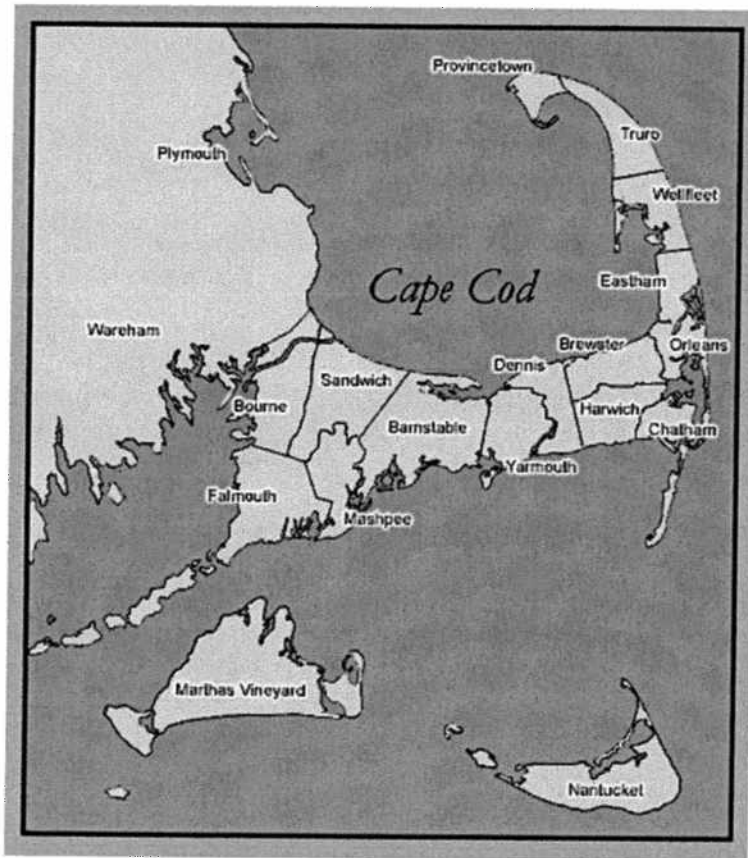


# Appendix A

---

## Commonwealth of Massachusetts Petition to Name the Nantucket Sound As a National Marine Sanctuary

---



---

December 22, 1980

NOMINATION LETTER  
for  
a Marine Sanctuary in  
Nantucket Sound

Pursuant to Title III of the Marine Protection, Research and  
Sanctuaries Act of 1972

Prepared by:

Executive Office of Environmental Affairs  
Massachusetts Coastal Zone Management  
Department of Environmental Management  
Division of Marine Fisheries

Office of the Attorney General

December 22, 1980

Publication No: 12247-62-100-1-81-CR

Approved by: John Manton, Acting State Purchasing Agent

## Table of Contents

I.	Introduction	1
II.	Area Nominated	2
	A. General Description	2
	B. Coordinates, Approximate Size and Boundaries	4
III.	Characteristics of Nantucket Sound	7
	A. Oceanographic Conditions	7
	B. Seafloor Topography	8
	C. Weather Conditions	9
	D. Water Quality	
	E. Shoreline Habitat Value and Diversity	10
	F. Important Animal and Plant Habitat Species	12
	1. Finfish	12
	2. Shellfish	15
	3. Marine <u>Mammals</u> and Reptiles	15
	4. Marine and Shore Bird Populations	18
	5. Marine Plants	19
	6. Conservation and Recreational Features	20
	7. Unique Historic Features	21
	8. Special Area Planning	23
IV.	Description of Present Uses of Nantucket Sound	25
	A. Commercial Fisheries	25
	B. Recreational Fisheries	26
	C. Recreational Boating	27
	D. General Recreational Activities	28

- V. Impacts of Present and Potential Uses on Nantucket Sound and its Unique Resources 31
  - A. Introduction 31
  - B. Fishing Activity 31
  - C. Oil and Gas Development 32
    - 1. Oil and Gas Exploration and Development 32
    - 2. Oil and Gas Pipelines 32
    - 3. Oil and Gas Transportation 33
    - 4. Impacts of Oil Pollution on the Resources of Nantucket Sound 33
  - D. Sand and Gravel Mining 38
  - E. Ocean Dumping 39
  - F. Sewage Outfall and Sludge Disposal 39
  - G. Underwater Archaeological Excavation 40
- VI. Probable Impacts of Sanctuary Designation on Current and Future Uses 41
  - A. Fishing Activities 41
  - B. Other Activities 41
- VII. Sanctuary Management 43
  - A. Introduction 43
  - B. Existing Management of Massachusetts Coastal Waters 44
  - C. Existing Management of the Nominated Area 47
  - D. Proposed Management Plan 51
  - E. Recommended Research Areas 54
- VIII. Available Data on the Resources of Nantucket Sound 57
- IX. References 58
- X. Appendices 61

## I. INTRODUCTION

This nomination letter formally nominates the central portion of Nantucket Sound located outside of Massachusetts coastal waters as a marine sanctuary pursuant to Title III of the Marine Protection, Research and Sanctuaries Act of 1972. This nomination letter was prepared by the Massachusetts Executive Office of Environmental Affairs and the Massachusetts Attorney General's Office.

The Commonwealth of Massachusetts finds that Nantucket Sound contains distinctive ecological, recreational, historic and aesthetic resources that form the basis of the predominant economic pursuits of the area; fishing and tourism. Nantucket Sound is an important habitat area containing spawning, nursery and feeding grounds and migration routes for a number of the nation's important living animal resources, an area with a high biological productivity and diversity of species, and a premier marine-oriented recreational and historic area of regional and national significance.

The Massachusetts coastal waters of Nantucket Sound are now subject to a comprehensive regulatory scheme set forth in Massachusetts General Laws Chapter 132A, Sections 13-16 and 18 (The Ocean Sanctuary Act). This law establishes sanctuaries along the coastline of Massachusetts to protect these water bodies from any exploitation, development or activity that would seriously alter or otherwise endanger the ecology or the appearance of the ocean, the seabed or subsoil thereof or the Cape Cod National Seashore. These sanctuaries are under the care and control of the Department of Environmental Management within the Executive Office of Environmental Affairs. The Cape and Islands Ocean Sanctuary was established in 1972. It is the purpose of this nomination to insure that the valuable resources located in the central waters of the Sound are protected and enhanced just as the resources in the coastal waters are through the Cape and Islands State Ocean Sanctuary. The central waters of Nantucket Sound are nominated for their value as a habitat area, species area, unique area and a recreational and aesthetic area.

This sanctuary nomination proposes that the management of the Nantucket Sound Marine Sanctuary be delegated to the Massachusetts Executive Office of Environmental Affairs (EOEA). This Secretariat is responsible at the state level for the environmental management of the coastal waters and adjacent land areas of Nantucket Sound. It is appropriate that the agency responsible for managing the state Ocean Sanctuary, also manage a marine sanctuary for the central waters in the Sound and that the entirety of Nantucket Sound be subject to an integrated management scheme.

The Commonwealth further proposes that the scope and substance of the proposed Nantucket Sound Marine Sanctuary conform with the statutory standards currently existing for the Cape and Islands Ocean Sanctuary. Among the activities that are prohibited in the state Ocean Sanctuary are: the building of any structure on the seabed or under the subsoil; the construction or operation of offshore or floating electric generating stations; the removal of any minerals such as sand or gravel; the drilling for gas or oil; the dumping or discharge of any commercial or industrial wastes; municipal wastewater treatment discharge; commercial advertisement and the incineration of solid waste material or refuse on, or in, any vessel or boat of any size moored within the boundaries of the sanctuary.

## II. AREA NOMINATED

This nomination letter formally nominates the central portion of Nantucket Sound that constitutes federal waters as a marine sanctuary pursuant to Title III of the Marine Protection, Research and Sanctuaries Act of 1972 to be managed by the Massachusetts Executive Office of Environmental Affairs.

### A. General Description

The Nantucket Sound area contains numerous distinctive ecological, recreational, historic and aesthetic resources of regional and national significance. While the proposed marine sanctuary consists of the federal waters found in the central section of the Sound, these, the coastal waters and the surrounding land area of Cape Cod, Martha's Vineyard and Nantucket constitute one integrated ecosystem whose living

resources use the entire Nantucket Sound area without knowledge or consideration of political boundaries. Activities occurring in federal waters directly impact Massachusetts coastal waters, estuaries and other shore areas and vice versa.

Located south of Cape Cod, Nantucket Sound lies in an area of convergence of two major ocean currents, the Laborador Current and the Gulf Stream. While the temperate waters of the Gulf Stream predominate, the mixture of these two water systems contributes to the large diversity of species found here. It is this diversity of species rather than the volume of biomass that is one of the distinguishing characteristics of this important resource area. Cape Cod represents the southern limit for many cold water species and the northern limit for warm water types. Marine mammals and bird colonies, attracted by the shallowness of the sound, avail themselves of these productive and protected waters for feeding and migratory habitats. The richness of this transition zone ecology enhances the stability of plant life and the productivity of the estuaries in bordering coastlands, that provide habitats for the many species that use the proposed marine sanctuary areas as nursery and feeding grounds.

Nantucket Sound is bordered by Cape Cod, Nantucket and Martha's Vineyard collectively forming one of the most popular summer resorts on the East Coast. The high quality of the Sound's water supports a multitude of recreational activities essential to a viable tourist industry. There is a physical and emotional attractiveness about the Cape and Islands which has appealed to tourists for decades. Boating, swimming, fishing and sightseeing enthusiasts have traditionally been lured by the Sound's excellent water and overall aesthetic quality. For Canada and other northern locations, the Nantucket Sound area is the shortest distance to a warm water beach. Sportfishermen benefit from the diversity of species in the Sound and consider the many shoals of Nantucket Sound as prime fishing spots. The Sound's reliable southwest breeze, picturesque harbors and good marine facilities make the location a mecca for recreational boating.

Cape Cod and the Islands contain a large number and variety of public beaches,

parks, conservation and other recreational areas. The area's important tourist and recreational industry is dependent upon the continued protection and enhancement of the Sound's many distinctive natural resources.

The waters of Nantucket Sound also support the economically valuable commercial and recreational fisheries of the area. Finfish and shellfish resources are dependent on the Sound's oceanographic conditions and water quality. These fisheries have traditionally been a social and economic mainstay for many Cape and Island communities. Of the some 80 species found in Nantucket Sound, black seabass, scup, flounder, squid, blackfish, quahog and bay scallops are the predominate commercial fisheries. In addition to the species which have traditionally contributed to the fishery resource, there are varieties of finfish and shellfish in the Sound that are not now regularly taken by commercial fishermen. This potential fish supply could well contribute to the growth of the regional fishing industry through the development of underutilized species.

The Nantucket Sound area is of exceptional value for its contribution to the heritage of the United States. Nantucket Sound, Cape Cod and the Islands form an integral part of the maritime tradition of this country. Since the Revolutionary War period, Nantucket Sound has been the location of shipyards, served as a major shipping corridor and the home port for a large segment of America's fishing and coastal trading industry. During the nineteenth century, Nantucket was the leading whaling port in the world, sheltering a fleet of 65 vessels. Reflecting this tradition, the entire island of Nantucket was included in the National Register of Historic Landmarks in 1975. The nominated marine sanctuary area contains a number of shipwrecks that are of historic and educational value in interpreting the maritime history of America.

B. Coordinates, Approximate Size and Boundaries

As proposed, the Nantucket Sound Marine Sanctuary would include approximately 163 square nautical miles of water and seabed located between Cape Cod, Vineyard Sound, the islands of Martha's Vineyard and Nantucket extending seaward beyond



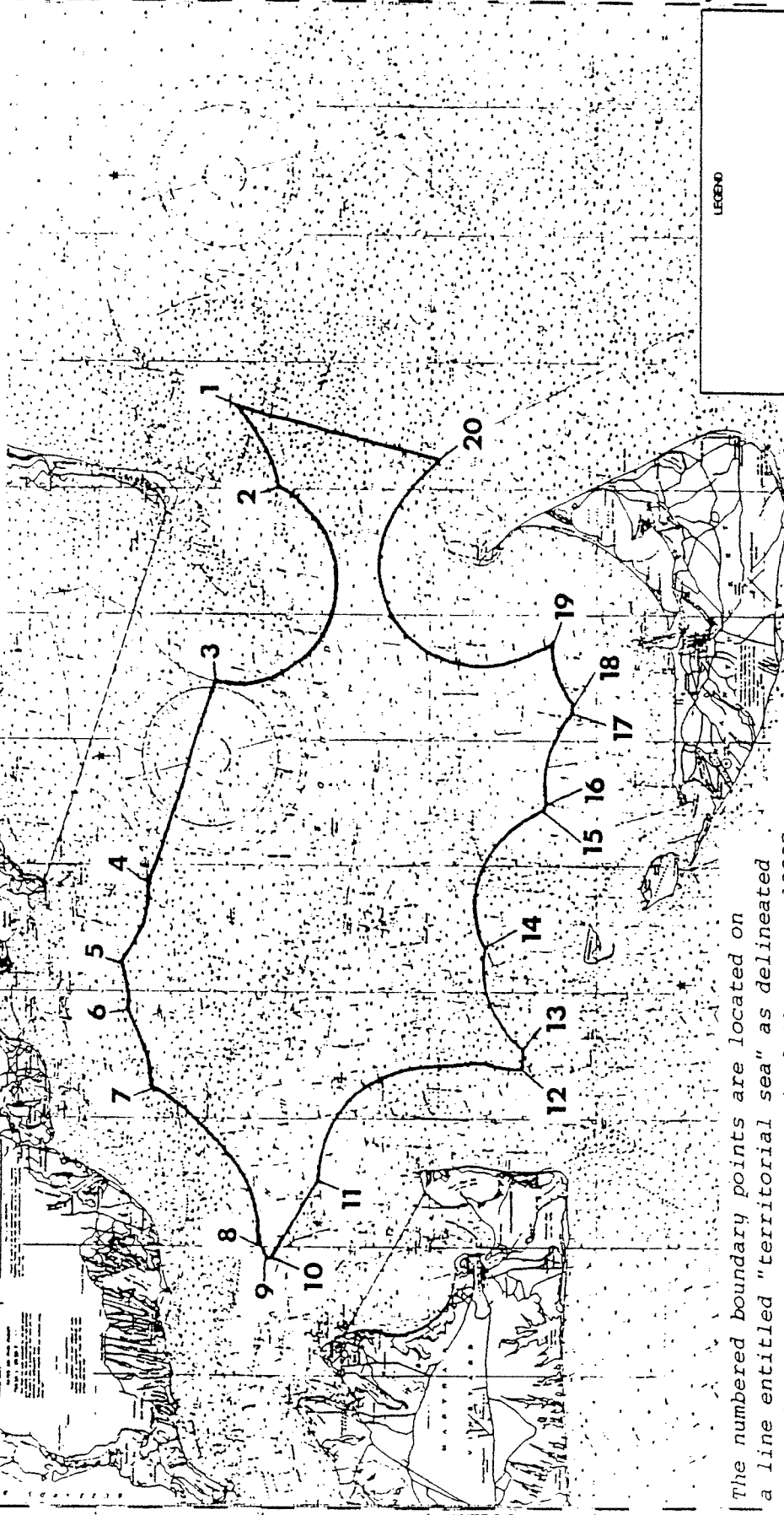
Monomoy and Nantucket islands. The sanctuary would include all waters and seabed within Nantucket Sound outside the three mile limit, as measured from the mean low water line together with an area extending seaward three (3) geographic miles from a presently hypothetical line drawn between Monomoy and Nantucket Island and bounded on the north and south by the three mile seaward limits of state ownership, as set forth by the Memorandum of Settlement approved by the Special Master for the United States Supreme Court in proceedings supplementary to United States of America v. State of Maine, et al, October term, 1979.

The proposed boundaries are delineated in the map on figure 1 and the coordinates of which are listed in table 1.

The area proposed for a federal marine sanctuary consists of all the waters in Nantucket Sound that will come under federal jurisdiction should the above referenced settlement be consummated. As federal waters, this area would not be subject to regulation as part of the Massachusetts Cape and Islands Ocean Sanctuary. The absence of marine sanctuary protection for the federal waters in the center of the Sound would negate efforts by the Commonwealth of Massachusetts to insure the environmental protection of the marine resources of this important water body through its Ocean Sanctuary Program. Nantucket Sound must have a coordinated management regime as proposed in this nomination letter if the ecological, recreational, historic and aesthetic resources of the Sound are to be adequately protected.

SOUNDINGS IN FEET

# PROPOSED NANTUCKET SOUND MARINE SANCTUARY



The numbered boundary points are located on a line entitled "territorial sea" as delineated on National Ocean Survey Nautical Chart No. 13237 (Nantucket Sound and Approaches), 25th ed., Nov. 5, 1977.

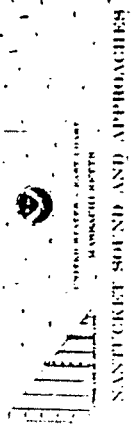


Figure 1.

Table 1. Boundaries of Nantucket Sound Marine Sanctuary

	<u>Latitude</u>	<u>Longitude</u>
1.	41° 30' 42"	69° 56' 40"
2.	41° 29' 36"	70° 00' 00"
3.	41° 31' 25"	70° 07' 48"
4.	41° 33' 36"	70° 16' 00"
5.	41° 34' 24"	70° 18' 55"
6.	41° 34' 10"	70° 20' 43"
7.	41° 33' 20"	70° 23' 54"
8.	41° 30' 07"	70° 29' 50"
9.	41° 29' 54"	70° 30' 30"
10.	41° 29' 40"	70° 30' 18"
11.	41° 28' 22"	70° 27' 18"
12.	41° 22' 15"	70° 23' 03"
13.	41° 22' 12"	70° 22' 15"
14.	41° 23' 22"	70° 18' 15"
15.	41° 21' 38"	70° 12' 52"
16.	41° 21' 30"	70° 12' 30"
17.	41° 20' 45"	70° 09' 00"
18.	41° 20' 45"	70° 08' 36"
19.	41° 21' 24"	70° 06' 06"
20.	41° 24' 42"	69° 58' 48"

### III. CHARACTERISTICS OF NANTUCKET SOUND

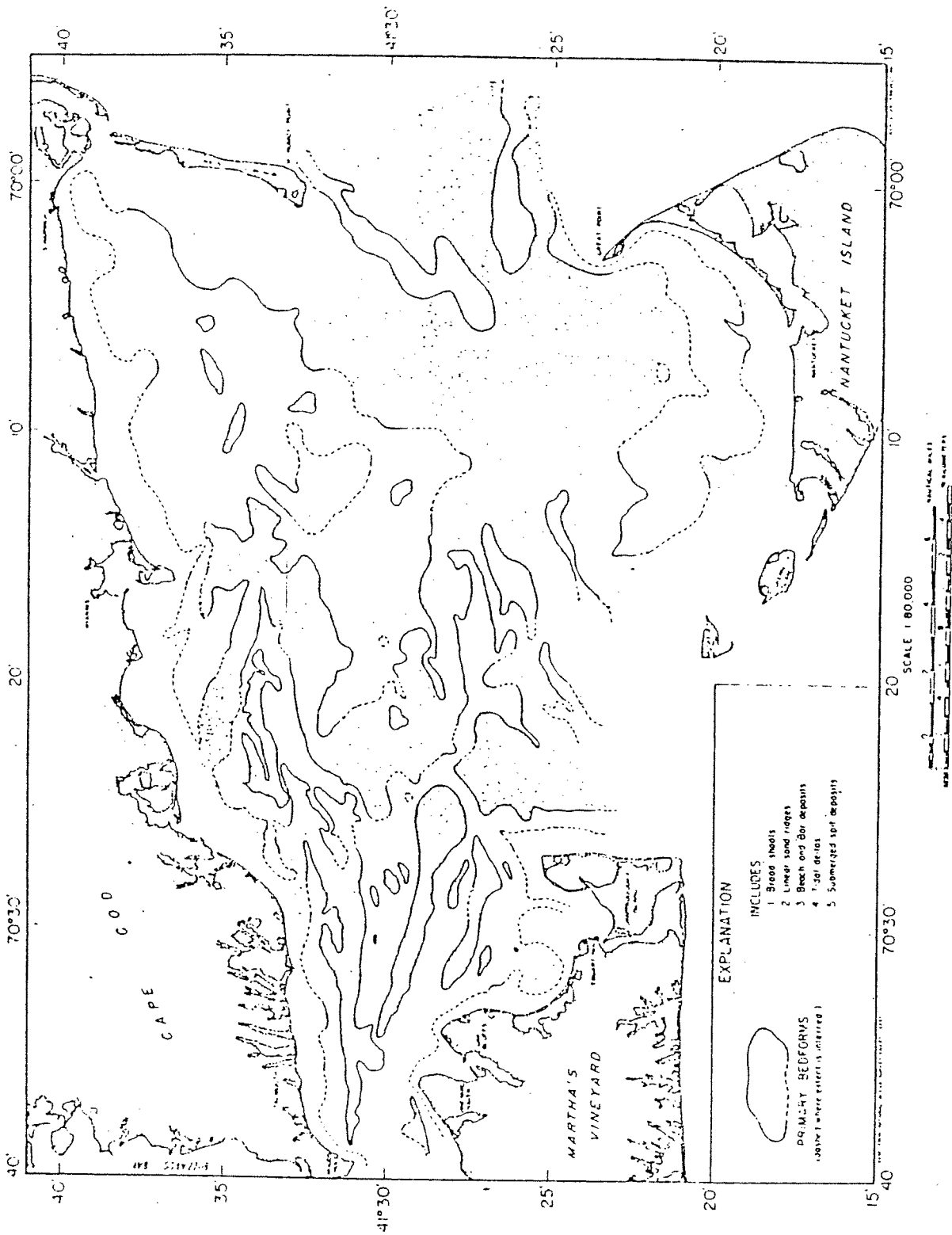
#### A. OCEANOGRAPHIC FEATURE

Two important oceanographic conditions in Nantucket Sound are the merging of two major ocean currents and the continuous flood and ebb tide movement resulting in a continuous mixing of the waters throughout the Sound area. Worldwide, there are few coastal areas where two major marine ecosystems meet and Nantucket Sound is part of one such area. The confluence of the Labrador Current and the Gulfstream create a dynamic and highly diverse marine environment. The Sound's daily flood and ebb of water help create a highly productive ecosystem by insuring that the waters are thoroughly mixed on a continuous basis. This continuous mixing of the waters circulates nutrients throughout the entire Sound area from the many productive estuaries on Cape Cod and the islands.

There are three major tidal entrances to Nantucket Sound which are responsible for the good circulation in this water body. These are Vineyard Sound between Martha's Vineyard, Woods Hole and the Elizabeth Islands, Pollock Rip Channel between Monomoy Island and Great Point on Nantucket, and Muskeget Channel between Muskeget Island and Martha's Vineyard.

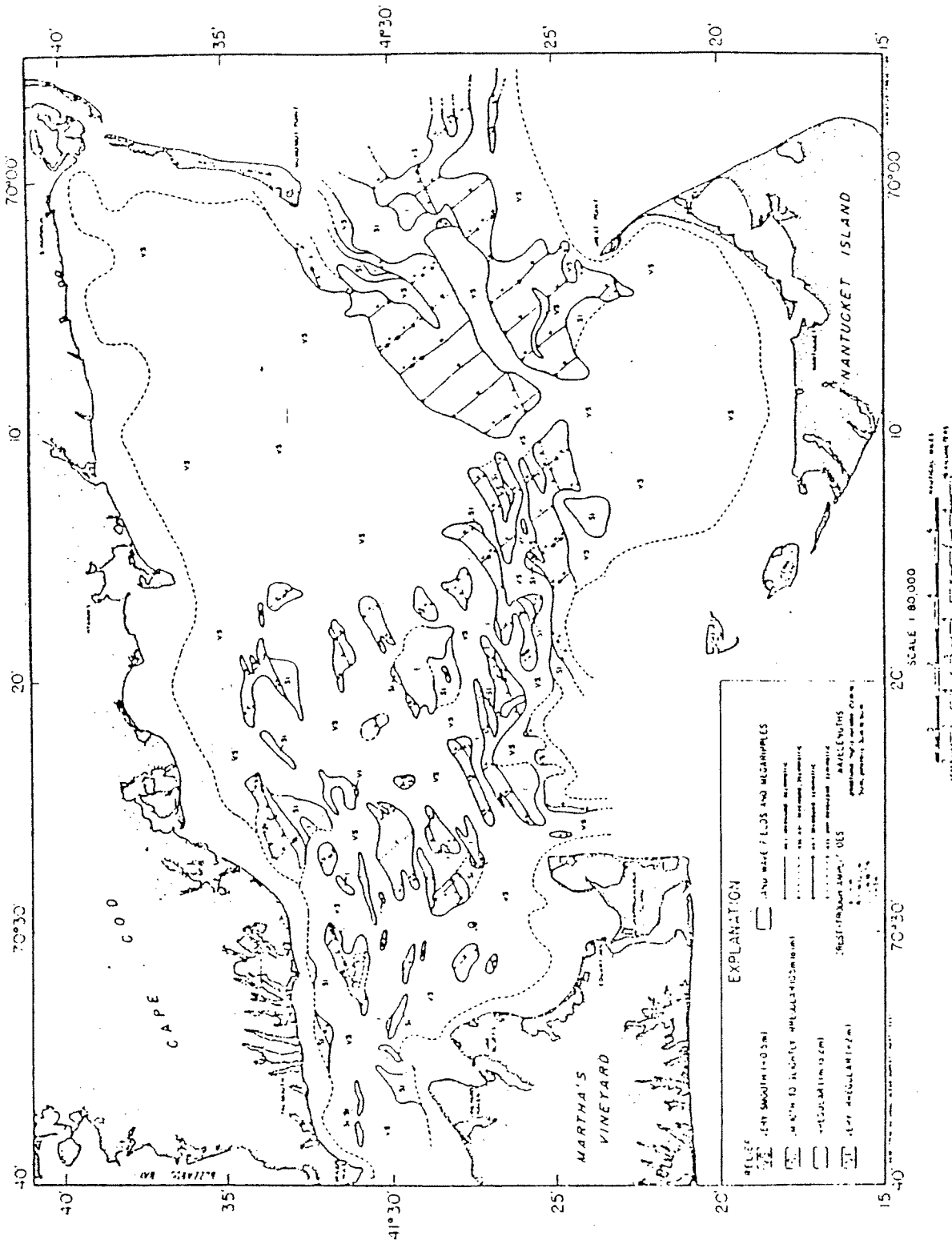
In general, the tidal currents move eastward during flood stages and westward during ebb stages. Average spring tidal velocities at selected stations in each entrance were plotted from National Oceanographic Service current data (1980) in order to further characterize these areas. Summarization of the time/velocity data indicate the following:

- 1) maximum velocities during both stages and the time at which peak velocities occur define a symmetrical tide curve for each station;
- 2) maximum current velocities differ between stations (i.e., Pollock Rip Channel 1.5 kts. Vineyard Sound 3 kts. and Muskeget Channel 4 kts.); and,
- 3) there is a temporal difference in tidal response between stations. Based on Pollock Rip Channel, tides occur .0.5 hours later in



MAP SHOWING DISTRIBUTION OF PRIMARY BEDFORMS

by  
Charles C. Hara  
1980



MAP SHOWING SEAFLOOR MICROTOPOGRAPHY

by  
Charles J. O'Hara  
1980

Muskeget Channel and 1.5 hours later in Vineyard Sound.

B. Seafloor Topography

All of Nantucket Sound, and the landbodies of Martha's Vineyard and Nantucket comprise an area at or above the 20 meter (65 feet) offshore contour and can be considered as one contiguous geological unit. The deposition of outwash plain material over the coastal plain deposits are responsible for the unusually shallow water depth throughout the Sound. Average depths are only on the order of 10 - 15 (30 - 50 feet) meters. The bottom topography of Nantucket Sound has been mapped (O'Hara, 1980) as three (3) bedform units. First are the primary bedforms covering over 50 - 60% of the Sound. These are very large features which include: 1) broad shoals, 2) linear sand ridges, 3) beach and bar deposits, 4) tidal deltas, and 5) submerged spit deposits. It appears as though most of the primary bedforms are composed of moderate to well sorted, medium to coarse sands with small percentages of gravel. The largest of these bedforms are the sand ridges, some of which are 20 kilometers (12.4 miles) long, 3 kilometers (1.9 miles) wide and 13 meters (46 feet) thick.

Superimposed on the primary bedforms are secondary bedforms. These are very well developed sand waves, 1 to 4 meters in height, and megaripples, less than 1 meter (3.5 feet) in height. The existence of these features indicates that the larger primary bedforms are mobile and that they form and/or migrate in response to tidal currents. Active sand bodies are found throughout the center of the Sound from Vineyard Sound eastward to the Atlantic Ocean. The most significant area of bedform activity is located between Monomoy Island and Great Point at the eastern entrance to Nantucket Sound from the Atlantic Ocean.

The last of the bedform units are the swales and interr ridge lows which occur between the larger primary bedforms. Generally, the swales and lows are very flat surfaces representing either areas undergoing scour as in western

portions of the Sound, or, sediment sinks in which very fine sediments are being deposited under low energy "quiet water" conditions. The latter appears to be representative of the northeastern Sound area where tidal currents have very low velocity peak flows. An important geotechnical feature of the swale unit sediment, is highly unstable organic gas-charged muds which are often present.

#### C. WEATHER CONDITIONS

General wind conditions for the Sound are summarized from data collected on Nantucket. The eight year record documents the year-round wind duration, average speed, and maximum intensities. Winds from the WSW (west-southwest) and SW (southwest) have the greatest duration and therefore can be considered the prevailing winds. Average wind speeds are quite similar from all compass directions and range between 12 and 14 mph. Winds from the NNE (north northeast) have an average speed greater than 14 mph. probably as a result of the maximum winds which occur during winter. The NNE winds have the greatest occurrence of speeds over 32 mph and therefore are the dominant winds, in spite of their short duration.

#### D. WATER QUALITY

All the tidal waters in Nantucket Sound with the exception of Hyannis, Falmouth and Nantucket inner harbor basins are classified as SA under the Massachusetts Water Quality Standards.

Class SA is the highest class for coastal and marine waters. Waters assigned to this class are designated for the uses of protection and propagation fo fish, other aquatic life and wildlife; for primary and secondary contact recreation; and for shellfish harvesting without depuration in approved areas.

The specified levels of certain parameters of water classified as SA is as follows:

- 1) Dissolved Oxygen: not less than 6.5 mg/l; ph: 6.8 - 8.5
- 2) Coliform Bacteria: not to exceed a median value of 70 and not more than 10% of samples over 230



- 3) Chemical Constituents: none in concentrations or combinations which would be harmful to human, animal or aquatic life or which would make the waters unsafe or unsuitable for fish or shellfish or their propagation, impair the palatability of same, or impair the waters for any other use.

Special antidegradation provisions exist for those waters of Nantucket Sound whose quality is or becomes consistently higher than that quality necessary to sustain the national goals. The water quality shall be maintained at that higher level unless limited degradation is authorized by the Massachusetts Division of Water Pollution Control.

E. SHORELINE HABITAT VALUE AND DIVERSITY

The shorelines of Cape Cod, Monomoy Island, Nantucket, Ester Island, Tuckernut Island, Muskeget Island, and Martha's Vineyard border on Nantucket Sound and comprise over 100 statute miles of an open-coast environment. This extensive system of salt ponds, salt marshes, estuaries and embayments provide irreplaceable habitats for many of the marine and shore birds and fisheries that utilize the proposed sanctuary area as a feeding and migratory habitat. This system also provides large quantities of nutrients to the marine food chain of the Sound, thus significantly contributing to the productivity of this ecosystem.

The barrier beaches located at the entrances to these coastal waterbodies provide habitats for nesting and migratory birds and other wildlife and are the sites of most of the public beaches in the Nantucket Sound area.

The coastal wetlands resources along the southern shore of Cape Cod have been mapped by the Department of Environmental Management (E0EA) with the use of aerial photography taken in the Spring of 1978. This mapping identified over 2500 acres of salt marsh, 39 coastal water bodies and 22 barrier beaches along this section of coast. Nantucket and Martha's Vineyard also contain productive estuaries and embayments that are important to the continued productivity of the Nantucket Sound area.

The Massachusetts Legislature adopted the Coastal Wetlands Act to promote the public safety, health and welfare, to protect public and private property and to protect wildlife and marine fisheries by restricting certain land uses. This form of wetland protection is accomplished by placing a restriction order on the property deed of the land owner. Recognizing the importance of the coastal wetlands in the Nantucket Sound area, wetland restriction orders have been signed for the Cape Cod towns facing the Sound and the coastal wetland restrictions program will be completed for Nantucket and Martha's Vineyard in 1981.

Table 2. Distribution and Diversity of Habitats Along Nantucket Sound Coast of Cape Cod Critically Important to Wildlife and Marine Fisheries

<u>Town</u>	<u>Salt Marsh Acreage</u>	<u>Water Bodies<sup>(1)</sup></u>	<u>Barrier Beaches</u>
Falmouth	215	11	7
Mashpee	230	5	3
Barnstable	575	7	7
Yarmouth	310	3	2
Dennis	295	4	1
Harwich	420	4	0
Chatham	<u>470</u>	<u>5</u>	<u>2</u>
Total	2,515	39	22

---

(1) Includes salt ponds, harbors, bays, rivers, and estuaries connected to Nantucket Sound. (Wetlands Restriction Program, DEM (EOEA).

The Connamessett River, Childs River, Quasket River, Mashpee River, Santuit River, Marstons Mills River, Centerville River, Mill Creek, Parker River, Bass River, Herring River, Andrews River, Mill Pond, Frostfish Creek, and Muddy Creek on Cape Cod are active anadromous fish runs for the alewife.

The land areas adjoining the Sound contain a number of important wildlife refuges. These refuges compliment the extensive areas of shallow water within the nominated area that provide feeding habitat for the bird species that utilize the refuges.

F. IMPORTANT ANIMAL AND PLANT LIFE

1. Finfish

The section of Nantucket Sound nominated as a marine sanctuary is an important species habitat containing spawning, breeding, nursery and feeding grounds for many shellfish and finfish species. In this transition zone species from two distinct systems come together to form a richly diverse and productive biota.

Over 79 different finfish and shellfish have been captured in bottom trawl surveys conducted by the Massachusetts Division of Marine Fisheries in Nantucket Sound between 1974 and 1980. (See Appendix 1). The Division initiated a more comprehensive bottom trawl survey program in 1978 to monitor the relative abundance of fish stocks in Massachusetts coastal waters using a Yankee Otter Trawl, size 20. In Nantucket Sound, the surveys included both coastal waters and waters in the nominated area. The ten most predominant species by weight per tow and number per tow in Nantucket Sound for both spring and autumn bottom trawl surveys in 1978 are listed in appendix 2. The species composition and relative abundance changed little between 1978 and 1979, indicating that this is an accurate listing of the predominate fish of the Sound.

These annual Fishery Resource Assessments also document the importance of Nantucket Sound as a spawning and nursery ground for many valuable commercial and recreational species and other species important in the food chain. The spring bottom trawl catches consisted primarily of mature fish approaching spawning conditions. The autumn trawl survey results showed an abundance of one year olds as well as large numbers of young-of-the-year fish.

The following is a brief discussion of the predominant species of finfish and shellfish that utilize Nantucket Sound as a breeding, spawning or nursery habitat:

American sand lance (Ammodytes americanus) is a coastal species commonly found in the mouths of estuaries and along sandy bottoms. Spawning is believed to

occur in late winter in Massachusetts from eggs broadcasted on sandy bottoms in water up to 20m deep. Sand lance are taken for bait fisheries. Various sport fishes, including cod, striped bass and bluefish as well as sea birds and whales are heavily dependent on this finfish species for food.

Black sea bass (Centropristis striata) is an important sport fish that is also taken commercially by pot and otter trawl. The Stock Resource Assessment conducted by the Division of Marine Fisheries found spring catches to consist of pre-spawning adults. 99% of black sea bass in autumn tows consisted of young-of-the-year fish as well as possibly age 1 fish. In Massachusetts waters, this species is most common in Nantucket Sound.

Butterfish (Peprilus triacanthus) spawn a few miles out to sea (including Nantucket Sound) in the summer months. During the fall, butterfish are a predominant species in Nantucket Sound and found in nearly all depth strata.

Little Skate (Raja erinacea) is a common species in Nantucket Sound. This species has no defined spawning site. Eggs are found throughout the Sound, being most abundant in the spring. While this species has little commercial or recreational value, it is an important component in the Nantucket Sound marine community.

Longhorn Sculpin (Myoxocephalus octodecemspinosus) is another common species in Nantucket Sound that spawns nearshore during winter and early spring. It is believed that the longhorn sculpin moves to deeper waters in late spring and returns shoreward in the late autumn.

Menhaden (Brevoortia tyrannus) range from Nova Scotia to Florida and occur in estuarine waters as eggs, larvae, juveniles and adults. Menhaden spawn in nearshore waters during late spring and summer. Juveniles enter the estuaries of Nantucket Sound in late winter and early spring and remain in these environments for 6 to 8 months before leaving for its southern range in early fall. This species is food of the striped bass, bluefish, summer flounder and weakfish. Menhaden is an important commercial species used for fish bait, fish oil, meal and solubles.

Northern searobin (Prionotus carolinus) is one of the most abundant finfish species in Nantucket Sound. It spawns from June to September in the shoal water and estuaries of the Sound. The northern searobin is taken by commercial and recreational fishermen and is increasing in importance as an underutilized species.

Scup (Stenotomus chrysops) is a species of the continental shelf of eastern North America occurring regularly from Cape Hatteras to Cape Cod. This species is a summer and early fall resident of southern Massachusetts coastal waters when it comes inshore to spawn. Scup are an important link in the food chain. They are predominantly bottom feeders and are in turn eaten by fish such as cod and bluefish. It is an important foodfish species to draggermen, trap fisherman and sport fishermen. Division of Marine Fisheries Resource Stock Assessments during 1978 and 1979, found that while scup were rarely found in the bottom trawl north of Cape Cod, they ranked No. 2 in weight and number during the spring bottom trawl survey and No. 1 in the autumn survey in Nantucket Sound.

Tautog or blackfish (Tautoga onitis) represents a prominent member of inshore benthic community and are usually taken on rocky bottoms or near pilings, jetties and any bottom irregularly. In Massachusetts waters, this species is most abundant south of Cape Cod in the immediate vicinity of the coast (less than 60 feet depth). They spawn from May to August in weedy inshore areas of the Sound. The tautog represents an important resource for Massachusetts as a recreational fish. Sport catches are abundant from May through September.

Windowpane (Scophthalmus aquosus) is a common species of Massachusetts coastal waters and is predominantly abundant in Nantucket Sound in the spring. Also, the greatest number of large fish of this species found in Massachusetts waters occur in Nantucket Sound. Spawning is during spring and fall. The windowpane is a very-thin bodied flounder and while not attractive as a commercial or recreational fish, it serves an important role in the marine food chain.

## 2. Shellfish

Longfin Squid (Loligo pealei) is a very important species in the marine food chain. It is prolific, rapid growing and short lived. This species remains the object of offshore pelagic trawl fisheries and is of increasing interest to inshore draggers and trap operators. In the spring, they are concentrated in shoal waters south of Cape Cod, where spawning occurs. The Division of Marine Fisheries stock assessment surveys document Nantucket Sound as a nursery for this species.

Bay Scallop (Aequipecten irradians) is the most common and commercially valuable shellfish species found in the Nantucket Sound area. It spawns and makes habitat of flats exposed at lowest tides and subtidally on the shoals of Nantucket Sound.

Hard-shelled clam or Quahog (Mercenaria) is very abundant in Nantucket Sound ranging in depths of two to forty feet. This species is very important commercially and is marketed as littleneck, cherrystone and hard shell clams.

American lobster (Homarus americanus) is found in the nominated area. Lobster larvae hatch in the summer and remain planktonic, drifting in near-surface currents for 10-30 days before settling to the bottom.

Atlantic deep sea scallop (Placopecten magellanicus) is found in limited quantities in Nantucket Sound in depths greater than 20 feet. This species spawns in late September and early October and utilizes these waters as a permanent habitat.

## 3. Marine Mammals

The waters of Nantucket Sound support several marine mammal populations either as occasional migrants or as permanent residents. Of these, the grey seal (Halichoerus grypus) is the most permanent and perhaps most unique. The grey seal ranges from Western Europe across the North Atlantic to Iceland and Canada. Muskeget Island, located in coastal waters of Nantucket Sound adjoining the nominated area, harbors the southern most breeding population in the world and the only one known in the United States. While the current population consists of one or two dozen

individuals, historically it was larger containing up to as many as 50 seals two decades ago. This species of seals breed, pup and feed in an area roughly seven miles by three miles surrounding Tuckernuck and Muskeget Islands. Grey seals have been sighted in all months of the year. In 1980, approximately nineteen individuals were signed on Muskeget and the adjacent sand spits, and in 1978 sightings were reported on Bigelow Point, Tuckernuck Island and off of Nantucket at Scasconset.

The harbor seal (Phoca vitulina) ranges from Labrador to Rhode Island and is an inshore resident of bays and sounds, breeding, sunning and resting on tidal ledges and sand shoals. A small population (in the hundreds) of harbor seals uses Nantucket Sound as an annual resident winter habitat. Their haul out points include Monomoy Island, a barrier island on the eastern end of the Sound and other islands and sand spits in the Sound.

Different species of whales use the offshore waters as a migratory passage between northern summering grounds and southern wintering grounds. Right, humpback and pilot whales occasionally pass through Nantucket Sound. The right whale (Eubalaena glacialis), classified as endangered by the U.S. Fish and Wildlife Service, has been sighted west of Nantucket Sound in Vineyard Sound off of Quick's Hole in 1958, off of Menemsha Bight (Martha's Vineyard) for 4 consecutive days during the same year and once in 1959. This species was sighted off of Squash Meadow Shoal in Nantucket Sound in 1959. There were two possible sightings in Nantucket Sound in the summer of 1979 and one definite sighting in 1978 of the humpback whale (Legapteria movaeangliae). The pilot whale (Globicephala melaena) has been sighted in Nantucket Sound in 1979 and 1980. These, the finback whale (Balaenoptera physalus) and possibly other species of whales are seen more frequently off of Little and Great Round Shoals to feed on invertebrates and fish that are abundant in this area. Portions of these shoals lie on the eastern boundary of the nominated marine sanctuary area.

There are four species of sea turtles that are found in Nantucket Sound; the green turtle, (Chelonia mydas), Kemp's ridley (Lepidochelys Kempfli), the leatherback (Dermodochelys coriacea) and the diamondback terrapin (Melaclemys terrapin

The green turtle is a highly migratory species that breed and nest in tropical waters. The young hatchings leave for more northern waters where they feed as carnivores until they reach maturity. One of the few places in New England where concentrations of young greens are found is Nantucket Sound. The species was once the most numerous of sea turtles, but it has been systematically extirpated in habitat after habitat by human predators in search of the green turtle's economically valuable meat and colipee. The green turtle is now listed as a federally threatened species and has state endangered status in Massachusetts.

The leatherback is another migratory species that is currently on the Federal Endangered Species List. The leatherback's population has been seriously depleted from egg collection on nesting beaches and high mortality from ingesting toxic or indigestible objects. Concentrations of leatherback turtles are found in Massachusetts waters during the summer and autumn months, particularly in the waters south of Cape Cod.

The Kemp's ridley or the Atlantic ridley nests on the Gulf coast of Mexico with the young carnivorous turtles migrating north during the summer months. Survival during the ridley's juvenile stage in New England waters is critical to the continued existence of this species. The ridley turtle concentrates in Massachusetts waters from July through November in shallow waters adjacent to Cape Cod including Nantucket Sound. This species is on the Federal Endangered Species List and its population had dropped from 250,000 in the 1940's to a current figure of less than 3,000.

The diamondback terrapin's northernmost breeding habitat is on the shores of Cape Cod. In the Nantucket Sound area, this species is found in Pleasant Bay, (Chatham) and Washburn Island (Falmouth) where they nest in the sand dunes.

Muskeget Island is the only known habitat of the Muskeget vole (Microtus breweri). While not a marine mammal, this species' only occurrence is on a low-lying island in Nantucket Sound and would be susceptible to a large scale degradation of the waters of the Sound.



#### 4. Bird Populations

The Nantucket Sound area is of regional and national importance as a breeding, nesting, resting and feeding bird habitat. The Sound's ecosystem containing clean water, large productive estuaries, extensive shallow shoal areas, thousands of acres of salt marsh and long stretches of undeveloped beaches attract and provide ideal habitats for vast migratory and resident bird populations.

The Monomoy National Wildlife Refuge illustrates the productivity of the many bird refuges and other habitat areas not officially designated in Nantucket Sound. This wildlife refuge is located on Monomoy and Morris Islands separating the Atlantic Ocean from Nantucket Sound and consists of sand dunes, salt and fresh water marshes, fresh water ponds and beaches. More than 300 species of birds have been recorded on the refuge including nesting waterfowl, gulls and terns. The refuge is an important nesting habitat for waterfowl, breeding habitat for a number of species and a heavily used migratory habitat for shore birds.

Nantucket Sound lies within the Atlantic Flyway, one of four major migratory routes used by North American waterfowl. Vast numbers of birds use the salt marshes, estuaries, shoals and nearshore areas as resting and feeding areas during spring and fall migration. The nominated area which includes portions of Little Round and Great Round shoals east of Monomoy Island serves as part of the largest winter habitat for waterfowl on the east coast of the United States. Significant percentage of the total east coast population of some species congregate in the Sound area. Common eiders (Somateria mollissima) and different types of scoters, including the black scoter (Melavitta nigra) and the surf scoter (M. perspicillata) are found during the fall and winter in the hundreds of thousands in the offshore shoal areas east of Monomoy Island. The extensive acreage of salt marsh in the Nantucket Sound area provide habitat for numerous species of marsh birds such as the herons, egrets and rails.

Many species of shorebirds use the beaches, dunes and tidal flats of Nantucket Sound area as nesting and feeding areas during the summer months.

Terns are abundant in the coastal zone and the individual species that

breed in Massachusetts include the common tern (*Sterna hirundo*), least tern (*S. albifrons*), roseate tern (*S. dougallii*), and the arctic tern (*S. paradisaea*). Active colonies presently exist along the shore of Nantucket Sound including Monomoy Island, Dennis, West Yarmouth and Nantucket. The arctic tern is at the southernmost extent of its range and this species and the roseate tern is uncommon in Massachusetts.

#### 5. Rare and Endangered Marine Plants

Several rare plant species have documented occurrences in the coastlands bordering on Nantucket Sound. The most notable of these is the seabeach knotweed (*Polygenium glaucum*). The plant is rare in Massachusetts, with only peripheral distribution here at the northernmost edge of its range. Nantucket contains several viable colonies of seabeach knotweed on beach areas where the dunes are accreting. In 1980, colonies were located on Great Point, Coskata, east of Tom Nevers, and on Eel Point. A colony was reported on Coatue Point in 1978.

Historical sightings have been recorded in the Nantucket Sound area for the golden club (*Orontium aquaticum*), bristly foxtail (*Setaria geniculata*) and an alkali grass (*Puccinallia paupercula*, var. *alaskana*). While there have been no recent recorded sightings, it is possible that these plants still exist in undisturbed habitats along the coastal fringe of the Sound.

#### D. CONSERVATION AND RECREATIONAL RESOURCES

Federal, state and local governments and non-profit organizations have long recognized the unique natural resource value of the Nantucket Sound area and the need to protect these resources for conservation and recreation purposes. As a result, a large percentage of the land on Cape Cod and the islands is dedicated to conservation, open space and recreational uses. In the communities facing Nantucket Sound, there are approximately 1,750 acres of municipal recreation and conservation land, 56 acres of state land, 2,738 acres of federal land and 2,400 acres held by semi-public agencies.

Some of the important conservation and recreational facilities in the Nantucket Sound area that the proposed marine sanctuary would complement are listed in the following table:

<u>FEDERAL</u>			
<u>Name</u>	<u>Location</u>	<u>Size in Acres</u>	<u>Type</u>
Cape Cod National Seashore	Lower Cape	25,000	recreational conservation
Monomoy National Wilderness Area	Chatham	2,698	conservation
Muskeget Island Wilderness Site	Nantucket Sound	230	wildlife refuge
Nantucket Island National Historic Landmark	Nantucket	entire island 50 square miles	historic preservation district
<u>STATE</u>			
Nickerson State Park	Brewster	1,779	recreation
Martha's Vineyard State Forest	W. Tisbury Edgartown	4,000	recreation
Nantucket State Forest	Nantucket	137	conservation
Waquoit Bay Area of Critical Env. Concern	Falmouth Mashpee	1,213	environmental protection
<u>PRIVATE NON-PROFIT</u>			
<u>The Trustess of Reservations</u>			
Mashpee River	Mashpee	375	natural trout stream
Coskata-Coatue Wildlife Refuge	Nantucket	810	refuge
Great Point	Nantucket	42	refuge
Wasque Reservation	Martha's Vineyard	200	refuge
Menemsha Hills	Martha's Vineyard	120	refuge
Cape Poge Wildlife	Martha's Vineyard	428	refuge

Massachusetts Audubon Society (cont.):

<u>Name</u>	<u>Location</u>	<u>Size in Acres</u>	<u>Type</u>
Tern Island	Chatham	10	refuge
Felix Neck Wildlife Sanctuary	Edgartown	200	refuge
Salt Pond	Falmouth	117	refuge
Wells Land	Cotuit	1/3	refuge
Popponeset Sand Spit	Barnstable/Mashpee	50	refuge
Dead Neck/Sampson's	Cotuit	15	refuge

The establishment of a marine sanctuary in Nantucket Sound would be an important step in protecting and enhancing the extensive system of conservation and recreational areas in Nantucket Sound. Many of these areas are directly dependent upon the continued high quality of the waters of Nantucket Sound and any serious degradation of these waters would have a direct adverse impact on such areas.

E. UNIQUE HISTORIC FEATURES

Nantucket Sound has played an important role in the history of the United States. Cape Cod and the islands were inhabited by American Indians centuries before the arrival of the first European explorers in the first decade of the seventeenth century (Champlain 1605, Gosnold 1605, Hudson 1609 and Smith 1614).

The early European settlers were initially attracted by the broad stands of timber, but gradually turned to fishing and other maritime pursuits for their livelihood. Shipyards were established in the harbors (Osterville, Coquit, Hyannis, Waquoit Bay and Bass River) and an active fishing and coastal trading industry developed in the Sound.

During the eighteenth and nineteenth centuries, Nantucket Sound served as a major corridor of coastal shipping between the Mid-Atlantic states and New England. The vessels carried coal, lumber, cobblestones and ice. They used Nantucket Sound as it was a protected corridor and to avoid the many shoals south and southwest of Nantucket. However, Nantucket Sound proved to be as dangerous as the shoals to the south. Shifting shoals, poor navigational aides, sudden fogs, and storms caused many ships to suffer while trying to navigate this water body. A number of these wrecks are located

within or in waters adjacent to the nominated area. For example, the following is a list of reported wrecks on Long Shoal and Tuckernuck Shoal; only two of the many shoals in the nominated area.

Long Shoal is located entirely and Tuckernuck partially within the proposed marine sanctuary.

Long Shoal

Schooner Enterprise - 1896	Schooner Victory - 1821
Schooner Evolution - 1921	Schooner French Van Guilder - 1885
Schooner Richard S. Leaming - 1904	Schooner Alice M. Lawrence - 1914
Schooner Sarah Woodbridge - 1859	Ga. S F/V Shenandoah - 1912
Ship Seniranmis - 1803	Schooner Unique - 1917
	Schooner Laura Annie Barnes - 1939

Tuckernuck Shoal

Schooner Addison - 1844	Schooner Meridan - 1845
Schooner Champion - 1864	Schooner Orb - 1841
Schooner Emma G. Edwards - 1879	Schooner Rebecca Fogg - 1853
Schooner Elvya - 1836	Ship Shooting Star - 1859
Schooner L.B. Myers - 1863	Schooner Splendid - 1856
Brig. Madison - 1853	Schooner Union - 1878
Brig. Mary - 1802	Schooner Warsaw - 1837
Schooner Mary George - 1851	Schooner William Capes - 1876
Schooner Mary Louise - 1876	

These shipwrecks are important examples of the different types and styles of ship construction. As the techniques for successfully excavating and salvaging wooden shipwrecks develop, the historic and educational value of these and other wrecks in the nominated area for interpreting American maritime history will be enhanced.

A number of maritime related structures and sites facing Nantucket Sound have been included in the National Register of Historic Landmarks. These include the Wianno Club, the Chatham Windmill and the Monomoy Point Lighthouse on Cape Cod, the Edgartown, Cape Pogue, East Chop and West Chop Lighthouses, the entire island of Nantucket and the Wesleyan Grove National Register Historic District (including 300 sites and structures) on Martha's Vineyard.

F. SPECIAL AREA PLANNING PROGRAMS

1. Martha's Vineyard Commission

In 1974, the Massachusetts Legislature in recognition of the unique qualities of Martha's Vineyard, created the Martha's Vineyard Commission to:

"...preserve and conserve for the enjoyment of present and future generations the unique natural, historical, ecological, scientific and cultural values of Martha's Vineyard which contribute to public enjoyment, inspiration and scientific study and to protect these values from development and uses which would impair them and to promote the enhancement of sound local economies", (Chapter 637 of laws of 1974).

2. Areas of Critical Environmental Concern

Waquoit Bay in Falmouth and Mashpee on Cape Cod has been designated an Area of Critical Environmental Concern pursuant to Massachusetts General Laws, Chapter 21A, section 2(7) and Popponesset Bay located in the Town of Mashpee was proposed for such a designation in the Massachusetts Coastal Zone Management Plan. ACECs are significant natural resource systems unique for their high natural productivity of known spawning grounds; shellfish beds; anadromous fish runs; feeding and breeding areas for waterfowl and birds dependent on coastal resources; habitat areas for threatened and endangered species and/or high water quality or potential to meet highest water quality standards. The basic function of an ACEC designation is to provide for a more thorough environmental review of state funded or state permitted projects, to coordinate and focus state environmental programs with federal programs and to encourage all levels of government to act consistently within the boundaries of ACECs.

Waquoit Bay is an extensive natural resource system which perhaps best typifies the many important estuarine systems forming a part of the Nantucket Sound ecosystem. This area's natural features include an undeveloped barrier beach, 330 acres of highly productive saltmarsh; economically important quahog, bay scallop and soft shelled clam shellfish beds whose harvest in 1977 exceeded \$100,000.; an alewife anadromous fish run; a great diversity of estuarine finfish species and important feeding and breeding grounds for many species of birds.

IV. DESCRIPTION OF PRESENT USES OF NANTUCKET SOUND

The major present uses of Nantucket Sound are commercial fin and shell fishing, recreational fishing and boating and other marine related recreational activities.

A. Commercial Fisheries

Commercially important finfish found within the nominated area include Black seabass, butterfish, bluefish, cod, flounders, scup, striped bass, and tautog.

The Massachusetts landings in 1979 for Barnstable and Dukes (Martha's Vineyard) County ports is shown in the table below. These fish were caught within the nominated area as well as in other locations. They are included to indicate the relative size and dollar value of these commercial species in this section of Massachusetts. The weights of fish given in this table are those of the fresh fish landed and the values are those received by the fishermen.

	<u>1979 Landings for Barnstable and Dukes County Ports</u>			
	Barnstable		Dukes	
	lbs.	\$	lbs.	\$
<u>Finfish</u>				
Alewife	185	80	8,260	295
Bluefish	177,189	40,736	57,431	15,341
Cod (drawn	491,770	161,029	5,905	2,290
<u>Flounders</u>				
Blackback	21,601	7,096	20,245	6,499
Dab, sea	521	230	851	171
Fluke	2,464	1,025	40,124	30,153
Scup	4,888	1,274	1,381	366
Striped Bass	93,078	94,692	27,227	26,308
Tautog	<u>3,000</u>	<u>383</u>	<u>7,475</u>	<u>1,336</u>
TOTAL	794,696	\$306,545	168,899	\$ 82,759

(NFMS- Massachusetts Landings- January-December 1979-)



Quahogs, bay and sea scallops, longfin squid and lobsters are shellfish species harvested commercially within the nominated area. These species are an important component of this regionally viable industry. The following table shows the size and dollar value of the 1979 landings for shellfish in the ports of Barnstable and Dukes (Martha's Vineyard) counties:

1979 Landings for Barnstable and Duke's County Ports

	Barnstable County		Dukes County	
	lbs	\$	lbs	\$
<u>Shellfish</u>				
<u>Clams</u>				
hard (meats)	153,747	479,223	56,017	150,545
soft (meats)	30,127	63,472	13,455	33,978
surf (meats)	1,340	1,852	3,681	3,802
Whelk (meats)	20,961	22,589	730	625
<u>Scallops</u>				
bay (meats)	39,957	164,979	219,566	846,196
sea (meats)	78,114	253,290	560	1,949
Squid	<u>183</u>	<u>68</u>	<u>2,166</u>	<u>690</u>
TOTAL	324,429	\$ 985,473	296,175	\$1,037,785

(NMFS-Massachusetts Landings- January to December, 1979)

Channeled Whelk (Busycon canaliculatum) fishery has recently become active in various sections of Nantucket Sound including portions of the nominated area near Horseshoe Shoals. This species is captured in shallow water on sandy bottoms. Surf clam (Spisula solidissima), soft shell clam (Mya arenaria) and oysters (Crassostrea virginica) are shellfish species harvested in the coastal waters of Nantucket Sound.

B. RECREATIONAL FISHERIES

Nantucket Sound contains a productive and diverse recreational fishery attracting fishermen from all over the country. Atlantic cod, bluefish, fluke, long-horn scuplin, sea robin, scup, striped bass, tautog, white perch and winter flounder are species found throughout the area being proposed as a marine sanctuary. The

striped bass, bluefish, flounder, cod and scup are among the most popular species of the sportfishermen in this area. There are over 30 boat launching ramps on Cape Cod and the islands and the Division of Marine Fisheries conservatively estimates that on a good summer day there are at least 200 rod and reel fishing boats utilizing Nantucket Sound. Shore fishermen are present during all seasons, while sports fishermen using boats confine their activities to the months of May through October.

A survey of sports fishermen conducted in 1975 by the Massachusetts Division of Marine Fisheries indicates that out-of-state fishermen make up 15% of the total marine recreational anglers fishing Massachusetts waters. The percentage of out-of-state anglers fishing Nantucket Sound waters was approximately 18%. Nantucket waters 86% and Martha's Vineyard waters 31%. Of the 18% out-of-state fishermen, 17% from New Jersey, 10% from Rhode Island, 7% from Delaware, 2% from Maine and the remaining 15% from other states of the Union. From the results of this survey, the Division estimates that there were approximately 100,000 outings by sportfishermen in the Nantucket Sound area in 1975.

Nantucket and Martha's Vineyard host two nationally known tournaments, the Nantucket Bluefish Tournament in August and the Martha's Vineyard Striper and Bluefish Tournament in September and October.

The charter and partyboat fishery has long been one of the major components of the Massachusetts salt water sportfishery. Operating out of ports on Cape Cod and Martha's Vineyard, 42 charter vessels and 10 head boats traverse the Sound; and concentrate on the many bars and shoal areas that provide prime fishing opportunities.

### C. RECREATIONAL BOATING

Nantucket Sound is a nationally prominent recreational boating area. The high water quality, the protected water body, the numerous harbors and boating facilities and the attractiveness of the shore areas attract boats from many places on the East Coast.

Approximately 11,600 recreational craft are based at over 30 harbors located in Nantucket Sound. These harbors contain 47 marinas, 44 boat yards, 18 yacht clubs,

11 boat rentals, 7 public docks, 30 public launching ramps, 13 mooring areas and 13 jetties or fishing piers. Hyannis and Edgartown host major sailing regattas each summer.

D. GENERAL RECREATIONAL ACTIVITIES

The Nantucket Sound area including the coastal regions of Cape Cod and the islands is a premier regional and national marine recreational resource. The Nantucket Sound area is unique in its distinctive combination of cultural and natural resources. Cape Cod and the islands have to a large degree retained their architectural character with attractive small villages in a relatively unspoiled natural setting. The coastal shores consist largely of sea cliffs, sand dunes, sandy beaches, tidal marshes and shallow estuaries. The waters of Nantucket Sound and the fresh water streams that flow into the Sound are generally of excellent quality.

The Nantucket Sound area is slightly more than two hours away from metropolitan Boston and within one day's drive of one-third of the nation's population. This accessibility, coupled with the aesthetic, natural and recreational attractiveness of the area has resulted in the development of a thriving and expanding tourist industry.

In 1978, there were approximately 13,224,000 visitor days in Barnstable (all of Cape Cod), Dukes (Martha's Vineyard and the Elizabeth Islands) and Nantucket counties. Martha's Vineyard is the largest island in New England. The island's coastal features including clean warm waters, good beaches, salt ponds, attractive ports and sheltered harbors support the many marine dependent recreational activities that form one of the mainstays of the island's economy. Martha's Vineyard has been an active summer resort for over 100 years. The Steamship Authority which provides the primary access to the islands carried in 1979 96,604 automobiles and 545,626 passengers across Nantucket Sound to Martha's Vineyard from ports on Cape Cod.

Nantucket, the outermost county of Massachusetts, is 50 square miles in area and lies 30 miles to sea. The island was the center of the nineteenth century whaling industry. When this industry collapsed, the island entered a long period of economic decline. The island's remoteness and lack of economic growth allowed

Nantucket to retain its traditions and architectural heritage. Over 500,000 tourists each year visit this "living museum" of nineteenth century maritime America. As is the case with Martha's Vineyard, most of the visitors to Nantucket reach the island by crossing the nominated area by boat. An integral part of the attractiveness of these islands to the visitors is the ferry voyage across the waters of Nantucket Sound.

In 1978, Barnstable County exhibited the greatest total expenditures by visitors and the greatest number of visitor days of all the counties of the Commonwealth. A large percentage of these visitor days occurred in the areas facing Nantucket Sound, as a majority of tourist and marine-related recreational facilities on Cape Cod are located along its southern shoreline. Informal surveys by the Cape Cod Chamber of Commerce, the Martha's Vineyard Commission and the Nantucket Economic Development and Planning Commission indicate that between 50 and 60% of the visitors to the area are from out-of-state.

The following tables list the basic tourist statistics for 1978 and a comparison of visitor days and expenditures for 1976, 77 and 78.

COUNTY & STATE TOURIST STATISTICS: 1978

<u>County</u>	<u>Total Visitor Days</u>	<u>Total Expenditure</u>	<u>Employment due to Travelers</u>	<u>Payroll paid by Travelers</u>
Barnstable	11,673,714	\$320,307,000	12,598	\$ 65,127,000
Dukes	888,000	23,588,000	868	4,771,000
Nantucket	<u>662,868</u>	<u>19,118,000</u>	<u>699</u>	<u>3,897,000</u>
Total	13,224,582	\$363,013,000	14,165	\$ 73,795,000
State	<u>42,641,749</u>	<u>1,241,069,000</u>	<u>51,063</u>	<u>263,627,000</u>
% of State	31%	29%	28%	28%

VISITOR DAYS AND TOTAL EXPENDITURES: 1976, 1977, 1978

<u>County</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>	<u>1976</u>	<u>1977</u>	<u>1978</u>
Barnstable	11,316,637	12,225,203	11,073,714	270,753,000	300,941,000	320,307,000
Dukes	717,744	920,132	888,000	16,169,000	21,410,000	23,588,000
Nantucket	<u>596,038</u>	<u>687,407</u>	<u>662,868</u>	<u>14,470,000</u>	<u>17,616,000</u>	<u>19,118,000</u>
TOTAL	12,620,419	13,822,742	12,624,582	301,392,000	322,351,000	363,013,000

The primary activity of tourists in the Nantucket Sound area is marine related recreation. The beach and the water are prime attractions and access to the beach and the quality of the beach and adjoining waters as a critical factor in the decision of people to spend their vacation in this particular area.

There are 52 public beaches (town and state) with a total shore length of 16.5 miles and 13 private beaches with 19 miles of the shoreline facing the waters of Nantucket Sound. The Commonwealth is in the final stages of purchasing an additional beach frontage in the Town of Mashpee.

V. IMPACTS OF PRESENT AND POTENTIAL USES ON NANTUCKET SOUND AND ITS UNIQUE RESOURCES

A. Introduction

The focus and intent of this nomination is to maintain the integrity of Nantucket Sound area for its marine productivity and its unique aesthetic, historic and recreational value. This can best occur if there is a management regime for the central waters that complements the existing ocean sanctuary regime for Massachusetts coastal waters. Potential uses of the nominated area will be discussed in terms of their impact on the ecological, historic, recreational and aesthetic values of the area.

B. Fishing Activity

Commercial and recreational fishing are important uses of the Sound and of increasingly important economic value to the developing Massachusetts marine fishing industry and the local economies of Cape Cod, Martha's Vineyard and Nantucket. Commercial fishing of traditional and non-traditional species in near-shore waters is becoming more and more important as the demand for fish products increase along with the ever escalating costs of steaming time of the fishing fleet to and from George's Bank.

The Massachusetts Division of Marine Fisheries provides the existing management of fisheries in Nantucket Sound and conducts stock assessment studies and other fishery related research in the area. This nomination letter, proposes that the Division of Marine Fisheries (EODEA) and the New England Fisheries Management Council manage the fisheries of the nominated area within the existing fishery management framework. A unified management structure for the commercial fisheries in Nantucket Sound is one of the purposes of this sanctuary nomination and would not adversely impact the fisheries or the other distinctive features of Nantucket Sound.

C. Oil and Gas Development and Transmission

Exploration and development of oil and gas from the sea bed of Nantucket Sound or the transmission of oil and gas through the Sound would pose a serious threat to the ecological, recreational, historic and aesthetic features of the area.

1. Oil and Gas Exploration, and Development

The potential for oil and gas development and production in Nantucket Sound is low. The seismic profiles collected through the USGS/ZDPW cooperative program reveal that the subsurface geology does not support the formation of oil or gas deposits.

2. Oil and Gas Pipelines

The exploration for oil and gas reserves of Georges Bank will be actively under way in 1981. The establishment of pipeline routes from Georges Bank to accessible port facilities on the southern shoreline of Cape Cod, nearby Buzzards Bay and Mt. Hope Bay present strong possibilities for the location of pipelines through Nantucket Sound. However, the geological characteristics of the sea bed of the nominated area creates serious construction problems for potential pipelines. Nantucket Sound contains mobile bottom bedforms which effect the structural stability of pipelines in several ways. First, if the pipeline is not buried to a depth well below the effective reach of the bedform features and into the more stable subbottom, the pipeline could be left suspended high above the Sound floor as the bedforms migrate. Secondly, the great weight that a large, migrating bedform would exert as it passed over a pipeline increases the likelihood of collapsing or shearing the line.

The construction of a pipeline in the nominated area would require a tremendous excavation of material on the seabed on the Sound. This would

have a serious adverse impact on the finfish and shellfish spawning areas, permanently alter feeding habitats of the large waterfowl populations of the Nantucket Sound area and disrupt the habitats of marine mammals and sea turtles in the area.

### 3. Oil and Gas Transportation

The shortest and most direct route from Georges Bank to the mainland is through Nantucket Sound. If the decision was made to transport the oil and gas production from George Bank by barge or tanker, the producers might well seek to route the traffic through Nantucket Sound. The petroleum would be then transferred at facilities in the port areas or possibly via floating transfer docks located in the Sound. This would only increase dramatically the danger of contamination from oil spills, increase collision danger with the many recreational boaters and impair the aesthetic and visual experience that hundreds of thousands of tourists annually obtain from the area. The numerous shoals and mobile bedform characteristics of much of the nominated area makes for hazardous navigation and increases the risk of spillage.

Increase traffic could also have adverse impacts on the resident biota. The increase flow of traffic could disturb a wary grey seal population perhaps to the point of driving it from its Nantucket Sound habitat. Transportation-related facilities and structures would significantly alter the ecosystem of the Sound and perhaps make it undesirable for certain species.

### 4. Impacts of Oil Pollution on the Resources of Nantucket Sound

One of the major threats to the continued wellbeing of the resources of the nominated area as well as Nantucket sound as a whole would be chronic oil seepage from pipeline(s), the rupture of a pipeline or the collision or sinking of an oil barge resulting in major oil spill.



The impact of oil on the marine environment has been thoroughly documented and discussed in detail in numerous journals and reports. It would suffice to limit discussion in this nomination letter to a summary of the specific impact of oil pollution on the resources of Nantucket Sound.

Responses of the marine biota to petroleum pollution range from the immediately lethal to long-term sublethal effects including interference susceptibility to predation. Immediately lethal effects are caused by high levels of exposure to petroleum, particularly petroleum with a high aromatic content. It is acutely toxic in this state to virtually all marine organisms (birds, mammals, fish, plankton, and microbes) primarily through smothering and clogging action. After the petroleum has had time to weather, it has only minor impact on marine macroorganisms, with a few notable exceptions.

The consequences of the current patterns in Nantucket Sound makes the impact of any major spill in the Sound potentially catastrophic as the petroleum hydrocarbons would be quickly dispersed over the entire water body. The impact of an oil spill would be especially severe in the biological sensitive areas of the nomination area and the adjacent shorelines with their economically important beaches, shellfish beds and productive estuarine habitats.

i. Marine and Shore Bird Populations

The various bird populations in the Nantucket Sound area would register an immediate and drastic impact upon exposure to petroleum products. They would be vulnerable to oil fouling and poisoning from ingestion of fish that have been contaminated with petroleum compounds. Fouling of the shoal areas in the Sound would be particularly devastating to the many bird species that use the area as a feeding ground.

ii. Marine Mammals and Reptiles

Nantucket Sound contains the only known habitat in the United States of the North Atlantic grey seal. This species is extremely vulnerable to environmental disruptions because of their highly restricted range and high level of sensitivity to petroleum products. A single major oil spill could cause significant reduction in the small population and force the grey seal to abandon its Nantucket Sound habitat. For example, the grey seal herd normally produces from one to three pups a year. In 1978, following the Argo Merchant spill, none were seen.

Sea turtles are also highly vulnerable to petroleum contamination by ingesting floating objects such as tar balls.

iii. Wetlands

The highly productive and fragile coastal wetlands system on the Cape Cod's south shore and the islands would be particularly vulnerable to an oil spill occurring in the central section of the Sound. The unrestricted openings of the estuaries, the close proximity to the point of any spillage in the Sound and the strong circular tidal action would move slicks and surface contamination directly into the wetlands. Restricted flushing in the confined embayments contain and concentrate oil contaminants and toxic chemicals thus magnifying their impact on the marine organisms that come there to feed, breed and spawn. The wetland peat substrate is highly absorptive. Materials like petroleum are readily retained and slowly released into an estuarine environment up to ten years. These chronic low level releases of petroleum can produce continued contamination of the sensitive estuarine resources. The 2500 acres of salt marshes in these estuaries are important spawning and nursery areas for many species of

finfish found in the nomination area. They also support many local species of birds and provide migratory habitats for the many bird populations using the Atlantic Flyway.

iv. Shellfishing

The main adverse impact of an oil spill on shellfishing is the tainting of meat due to the accumulation of oil residue in the shellfish. This could lead to the closing of the area to shellfish harvesting for a number of years due to oil contamination of the shellfish beds. The closing of shellfish beds could lead to the overutilization of remaining areas thus diminishing breeding stocks.

v. Sport Fisheries

The short term impact of an oil spill on sport fishing would result in the loss of fishing opportunities caused primarily by (1) the physical presence of an oil slick and the dispersion of the fish population, (2) fouling of fishing gear and (3) the incorporation of oil into the sediments which may lead to a reduction and/or contamination of the benthic organisms. If a spill were to impact one of the anadromous fish runs during a run, the fishing for alewives would be interrupted for the duration of the spill. Since most runs are relatively short, a spill would probably preclude any fishing for that year. If a spill were to occur during the time when young fish are migrating to sea, they could suffer high mortality rates.

vi. Recreation

If an oil spill were to impact the recreation beaches in the Sound during or just prior to the tourist season, there could be an adverse impact for the remainder of the season. Even if clean-up efforts were completed immediately, publicity on the spill would detract from the overall reputation of the area.

A 1979 report prepared for the federal Office of Coastal Zone Management applied the economic hedonic pricing model to estimate the cost associated with polluting beaches in the Cape Cod and Martha's Vineyard area of Massachusetts. The basic assumption of this model is that a tourist renting a coastal accomodation is renting a package of characteristics including the accomodation itself,, nearby tourist facilities and the surrounding environment. The "package" for virtually all tourist accomodations on Cape Cod and Martha's Vineyard includes the proximity, the quality and access to beaches. If the quality of a beach is reduced due to pollution, the tourist willingness to pay will be reduced along with a decrease in the area's rental income. This study found that if all the beaches of Buzzard's Bay were polluted to the degree of being unusable for the duration of the tourist season, the loss in rents alone would be about \$1,100,000.

D. Sand and Gravel Mining

Ocean mining of sand and gravel is a major industry in many parts of world and improvements are continuously being made in extraction technology. Because of its proximity to shore, the existence of large deposits of sand and gravel relatively near the surface and sheltered waters for mining operations, Nantucket Sound is a potential site for sand and gravel mining.

1. Large scale removal of sand deposits would change bottom topography, and therefore, the currents and substrate characteristics over time. This would not only impact the immediate area of mining, but could also create an artificial sediment sink which would draw adjacent sediment into the void at an unnaturally high rate. The main impact would be the alteration and disruption of benthic habitats during excavation. Substrate removal is a serious threat to benthic communities, since the species composition of a community is primarily determined by substrate characteristics.

2. Excavation also resuspends an enormous volume of sediment in the water column, increasing turbidity levels and causing silt-related suffocation that could devastate sensitive spawning and nursery areas. Light penetration is reduced, reducing the rate of primary production, diminishing the standing crop or biomass, and thus the amount of food available to primary (and ultimately secondary, etc) consumers. Smaller particles of suspended matter can remain in suspension for long periods of time and over great distances (over 0.5 miles), extending negative impacts beyond the local area.

3. Excavation of large quantities of material from Nantucket Sound would permanently disrupt the feeding grounds for the large bird populations utilizing the many refuges of the Nantucket Sound Area.

4. Excavation could permanently adversely impact sites of historic value in Nantucket Sound. The many shipwrecks located in the proposed sanctuary area could easily be permanently destroyed by sand and gravel mining operations.

5. Negative aesthetic impacts would result from the placement of dredging and mining equipment in Nantucket Sound. A very strong, negative visual impact would be felt in areas of Nantucket Sound from which the equipment was visible. Several studies have documented that individuals participating in recreational activities place a high priority on the visual quality of an area in the selection process to decide where to spend their recreational time.

6. The placement of sand and gravel mining equipment in stationary locations in Nantucket Sound increases the danger of collision in a heavily travelled area which is susceptible to sudden fogs.

E. Ocean Dumping

The disposal of dredge spoil materials has both acute and chronic biological effects. Many benthic and free-swimming organisms are buried or suffocated by dumped spoil. Contaminated dredge spoil disposal would cause significant disruption in the benthic habitats.

The many harbors bordering Nantucket Sound and in other coastal areas of southeastern Massachusetts will require maintenance dredging during this decade. While much of the material to be dredged from Nantucket Sound harbors is clean fill, the dredge spoil from the inner harbors (Falmouth, Hyannis and Nantucket) and the harbors in southeastern Massachusetts such as Fall River and New Bedford contain concentrations of heavy metals.

A 1980 bedform morphology study of Nantucket Sound prepared for the United States Geological Survey indicates that a majority of the bottom of the proposed marine sanctuary area consists of mobile bedforms migrating in response to strong tidal currents. Material disposed of in this environment would be dispersed throughout the Sound quite rapidly even if it had been capped with an overlay of clean sediment. This report, however, did identify two potential areas in Nantucket Sound that may be suitable in terms of hydrographic considerations for ocean disposal of dredge-spoil material. These areas include part of the northern and southeastern sections of the proposed marine sanctuary site. This identification was conditioned with the need for further study of the local bottom water circulation and sediment transport conditions.

F. Sewage Outfall and Sludge Disposal

The location of a sewage outfall within the nominated area is quite remote because of the prohibitions of the Cape and Islands State Ocean Sanctuary and the tremendous cost of laying three miles of outfall pipe.

However, the use of the proposed sanctuary waters as a site for wastewater sludge disposal is entirely feasible. The discharge of wastewater sludge into the Sound would negatively impact the ecosystem by altering the physiochemical balance which now supports the diversity of species in the area. Benthic communities would be smothered with each sludge dumping, filter feeding macroorganisms would be exposed to bacterial and viral contamination and bottom feeding fishes would likewise be contaminated. The creation of sludge blankets and areas of low dissolved oxygen would adversely affect organisms in the dumping area. Sludge disposal would also increase the turbidity in the water column, decrease visibility and light penetration.

G. Underwater Archaeological Excavation

The many shipwrecks that lie within the nominated area are important for their value in interpreting American maritime history. Unregulated excavation and salvaging of these wrecks and their associated artifacts could easily result in the permanent loss of these historically valuable resources. It is necessary that all excavating and salvaging activities be carefully reviewed and regulated through a permitting process that would be pursuant of regulations adopted for the proposed Nantucket Sound Marine Sanctuary.

VI. PROBABLE EFFECTS OF SANCTUARY DESIGNATION AND REGULATION ON CURRENT AND FUTURE USES

A. Fishing Activities

Existing commercial and recreational fisheries management activities within the nominated area are being accomplished by the Massachusetts Division of Marine Fisheries (E0EA). Since the purposes of this marine sanctuary designation are intended to provide for a unified resource management regime for the entire sound, it is the intent of this nomination that the Division of Marine Fisheries (E0EA) and the New England Fishery Management Council manage the fisheries of Nantucket Sound within the existing fish management framework.

B. Other Activities

All activity other than fishing would be regulated by standards adopted in the proposed Nantucket Sound Marine Sanctuary regulations. In order to establish uniform standards for all the waters of Nantucket Sound, this nomination proposes that the scope and substance of the standards for the proposed Nantucket Sound Marine Sanctuary conform with the standards contained in the Massachusetts Sanctuaries Act as applied in the Cape and Islands Ocean Sanctuary.

All proposed activities and consistency determinations would be reviewed in light of the purposes of the sanctuary to protect and enhance the ecological, recreational, historic and aesthetic resources of Nantucket Sound.

1. Oil and Gas Exploration, Development and Transmission

It is proposed that the drilling or removal of gases or oils and the building of any structure on the seabed or under the subsoil including without limitation any structure for the extraction or transportation of resources such as gases or oils, would be prohibited under the marine sanctuary regulations.



2. Sand and Gravel Extraction

Mineral extractions within the marine sanctuary would be severely limited under the proposed regulations. The extraction of any sand or gravel from the seabed for subsoil would be prohibited unless such sand and gravel is to be used for shore protection or beach restoration projects.

3. Ocean Dumping

The dumping or discharge of commercial or industrial wastes, the disposal of debris or contaminated dredge spoil material and the dumping of wastewater treatment sludge would be prohibited within the marine sanctuary. The incineration of solid waste material or refuse on or in vessels moored or afloat would also be prohibited within the boundaries of the sanctuary.

4. Ocean Outfalls

Municipal wastewater treatment discharge outfalls would be prohibited within the marine sanctuary.

5. Underwater Archeological Excavation

It is proposed that all underwater archeological salvaging within the marine sanctuary be subject to careful review and permitting.

## VII. SANCTUARY MANAGEMENT

### A. Introduction

Nantucket Sound serves as a habitat and species area for a wide variety of fish; a habitat area for a number of endangered or threatened mammals and reptiles; a key feeding area for diverse and extensive bird populations; supports a growing commercial and recreational fishery; houses a number of historical shipwrecks and is an integral part of one of the premier marine recreational and boating areas of the East Coast. In addition to the ongoing fishing activities in Nantucket Sound, possible future activities include oil and gas pipelines, expansion of existing transportation uses to include the barging of oil and gas deposits from Georges Bank, installation of floating oil and gas transfer docks, sand and gravel mining, disposal of dredged spoil material, dumping of waste water treatment sludge and archaeological excavation.

All of these current and potential activities impact and will impact the many distinctive ecological, recreational, historic and aesthetic resources of Nantucket Sound. The resources that are found in the Massachusetts coastal waters of Nantucket Sound are adequately protected through the provisions of the Massachusetts Sanctuaries Act, the fish management programs of the Massachusetts Division of the Marine Fisheries and other applicable state environmental laws. Without designation of the federal waters of Nantucket Sound as a marine sanctuary, the core of this important waterbody would not be adequately protected from possible future activities and there would be no cohesive, integrated management system for the area as a whole. Designation of Nantucket Sound as a marine sanctuary under the management of the Massachusetts Executive Office of Environmental Affairs would provide a needed comprehensive management system for the entire Nantucket Sound area.

B. Existing Management of Massachusetts Coastal Waters in Nantucket Sound

The Massachusetts coastal waters come under the purview of the Massachusetts Ocean Sanctuaries Act, the Massachusetts Coastal Zone Management Plan, the Massachusetts Environmental Policy Act, the Massachusetts Wetlands Protection Act, the Massachusetts Coastal Wetlands Restrictions Act, the Massachusetts Clean Water Act, the fish management policies of the Massachusetts Division of Marine Fisheries and the Massachusetts Underwater Archeology Act.

1. The Ocean Sanctuaries Act (Mass. General Laws, chapter 132A, sections 13-16 and 18)

Established sanctuaries along the coastline of Massachusetts to protect these water bodies from any exploitation, development or activity that would seriously alter or otherwise endanger the ecology or the appearance of the ocean, the seabed or subsoil thereof, or the Cape Cod National Seashore.

The Cape and Islands Ocean Sanctuary was established in 1971 and includes all the Massachusetts Coastal waters of Nantucket Sound. Among the activities that are prohibited in the Cape and Islands Ocean Sanctuary are: the building of any structure on the seabed or under the subsoil; the construction or operation of offshore or floating electric generating stations; the removal of any minerals, such as sand or gravel; the drilling for gas or oil; the dumping or discharge of any commercial or industrial wastes; municipal wastewater treatment discharge; commercial advertisement by any means, including, but not limited to structures or vessels or boats of any size and the incineration of solid waste material or refuse on, or in, any vessel or boat of any size within the boundaries of the sanctuary.

The harvesting and propagation of all finfish and shellfish is permitted provided that the Massachusetts Department of Environmental Management and the Massachusetts Division of Marine Fisheries are satisfied that such activities will be carried out in accordance with sound conservation practices.

2. Massachusetts Coastal Zone Management Program

The Massachusetts Coastal Zone Management Program was approved by the Department of Commerce in April, 1978 and focuses on protecting, developing and enhancing the important resources of the Massachusetts coastal zone. The Massachusetts coastal zone extends from the seaward limit of the state's territorial sea and landward to 100 feet inland of the first major road, rail line or 100 feet inland of the 100 year flood plain along tidal rivers or Anadromous/Catadromous fish runs. The Coastal Zone includes all of Cape Cod, Martha's Vineyard and Nantucket. The Massachusetts Coastal Zone Management Office reviews for consistency with the approved plan all proposed federal permits, licenses, funding actions in or affecting the coastal zone to include off-shore oil and gas exploration and development plans and activities.

3. The Massachusetts Environmental Policy Act (Mass. General Laws chapter 30, section 51 and 62)

Establishes an environmental review process for all actions requiring state permits and those to be conducted by state agencies. Activities which are regulated by this Act include the construction of structures in a waterway or any onshore facility with potential impacts on land and water.

4. Massachusetts Wetlands Protection Act (Mass. General Laws chapter 131, section 40)

Authorizes local Conservation Commissions to review and condition any proposal to remove, fill, dredge or otherwise alter any freshwater or coastal wetland, beaches, dunes, flats, marshes, meadows or swamps

bordering on the ocean or on any estuary, creek, river, stream, pond, or lake; any land under these waters; or lands subject to tidal actions, coastal storm flowage or flooding. At the state level, the Department of Environmental Quality Engineering may entertain appeals of locally issued Orders of Conditions and issue and enforce superceding orders.

5. Massachusetts Coastal Wetlands Act (Mass. General Laws, chapter 130, section 105)

Authorizes the Commissioner of Environmental Management to adopt orders restricting or prohibiting dredging, filling, removing or otherwise altering or polluting wetlands. These wetlands include banks, marshes, swamps, meadows, flats or other low lands subject to tidal action or coastal storm flowage and contiguous lands such as coastal beaches, barrier beaches, coastal dunes, banks and rocky intertidal shores.

6. Massachusetts Rules for the Prevention and Control of Oil Pollution in the Waters of the Commonwealth

The Division of Water Pollution Control has been charged by the Commonwealth with the responsibility for preventing and controlling the discharge, spillage, seepage or filtration of oil into the waters of Massachusetts and reviewing and permitting all municipal water supply and water treatment facilities.

7. Marine Fisheries (Mass. General Laws, chapter 130, section 19 et al.)

The Division of Marine Fisheries, with the approval of the state Marine Fisheries Advisory Commission, manages the fisheries in coastal waters to include establishing the manner of taking fish, legal size limits, seasons, numbers and quantities of fish which may be taken and the opening and closing of areas. The Division is also charged with aiding the promotion and development of the commercial fishing industry and conducting fisheries management research in Massachusetts coastal waters.

8. Massachusetts Underwater Archaeology Act (Mass. General Laws, chapter 6, sections 179 and 180)

Establishes a Board of Underwater Archaeological Resources to protect and preserve historical, scientific and archaeological information about underwater archaeological resources located within the inland and coastal waters of the Commonwealth. The Board reviews and issues permits for any removal or salvage of underwater resources that have historical and educational value, oversees salvage and recovery operations and maintains an inventory of underwater archaeological resources. This Act further declares that title to all underwater archaeological resources to be in the Commonwealth of Massachusetts.

C. Existing Management of the Proposed Nantucket Sound Marine Sanctuary Area

The area being proposed as Nantucket Sound Marine Sanctuary comes under the jurisdiction of different federal programs. These programs do not provide the extent of resource protection currently existing for the surrounding Massachusetts coastal waters through the provisions of the Massachusetts Ocean Sanctuaries Act, other Massachusetts environmental laws and the fish management programs of the Division of Marine Fisheries.

Designation of a Nantucket Sound Marine Sanctuary would clearly establish protection, conservation and enhancement of the ecological, recreational, historic and aesthetic features as the primary management objectives of the federal waters of Nantucket Sound. Such a designation would also compliment the surrounding Cape and Islands Ocean Sanctuary and would provide a unified resource management regime for all the waters of Nantucket Sound.

The following is a summary of the federal resource management programs that presently effect the proposed marine sanctuary area.

1. The Ocean Dumping Section of the Marine Protection, Research and Act Citation, regulates the dumping of dredged material, solid waste, sewage sludge, chemicals, rock, sand and other wastes from any vessel originating in the U.S. The U.S. Environmental Protection Agency issues dumping permits only if it can be shown that the waste will not "unreasonably degrade or endanger...the marine environment, (or) ecological systems..." While this law will prevent dumping of certain substances, it neither totally prohibits the dumping or discharge of commercial or industrial wastes, contaminated dredge spoil material, or municipal wastewater treatment sludge, or prevents oil spills from pipeline seepage or rupture. The law controls only that petroleum which is on board a vessel for the express purpose of dumping at sea.

2. The Massachusetts Coastal Zone Management Plan (MCMZP) incorporates the state's Ocean Sanctuaries Act and establishes the provisions of this Act as one of the main regulatory tools to protect the quality of the coastal water bodies. The designation of the central portion of Nantucket Sound as federal waters and its subsequent removal from the jurisdiction of the Cape and Islands Ocean Sanctuary reduces the role of the Massachusetts Coastal Zone Management (Plan in the Commonwealth's efforts) to conserve and enhance the coastal environment of Nantucket Sound. Although the Massachusetts Coastal Zone Management Office would continue to review for consistency with the MCZMP those development activities being proposed in federal waters of the Sound that would affect land and water uses within the coastal zone, its review would be limited in so far as the prohibitions of the Massachusetts Ocean Sanctuaries Act would no longer apply to these waters. However, the proposed designation of the Massachusetts EOEA as the onsite manager of the Nantucket Sound Marine Sanctuary is intended to help ensure that such environmental protection remains applicable to both state and federal waters of the Sound.

3. The Outer Continental Shelf Lands Act would be the primary federal law governing oil and gas development and pipeline construction in the federal waters of Nantucket Sound. Newly enacted amendments to the OCSLA add certain environmental safeguards and provide for the compensation of economic losses due to oil spills. The provisions of the amended Outer Continental Shelf Lands Act, might protect the distinctive resources of Nantucket Sound from some of the hazards of any potential oil and gas transmission activities. However, since the protective provisions in the OCSLA are designed to lessen potential conflicts on a nation-wide basis, they fail to recognize the unique distinctive resources of Nantucket Sound and to provide the special level of safeguards required in this area. Therefore, if oil and gas transmission activities in Nantucket Sound were governed primarily by the OCSLA, the primary emphasis of the managing agency, the Department of the Interior, would be the transshipment of oil and gas reserves to the mainland.

4. The Port and Tanker Safety Act of 1978 authorizes the Department of the Treasury and the Coast Guard to regulate shipping and navigation for several purposes, including protection of the marine environment. The Act imposes specific requirements on oil-carrying vessels, such as minimum standards for tanker design, construction, equipment and manning. It also authorizes, but does not direct, the Secretary to regulate vessel operations in certain areas. While this Act goes a long way towards preventing disastrous oil spills from barge and tanker collisions, it touches only one aspect of the potential danger to the resources of the Sound from oil spillage.

5. Fisheries Management

Fisheries within the nominated marine sanctuary area are not currently regulated under any specific federal or state regulations. The Commonwealth



does license Massachusetts boats fishing in the nominated area and specific research activities that have occurred in this area have been conducted by the Massachusetts Division of Marine Fisheries. Since 1964, the Massachusetts Division of Marine Fisheries has conducted fishery resource assessments for all the waters of Nantucket Sound. These fishery management studies were partially funded in the earlier years with funds made available by the Commercial Fisheries Research and Development Act (P.L.88-309) and recently with grants from the National Marine Fisheries Service. The current surveys are part of a Coastwide Fishery Resource Assessment being conducted by NMFS. During this period, all or most of the fishery management research in Nantucket Sound has been conducted by the Massachusetts Division of Marine Fisheries.

If the previously mentioned settlement agreement is consummated, the Fishery Conservation and Management Act would come into play for the federal waters of the Sound. The Fishery Conservation and Management Act of 1976, 16 U.S.C. (1801, et seq.), as amended (FCMA) extends the authority of the United States over marine fisheries to a "fishery conservation zone" (FCZ) which encompasses an area beginning at the seaward boundard of each of the coastal states and extending to a line 200 nautical miles from the base line (or 197 nautical miles from the states' seaward boundaries). 16 U.S.C. (1811). The FCMA created eight Regional Fishery Management Councils authorized to develop fishery management plans (FMPs) for fisheries within their geographic areas. 16 U.S.C. (1852). FMPs developed and approved by these councils are submitted to the Secretary of Commerce for approval and implementation through federal rulemaking. 16 U.S.C. (1853) (c).

D. PROPOSED MANAGEMENT PLAN

1. Summary

i. NOAA shall have the responsibility for the overall management of the Sanctuary pursuant to the delegation of authority from the Secretary of the U.S. Department of Commerce to the Administrator of NOAA issued on March 19, 1974.

ii. It is proposed that NOAA designate the Executive Office of Environmental Affairs (EOEA) to serve as the on-site manager of the Sanctuary. EOEA will carry out its responsibilities within the framework of the rules and regulations to be promulgated by NOAA which pertain to the Sanctuary.

iii. The U.S. Coast Guard and the Division of Law Enforcement (EOEA) shall have the responsibility for the surveillance and enforcement of the regulations.

iv. An Advisory Board shall be established to assist NOAA and EOEA in the management of the sanctuary.

2. NOAA's Responsibilities

i. NOAA is responsible for the overall management of the marine sanctuary.

ii. NOAA reviews and approves:

a. management plans for the marine sanctuary prepared by Executive Office of Environmental Affairs; and

b. research programs designed by Executive Office of Environmental Affairs

iii NOAA issues final consistency certificates that proposed activities are in conformance with the purposes for which the sanctuary was established.

iv. NOAA oversees environmental monitoring and enforcement of regulations.

v. NOAA provides financial support to Executive Office of Environmental Affairs for it to carry out its managerial functions.

3. EOEA's Responsibilities

i. EOEA is responsible for the day to day management of the sanctuary.  
ii. EOEA prepares management plans & designs research programs,  
iii. EOEA implements the management plans, research and public information programs.

iv. EOEA reviews any applications for permits, licenses or other authorizations as to the proposed activity's consistency with the purposes for which the sanctuary was established and the regulations promulgated for the sanctuary. After completing the evaluation, EOEA submits a recommendation to NOAA as to whether or not NOAA should certify the proposed activity.

v. EOEA, in cooperation with the U.S. Coast Guard is responsible for the enforcement of the sanctuary regulations.

4. Advisory Board

i. An advisory board shall be established to assist NOAA and EOEA in managing the sanctuary.

ii. The advisory board will have the following duties:

a. advise NOAA and EOEA on the setting of priorities for NOAA funding of sanctuary programs;

b. review the management of the sanctuary on an on-going basis and recommend to EOEA and NOAA changes in the sanctuary regulations and/or management procedures; and

c. at the request of EOEA, review and comment on permit and certification applications.

5. Consistency Review

i. Section 302(f) of the Marine Sanctuaries Act states that:

"After a marine sanctuary is designated...no permit, license or other authorization issued pursuant to any other authority shall be valid unless the Secretary of Commerce shall certify that the permitted activity is consistent with the purposes of this title and can be carried out within the regulations promulgated under this section."

ii. All federal and state agencies are required to notify NOAA of any pending application for a permit, license or other authorization to conduct an activity within the boundaries of the sanctuary.

iii. Upon receipt of the notification, NOAA will send a copy of the notification to EOEa. EOEa will evaluate the notification documents and submit a recommendation to NOAA within 30 days of the receipt of the notification.

iv. Either NOAA or EOEa may request additional information as it deems necessary from the permit, license or other authorization applicant.

v. EOEa may elect to seek the advice of the Advisory Board as to whether or not NOAA should certify that the proposed activity on the part of the applicant is in conformance with the purposes for which the sanctuary was established.

6. Permits for Scientific Research

i. Upon receipt of a permit application, NOAA will send a copy of the application to EOEa. EOEa, in conjunction with the Massachusetts Board of Underwater Archeological Resources will review the merits of the application and will submit a recommendation to NOAA within 30 days of receipt of the application.

ii. The permit applicant shall be notified within 60 days from date of receipt by NOAA as to whether or not the permit application has been approved. Either NOAA or EOEAA may request additional information as it deems necessary from the permit applicant consistent with the treaty obligations of the United States.

iii. Upon receipt of the application, EOEAA may elect to seek the advice and recommendations of the Sanctuary Advisory Board.

#### 7. Enforcement

i. Enforcement of the Sanctuary regulations shall be accomplished through a joint cooperative effort between the Massachusetts Division of Law Enforcement and the U.S. Coast Guard. The U.S. Coast Guard, pursuant to 14 U.S.C. Section 89, shall have responsibility for the citation of all violations of the Sanctuary regulations.

ii. The Attorney General of the United States shall, on the written request of NOAA, or EOEAA, or on his own initiative, commence the appropriate action in the United States District Court to restrain violations of the sanctuary regulation and to collect the unpaid penalties assessed for violations of the such regulations.

#### E. RECOMMENDED RESEARCH AREAS

During the course of preparing the Nomination Letter, the following have been identified as some of the areas for future research:

##### 1) Cultural Resources

Nantucket Sound contains a large number of shipwrecks and their associated artifacts. An historic assessment needs to be completed to determine the exact location of the wrecks, their condition and historic value in order to provide a rational foundation for managing these resources.

2) Fisheries Assessment

The Massachusetts Division of Marine Fisheries has been conducting a semi-annual bottom trawl survey in Nantucket Sound since 1978.

The objectives of this fishery resource assessment include:

- i. estimate relative abundance of groundfish and certain shellfish species in terms of weight and numbers.
- ii. determine periodic trends in finfish abundance, population structures and species composition.
- iii. collect information on age and growth, maturity, food habits, mortality and recruitment.
- iv. describe fish distribution in relation to temperature, salinity, and depth.

In order to allow for a more rational conservation and management of the fisheries, the current fisheries assessment efforts should be expanded to provide a more in-depth analysis of species breeding habitats, migration, growth, mortality, recruitment, distribution and abundance. Also, an evaluation needs to be conducted of the potential impacts of the marine sanctuary of the new technological innovations for use in the fishing industry.

3) Marine Birds, Mammals and Reptile Research

The proposed marine sanctuary is an habitat for many species of marine birds marine mammals and reptiles. Several of these species have rare, endangered or threatened status such as the grey seal and the green turtle. To ensure the protection and the enhancement of these species, additional research is needed on their habitats, migration and feeding patterns, breeding and nursery habits, distribution and abundance.

4. Geological Features

The relatively flat seabed and shallow waters of the Sound bounded by Cape Cod and the Islands make this semi-enclosed sea a distinctive area for marine geologic and physical oceanographic research.

Pre-glacial geology, seafloor topography and tidal currents have been studied by various private and public agencies. Additional studies are needed to:

- i. determine the developmental characteristics and migration pattern of the Sound's bedform features. Specifically this should include the determination of sediment source, formative mechanics and movement patterns through the collection of time series data.
- ii. reconstruct the geological history of the Sound in relation to Cape Cod.
- iii. detail map the surficial sediments and tidal currents.
- iv. study the physical, chemical and biological impacts of the disposal of clean dredged material in Nantucket Sound.

5. Recreational Activities

Little research has been conducted on the recreational opportunities and potential for Nantucket Sound as a unified geographic area. Some of the research that could be conducted include:

- i. research and map existing recreational facilities and public access areas enabling visitors to reach the proposed sanctuary.
- ii. develop a recreational guide to Nantucket Sound including a detailed description of the areas unique natural, cultural, historic and recreational resources.

VIII. AVAILABLE DATA ON THE RESOURCES OF NANTUCKET SOUND

A. Woods Hole Oceanographic Institution (WHOI) is a research institution whose physical and political scientists are very knowledgeable of the natural and man-made resources of the Nantucket Sound Area.

B. The Massachusetts Division of Marine Fisheries (EOEA). The Division of Marine Fisheries is responsible for conducting fishery resource surveys in Nantucket Sound and analyzing the collected data. This agency is the best source of information and data on the Sound's fish resources.

C. The National Fisheries Service (Woods Hole). This agency is another source of information and statistics concerning the fishery resources of the Sound.

D. Massachusetts Natural Heritage Program. This agency within EOEA has current information on the rare, endangered and special species of plants and animals in the Nantucket Sound Area.

E. Other Main Sources of Information

1. Cape Cod Museum of Natural History.
2. Cape Cod Planning and Economic Development Commission.
3. Martha's Vineyard Commission.
4. Massachusetts Audubon Society.
5. Monomoy National Wildlife Refuge.
6. Nantucket Planning and Economic Development Commission.
7. Peter Foulger Museum; Nantucket
8. Provincetown Center for Coastal Studies.
9. The United States Geologic Survey.



IX. REFERENCES

- Alexander, Lewis M. "The Impact of Tourism on the Economy of Cape Cod, Massachusetts". Economic Geography Vol. 29, 1953 pp 320-321.
- Andrews, Clinton J., "An Annotated List of the Salt-water Fishes of Nantucket". The Nantucket Maria Mitchell Association, Nantucket, Mass., 1973.
- Cape Cod Chamber of Commerce. "Sportman's Guide to Cape Cod". Hyannis, Ma. 1980.
- Cape Cod Planning and Economic Development Commission. "An Economic Profile of the Cape and Island Fisheries". Barnstable, Ma. 1978.
- Cape Cod Planning and Economic Development Commission. "Draft Environmental Impact Statement and Proposed 208 Water Quality Management Plan for Cape Cod". Barnstable, Mass. 1978.
- Clark, J., Coastal Ecosystem Management, Wiley and Sons. New York City 1977.
- Clayton Gary, Charles Cole and Steven Murawski, "Common Marine Fishes of Coastal Massachusetts", Massachusetts Cooperative Extension Service, C-132. Amherst, Ma. 1978.
- Coddington, J. and K. Fields, Rare and Endangered Vascular Plant Species in Massachusetts, New England Botanical Club. Cambridge, Mass. 1978.
- Counoyer, Norman G. and James K. Kindahl, "Travel and Tourism in Massachusetts, 1978: An Economic Analysis". University of Massachusetts at Amherst, Department of Economics, 1979.
- Counoyer, Norman G. and James K. Kindahl, "Travel and Tourism in Massachusetts 1977: An Economic Analysis". University of Massachusetts at Amherst, Department of Economics, 1978.
- Davis, Jonathan P. and Maltheissen, G.C., "Investigations on the Whelk Fishery and Resource of Southern New England". Marine Research, Inc. Falmouth, Massachusetts, 1978.
- Godin, A.J., Wild Mammals of New England, Johns Hopkins University Press. Baltimore, 1977.
- Lazell, J.D., "New England Waters Critical Habitat for Marine Turtles". Copeia, 1980(2) pp.290-298.
- Lazell, J.D., This Broken Archipelago, Demeter Press. New York, N.Y., 1978.
- Martha's Vineyard Commission. "Draft Environmental Impact Statement on the Proposed 208 Water Quality Management Plan for Martha's Vineyard". Oak Bluffs; Mass., 1977.
- Massachusetts Executive Office of Environmental Affairs, Division of Marine Fisheries, "Anadromous Fish of Massachusetts". Boston, Mass., 1979.

- Massachusetts Executive Office of Environmental Affairs, Department of Environmental Quality Engineering. "Cape Cod Drainage Water Quality and Wastewater Discharge Survey Data 1975 and 1976", Publication No. 143-65-11-77-Cr. Boston, Mass. 1977.
- Massachusetts Executive Office of Environmental Affairs, D.E.Q.E., Division of Water Pollution Control. "Cape Cod - 1976, Water Quality and Wastewater Discharge Data", P.N. 143-65-11-77-CR. Westborough, Ma. 1977.
- Massachusetts Executive Office of Environmental Affairs, Division of Marine Fisheries. "Fishery Resource Assessment, Coastal Massachusetts, January 20, 1978 - January 20, 1979". Boston, Mass. 1979.
- Massachusetts Executive Office of Environmental Affairs, Division of Marine Fisheries. "Fishery Resource Assessment, Coastal Massachusetts, January 20, 1979-January 20, 1980". Boston, Massachusetts 1980.
- Executive Office of Environmental Affairs, Division of Marine Fisheries. "Map of Shelfish Resources of the Massachusetts Coast - 1978". Boston, Mass. 1978.
- Massachusetts Executive Office of Environmental Affairs, Massachusetts Coastal Zone Management. "Massachusetts Coastal Regions and an Atlas of Resources", Massachusetts Coastal Zone Management Plan, Volume 11 of 2. Boston, Mass. 1977.
- Massachusetts Executive Office of Environmental Affairs, Department of Environmental Management. "Massachusetts Forests and Parks", 50-m-7-80-156678. Boston, Mass. 1980.
- Massachusetts Executive Office of Environmental Affairs, Water Resources Commission, Division of Water Pollution Control. "Massachusetts Water Quality Standards". September 21, 1978.
- Massachusetts Executive Office of Environmental Affairs, Division of Marine Fisheries. "Summarization of Massachusetts Marine Sport Fishery Statistics - 1975". Boston, Massachusetts 1977.
- Morton, James Walter, "Ecological Effect of Dredging and Dredge Spoil Disposal: A Literature Review", New York Cooperative Fishery Research Unit, Cornell University. Ithaca, N.Y. 1977.
- Nantucket Planning and Economic Development Commission. "Commercial Fishing... Can Nantucket Bring it Back?". Nantucket, Massachusetts, 1979.
- New England River Basins Commission. "Report of the Southeastern New England Study - Cape Cod and the Islands Planning Area Report". Boston, Mass. 1975.
- Nickerson, N.A., Nantucket Sound Islands - Feasability-Suitability Report, National Park Service/Nantucket Sound Islands Evaluation Task Force, 1972.
- O'Hara, C.J., Bedform Morphology of Nantucket Sound, Massachusetts, Administrative Report, U.S. Department of the Interior U.S.G.S., 1980.
- O'Hara, C.J. and Oldale, "Geology and Shallow Structure, Eastern Rhode Island Sound and Vineyard Sound, Mass.", U.S.G.S., Reston, Va. 5-sheet 1980.

- Oldale, R.N. and O'Hara, C.J., "New radiocarbon dates from the inner Continental Shelf off Southeastern Massachusetts and a local sea-level-rise curve for the past 12,000 years", Geology, v.8, p. 102-106 1980.
- Oldale, R.N., "Thrusted coastal and moraines and a Woodfordian fluctuating ice margin, evidence from Massachusetts onshore and offshore areas", U.S.G.S. Woods Hole, 1979.
- Price, Richard C., "Settlement and Beach Resource Allocation on Cape Cod", A paper presented at the annual meeting of the New England-St. Lawrence Valley Geographical Society, Marine Policy Program, W.H.O.I. Woodshole, Ma. 1980.
- Stackpole, Edouard A., Life Saving Nantucket, Nantucket Life Saving Museum. Nantucket, 1972.
- Svenson, H.K. and R.W. Pyle, The Flora of Cape Cod, Cape Cod Museum of Natural History. Brewster, Massachusetts, 1979.
- Wilman, Elizabeth A. and John V. Krutilla, "Hedonic Process and Beach Recreational Values, A Case Study of Cape Cod and Martha's Vineyard", Final Report to the Resource Use Assessment and Co-Ordination Office, O.C.Z.M, N.O.A.A. U.S. Dept. of Commerce. Prepared by Resources for the Future, Inc. July, 1979.
- The Woods Hole, Martha's Vineyard and Nantucket Steamship Authority, "Annual Reports, 1977, 1978, 1979".
- United States Department of Commerce, National Oceanic and Atmospheric Administration, O.C.Z.M. "Georges Bank Sanctuary Issue Paper". Washington, D.C. July 27, 1979.
- United States Department of Commerce, National Oceanic and Atmospheric Administration, O.C.Z.M. "Massachusetts Coastal Zone Management Program and Final Environmental Impact Statement". Washington, D.C. 1978.
- United States Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service. "Massachusetts Landings, January - December 1979". Washington, D.C.
- United States Department of the Interior, Fish and Wildlife Service. Coastal Waterbird Colonies: Maine to Virginia, 1977, FWS/IBS-79/08. Washington, D.C., 1979.
- United States Department of the Interior, Bureau of Land Management. "Final Environmental Statement for OCS Sale no. 42", Vol. 1, Washington, D.C.
- Vineyard Open Land Foundation. "Looking at the Vineyard". West Tisbury, Mass., 1973.

Finfish and selected shellfish species captured in Massachusetts Division of Marine Fisheries bottom trawl surveys, Nantucket Sound, 1974-1980.

Alewife	Ocean pout
Alligatorfish	Ocean quahog
American lobster	Orange filefish
Atlantic cod	Oyster toadfish
Atlantic herring	Planehead filefish
Atlantic mackerel	Pollock
Atlantic menhaden	Quahog
Atlantic silversides	Rainbow smelt
Bay scallop	Red goatfish
Black sea bass	Red hake
Blueback herring	Rock crab
Bluefish	Rock gunnel
Bluespotted cornetfish	Round scad
Blue runner	Sand lance
Butterfish	Scup
Calico crab	Sea raven
Channel whelk	Seasnail
Crevalle jack	Short bigeye
Cunner	Shortfin squid
Flying gurnard	Silver hake
Fourbeard rockling	Smooth dogfish
Fourspot flounder	Snake blenny
Gray triggerfish	Snakefish
Goosefish	Spider crab
Grubby	Spiny dogfish
Gulf Stream flounder	Striped anchovy
Horseshoe crab	Striped searobin
Inshore lizardfish	Striped seasnail
Knobbed whelk	Summer flounder
Little skate	Surf clam
Longfin squid	Tautog
Longhorn sculpin	Thorny skate
Lumpfish	Trumpetfish
Mackerel scad	Weakfish
Moonsnail	White hake
Mussel unclass.	Windowpane
Northern kingfish	Winter flounder
Northern pipefish	Winter skate
Northern puffer	Yellowtail
Northern searobin	