and Three Bays Preservation, Inc. should continue to cooperate in the protection of Piping Plovers, Least Terns, American Oystercatchers, and possibly Roseate Terns as well as spring and fall migrants. Protection efforts and management

should be according to state and federal guidelines and coordinated between the two organizations.

- **Reduce the impacts of predation.** Actions taken to reduce predation on plovers and terns could include removing trees that serve as perches for avian predators, erecting exclosures around nests, use of electric fencing, and predator removal.
 - **Minimize disturbance from humans.** We should continue to take management measures necessary to protect the birds from disturbance, such as continuing to have a presence on the beach during the nesting and post-breeding season, and prohibiting the public from areas where the birds are currently nesting. Pro-active symbolic fencing should continue to be erected with appropriate buffer zones for each species.
 - **Monitor coastal nesting birds during the pre- to post-breeding season.** The use of DNSI by Piping Plovers and Least Terns is its most apparent wildlife conservation value. Mass Audubon should therefore continue to track pair establishment, hatching success, and productivity, and evaluate and adjust habitat, human and predator management based on those data.
 - **Enhance the island as a habitat for nesting terns.** Terns and plovers tend to avoid nesting in areas with dense vegetation, instead favoring overwash areas and other places of sparse or no vegetation. Vegetation removal and placement of compatible dredge material from local projects would open up more optimal nesting habitat in places on the island where the elevation of the habitat area has increased beyond that which can be reached by flood waters driven by storms.
- **Protect and monitor migratory shorebirds and staging terns.** Disturbance from humans could stress shorebirds and pre-migratory terns at a time when they need to develop reserves for fall migration. Increased education and enforcement, signage explaining the issue, and erecting symbolic fencing around areas in which the birds congregate could be useful management measures. Recommendations similar to nesting shorebirds should be followed.
 - **Implement short term measures to maintain the integrity of the barrier beach in anticipation of long term management plan.** Mass Audubon and Three Bays Preservation, Inc. should continue their efforts to permit small scale maintenance dredging projects removing sand from the nearby navigation channels, and utilize the compatible materials to attempt to maintain the barrier beach system, and habitat it provides. This short term collaborative effort should also encourage the continued acceptance of compatible materials from other maintenance dredging projects in the area.
 - **Develop long term management plan for maintaining the integrity of the barrier beach.** Mass Audubon and Three Bays Preservation, Inc. have

been working towards such a comprehensive management plan for some time. The management plan is needed to integrate the protection and enhancement of coastal nesting bird habitat with maintaining the integrity of the island. This requires a comprehensive and perhaps innovative look at ways to provide sand to eroding portions of the island such that environmental disruptions are minimized elsewhere. One approach currently under consideration is a sand back-pass alternative. Final details of such a solution require input from all stakeholders, including local, state and federal regulatory agencies.

- **Begin implementation of long term management plan for maintaining the integrity of the barrier beach by beginning permitting process.** Mass Audubon and Three Bays Preservation, Inc. have determined that the best mechanism to get input from all stakeholders is to file an Environmental Notification Form with the Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs MEPA Office. It is the goal to submit 5% complete project design in the early summer of 2011 using this Rapid Ecological Assessment and other shoreline and cross section survey's, bathymetric surveys, hydrodynamic models and water quality studies and other information previously collected by Three Bays Preservation, Inc. to support this permitting. The next step is to have a comment period from the regulatory agencies and follow that up with a site visit with all stakeholders. With positive feedback from these efforts, design and permitting could proceed.
- **Begin implementation of long term vegetation management / removal plan for invasive plants and habitat enhancement.** It is hoped that the Coastal Waterbird and Seasonal Field Staff could undertake portions of the vegetation management / removal plan. Those portions of the plan better accomplished with heavy equipment, or requiring transportation of materials could be accomplished in coordination with the ongoing short term and/or eventual long term projects for maintaining the integrity of the barrier beach. Priority should be given to the phragmites removal, which will become more difficult to control the longer it has to establish itself. Possible grant funding from USDA or WHIP grant programs could be sought for this project.
- **Begin dredging / nourishment for long term management plan for maintaining the integrity of the barrier beach.** It is the goal that the dredging and nourishment could be accomplished in collaboration with the Town of Barnstable and the County Dredge Department. The extent, frequency, and methodology of the dredging and nourishment will be well vetted through the design and permitting above.
- **Increase education and engagement of visitors to DNSI to increase sensitivity to coastal birds and barrier beach habitat.** Educating the

public about the vulnerability of these birds and the coastal dune habitat is essential for protecting the birds. Mass Audubon and Three Bays Preservation should coordinate to develop an enhanced visitor education and management plan, which includes a more active role by Mass Audubon seasonal staff in public education, standardized field dress, and the use of trained volunteers where appropriate.

- **Have an annual meeting of Mass Audubon and Three Bays Preservation staff to assess management of DNSI.** Both organizations need to work together to consider adjusting visitation/admissions policies in order to maintain levels (and locations) of visitation that are consistent with protection of the resources.
- **Evaluate current level of use of the island and the possible need for additional use restrictions.** Develop a survey for users of DNSI and evaluate responses.

9. Priority Inventory and Monitoring Needs

- **Monitor coastal nesting birds during the pre- to post-breeding season.** The use of DNSI by Piping Plovers and Least Terns is its most apparent conservation value. Mass Audubon should therefore continue to track pair establishment, hatching success, and productivity, and evaluate and adjust habitat, human and predator management based on those data.
- **Monitor staging terns and American Oystercatchers in late summer and early fall.** Mass Audubon should conduct regular (i.e. daily to weekly) counts of the number of shorebirds, terns and oystercatchers staging on DNSI during the post-breeding dispersal period.
- **Redo plant inventory and determine extent of invasive plants, and develop long term vegetation management / removal for invasive plants and habitat enhancement.** The plant list for DNSI has not been updated since it was originally developed in 1989, so it is possible that new species have colonized the island since then. It would also be useful to distinguish plants on Sampson's Island from Dead Neck since they are owned by different organizations. We should determine the status of various invasives to assess whether management measures are warranted. It should also be determined if management / removal measures of other plants could improve the habitat function of DNSI.
- **Shoreline change surveys.** 3 Bays currently coordinates shoreline change surveys using protocols developed by the Woods Hole Oceanographic Institution. This is a volunteer-based program.

10. Sanctuary Administration

Sampson's Island is managed by Ian Ives, the sanctuary director at Long Pasture and other central Cape Cod properties. Dead Neck is managed by Three Bays Preservation, Inc. of Osterville, MA. Stewardship of coastal waterbirds is carried out by Mass Audubon's Coastal Waterbird Program, under the direction of Kathy Parsons and in coordination with Ian Ives. Sampson's Island is in Mass Audubon's Southeast, Cape, and Islands Region. Kathy Sferra is the Regional Director and Robert Buchsbaum the Regional Scientist. Gary Clayton, Vice President for Conservation Programs, has oversight of Mass Audubon's entire statewide wildlife sanctuary system.

11. References

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² This is one of a series of annual reports.

12. Document History

The original draft was written by Robert Buchsbaum, Southeast Cape and Islands Regional Scientist. It has been reviewed by staff at both Mass Audubon and staff and consultants to Three Bays:

Gary Clayton, Mass Audubon
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John O’Dea, Sullivan Engineering
John Ramsey, Applied Coastal Engineering
Kathy Parsons, Mass Audubon
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Peter Sullivan, Sullivan Engineering

Figure 1. Locator Map

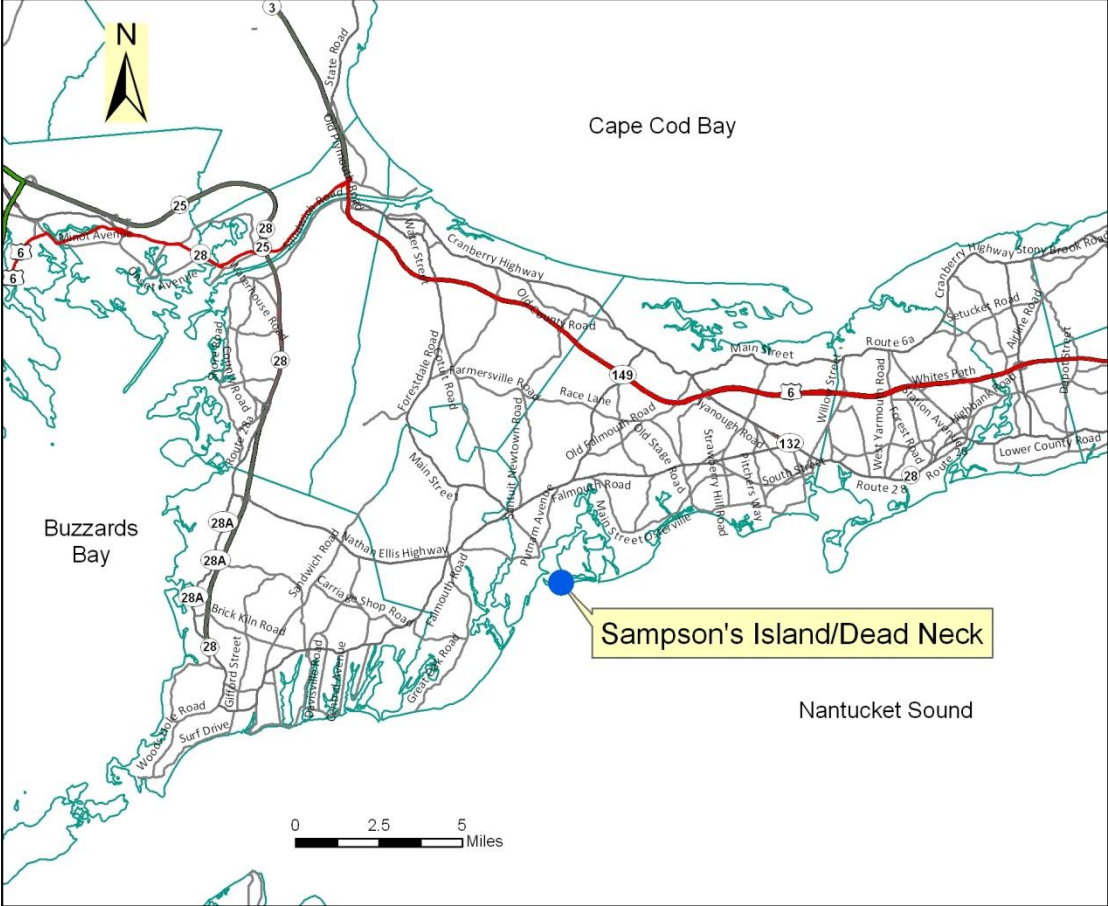


Figure 2. Dead Neck and Sampson's Island. Sampson's Island (Mass Audubon) outlined in blue. The remainder is Three Bays Preservation, Inc's Dead Neck.



Figure 3. Natural Communities of DNSI.

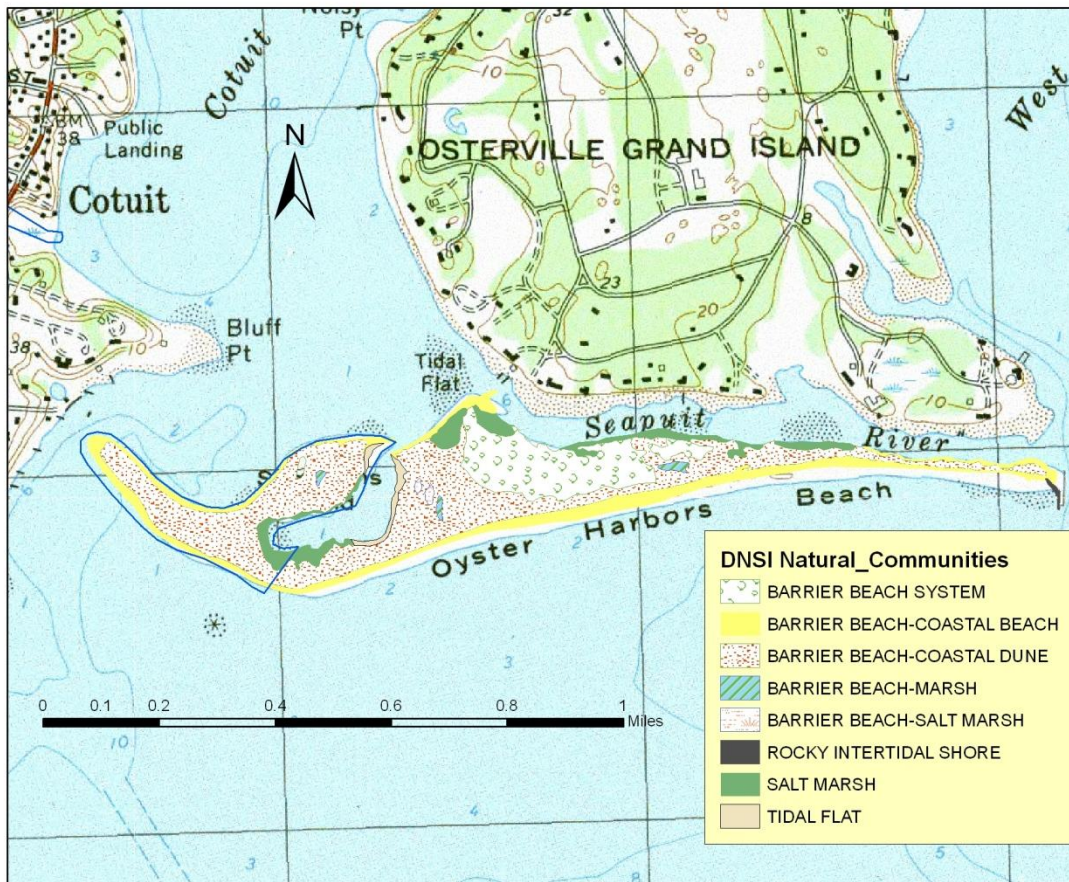




Figure 4. The eastern portion of Dead Neck in 1999, showing at least two locations where the beach had significant storm over wash areas.



Figure 5. Dead Neck Beach immediately following the beach nourishment in 2000, where the beach width had been increased significantly to prevent breaching of the barrier.

Appendix 1. Public Benefits of Mass Audubon Sanctuary Land

Sanctuary: **Dead Neck Sampson's Island**

- Human Health
 - Protects Clean Water for human health (contains groundwater protection zones (I, II, II) or surface water protection zones (A, B, C))
 - Provides Clean Air for human health
 - Provides passive recreation opportunities to promote physical fitness
 - Provides opportunities for spiritual renewal/mental health

- Public Interests Protected Under the Massachusetts Wetlands Protection Act
 - Protection of public and private water supply
 - Protection of ground water supply
 - Flood control
 - Storm damage prevention
 - Prevention of pollution
 - Protection of land containing shellfish
 - Protection of fisheries
 - Protection of wildlife habitat

- Protects Priority Conservation Land Identified by Government Agency
 - BioMap (Core, Critical Supporting Landscape)
 - Priority Habitat (NHESP)
 - Local Open Space & Recreation Plan
 - Historic Resource landscape inventories
 - State-designated Forest Reserve
 - State-designated Forest Legacy Areas
 - State-designated Area of Critical Environmental Concern (ACEC)
 - Flood Hazard Zones
 - Groundwater Protection Districts
 - Watershed Protection Districts
 - Certified vernal pools
 - Coldwater Fisheries Resources
 - Protects or Enhances Abutting or Nearby Gov't. Conservation Holding

- Provides research opportunities for scientists studying natural ecological processes

- Climate Change Mitigation and Adaptation
 - Stores carbon
 - Absorbs atmospheric carbon
 - Protects vegetation along cold water stream
 - Provides flood storage
 - Provides for migration of salt marsh system as sea level rises

- Provides migration corridors for organisms adapting their ranges to climate change
- Vegetative buffers to climate extremes (drought, storms)
- Provides natural communities for understanding the impacts of climate change

Habitat and Biodiversity

- Protects known rare (federal or state listed) species of plants and animals.
- Protects habitat for rare species
- Protects species listed in the State Wildlife Action Plan (including those not state- or federally-listed)
- Protects high quality examples of natural communities

Working Landscapes and Human Communities

- Protects high quality agricultural soils
- Enhances viability of working landscape (farms, forestry)
- Preserves key elements of host community's "sense of place"
- Protects visual/aesthetic qualities
- Reduces or eliminates potential future demands for community services (school, police, fire, water & sewer connection)
- Supports or enhances nearby property values
- Provides educational opportunities for visitors

Landscape Connections

- Links to other protected land
- Part of long distance passive recreation trail

Economic benefits of the ecosystem (Ecosystem Services)

- Waste assimilation
- Nutrient regulation
- Soil retention and formation
- Pollination
- Local food or fiber production