

## 7. Environmental Quality

The enabling legislation for Fire Island National Seashore obligated the National Park Service to conserve and preserve "certain relatively unspoiled and undeveloped beaches, dunes, and other natural features. . . which possess high values to the Nation as examples of unspoiled areas of great natural beauty." Implicit in this directive is the maintenance and enhancement of environmental quality, which has always been a major management objective of all units of the National Park System.

### a. Water Quality

#### (1) Great South Bay/Moriches Bay

Great South Bay and Moriches Bay are part of an interconnected series of shallow estuaries that lie between the barrier beach and Long Island from Southampton on the east to Atlantique Beach on the west, a distance of about 75 miles. Water quality in these estuaries is strongly influenced by land-use patterns and development on Long Island and, to a lesser degree, on the barrier islands.

The estuaries are shallow throughout the study area; mean low-water depths range from about 7 feet near the Robert Moses Causeway to about 4 feet in Moriches Bay. Navigation channels have been dredged to facilitate east-west boat traffic along the intracoastal waterway and for access between Long Island and the barrier islands. Most such channels average 6 to 10 feet deep, but some reach 28 feet in places. The bays are used primarily for navigation, recreation, and commercial shellfishing, all of which are essential to the regional economy.

The water in the bays is derived primarily from groundwater seepage from Long Island and tidal inflow through the inlets; surface flow from Long Island streams is relatively insignificant. Tidal influx is largely restricted to the inlets, where the average tidal range is about 4 feet (data for Fire Island Inlet). Near the center of the bay, tidal range is only about 1 foot, decreasing to about 8 inches along the Long Island shore. Tidal currents during flood tides generally flow eastward from Fire Island Inlet and westward from Moriches Inlet, reversing direction on the ebb. Areas of Fire Island nearest the inlet therefore receive relatively efficient flushing of pollutants due to tidal action. In general, however, directional water movement in the bays is slow, and the flushing time is long (a 1972 Corps of Engineers estimate is 48 days for the Great South Bay System). Because of the slow flushing rate, accumulation of

pollutants is a potentially more serious problem in this system than in many other estuaries.

Throughout most of the bay, circulation is strongly influenced by wind. In Moriches Bay, the wind is capable of preventing the normal reversal of tidal currents between ebb and flood tides. Circulation patterns, and therefore the dispersion of pollution from known sources, are difficult to predict because of the great variability in wind-induced water movement.

During the last 20 years, there have been many studies of the chemical and biological characteristics of the south-shore estuary system (Lackey et al. 1950; Guillard et al. 1960; Redfield 1951, 1952; Ryther et al. 1956, 1957, 1958). The following general information forms a useful overview of water quality.

(a) Temperature

Mean temperatures of bay waters range from about 37 degrees Fahrenheit in February to 77 degrees in July, and there is no significant temperature difference between the bottom and the surface of the bay. Freezing of large areas of surface waters during midwinter occurs infrequently. Waters along the Long Island shore average about 2 degrees warmer than elsewhere in the region. (See figure 14 for a map of the region.)

(b) Dissolved Oxygen

Bay waters are normally at or about 100 percent oxygen saturation, indicating good water quality. The high dissolved oxygen levels are probably due to good mixing by winds in these shallow estuaries.

(c) Salinity

Salinity averages about 26 parts per thousand (ppt), ranging from around 22 ppt near the mouths of certain Long Island streams to about 29 ppt near the inlets. By comparison, open seawater averages 35 to 36 ppt. Before Moriches Inlet opened, salinity in this area averaged 10 to 12 ppt. After the inlet opened naturally in 1931, salinity in Moriches Bay increased to 23 ppt, and circulation patterns in the bay developed rapidly.

(d) Turbidity

Bay waters typically are relatively clear, and sunlight penetrates the entire depth of the water column. Temporary increases in turbidity periodically result from disruption of bottom sediments due

to dredging, gouging by propellers of motorized boats, commercial clamming operations, and other cultural sources of direct disturbance, as well as from locally excessive growth of plankton, discharge of turbid wastewater, and increased runoff and disturbance of the bay bottom during storms.

(e) pH

The bay water tends to be slightly alkaline, ranging from pH 7.8 to 8.6. The high pH is due in part to photosynthetic production of carbon dioxide by aquatic plants and algae in this well-illuminated system. As carbon dioxide tends to form alkaline carbonates in solution, a high level of photosynthesis therefore may substantially raise the pH of an estuary. High pH levels are not abnormal for warm, shallow estuaries like Great South Bay.

(f) Nitrogen and Phosphorus

The annual mean total phosphorus level, which includes organic, particulate, and dissolved inorganic components, has been estimated at about 66 to 68 parts per billion (ppb), with an October high of 115 ppb. The total phosphorus level is considered high for an estuary and suggests substantial phosphorus pollution, which may be controllable through reduction of phosphorus input from known sources on Long Island.

Nitrogen in the form of nitrate followed a similar pattern to phosphorus, with concentrations in the rivers averaging three times that of the bay. The highest levels in the bay were recorded near the mouths of heavily developed streams, the lowest values near the inlets and along most of the north shore of Fire Island. The only elevated nitrate level near Fire Island was recorded near the outfall from the primary sewage-treatment plant at Ocean Beach. This plant is being upgraded to provide secondary treatment, but even after the improvement, substantial nitrogen enrichment will probably still occur in this area. Levels of nitrite and ammonia were also highest on the north shore and lowest near Fire Island. In summary, nutrient enrichment appears to be largely related to land use on Long Island, is most pronounced on the north shore, is least significant near Fire Island Inlet where tidal flushing is greatest, and is generally a less serious environmental problem near Fire Island than elsewhere in the bay.

#### (g) Pesticides

Pesticide pollution poses a serious threat to the estuarine environment. Low concentrations of DDT and its metabolites are present in shellfish. The Sandy Hook Marine Laboratory noted that DDT, parathion, and detergents in very small quantities immediately affect larval eels and juveniles of many fish species (Ernst 1963).

DDT contamination of the tidal marshes has been severe in recent years. Many species of marine animals, which spend all or part of their lives in the tidal marshes, reportedly have been drastically reduced in numbers. The economic loss has been large, but the damaging effect upon the food chain of the entire ecosystem might be even more substantial. However, it is difficult to determine with certainty whether pesticide contamination has contributed significantly to the reported population declines, as these species are known to undergo large, possibly natural, fluctuations in population size.

The Suffolk County Vector Control Board (formerly the Mosquito Control Commission) has stopped the use of DDT and its derivatives already present in the bay, therefore a gradual reduction in the level of these pesticide residues is likely to occur through natural processes.

#### (h) Bacteria

High concentrations of coliform bacteria indicate serious pollution from domestic sewage or animal wastes. Coliform bacteria and certain pathogenic bacteria with similar habitat requirements can accumulate in the mantle cavity of bivalve mollusks (clams, oysters), making them unsafe for human consumption. Large portions of Great South Bay and Moriches Bay have been closed from time to time by New York State because of elevated coliform levels. The off-limits acreage has been increasing in recent years, which may be due either to increased pollution or simply to increased surveillance by the state. At present, much of northeastern Moriches Bay is closed to shellfishing. Within the national seashore, a small area near the Ocean Beach sewage-treatment plant outfall, the waters adjacent to marinas at Watch Hill, Davis Park, Barret Beach, Fire Island Pines, Cherry Grove, and Sunken Forest have been closed because unacceptable coliform levels have been found.

As of 1970, only 7 percent of Suffolk County was served by sewers. The remaining acreage depended primarily on the traditional septic-tank/leach-field method of primary sewage treatment for

individual residences. Malfunction of these individual systems may be contributing to significant pollution of Long Island's rivers and the estuaries into which they flow. Most of the pollution probably results in increased nutrient levels rather than bacterial contaminants. Effluents from duck farms were a major source of elevated coliform levels in the 1960s, but recent governmental controls and subsequent implementation of pollution-control measures have reduced pollution from this source substantially. In addition, the number of duck farms has also declined.

Even though sewage treatment in Fire Island's communities is almost exclusively by septic tank/leach field (except in Ocean Beach), there is no evidence to suggest that seepage of contaminated groundwater has resulted in elevated coliform levels in the bay. However, recent bacteriological surveys of shellfish-growing areas during periods of maximal recreational activity indicate several locations that may be sources of pollution during such periods. High coliform levels have been recorded near Sunken Forest and Fire Island Pines during the peak visitor season, as well as near Point O'Woods, Cherry Grove, Barrett Beach, and Water Island. High concentrations of small pleasure craft have been suggested as a possible source of this pollution, but the evidence is inconclusive.

The New York Department of Environmental Conservation has recommended that shellfishing restrictions be implemented near the boat basins at Watch Hill and Davis Park/Leja Beach, and testing is underway to determine whether closure of shellfish beds in these areas is necessary. As a general rule, shellfish beds in areas of intensive recreational boating should be monitored frequently to ensure that the public health is not jeopardized.

Coliform levels on Fire Island's bayside beaches are well below the maximum for swimming beaches, and there are no data to suggest that swimming in the bay should be restricted. However, coliform levels in much of the bay have been rising in recent years, and frequent testing will be needed to detect unusual increases in the Fire Island area that might cause swimming restrictions to be imposed.

(i) Plankton

The shallow nutrient-rich waters of the bay support a high level of plankton productivity, which may be greater than in any other estuary in the northeastern United States. In general, plankton blooms occur in midsummer and again in the fall or early winter. Although the long-term effects of algal blooms are not known, the adverse effects of past algal blooms suggest

that any further rate increases in the addition of nutrients--particularly phosphorus--may be harmful to the ecosystem.

#### (j) Rooted Aquatic Vegetation

Eelgrass (Zostera marina) is the predominant rooted aquatic plant of the bay. It typically grows in 7 to 8 feet of water and has leaf blades up to 6 feet long. Adapted to a wide variety of salinities and substrates, it is a major component of the ecosystem, providing valuable food, shelter, and nursery grounds for estuarine biota.

Eelgrass is subject to periodic population declines, during which it may virtually disappear from the ecosystem. Although declines may be linked to a recurring fungus blight, the precise cause is unknown. Eelgrass has become a major problem in the Fire Island region, choking propellers, clogging fishing and shellfishing gear, and littering bayside beaches. The smell of rotting eelgrass is noticeable in many places on Fire Island. Gases from rotting submerged eelgrass in docking areas cause severe discoloration of painted hulls and other surfaces, and the decomposition process itself may result in local oxygen depletion leading to fish kills.

#### (2) Atlantic Ocean

Water quality in the ocean adjacent to Fire Island is generally good. Salinity ranges from about 24 parts per thousand (ppt) to 33 ppt, or slightly less than the 35 to 36 ppt found in the open sea. The reduction is probably due to dilution by fresh water from the mainland and limited seepage of groundwater from the barrier island. Surface water temperatures range from about 37 degrees during late winter to 70 degrees in late summer, averaging 52 degrees. Comfortable temperatures for swimming occur from late June through October, although the water temperature may drop to the high 50s or 60s anytime during the summer. Dissolved oxygen level, turbidity, pH, nutrient levels, and coliform levels are all within normal limits.

Nearshore ocean waters in this area typically undergo major spring and autumn blooms of phytoplankton and minor midsummer blooms. Each bloom has its own assemblage of species. Productivity tends to increase nearshore, possibly due to the input of nutrients from the estuaries.

b. Air Quality

Air quality is variable depending on turbulence, wind direction, and thermal stratification of the atmosphere. Prevailing westerly winds often carry pollutants over Long Island from the heavily industrialized areas of New Jersey and metropolitan New York. The far western horizon is usually shrouded in smog. The nearest air quality monitoring stations to central Fire Island are at Islip, about 8 miles away. In general, the levels of most monitored pollutants are in the intermediate range--much lower than downtown New York City but still substantially higher than rural upstate New York. Activities on Fire Island itself generate almost no on-site air pollution.

c. Noise

Natural sources of noise, such as wind, wave, and wildlife, provide the background for Fire Island visitors' experiences. Most of the sounds of the barrier island are manifestations of the dynamic forces that continually mold and remold its profile. To most people, such noises--regardless of how loud--are acceptable and even desirable components of the total environment. However, the introduction of the noises of man's technological society into this natural acoustical system is obtrusive to many, if not most, visitors to the national seashore. These are the very sounds that many hope to leave behind during their seashore visit.

Almost all major unnatural noise is generated by motorized vehicles. Ferries are among the noisiest, and it is a rare visitor who can conduct a conversation on the deck of the ferry amid the din of wind, wave, and engine. Speedboats in the bay and large craft in the marinas produce considerable noise, most of which cannot be controlled if the seashore is to continue to provide for pleasure boating, water-skiing, sport fishing, and related boat-oriented activities.

Four-wheel-drive beach buggies, operated under special-use permits from the National Park Service and the towns of Islip and Brookhaven, are restricted largely to the beach, where the noise and the sight of these vehicles irritates many seashore visitors. These vehicles are disruptive to wildlife and, along with pedestrians, are responsible for almost total elimination of beachfront nesting water birds on Fire Island. The town of Islip severely restricted use of overland vehicles beginning summer 1973, and the National Park Service has been reducing the number of permits issued each year. Eventually, the noise generated by these vehicles should be reduced to negligible levels.

Aircraft of all types are increasingly more significant sources of noise. Helicopters and seaplanes are used frequently for access to private lands (although they are not permitted for access to federal lands, except for official purposes). Both types of aircraft generate substantial noise on landing and especially on takeoff, and use of seaplanes is also a safety hazard to boaters in certain parts of the bay. Aircraft that occasionally pass over the beach in the summer at dangerously low altitudes constitute a particular safety hazard. Cooperative agreements between the National Park Service and other interests may soon be necessary to define landing, takeoff, and overflight zones, thereby reducing noise levels, particularly near important natural areas and visitor-use zones. Commercial aircraft fly over Fire Island frequently, but noise levels generally are not great enough to disturb most visitors.

d. Solid Waste

Solid wastes from most of Fire Island's federal and community developments are transported by truck, or barge and truck, to mainland sanitary landfills. The towns of Brookhaven and Islip provide solid-waste collection and disposal service by agreements with most exempted communities. Both New York State and Suffolk County truck solid wastes from their park facilities to landfills on Long Island. The National Park Service has a waste-disposal contract with private contractors to transport wastes by barge and truck to municipal sanitary landfills in Islip and Brookhaven.

Open dumps still occur at scattered locations on Fire Island, the largest in Point O'Woods. Trash occurs on small unimproved tracts within or adjacent to exempted communities where residents illegally use them as dumps. The dumping areas are almost always located on high ground behind the primary dunes. In addition to their unsightly appearance, materials leached from trash accumulations may pollute near-surface groundwater and therefore present an obvious health hazard. Decomposition of most solid wastes on the dry sand surface is slow, and much of the material remains visible at the surface until it becomes buried under natural accumulations of sand or is washed into the bay by overwash or bayside flooding.

A portion of old surface trash deposits has been removed from federally owned lands east of Point O'Woods, but tracts 2, 3, and 4 in the western community zone are still used occasionally as dumping grounds by community residents and have never been cleaned up. Dumps on private lands will continue to be used occasionally until they are cleaned up and further dumping is strictly prohibited.

Makeshift dune-stabilization programs in some of the communities have involved the dumping of old Christmas trees, appliances, and other materials on the ocean-facing dunes. Such practices establish specialized dumps in the most often seen part of the seashore's landscape, and they contribute substantially to the already excessive load of trash in the ocean when storm tides wash away the would-be stabilizers.

e. Visual Quality

The objective evaluation of visual quality is impeded by extreme differences in individual viewpoints on what constitutes a visually attractive or unattractive environment. The new visitor complex at Watch Hill, with its multicolored panels and modernistic design, is viewed by some as an architectural nightmare and by others as a fine example of environmentally compatible design. Controversial visual scenes such as this therefore will not be a part of the following discussion, which will deal largely with visual intrusions that are obviously incompatible with the maintenance of the natural beauty of Fire Island.

Landscape scars constitute a major source of visual degradation. Some, such as eroded dunes and blowouts, may be of natural origin. Others, such as zones of graded fill and cleared vegetation, may be due to man's activities. Still others may be caused by both natural and cultural agents, an example being the eroded dunes that have been damaged by both vehicles and natural forces. In all cases, the aesthetic integrity of the natural environment has been interrupted. Landscape scars are particularly evident at Watch Hill (leach-field area), Bellport Beach (graded fill), near Forge Point (graded fill), and on the beaches and behind the dunes wherever vehicular travel is frequent.

Visually incompatible development constitutes another impairment to the visual environment. Structures that interrupt the expanse of undeveloped beach, such as groins and jetties, fall into this category. Sand fences, particularly if damaged or erected haphazardly, as well as other artificial dune-stabilizing devices, degrade the naturalness of the dune zone, as do homes and other development on the dunes themselves. The extent of degradation depends on the visual characteristics of the surrounding environment. A new home on the dunes in an area where the rest of the dune line is undeveloped constitutes a more significant aesthetic intrusion than an additional home on a dune line that is already 80 percent developed. Visually incompatible development includes the groins and water tower at Ocean Beach, the "dune project" zone in many

communities, and the remaining residences in the high dune management unit.

Structures that are visible above a high ocean-facing dune line are visually incongruent, as are poorly maintained structures wherever they occur. Within the communities, great differences in architectural style or the condition of residences may result in visual incompatibility or degradation locally.

Dumps and trash deposits behind the dunes and on the beach are significant sources of visual degradation. Most of the material in the interdunal area has been intentionally discarded by community residents, but a substantial amount of trash, often originating as far away as New England, is washed up on the beach.

The trash that litters the bay-bottom and bayside beaches is more likely to originate within the Long Island region. In view of the large volume of cultural debris already in the estuaries and ocean, trash removal is certain to be a major management problem for an indefinite time.

#### D. Cultural Resources

##### 1. Brief History of Fire Island Area

European contact with the lands now comprising Fire Island National Seashore may have begun as early as 1524, when Giovanni de Verrazano may have passed along the coast after leaving New York Harbor. Dutch and British settlement of Long Island occurred during the 18th century, and the eastern part of the Fire Island barrier beach was purchased from the local Algonquin Indians by Colonel William Smith in May 1691. This section subsequently became part of the Manor of St. George. An inlet in the general vicinity of the present Fire Island Inlet was created by a storm in 1688 and subsequently widened in 1690 and 1691, but the name Fire Island Inlet was not recorded until 1781.

There are conflicting views as to the origin of the name Fire Island. According to one hypothesis, the name is a corruption of the Five Islands patented by William Nicholls in 1688 in what is now the western end of Fire Island. Under another hypothesis, the name originates from the fires reportedly set by pirates to lure vessels to shore. Regardless of whether either hypothesis is true, the name Fire Island has long been applied to the western part of Fire Island, as now roughly defined by the communities governed by the town of Islip. The more easterly part of the barrier island was known as