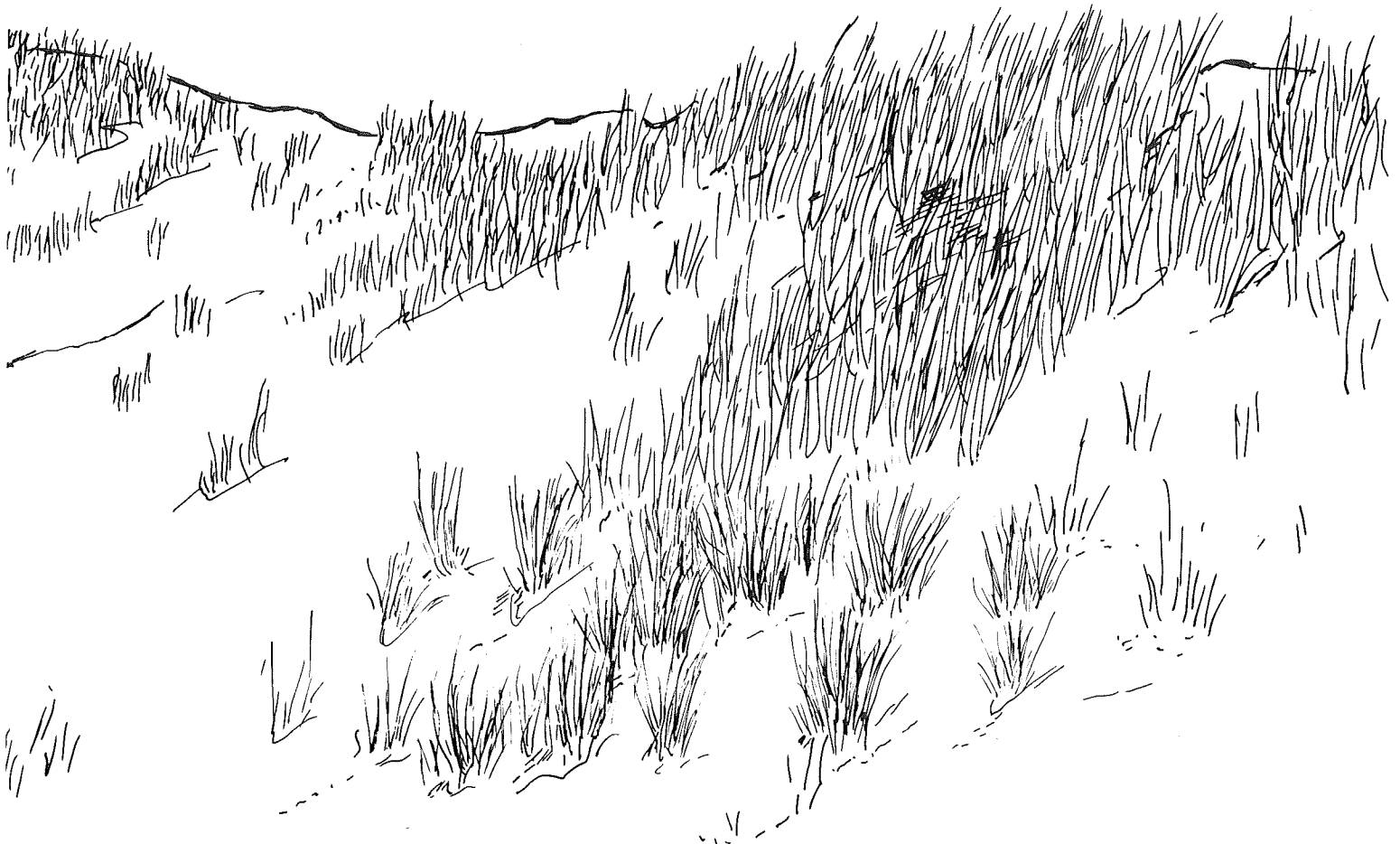




Natural Area Management Plan

Island Beach Northern Natural Area



DIETRICH '82



TOM HAINSTON
Bsk

State of New Jersey
DEPARTMENT OF ENVIRONMENTAL PROTECTION

DIVISION OF PARKS AND FORESTRY
OFFICE OF THE DIRECTOR

PLEASE ADDRESS REPLY TO:
CN 404
TRENTON, N.J. 08625

DIVISION ORDER NO. 27

In accordance with N.J.A.C. 7:2-11.5(a), I hereby adopt as amendments to the Island Beach Northern Natural Area Management Plan the attached recommendations of the Natural Areas Council.

These amendments shall supplement the current management practices mandated by the Plan and become effective immediately.

October 11 1985

Date

Gregory A. Marshall
Gregory A. Marshall
Director

AMENDMENTS TO ISLAND BEACH NORTHERN
NATURAL AREA MANAGEMENT PLAN

At a meeting on August 15, 1985 the Natural Areas Council considered proposed changes to the adopted management plan for Island Beach Northern Natural Area. A presentation by the park superintendent and a discussion of alternatives led to recommended changes in the adopted plan.

There presently exists a bicycle path extending from the bathing area north to a point 100 to 500 feet south of the toll booths. Mr. Riker, the Park Superintendent, has requested that the four foot wide path be extended to the Park boundary at 24th Street. Safety problems due to congestion and the narrow width of the road at the toll booths require this extension. Mr. Riker has indicated that placement of the bike path as a dual lane to the east of the present road, as suggested by the Council in August 1984, would create safety problems outside of the park. All bicyclists would have to cross traffic to get to an eastern lane and then would be in violation of traffic laws by travelling against traffic flow inside the park. The area of the proposed path consists mainly of introduced vegetation when the utility lines were installed.

On a motion by Ms. Porter, seconded by Mr. Krauth, the Council approved an amendment to the Management Plan to allow the extension of the existing bike path to the park boundary and permit either gravel or paving, to be decided by the Park Service.

Mr. Riker has proposed revision to the plan which would allow vehicles in the natural area from Gillikins Rd., south to the bathing beach all year. The current plan prohibits vehicles on the beach three months out of the year, from Memorial Day to Labor Day. Mr. Riker has stated that there have been no administrative problems with vehicles on the beach over the last year. Mr. Hampton has indicated that the prohibition on vehicles was in the plan because the previous superintendent requested it for administrative control, but there are no apparent environmental reasons for the exclusion.

On a motion by Mr. Gilmore, seconded by Mr. Hampton, the Council approved an amendment to the plan which allows vehicle use all year in the natural area. The use of the beach by vehicles will be subject to any administrative controls the Park Superintendent deems necessary for orderly control of the use and protection of the natural area.

The Council has reviewed the current practice of vehicle parking by permit at Two-Bit Rd. and F-1 parking area. Mr. Riker has stated that very few permits have been issued for parking and that the system is unnecessary paperwork.

On a motion by Mr. Hampton, seconded by Ms. Porter, the Council approved an amendment to the plan which makes the issuance of permits for these areas subject to the discretion of the Park Superintendent.

ENVIRONMENTAL PROTECTION AND ENERGY

DIVISION OF PARKS AND FORESTRY

Natural Areas System

Management Plan, Island Beach Northern Natural Area

Authority: N.J.S.A. 13:1B-15.4 et seq.; 13:1B-15.12a et seq.; and N.J.A.C. 7:5A.

TAKE NOTICE that in accordance with N.J.A.C. 7:5A-1.8 and the recommendation of the Natural Areas Council (Council), Scott A. Weiner, Commissioner, Department of Environmental Protection and Energy, has adopted amendments to the management plan for Island Beach Northern Natural Area.

The Island Beach Northern Natural Area, located within Berkeley Township, Ocean County, is a State-owned parcel administered by the Department's Division of Parks and Forestry through Island Beach State Park (hereinafter referred to as the administering agency). In May of 1984, the Department adopted a management plan for Island Beach Northern Natural Area. The primary purposes of a natural area management plan are to describe the natural features of the area and prescribe specific long and short term management techniques and public uses to ensure preservation of the area in accordance with its designation objective (see N.J.A.C. 7:5A-1.8). The amendments to this management plan concern removal of several management duties no longer relevant to management of the area and several revisions and additions to the plan to ensure preservation of the natural area. At a meeting held on October 30, 1991, the Natural Areas Council recommended that these amendments be submitted to the Commissioner of Environmental Protection and Energy for his approval.

The management plan for Island Beach Northern Natural Area is hereby amended to remove the following management duties:

1. There will no longer be a requirement that signs be placed at the beginning of the nature trail to direct visitors to register prior to trail use.

This requirement is waived because it has been determined by the Superintendent of Island Beach State Park that the limited public use of the nature trail does not justify such registration, which was originally intended to control impacts of public use on the primary and secondary dune system.

2. There will no longer be a requirement that if an increase in use levels of the nature trail results in a similar increase in the impacts of straying, the Office of Natural Lands Management (ONLM), in coordination with Park Service staff may decrease the volume through the register system.

This requirement is waived because of the removal of the above registration system. Should the volume of public use increase precipitously in the future, the Park Superintendent will take actions to limit public use.

3. There will no longer be a requirement that the Fence Maintenance Road dune crossing will be realigned using snow fencing, and stabilized within two years.

This requirement is waived because according to the Park Superintendent Fence Maintenance Road is no longer in use.

4. There will no longer be a requirement that State Park Service staff, in cooperation with ONLM, will collect data on dune and beach profiles in the Natural Area. Specific requirements deleted from the management plan include the collection of data, using the modified Emery method, on a biweekly basis for one year, and more frequently to bracket storms or to follow the beach rebuilding process. This study was scheduled to begin within 6 months of adoption of the management plan. ONLM was to receive copies of data collection sheets on a monthly basis.

This requirement is waived because information obtained subsequent to management plan adoption indicates that the Emery method is not effective in accurately measuring beach profiles. As a result of this, and the fact that the beach is highly dynamic with elevation changes occurring daily, staff of ONLM believes that these measurements would not provide useful information. Further, in the eight years since adoption of the Island Beach Northern Natural Area Management Plan the lack of adequate staff by the State Park Service and the ONLM has prevented the collection of any of the above data on dune and beach profiles. According to the Park Superintendent and staff of ONLM, it is not anticipated that staff will become available to perform such detailed field studies.

5. There will no longer be a requirement that ONLM evaluate the reports supplied by the Park staff and conduct an annual inspection of the beach and primary dune system, as well as the motor vehicle access points and walk-on trails for fishermen. Photos shall not be taken of the same sites (beach, primary dune system, motor vehicle access points and walk-on trails for fishermen) each year and staked reference points shall not be examined for both vertical and horizontal change in the location of the toe of the primary dune.

This requirement is waived because of the highly dynamic nature of the beach system, and because staff of ONLM believes that these subjective observations would not provide useful information.

6. There will no longer be a requirement that ONLM shall prepare an evaluation, including recommendations, based on the reports and inspections for continued or revised use of the beach and access points. Additional related requirements deleted from the management plan include the following: The evaluation shall be reviewed by the Director of the Division of Parks and Forestry and State Park Service staff. Thereafter the New Jersey Beach Buggy Association, and other groups expressing an interest in beach use, will be consulted for their views regarding the recommendations for the future. A final evaluation will then be presented to the Natural Areas Council for consideration and recommendation to the Department.

This requirement is waived because of the removal of the above reporting and inspection requirements. Revised rules, since preparation of the plan, allow the Superintendent to restrict public use of the beach (see N.J.A.C. 7:5A-1.9). The Park Superintendent currently coordinates his plans and actions with numerous public interest groups that use the beach in the natural area, and will continue this dialogue in the future.

The management plan for Island Beach Northern Natural Area is hereby amended to add the following management duties:

1. The administering agency shall post Two-Bit Road and parking area F1 "for fishing purposes and walking on wet sand only".

This allowance is added because the Park Superintendent feels that a need exists for the non-fishing public to be allowed to at least walk on these two sections of the natural area as long as they are restricted to areas of wet sand. The reason for the wet sand restriction is that these areas are tidally affected and are not subject to the negative impacts of foot traffic which characteristically occur on the dry sand of the primary and secondary dunes.

2. The administering agency shall add the following two questions to the existing Beach Buggy Permit Application - "Do you use the Island Beach Northern Natural Area?" and "if so, approximately how many times a year?".

This amendment is made because adding two questions to the current application will provide the needed information about public use of the natural area without necessitating the creation and distribution of a new survey, thereby reducing paperwork.

3. The administering agency, in cooperation with the Division of Fish, Game and Wildlife, shall initiate a program aimed at trapping and removal of feral cats within the Northern Natural Area, in hope that removal of this predator will make the dune system more suitable for use by endangered beach nesting birds.

This new requirement is being added to the management plan because cats, abandoned in the natural area or originating from residences in adjacent Seaside Park, are believed to be establishing wild breeding populations in the natural area, and because these feral cats are believed to be having a detrimental effect on endangered beach nesting bird species, including the least tern, black skimmer and piping plover, that attempt to establish nest sites within the Northern Natural Area. This view is supported by the Park Superintendent and by a draft report entitled *New Jersey Endangered Beachnesting Birds Management Plan* prepared by the Division of Fish, Game and Wildlife, Endangered and Nongame Species Program, and dated December, 1990.

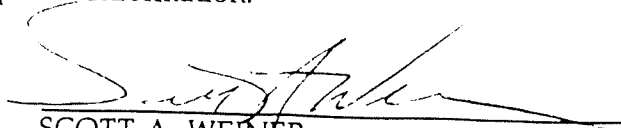
Copies of the adopted plan and amendments may be obtained from:

Office of Administrative Law
Quakerbridge Plaza, Building 9
CN 049
Trenton, New Jersey 08625

Department of Environmental Protection and Energy
Division of Parks and Forestry
Office of Natural Lands Management
CN 404
501 E. State Street
Station Plaza Bldg. #5, 2nd Floor
Trenton, New Jersey 08625

This notice is published as a matter of public information.

DATE: April 8, 1992



SCOTT A. WEINER
Commissioner, Department of Environmental
Protection and Energy

ISLAND BEACH
NORTHERN NATURAL AREA
MANAGEMENT PLAN

PREPARED BY:
OFFICE OF NATURAL LANDS MANAGEMENT
CN 404
TRENTON, NJ 08625

MAY, 1984

THOMAS H. KEAN
GOVERNOR

ROBERT E. HUGHEY
COMMISSIONER

The Office of Natural Lands Management expresses its gratitude to the Natural Areas Council; Beryl Robichaud Collins, Chairperson, David Moore, James H. Knox, George Schindler, William Baranyay, and Michael K. Ligoramo; and those persons of the Divisions of the Department of Environmental Protection who contributed information, reviewed and made constructive comments for the drafts of this document.

Special thanks to John B. Verdier, who has served as Superintendent of Island Beach State Park since April 1954, and who can be credited with maintaining the Natural Areas features prior to this plan.

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EXECUTIVE SUMMARY

Island Beach State Park, which is a ten mile long barrier island bounded by the Atlantic Ocean and Barnegat Bay, is located in Ocean County, New Jersey. At the time of State acquisition in 1953, the northern one third of the island was preserved as a botanical zone. Later in 1978, this portion of the State Park was included in the Natural Areas System as Island Beach Northern Natural Area, administered by the Division of Parks and Forestry in the Department of Environmental Protection (DEP).

This ecosystem is an important component of the Natural Area System because it is one of the States largest and least disturbed representative examples of dune vegetation on an Atlantic Coast barrier island.

The Island Beach Northern Natural Area Management Plan has been developed pursuant to N.J.A.C. 7:2-11.5 which mandates that management plans be prepared for all areas in the System. The purpose of the plan is to present a strategy to ensure the protection of specific natural features while allowing for appropriate non-damaging uses.

The approach used in developing the management strategy for this Natural Area consisted of investigating the environmental factors and sensitivities of the barrier island through a literature review and field inspections. On-site research conducted by Martin (1959), Shure (1966), and others, contributed to assessment of vegetation, wildlife and sand dune topography. Specific information regarding sensitivities exhibited by the dunes, drift line and marshes are limited to studies of other barrier islands by authorities such as Leatherman and Godfrey.

The sensitivities of the dune complex are related to their extreme intolerance to human intrusion. Very low carrying capacity, extreme erodibility and long recovery time are common elements.

Limited foot or vehicle travel within the dune system immediately displaces sand. Plant root systems are then exposed, leading to vegetation die off. As plants die, there is wind erosion of the dune leading to further plant mortality. Storm waves tend to replenish sand supplies in certain areas, but the system never achieves its natural state.

Forest communities, which are found landward of the secondary dune system, are relatively stable; however, the soils of these communities are intolerant to continual human use. These soils are characterized as having a poor ability to regenerate vegetation. Likewise, bayshore marshes and sand flats are extremely sensitive to vehicle traffic. Studies have shown that vehicular use of saltwater marshes, intertidal flats, and the marsh/dune border has a severe environmental impact that warrants a complete ban of vehicles in such areas.

The high degree of land sensitivity, beginning at the winter drift line and extending through the primary and secondary dunes to the bay shore, mandates restricted public access. This portion of the Natural Area will be primarily limited to ecological research and study with compatible

interpretive use. Entry to this portion of the Natural Area will be restricted through a registration procedure.

The ocean beach, seaward of the winter drift line, is relatively tolerant to human use based on existing studies of similar areas in Cape Cod. For this reason, the ocean beach is considered a buffer for the highly sensitive dune complex. Foot and vehicle traffic are permitted, within limitations of season and location.

Existing uses within both the dune complex and beach buffer were assessed for their impacts on the area. Various alternatives were evaluated for uses not contributing directly to the purpose of the Natural Area. In two instances current public use was expanded, allowing year round walking and fishing along the beach.

A detailed examination of uses and management techniques are contained in Chapter V: The following is a summary of the proposed management of each use.

STRUCTURES

Existing structures serving the purpose of the Natural Area such as the entrance complex, the main office, the nature center and the boundary fence and pilings will be maintained.

Existing structures not serving the purpose of the Natural Area such as the restroom facilities at Two-Bit Road will be removed when maintenance becomes prohibitive.

EASEMENT

The present utility easement will continue in its present location. No expansion of the easement corridor will be allowed and new utilities should be located in the existing easement.

ENVIRONMENTAL EDUCATION

No expansion of existing educational trails and roads or development of new trails will be allowed.

Access for self-guided use will be through registration at the Nature Center, during times when the center is open, or the main office, during times when the center is closed.

Park Service shall install signs at the beginning of the nature trail to direct vistors to register prior to entering the trail system.

Park Staff will be responsible for periodic inspection of the trail system regarding straying and/or vandalism.

Guided interpretive use of the Natural Area will continue or be expanded as staff availability permits.

The nature center will be used for guided tours and as a library of research to serve the purpose of the Natural Area.

Future lists of flora and fauna and other reference publications should reflect sightings specific to the Northern and Southern Natural Areas.

SWIMMING

Swimming will not be permitted in the Natural Area with the exception of swimming by residents and guests at the Ocean House.

PUBLIC ACCESS

The Ocean beach will be open to the general public for walking, and jogging.

Park Service shall place signs seaward of the winter drift line indicating that pedestrian traffic is not permitted along the drift line/dune toe and the dune systems.

The primary access road will be open to the general public for walking, jogging and bicycling.

FISHING

The ocean beach will be open to fishermen year round.

Foot traffic will be confined to one beach access path at Two-Bit Road and at the maintenance beach access path.

MOTOR VEHICLE

The primary access road and the Nature Center parking area will continue to be used by the general public to gain access to the Natural Area and the remaining portion of the State Park.

Two-Bit Road and Parking Area F1 (maintenance area beach access) will be available year round for fishermen parking. Parking at these two locations will be by daily permits only.

Park Service shall erect signs indicating the intended use of the parking areas. A limited number of color coded cards will be maintained at the entrance gate for fisherman.

The use of 4-wheel drive vehicles on the ocean beach for fishing purposes will be permitted between Labor Day and Memorial Day weekends from Gillikins Road to the southern Natural Area boundary. Access for vehicle use of the beach will be through Gillikins Road.

Park Service in coordination with the Office of Natural Lands Management shall establish registration markers at each end of the Natural Area beach marking the north-south limits of travel and post

limit of travel seaward of the winter drift line, at intervals of 1,000 feet.

Copies of incident reports dealing with vehicle infractions of the landward limit of travel shall be forwarded to the Office of Natural Lands Management.

Data on the frequency of use and the affect on the Natural Area by 4-wheel drive vehicles will be collected by questionnaire for a one year period by the Park Service.

After each major storm affecting beach contours, the Park Superintendent shall forward a copy of his general observations regarding erosion or overwash to the Office of Natural Lands Management.

The Park Superintendent shall submit a report to the Office of Natural Lands Management once each year, during May, describing his subjective evaluation of 4-wheel drive vehicle use on the beach and dune habitats.

Office of Natural Lands Management shall conduct an annual inspection of the Natural Area and shall keep a photographic history of the same sites.

Park Service shall collect data on dune and beach profiles using the Emery method. Data shall be collected on a biweekly basis for a period of one year, beginning within six months after adoption of this plan.

Park Service vehicles will be permitted on the Ocean beach, seaward of the winter drift line for administrative purposes.

DUNE MANAGEMENT

Dune building or stabilization will be terminated except to repair major storm damage and dune breaches which threaten damage or loss of structure and the primary access road.

Park Service shall perform maintenance on dunes in those areas where uses have been terminated.

Park Service will repair, realign and stabilize dune crossings at the boundary fence, Two-Bit Road, the maintenance area beach access, the nature trail and Gillikins Road.

INSECT CONTROL

Non-persistent pesticides will be used to control mosquito and biting fly populations.

No physical manipulation of the marshes to control mosquito populations will be permitted.

Park Service shall submit a report to the Natural Areas Council each year during the month of October indicating the insect control measures used during the preceeding year.

These management techniques are based on the best available scientific information and the advice of the Department's experts in various fields. This document and the techniques are, however, subject to change based on new information or changing situations within the Natural Area.

Members of the public and the Parks Service are encouraged to suggest changes to the plan as future conditions warrant.

CHAPTER I: INTRODUCTION

Island Beach State Park is located along the eastern margin of New Jersey. It is a 10 mile portion of a barrier island which is bounded by the Borough of Seaside Park to the north; Barnegat Inlet to the south; and the Atlantic Ocean and Barnegat Bay to the east and west, respectively (Figure 1).

At the time of its acquisition, in 1953, Island Beach's value as a relatively undeveloped barrier beach and its need for protection was realized. The northern one third of the Park was administered as a botanical zone; the central one third, as a recreational zone; and the southern one third, as a wildlife sanctuary and fishing area. Today, both the northern and southern sections are designated natural areas and the central section remains a recreational zone (Figure 2).

The northern area was officially designated as a natural area in 1978. N.J.S.A. 13:1B-15.4 defines natural areas as "areas of land or water which have retained their primeval character, although not necessarily completely natural and undisturbed, or having rare or vanishing species of plant and animal life or having similar features of interest which are worthy of preservation for the use of present and future residents of the State."

Management plans for this and all of the natural areas are mandated by the Natural Area Rules and Regulations, N.J.A.C. 7:2-11.5. The purpose of the management plan is to devise a strategy to ensure the protection of inately sensitive and valuable lands while allowing for appropriate non-damaging uses.

This study investigates the environmental factors and sensitivities that characterize the northern natural area which serves as the basis for the classification of the area. From both the classification's use limitations and the specific sensitivities identified, a management strategy has been developed.

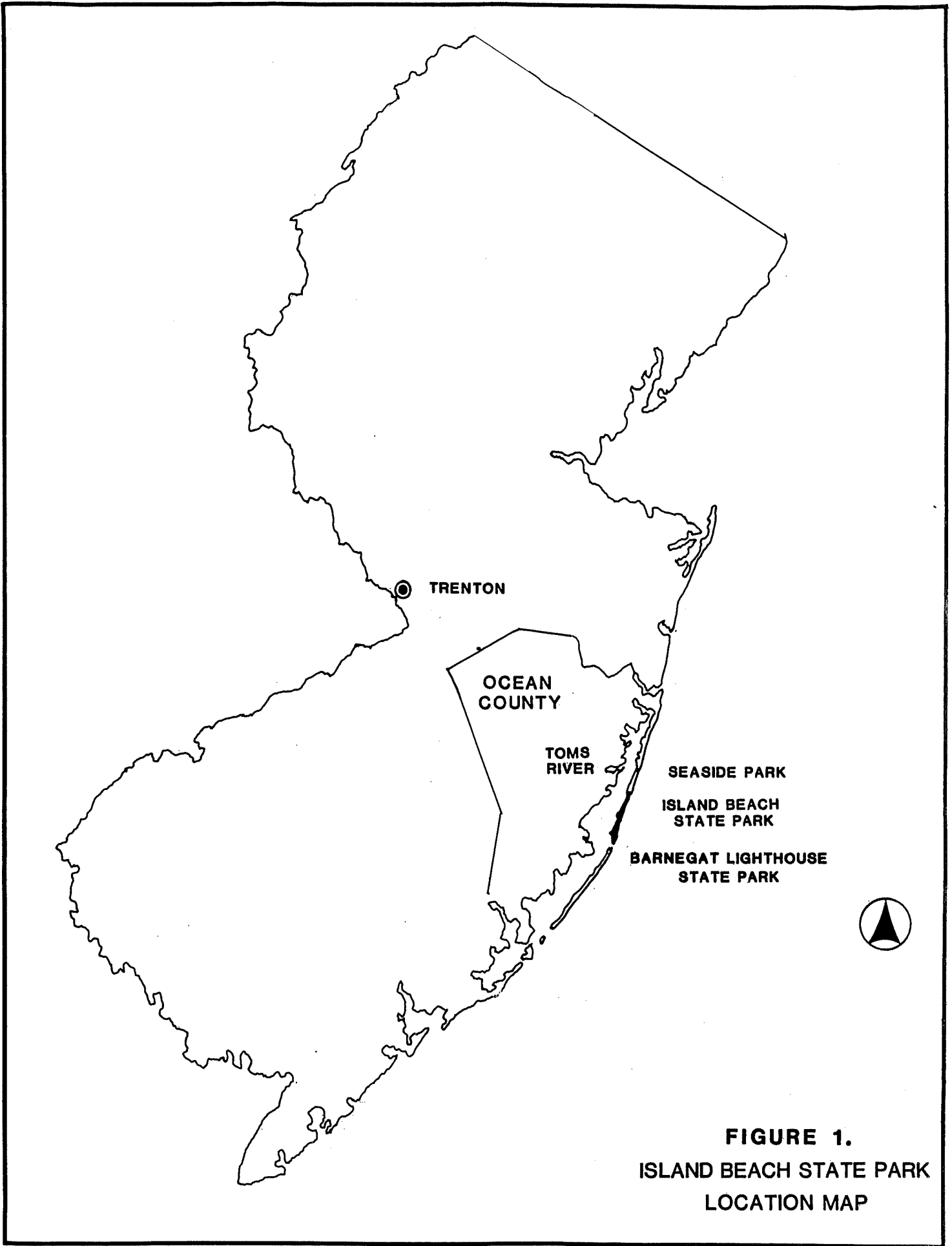


FIGURE 1.
ISLAND BEACH STATE PARK
LOCATION MAP

BARNEGAT
BAY

ISLAND BEACH
NORTHERN
NATURAL AREA

A T L A N T I C
O C E A N

ISLAND BEACH
SOUTHERN
NATURAL AREA



FIGURE 2.
ISLAND BEACH STATE PARK
NORTHERN & SOUTHERN
NATURAL AREAS

CHAPTER II: DELINEATION OF NATURAL AREA

The Island Beach Northern Natural Area is designated in the Rules and Regulations concerning Natural Areas and the Natural Areas System, N.J.A.C. 7:2-11.1 et seq., as "an area of 700 acres (\pm) encompassing the width of the Park from the northern limit of the Park running south 3.3 miles (one third the length of the Park) except maintenance area and official residence." The legal boundaries of Island Beach State Park, of which the northern one third is the Island Beach Northern Natural Area, is registered as a deed at the Ocean County Clerk's Office, Deed Book 1491, page 426.

The Northern boundary of the Natural Area is the boundary fence of the Park which is parallel to, and is located 10 feet south of, the legal boundary east of the access road and 4 feet south of the legal boundary west of the access road; the eastern boundary is the mean high water mark of the Atlantic Ocean, the western boundary is the mean high water mark of Barnegat Bay and the Southern Boundary a line perpendicular to the access road which is located three and one-third miles south of the northern park boundary (map insert).

The maintenance area, the Ocean House, the Bay House and the Superintendent's House are excluded from the Natural Area. Within one year of the adoption of this plan, the Northern Natural Area shall be posted by the Park Service. Signs shall be placed at the northern and southern boundaries indicating that one is entering or leaving the Natural Area. The official residence and maintenance facility will also be marked by signs indicating their exclusion from the Natural Area.

Easements are limited to a single corridor parallel and adjacent to the primary access road. The easement corridor is approximately 15 to 20 feet wide beginning at the access road center line and running west, containing both telephone and electric underground cables, as shown on surveys on file with the Division of Parks and Forestry.

CHAPTER III. BACKGROUND INFORMATION

HISTORY

Island Beach State Park has recently been described as one of the last relatively undisturbed barrier beaches within the State. It has maritime vegetation believed to be largely undisturbed and similar to that of pre-settlement times (Martin, 1959, 1970). Henry Phipps purchased Island Beach in 1926. He visualized Island Beach as an elaborate seashore resort with large, expensive homes. Although Mr. Phipps plans were begun, they were quickly thwarted by the decline of the stock market in 1929 and his death in 1930.

During the late forties, Island Beach was under consideration as a national monument; however, funds were never allocated for the purchase. The State of New Jersey, recognizing the importance of the area, purchased 2,200 acres from the Phipps Estate in 1953 and created Island Beach State Park. Through an additional purchase and a gift, the park has grown to 3,001.63 acres.

Despite its present natural character, the park had sustained some disturbance under Phipp's ownership and shortly afterwards. Building sites were once much more common throughout the barrier island (Miller, 1981). Remnants of a road built in 1932, now mostly covered by sand, still exist inland of the primary dune in the Northern Natural Area (Martin, 1959). Mosquito ditching of several marsh areas was also completed in the early 1930's (Martin, 1959). The primary access road bisects the park longitudinally from the entrance south for approximately 8 miles.

The northern portion of Island Beach has only four homes including the Tilton House which is presently the park office, the Ocean House which is the summer residence of the Governor of New Jersey, the Bay House which is used by the Governor's guests, and the park superintendent's residence.

GEOLOGIC HISTORY

Island Beach is located in the physiographic region of New Jersey known as the Atlantic Coastal Plain. It is one of a chain of barrier islands that extends from Point Pleasant to Cape May, along the eastern boundary of New Jersey. These barrier islands are believed to have formed 5,000 to 3,500 years ago during the Holocene Epoch, the period of the latest marine transgression of the Coastal Plain.

Debates over the origin of barrier islands are ongoing (Johnson, 1919; Fisher, 1967; Hoyt, 1967; Schwartz, 1971; Halsey, 1979). However, research has revealed some well accepted theories on barrier island dynamics. Barrier islands are comprised of unconsolidated sands, silt and clays that continually shift and migrate landward in response to the rise in sea level (Sanders and Kumar, 1975; Swift, 1975, Field and Duane, 1976) and are controlled in their development by regional sediment supply (Field and Duane, 1976) and various climatic factors.

Island Beach State Park is the southern portion of the barrier island which has changed greatly in recent geologic history. At various times in its migration toward the mainland, the park area was separated from the rest of the barrier island. In fact, traces of ancient inlets indicate that Island Beach may have been formed from the consolidation of several different barrier islands.

SOILS

The soils of Island Beach include the Fripp fine sand, Atsion sand-tide flooded, and the Sulfaquents and Sulfihemists association (Figure 3). The Fripp soil, essentially unconsolidated sands, is excessively well-drained sandy soil, common to the New Jersey barrier islands. The Fripp soil is by far the dominant soil type at Island Beach within the beach zone, the primary and secondary dune zones, and portions of the bayshore zone. The sensitivities of the beach and dune areas, which will be discussed in a following section, are directly related to the excessive erodibility of the sandy Fripp soil (Ocean County Soil Survey, 1980). The Fripp soil also provides poor support for vegetation. The Atsion fine sand, a poorly drained soil, forms the upper fringe of the bayshore tidal marsh which is flooded at times when tides are abnormally high. The Sulfaquents and Sulfihemists are the poorly drained mineral and organic soils which form the balance of the tidal flats.

CLIMATE

New Jersey is characterized as having a humid, temperate, continental climate where precipitation is moderate and well distributed throughout the year. The coastal region of New Jersey is significantly impacted by the moderating influence of the Atlantic Ocean. There is, therefore, less snowfall, though the same amount of precipitation, in the coastal areas of New Jersey than inland portions of the State.

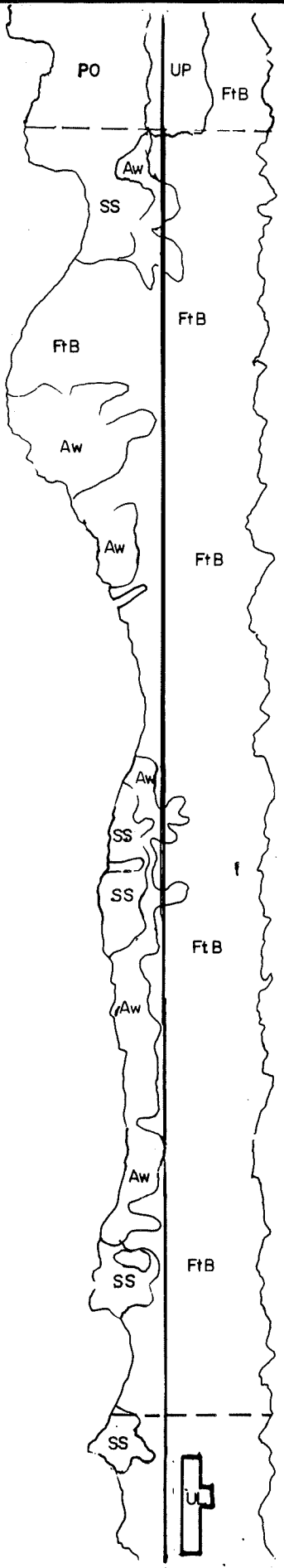
Ocean waters which require longer periods of time to heat and cool than do land masses, cause the Fall weather to be mild and the warmer Spring weather to be delayed. The breezes of the outer coastal areas result also from the differential heating and cooling of land and sea, and dominate local circulation patterns in the absence of storms (NOAA, 1980, Atlantic City).

Except for hurricanes, storms with winds from the northeast are the most severe storms usually occurring in the winter. These storms are significant in altering New Jersey's barrier islands. They cause steeper and narrower beach profiles and their high waves and strong winds can result in dune erosion, overwash and breaching.

AIR QUALITY

Monitoring data indicate that air quality at Island Beach Natural Area meets the National and State ambient standards. The Federal Environmental Protection Agency (EPA) together with the Division of Environmental Quality

BARNEGAT BAY



ATLANTIC OCEAN

LEGEND

- Aw ATSION SAND, TIDE FLOODED
- FfB FRIPP FINE SAND
- PO PSAMMENTS, SULFIDIC SUBSTRATUM
- SS SULFAQUENTS AND SULFIHEMISTS, FREQUENTLY FLOODED
- UL URBAN LAND
- UP URBAN LAND, FRIPP COMPLEX



FIGURE 3.
ISLAND BEACH STATE PARK
NORTHERN NATURAL AREA
SOILS MAP

(U. S. SOIL CONSERVATION SERVICE, 1980)

within the Department of Environmental Protection are charged with monitoring air quality.

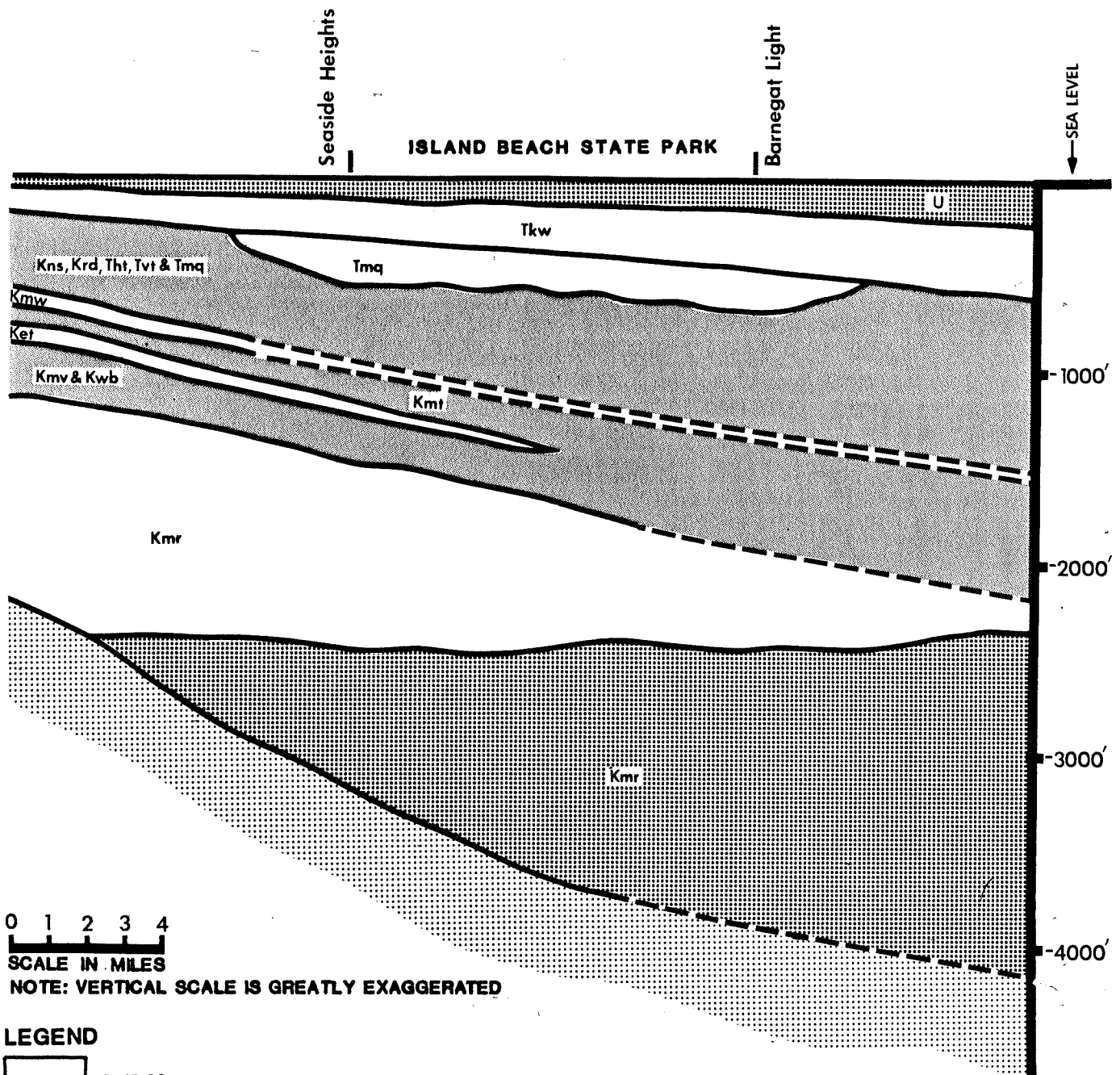
An air quality monitoring station was located near Bathhouse 2 in the recreation zone at Island Beach State Park and was maintained by the Division of Environmental Quality from 1972 to 1982. The instrument used to test the quality of the air, a high volume particulate sampler, showed that primary and secondary standards of particulate matter were not exceeded during the operation of the samples. The highest annual geometric mean found on Island Beach was 53.1 micrograms of particulate matter per cubic meter (ug/m^3) in 1981; the second highest 24-hour mean, also in 1981, was 126 ug/m^3 . These values are within the annual primary and secondary standards of 75 ug/m^3 and 60 ug/m^3 . Primary and secondary standards for a 24-hour period are 260 ug/m^3 and 150 ug/m^3 respectively not to be exceeded more than once per year (R.V. Dyba, 1981, personal communications). In view of the location, much of the particulate material may have been salt spray and sand. Other monitors at nearby locations measured carbon monoxide, ozone, nitrogen dioxide, nitric oxide and smoke shade. Since 1980, these pollutants have been found to be at satisfactory levels in the shore area, with the exception of ozone. Ozone, a secondary pollutant formed from chemical reaction of volatile organic substances (such as hydrocarbon emissions from motor vehicles) with nitrogen oxides, reaches unhealthy levels at monitoring sites throughout the State. Measures to reduce hydrocarbon emissions, such as reducing vehicle miles travelled, are primary strategies for improving the air quality in respect to ozone.

GROUNDWATER HYDROLOGY

Typically, the groundwater of barrier islands is an unconfined water table where fresh water is suspended over salt water. This table is replenished directly by precipitation most of which percolates through the sandy soils of the dunes. Storm waves and salt water flooding temporarily contaminate this ordinarily good quality water (Strahler, 1970).

There are two major aquifers at Island Beach. The Kirkwood Formation is 250 feet thick between 150 and 400 feet below the surface and is an important source of water. Below the Kirkwood is the Raritan-Magothy formation which has the potential for the greatest yield of water; however, its depth has been beyond the means of most well development. The formation is 1,728 feet thick and occurs from approximately 2,000 to 4,000 feet below the surface (Anderson and Appel, 1969). The salt content of this aquifer increases with depth but the upper zone is quite potable (Gill and others, 1963).

There are also two minor aquifers underlying the Park. The Cohansey Formation which is highly productive south and west of Island Beach appears as a clay layer about 30 feet thick and is above the Kirkwood Formation (Gill and others, 1963). However, this formation acts as an aquiclude protecting the underlying deep aquifer from saltwater (Figure 4). The Manasquan Formation and Mount Laurel Sands are aquifers of minor importance lying below the Kirkwood Formation (Anderson and Appel, 1969). The



LEGEND

- AQUIFERS**
- U Undifferentiated watertable aquifer
 - Tkw Kirkwood Formation aquifer
 - Tmq Manasquan Formation
 - Kmw Mount Laurel Sand & Wenonah Formation aquifer
 - Ker Englishtown Formation aquifer
 - Kmr Raritan & Magothy Formations (aquifer undefined)
- AQUITARDS**
- Tvt Vincentown Formation
 - Tht Hornerstown Sand
 - Krb Red Bank Sand
 - Kns Navesink Formation
 - Kmt Marshalltown Formation
 - Kwb Woodbury Clay
 - Kmv Merchantville
- Aquifer containing salt water**
- Pre-Cretaceous crystalline bedrock**

FIGURE 4.
ISLAND BEACH STATE PARK
GEOHYDROLOGIC SECTION
(ANDERSON AND APPEL, 1969)

Englishtown aquifer which is very important north of the Park was absent in a cut-well constructed by DEP and USGS in 1962 (Figure 4).

VEGETATION

Plant Communities

Recent surveys of the flora of Island Beach State Park include 292 vascular plant species (Small and Martin, 1958, N.J. Department of Environmental Protection, 1979). Approximately one-third of these species are not indigenous to sand dunes yet thrive in the disturbed areas adjacent to building sites and the primary access road (Martin, 1970).

Relationships Between Topographic Profile and Vegetation

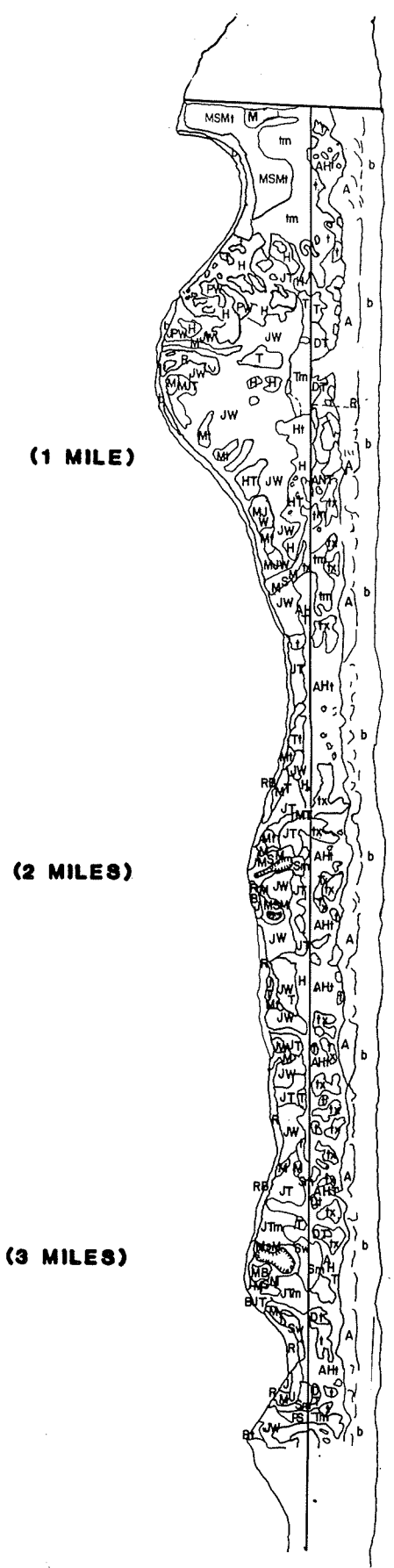
Martin (1959) interprets the mosaic pattern of vegetation at Island Beach as resulting from a corresponding mosaic of environmental conditions (Figure 5). The major limiting environmental factors for plants are: sand movement, soil moisture, groundwater salinity and salt spray deposition. These factors vary with physiographic features. For example, topographic areas unprotected from salt spray will accommodate salt-tolerant plants and the reverse is true for protected areas. Also, primary dune plants in addition to being salt tolerant must also tolerate sand movement and burial.

A transect from east to west (ocean to bay) across these topographic zones reveals striking differences in vegetation structure and composition. This is illustrated in Figure 6 where a hypothetical transect traverses several of the community types commonly encountered in the Northern Natural Area. Only the more common species are mentioned.

Information in the following paragraphs was obtained from Martin (1959) and through field examination by the staff of the Office of Natural Lands Management. It is noteworthy that Martin's data refers to the entire 10 mile barrier beach, not just the Northern Area and contains detail on the location and composition of specific community types. However, considerable change in vegetation pattern may have occurred since he recorded his vegetation mapping units more than 20 years ago. Martin's nomenclature follows that of Fernald (1950).

Ocean Beach Zone - This zone is generally devoid of plant growth with the exception of sparse vegetation between the drift line and toe of the primary dune. Scattered vegetation is a direct result of rhizome advancement from the primary dune or sprouting from seeds.

Primary Dune Zone - The foredune of the primary dune consists of an herbaceous dunegrass community dominated by American beachgrass (Ammophila breviligulata). Other species of lesser abundance in this community are seaside goldenrod (Solidago sempervirens), sea-rocket (Cakile edentula), and beach pea (Lathyrus japonica). Less than 10 percent of the ground is covered with vegetation, the rest is bare sand.



(1 MILE)

(2 MILES)

(3 MILES)



LEGEND

MISCELLANEOUS SYMBOLS

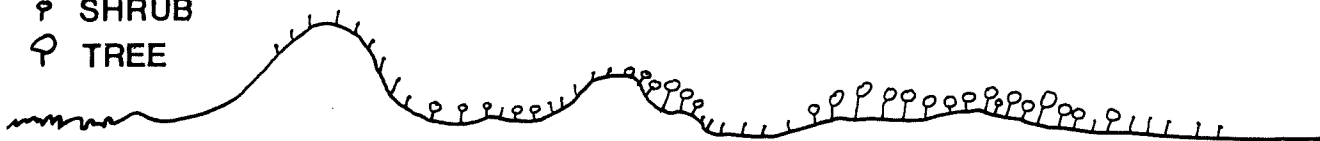
- MAIN HIGHWAY
- b BEACH, BARE SAND
- DR DUNE RIDGE
- ☁ PONDS & EMBANKMENTS

VEGETATION MAPPING SYMBOLS

- | | | | |
|----|-------------------------|----|--------------------|
| A | AMMOPHILA BREVILIGULATA | D | DUNE |
| B | BACCHARIS HALIMIFOLIA | SM | SALT MARSH |
| H | HUDSONIA TOMENTOSA | 1 | LOW THICKET -7' |
| J | JUNIPERUS VIRGINIANA | T | HIGH THICKET 7.17' |
| P | PINUS RIGIDA | M | FRESH MARSH |
| R | PHRAGMITES COMUNIS | W | WOODLANDS 15+' |
| S | SPARTINA PATENS | x | XERIC |
| Sm | SMILAX ROTUNDIFOLIA | m | MESIC |

FIGURE 5.
ISLAND BEACH STATE PARK
NORTHERN NATURAL AREA
MARTIN'S VEGETATION MAP

- 1 HERB
- ♀ SHRUB
- ♂ TREE



Atlantic Ocean	Shore Zone	Primary Dunes		Secondary Dunes			Bayshore		
		Fore-dunes	Back-dunes	Foredunes	Hollows	Backdunes	Inner	Outer	
		DUNEGRASS							BARNEGAT BAY
			BEACH HEATHER						
				FRESH MARSH					
				SALT MARSH					
		LOW XERIC THICKET							
			LOW MESIC THICKET						
				SALT GRASS-ELDER SAVANNA					
				HIGH MESIC THICKET					
				SALT GRASS SEA MYRTLE-RED CEDAR-SAVANNA					
				RED CEDAR WOODLAND					
				PINE WOODLAND					

FIGURE 6.
ISLAND BEACH
VEGETATION TRANSECT
 (MARTIN, 1959)

Several areas of primary dune have recently become dominated by Japanese sedge (Carex kobomugi), a plant believed to have been introduced more than 50 years ago when a passing ship from northeastern Asia discarded plants that washed ashore (Small, 1954). This species is now considered to be naturalized (Fernald, 1950). Although C. kobomugi does not presently appear to be outcompeting and thereby replacing the native dunegrass, it has spread vegetatively to several locations along the primary dune and other locations and is thought to be very effective in dune stabilization and the prevention of blowouts (Small, 1954; John V. Verdier, 1982, personal communication).

Proceeding inland towards the backdune of the primary dune zone, woody vegetation of the low xeric thicket community type becomes apparent. This consists of a dense impenetrable cover of shrubs and vines including poison ivy (Rhus radicans), virginia creeper (Parthenocissus quinquefolia), bayberry (Myrica pennsylvanica), black cherry (Prunus serotina), and greenbrier (Smilax rotundifolia). Interspersed with the low thickets is the much more open beach heather community type dominated by the low-growing beach-heather (Hudsonia tomentosa). This community is characterized by approximately 30% live vegetation cover with the remaining 70% consisting of bare sand or dead branches of beach-heather. Also present in this community are sea-beach panic grass (Panicum amarum), Gray's umbrella sedge (Cyperus grayii), little bluestem (Andropogon scoparius), and lichen (Cladonia spp.).

Secondary Dune Zone - The secondary dune zone contains the highest diversity of community types of all topographic zones. The foredune of the secondary dune may be characterized as an extension of the pattern of dunegrass, beach heather and low xeric thicket community types that are common to the dry primary dune zone. While dunegrass is generally restricted to the foredune of the secondary dunes, the beach heather and low xeric thicket types may be found throughout the secondary dune zone where suitable topographic conditions exist. Also common throughout this zone is the high mesic thicket community type which is often dominated by a dense canopy of highbush blueberry (Vaccinium corymbosum) and also contains shrub species and several tree species including American holly (Ilex opaca), red cedar (Juniperus virginiana), red maple (Acer rubrum), sassafras (Sassafras albidum), shadbush (Amelanchier canadensis) and dwarf sumac (Rhus copallina).

The backdune of the secondary dune supports the dune woodland communities. Red cedar dominates the canopy of the most common woodland community type, which also includes American holly, black cherry and shadbush. The vegetation beneath the canopy is composed of an impenetrable mass of trees, shrubs and vines. Other trees of woodland communities are pitch pine (Pinus rigida), white cedar (Chamaecyparis thyoides), American holly, balm-of-Gilead (Populus gileadensis) and white, willow, scrub, black jack and spanish oak (Quercus alba, Q. phellos, Q. ilicifolia, Q. marilandica and Q. falcata).

Low moist areas within the secondary dune zone provide habitats for small herbaceous fresh marsh communities which display considerable variation in composition. Some fresh marsh species commonly encountered are

broom-sedge (Andropogon virginicus), several sedges (species of Carex, Cyperus and Scirpus), rushes (Juncus spp.), marsh-fern (Dryopteris thelypteris), rose-mallow (Hibiscus palustris), cattail (Typha latifolia), reedgrass (Phragmites communis) and many others.

Bayshore Zone - Sandy ridges of the bayshore zone are commonly occupied by reedgrass communities. These are chiefly composed of tall stand of common reedgrass (Phragmites communis) which overshadows shrubs and herbs of poison ivy (Rhus radicans), red cedar (Juniperus virginiana), groundsel-tree (Baccharis halimifolia), rugose rose (Rosa rugosa) and seaside goldenrod (Solidago sempervirins). Storms and wave action typically cause mounds of eelgrass (Zostera marina), a common aquatic plant of the brackish waters of Barnegat Bay, to wash up onto the narrow bayshore beaches.

Rare and Endangered Plants

Park personnel (H.W. Cooper, personal communication, no date) have reported that the Northern Natural Area contains the seabeach-sandwort (Arenaria peploides) and the sickle-leaved golden aster (Chrysopsis falcata). These species are considered endangered and rare, respectively, in New Jersey (Snyder and Vivian, 1981). Although seabeach sandwort occurs naturally in moist depressions of the primary dune zone, the sickle-leaved golden aster appears to have recently been introduced and only a few individuals are present at a single location along a roadside. The Northern Area also contains the curly-grass fern (Schizaea pusilla) which is currently under federal review as being threatened or endangered throughout its range in the United States. An earlier list of rare and endangered plants of New Jersey (Fairbrothers and Hough, 1973) included three additional plants which park personnel have reported in the Northern Area: common adder's-tongue (Ophioglossum vilgatum), rare; Japanese sedge (Carex kobomugi), endangered; and seaside-spurge (Euphorbia polygonifolia), rare.

WILDLIFE

The wildlife in the Island Beach Natural Area is a combination of species which are found only in coastal environments and species which are found widely throughout New Jersey.

The variety of birds that have been found at Island Beach changes seasonally, as the natural area provides summer breeding habitat, winter feeding grounds, and spring and fall migration resting areas. Located along the Atlantic Flyway, it is a significant stopping point for many varieties which congregate in the shrub thickets lying between Barnegat Bay and the sand dunes. Common migrants have included raptor species such as osprey (Pandion haliaetus) and American kestrel (Falco sparverius), members of the woodpecker family including northern flicker (Colaptes auratus) and downy woodpecker (Picocoides pubescens), and Passerine birds such as brown creeper (Certhia familiaris) and northern parula (Parula americana). A large number of migrants are not coastal or waterfowl birds, and use Island Beach as a resting stop to inland woodlands, fields and freshwater ponds. During the summer months, coastal species are more apparent along the beach and shoreline, although there are large colonies of the year-round resident

herring gull (Larus argentatus), laughing gull (Larus atricilla) and sanderlings (Calidris alba). In winter different bird species again become evident, such as the golden-crowned kinglet (Regulus satrapa) and white-throated sparrow (Zonotrichia albicollis) (Leck, 1975).

Shure (1966) in his studies of small mammal populations of Island Beach State Park suggests that the distribution of white-footed mouse (Peromyscus leucopus), meadow mole (Microtus pennsylvanicus), meadow jumping mouse (Zapus hudsonicus), house mouse (Mus. musculus) and masked shrew (Sorex cinereus) are related to topography and associated plant communities. Shure noted that in the open plant communities, such as dune grass and beach heather, the small mammals sampled were much fewer than in thickets and woodlands and seem to forage in the open communities while using nearby thickets as cover. The distribution of other terrestrial animals residing in the natural areas, exhibit a similar dependence, directly on the plant community distribution and indirectly on the topography.

During the summer of 1979, one Atlantic loggerhead turtle (Caretta caretta) which is classified as endangered by N.J. Division of Fish, Game and Wildlife and threatened by the U.S. Fish and Wildlife Service was found within the Northern Natural Area. Shortly after the female left the nest, the eggs were washed out by a storm. This siting was highly unusual in New Jersey because the primary nesting grounds for loggerheads are located along the coast of North and South Carolina.

Appendices A through E are lists of wildlife which were sighted in Island Beach State Park since its acquisition in 1953. Although these lists do accurately reflect those species found within the State Park, no indication has been made as to the location of the sightings. Therefore, these lists will serve as a guide to possible wildlife in the Northern Natural Area and not data on specific species found in that Natural Area.

PHYSICAL CHARACTERISTICS AND SENSITIVITY

Barrier island formation is a result of the forces of the ocean and winds on the loose sandy coastal plain sediments and the specially adapted plant communities colonizing the sandy island. The major topographic features of the Island Beach Northern Natural Area are: beaches, dunes, hollows, swales, sandy flats and marshes.

Martin (1959) recognizes four zones based on topography and vegetation types. They are: the ocean beach zone, the primary dune zone, the secondary dune zone, and the bayshore zone (Figure 6). This section describes these four zones of Island Beach, the physical processes that affect each zone and the relative sensitivities of the zones to human disturbance.

Ocean Beach Zone

The ocean beach zone for this Natural Area Management Plan begins at the point of State Park ownership, the mean high tide, and extends to the start of the fore dune. State title to riparian lands, seaward of the mean

high tide, is limited to acting as trustee for the public (Goldshore, 1979). The ocean beach zone is divided into the foreshore and the backshore. The foreshore includes the inter-tidal beach and the berm crest, and the backshore includes the berm and winter drift line (Figure 7).

Storm induced waves erode the beach and, depending on the severity of the storm, can erode the dunes. The sand removed from the beach (assuming no washover events that carry sand into the back barrier area) is carried just offshore and deposited in an offshore bar (Figure 8). Fair weather waves acting on the higher sandy offshore bar quickly move this sand closer in toward the beach and back up the beachface. When the bar comes to shore, it becomes a ridge (very visible at low tide) which encloses a linear pond, known as a runnel, between it and the beach (Hayes and Boothroyd, 1969) (Figure 9). A landward migrating ridge is the mechanism by which a berm is rebuilt after a storm. As long as fair weather remains, the ridge continues to build landward into the runnel until the runnel is filled and the sand in the ridge is moved up the beachface thus building up the berm to its pre-storm configuration.

Spring tides or moderate northeast storms often overtop the berm and waves will travel a certain distance across the backshore. The backshore is the usually wide, flat, or very gently sloping area of the beach between the berm crest and the toe of the dune. When larger waves do inundate the backshore, they often bring organic (and often inorganic) debris which is deposited as the "litter line, drift line, or wrack line." These drift lines often contain seedlings, which if they remain on the beach through a growing season, will germinate and grow. These new plants will trap sand as they grow and new dunelets will form. If left undisturbed, these dunelets will create a new line of dunes seaward of the original primary dune. Of course, these new dunes will be the first dunes to be destroyed in a major storm but most of the sand from these newer dunes will be transported landward in the form of washovers thus building up the back barrier area.

Leatherman and Godfrey (1979) documented the critical nature of the drift line. They indicated that one vehicle pass could scatter and tear up the drift line and affect the decay rate of the organic matter in the deposit thus severely limiting the dune regenerative ability of drift lines.

If no drift line is present but vegetation exists in the dune toe area or out onto the beach, the critical zone begins at the seaward side of the vegetation. If neither drift line nor vegetation exists but a sloping dune toe or a scarped dune exists, the critical zone would begin seaward of the sloping dune toe or base of the scarp (Leatherman and Godfrey, 1979) (Figure 10).

The upper intertidal portion of the backshore, where most of the vehicular traffic occurs, is a relatively "insensitive" area (Leatherman and Godfrey, 1979). This traffic does not seem to cause much disturbance as documented in the Cape Cod National Seashore Study (Godfrey, 1981). The effects of pedestrian and vehicular traffic in the ocean beach zone, with the exception of those on the driftline, seem to be negated by the seasonal shift in the beach profile.

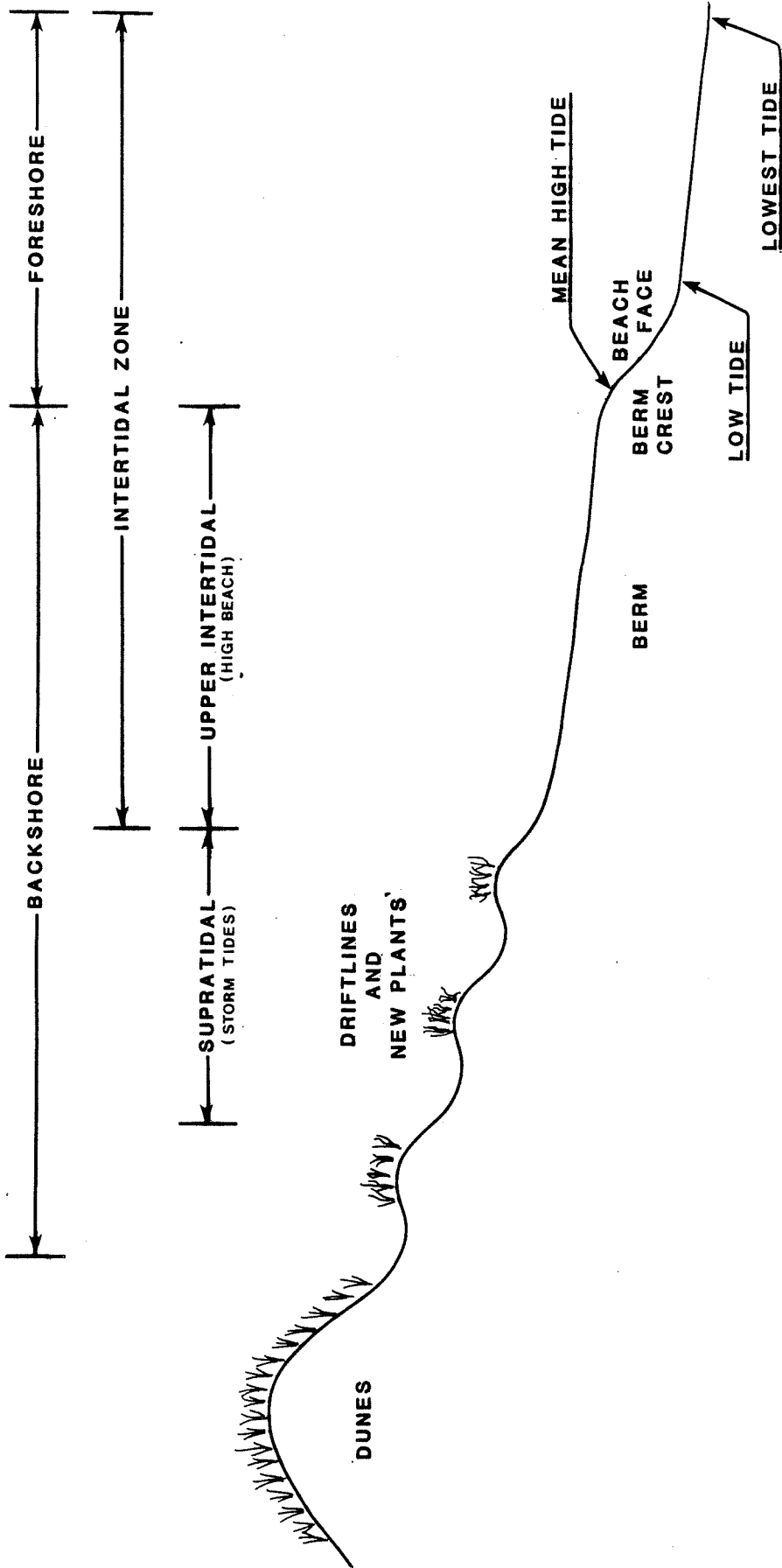


FIGURE 7.
OCEAN BEACH CROSS SECTION
 (REDRAWN FROM GODFREY AND GODFREY, 1980)

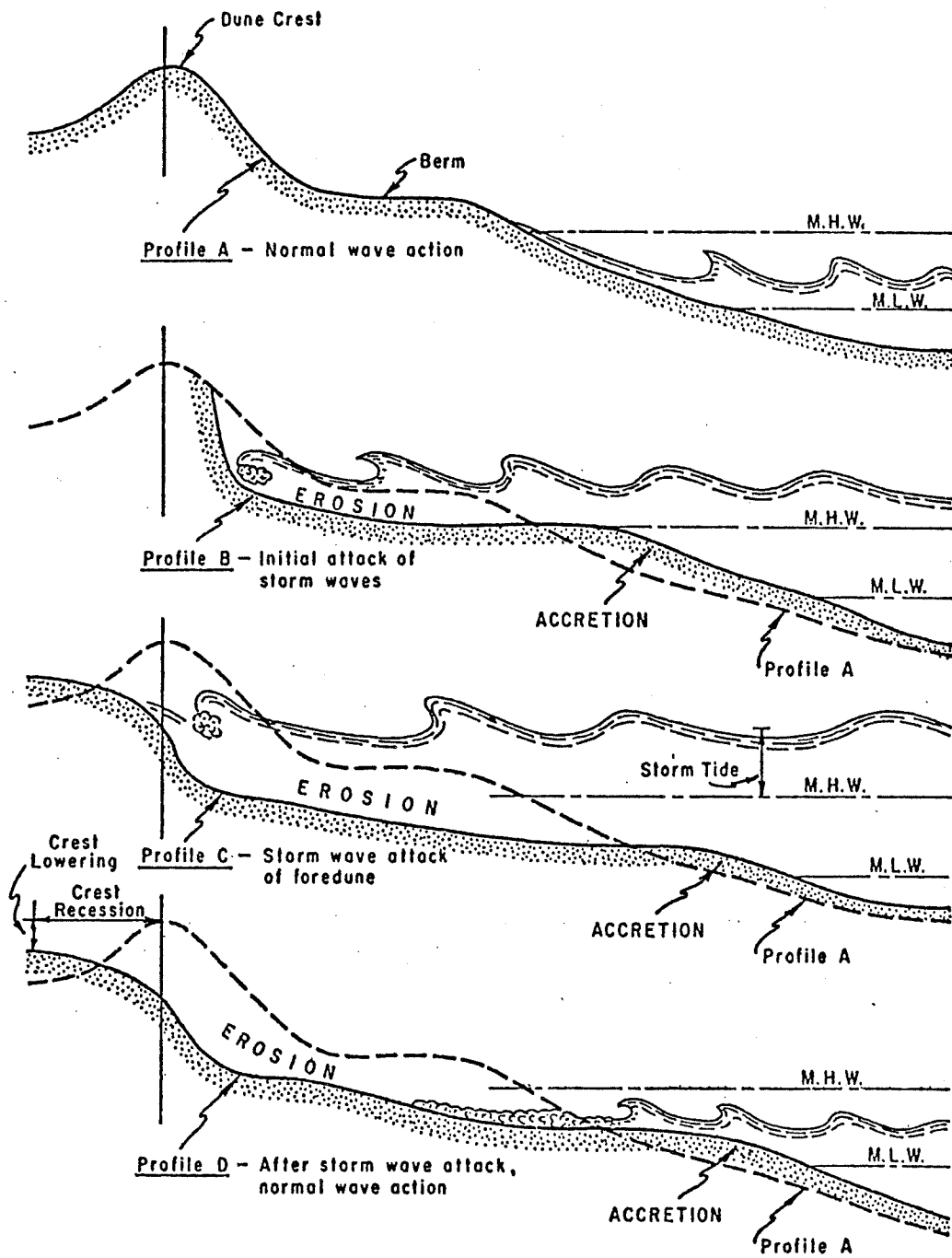


FIGURE 8.
STORM ATTACK ON
BEACH AND DUNE
 (NORDSTRUM, 1977)

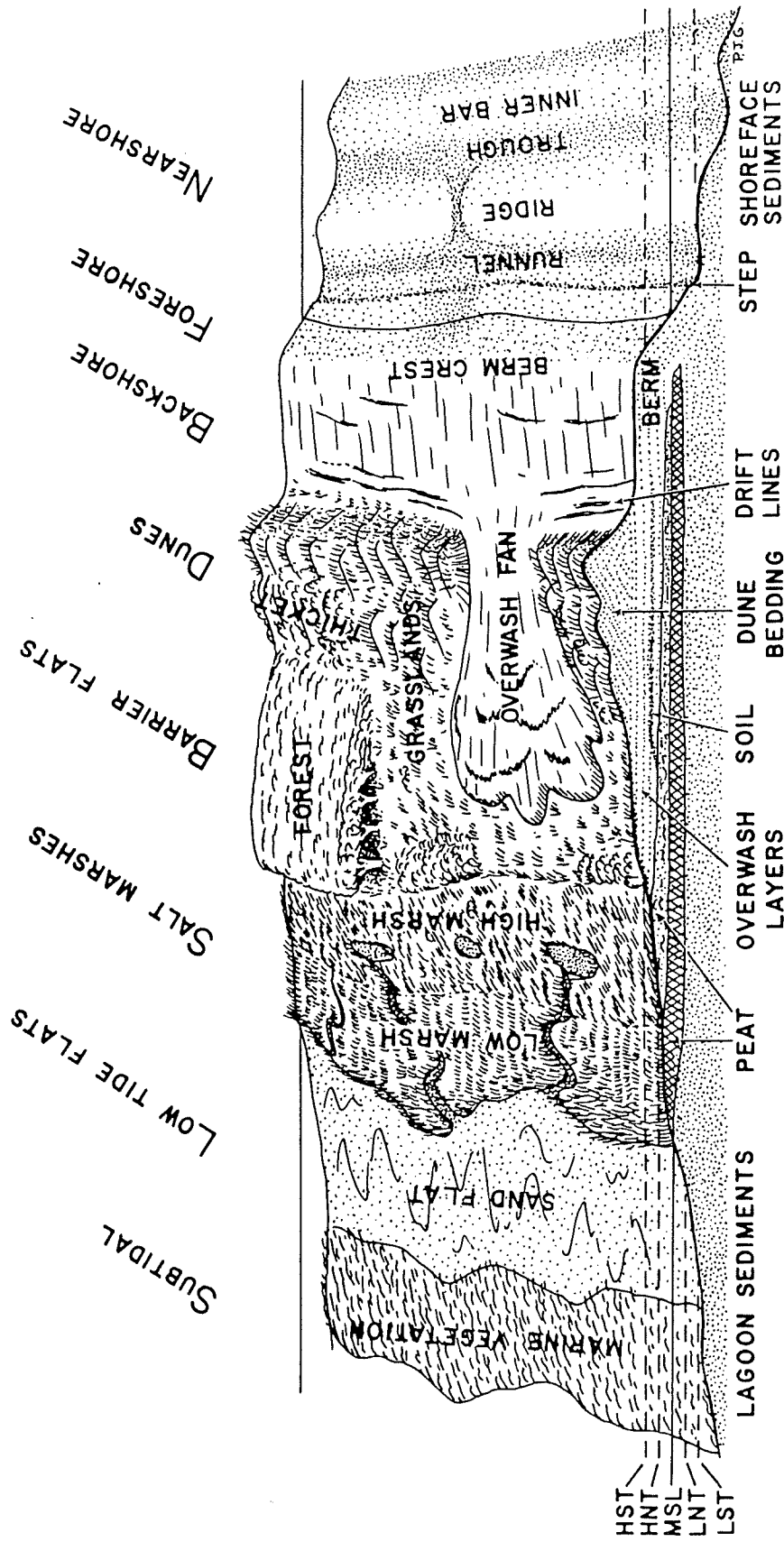


FIGURE 9.
BARRIER ENVIRONMENTS
 (GODFREY, 1976)

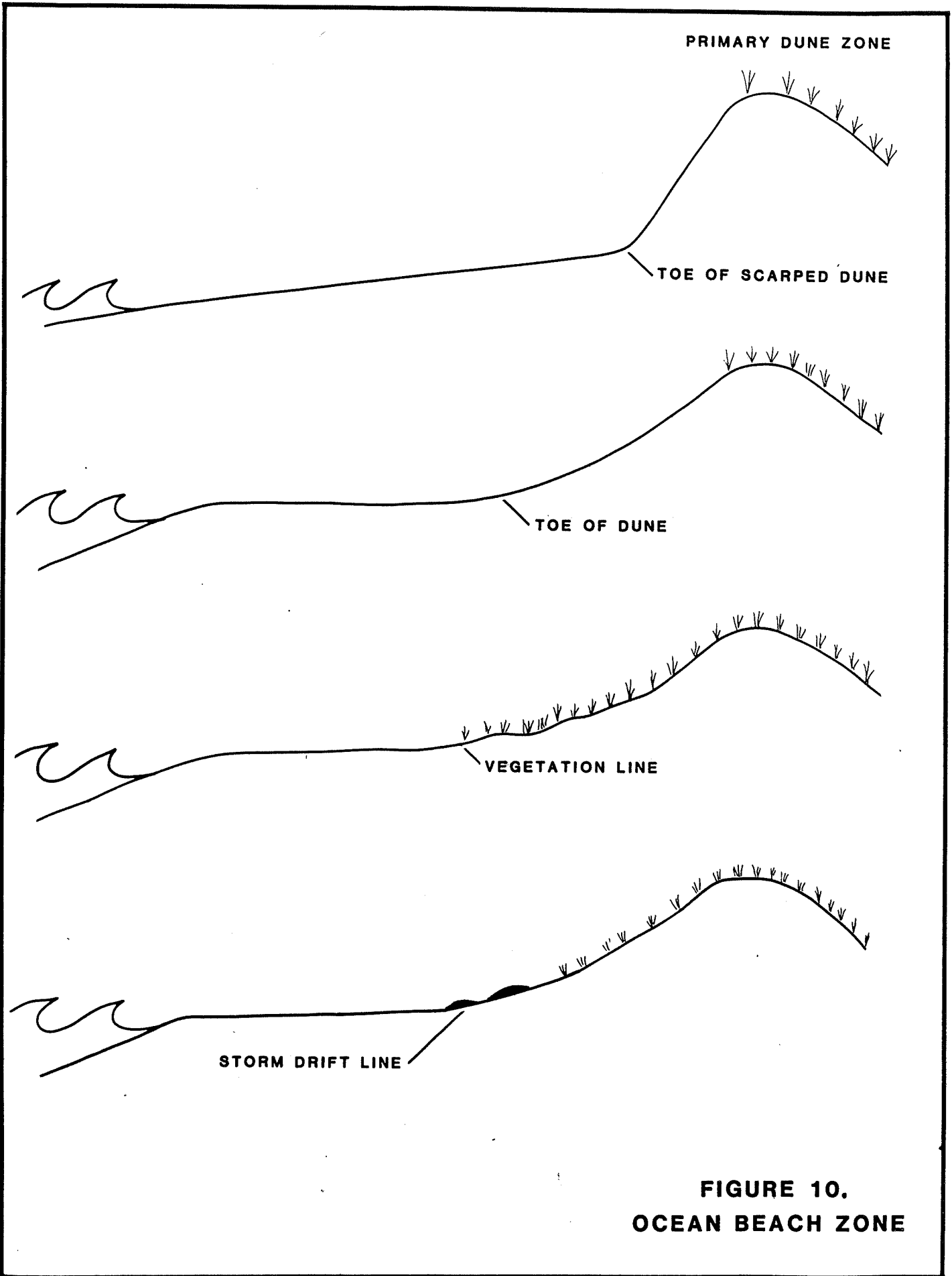


FIGURE 10.
OCEAN BEACH ZONE

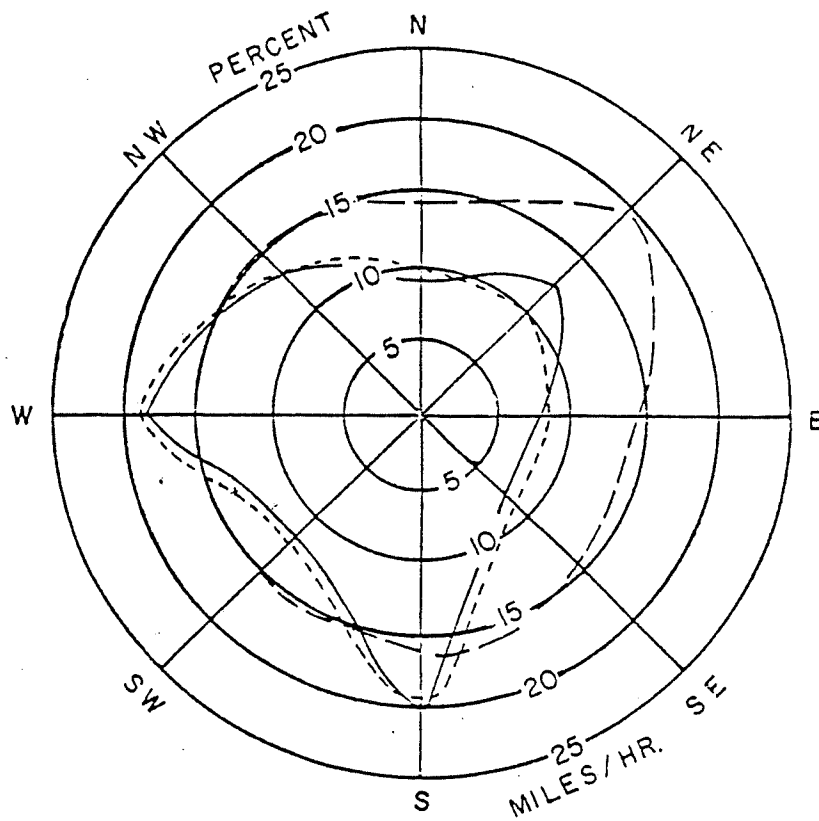
Primary Dune Zone

A dune is defined as a mound, ridge or hill of wind-blown sand, either bare or covered with vegetation (Gary and others, 1979). A dune ridge is a series of parallel foredunes formed along the shore. The highest and youngest dunes are usually found in the primary dune zone at Island Beach. The foredune area of the primary dune includes the dune toe area where there is a break in slope from the backbeach up to the crest of the dune. The backdune area is the landward slope of the dune and may be broken by swales, blowouts or overwash channels (Figure 9). The primary dune is predominantly vegetated with American beach grass (Ammophila breviligulata) which thrives in an environment characterized by salt spray and shifting sands (Leatherman, 1979; Leatherman and Godfrey, 1979; Martin, 1959; Clark, 1980).

The formation of the primary dune line is mainly a result of sand blown by the wind from the berm and backbeach areas of the beach during windy (usually more than 10 mph) conditions from the eastern quadrant and caught by dune grasses (Gares, Nordstrum, Psuty, 1979). The northeast direction brings the highest velocities (Figure 11) and sand moves even though rain or snow often accompanies the northeast storms. Additionally, the northwest winds are dominant sand movers and are responsible for shaping natural barrier islands such as Island Beach. Because washover is allowed to happen on natural barriers, there is a significant quantity of sand available to be brought back (seaward) into the dunes or at least up the back dune slope during high velocity northwest winds (Figure 8). This sand is instrumental in building the primary dunes to the heights we see them on Island Beach.

The importance of overwash in the overall health of the barrier island system is another process that has only recently (1979-present) been recognized. Washover sand is nature's "foundation" for the upwardly building and westerly migrating barrier island. Without the overwash process, barrier islands are not allowed to naturally grow upward thus keeping them at an artificially low elevation as sea level rises around them (Godfrey and Godfrey, 1976).

Dunes themselves are extremely sensitive to all traffic as documented by many writers such as Leatherman and Godfrey (1979) and Leatherman (1979). Commonly used access paths are quickly devegetated to the width that people use them and the sand becomes quite loosened by foot traffic. Beach grass, (Ammophila breviligulata) growing in areas not subjected to freely blowing sands, seems to be more affected by foot traffic possibly because it is located in the zone of marginal growth. One of the most significant conclusions, reached over the years of research, is that most dune vegetation and particularly beach grass and Spartina patens (when growing in dunes) had extremely low tolerance to traffic of any kind, pedestrian or vehicular, from the dune toe into the mature dune. Leatherman and Godfrey (1979) indicated that maximum damage to vegetation results during the first few vehicle passes. In addition to crushing, beach grass roots are churned up to the surface by vehicle wheels. When exposed to the air, the roots dessicate and die, and the underlying sand is again susceptible to wind erosion. The authors reported that although the maximum impact on vegetation occurs between 50-100 vehicle passes and each type of vegetation



LEGEND

- PERCENT OF TOTAL WIND MOVEMENT
- PERCENT OF TOTAL DURATION
- AVERAGE VELOCITY IN MILES PER HOUR

FIGURE 11.
ATLANTIC CITY WIND DATA
(1923-1952)

(U. S. ARMY CORPS OF ENGINEERS, 1981)

breaks down rapidly, the recovery rates of various plants vary. Beach grass in foredune areas was found to have a relatively rapid recovery rate. Later research (Godfrey and others, 1979) has indicated that the reason for the more rapid recovery rate of beach grass in foredunes was that beach grass grows with the most vigor when there is fresh sand supplied around its base. Even when beach grass is buried during the overwash process, new plants grow up toward the light and repopulate the new sand. Depending on the time of the year of overwash, new plants could grow in weeks, months, or wait for the next growing season.

When dunes are stripped of their vegetation, the underlying sand is easily carried away by winds, and the dunes begin to migrate sometimes very quickly. Often when vehicle or foot paths are oriented perpendicular to dominant winds, a depression forms called a "blowout" (Leatherman and Godfrey, 1979). Sand, stripped of its vegetative cover, blows away until the water table is reached or a lag deposit of coarser material such as shell fragments or pebbles is left as an armor to the finer sand below (Godfrey and others, 1979). Access paths to the beach are often widened and deepened by this blowout activity that may artificially increase the occurrence of overwash.

The susceptibility to overwash due to blowouts is greatly enhanced when paths are oriented to the northeast. Northeast storms send wave crests oriented in a northwest to southeast direction down the New Jersey coast, thus moving sand to the south during these storms along long stretches of coast not influenced by inlets. Depending on the stage of the tide and the severity of the storm, waves approaching from the northeast graze down the beach scarping the berm on a rising tide or overtopping the berm all together and grazing down the lowered back beach and dune toe area (Brumbaertner, 1975, Halsey, 1981). It is easy to see that an easterly or northeast-oriented, lowered access path would provide an easy conduit into which stormwater would pass. Those access paths that are neither lowered to the beach level nor oriented to the east-northeast at least make it more difficult for the heightened volume of water to seek escape westward through the dunes (Halsey, 1981).

Since dune formation is directly affected by not only the availability of sand and the velocity of the wind, but processes nearby on the beach as well, it is important that man's activities do not negatively impact the beach/dune system. The contribution of dunes to the healthy functioning of barrier islands has only recently been supported by data.

Secondary Dune Zone

The secondary dune zone is the broadest topographic zone of the barrier island. The foredune section is the seaward slope, top and backward slope of the secondary dune. The backdune includes the flats and small dunelets near the bay shore. The hollow is a low area separating the foredune section from the backdune section (Figure 6). As many as three discernable parallel dune ridges separated by swales can be identified.

The diverse habitats of the secondary dune zone depend on the integrity of the physical barriers formed by the primary and secondary dunes. The integrity of the vegetation is critical in stabilizing the foredune formation (Martin, 1959). This integrity is highly sensitive to any external disturbance. In fact, the composition of the plant communities relates directly to the levels of salt spray and sand movement allowed by the height and soundness of the dune formations both primary and secondary.

The hollow of the secondary dune zone is the most tolerant area of a dune habitat. The low topography of the hollow provides additional soil moisture and protection from the effects of salt spray and sand movement and has allowed a mature vegetative community to develop (Martin, 1959). Most of the existing structures and intensive uses in the Natural Area are located here in this hollow.

Other portions of the more stabilized secondary dune display the same sensitivity to motor vehicles traffic as the beach grass communities of the primary dune. Leatherman and Godfrey (1979) found maximum impact resulted after 40-100 passes; however, the rate of recovery of the specific plant communities varied considerably. "The most stable sites, and those with natural stresses such as drought and low nutrient levels, take the longest time to recover" (Leatherman, 1979). The beach grass of the foredune proved to have the most rapid recovery and the beach heather the least rapid. After four years of total protection, motor vehicle tracks were still visible and mostly bare. A vehicle track closed to use in 1952, is still barely discernable in the Northern Natural Area (J. Verdier, 1982, personal communication). The carrying capacity of this sensitive area is exceeded under normal low level use. Once a trail is established, only a few infrequent passes will eliminate any vegetative recovery in the trail.

The forest community which is found in the secondary dune zone west of the entrance road is relatively old and can be thought of as stable due to its age. However, the soil of the forest community is the same soil type found throughout the barrier island, including the dunes and ocean beach. This soil is characterized as having a poor ability to support vegetation and having properties severely unfavorable to foot traffic and vehicular traffic without major modifications. The forest area soils are, therefore, intolerant to use.

The very poor soil characteristics for supporting natural vegetation together with the intolerance to sand movement and salt spray by the specialized plant species of the secondary dune zone require that strict limitations of use be established to cause the least disturbance to the integrity of the dune system (Martin, 1959; Ocean County Soil Survey, 1980).

Bayshore Zone

The bayshore zone is made up of the peaty and sandy shores which are adjacent to the bay. The inner beach begins bayward of the secondary dune zone and is vegetated with transitional plant communities which separate the forest communities of the secondary dune zone from the marsh areas and the

sand beach of the outer beach. The outer beach is characterized by brackish marshes, sand ridges, and sandy shores that terminate at Barnegat Bay.

Leatherman and Godfrey (1979) indicated that other portions of the barrier island, particularly intertidal salt marshes and sand flats, are extremely sensitive to vehicle traffic. Although usually not a problem on Island Beach because of the way traffic is controlled, one of the conclusions of the Cape Cod study was that "ORV use of salt marshes, intertidal flats, and the marsh/dune border is a severe environmental impact that warrants a complete ban on vehicles in such areas."

CHAPTER IV: CLASSIFICATION

Sensitivities serve as the basis for placing the Island Beach Northern Natural Area into one of three classifications: Class I; Class II; or Class III. Class I areas "demonstrate outstanding examples of ecosystems, biotic types and geologic types or formations that are common to this State... atypical... or habitats of rare and vanishing species which are fragile and highly sensitive to the impact of man" (Natural Area Rules 7:2-11.4). Classes II and III exhibit the same natural values listed for Class I but are progressively less sensitive to the impact of man.

The Northern Natural Area is one of the largest and least disturbed examples of an Atlantic Coast barrier island vegetation and sand dune habitat in the State of New Jersey. Several endangered and threatened plant and animal species have been observed at Island Beach State Park. A number of endangered and threatened plant species as well as characteristic plant and animal communities of a barrier island have been observed in the Northern Natural Area.

The protection of this outstanding example of one of New Jersey's major geologic formations and ecosystems, the barrier island, must relate to the extreme sensitivity of the dune system and the provision of certain uses which are compatible with this protection.

Island Beach Northern Natural Area was included in the Natural Areas system as a botanical preserve demonstrating a sand dune habitat. Accordingly, N.J.A.C. 7:2-11.22 should be revised to indicate that the purpose of designation is to preserve a portion of near natural barrier island in addition to the dune habitat and botanical preserve.

The barrier island, resilient to the forces of the ocean, is relatively intolerant to human intrusion. This extreme sensitivity to intrusion begins at the winter drift line, and extends throughout the dune system to the hollow beyond the secondary dunes and includes the bayshore zone. The beaches seaward from the drift line to the ocean water, and the hollow between the secondary dune and its backdune are the only areas of the barrier island which may be considered relatively more tolerant to certain human use.

The unusual combination of a very low carrying capacity, extreme erodibility, and long recovery time of the habitats results in the dunes being extremely sensitive to human use. Therefore, the dune habitat within the Northern Natural Area is classified by this plan as a Class I Natural Area.

Although exhibiting some sensitivity to human disturbance the beach area seaward of the winter drift line (when present) does not demonstrate the same extreme sensitivity as does the dune area. The beach area indirectly impacts the sensitive dunes by protecting and supplying sediment to them. It is, therefore, important to manage the beach area in conjunction with the management of the dunes, but it is not necessary to

impose the same severe use limitations. For this reason, the beach area, seaward of the winter drift line, is classified by this plan as a buffer area to the Class I Natural Area.

The present management is generally consistent with that prescribed in the Rules for a Class I natural area. In the area from the drift line landward, all persons are restricted to entry by permit, or registration, except when accompanied by a designated Department employee during the summer. These areas may be used for guided nature tours if it is determined to be compatible with research and study uses.

The area of the ocean beach seaward of the winter drift line is a specific area where relative tolerance to use may allow certain low intensity recreational activities to continue under the conditions specified in this management plan.

CHAPTER V: PRESENT USES AND PRESCRIBED MANAGEMENT

The Natural Areas System Act describes the purpose of acquiring, maintaining and preserving Natural Areas as "... places of natural interest and scenic beauty, as a living illustration of the State's original heritage and as a place for scientific study" (N.J.S.A. 13:1B-15.5). N.J.A.C. 7:2-11.2 defines non-conforming use as "any use or facility or structure lying within but not serving the purpose of a natural area which is regulated by the Administrative Agency...". When non-conforming uses are present in a natural area, alternatives to their practice must be explored and their critical levels of impacts determined in the management plan. Critical levels of impacts are those levels at which uses begin to degrade a natural system. Because of a lack of quantifiable data, it is not possible to state with any certainty what the critical levels of impacts are for uses of the Natural Area. For the purposes of this management plan current non-conforming uses will be assumed to be at their critical levels of impacts.

STRUCTURES

The entrance complex and main office, considered important and essential in the proper management of the park, are located adjacent to the main access road in the least sensitive section of the natural area (map insert). Their location and design have minimized the visual impact on the natural area.

The use and maintenance of these structures to facilitate the distribution of park information and traffic regulations, the issuing of permits, and visitor access monitoring, serves the purposes of the natural area and the adverse impacts are insignificant in relation to the benefits.

The restroom facilities at Two Bit Road are utilized mainly by fishermen. The structure has adverse aesthetic impacts but it is adjacent to the parking area (map insert). This structure is considered non-conforming, though it does provide a convenience to those using the parking facilities.

The boundary fence and piling structures form the separation between the Natural Area and private residential and commercial properties to the north (map insert). The location of these structures on the northern boundary will help minimize their visual impact and serve as a physical barrier to unauthorized motor vehicles seeking access to the Natural Area. Maintenance of the fence and pilings are necessary to assure the integrity of the dune complex, and, therefore, serves the purposes of the Natural Area. Maintenance of this barrier should be a priority item in budget and staff allocations.

The boundary fence will be an eight foot high vinyl clad cyclone fence with wood pilings used as supports. The fence will begin at the park entrance and extend seaward to the mean high tide (950 feet). Wood pilings, alternating on either side of the fence mesh, will be spaced ten feet apart

for 700 feet and then five feet apart, will continue without fence mesh from mean high tide for a distance of 80 feet into the ocean. The absence of fence at this point would allow walk on access but still eliminate motor vehicle entry.

The official residences and the maintenance facility are specifically excluded from the designated Natural Area, however, the boundaries of these exclusions are not currently delineated. The existing edge of native vegetation will serve as the limit of the excluded area. The Park Service shall graphically delineate the areas on available maps or surveys within 6 months of the Management Plan's adoption.

STRUCTURES MANAGEMENT

No new structures will be developed except for temporary, unobtrusive structures for scientific purposes, and those structures prescribed as management techniques such as snow fence and signs.

Existing structures serving the purposes of the Natural Area will be maintained. These structures are the entrance complex, the main office, the nature center and the boundary fence and pilings. These structures may be reduced, expanded or upgraded to enhance and better serve the purposes of the Natural Area. Any request for expansion must be submitted to the Office of Natural Lands Management and Natural Areas Council for review and recommendation to the Director of the Division of Parks and Forestry.

The restroom facilities at Two-Bit Road have adverse aesthetic impacts while not serving the purposes of the Natural Area. Alternatives to the structure as it exists are renovation or removal.

Renovation of the structure would reduce the aesthetic impacts on the Natural Area; however, renovations would be costly and the structure would still not serve the purposes of the Natural Area. Removal of the structure from the Natural Area would eliminate impact. Since the structure does provide a convenience to those using the parking facilities its immediate removal is not necessary. The removal of the structure will be reviewed when the holding tank approaches its maximum capacity and maintenance become cost prohibitive.

EASEMENT

Telephone and electric underground cables are located in an easement which is a single corridor 15 to 20 feet wide which runs parallel and adjacent to the primary access road (see Delineation of Natural Area).

The only visual indications that the electric and telephone cables are underground in this easement are the station boxes which are inconspicuously located along the shoulder of the access road at various intervals. The only impact that the presence of these cables would have on the Natural Area would be in the event that repair of the cables is needed.

EASEMENT MANAGEMENT

Alternatives to the existing easement for utilities are aerial alignment of the cables, relocation of the cables under the roadway, a new corridor through a more sensitive area or no service.

In order to provide service (telephone and electricity) to support the daily functions of the staff of Island Beach State Park and of the Natural Area no feasible, economically practical or environmentally sound alternative exists.

The present easement will continue in its present location; however, no expansion will be allowed. Any new utilities should be located in this existing easement.

ENVIRONMENTAL EDUCATION USE

The existing facilities used for environmental education and study consist of an interpretive center, a one eighth mile self guided nature trail, fisherman's path and Lagoon Road, and Reeds Road (map insert). The interpretive center is located in the hollow of the secondary dune zone, the least sensitive area, and adjacent to the main access road. The one eighth mile self guided nature trail begins and ends at the nature center and is located in the primary and secondary dune zones. This trail has markers which describe points of interest along the trail. Fisherman's path and Lagoon Road are used by Island Beach State Park staff to conduct guided nature tours. Visitors are taken through the topographic zones of the Natural Area, from Barnegat Bay to the Atlantic Ocean, as vegetation, geology and wildlife are discussed. Reeds Road is used by ecological study groups which may or may not be accompanied by park staff. These facilities are serving the purposes of the Natural Area and are, therefore, conforming. However, the present use of these trails from September through May without the benefit of a guide or without permit, is inconsistent with the Class I designation.

The off-season self-guided use of these trails, roads and the ocean beach is at a low level, but, without monitoring for specific changes, any impacts are unknown. Impact on the adjacent vegetation caused by visitors leaving the established trail or road are evident but not significant at present levels of use. The dense, impenetrable nature of the adjacent vegetation in some portions of the Natural Area limits this impact; however, the open beach heather (Hudsonia tomentosa) community and beach grass (Ammophila breviligulata) community invites straying. Trampling of these areas may lead to significant vegetation loss. Natural renovation of these areas, even under total protection is too slow to sustain such trampling (see Secondary Dune Zone Sensitivities).

ENVIRONMENTAL EDUCATION MANAGEMENT

The present extent of existing trails and roads provides reasonable access for educational purposes and study. The development of new trails

which would destroy vegetation may not be necessary given the current low level useage.

Continued use of established trails and roads should not result in additional impacts. Unrestricted access for self-guided tours is inconsistent with a Class I designation and should be terminated. Access for self-guided tours will be restricted through registration, in effect a permit system. The register will be maintained in the Nature Center during the times when the Center is open, and when closed it will be located in the main office. Signs at the beginning of the nature trail should direct visitors to register prior to trail use. Park staff should walk the nature trail at least once every two days during the summer season and periods of heavy use and once each week during the remainder of the year to report incidents of straying and/or vandalism. Present use must be monitored by permit and routine staff assessments to identify threats to the integrity of adjacent vegetation. If an increase in use levels result in a similar increase in the impacts of straying, the Office of Natural Lands Management in coordination with Park Service staff may decrease the volume through the register system. Straying problems may be eliminated by the use of physical barriers, such as snow fence, in combination with natural vegetative barriers.

The use of the nature trail and other educational trails and roads for guided tours will continue, incorporating the register system. The nature center will also continue to be maintained (see Structures) and used for guided tours and as a library of research to serve the purposes of the Natural Area.

The guided interpretive use may be expanded by increasing the schedule for tours on the existing trails, roads, ocean beach and the nature center, as staff availability permits. No new trails or structures will be developed.

It has become apparent, through assembling information for the background portion of this management plan, that the Island Beach State Park plant and animal lists reflect those species which were observed at the State Park, but there is no indication as to the locations of the sightings. These lists only serve as a guide to species that might be found in the Natural Area, and not as information on species found specifically in the Northern Natural Area.

Species lists in the future should be annotated to indicate sighting in the Northern or Southern Natural Area.

SWIMMING USE

Swimming has been permitted in the ocean east of the Ocean House. This use does not serve the purpose of the Natural Area and is, therefore, a non-conforming use. This area is not open to the general public but only to the Governor and guests. Because of the limited use and frequency of use within the relatively insensitive beach zone, the impacts are minimal.

The access to the beach from the Ocean House is through the highly sensitive Primary Dune Zone of the Natural Area. Generally devegetation and lowering of the dune height may result in a breach of the primary dune. In 1982, this beach access was realigned away from the northeast.

SWIMMING MANAGEMENT

An alternative for the present swimming access for the Ocean House is a boardwalk constructed over the dune. There was previously a boardwalk in this location, but it was completely washed out by a storm in 1962. In accordance with DEP's policy on Coastal Resources (N.J.A.C. 7:7E-7.11) non-structural solutions to erosion problems are preferred over structural solutions. Non-structural measures include sand fencing, revegetation, addition of non-toxic appropriately sized material, and pedestrian and motor vehicle control. These non-structural measures are encouraged unless it can be demonstrated that they are unfeasible and impracticable.

Swimming will not be permitted in the Northern Natural Area with the exception of swimming by residents and guests at the Ocean House.

PUBLIC ACCESS

Public access in the Natural Area has been restricted. The only direct access permitted has been for the purpose of fishing, interpretive use and research. All other non-motorized activities such as walking, jogging and bicycling have been restricted to the primary access road corridor.

Although it is the Department's policy to promote these activities, they do not serve the purposes of the natural area and must, therefore, be evaluated as non-conforming uses.

PUBLIC ACCESS MANAGEMENT

It is the Department of Environmental Protection's policy to promote walking, jogging, bicycling, adjacent to the waterfront and to provide for access to the waterfront to the maximum extent practicable (N.J.A.C. 7:7E-8.13).

Non-motorized use, such as walking, jogging and bicycling will continue along the general access road corridor. In accordance with the Department's Policy on waterfront access (N.J.A.C. 7:7E-8.13) the ocean beach, seaward of the winter drift line, will be accessible to the general public for walking, jogging, sitting and viewing. Access for these activities will be from the recreational beach south of the Natural Area, through the northern boundary fence and the beach access paths at Two-Bit Road and the maintenance area.

The State Park Service in coordination with the Office of Natural Lands Management shall post the landward limit of pedestrian traffic along the ocean beach, seaward of the winter drift line/dune toe area, ever 1,000 feet.

FISHING USE

Surf fishing is the only recreational use, of those allowed by Natural Area Rules, that has been open to the public in the Northern Natural Area. Admission to the Natural Area for fishing has been in the off season only. The fishing takes place along the water's edge on the ocean beach which is tolerant of the low levels of use that have been allowed and has not conflicted with research or interpretive uses. The access for fishing has taken two forms both of which involve motor vehicle use in the Natural Area and both in the off-season only (see Motor Vehicle Use).

Several paths on the dunes are evidence that some pedestrians stray from the designated routes, and the devegetated paths are perpetuated by repeated use. Those paths which cross the primary dune can lead to blowout formations and increased potential for storm damage.

FISHING MANAGEMENT

Use of the ocean beach for fishing during the entire year is a permitted recreational use in the Natural Area. Motor vehicle parking for fishing purposes at Two-Bit Road and the maintenance area beach access parking area, FI., will be allowed by permit only (see motor vehicle use "Parking and Beach Access permits"). Walkon access through the recreational zone and the northern boundary fence will be permitted all year.

Impacts of pedestrian traffic on the dune system could be lessened by the construction of boardwalk crossings over the primary dune. The Coastal Resource Development Policy - Coastal Engineering (N.J.A.C. 7:7E-7.11) states that non-structural solutions to shoreline erosion problems are preferred over structural solutions; that the unfeasibility and impracticality of a non-structural solution must be demonstrated before structural solutions may be deemed acceptable; and that dune restoration and maintenance projects as a non-structural shore protection measure, including sand fencing, revegetation, additions of non-toxic appropriately sized material, control of pedestrian and vehicular traffic, are encouraged. Pursuant to this policy, alternatives to boardwalk crossings will be used in the Natural Area.

The impacts of beach access can be reduced considerably by confining foot traffic to one access point at Two-Bit Road and the beach access at the maintenance area. Both of these access points should be defined by Park Service Staff and stabilized by snowfence angled away from the northeast to restrict pedestrians from straying. After use has been restricted to one path, dune building and stabilization techniques, such as snow fencing to trap sand, beach grass planting and fertilization can be employed to repair existing damage. The beach access paths at Two-Bit Road and the maintenance area will be defined and stabilized by snowfence angled southeast by the Park Service within two years of the adoption of this plan.

MOTOR VEHICLE USE

The use of motor vehicles in the Northern Natural Area is primarily for access to the Natural Area and the State Park in general. Motor vehicle use can be divided into four forms of access: primary or general access to the entire Park; conventional vehicle or secondary dune access; 4-wheel drive vehicle or beach access; and administrative access. Each form of access has its particular impacts on the Natural Area.

1. Primary Access and Parking. The general public gains access to the Natural Area and the remainder of Island Beach State Park via the primary access road. For those engaged in interpretive study of the natural area, parking is provided at the nature center. This road and these parking areas serve the purpose of the Natural Area and are, therefore, conforming.

The primary access road and the nature center parking lot are located in the most stable area of the barrier island. The pavement at this location does not interfere with dune processes. It prevents further erosion and vegetation damage from traffic.

2. Conventional Vehicle Access. Conventional vehicles can drive in and park along Two-Bit Road or park at the improved parking area, FI, across from the maintenance facility.

Two-Bit Road is a gravel road extending from the primary access road into the secondary dune zone. The gravelled surface minimizes the potential for wind erosion of the underlying sand and enables regular motor vehicles to traverse this loose sandy area. Two-Bit Road and parking area FI, provide the only parking in the natural area for public access in conventional vehicles, but the area often becomes over-crowded. As an access road for public, Two-Bit Road does not serve the purpose of a natural area and, therefore, is non-conforming.

3. 4-Wheel Drive Vehicle Access. Fishermen may obtain a special beach buggy permit allowing properly licensed vehicles with 4-wheel drive capacity to gain access to the beach. The present use policy, similar to that adopted at the Cape Cod National Seashore, restricts 4-wheel drive vehicles to one designated access trail, Gillikins Road. From Gillikins Road 4-wheel drive vehicles can travel the beach south for one mile to the southern boundary of the Northern Natural Area during the off-season. Driving directly on the dunes is restricted at all times in all of Island Beach State Park (other than on Gillikins Road). Use of this road by 4-wheel drive vehicles is a non-conforming use because it does not serve the purpose of the Natural Area, but does allow fishermen access (see section on Fishing Management).

The data in this section concerning the impacts of motor vehicle use on the dunes and the beach is limited to studies of other barrier islands. These studies often identify the necessity for site specific impact assessment due to the variability of these sites. Therefore, the

impacts discussed can only be assumed since specific studies on traffic impacts were not conducted at Island Beach.

4. Administrative Access. Motor vehicle operation for administrative purposes, maintenance and patrol, entails a very low level of use. However, it is enough to keep the existing roads devegetated. The impacts experienced at the other roads having public use are not experienced at those roads used for Administrative access only (Boundary Fence Road, Reeds Road and the entire length of the ocean beach). Administrative use has not been found to cause road widening or dune displacement.

MOTOR VEHICLE MANAGEMENT

The use of the primary access road for access to Island Beach by the general public will continue as will the use of the nature center parking lot.

Expansion of the primary access road or expansion of the nature center parking lot to better serve the purposes of the Natural Area, will be determined by the Director of the Division upon recommendation from Park Service staff and the advice of the Office of Natural Lands Management and the Natural Areas Council.

Access to the ocean beach and parking for fishing purposes will continue as a non-conforming use in a Class I area at Two-Bit Road and at parking area FI during the entire year. Elimination of the use of Two-Bit Road for fishermen access and parking would result in a significant loss of fishing use and would not significantly change the impact of the road itself. If access were not eliminated but reduced to the number of vehicles that can be accommodated by the existing parking facilities, the potential for impacts related to over capacity at the FI parking area could be eliminated. Two-Bit Road also provides the only administrative access to the boundary fence for surveillance and maintenance.

Parking by permit will be limited by Park Service Staff to the present capacity of these two areas: 30 vehicles along Two-Bit Road and 14 vehicles in parking area FI. Temporary color coded parking and beach access permits will be issued and collected at the main entrance gate on a first-come, first-served basis. Both Two-Bit Road and parking area FI will be posted within 6 months of Management Plan adoption indicating that parking is by permit for fishing purposes only and that permits are available at the main entrance gate.

Off-season access to the ocean beach for fishing by holders of annual or 72 hour permits will continue as a non-conforming use. Access will continue to be through Gillikins Road to the beach and from that point south.

The use of Gillikins Road impacts the ocean beach, the primary dune, and the secondary dunes, where the road intersects these zones. However, most of the impacts are not immediately evident to the casual observer and

are assumed to be short term on the forebeach. Data concerning the impact of 4-wheel drive vehicles on the beach wildlife does not exist. It has been observed that the unvegetated and ungravelled sand of Gillikins Road is subject to wind erosion and difficult driving conditions. The height of the primary dune has been reduced by 4-wheel drive vehicular traffic and this increases the potential for overwash.

The downward displacement rate of the dune is directly related to the level of use. However, the impact could be lessened by the construction of a boardwalk crossing over the primary dune at a cost of \$10 a square foot as estimated by the National Park Service's study of Cape Lookout National Seashore. Realignment of the crossing away from the northeast, stabilization and grading to rebuild the necessary height, and a limitation of use levels would also keep impacts of downward displacement to a minimum and at a more reasonable cost. The limited use levels would still afford reasonable access for fishermen using 4-wheel drive vehicles.

The potential for the most significant impact relates directly to the recently documented sensitivity and importance of the winter drift lines and dune toe. Motor vehicles are not restricted from this area, and can interfere with the dune regeneration process (see Ocean Beach Zone Sensitivities) unless unusually high tides inundate the beach.

Elimination of 4-wheel drive vehicle use on the Ocean Beach and Gillikins Road may not necessarily eliminate impacts to the winter drift line and dune toe as long as motor vehicle operation for administrative purposes, maintenance and patrol is allowed to continue. The recovery of Gillikins Road would also be extremely slow without major renovation.

The general success experienced with the management of 4-wheel drive vehicle use at Cape Cod National Seashore provides evidence that an alternative to prohibiting all dune buggy use in these areas exists. The management of Cape Cod was directed at eliminating impacts on the sensitive and important winter drift line and the dune toe, not eliminating total access. The success of this type of management within the Natural Area would need to be determined by monitoring compliance and impacts.

To gain information on the amount of 4-wheel drive vehicle use that is taking place in the Natural Area, beach buggy permit holders will be required to complete and turn in a questionnaire concerning their use of the Northern Natural Area. Failure to comply would preclude that permit holder from being issued a permit for the remainder of the year (either a 72 hour pass or an annual pass) and the following year. State Park Service will realign Gillikins Road from the east to the southeast, in an effort to protect against artificial overwash, within two years of the adoption of this plan. The realignment plan will be coordinated with the Office of Natural Lands Management. No expansion of present 4-wheel drive vehicle use north of Gillikins Road will be allowed.

The use of motor vehicles by the State Park Service for administrative purposes will continue as a non-conforming use. Elimination of administrative use of Two-Bit Road and the Boundary Fence Road would

eliminate vital maintenance of the boundary fence and enforcement efforts resulting in possible increased impacts by pedestrians. The Fence Maintenance Road dune crossing will be realigned using snow fencing, and stabilized within two years.

The State Park Service in coordination with the Office of Natural Lands Management shall establish registration markers at each end of the Natural Area beach marking the North-South limits of travel and post the landward limit of travel, generally along the drift line/dune toe area, every 1,000 feet. All motor vehicle operation, administrative as well as public, will avoid the winter drift line and dune toe.

Pursuant to N.J.A.C. 7:2-11.7 and 8, the Department may further restrict or eliminate 4-wheel drive vehicle use if it becomes apparent that vehicles are having an adverse impact on the Natural Area, particularly the dune habitat, through documented observation or research. Documented observation will be by Park staff who shall patrol the entire length of the beach within the Natural Area a minimum of once each day during the off-season. Any infractions or suspected violations shall be reported by following procedures set by the State Park Service Law Enforcement Internal Records Systems (LEIRS). State Park Service will forward to the Office of Natural Lands Management those incident reports that pertain to the Natural Area. Reports should indicate the lineal extent of the violation and the observable effects on the dune and/or drift line. Further, after each major storm affecting the contour of the beach, the Park Superintendent shall submit a report of his general observations regarding erosion or overwash of the dune habitat to the Chief of the Bureau of Planning, Engineering and Maintenance with a copy to the Office of Natural Lands Management.

Finally, the Park Superintendent shall submit a report to the Office of Natural Lands Management once each year during the month of May, generally outlining his subjective evaluation of 4-wheel drive vehicle use and its effect on the beach and dune habitats.

The Office of Natural Lands Management shall evaluate the reports supplied by the Park staff and conduct an annual inspection of the beach and primary dune system, as well as the motor vehicle access points and walk-on trails for fishermen. Photos shall be taken of the same sites each year and staked reference points shall be examined for both vertical and horizontal change in the location of the toe of the primary dune. The Office shall prepare an evaluation, including recommendations, based on the reports and inspections for continued or revised use of the beach and access points. That evaluation shall be reviewed by the Director of the Division of Parks and Forestry and State Park Service staff. Thereafter, the New Jersey Beach Buggy Association, and other groups expressing an interest in beach use will be consulted for their views regarding the recommendations for the future. A final evaluation will then be presented to the Natural Areas Council for consideration and recommendation to the Department.

In addition to the general observations, State Park Service staff in cooperation with the Office of Natural Lands Management will collect data on dune and beach profiles in the Natural Area. The purpose of this data

collection is to compare that section of the ocean beach where 4-wheel drive vehicles are permitted, to a section of the ocean beach where they are not. The method by which dune and beach will be profiled is known as the modified Emery method (Emery, 1961). Data will be collected on a biweekly basis for one year, and more frequently to bracket storms or to follow the beach rebuilding process. This study will begin within six months from the adoption of this plan and the Office of Natural Lands Management will receive copies of data collection sheets on a monthly basis. Instruction on the use of the modified Emery method will be provided by the staff of the Division of Coastal Resources. The final conclusions of this data collection and other research projects which are generated, will serve as a basis for future ocean beach management.

Notwithstanding these reports, the Department encourages independent scientific research to be conducted in the Natural Area in order to monitor motor vehicle use and its effects on the fragile dune habitat. Such new research appears to be an appropriate project for institutions of higher education, particularly State colleges and universities. The investigation may be eligible for funding from the federal government. The procedures for applying to conduct research in the Natural Area shall be in accordance with N.J.A.C. 7:2-11.6.

At times, the area of beach available for 4-wheel drive vehicle use may become limited due to erosion, wave action, or extremely high tides. When such conditions prevail, which could lead to use of the beach landward of the drift line, the Park Superintendent may, at his discretion, temporarily close the Natural Area to vehicle use. This temporary closure may not exceed seven consecutive days without the approval of the Director of the Division.

DUNE MANAGEMENT

Management of the dunes in the Northern Natural Area has taken two forms: dune building and dune stabilization. Under certain conditions these practices can have a limiting impact on research or may mitigate impacts of existing uses to an acceptable level or repair impacts of terminated uses, thus serving the purposes of the Natural Area. Dune building when incorrectly practiced can create artificial dunes of an unnatural dimension which may thwart the overwash process, alter vegetation patterns (Leatherman, 1979, p. 93), and create other disruptions of the dynamic dune/beach system.

Dune stabilization has been done by planting and aerial fertilization of stands of beach grass. The affects of this planting and fertilizing on the natural distribution of the native vegetation within the Natural Area are unknown. This planting and fertilizing can have a direct impact on research projects relating to natural growth and distribution processes. The planting and fertilizing are, however, very effective in speeding up the recovery of damaged areas devegetated by recreational use, motor vehicle traffic or other disturbances.

Dune building and stabilization techniques have been used to repair major storm damage and dune breaches which threaten loss of or damage to the main access road and other structures in the Northern Natural Area. The serious consequences of allowing this type of damage to run its course preclude the termination of this practice on an emergency basis. All dune repairs and the techniques used must be recorded so that future research of the dune processes can account for these manipulations. Copies of reports of repair work should be filed with the Office of Natural Lands Management. The repair of damage is to be on a specific and finite basis as prescribed for each location (see Motor Vehicle Use, Swimming, Fishing).

Dune building or stabilization by such techniques as aerial fertilization, placement of snow fence, tires or debris, planting beach grass or Japanese sedge or any other practice intended to artificially induce or accelerate the growth of dunes will be terminated. Exceptions will be made for the repair of major storm damage and dune breaches threatening damage or loss of structures and the primary access road, the repair or renovation of areas damaged by uses which have been terminated, and the repair, realignment, stabilization, etc., prescribed for the Boundary Fence Maintenance Road crossing, the Two-Bit Road fishing access crossing, the Fishing access crossing at the maintenance facility, the Nature trail, and the Gillikins Road crossing.

INSECT CONTROL

With the acquisition of Island Beach by the State in 1953, insect control was established but was limited to control of the mosquito population. After 1958, measures to control biting flies greatly reduced the fly pest problem. Insect control in the Northern Natural Area involves the use of non-persistent pesticides to control populations of breeding mosquitoes and biting flies. These pesticides have been applied by various methods including hand spraying of specific breeding areas and aerial spraying of target areas.

The elimination of insect control measures for mosquitoes and biting fly populations in the Natural Area, because of the intensity of these pests, would create health and welfare problems for the State Park Service staff. It would also result in severe insect pest problems in the adjacent recreation zone and resort/residential areas, creating a social and economic burden.

Natural Areas Rules and Regulations allow legal mosquito control agencies to submit findings of significant mosquito nuisances and alternative control techniques for approval by the administering agency. In the Natural Area, the Office of Mosquito Control Coordination will coordinate mosquito pest control measures with the Division of Parks and Forestry.

The potential for adverse impacts on the ecological relationships of the Natural Area must be considered for the continuation of insect control. To minimize the potential for adverse impacts, techniques will be used that have a minimal effect on non-target species and have minimal effect on the

environment. Applications of insecticides used in control programs will be in accordance with manufacturers instructions or recommendations of the New Jersey Agriculture Experimental Station and will be in compliance with the regulations of the New Jersey State Bureau of Pesticides Control.

No physical manipulation of the marsh areas within the Natural Area for the control of insect pests will be permitted.

State Park Service shall prepare a report once each year during the month of October outlining the insect control measures used during the preceeding year, an evaluation of the success of these measures, an evaluation of the insect pest populations and those measures that are proposed for use in the next year. This report will be presented to the Natural Areas Council for consideration and recommendation to the Department.

APPENDICES

APPENDIX A

BIRDS OF ISLAND BEACHClass Aves

<u>Common Name</u>	<u>Scientific Name</u>	<u>Residence Status*</u>
Common Loon	<u>Gavia immer</u>	T-W
Red-Throated Loon	<u>Gavia stellata</u>	T-W
Horned Grebe	<u>Podiceps auritus</u>	T-W
Pied-billed Grebe	<u>Podilymbus podiceps</u>	R
Sooty Shearwater	<u>Puffinus griseus</u>	T
Greater Shearwater	<u>Puffinus gravis</u>	T
Wilson's Storm Petrel	<u>Oceanites oceanicus</u>	T
Leach's Storm Petrel	<u>Oceanodroma leucorhoa</u>	T
Eastern Brown Pelican	<u>Pelecanus occidentalis</u>	T
Double-crested Cormorant	<u>Phalacrocorax auritus</u>	T-W
Great Blue Heron	<u>Ardea herodias</u>	R
Green-backed Heron	<u>Butorides virescens</u>	T-S
Little Blue Heron	<u>Florida caerulea</u>	T-S
Cattle Egret	<u>Bubulcus ibis</u>	T-S
Great Egret	<u>Casmerodius albus</u>	T-S
Snowy Egret	<u>Leucophoyx thula</u>	T-S
Black-crowned Night Heron	<u>Nycticorax nycticorax</u>	T-S
Yellow-crowned Night Heron	<u>Nyctanassa violacea</u>	T-S
Least Bittern	<u>Ixobrychus exilis</u>	T-S
American Bittern	<u>Botaurus lentiginosus</u>	T-S

* Residence Status: resident, R; transient, T; summer, S; winter, W; and undetermined, U.

<u>Common Name</u>	<u>Scientific Name</u>	<u>Residence Status</u>
Glossy Ibis	<u>Plegadis falcinellus</u>	T-S
Mute Swan	<u>Cygnus olor</u>	R
Tundra Swan	<u>Olor columbianus</u>	T-W
Canada Goose	<u>Branta canadensis</u>	T-W
Brant	<u>Branta bernicla</u>	T-W
Snow Goose	<u>Chen caerulescens</u>	T-W
Mallard	<u>Anas platyrhynchos</u>	R
American Black Duck	<u>Anas rubripes</u>	R
Gadwall	<u>Anas strepera</u>	T-S
Pintail	<u>Anas acuta</u>	T
Green-winged Teal	<u>Anas crecca</u>	T
Blue-winged Teal	<u>Anas discors</u>	T-S
American Wigeon	<u>Anas americana</u>	T-W
Wood Duck	<u>Aix sponsa</u>	T-S
Redhead	<u>Aythya americana</u>	T-W
Canvasback	<u>Aythya valisineria</u>	T-W
Greater Scaup	<u>Aythya marila</u>	T-W
Lesser Scaup	<u>Aythya affinis</u>	T-W
Common Golden-eye	<u>Bucephala clangula</u>	T-W
Bufflehead	<u>Bucephala albeola</u>	T-W
Oldsquaw	<u>Clangula hyemalis</u>	T-W
White-winged Scoter	<u>Melanitta deglandi</u>	T-W
Harlequin Duck	<u>Histrionicus histrionicus</u>	U
Common Eider	<u>Somateria mollissima</u>	U

<u>Common Name</u>	<u>Scientific Name</u>	<u>Residence Status</u>
King Eider	<u>Somateria spectabilis</u>	U
Ruddy Duck	<u>Oxyura jamaicensis</u>	R
Surf Scoter	<u>Melanitta persipicillata</u>	T-W
Black Scoter	<u>Melanitta nigra</u>	T-W
Hooded Merganser	<u>Lophodytes cucullatus</u>	T-W
Red-breasted Merganser	<u>Mergus serrator</u>	T-W
Common Merganser	<u>Mergus merganser</u>	T-W
Turkey Vulture	<u>Cathartes aura</u>	R
Sharp-shinned Hawk	<u>Accipiter striatus</u>	T
Cooper's Hawk	<u>Accipiter cooperii</u>	R
Red-tailed Hawk	<u>Buteo jamaicensis</u>	R
Marsh Hawk	<u>Circus cyaneus</u>	R
Osprey	<u>Pandion haliaetus</u>	T-S
Peregrine Falcon	<u>Falco peregrinus</u>	R
Merlin	<u>Falco columbarius</u>	T
American Kestrel	<u>Falco sparverius</u>	R
Northern Bobwhite	<u>Colinus virginianus</u>	R
Ring-necked Pheasant	<u>Phasianus colchicus</u>	R
Clapper Rail	<u>Rallus longirostris</u>	R
King Rail	<u>Rallus elegans</u>	T-S
Virginia Rail	<u>Rallus limicola</u>	T-S
Sora	<u>Porzana carolina</u>	T
Common Moorhen	<u>Gallinula chloropus</u>	T
Purple Gallinule	<u>Porphyryula martinica</u>	T

<u>Common Name</u>	<u>Scientific Name</u>	<u>Residence Status</u>
American Oystercatcher	<u>Haematopus palliatus</u>	T-S
Semipalmated Plover	<u>Charadrius semipalmatus</u>	T
Piping Plover	<u>Charadrius melodus</u>	T-S
Killdeer	<u>Charadrius vociferus</u>	R
Lesser Golden Plover	<u>Pluvialis dominica</u>	U-T
Black-Bellied Plover	<u>Pluvialis squatarola</u>	T-W
Ruddy Turnstone	<u>Arenaria interpres</u>	T
American Woodcock	<u>Philohela minor</u>	T-S
Common Snipe	<u>Capella gallinago</u>	T
Whimbrel	<u>Numenius phaeopus</u>	T
Spotted Sandpiper	<u>Actitis macularia</u>	T-S
American Coot	<u>Fulica americana</u>	R
Willet	<u>Catoptrophorus semipalmatus</u>	T-S
Solitary Sandpiper	<u>Tringa solitaria</u>	T
Greater Yellowlegs	<u>Tringa melanoleucus</u>	T-W
Lesser Yellowlegs	<u>Tringa flavipes</u>	T
Red Knot	<u>Calidris canutus</u>	T
Purple Sandpiper	<u>Calidris maritima</u>	T-W
Pectoral Sandpiper	<u>Calidris melanotos</u>	T
Least Sandpiper	<u>Calidris minutilla</u>	T
Baird's Sandpiper	<u>Calidris bairdii</u>	U-T
White-rumped Sandpiper	<u>Calidris fuscicollis</u>	T
Dunlin	<u>Calidris alpina</u>	T-W
Short-billed Dowitcher	<u>Limnodromus griseus</u>	T

<u>Common Name</u>	<u>Scientific Name</u>	<u>Residence Status</u>
Long-billed Dowitcher	<u>Limnodromus scolopaceus</u>	T
Stilt Sandpiper	<u>Micropalama himantopus</u>	U-T
Semipalmated Sandpiper	<u>Calidris pusillus</u>	T
Western Sandpiper	<u>Calidris mauri</u>	T
Sanderling	<u>Calidris alba</u>	T-W
Hudsonian Godwit	<u>Limosa haemastica</u>	T-T
Wilson's Phalarope	<u>Steganopus tricolor</u>	U-T
Red Phalarope	<u>Phalaropus fulicarius</u>	U-T
Red-necked Phalarope	<u>Lobipes lobatus</u>	U-T
Pomarine Jaeger	<u>Stercorarius pomarinus</u>	U-T
Parasitic Jaeger	<u>Stercorarius parasiticus</u>	T
Long-tailed Jaeger	<u>Stercorarius longicaudus</u>	U
Great Black-backed Gull	<u>Larus marinus</u>	U
Iceland Gull	<u>Larus glaucoides</u>	U-W
Herring Gull	<u>Larus argentatus</u>	R
Glaucous Gull	<u>Larus hyperboreus</u>	U-W
Ring-billed Gull	<u>Larus delawarensis</u>	R
Laughing Gull	<u>Larus atricilla</u>	T-S
Bonaparte's Gull	<u>Larus philadelphia</u>	T-W
Black-legged Kittiwake	<u>Rissa tridactyla</u>	U
Common Tern	<u>Sterna hirundo</u>	T-S
Royal Tern	<u>Sterna maximus</u>	T
Least Tern	<u>Sterna albifrons</u>	S
Gull-billed Tern	<u>Gilochelidon nilotica</u>	U-S

<u>Common Name</u>	<u>Scientific Name</u>	<u>Residence Status</u>
Black Tern	<u>Chlidonias niger</u>	T
Sooty Tern	<u>Sterna fuscata</u>	T
Bridled Tern	<u>Sterna anaethetus</u>	T
Caspian Tern	<u>Sterna caspia</u>	T
Black Skimmer	<u>Rynchops nigra</u>	T-S
Dovekie	<u>Alle alle</u>	U-W
Thin-billed Murre	<u>Uria aalge</u>	U-W
Razorbill	<u>Alca torda</u>	U-W
Mourning Dove	<u>Zenaida macroura</u>	R
Yellow-billed Cuckoo	<u>Coccyzus americanus</u>	T-S
Black-billed Cuckoo	<u>Coccyzus erythrophthalmus</u>	U
Common Barn Owl	<u>Tyto alba</u>	R
Snowy Owl	<u>Nyctea scandiaca</u>	U-R
Long-eared Owl	<u>Asio otus</u>	R
Northern Saw-whet Owl	<u>Aegolius acadicus</u>	T-W
Short-eared Owl	<u>Asio flammeus</u>	R
Chuck-Will's-Widow	<u>Caprimulgus carolinensis</u>	T-S
Whip-Poor-Will	<u>Caprimulgus vociferus</u>	T-S
Common Nighthawk	<u>Chordeiles minor</u>	T-S
Chimney Swift	<u>Chaetura pelagica</u>	T-S
Ruby-throated Hummingbird	<u>Archilochus colubris</u>	T-S
Belted Kingfisher	<u>Megaceryle alcyon</u>	R
Northern Flicker	<u>Colaptes auratus</u>	R
Red-bellied Woodpecker	<u>Melanerpes carolinus</u>	T

<u>Common Name</u>	<u>Scientific Name</u>	<u>Residence Status</u>
Red-headed Woodpecker	<u>Melanerpes erythrocephalus</u>	T
Yellow-bellied Sapsucker	<u>Sphyrapicus varius</u>	T
Hairy Woodpecker	<u>Picoides villosus</u>	R
Downy Woodpecker	<u>Picoides pubescens</u>	R
Black-backed Woodpecker	<u>Picoides arcticus</u>	T
Eastern Kingbird	<u>Tyrannus tyrannus</u>	U
Western Kingbird	<u>Tyrannus verticalis</u>	U-T
Great Crested Flycatcher	<u>Myiarchus crinitus</u>	T-S
Eastern Phoebe	<u>Sayornis phoebe</u>	T-S
Yellow-bellied Flycatcher	<u>Empidonax flaviventris</u>	T-S
Acadian Flycatcher	<u>Empidonax virescens</u>	T
Least Flycatcher	<u>Empidonax minimus</u>	T
Eastern Wood Pewee	<u>Contopus virens</u>	T-S
Olive-sided Flycatcher	<u>Nuttallornis borealis</u>	T
Horned Lark	<u>Eremophila alpestris</u>	R
Tree Swallow	<u>Iridoprocne bicolor</u>	T-S
Bank Swallow	<u>Riparia riparia</u>	T
Norhtern Rough-winged Swallow	<u>Stelgidopteryx ruficollis</u>	T-S
Barn Swallow	<u>Hirundo rustica</u>	T-S
Cliff Swallow	<u>Petrochelidon pyrrhonota</u>	T
Purple Martin	<u>Progne subis</u>	T-S
Blue Jay	<u>Cyanocitta cristata</u>	R
Fish Crow	<u>Corvus ossifragus</u>	R

<u>Common Name</u>	<u>Scientific Name</u>	<u>Residence Status</u>
Black-capped Chickadee	<u>Parus atricapillus</u>	R
Carolina Chickadee	<u>Parus carolinensis</u>	R
Tufted Titmouse	<u>Parus bicolor</u>	R
White-breasted Nuthatch	<u>Sitta carolinensis</u>	R
Brown Creeper	<u>Certhia familiaris</u>	T-W
House Wren	<u>Troglodytes aedon</u>	T-S
Winter Wren	<u>Troglodytes troglodytes</u>	T
Bewick's Wren	<u>Thryomanes bewickii</u>	T
Carolina Wren	<u>Thryothorus ludovicianus</u>	R
Marsh Wren	<u>Cistothorus palustris</u>	T-S
Sedge Wren	<u>Cistothorus platensis</u>	T-S
Northern Mockingbird	<u>Mimus polygottos</u>	R
Gray Catbird	<u>Dumetella carolinensis</u>	T-S
Brown Thrasher	<u>Toxostoma refum</u>	T-S
American Robin	<u>Turdus migratorius</u>	R
Wood Thrush	<u>Hylocichla mustelina</u>	T-S
Hermit Thrush	<u>Catharis guttata</u>	T
Swainson's Thrush	<u>Catharis ustulatus</u>	T
Gray-cheeked Thrush	<u>Catharis minimus</u>	T
Veery	<u>Catharis fuscescens</u>	T
Eastern Bluebird	<u>Sialia sialis</u>	R
Blue-gray Gnatcatcher	<u>Polioptila caerulea</u>	T-S
Golden-crowned Kinglet	<u>Regulus satrapa</u>	T-W
Ruby-crowned Kinglet	<u>Regulus calendula</u>	T-W

<u>Common Name</u>	<u>Scientific Name</u>	<u>Residence Status</u>
Cedar Waxwing	<u>Bombycilla cedrorum</u>	R
Loggerhead Shrike	<u>Lanius ludovicianus</u>	U-T
Northern Shrike	<u>Lanius excubitor</u>	U-W
European Starling	<u>Sturnus vulgaris</u>	R
White-eyed Vireo	<u>Vireo griseus</u>	T-S
Yellow-throated Vireo	<u>Vireo flavifrons</u>	T
Bell's Vireo	<u>Vireo bellii</u>	T
Solitary Vireo	<u>Vireo solitarius</u>	T
Red-eyed Vireo	<u>Vireo olivaceus</u>	T-S
Philadelphia Vireo	<u>Vireo philadelphicus</u>	T
Warbling Vireo	<u>Vireo gilvus</u>	T
Black-and-White Warbler	<u>Mniotilta varia</u>	T-S
Prothonotary Warbler	<u>Protonotaria citrea</u>	T-S
Blue-winged Warbler	<u>Vermivora pinus</u>	T
Worm-eating Warbler	<u>Helmitheros vermivorus</u>	T
Golden-winged Warbler	<u>Vermivora chrysoptera</u>	T
"Brewster's" Warbler	<u>Vermivora leucobronchialis</u>	T-S
"Lawrence's" Warbler	<u>Vermivora Lawrencei</u>	T-S
Nashville Warbler	<u>Vermivora ruficapilla</u>	T
Virginia Warbler	<u>Vermivora virginiae</u>	T
Northern Parula	<u>Parula americana</u>	T
Yellow Warbler	<u>Dendroica petechia</u>	T-S
Tennessee Warbler	<u>Vermivora pergrina</u>	T
Orange-crowned Warbler	<u>Vermivora celata</u>	T

<u>Common Name</u>	<u>Scientific Name</u>	<u>Residence Status</u>
Magnolia Warbler	<u>Dendroica magnolia</u>	T
Cape May Warbler	<u>Dendroica tigrina</u>	T
Black-throated Blue Warbler	<u>Dendroica caerulescens</u>	T
Yellow-rumped Warbler	<u>Dendroica coroanta</u>	T-W
Black-throated Gray Warbler	<u>Dendroica nigrescens</u>	T
Black-throated Green Warbler	<u>Dendroica virens</u>	T
Blackburnian Warbler	<u>Dendroica fusca</u>	T
Cerulean Warbler	<u>Dendroica cerulea</u>	T
Yellow-throated Warbler	<u>Dendroica dominica</u>	T-S
Bay-breasted Warbler	<u>Dendroica castanea</u>	T
Blackpoll Warbler	<u>Dendroica striata</u>	T
Chestnut-sided Warbler	<u>Dendroica pensylvanica</u>	T
Pine Warbler	<u>Dendroica pinus</u>	T-S
Prairie Warbler	<u>Dendroica discolor</u>	T-S
Palm Warbler	<u>Dendroica palmarum</u>	T
Ovenbird	<u>Seiurus aurocapillus</u>	T-S
Northern Waterthrush	<u>Seiurus noveboracensis</u>	T
Louisiana Waterthrush	<u>Seiurus motacilla</u>	T
Kentucky Warbler	<u>Oporornis formosus</u>	T
Mourning Warbler	<u>Oporornis philadelphia</u>	T
Common Yellowthroat	<u>Geothlypis trichas</u>	T-S
Yellow-breasted Chat	<u>Icteria virens</u>	T-S
Hooded Warbler	<u>Wilsonia citrina</u>	T-S
Wilson's Warbler	<u>Wilsonia pusilla</u>	T

<u>Common Name</u>	<u>Scientific Name</u>	<u>Residence Status</u>
Canada Warbler	<u>Wilsonia canadensis</u>	T
American Redstart	<u>Setophaga ruticilla</u>	T-S
House Sparrow	<u>Passer domesticus</u>	R
Bobolink	<u>Dolichonyx oryzivorus</u>	T
Eastern Meadowlark	<u>Sturnella magna</u>	R
Red-winged Blackbird	<u>Agelaius phoeniceus</u>	R
Orchard Oriole	<u>Icterus spurius</u>	T-S
Rusty Blackbird	<u>Euphagus carolinus</u>	T-W
Common Grackle	<u>Quiscalas quiscula</u>	R
Brown-headed Cowbird	<u>Molothus ater</u>	R
Scarlet Tanager	<u>Piranga olivacea</u>	T-S
Summer Tanager	<u>Piranga rubra</u>	T
Northern Cardinal	<u>Cardinalis cardinalis</u>	T
Rose-breasted Grosbeak	<u>Pheucticus ludovicianus</u>	T-S
Black-headed Grosbeak	<u>Pheucticus melanocephalus</u>	T
Blue Grosbeak	<u>Guiraca caerulea</u>	T-S
Indigo Bunting	<u>Passerina cyanea</u>	T-S
Dickcissel	<u>Spiza ameriana</u>	U-W
Evening Grosbeak	<u>Hesperiphona vespertina</u>	T-W
Purple Finch	<u>Carpodacus purpureus</u>	T-W
Common Redpoll	<u>Carduelis flammea</u>	U-W
Pine Siskin	<u>Carduelis pinus</u>	U-W
American Goldfinch	<u>Carduelis tristis</u>	R
Rufous-sided Towhee	<u>Pipilo erythrophthalmus</u>	T-R

<u>Common Name</u>	<u>Scientific Name</u>	<u>Residence Status</u>
Lark Bunting	<u>Calamospiza melanocorys</u>	T
Ipswich Sparrow	<u>Passerculus sandwichensis</u>	T-W
Northern Oriole	<u>Icterus galbula</u>	T-W
Painted Bunting	<u>Passerina ciris</u>	T
House Finch	<u>Carpodacus mexicanus</u>	T-W
Savannah Sparrow	<u>Passerculus sandwichensis</u>	R
Grasshopper Sparrow	<u>Ammodramus savannarum</u>	T-S
Henslow's Sparrow	<u>Ammodramus henslowii</u>	T-S
Seaside Sparrow	<u>Ammospiza maritima</u>	R
Vesper Sparrow	<u>Poocetes gramineus</u>	R
Lark Sparrow	<u>Chondestes grammacus</u>	U-T
Northern Junco	<u>Junco hyemalis</u>	T-W
American Tree Sparrow	<u>Spizella arborea</u>	T-W
Chipping Sparrow	<u>Spizella passerina</u>	T-S
Clay-colored Sparrow	<u>Spizella pallida</u>	T
Field Sparrow	<u>Spizella pusilla</u>	R
White-crowned Sparrow	<u>Zonotrichia leucophrys</u>	T
White-throated Sparrow	<u>Zonotrichia albicollis</u>	T-W
Fox Sparrow	<u>Passerella iliaca</u>	T-W
Lincoln's Sparrow	<u>Melospiza lincolni</u>	T
Swamp Sparrow	<u>Melospiza georgiana</u>	R
Song Sparrow	<u>Melospiza melodia</u>	R
Lapland Longspur	<u>Calcarius lapponicus</u>	T-W

<u>Common Name</u>	<u>Scientific Name</u>	<u>Residence Status</u>
Snow Bunting	<u>Plectrophenax nivalis</u>	U-W
Sharp-tailed Sparrow	<u>Ammodramus caudacuta</u>	R
Harris' Sparrow	<u>Zonotrichia querula</u>	T

APPENDIX B

MAMMALS OF ISLAND BEACHClass Mammalia

<u>Common Name</u>	<u>Genus & Species</u>	<u>Family</u>
Opossum	<u>Didelphis marsupialis</u>	Didelphiidae
Masked Shrew	<u>Sorex cinereus</u>	Soricidae
Little Brown Myotis (bat)	<u>Myotis lucifugus</u>	Vespertilionidae
Eastern Cottontail Rabbit	<u>Sylvilagus floridanus</u>	Leporidae
Eastern Gray Squirrel	<u>Sciurus carolinensis</u>	Sciuridae
White-footed Mouse	<u>Peromyscus leucopus</u>	Cricetidae
Meadow Vole	<u>Microtus pennsylvanicus</u>	Cricetidae
House Mouse	<u>Mus musculus</u>	Muridae
Meadow Jumping Mouse	<u>Zapus hudsonius</u>	Zapodidae
Red Fox	<u>Vulpes fulva</u>	Canidae
Raccoon	<u>Procyon lotor</u>	Procyonidae
Weasel	<u>Mustela spp.</u>	Mustelidae
Mink	<u>Mustela vison</u>	Mustelidae

APPENDIX C

AMPHIBIANS AND REPTILES OF ISLAND BEACHClass Amphibia

<u>Common Name</u>	<u>Scientific Name</u>	<u>Family</u>
Fowler's Toad	<u>Bufo woodhousei fowleri</u>	Bufonidae
Southern Leopard Frog	<u>Rana utricularia</u>	Ranidae

Class Reptilia

<u>Common Name</u>	<u>Scientific Name</u>	<u>Family</u>
Snapping Turtle	<u>Chelydra serpentina</u>	Chelydridae
Eastern Mud Turtle	<u>Kinosternon subrubrum subrubrum</u>	Kinosternidae
Stinkpot	<u>Sternotherus odoratus</u>	Kinosternidae
Spotted Turtle	<u>Clemmys guttata</u>	Emydidae
Northern Diamondback	<u>Malaclemys terrapin terrapin</u>	Emydidae
Eastern Box Turtle	<u>Terrapene carolina carolina</u>	Emydidae
Atlantic Loggerhead	<u>Caretta caretta caretta</u>	Cheloniidae
Atlantic Green	<u>Chelonia mydas mydas</u>	Cheloniidae
Atlantic Ridley	<u>Lepidochelys kempfi</u>	Cheloniidae
Atlantic Hawksbill	<u>Eretmochelys imbricata imbricata</u>	Cheloniidae
Atlantic Leatherback	<u>Dermodochelys coriacea coriacea</u>	Cheloniidae
Northern Black Racer	<u>Coluber constrictor constrictor</u>	Colubridae
Eastern Hognose Snake	<u>Heterodon platyrhinos</u>	Colubridae
Red-bellied Snake	<u>Storeria occipitomaculata</u>	Colubridae

APPENDIX D

FISH OF ISLAND BEACH CLASS PISCES

<u>Common Name</u>	<u>Scientific Name</u>	<u>Family</u>
American Eel	<u>Anquilla rostrata</u>	Anquillidae
Atlantic Silverside	<u>Menidia menidia</u>	Atherinidae
Tidewater Silverside	<u>Menidia beryllina</u>	Atherinidae
Oyster Toadfish	<u>Opsanus tau</u>	Batrachoididae
Atlantic Needlefish	<u>Strongylura marina</u>	Belonidae
Striped Blenny	<u>Chasmodes bosquianus</u>	Blenniidae
Summer Flounder	<u>Paralichtys dentatus</u>	Bothidae
Windowpane	<u>Scophthalmus aquosus</u>	Bothidae
Smooth mouth Flounder	<u>Etropus microstomus</u>	Bothidae
Lookdown	<u>Selene vomer</u>	Carangidae
Crevalle Jack	<u>Caranx hippos</u>	Carangidae
Horse-eye Jack	<u>Caranx latus</u>	Carangidae
American Shad	<u>Alosa sapidissima</u>	Clupeidae
Blueback Herring	<u>Alosa aestivalis</u>	Clupeidae
Alewife	<u>Alosa pseudoharengus</u>	Clupeidae
American Menhaden	<u>Brevoortia tyrannus</u>	Clupeidae
Atlantic Herring	<u>Clupea harengus</u>	Clupeidae
Gizzard Shad	<u>Dorosoma cepedianum</u>	Clupeidae
Round Herring	<u>Etrumeus teres</u>	Clupeidae
Grubby	<u>Myoxocephalus aeneus</u>	Cottidae
Sheepshead Minnow	<u>Cyprinodon varienatus</u>	Cyprinodontidae
Banded Killifish	<u>Fundulus diaphanus</u>	Cyprinodontidae

<u>Common Name</u>	<u>Scientific Name</u>	<u>Family</u>
Mummichog	<u>Fundulus heteroclitus</u>	Cyprinodontidae
Striped Killifish	<u>Fundulus majalis</u>	Cyprinodontidae
Rainwater Killifish	<u>Lucania parva</u>	Cyprinodontidae
Roughtail Stingray	<u>Dasyatis centroura</u>	Dasyatidae
Striped Burrfish	<u>Chilomycterus schoepfi</u>	Diodontidae
Spotted Burrfish	<u>Chilomycterus atinga</u>	Diodontidae
Bay Anchovy	<u>Anchoa mitchilli</u>	Engraulidae
Pollock	<u>Pollachius virens</u>	Gadidae
Red Hake	<u>Urophycis chuss</u>	Gadidae
Fourspine Stickleback	<u>Apeltes quadracus</u>	Gasterosteidae
Threespine Stickleback	<u>Gasterosteus aculeatus</u>	Gasterosteidae
Naked Goby	<u>Gobiosoma bosci</u>	Gobiidae
Tautog	<u>Tautoga onitus</u>	Labridae
Cunner	<u>Tautogolabrus adspersus</u>	Labridae
White Mullet	<u>Mugil curena</u>	Mugilidae
Striped Mullet	<u>Mugil cephalus</u>	Mugilidae
White Perch	<u>Morone americana</u>	Percichthyidae
Striped Bass	<u>Morone saxatilis</u>	Percichthyidae
Winter Flounder	<u>Pseudopleuronectes americanus</u>	Pleuronectidae
Bluefish	<u>Pomatomus saltatrix</u>	Pomatomidae
Black Drum	<u>Pogonias cromis</u>	Sciaenidae
Spot	<u>Leiostomus xanthurus</u>	Sciaenidae
Northern Kingfish	<u>Menticirrhus saxatilis</u>	Sciaenidae
Silver Perch	<u>Bairdiella chrysura</u>	Sciaenidae

<u>Common Name</u>	<u>Scientific Name</u>	<u>Family</u>
Weakfish	<u>Cynoscion regalis</u>	Sciaenidae
Red Grouper	<u>Epinephelus morio</u>	Serranidae
Hogchoker	<u>Trinectes maculatus</u>	Soleidae
Butterfish	<u>Peprilus triacanthus</u>	Stromateidae
Northern Pipefish	<u>Syngnathus fuscus</u>	Syngnathidae
Lined Seahorse	<u>Hippocampus erectus</u>	Syngnathidae
Northern Puffer	<u>Sphoeroides maculatus</u>	Tetraodontidae
Northern Searobin	<u>Prionotus carolinus</u>	Triglidae

As compiled by Charles B. Wurtz, La Salle College, 1969.

APPENDIX E

SHELLS OF ISLAND BEACH

<u>Common Name</u>	<u>Scientific Name</u>
False Angel Wing	<u>Petriocola pholadiformis</u>
Blood Ark	<u>Anadara ovalis</u>
Transverse Ark	<u>Anadara transversa</u>
Chestnut Astarte	<u>Astarte castanea</u>
Gem Shell	<u>Gemma gemma</u>
Common Razor Clam	<u>Ensis directus</u>
Ribbed Pod	<u>Siliqua costata</u>
Surf Clam	<u>Spisula solidissima</u>
Veiled Clam	<u>Solemya velum</u>
Little Green Razor Clam	<u>Solen viridis</u>
Soft-shell Clam	<u>Mya arenaria</u>
Stout Tagelus	<u>Tagelus plebeius</u>
Oyster Drill	<u>Urosalpinx cinerea</u>
Thick-lipped Oyster Drill	<u>Eupleura caudata</u>
Jingle Shell	<u>Anomia simplex</u>
Baltic Macoma	<u>Macoma balthica</u>
Ribbed Mussel	<u>Modiolus demissus</u>
Blue Mussel	<u>Mytilus edulis</u>
Common Oyster	<u>Crassostrea virginica</u>
Solitary Glassy Bubble	<u>Haminoea solitaria</u>
Common Periwinkle	<u>Littorina littorea</u>
Gulf Periwinkle	<u>Littorina irrorata</u>
Rough Periwinkle	<u>Littorina saxatilis</u>

Common Name

Scientific Name

Quahog

Mercenaria mercenaria

Bay Scallop

Aequipecten irradians

Common Shipworm

Teredo navalis

Common Slipper Shell

Crepidula fornicata

Flat Slipper Shell

Crepidula plana

Lobed Moon Shell

Polinices duplicatus

Northern Moon Shell

Lunatia heros

Coffee-bean Snail

Melampus coffeus

Mud Dog Whelk

Nassarius obsoletus

New England Dog Whelk

Nassarius trivittatus

Dwarf Tellin

Tellina agilis

Channeled Whelk

Busycon canaliculatum

Knobbed Whelk

Busycon carica

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Glossary

Most of the terms provided in this glossary have been reproduced without modification from Gares (1972).

ACCRETION - May be either NATURAL or ARTIFICIAL. Natural accretion is the buildup of land, solely by the action of the forces of nature, on a BEACH by deposition of waterborne or airborne material. Artificial accretion is a similar buildup of land by reason of an act of man, such as the accretion formed by a groin, breakwater, or beach fill deposited by mechanical means. Also AGGRADATION.

BACKDUNE - Dune ridge immediately landward of the foredune.

BACKSHORE - That zone of the beach lying between the foreshore and the foredune and acted upon by waves only during severe storms, especially when combined with exceptionally high water.

BAR - A generally submerged embankment of sand, gravel, or other unconsolidated material built on the sea floor in shallow water by waves and currents.

BARRIER ISLAND - Similar to a barrier beach but with multiple ridges, dunes, vegetated zones, and marsh terraces which extend into the lagoon. In addition, it is commonly detached from the mainland by inlets.

BEACH FACE - The section of the beach normally exposed to the action of the wave uprush and backwash. The foreshore of a beach.

BEACH WIDTH - The horizontal dimension of the beach as measured from the water's edge to the base of the foredune.

BERM - A nearly horizontal part of the beach or backshore formed by the deposit of material by wave action. Some beaches have no berms, others have one or several.

BLOWOUT - A vegetation-free hollow formed by wind erosion on a pre-existing dune or other sand deposit.

CARRYING CAPACITY (VISITORS) - The total number of people that can be sustained on a given land area. Usually described in terms of a minimum area necessary per person.

DELTA - An alluvial deposit, roughly triangular or digitate in shape, formed at a river mouth or inlet.

DRIFT LINE - A line near the limit of storm wave uprush marking the landward limit of debris deposits.

DUNE CREST - The point or line where the dune's highest elevation is located.

DUNE SCARP - Located on the seaward side of the foredune. An almost vertical slope along the dune caused by wave erosion.

DUNES - (1) Ridges or mounds of loose, wind-blown material, usually sand.

EQUILIBRIUM - A least-work, equal area energy expenditure condition for a land system characterized by imperceptible, short-term physical changes.

EROSION - The wearing away of land by the action of natural forces. On a beach, the carrying away of beach material by wave action, tidal currents, littoral currents, or by deflation.

FLOOD - A general and temporary condition of partial or complete inundation of normally dry land areas.

FLOOD TIDAL DELTA - Accumulation of sediment, generally sub-aqueous, located at the bayside end of an inlet.

FOREDUNE - The front dune immediately behind the BACKSHORE.

FORESHORE - The part of the shore lying between the crest of the seaward berm (or upper limit of wave wash at high tide) and the ordinary low water mark, that is ordinarily traversed by the uprush and backrush of the waves as the tides rise and fall.

INLET - (1) A short, narrow waterway connecting a bay, lagoon, or similar body of water with a large parent body of water. (2) An arm of the sea (or other body of water) that is long compared to its width, and may extend a considerable distance inland.

MEAN HIGH WATER (MHW) - The average height of the high waters over a 19-year period. For shorter periods of observations, corrections are applied to eliminate known variations and reduce the results to the equivalent of a mean 19-year value. All high water heights are included in the average where the type of tide is either semi-diurnal or mixed. Only the higher high water heights are included in the average where the type of tide is diurnal. So determined, mean high water in the latter case is the same as mean higher high water.

MEAN LOW WATER (MLW) - The average height of low waters over a 19-year period. For shorter periods of observations, corrections are applied to eliminate known variations and reduce the results to the equivalent of a mean 19-year value. All low water heights are included in the average where the type of tide is either semi-diurnal or mixed. Only lower low water heights are included in the average where the type of tide is diurnal. So determined, mean low water in the latter case is the same as mean lower low water.

MESIC - Of sites or habitats characterized by intermediate moisture conditions, i.e., neither decidedly wet (Hygric) nor decidedly dry (Xeric).

OFF-SEASON - That period of the year which is not the primary recreational period in State Parks; the period falling between Labor Day and the Memorial Day of the following year.

OVERWASH - That portion of the uprush that carries over the crest of a berm, a dune, or of a structure.

OVERWASH FAN - Gently sloping, conical accumulation of sediment deposited landward of the beach by overwash processes that result from storm wave activity.

PRIMARY DUNE - See FOREDUNE.

SECONDARY DUNE - Second dune ridge located landward of the primary dune - see also backdune.

SEDIMENT - The loose material forming the beach and dune which is composed of different sized particles derived primarily from rocks. The sediment may be transported in the beach environment both by water and by wind.

SPIT - A small point of land or a narrow shoal projected into a body of water from the shore.

SWASH - The rush of water up onto the beach face following the breaking of a wave.

TIDAL RANGE - The difference in height between consecutive high and low (or higher high and lower low) waters.

XERIC - Of site or habitats characterized by decidedly dry conditions.

