

SURVEILLANCE OF THE PRIMARY DUNE AND BEACH SHORELINE

OF

ASSATEAGUE STATE PARK

JUNE 1965 - JANUARY 1971

by

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"PLEASE DO NOT DESTROY --- PROPERTY OF
NATURAL RESOURCES MANAGEMENT DIVISION
ASSATEAGUE ISLAND NATIONAL SEASHORE"

INTRODUCTION

On June 7, 1965, the Maryland Geological Survey in cooperation with the Department of Forests and Parks, as part of its Statewide tidal erosion surveillance program, initiated a survey of Assateague State Park dune and beach shoreline development and stability.

Primary plans for the new Ocean State Park called for construction of a primary dune to replace the one completely destroyed by the storm of March 6-8, 1962. During the fall of 1964 the first standard sand fence was erected along most of the 10,400 feet of park shoreline and 200 feet landward of mean high tide. During the fall of 1965 a second fence was erected 20 to 21 feet eastward of the first fence. A third sand fence was erected in the spring of 1966 about 15 feet westward of fence 2 and after substantial sand had accumulated between fences 1 and 2.

In order to measure the seasonal growth of the primary sand dune, a survey baseline was established during June 7-11, 1965, about 600 feet inland paralleling the Ocean. Construction of park facilities necessitated abandonment of this temporary baseline and establishing a new one on August 15, 1968 along the top of the newly formed primary dune. Baseline profiles indicate that development of the primary dune, through the use of sand fences supplemented by planting of beach grass, has been excellent. Average elevation along the top fence line is 14.5 feet. Only the top of fence No. 3 is visible and beach grass has widened the dune eastward an average of 30 feet. Westward of the dune, along a fenced zone about 100 feet width, plantings of beach grass have increased the elevation of the western slope of the dune by an average of 3 feet.

Mean high tide line has maintained an overall stable position over the period June 1965 to January 1971. The Maryland coastline has fortunately not experienced any extreme climatic conditions since the March 1962 storm.

SURVEY DATA

Base line No. 1 - Profiles

Established June 7-11, 1965

This base line was marked by 10 steel fence posts, extending from north to south Park boundaries, ranging from 630 to 1,860 feet apart. The location of the posts and profiles are shown on map 1 (May 6, 1962 aerial survey map) accompanying this report. An elevation survey was made from "Greiner" monument 18, 9.968 feet above mean sea level to all 10 fence posts. The number and date of profiles surveyed from base line No. 1 are hereby listed:

<u>Baseline Post No.</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>
2			July 13
3	June 10	June 16	July 13
7	June 11	June 15	July 13
8	Sept. 3	June 15	
9	Sept. 3		
10	June 11		

The profile cross sections, excepting No. 2, July 13, 1967, for the above listed dates are shown on Figure 1. Principally due to attrition of the base line bench marks, only profiles 3 and 7 show the time sequence development of the primary dune. During the July 13, 1967 survey, fence No. 1 was completely covered and No. 2 almost covered. These profiles also show that widening of the dune eastward was greater than the buildup on the western slope of the dune. The scope and detail of the field survey data for 1965, 1966 and 1967 is not sufficient to

differentiate quantities of sand derived from landward and seaward sources. Prior to establishment of the beach grass the principal direction and sand source was landward rather than from beach sources. On July 13, 1967 fence No. 3 was exposed 2 to 3 feet, making general dune height about 12 feet.

Base line No. 2 - Profiles

Established August 15, 1968

This base line is marked by five 6 inch diameter poured concrete posts, emplaced $3\frac{1}{2}$ feet deep, one foot exposed. A circular, bronze $3\frac{3}{4}$ inch diameter Maryland Geological Survey marker was set at the top of the poured concrete post. The posts were set immediately on the west side of primary dune fence No. 3. Post No. 1 is 1,957 feet south of the northern Park boundary and No. 5 is 1,077 feet north of the southern Park boundary. The distance between posts ranges from 1,524 to 2,259 feet. Location of these base line markers is shown on the accompanying May 6, 1962 aerial survey map. Elevation of each base line mark was surveyed from "Greiner" monument 18 (9.968 feet above mean sea level datum). Because of sand deflation, base line marker No. 3 was exposed over 3 feet and was in a leaning position on August 13, 1970. The post on that date was relocated eastward 5.6 feet of dune fence No. 3. to date this is the only relocation of the markers, due either to sand deflation or to covering.

In addition to the concrete base line markers, timber poles of the north and south Park boundary line fences that are on alignment with dune fence No. 3 are being utilized as base line markers. Thus,

currently seven base line profiles are being surveyed. The number and date of profiles surveyed from base line No. 2 to date are hereby listed:

Base line Post No.	1968	1969	Winter 1970	Summer	Winter 1971
North Boundary		Aug. 15	Jan. 26	Aug. 13	Jan. 27
1	Aug. 16	Aug. 14	Jan. 26	Aug. 12	Jan. 26
2	Aug. 16	Aug. 14	Jan. 26	Aug. 12	Jan. 26
3	Aug. 16	Aug. 14	Jan. 26	Aug. 13	Jan. 25
4	Aug. 16	Aug. 14	Jan. 26	Aug. 12	Jan. 25
5	Aug. 16	Aug. 14	Jan. 26	Aug. 13	Jan. 25
South Boundary		Aug. 15	Jan. 27	Aug. 13	Jan. 25

Comparison of the locations (map 1) of the first and second base line profiles shows that only No. 8 of the first and No. 4 of the second are close enough (130 feet) to each other for relative comparison over the period September 3, 1965 to January 25, 1971. Comparing development of base line No. 2 profiles, as shown on Figure 2, shows progressive growth of the primary dune, principally on the ocean side. Profiles 3 and 4 have shown the greatest growth. The west side of the primary dune along the planted beach grass zone has undergone varying degrees of accretion and erosion. This irregular development pattern, lying immediately west of the fence dune may be attributed to a) the irregular pre-existing dune topography, b) construction of camping site facilities and roads and c) an irregular growth of emplaned beach grass. This inland beach grass zone west of the dune, as it becomes mature and dense, may greatly reduce movement of sand eastward to the fenced part of the dune.

The zone of beach grass seaward of the dune fence area has widened to an average of 30 feet and, because of the uniformity of beach topography, has developed uniformly along the entire Park ocean front. Future development of this beach grass zone will depend largely upon the beach area as a source of sand.

The fences have done their part in establishing the dune, and beach grass has supplemented and amplified the fence's efforts. The initial three fences can only help to anchor the dune but their dune building abilities are over, the beach grass has taken over, as shown by the profile cross sections.

Beach Zone Survey Data

Profiles in every case were surveyed to the mean high tide line as estimated for the day of the survey, which obviously is a datum plane of great variability. Even so, the profiles surveyed to this datum do not show any net accretion or erosion along the State Park ocean front.

A local potential weak area is the beach immediately adjacent to the State Park's north boundary. The State's dune system at the north does not merge with a comparable dune. In other words, it may be possible for the State's northern dune and boundary to be flanked by extreme high tide and wave. The southern boundary of the Park does merge with a near comparable dune system; therefore, this area is in much better shape than the north boundary dune area.

SHORELINE CHANGES

Ocean City Inlet to State Park, 1849-1965

To better understand possible future shoreline changes of the Park and the beach north to Ocean City Inlet, we should review past recorded shoreline changes.

Map 2 shows the shoreline from Ocean City south to the southern boundary of the State Park for the periods 1849-50, 1933, 1964 and 1965.

Due in part to the Ocean City Inlet, crested by the August, 1933 hurricane, and stabilized by the U.S. Corps of Engineers with jetties, the northern section of Assateague Island has receded westward at an accelerated pace. The upper two mile section has undergone the most change, a maximum recession of about 1,700 feet since 1933, the March 1962 storm contributing greatly to the change.

Annual net littoral drift movement is southward along Maryland's coast; however, because of Ocean City Inlet, the movement of sand is interrupted to the advantage of Ocean City and the detriment of the northern end of Assateague Island. Although the inlet has contributed to the rapid migration of the upper two miles of Assateague Island westward, the State Park 6 miles south of the inlet has not been materially affected. Since 1849 the upper third of the Park shoreline has receded a maximum of 300 feet, and the southern two thirds of the Park shoreline has been stable.

The Park shoreline has a "healthy look", as does the shoreline south of the Park. The shoreline northward to the inlet (now in federal ownership), especially the upper two miles, is questionable as to its "health". The State Park beach area is dependent in large measure for its net supply of sand on the Island all the way to the inlet. It must be acknowledged that the offshore is a potential supplier of unknown amounts of sand that eventually find their way up onto the beach. During the summer months the prevailing winds and waves create an along shore current that carries the littoral drift northward. Winter winds

reverse this order. In other words, in the State Park beach area, littoral drift seasonally moves back and forth, the net remaining quantity enough to maintain a "healthy look".

If for some reason the net drift should change to a lesser amount, the State Park shoreline will cease to be "healthy" and will begin to receded. The present stability of the State Park beach could be threatened if an inlet were to open at a weak point, such as that area $2\frac{1}{2}$ miles north of the State Park boundary. The lack of an adequate dune system to the north certainly increases the possibility.

PROTECTIVE ADEQUACY OF THE PRIMARY DUNE

It has already been stated that the State Park, dune-beach shoreline has a "healthy look", but what does this mean in terms of strength or protective ability of the primary dune against extreme forces of nature? To be realistic, it is not simply the primary dune against the onslaught of wave and tide, but the combination of beach or beach berm in front of the dune plus the dune. A protective beach is classed by the U.S. Army Corps of Engineers as "a shore-protection structure". A beach of adequate width is an essential part of a protective dune system. The U.S. Army Corps of Engineers, in their report on the devastating effects of the March, 1962 storm, discussed and presented emergency shore protection plans. They stated, "protection should at least defend the backshore from a storm of violence to be expected statistically at a given locality once each ten years, i.e., a ten-year storm. The 10-year storm could be expected to have a duration of not over one day at peak violence. A 10-year storm of one day duration would be at a level near +8.0 feet above mean low water for a total of 5 hours; the higher portions of the beach and toe of the

dunes, where existent, would be brought under attack for about 5 hours". Considering all past recorded data of storms and hurricanes and through tank tests, an emergency dune-beach protection plan was evolved. The plan called for a dune of +12 feet above MLW, with a 20 foot wide dune crest, a seaward near level berm of 50 feet fronted by a beach of 1:20 slope out a distance of 200 feet to 0 feet MLW.

Inspection of this report's Figures 1 and 2 show that Park dune crest varies from 50 to 80 feet width at average height of 14-15 feet above mean sea level. To convert to height above MLW, a factor of 1.19 or 1.2 feet must be added to MSL, thus making the present dune about 16 feet above MLW. The beach berm in front of the dune averages 8 feet above MSL or 9 feet MLW, and 100 to 150 feet width.

The U.S. Army Corps of Engineers also recommends that a long-term protection plan should protect against major hurricane attacks. The long-term system should point toward a dune elevation of +16 feet above MLW, the crown width of dune to 25 feet and the seaward berm width to 100 feet.

Thus, based upon present Park dune beach berm dimensions, the system should be of adequate protection against a "10 year storm", and hopefully be adequate against a "standard" hurricane. The August, 1933 hurricane can be classed as a 5-10 year storm. The March, 1962 storm, based upon frequency of tide height, is estimated to be a 50 year storm. If only the tide height of the March, 1962 storm occurs, it, coupled with the expected wave heights, could most likely be weathered by the present dune-beach berm, but not a recurrence of the identical forces of the March, 1962 storm.

Assateague State Park beach and dune system sets an example of what is needed along portions of Ocean City beach. A prime site of concern at Ocean City is the lack of beach at 15th Street. At times high tide washes under the boardwalk. The U.S. Army Corps of Engineers in their forthcoming report on the Maryland Atlantic Coast, will present plans for protection of the Ocean City beach.

RECOMMENDATIONS

Since 1964, the efforts of man and nature have combined to produce a primary dune system of excellent proportion in height and breadth. The dune is termed "primary" but in essence it is the only continuous protective dune system for the Park's landward facilities. Therefore, maximum effort should be made for continuation of development and buildup of the dune to a height and width commensurate with the ability of natural forces and needs of the Park.



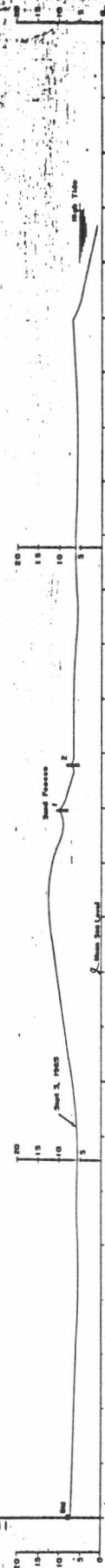
PROFILE 3



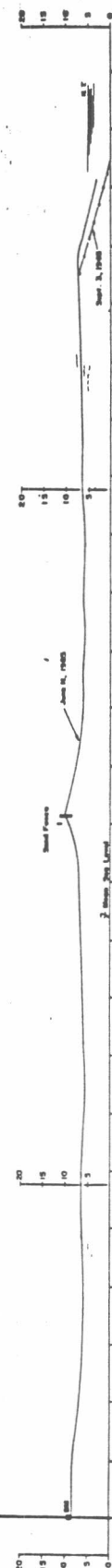
PROFILE 7



PROFILE 8



PROFILE 9



PROFILE 10
ASSATEAGUE STATE PARK
Profiles

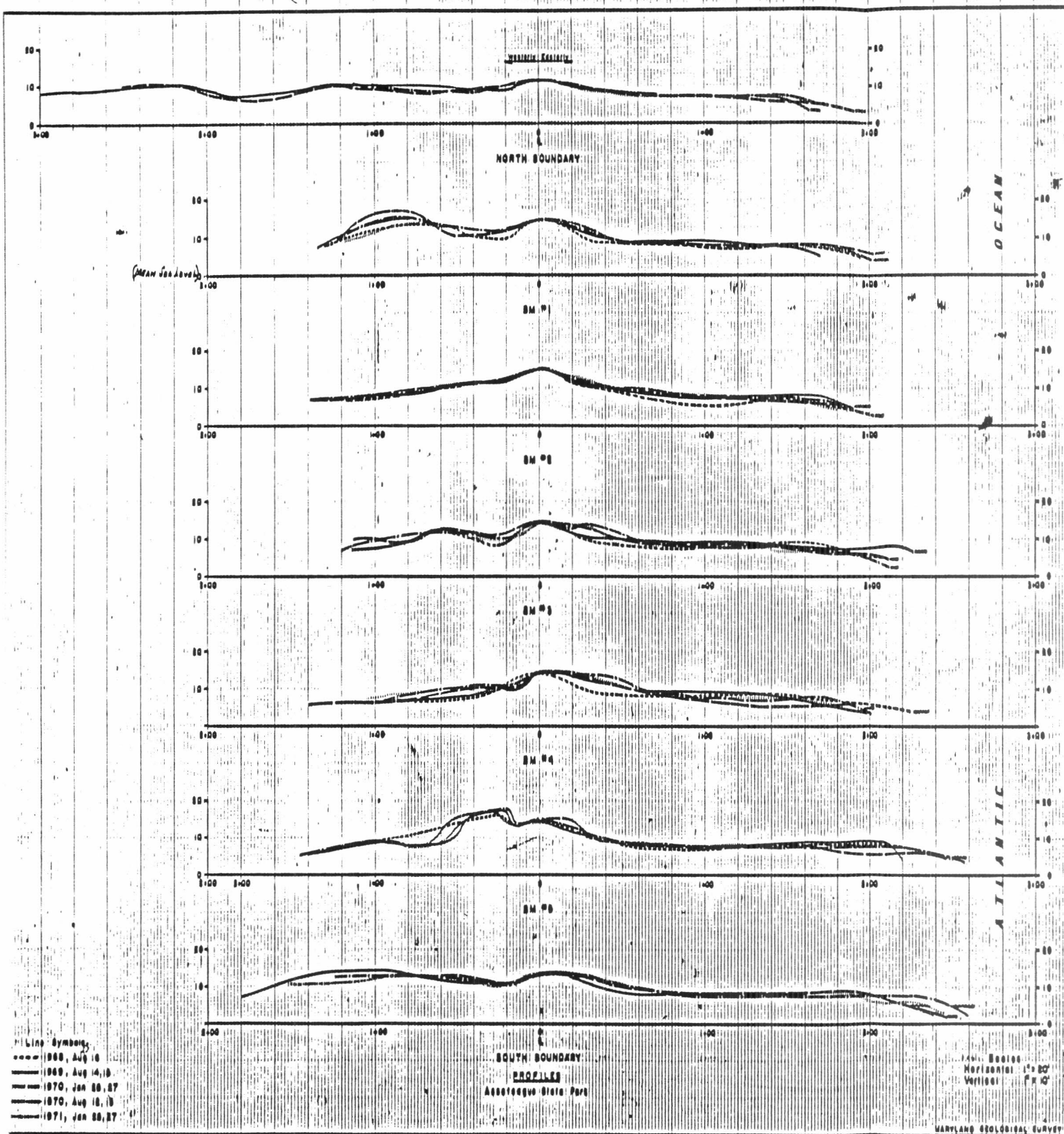
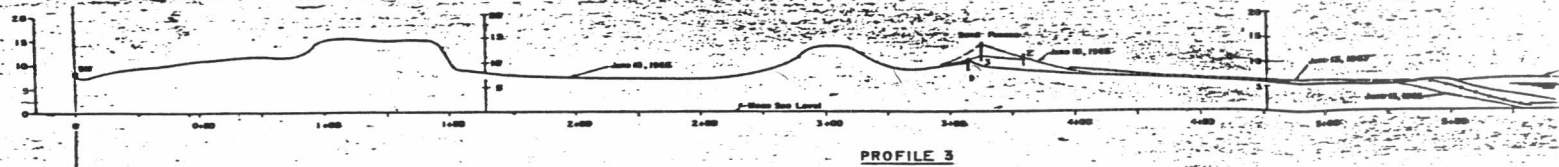
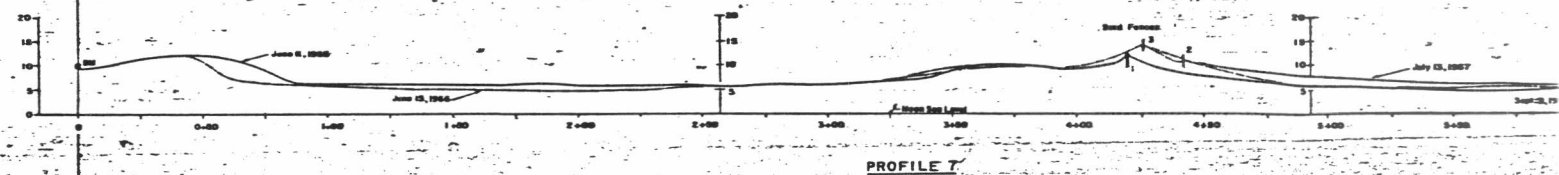


Figure 2

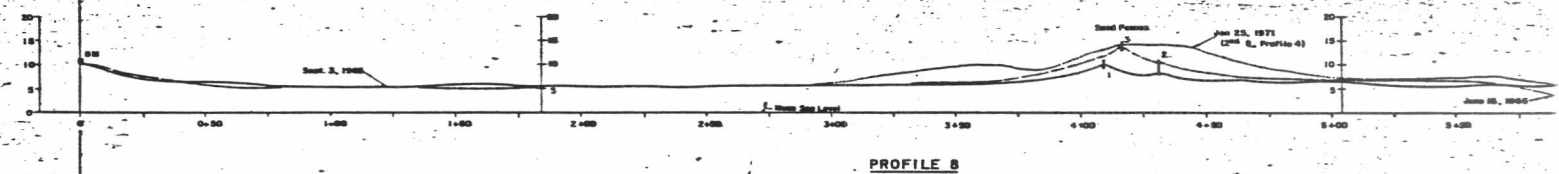
Graph



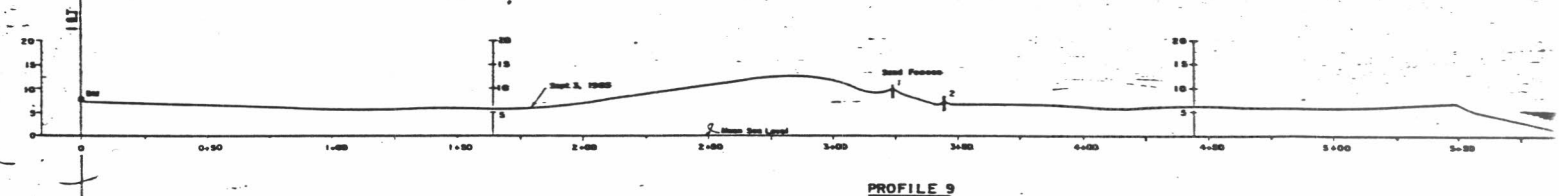
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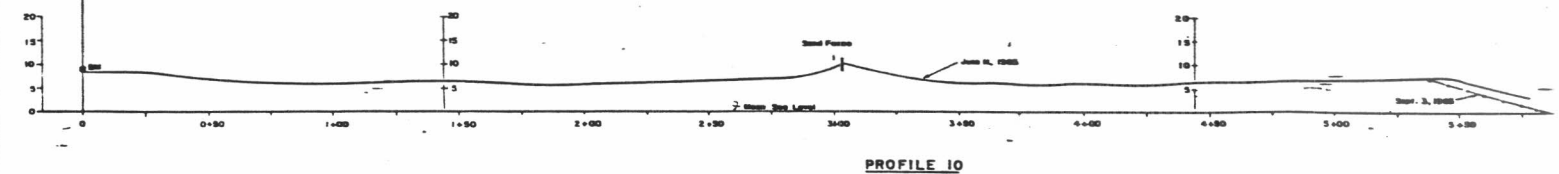
PROFILE 7



PROFILE 8



PROFILE 9



PROFILE 10

ASSATEAGUE STATE PARK Profiles

SCALES
HORIZONTAL: 1" = 50'
VERTICAL: 1" = 10'

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