4-2003

Mathews County Dune Inventory

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Cover Photo
New Point Comfort, Mathews, Virginia June 2003, by VIMS, Shoreline Studies Program

1 INTRODUCTION

1.1 Purpose

Mathews County, Virginia is located along the western shore of Chesapeake Bay and is at the eastern end of Virginia's Middle Peninsula (Figure 1). Eighteen dune sites were identified along the Mathews County shoreline by site visits performed in 1999 and 2000. Of those 18 sites, 13 are located on Chesapeake Bay (Figure 2). It is the intent of this publication to provide the user with information on the status of dunes in Mathews County. This information comes from research performed in 1999 and 2000 which was presented in a report entitled "Chesapeake Bay Dune Systems: Evolution and Status (Hardaway *et al.*, 2001). Since much of the data was collected several years ago and the beach and dune systems may have changed, this report is intended only as a resource for coastal zone managers and homeowners; it is not intended for use in determining legal jurisdictional limits.

1.2 Dune Act

Coastal dune systems of the Commonwealth of Virginia are a unique and valuable natural resource. Dunes are important to both the littoral marine system (as habitat for flora and fauna) and the adjacent landward environment (as erosion control and protection from storms). These functions form the basis for the Coastal Primary Sand Dune Protection Act of 1980 (Act)[1] and the related resource management effort under which the primary dune and beach components of existing dune systems are protected. Secondary dunes are not protected under the Act; however, as they are an important part of the overall dune system, they were included in the original report (Hardway *et al.*, 2001) and analyzed as part of a risk assessment performed by Varnell and Hardaway (2002). In this inventory, both primary and secondary dunes are included.

Primary dunes must meet three criteria in order to fall under the Act's jurisdiction:

1. **Substance**: a mound of unconsolidated sandy soil contiguous to mean high water
2. **Morphology**: landward and lateral limits are marked by a change in grade from >10% to <10%.
3. **Character**: primary dunes must support specific plant species or communities which are named in the Act and include: American beach grass (*Ammophila breviligulata*); beach heather (*Hudsonia tometosa*); dune bean (*Strophostylis* spp.); dusty miller (*Artemisia stelleriana*): saltmeadow hay (*Spartina patens*); seabeach sandwort (*Arenaria peploides*); sea oats (*Uniola paniculata*); sea rocket (*Cakile edentula*); seaside goldenrod (*Solidago sempervirens*); and short dune grass *(Panicum ararum*).

[1]The General Assembly enacted the Coastal Primary Sand Dune Protection Act (the Dune Act) in 1980. The Dune Act was originally codified in Code § 62.1-13.21 to -13.28. The Dune Act is now recodified as Coastal Primary Sand Dunes and Beaches in Code § 28.2-1400 to -1420.

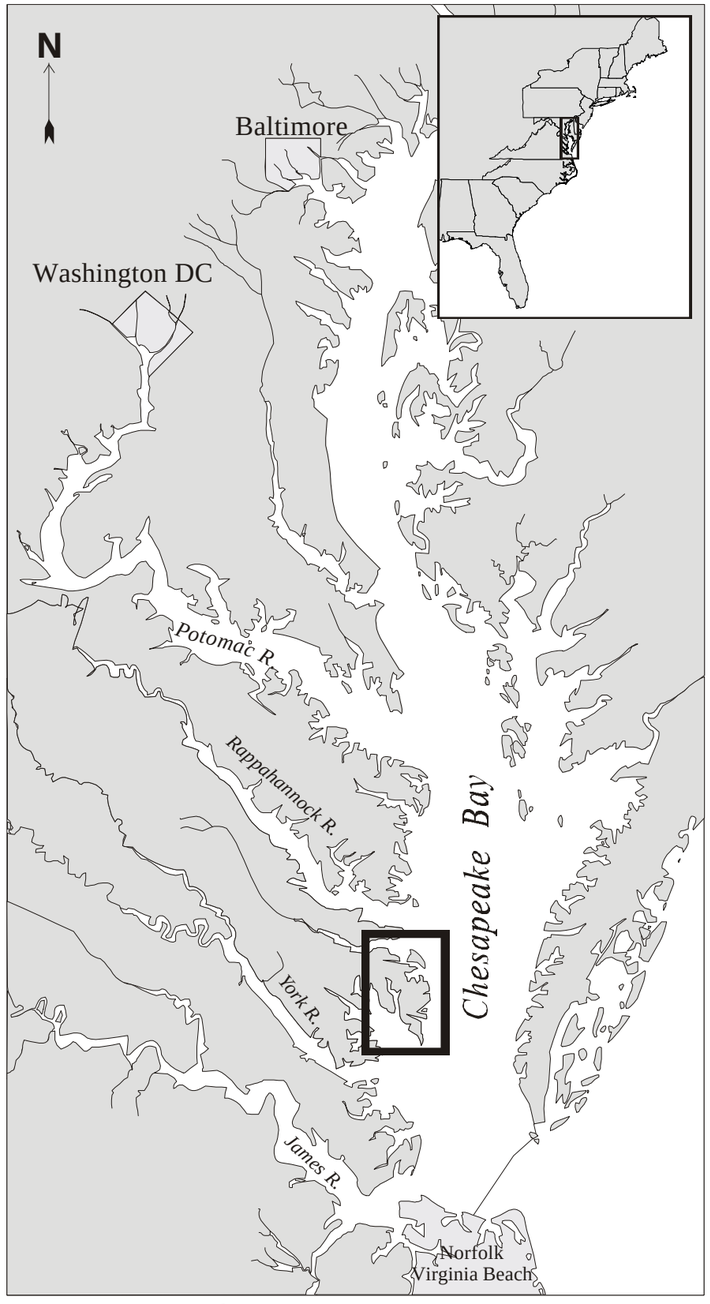

Figure 1. Location of Mathews County.

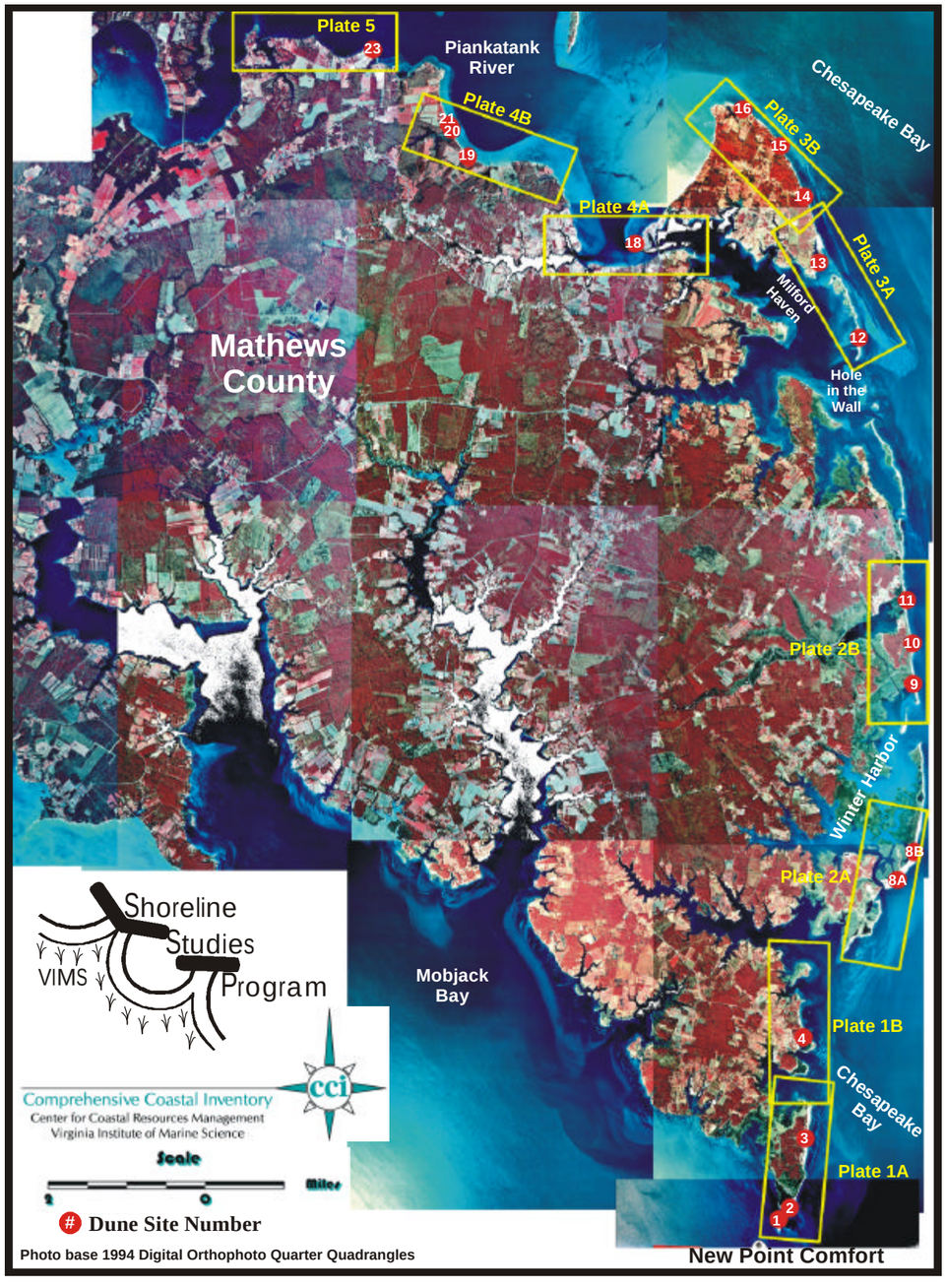

Figure 2. Geographic extent of dunes in Mathews County.

2 BACKGROUND

Coastal primary sand dunes form by the accumulation of sand due to the interaction of wind and wave action along the shore. Sand deposited on the beach during periods of relatively low wave energy is moved landward by onshore winds. The deposition of material above the intertidal zone allows vegetation to take root along the wrack line which then acts as a baffle, slowing wind speed and causing wind-borne sand to settle and be trapped in the vegetation thereby resulting in further accretion of the dune. Therefore, the size and location of a primary dune is determined by the amount of sand available and the ability of wind and waves to move it as well as the degree to which any existing vegetation can act to trap it. Thus, just as the intensity, direction, and duration of winds and waves constantly change through the seasons, so too, do coastal dunes exist in a state of flux.

Dunes act as a reservoir of sand which can buffer inland areas from the effects of storm waves and, in the process, act as natural levees against coastal flooding. During high energy conditions, such as the northeast storms which frequent the Eastern Seaboard, primary dunes may be subject to attack by wind-driven waves aided by storm surges. The dune may be eroded, and the sand deposited in an offshore bar. Then, under low-energy conditions, the sand may move back to the beach.

All dunes in the Chesapeake Bay estuarine system are mobile features especially with regards to coastal zone management. Unlike ocean dune fields that are relatively continuous features exposed to the open ocean, the dunes of the Chesapeake form across a temporal and spatial geomorphic matrix driven by sand volume, varying wave climate, and shoreline geology. The coastal geology, in large part, determines whether shoreline erosion acts upon the upland (high bank) or marsh (low bank). Sand supply and the long-term local wave climate are significant factors in the location of dunes. The stability or ability of a dune/beach system to accrete over time is necessary for the formation of secondary dunes.

Natural dunes in the Chesapeake Bay estuarine system vary in size and nature but all require that an accreted feature, such as a beach washover or a spit, becomes vegetated above the intertidal zone. The vegetation and a continuous beach/dune profile are required to create the jurisdictional primary dune. If the dune/beach forms across a low marsh shoreline, the system will move landward in response to storms, and only a low primary dune will exist. If sand can accrete bayward due to shoals, spits, or man-made features such as jetties and groins, then a secondary dune may develop from the original primary dune.

Hardaway *et al.* (2001) found that the occurrence of dunes around Chesapeake Bay is due, in part, to three factors: 1) morphologic opportunity (*i.e.*, relatively stable setting), 2) abundant sand supply in the littoral transport system, and 3) conducive onshore wind/wave climate. Deposited sand must remain above a stable backshore to allow dune vegetation to become established. Each dune documented by Hardaway *et al.* (2001) has its own history of change -- growth and decay; natural and anthropogenic. Many miles of natural dunes have been altered by development, and many have been formed in response to processes altered by man's influence. Dunes around the Chesapeake Bay estuarine system in the localities within the Act encompass only about 40 miles of shoreline (Hardaway *et al.*, 2001). This is about 0.4% of the total Bay shore - making it an important, but rare, shore type.

2.1 Dune System Classification

The Chesapeake Bay dune classification was developed in Hardaway *et al.* (2001) and is portrayed in Figure 3. This classification is based on factors that are unique to certain dune systems and has a basis in the dune field evolution, vegetative zones, lateral and vertical extent of primary and secondary dune features, and anthropogenic impacts.

Dunes are categorized as Natural, Man Influenced, or Man Made. These three types reflect how the state of the dune is most impacted. The parameters (A through G) are most influential in defining the status of a given dune system. Parameter values within each category assign a range of limits or characteristics. Categories A, B, and C relate to the nature of the impinging wave climate at a given site while categories D, E, and F relate to geologic parameters. Dune parameter G relates to the type of anthropogenic influence.

Fetch Exposure (A) is a qualitative assessment of the wave exposure and wave climate across open water. Wave impact is the dominant natural process driving shoreline erosion and sediment transport along the Bay coasts. Riverine, Bay Influenced (A.1) is somewhere between the Open Bay exposure (A.2) and Riverine Exposure (A.3). Generally, A.1 sites have fetches of 5-10 nautical miles (nm); A.2 have fetches of >10 nm; and A.3 have fetches <5 nm.

Shore Orientation (B) is the direction the main dune shore faces according to eight points on the compass. Shoreline exposure to dominant directions of wind and waves is a component of fetch exposure (A) and wave climate as well as aeolian processes that assist in dune growth and decay.

Nearshore Gradient (C) controls wave refraction and shoaling that, in turn, affect the nature of wave approach and longshore sand transport as well as onshore/offshore transport. The presence or absence of bars indicates the relative amount of nearshore sediment available for transport.

The Morphologic Setting (D) is significant in the genesis of a particular dune site. Aerial imagery from VIMS SAV Archive and field observations were used to determine and classify the Morphologic Setting. Four basic categories were developed including: 1) Isolated dunes, 2) Creek mouth barrier dune/spit, 3) Spit and 4) Dune fields. Morphological Settings 1 and 4 are distinguished only by shore length (*i.e*. Morphologic Setting 1 < 500 ft and Morphologic Setting 4 > 500 ft) as an arbitrary boundary. These categories were subdivided to reflect the nature of the setting into four subcategories which are 1) Pocket, 2) Linear, 3) Shallow Bay and 4) Salient.

The Relative Stability (E) of a dune is very subjective. It is meant as a value judgement as to the overall current and future integrity at the time of the site visit. If the site had wave cut scarps along the primary dune face and/or was actively moving landward (overwash), it was termed Land Transgressive/Erosional (E.3). If the backshore/dune face had a slight gradient with stabilizing vegetation, it was stable (E.2) or, possibly, accretionary (E.1).

Dune Classification System

Dune Type

1. Natural **2. Man Influenced** **3. Manmade**

Dune Parameters

A. Exposure: fetch
1. Riverine, Bay Influenced
2. Open Bay
3. Riverine

B. Shore Orientation (direction of face)
1. North
2. Northeast
3. East
4. Southeast
5. South
6. Southwest
7. West
8. Northwest

C. Nearshore Gradient (Distance to the 6 ft contour)
1. 0 to 1,000 ft
2. 1,000 to 3,000 ft
3. Greater than 3,000 ft
    1. Extensive Bars
    2. No Bars

D. Morphologic Setting
1. Isolated (less than 500 ft alongshore)
    1. Pocket
    2. Linear
    3. Shallow Bay (curvilinear)
    4. Salient (point)
2. Creek Mouth Barrier/Spit
3. Spit
4. Dune Field (greater than 500 ft alongshore)
    1. Pocket
    2. Linear
    3. Shallow Bay (curvilinear)
    4. Salient (point)

E. Relative Stability
1. Stable
2. Accretionary
3. Land Transgressive/Erosional

F. Underlying Substrate
1. Marsh/Creek Bottom
2. Upland

G. Structure/Fill
1. Groin
2. Revetment/Bulkhead
3. Breakwater
4. Jetty
5. Beach Fill

Figure 3. Classification system for Chesapeake Bay identified dune systems (from Hardaway *et al.*, 2001).

The underlying substrate (F) is a general category for the type of substrate or sediment the dune resides on and against. Two broad categories were chosen - marsh and upland. The marsh category includes creek bottoms which should be a separate category because beach/dune development can occur across the mouth of a creek bottom without a true marsh. The distinction between upland and marsh was that the marsh substrate is usually a low bank that is subject to washover processes whereas the upland area offered a "backstop" to land beach/dune migration.

If the site was not Natural (1), *i.e.* Man-influenced (2) or Man-made (3), then the nature of man's impact was determined by the type of modification. The shore structures include Groins (G.1), Bulkheads and Revetments (G.2), Breakwaters (G.3), Jetties (G.4), and Beach Fill (G.5). The degree of impact any given structure or combination of structures had on the dune site was not always clear. The Relative Stability (E) relates in part to whether man's influence was erosive (destructive) or accretionary/stable (constructive).

2.2 Site Characteristics

Coastal zone profile and vegetation types present on dunes were determined by site visit. Beach profile transects were performed at most sites to measure the primary and secondary dune (where present) within 100 feet of the shoreline. Standard surveying and biological procedures were utilized. Not all dune sites were surveyed.

Each surveyed transect used the crest of the primary dune as the horizontal control and mean low water (MLW) as the vertical control. The primary dune crest was determined on site. The MLW line was indirectly obtained from water level measurements. The observed water level position and elevation were checked against recorded tidal elevations at the nearest NOAA tide station and time of day to establish MLW on the profile.

The typical dune profile has several components (Figure 4). A continuous sand sheet exists from the offshore landward and consists of a 1) nearshore region, bayward of MLW, 2) an intertidal beach, berm, and backshore region between MLW and base of primary dune, 3) a primary dune from bayside to landside including the crest, and, where present, 4) a secondary dune. All profiles extended bayward beyond MLW and landward to at least the back of the primary dune. The secondary dune crest was always measured but the back or landward extent of the secondary dune could not always be reached. The dimensions, including lateral position and elevation of various profile components were measured. These include: primary dune crest elevation, distance from primary dune crest to back of dune, distance from primary dune crest to MLW, secondary dune crest elevation, secondary dune crest to back of primary dune, secondary dune crest to back of secondary dune, distance from back of primary dune to back of secondary dune, width of secondary dune, and width of primary and secondary dune.

During each site visit, dominant plant communities occupying the primary and secondary dunes (if present) were analyzed (Figure 4). Plant species distribution is based on observed percent cover in the general area of profiling and sampling within the identified dune reach.

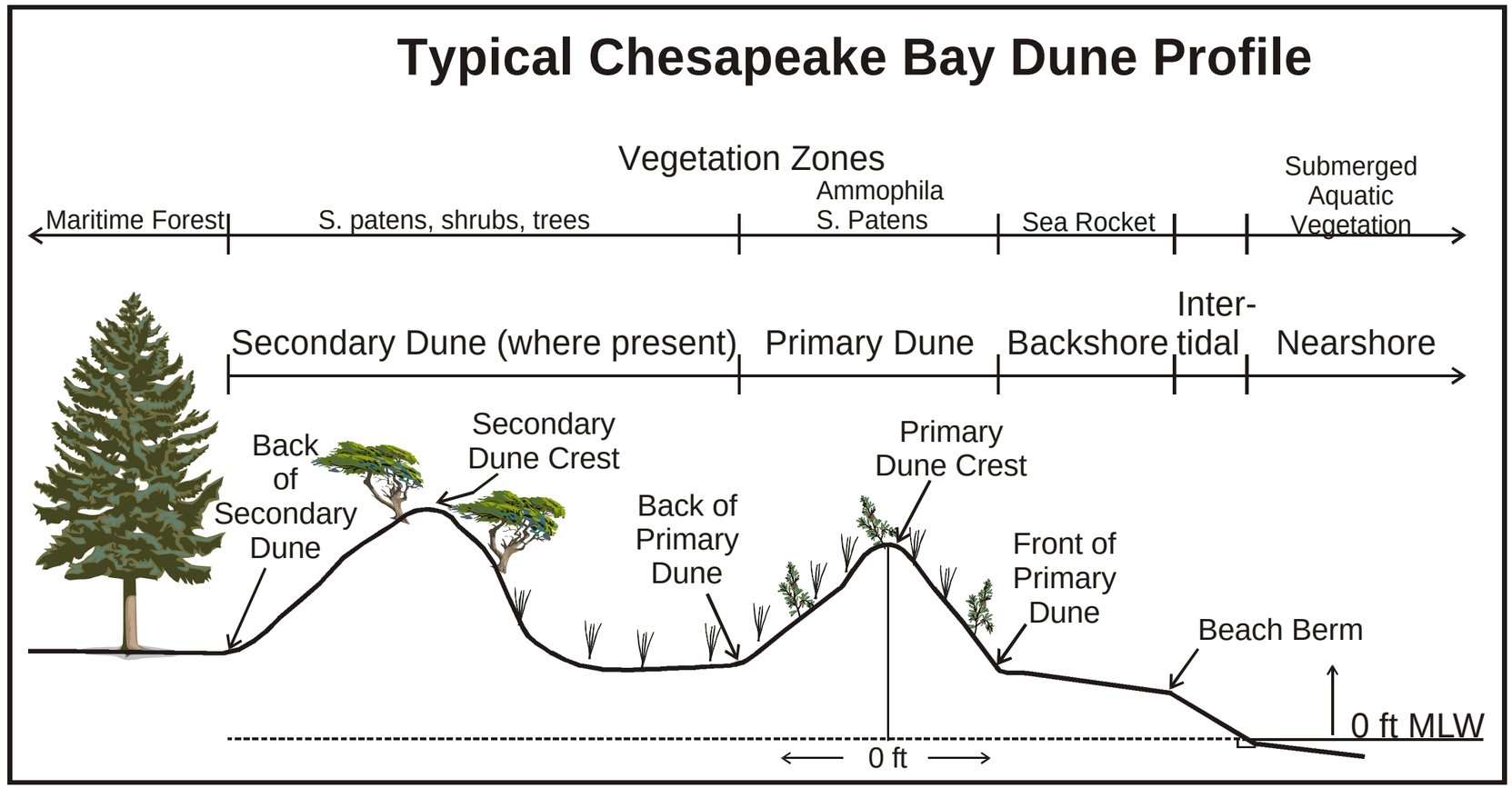

Figure 4. Typical profile of a Chesapeake Bay dune system (from Hardaway *et al.*, 2001).

3 DUNE DATA SUMMARY

Approximately 3.6 miles of dune shore consisting of 18 sites (Table 1) were identified in Mathews County. Previous work by Hardaway *et al.* (2001) had named a total of 24 possible dune sites in Mathews, but site visits verified just 18. Mathews County dune sites had a wide variety of site conditions, ranging from large dune fields at MA8 to small isolated dunes along Gwynn's Island (MA15 and MA16). Most of the dune sites resided along the open Chesapeake Bay coast which has a history of dynamic shore change and geomorphic evolution. Dunes resided in areas of sand accretion and stability such as around tidal creek mouths, embayed shorelines, in front of older dune features, as washovers, as spits and against man-made structures like channel jetties or groin fields. From a development perspective, MA3 at Bavon has been the most impacted; much of the secondary dune has been built upon. Site visits occurred in 1999 and 2000; site characteristics may now be different due to natural or man-induced shoreline change.

In Mathews County, 5 of the 18 dune sites had both primary and secondary dunes. Table 2 presents the measurements of the dune attributes. The average length of primary dune only sites was 430 ft whereas the average length of the primary with secondary dunes was 2,508 feet. Clearly, the wider sites were also the longest.

The 3 main categories of Natural, Man-Influenced and Man-Made were used to portray a site's potentially most influential element. In Mathews County, 33% are Natural, 68% are Man-Influenced, and none were Man-Made (Table 3).

Table 1. Identified dune sites in Mathews County as of 2000. Site characteristics may now be different due to natural or man-induced shoreline change.

Dune Site No.	Location^ Easting (Feet)	Northing (Feet)	Date Visited	Dune Shore Length (Feet)	Primary Dune Site?	Secondary Dune Site?	*Public Ownership?
1	2,645,910	362,500	8/7/2000	630	Yes		
2	2,646,620	363,300	8/7/2000	1,600	Yes	Yes	
3	2,647,500	368,050	4/14/1999	4,290	Yes	Yes	
4	2,647,100	374,900	4/14/1999	500	Yes		
8A'	2,654,100	387,100	8/28/2000	3,150	Yes	Yes	
8B'			8/28/2000	3,050	Yes	Yes	
9	2,653,780	399,100	4/14/1999	225	Yes		
10	2,653,440	401,900	4/14/1999	485	Yes		
11	2,652,950	404,800	4/14/1999	515	Yes		
12	2,649,180	422,450	8/28/2000	1,540	Yes		
13	2,646,340	427,600	9/8/2000	450	Yes	Yes	
14	2,644,980	431,900	9/8/2000	460	Yes		
15	2,643,340	435,300	9/8/2000	65	Yes		
16	2,640,680	437,720	9/8/2000	105	Yes		
18	2,633,820	428,300	9/8/2000	525	Yes		
19	2,622,400	433,780	9/8/2000	250	Yes		Yes&Private
20	2,621,180	435,550	8/28/2000	315	Yes		
21	2,620,940	435,900	8/28/2000	430	Yes		
23	2,615,720	440,840	8/28/2000	250	Yes		
Total				18,835			

*Public ownership includes governmental entities including local, state, and federal; otherwise ownership is by the private individual.
^Location is in Virginia State Plane South, NAD 1927
'One site with variable alongshore dune conditions

Table 2. Dune site measurements in Mathews County as of 2000. Site characteristics may now be different due to natural or man-induced shoreline change.

Mathews		Dune Site Measurements								
				Extent from Crest			Secondary Dunes			
	Site No.	Dune Shore Length (feet)	Crest Elev (ftMLW)	landward (Feet)	To MLW (Feet)	Juris-diction	Crest Elev (ftMLW)	LandXtnt From PrimCrest (Feet)	2ndCrest landward (Feet)	2ndCrest BackBase PrimDune (Feet)
MA	1	630	9.6	44	98	Yes	8.4	56	73	
MA	2	1,600	10.2	12	370	Yes	8.0	180	155	13
MA	3	4,290	10.0	8.5	65	Yes	8.4	98	20	69.5
MA	4	500	6.9	8	239					
MA	8A	3,150	6.9	64	68	Yes	8.0	224	71	89
MA	8B	3,050	9.2	82	60	Yes	6.3	340	35	223
MA	9	225	4.5	15	56					
MA	10	485	6.9	9	50					
MA	11	515	6.3	8	62					
MA	12	1,540	7.2	45	96					
MA	13	450	8.0	13	97	Yes	5.7	44	13	18
MA	14	460	6.8	18	63					
MA	15*	65								
MA	16*	105								
MA	18	525	6.1	64	62					
MA	19	250	4.5	10	58					
MA	20	315	5.2	26	43					
MA	21	430	5.8	24	126					
MA	23	250	3.5	31	36					

*Not profiled

Table 3. Dune site parameters in Mathews County as of 2000. Site characteristics may now be different due to natural or man-induced shoreline change.

Mathews			Dune Site Parameters							
	Site No.	Type	Fetch Exposure A	Shoreline Direction of Face B	Nearshore Gradient C		Morphologic Setting D	Relative Stability E	Underlying Substrate F	Structure or Fill G
MA	1	Natural	Open Bay	East	Medium	Bars	Dune Field, linear	Erosional	Marsh/CB	
MA	2	Natural	Open Bay	Southeast	Medium	Bars	Dune Field, salient	Stable	Marsh/CB	
MA	3	Man-Inf	Open Bay	East	Shallow	Bars	Dune Field, linear	Stable	Upland	
MA	4	Man-Inf	Open Bay	Northeast	Medium	Bars	Isolated, bay	Stable	Upland	Beach fill
MA	8A	Man-Inf	Open Bay	Southeast	Medium	No Bars	Ck Mouth	Accretion	Marsh/CB	
MA	8B	Man-Inf	Open Bay	East	Medium	No Bars	Ck Mouth	Accretion	Marsh/CB	
MA	9	Natural	Open Bay	East	Medium	No Bars	Isolated, pocket	Erosional	Marsh/CB	
MA	10	Man-Inf	Open Bay	East	Medium	No Bars	Isolated, linear	Stable	Upland	Groin
MA	11	Man-Inf	Open Bay	East	Shallow	No Bars	Dune Field, linear	Erosional	Marsh/CB	Jetty
MA	12	Natural	Open Bay	East	Medium	Bars	Ck Mouth	Erosional	Marsh/CB	
MA	13	Man-Inf	Open Bay	Northeast	Medium	Bars	Isolated, pocket	Erosional	Upland	Groin
MA	14	Man-Inf	Open Bay	Northeast	Medium	Bars	Isolated, linear	Stable	Upland	Groin
MA	15	Man-Inf	Open Bay	Northeast	Medium	Bars	Isolated, linear	Stable	Upland	Revet/BH
MA	16	Man-Inf	Open Bay	Northeast	Medium	Bars	Isolated, pocket	Stable	Upland	Groin
MA	18	Man-Inf	Riv-Bay	North	Steep	No Bars	Dune Field, linear	Stable	Upland	Jetty
MA	19	Natural	Riv-Bay	Northeast	Steep	Bars	Isolated, linear	Stable	Upland	
MA	20	Man-Inf	Riv-Bay	Northeast	Steep	Bars	Isolated, linear	Stable	Marsh/CB	Jetty Beach Fill
MA	21	Man-Inf	Riv-Bay	Northeast	Steep	Bars	Isolated, linear	Stable	Upland	Jetty
MA	23	Natural	Riverine	East	Steep	No Bars	Isolated, linear	Stable	Upland	

4 INVENTORY

Each dune site is located on plates in Appendix A. The individual site inventory sheets are in Appendix B. Due to the mobile nature of dunes, their extent and morphology changes through time. The data presented in this report represents the status of the site at the time of assessment and to the best of the author's knowledge. This information is for general management purposes and should not be used for delineation. For detailed delineation of any dune site, the reader should contact the local wetlands board or Virginia Marine Resources Commission. See Figures 3 and 4 for description of the site parameters and measurements listed below.

Each dune site has the following information on its inventory page:

1. Date visited
2. Central site coordinates in Virginia South State Plane Grid NAD 1927
3. Coordinates of profile origin
4. Site length in feet
5. Ownership
6. Site Type
7. Fetch Exposure
8. Shoreline Direction of Face
9. Nearshore gradient
10. Morphologic Setting
11. Relative Stability
12. Underlying Substrate
13. Type of structure or fill (man-influenced only)
14. Primary Dune Crest Elevation in feet above Mean Low Water (MLW)
15. Landward extent of Primary Dune from Dune Crest in feet
16. Distance from Dune Crest to MLW
17. Secondary Dune Crest Elevation in feet above MLW (if present)
18. Landward extent of Secondary Dune Crest from Primary Dune Crest
19. Landward extent of Secondary Dune from Secondary Dune Crest
20. Primary Dune vegetation communities
21. Secondary Dune vegetation communities
22. General Remarks

Also included on the dune site inventory page is the site cross-section, if surveyed, and ground photos, if taken. Long sites may have been represented with two or more profiles because the general morphology differs alongshore. Each profile was intended to be representative of that dune portion of the site. In Mathews County, MA8 has two representative profiles.

5 REFERENCES

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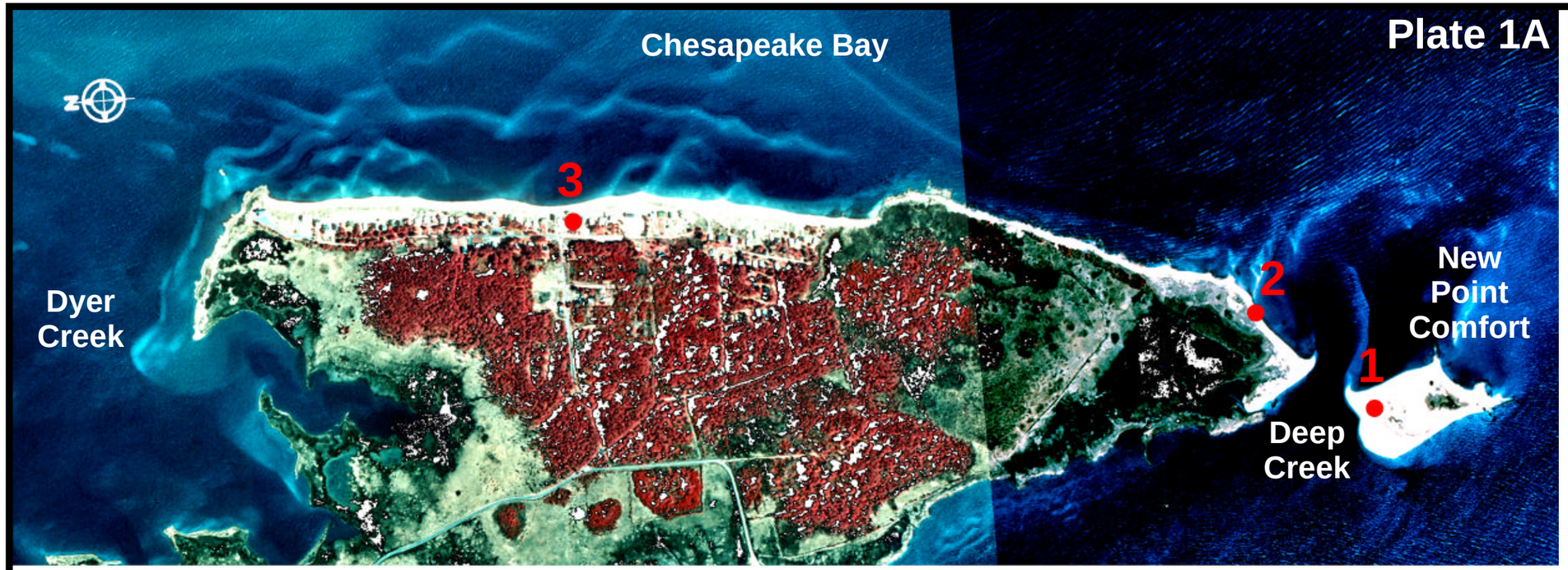
Appendix A

Location of Dune Sites



Mathews County

Dune Site

Photo base 1994
Digital Orthophoto
Quarter Quadrangles

Scale
1000 0 1000 Feet

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VIMS

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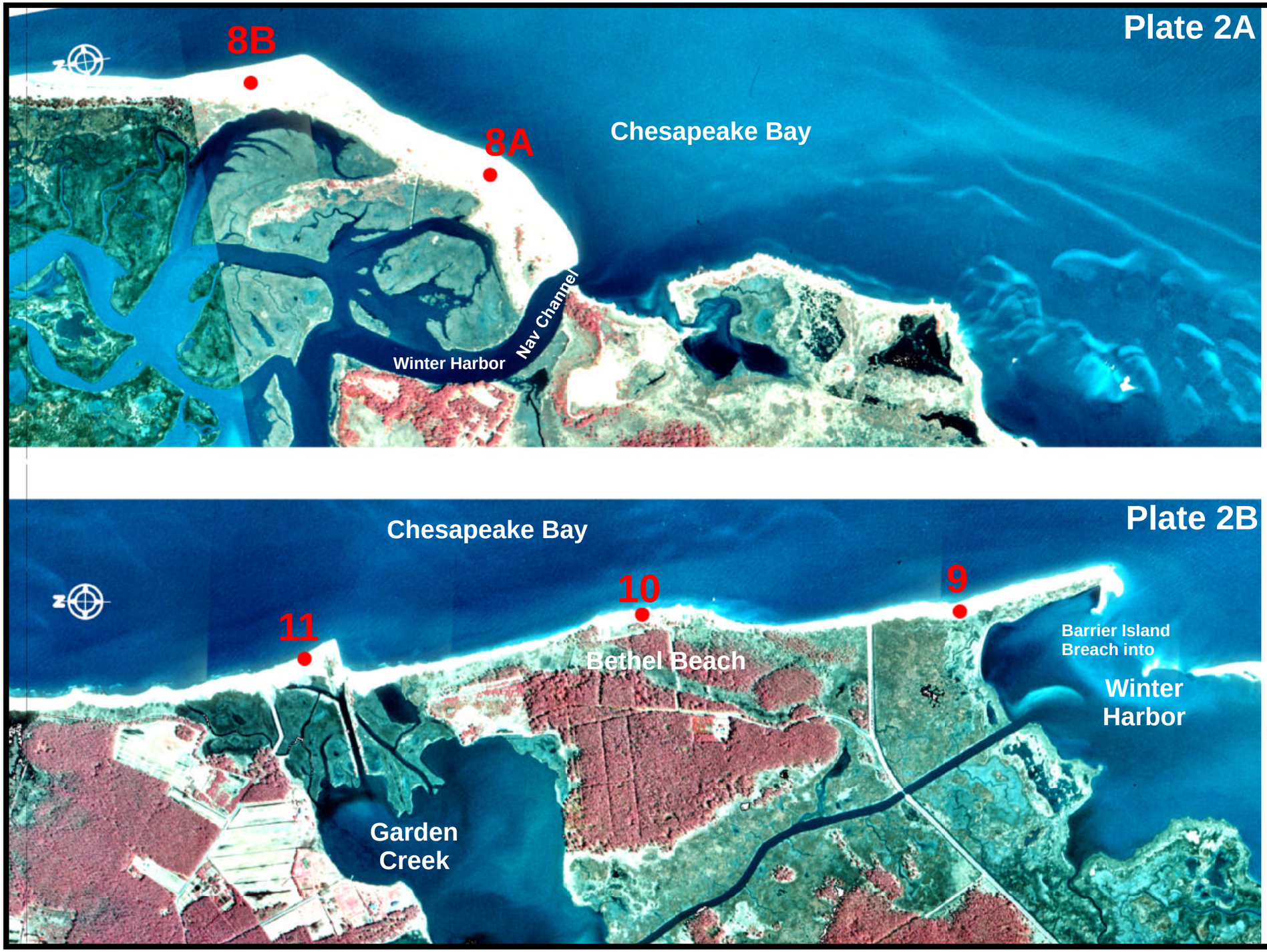
Center for Coastal Resources Management
Virginia Institute of Marine Science
cci



Mathews County

● Dune Site

Photo base 1994
Digital Orthophoto
Quarter Quadrangles

Scale
1000 0 1000 Feet

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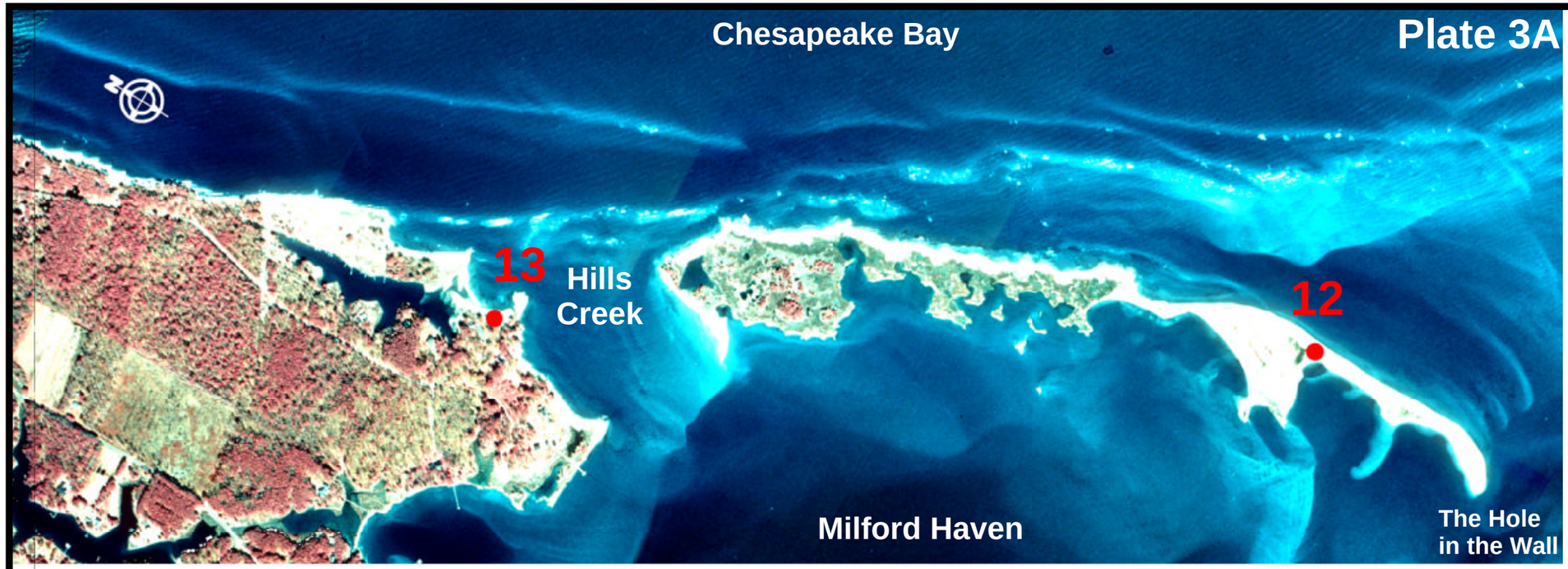
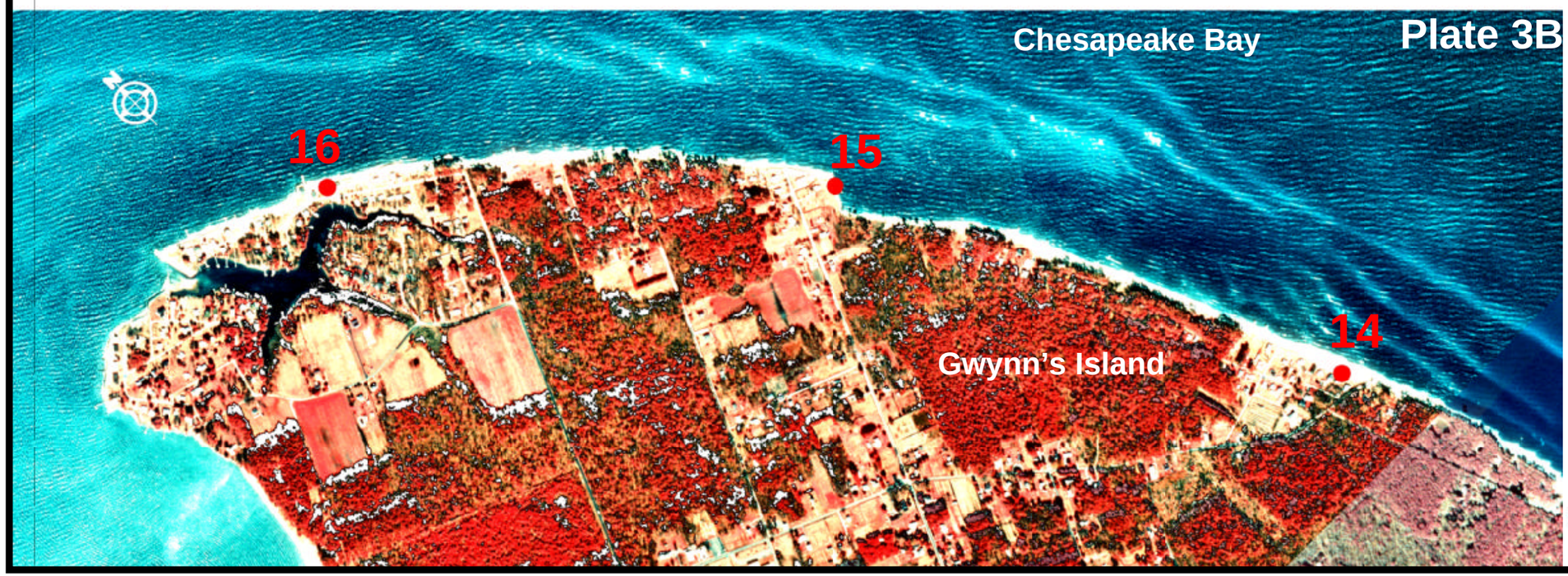


Mathews County



Dune Site

Photo base 1994
Digital Orthophoto
Quarter Quadrangles

Scale
1000 0 1000 Feet

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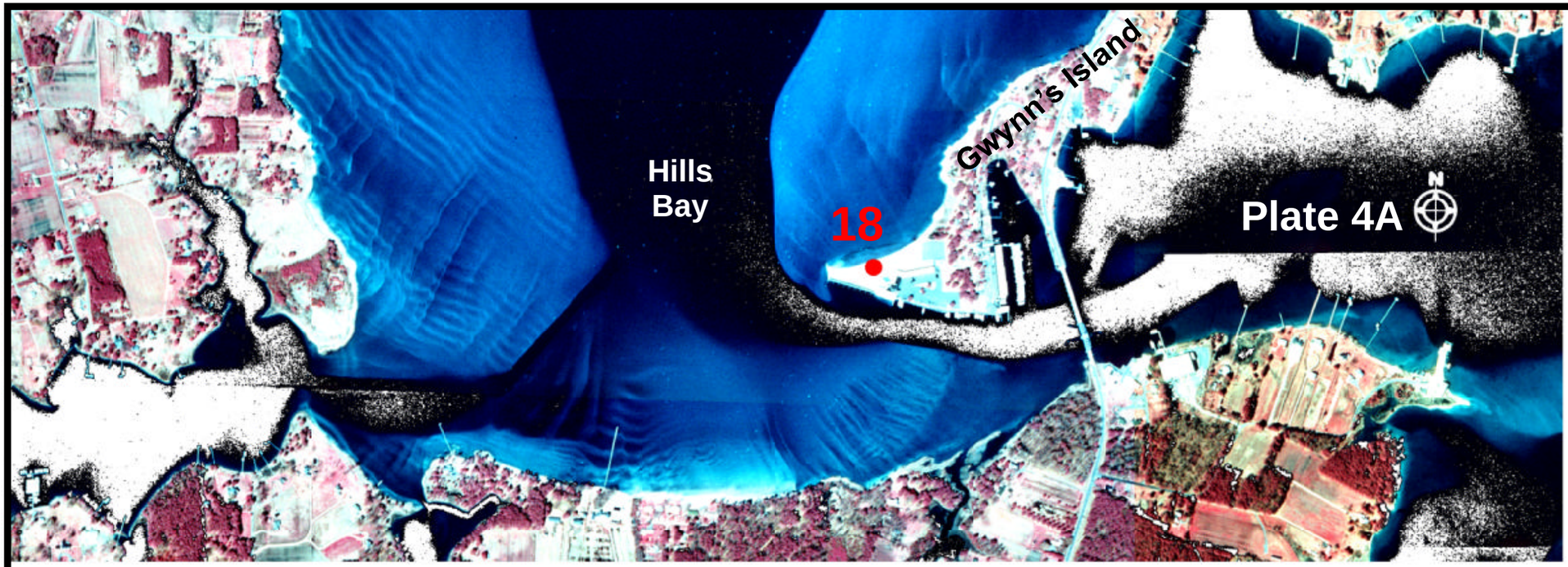
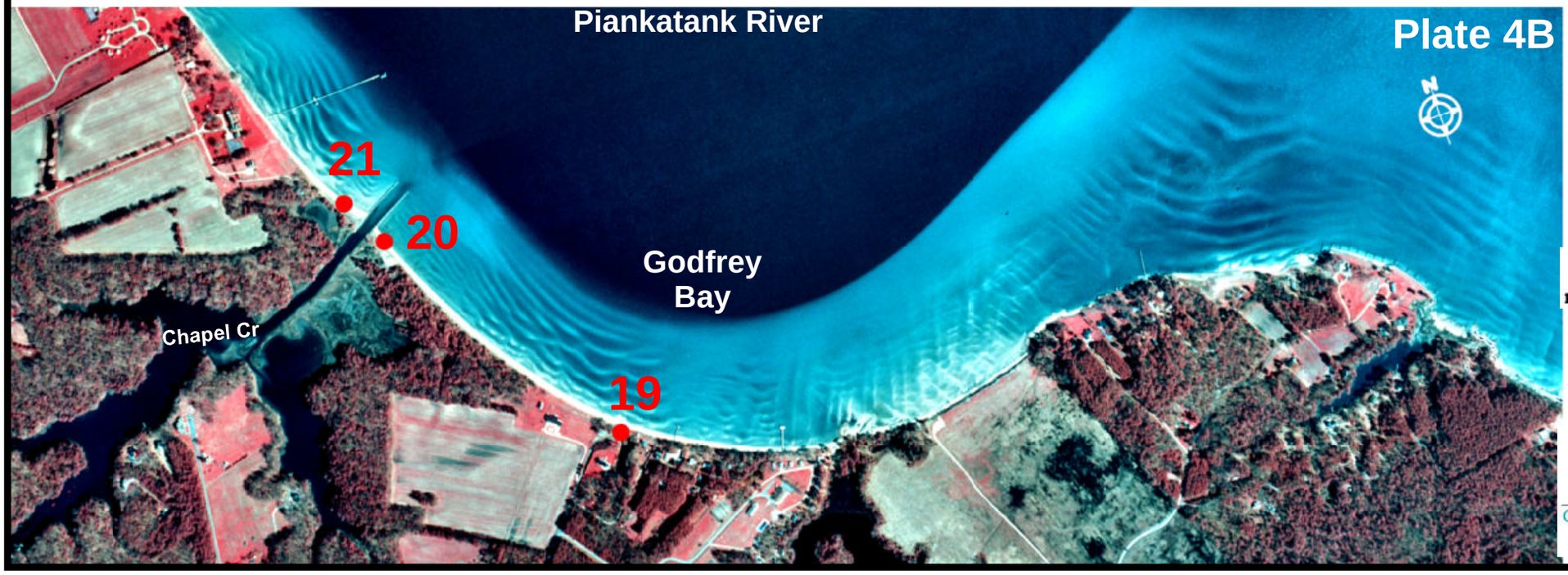
Mathews County





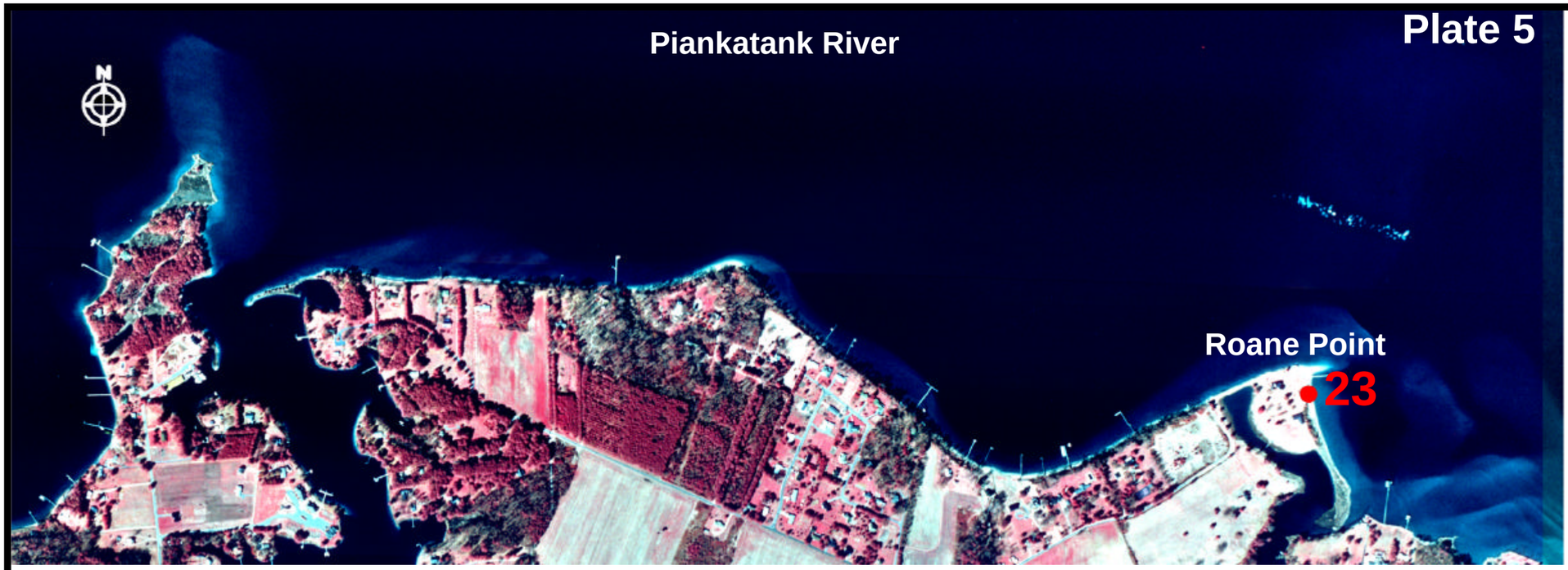
Dune Site

Photo base 1994
Digital Orthophoto
Quarter Quadrangles

Scale
1000 0 1000 Feet

Shoreline Studies Program
VIMS

Comprehensive Coastal Inventory
Center for Coastal Resources Management
Virginia Institute of Marine Science
cci



Mathews County

Dune Site

Photo base 1994
Digital Orthophoto
Quarter Quadrangles

Scale
1000 0 1000 Feet

Shoreline Studies Program
VIMS

Comprehensive Coastal Inventory
Center for Coastal Resources Management
Virginia Institute of Marine Science
cci

Appendix B

Individual Dune Inventory Sheets

MA 1
MA 2
MA 3
MA 4
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MA 13
MA 14
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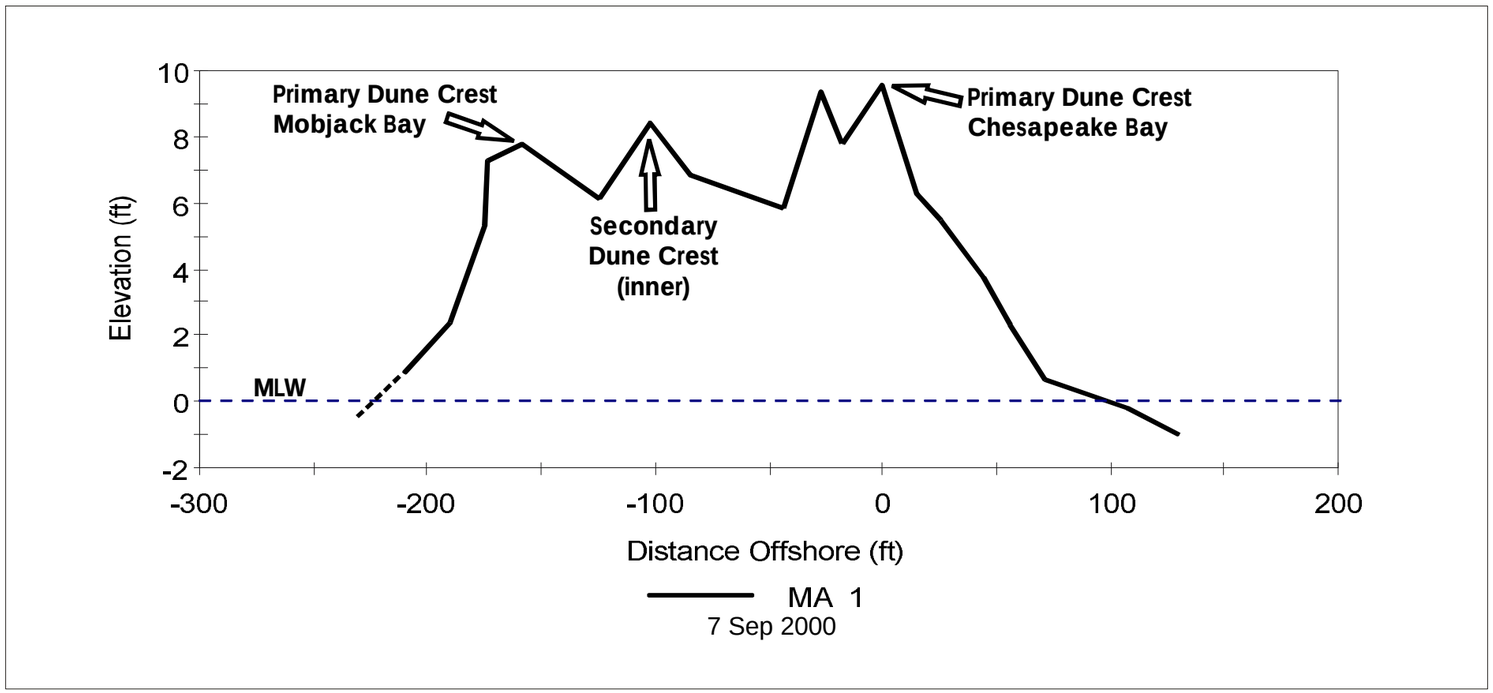
MA 19
MA 20
MA 21
MA 23

MATHEWS COUNTY DUNE SITE 1



Site Information

1. **Date Visited:** 7 Sep 2000
2. **Central Coordinates:** **N:** 362,500 ft **E:** 2,645,910 ft
3. **Profile Coordinates:** **N:** 362,500 ft **E:** 2,645,910 ft

Virginia South State Plane Grid NAD 1927 [4502]

4. **Site Length:** 630 ft Chesapeake Bay shore; 1,100 ft on Island
5. **Ownership:** Private

Plate 1A

Site Parameters

6. **Type:** Natural
7. **Fetch Exposure:** Open Bay
8. **Shoreline Direction of Face:** East
9. **Nearshore Gradient:** 1,000 to 3,000 ft/Extensive Bars
10. **Morphologic Setting:** Dune Field >500 ft Alongshore/Linear
11. **Relative Stability:** Land Transgressive/Erosional
12. **Underlying Substrate:** Marsh
13. **Structure or Fill:** N/A

Looking south toward New Point Comfort Lighthouse.

Looking northwest along north shore dune into Mobjack Bay.

Site Measurements

	Chesapeake Bay Shore	Mobjack Bay Shore
Primary Dune:		
14. Crest Elevation (ft MLW):	9.6	7.8
15. Extent from Crest Landward (ft):	44	34
16. Extent from Crest To MLW (ft):	98	70

Secondary Dune:

17. Crest Elevation (ft MLW): 8.4

18. Land Extent From Primary Crest (ft): 56 from Mobjack Bay side

19. Second Crest – Landward (ft): 73

Vegetation Communities

20. Primary Dune: *Ammophilla breviligulata* (American beach grass)

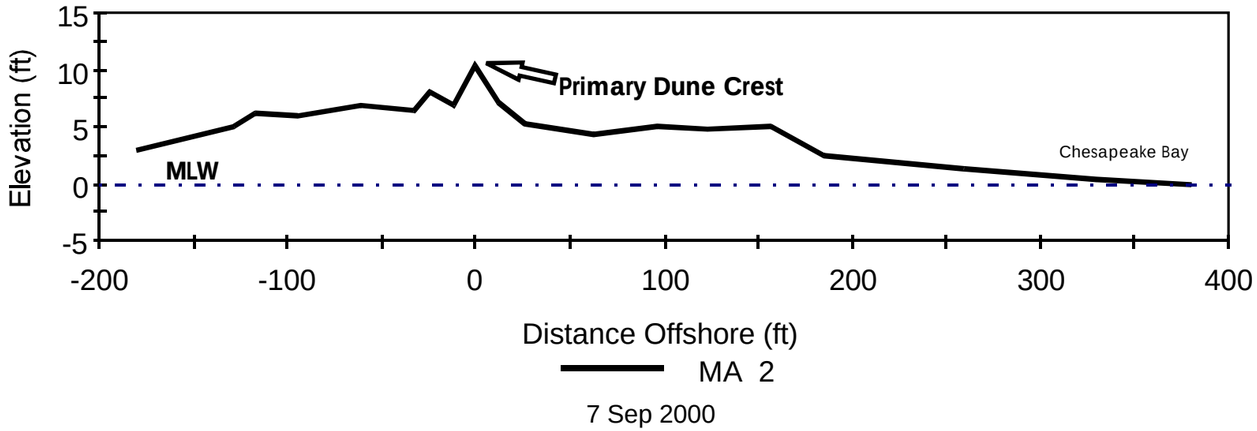
21. Secondary Dune: *Ammophilla breviligulata* (American beach grass)

22. Remarks:

MA 1 is located on the remains of New Point Comfort Island. This island continues to recede on the south end where the dune face is generally eroding. Some dune advances were evident on the north and west sides during the site visit. A primary dune occurs on each side of the island. The transect crosses the island from Chesapeake Bay to Mobjack Bay. The inner dune crest can be designated as a secondary dune.

Not intended for use in determining legal jurisdictional limits

MATHEWS COUNTY DUNE SITE 2



Looking southwest at the primary dune face and backshore. Note ridges and runnel system to the left consisting of low tide bar (ridge) and trapped water channel (runnel).

Looking southwest along primary dune crest.

Site Information

1. **Date Visited:** 7 Sep 2000
2. **Central Coordinates:** **N:** 363,300 ft **E:** 2,646,620 ft
3. **Profile Coordinates:** **N:** 363,300 ft **E:** 2,646,620 ft

Virginia South State Plane Grid NAD 1927 [4502]

4. **Site Length:** 1,600 ft
5. **Ownership:** Private

Plate 1A

Site Parameters

6. **Type:** Natural
7. **Fetch Exposure:** Open Bay
8. **Shoreline Direction of Face:** Southeast
9. **Nearshore Gradient:** 1,000 to 3,000 ft/Extensive Bars
10. **Morphologic Setting:** Dune Field >500 ft Alongshore/Salient
11. **Relative Stability:** Stable
12. **Underlying Substrate:** Marsh
13. **Structure or Fill:** N/A

Site Measurements

Primary Dune:

14. **Crest Elevation (ft MLW):** 10.3
15. **Extent from Crest Landward (ft):** 12
16. **Extent from Crest To MLW (ft):** 370

Secondary Dune:

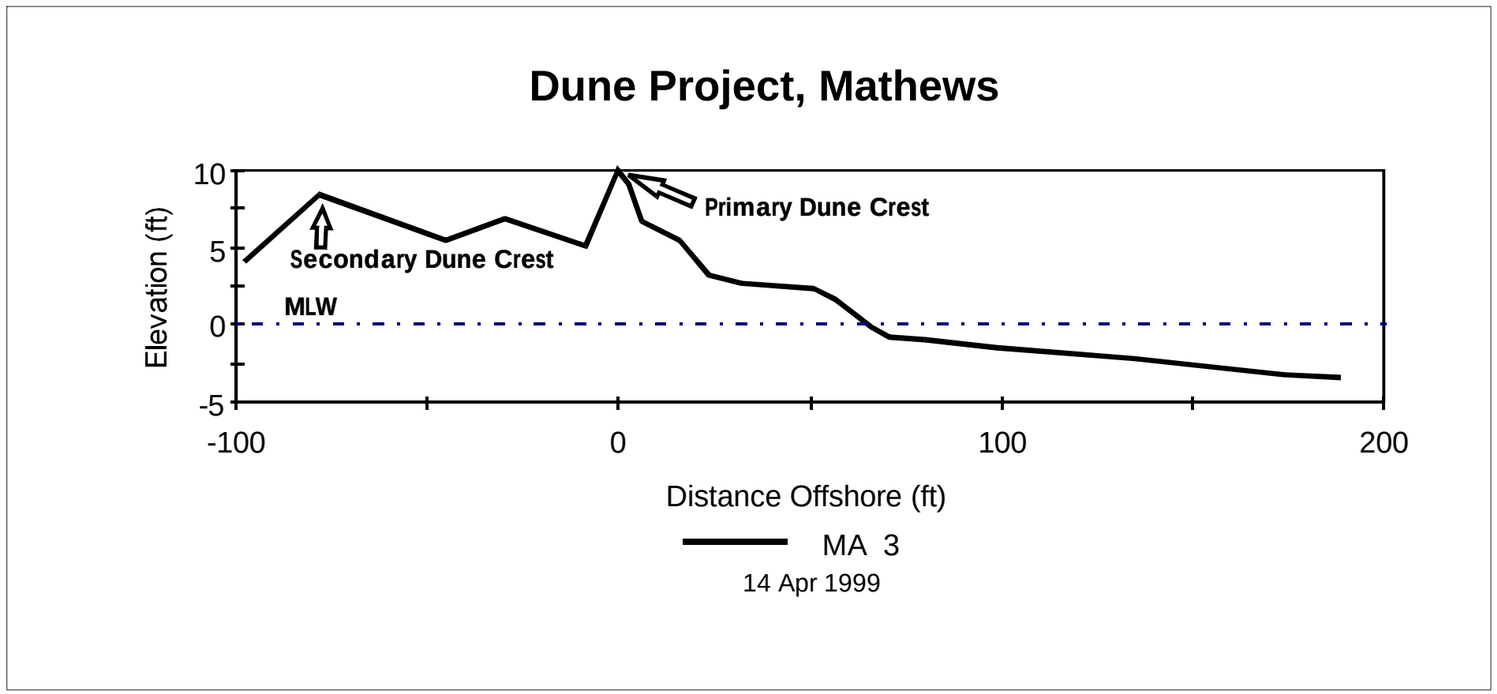
17. **Crest Elevation (ft MLW):** 8.0
18. **Land Extent From Primary Crest (ft):** 180
19. **Second Crest – Landward (ft):** 155

Vegetation Communities

20. **Primary Dune:** *Ammophilla breviligulata* (American beach grass)
21. **Secondary Dune:** *Spartina patens* (saltmeadow hay), *Solidago sempervirens* (seaside goldenrod)

22. **Remarks:**
Site MA 2 is the mainland equivalent of MA 1. The primary dune is relatively high due to abundant sand and moderate to severe wind/wave climate. The broad tidal flats and bayside berm are a good source of wind blown sand. The site appears to be relatively stable.

MATHEWS COUNTY DUNE SITE 3



Site Information

1. **Date Visited:** 14 Apr 1999
2. **Central Coordinates:** **N:** 368,050 ft **E:** 2,647,500 ft
3. **Profile Coordinates:** **N:** 368,050 ft **E:** 2,647,500 ft

Virginia South State Plane Grid NAD 1927 [4502]

4. **Site Length:** 4290 ft
5. **Ownership:** Private

Plate 1A

Site Parameters

6. **Type:** Man Influenced
7. **Fetch Exposure:** Open Bay
8. **Shoreline Direction of Face:** East
9. **Nearshore Gradient:** >3,000 ft./Extensive Bars
10. **Morphologic Setting:** Dune Field >500 ft. Alongshore/Linear
11. **Relative Stability:** Stable
12. **Underlying Substrate:** Upland
13. **Structure or Fill:** N/A

Looking north. Note the recent advance of foredune.

Looking northward at the "hot spot", by the yellow house. The surveyed transect is on the north side of the house.

Looking south along the primary dune crest at MA 3.

Site Measurements

Primary Dune:

14. **Crest Elevation (ft MLW):** 10.0
15. **Extent from Crest Landward (ft):** 8.5
16. **Extent from Crest To MLW (ft):** 65

Secondary Dune:

17. **Crest Elevation (ft MLW):** 8.4
18. **Land Extent From Primary Crest (ft.):** 98
19. **Second Crest – Landward (ft.):** 20

Vegetation Communities

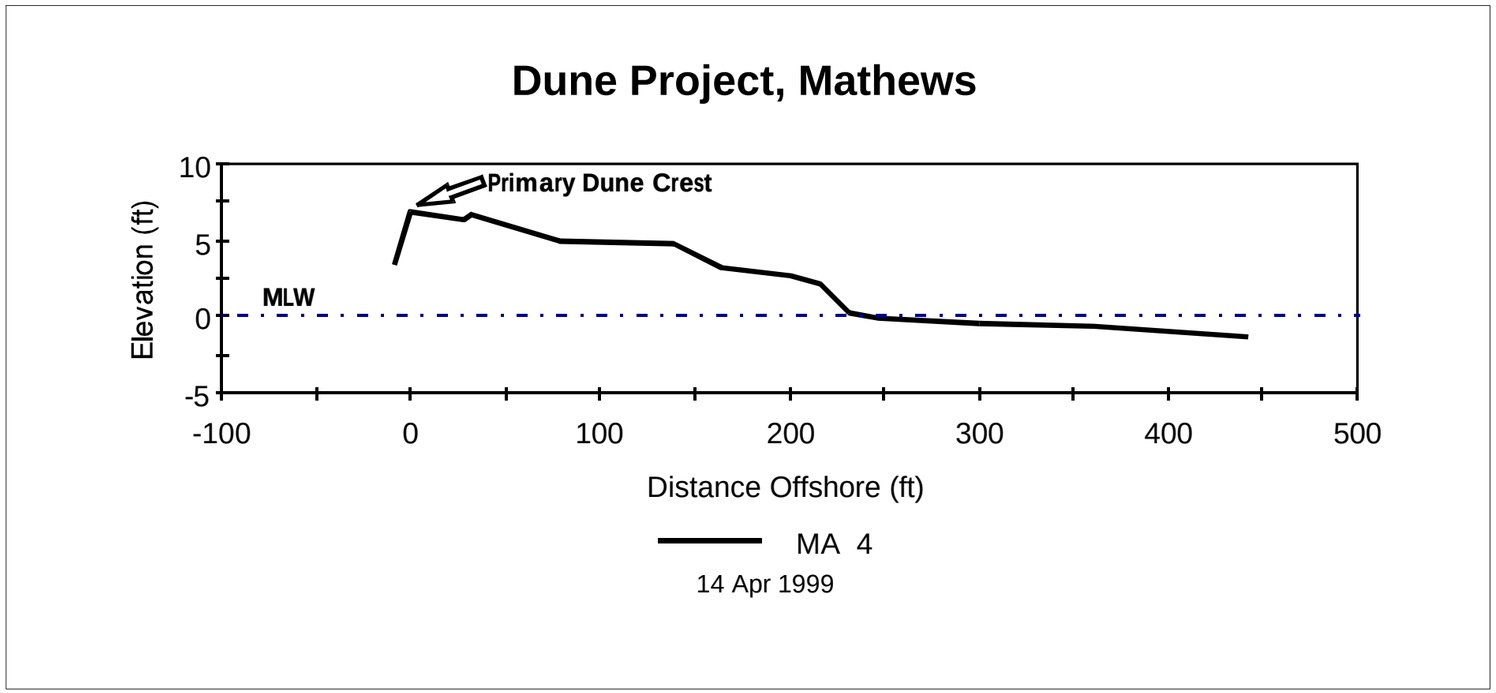
20. **Primary Dune:** *Ammophilla breviligulata* (American beach grass) *Spartine patens* (saltmeadow hay)
21. **Secondary Dune:** Mixed herbaceous/shrub

22. **Remarks:**

MA 3 is an extensive dune field that fronts the cottage communities of Bavon and Chesapeake Shores. A breakwater/sill system at the north end has prevented beach sand losses. Overall, the site is relatively stable except for a "hot spot" about midway in the reach. A secondary dune exists along much of this site.

Not intended for use in determining legal jurisdictional limits

MATHEWS COUNTY DUNE SITE 4



Site Information

1. **Date Visited:** 14 April 1999
2. **Central Coordinates:** **N:** 374,900 ft **E:** 2,647,100 ft
3. **Profile Coordinates:** **N:** 374,900 ft **E:** 2,647,100 ft

Virginia South State Plane Grid NAD 1927 [4502]

4. **Site Length:** 500 ft
5. **Ownership:** Private

Plate 1B

Site Parameters

6. **Type:** Man Influenced/man-made
7. **Fetch Exposure:** Open Bay
8. **Shoreline Direction of Face:** Northeast
9. **Nearshore Gradient:** 1,000 to 3,000 ft/Extensive Bars
10. **Morphologic Setting:** Isolated <500 ft Alongshore/Shallow Bay
11. **Relative Stability:** Stable
12. **Underlying Substrate:** Upland
13. **Structure or Fill:** Beach Fill

Looking north along primary dune crest with the campground in the background.

Looking south across the beach and broad backshore region

Site Measurements

Primary Dune:

14. **Crest Elevation (ft MLW):** 6.9
15. **Extent from Crest Landward (ft):** 8
16. **Extent from Crest To MLW (ft):** 239

Secondary Dune: None

17. **Crest Elevation (ft MLW):** N/A
18. **Land Extent From Primary Crest (ft):** N/A
19. **Second Crest – Landward (ft):** N/A

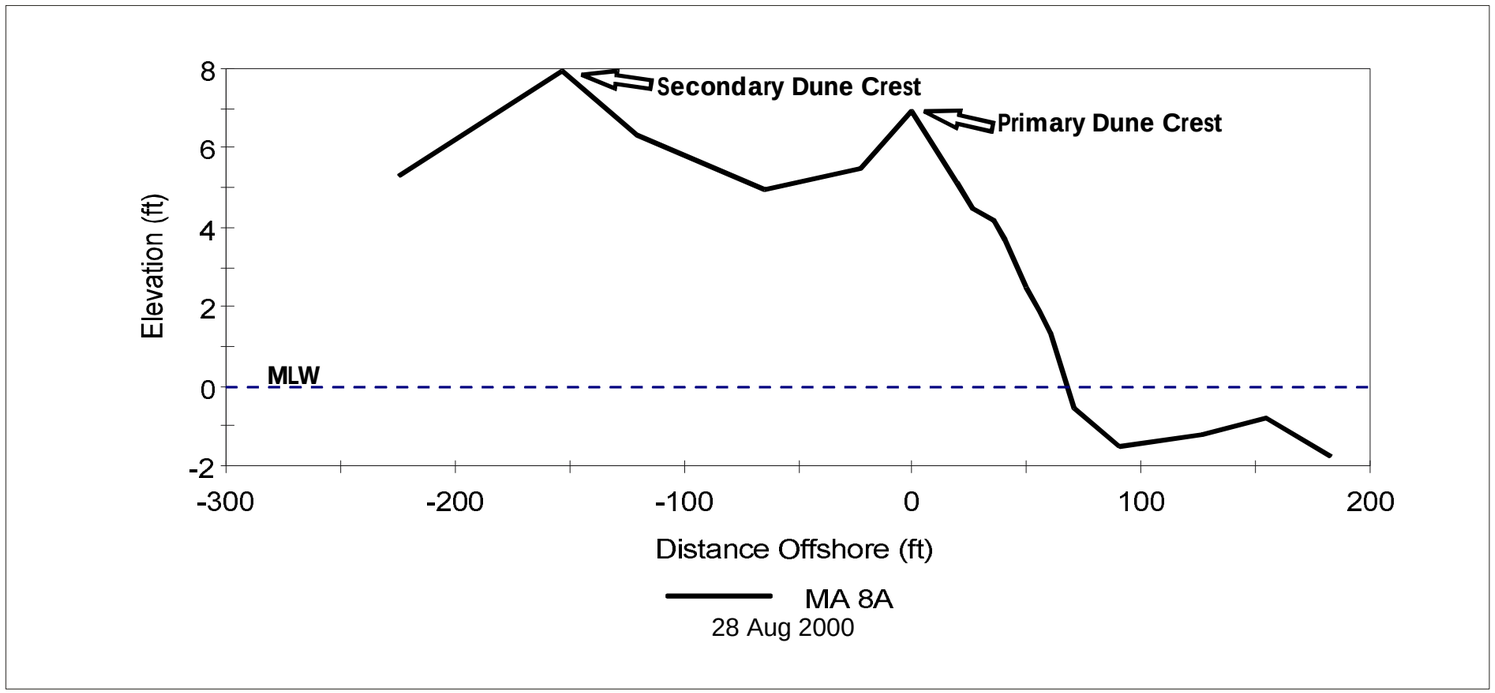
Vegetation Communities

20. **Primary Dune:** *Ammophilla breviligulata* (American beach grass)
Spartina patens (saltmeadow hay)
21. **Secondary Dune:** N/A

22. **Remarks:**
Site MA 4 is located at the New Point Campground and has been influenced by several beach fill projects from maintenance dredging of Horn Harbor. This has produced an oddly shaped profile where the primary dune is at the back of the fill. Much of the site has been disturbed as a recreational area for volleyball.

Not intended for use in determining legal jurisdictional limits

MATHEWS COUNTY DUNE SITE 8A



Site Information

1. **Date Visited:** 28 Aug 2000
2. **Central Coordinates:** **N:** 387,100 ft **E:** 2,654,100 ft
3. **Profile Coordinates:** **N:** 385,810ft **E:** 2,653,013 ft

Virginia South State Plane Grid NAD 1927 [4502]

4. **Site Length:** 3,150 ft
5. **Ownership:** Private

Plate 2A

Site Parameters

6. **Type:** Man Influenced
7. **Fetch Exposure:** Open Bay
8. **Shoreline Direction of Face:** Southeast
9. **Nearshore Gradient:** 1,000 to 3,000 ft/No Bars
10. **Morphologic Setting:** Creek Mouth Barrier/Spit
11. **Relative Stability:** Accretionary
12. **Underlying Substrate:** Marsh
13. **Structure or Fill:** Beach fill

Looking southwestward along the primary dune crest across the transect MA 8A.

Looking northward along the primary dune crest across the transect MA 8A.

Site Measurements

Primary Dune:

14. **Crest Elevation (ft MLW):** 6.9
15. **Extent from Crest Landward (ft):** 64
16. **Extent from Crest To MLW (ft):** 68

Secondary Dune:

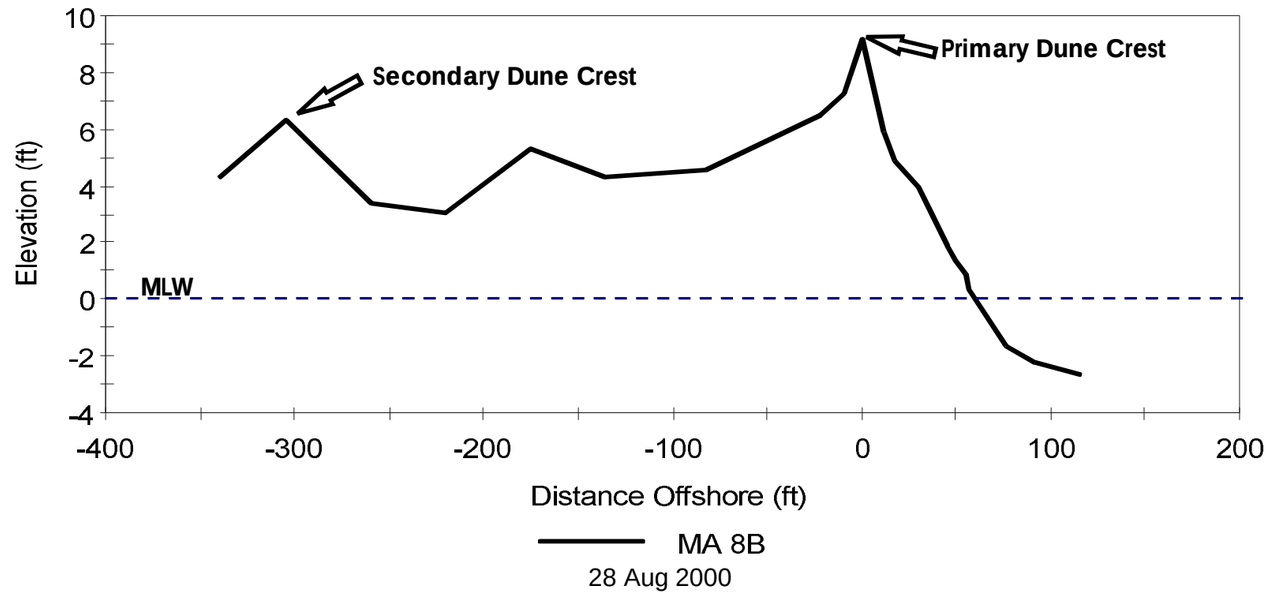
17. **Crest Elevation (ft MLW):** 8.0
18. **Land Extent From Primary Crest (ft):** 224
19. **Second Crest – Landward (ft):** 71

Vegetation Communities

20. **Primary Dune:** *Ammophila breviligulata* (American beach grass)
    Panicum virgatum (switch grass)
21. **Secondary Dune:** *Spartina patens* (saltmeadow hay)
    shrub/woody

22. **Remarks:**
Site MA 8A is a long dune field situated on the north shore of the navigational channel into Winter Harbor. It is heavily man influenced as a disposal area for dredged material from Winter Harbor. Transect MA 8A represents the southern extent of the dune field.

MATHEWS COUNTY DUNE SITE 8B



Site Information

1. **Date Visited:** 28 Aug 2000
2. **Central Coordinates:** **N:** 387,100 ft **E:** 2,654,100 ft
3. **Profile Coordinates:** **N:** 387,752 ft **E:** 2,654,081 ft

Virginia South State Plane Grid NAD 1927 [4502]

4. **Site Length:** 3,050 ft
5. **Ownership:** Private

Plate 2A

Site Parameters

6. **Type:** Man Influenced
7. **Fetch Exposure:** Open Bay
8. **Shoreline Direction of Face:** East
9. **Nearshore Gradient:** 1,000 to 3,000 ft/No Bars
10. **Morphologic Setting:** Creek Mouth Barrier/Spit
11. **Relative Stability:** Accretionary
12. **Underlying Substrate:** Marsh
13. **Structure or Fill:** Beach fill

Looking south across transect MA 8B along the primary dune crest.

Looking northward along the primary dune crest.

Site Measurements

Primary Dune:

14. **Crest Elevation (ft MLW):** 9.2
15. **Extent from Crest Landward (ft):** 82
16. **Extent from Crest To MLW (ft):** 60

Secondary Dune:

17. **Crest Elevation (ft MLW):** 6.3
18. **Land Extent From Primary Crest (ft):** 340
19. **Second Crest – Landward (ft):** 35

Vegetation Communities

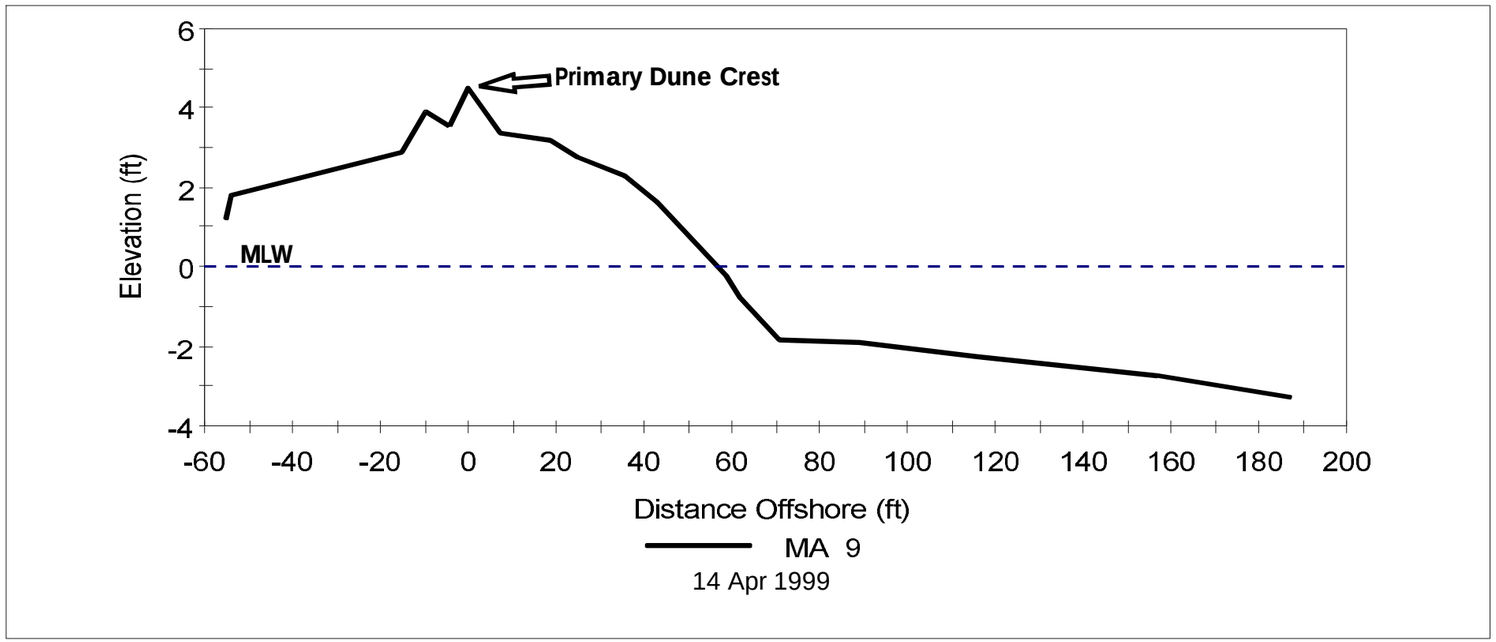
20. **Primary Dune:** *Ammophila breviligulata* (American beach grass)
21. **Secondary Dune:** *Panicum virgatum* (switch grass)

22. **Remarks:**

MA 8B is typical of the northern portion of site MA8. Overall, the site is relatively stable due, in part, to the continuous beach nourishment using sandy material from Winter Harbor maintenance dredging. Secondary dunes have developed as the dune field has advanced over time.

Not intended for use in determining legal jurisdictional limits

MATHEWS COUNTY DUNE SITE 9



Site Information

1. **Date Visited:** 14 April 1999
2. **Central Coordinates:** **N:** 399,100 ft **E:** 2,653,780 ft
   Virginia South State Plane Grid NAD 1927 [4502]
3. **Profile Coordinates:** **N:** 399,100 ft **E:** 2,653,780 ft
4. **Site Length:** 225 ft
5. **Ownership:** Private

Plate 2B

Site Parameters

6. **Type:** Natural
7. **Fetch Exposure:** Open Bay
8. **Shoreline Direction of Face:** East
9. **Nearshore Gradient:** 1,000 to 3,000 ft/No Bars
10. **Morphologic Setting:** Isolated <500 ft Alongshore/Pocket
11. **Relative Stability:** Land Transgressive/Erosional
12. **Underlying Substrate:** Marsh
13. **Structure or Fill:** N/A

Site Measurements

Primary Dune:

14. **Crest Elevation (ft MLW):** 4.5
15. **Extent from Crest Landward (ft):** 15
16. **Extent from Crest To MLW (ft):** 56

Secondary Dune: None

17. **Crest Elevation (ft MLW):** N/A
18. **Land Extent From Primary Crest (ft):** N/A
19. **Second Crest – Landward (ft):** N/A

Vegetation Communities

20. **Primary Dune:**
    Ammophila breviligulata (American beach grass)
    Spartina patens (saltmeadow hay)
21. **Secondary Dune:** N/A

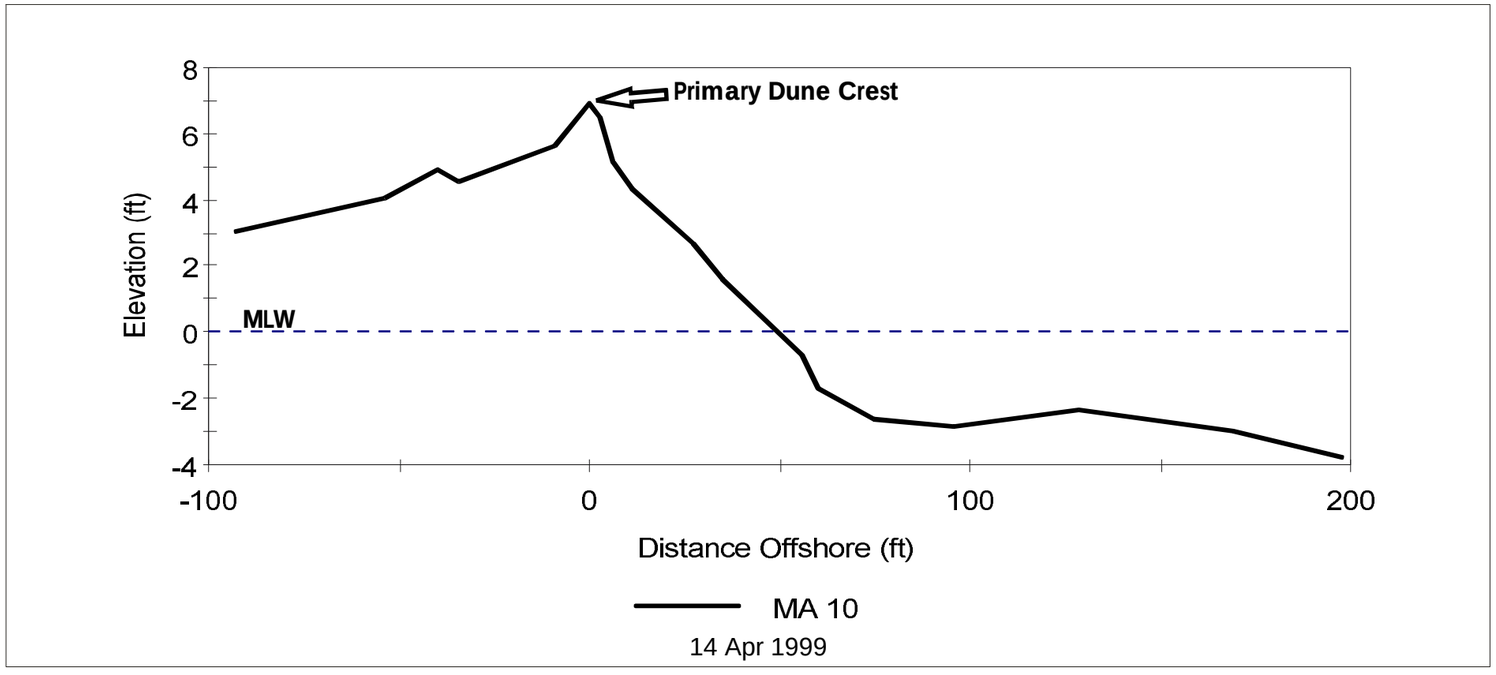
22. **Remarks:**
    MA 9 is an isolated pocket beach/dune bounded by marsh peat headlands. This is an active system subject to overwash during storms which results in a low primary dune.

Looking north at the complete beach/dune profile. A break in the clayey terrace has allowed the pocket beach to form.

Looking north of the pocket beach at the controlling peat substrate.

Not intended for use in determining legal jurisdictional limits

MATHEWS COUNTY DUNE SITE 10



Site Information

1. **Date Visited:** 14 April 1999
2. **Central Coordinates:** **N:** 401,900 ft **E:** 2,653,440 ft
3. **Profile Coordinates:** **N:** 401,900 ft **E:** 2,653,440 ft

Virginia South State Plane Grid NAD 1927 [4502]

4. **Site Length:** 485 ft
5. **Ownership:** Private

Plate 2B

Site Parameters

6. **Type:** Man Influenced
7. **Fetch Exposure:** Open Bay
8. **Shoreline Direction of Face:** East
9. **Nearshore Gradient:** 1,000 to 3,000 ft/No Bars
10. **Morphologic Setting:** Isolated <500 ft Alongshore/Linear
11. **Relative Stability:** Stable
12. **Underlying Substrate:** Upland
13. **Structure or Fill:** Groins

Looking south across transect MA 10.

Looking north along primary dune crest and groin field.

Site Measurements

Primary Dune:

14. **Crest Elevation (ft MLW):** 6.9
15. **Extent from Crest Landward (ft):** 9
16. **Extent from Crest To MLW (ft):** 50

Secondary Dune: None

17. **Crest Elevation (ftMLW):** N/A
18. **Land Extent From Primary Crest (ft.):** N/A
19. **Second Crest – Landward (ft.):** N/A

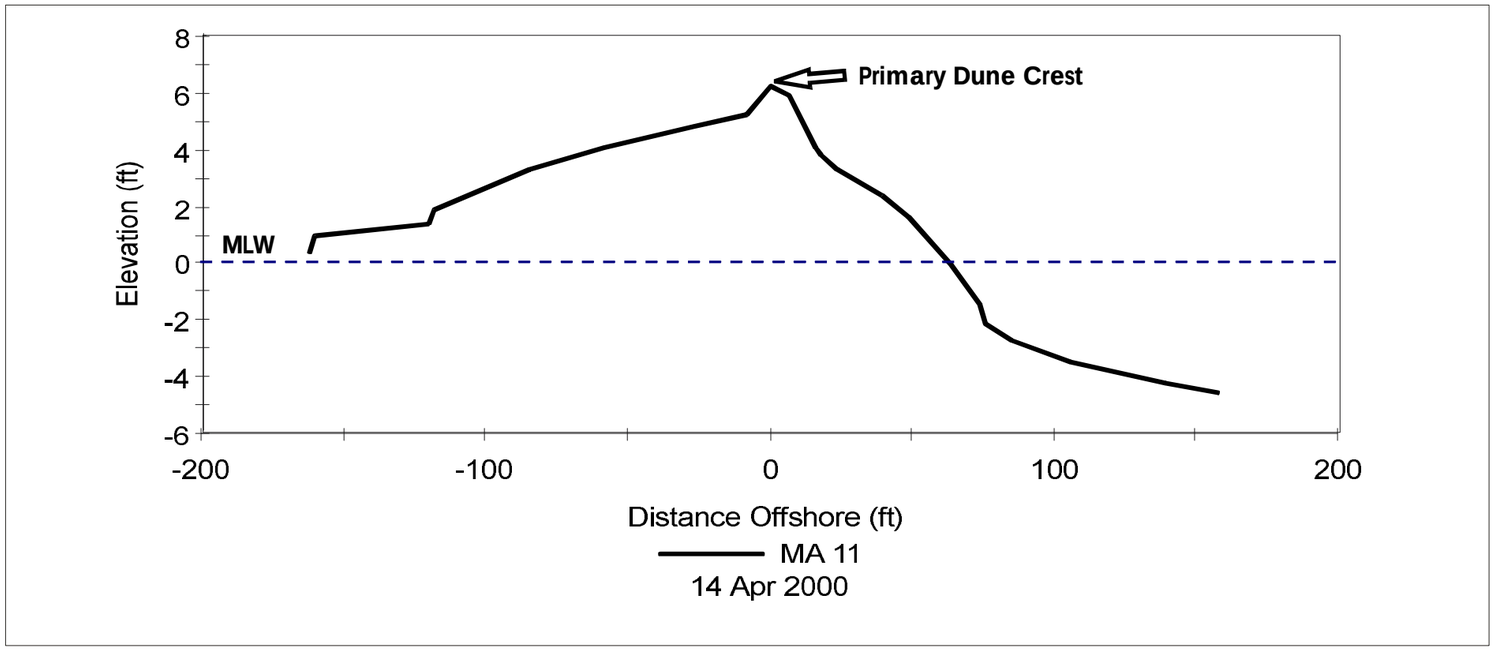
Vegetation Communities

20. **Primary Dune:** *Spartina patens* (saltmeadow hay)
Ammophila breviligulata (American beach grass)
21. **Secondary Dune:** N/A

22. **Remarks:**

MA 10 has evolved due, in part, to the groin field at Bethel Beach.

MATHEWS COUNTY DUNE SITE 11



Site Information

1. **Date Visited:** 14 Apr 1999
2. **Central Coordinates:**
   N: 404,800 ft
   E: 2,652,950 ft
   Virginia South State Plane Grid NAD 1927 [4502]
3. **Profile Coordinates:**
   N: 404,800 ft
   E: 2,652,950 ft
4. **Site Length:** 515 ft
5. **Ownership:** Private

Plate 2B

Site Parameters

6. **Type:** Man Influenced
7. **Fetch Exposure:** Open Bay
8. **Shoreline Direction of Face:** East
9. **Nearshore Gradient:** >3,000 ft/No Bars
10. **Morphologic Setting:** Dune Field >500 ft Alongshore/Linear
11. **Relative Stability:** Land Transgressive/Erosional
12. **Underlying Substrate:** Marsh
13. **Structure or Fill:** Jetty

Site Measurements

Primary Dune:

14. **Crest Elevation (ft MLW):** 6.3
15. **Extent from Crest Landward (ft):** 8
16. **Extent from Crest To MLW (ft):** 62

Secondary Dune: None

17. **Crest Elevation (ft MLW):** N/A
18. **Land Extent From Primary Crest (ft):** N/A
19. **Second Crest – Landward (ft):** N/A

Vegetation Communities

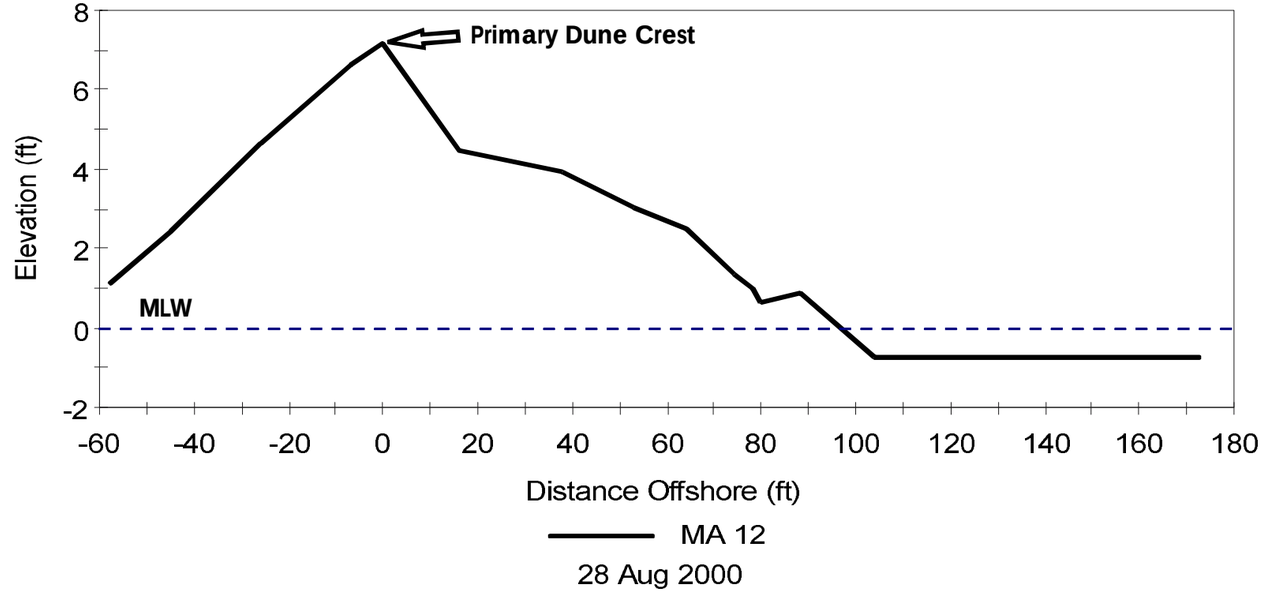
20. **Primary Dune:** *Ammophilia breviligulata* (American beach grass)
    Spartina patens (saltmeadow hay)
21. **Secondary Dune:** N/A

22. **Remarks:**
    MA 11 has evolved due to littoral drift sand accumulated at the Garden Creek jetties.

Looking south at Garden Creek jetties.

Looking north across transect MA 11.

MATHEWS COUNTY DUNE SITE 12



Site Information

1. **Date Visited:** 28 Aug 2000
2. **Central Coordinates:** **N:** 422,450 ft **E:** 2,649,180 ft
3. **Profile Coordinates:** **N:** 422,450 ft **E:** 2,649,180 ft

Virginia South State Plane Grid NAD 1927 [4502]

4. **Site Length:** 1,540 ft
5. **Ownership:** Private

Plate 3A

Site Parameters

6. **Type:** Natural
7. **Fetch Exposure:** Open Bay
8. **Shoreline Direction of Face:** East
9. **Nearshore Gradient:** 1,000 to 3,000 ft/Extensive Bars
10. **Morphologic Setting:** Creek Mouth Barrier/Spit
11. **Relative Stability:** Land Transgressive/Erosional
12. **Underlying Substrate:** Marsh
13. **Structure or Fill:** N/A

Looking south toward the distal end of the spit/dune.

Looking northward across a wide dune backshore region.

Site Measurements

Primary Dune:

14. **Crest Elevation (ft MLW):** 7.2
15. **Extent from Crest Landward (ft):** 45
16. **Extent from Crest To MLW (ft):** 96

Secondary Dune: None

17. **Crest Elevation (ft MLW):** N/A
18. **Land Extent From Primary Crest (ft):** N/A
19. **Second Crest – Landward (ft):** N/A

Vegetation Communities

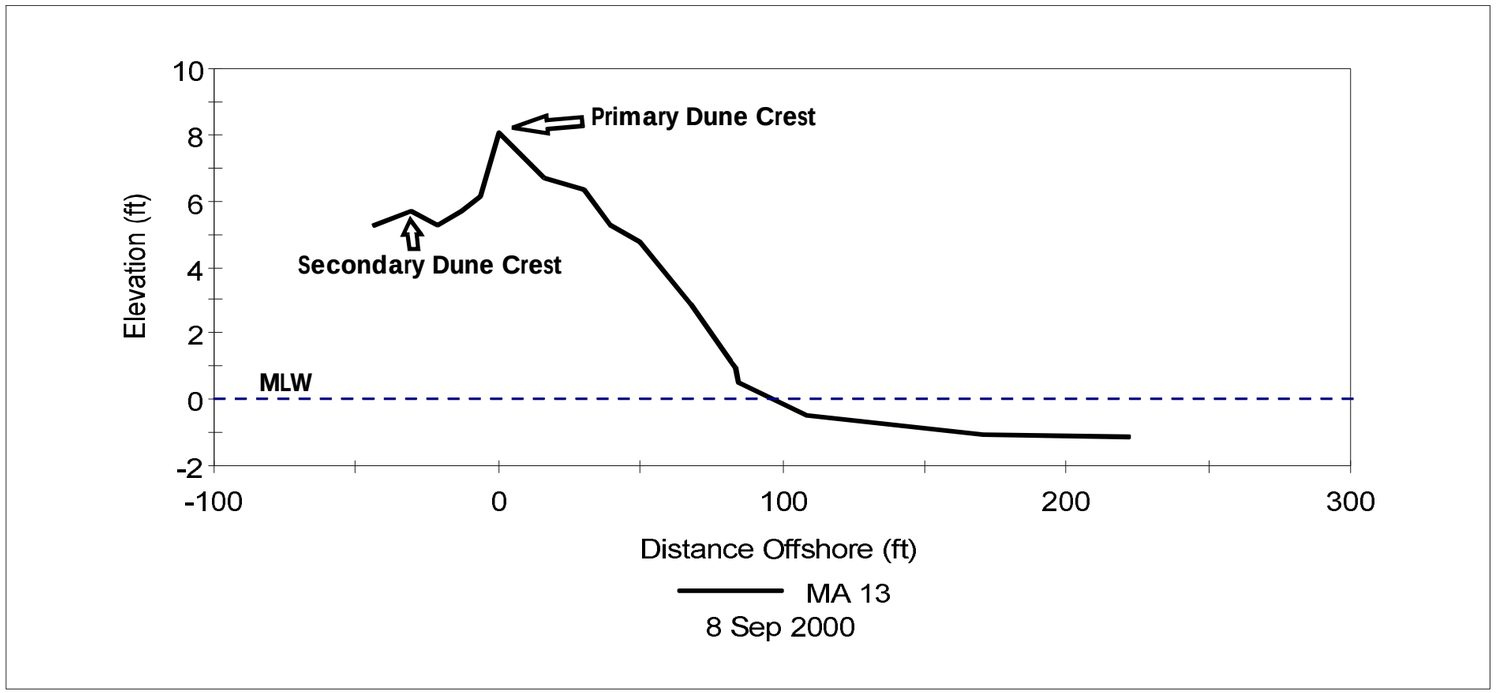
20. **Primary Dune:** *Ammophila breviligulata* (American beach grass)
21. **Secondary Dune:** N/A

22. **Remarks:**

Site MA 12 occurs along a spit at the "The Hole in the Wall", an entrance to Milford Haven. This highly mobile dune region is a remnant of a much larger barrier island that was once continuous but now is highly fragmented.

Not intended for use in determining legal jurisdictional limits

MATHEWS COUNTY DUNE SITE 13



Site Information

1. **Date Visited:** 8 Sep 2000
2. **Central Coordinates:** **N:** 427,600 ft **E:** 2,646,340 ft
3. **Profile Coordinates:** **N:** 427,600 ft **E:** 2,646,340 ft

Virginia South State Plane Grid NAD 1927 [4502]

4. **Site Length:** 450 ft
5. **Ownership:** Private

Plate 3A

Site Parameters

6. **Type:** Man Influenced
7. **Fetch Exposure:** Open Bay
8. **Shoreline Direction of Face:** Northeast
9. **Nearshore Gradient:** 1,000 to 3,000 ft./Extensive Bars
10. **Morphologic Setting:** Isolated <500 ft. Alongshore/Pocket
11. **Relative Stability:** Land Transgressive/Erosional
12. **Underlying Substrate:** Upland
13. **Structure or Fill:** Groin

Looking south along the primary dune crest.

Looking north along the primary dune crest.

Site Measurements

Primary Dune:

14. **Crest Elevation (ft MLW):** 8.0
15. **Extent from Crest Landward (ft):** 13
16. **Extent from Crest To MLW (ft):** 97

Secondary Dune:

17. **Crest Elevation (ft MLW):** 5.7
18. **Land Extent From Primary Crest (ft):** 44
19. **Second Crest – Landward (ft):** 13

Vegetation Communities

20. **Primary Dune:**

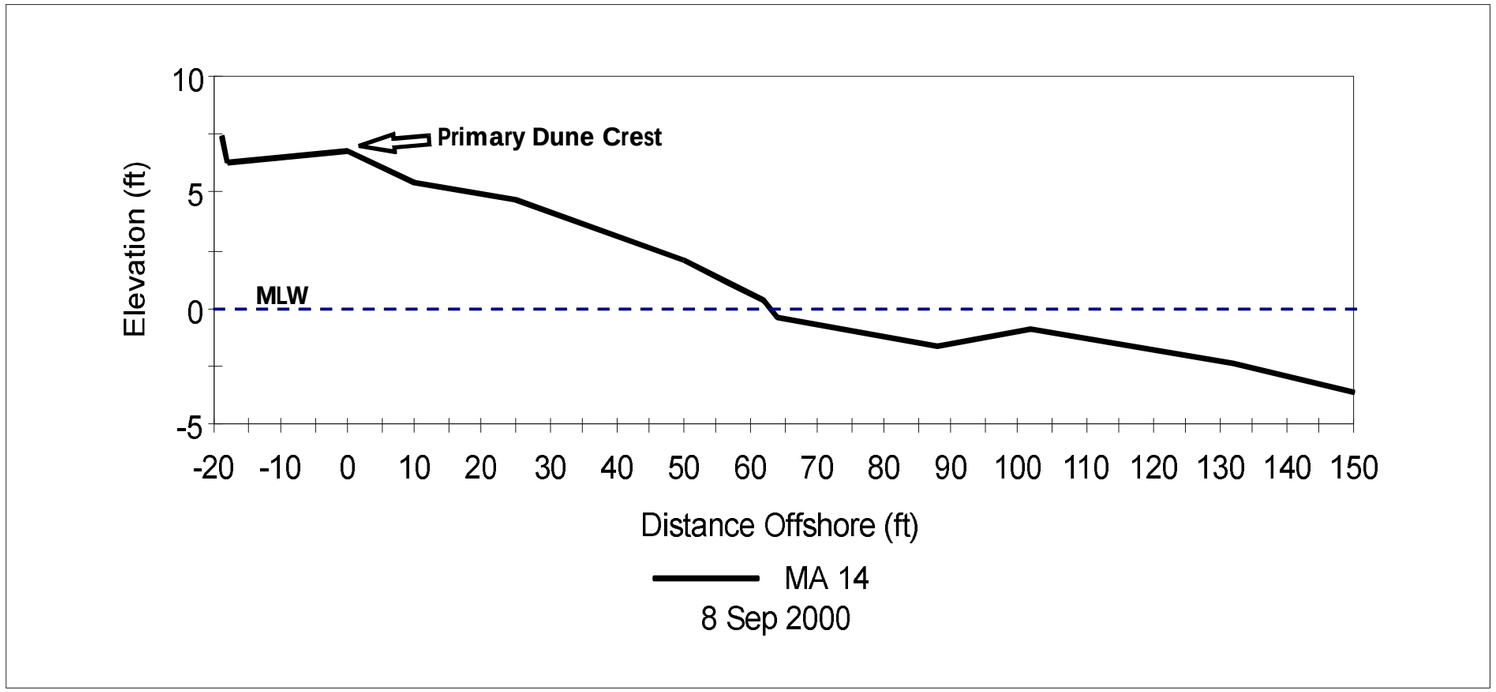
Ammophila breviligulata (American beach grass)

21. **Secondary Dune:** N/A

22. **Remarks:**

MA 13 is a pocket beach and dune that developed along Hills Creek after the breach of the Bay barrier in the early 1980s. It is bordered on the north by a bulkhead and pinned on the south by an old, failed stone revetment. The low secondary dune is evidence of a rapid bayward growth after initial beach deposition.

MATHEWS COUNTY DUNE SITE 14



Site Information

1. **Date Visited:** 8 Sep 2000
2. **Central Coordinates:** **N:** 431,900 ft **E:** 2,644,980 ft
3. **Profile Coordinates:** **N:** 431,900 ft **E:** 2,644,980 ft

Virginia South State Plane Grid NAD 1927 [4502]

4. **Site Length:** 460 ft
5. **Ownership:** Private

Plate 3B

Site Parameters

6. **Type:** Man Influenced
7. **Fetch Exposure:** Open Bay
8. **Shoreline Direction of Face:** Northeast
9. **Nearshore Gradient:** 1,000 to 3,000 ft./Extensive Bars
10. **Morphologic Setting:** Isolated <500 ft. Alongshore/Linear
11. **Relative Stability:** Stable
12. **Underlying Substrate:** Upland
13. **Structure or Fill:** Groin

Looking north.

Looking south.

Site Measurements

Primary Dune:

14. **Crest Elevation (ft MLW):** 6.8
15. **Extent from Crest Landward (ft):** 18
16. **Extent from Crest To MLW (ft):** 63

Secondary Dune: None

17. **Crest Elevation (ft MLW):** N/A
18. **Land Extent From Primary Crest (ft):** N/A
19. **Second Crest – Landward (ft):** N/A

Vegetation Communities

20. **Primary Dune:**

Ammophila breviligulata (American beach grass)

21. **Secondary Dune:** N/A

22. **Remarks:**

MA 14 is a relatively short, groin-controlled, low dune site on the bay side of Gwynn's Island.

Not intended for use in determining legal jurisdictional limits

MATHEWS COUNTY DUNE SITE 15

Site Information

1. **Date Visited:** 8 Sep 2000
2. **Central Coordinates:** **N:** 435,300 ft **E:** 2,643,340 ft **Virginia South State Plane Grid NAD 1927 [4502]**
3. **Profile Coordinates:** **Not Profiled**
4. **Site Length:** 65 ft
5. **Ownership:** Private

Plate 3B

Site Parameters

6. **Type:** Man Influenced
7. **Fetch Exposure:** Open Bay
8. **Shoreline Direction of Face:** Northeast
9. **Nearshore Gradient:** 1,000 to 3,000 ft/Extensive Bars
10. **Morphologic Setting:** Isolated <500 ft Alongshore/pocket
11. **Relative Stability:** Stable
12. **Underlying Substrate:** Upland
13. **Structure or Fill:** Bulkhead/Revetment/Groin

Site Measurements

Primary Dune:

14. **Crest Elevation (ft MLW):** No Data
15. **Extent from Crest Landward (ft):** No Data
16. **Extent from Crest To MLW (ft):** No Data

Secondary Dune: None

17. **Crest Elevation (ft MLW):** N/A
18. **Land Extent From Primary Crest (ft):** N/A
19. **Second Crest – Landward (ft):** N/A

Vegetation Communities

20. **Primary Dune:** No data
21. **Secondary Dune:** N/A

22. **Remarks:**

MA 15 is bounded on the north side by a bulkhead/ revetment and a series of groins on the south. These structures have allowed the beach to evolve - even forming a dune with grasses in the middle.

Site MA 15

Site MA 16

MATHEWS COUNTY DUNE SITE 16

Site Information

1. **Date Visited:** 8 Sep 2000
2. **Central Coordinates:** **N:** 435,300 ft **E:** 2,643,340 ft **Virginia South State Plane Grid NAD 1927 [4502]**
3. **Profile Coordinates:** **Not Profiled**
4. **Site Length:** 65 ft
5. **Ownership:** Private

Plate 8B

Site Parameters

6. **Type:** Man Influenced
7. **Fetch Exposure:** Open Bay
8. **Shoreline Direction of Face:** Northeast
9. **Nearshore Gradient:** 1,000 to 3,000 ft/Extensive Bars
10. **Morphologic Setting:** Isolated <500 ft Alongshore/pocket
11. **Relative Stability:** Stable
12. **Underlying Substrate:** Upland
13. **Structure or Fill:** Bulkhead/Revetment/Groin

Site Measurements

Primary Dune:

14. **Crest Elevation (ft MLW):** No Data
15. **Extent from Crest Landward (ft):** No Data
16. **Extent from Crest To MLW (ft):** No Data

Secondary Dune: None

17. **Crest Elevation (ft MLW):** N/A
18. **Land Extent From Primary Crest (ft):** N/A
19. **Second Crest – Landward (ft):** N/A

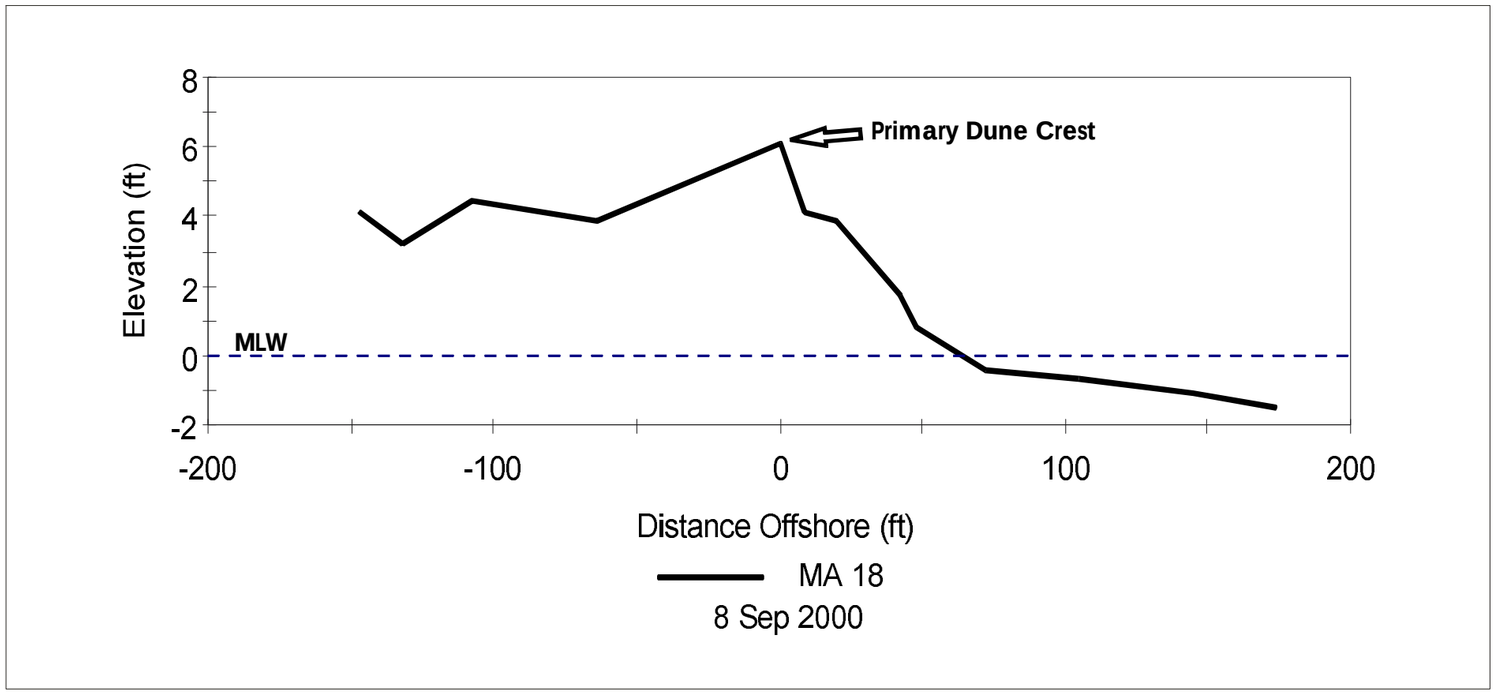
Vegetation Communities

20. **Primary Dune:** No Data
21. **Secondary Dune:** N/A

22. **Remarks:**

Site MA 16 is a pocket beach and dune situated between bulkhead and groins.

MATHEWS COUNTY DUNE SITE 18



Site Information

1. **Date Visited:** 8 Sep 2000
2. **Central Coordinates:** **N:** 428,300 ft **E:** 2,633,820 ft
3. **Profile Coordinates:** **N:** 428,300 ft **E:** 2,633,820 ft

Virginia South State Plane Grid NAD 1927 [4502]

4. **Site Length:** 525 ft
5. **Ownership:** Private

Plate 4A

Site Parameters

6. **Type:** Man Influenced
7. **Fetch Exposure:** Riverine, Bay Influenced
8. **Shoreline Direction of Face:** North
9. **Nearshore Gradient:** 0 to 1,000 ft/No Bars
10. **Morphologic Setting:** Dune Field >500 ft Alongshore/Linear
11. **Relative Stability:** Stable
12. **Underlying Substrate:** Upland
13. **Structure or Fill:** Jetty

Looking north from approximately mid-site with wood bulkhead/jetties in background.

Looking south from approximately mid-site with restaurant/motel complex to the right.

Site Measurements

Primary Dune:

14. **Crest Elevation (ft MLW):** 6.1
15. **Extent from Crest Landward (ft):** 64
16. **Extent from Crest To MLW (ft):** 62

Secondary Dune: None

17. **Crest Elevation (ft MLW):** N/A
18. **Land Extent From Primary Crest (ft):** N/A
19. **Second Crest – Landward (ft):** N/A

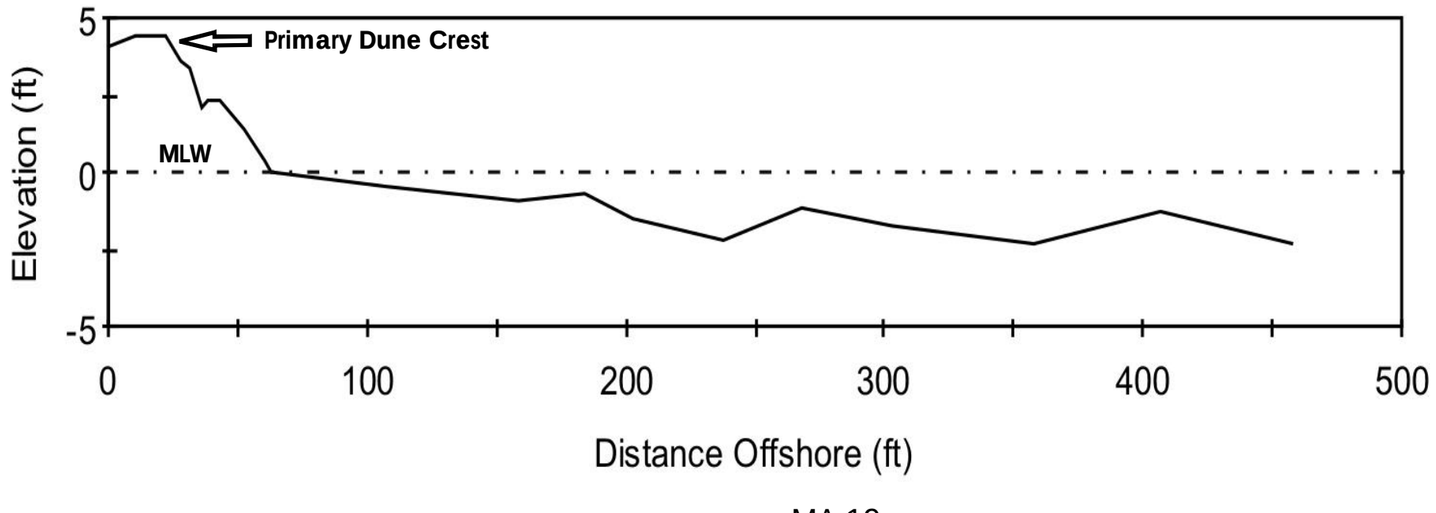
Vegetation Communities

20. **Primary Dune:**
    Ammophila breviligulata (American beach grass)
    Panicum virgatum (switch grass)
21. **Secondary Dune:** N/A

22. **Remarks:**
Site MA 18 is an accreting beach and dune that has evolved in response to a combination bulkhead/jetty that was installed as part of the Gwynn's Island Marina and restaurant/motel complex.

Not intended for use in determining legal jurisdictional limits

MATHEWS COUNTY DUNE SITE 19



This is a public beach site that was profiled on 09 Sep 1997.

Site Information

1. **Date Visited:** 8 Sep 2000
2. **Central Coordinates:** **N:** 433,780 ft **E:** 2,622,400 ft
3. **Profile Coordinates:** **N:** 433,780 ft **E:** 2,622,400 ft

Virginia South State Plane Grid NAD 1927 [4502]

4. **Site Length:** 250 ft
5. **Ownership:** Public/Private

Plate 4B

Site Parameters

6. **Type:** Natural
7. **Fetch Exposure:** Riverine, Bay Influenced
8. **Shoreline Direction of Face:** Northeast
9. **Nearshore Gradient:** 0 to 1,000 ft/Extensive Bars
10. **Morphologic Setting:** Isolated <500 ft Alongshore/Linear
11. **Relative Stability:** Stable
12. **Underlying Substrate:** Upland
13. **Structure or Fill:** N/A

Looking east from approximately mid-site.

Looking west from public beach landing area, showing the graded bank and modified back shore region.

Site Measurements

Primary Dune:

14. **Crest Elevation (ft MLW):** 4.5
15. **Extent from Crest Landward (ft):** 10
16. **Extent from Crest To MLW (ft):** 58

Secondary Dune: None

17. **Crest Elevation (ft MLW):** N/A
18. **Land Extent From Primary Crest (ft):** N/A
19. **Second Crest – Landward (ft):** N/A

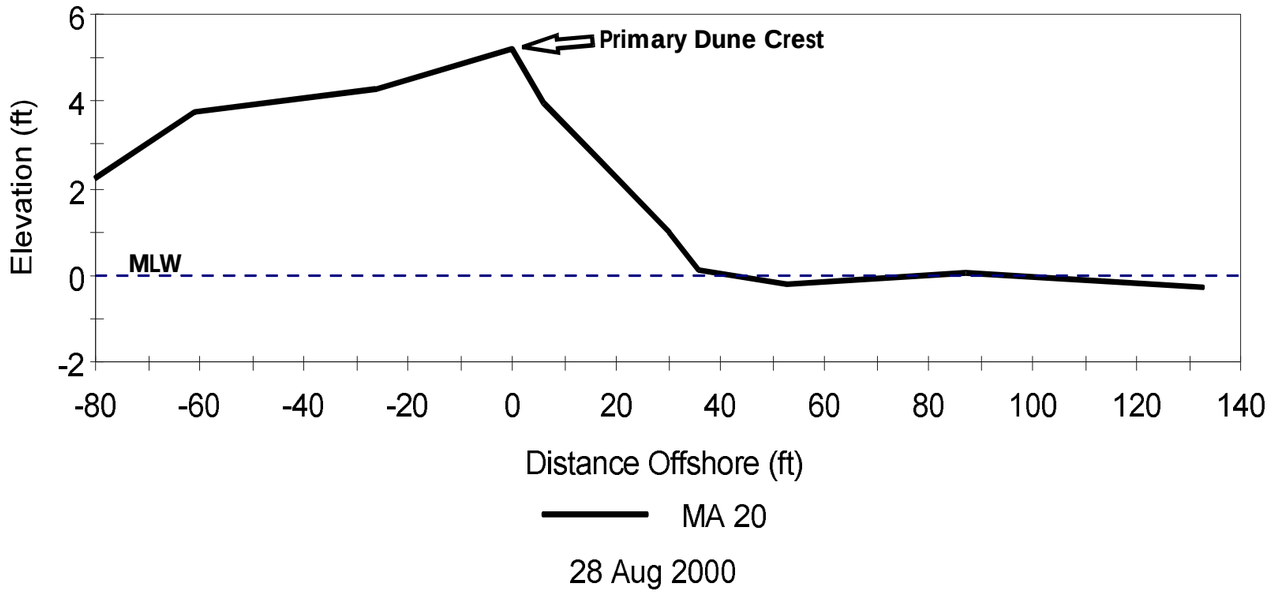
Vegetation Communities

20. **Primary Dune:** *Spartina patens* (saltmeadow hay)
21. **Secondary Dune:** N/A

22. **Remarks:**
The western half of MA 19 is a public beach/landing in Godfrey Bay which has a low accreting dune against a high upland bank. The old dune areas to the east and west have been modified by bank grading and mowing.

Not intended for use in determining legal jurisdictional limits

MATHEWS COUNTY DUNE SITE 20



Site Information

1. **Date Visited:** 28 Aug 2000
2. **Central Coordinates:** **N:** 435,550 ft **E:** 2,621,180 ft
3. **Profile Coordinates:** **N:** 435,550 ft **E:** 2,621,180 ft

Virginia South State Plane Grid NAD 1927 [4502]

4. **Site Length:** 315 ft
5. **Ownership:** Private

Plate 4B

Site Parameters

6. **Type:** Man Influenced
7. **Fetch Exposure:** Riverine, Bay Influenced
8. **Shoreline Direction of Face:** Northeast
9. **Nearshore Gradient:** 0 to 1,000 ft/Extensive Bars
10. **Morphologic Setting:** Isolated <500 ft Alongshore/Linear
11. **Relative Stability:** Stable
12. **Underlying Substrate:** Marsh
13. **Structure or Fill:** Jetty and Beach Fill

Looking southeast along Godfrey Bay coast.

Looking northwest across Chapel Creek channel jetties.

Site Measurements

Primary Dune:

14. **Crest Elevation (ft MLW):** 5.2
15. **Extent from Crest Landward (ft):** 26
16. **Extent from Crest To MLW (ft):** 43

Secondary Dune: None

17. **Crest Elevation (ft MLW):** N/A
18. **Land Extent From Primary Crest (ft):** N/A
19. **Second Crest – Landward (ft):** N/A

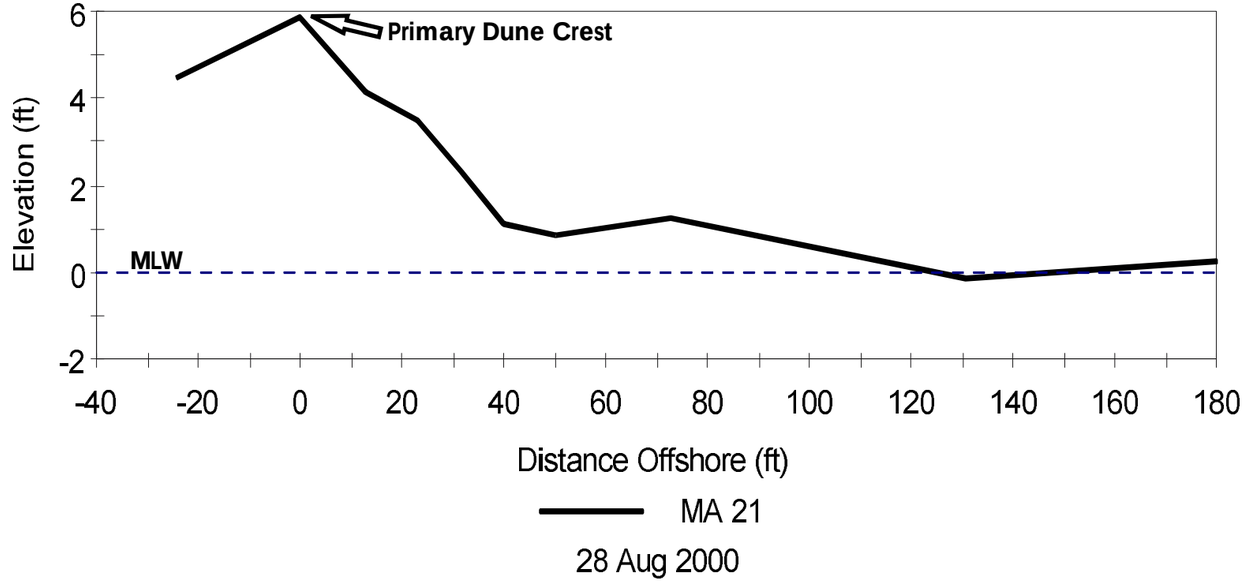
Vegetation Communities

20. **Primary Dune:**
Ammophilia breviligulata (American beach grass)
21. **Secondary Dune:** N/A

22. **Remarks:**
MA 20 is located on the southeast side of Chapel Creek and is controlled, in part, by stone channel jetties that were built in the early 1980s. However, he site was in existence before then. It may also qualify as a creek mouth barrier dune.

Not intended for use in determining legal jurisdictional limits

MATHEWS COUNTY DUNE SITE 21



Site Information

1. **Date Visited:** 28 Aug 2000
2. **Central Coordinates:** **N:** 435,900 ft **E:** 2,620,940 ft
3. **Profile Coordinates:** **N:** 435,900 ft **E:** 2,620,940 ft

Virginia South State Plane Grid NAD 1927 [4502]

4. **Site Length:** 430 ft
5. **Ownership:** Private

Plate 4B

Site Parameters

6. **Type:** Man Influenced
7. **Fetch Exposure:** Riverine, Bay Influenced
8. **Shoreline Direction of Face:** Northeast
9. **Nearshore Gradient:** 0 to 1,000 ft/Extensive Bars
10. **Morphologic Setting:** Isolated <500 ft Alongshore/Linear
11. **Relative Stability:** Stable
12. **Underlying Substrate:** Upland
13. **Structure or Fill:** Jetty

Looking southeast at the scrub/shrub vegetation on the primary dune along the north channel jetty.

Looking northwest along the Godfrey Bay coast.

Site Measurements

Primary Dune:

14. **Crest Elevation (ft MLW):** 5.8
15. **Extent from Crest Landward (ft):** 24
16. **Extent from Crest To MLW (ft):** 126

Secondary Dune: None

17. **Crest Elevation (ft MLW):** N/A
18. **Land Extent From Primary Crest (ft):** N/A
19. **Second Crest – Landward (ft):** N/A

Vegetation Communities

20. **Primary Dune:**

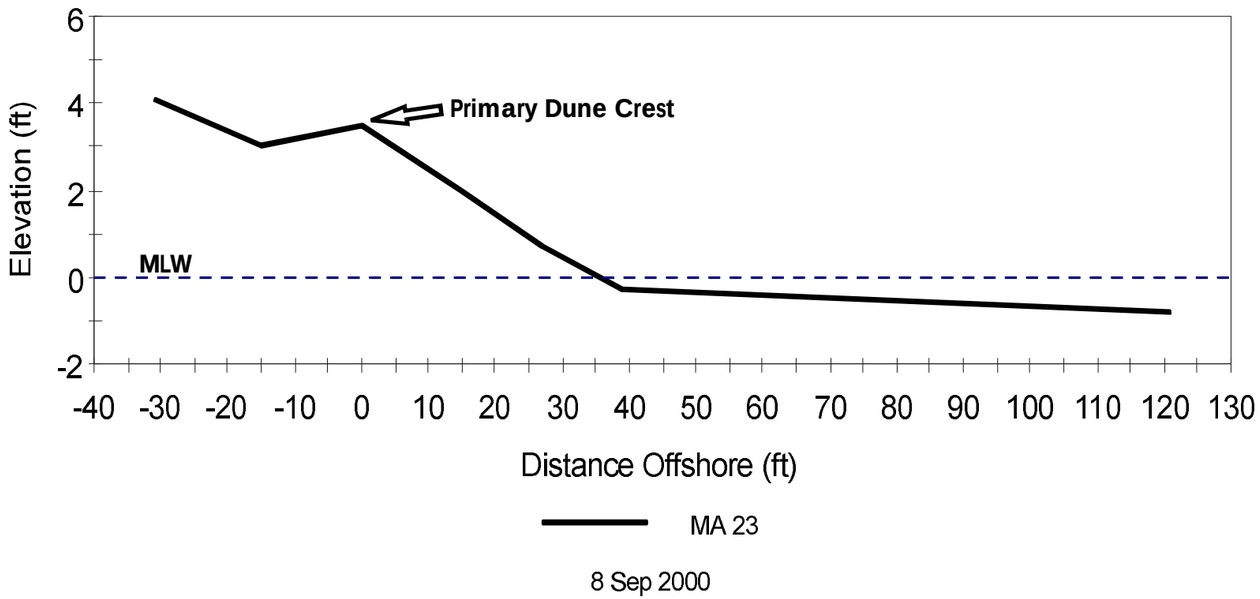
Spartina patens (saltmeadow hay)

21. **Secondary Dune:** N/A

22. **Remarks:**

MA 21 is situated on the northwest side of Chapel Creek and is controlled, in part, by the stone channel jetties that bound the southeast side of the site. This site also may be characterized as a creek mouth barrier dune.

MATHEWS COUNTY DUNE SITE 23



Site Information

1. **Date Visited:** 8 Sep 2000
2. **Central Coordinates:** **N:** 441,350 ft **E:** 2,608,500 ft
3. **Profile Coordinates:** **N:** 441,350 ft **E:** 2,608,500 ft

Virginia South State Plane Grid NAD 1927 [4502]

4. **Site Length:** 350 ft
5. **Ownership:** Private

Plate 5

Site Parameters

6. **Type:** Natural
7. **Fetch Exposure:** Riverine
8. **Shoreline Direction of Face:** North
9. **Nearshore Gradient:** 0 to 1,000 ft/No Bars
10. **Morphologic Setting:** Isolated, Linear
11. **Relative Stability:** Stable
12. **Underlying Substrate:** Marsh
13. **Structure or Fill:**

Looking up river toward Roane Point.

Looking southward.

Site Measurements

Primary Dune:

14. **Crest Elevation (ft MLW):** 3.5
15. **Extent from Crest Landward (ft):** 31
16. **Extent from Crest To MLW (ft):** 36

Secondary Dune: None

17. **Crest Elevation (ft MLW):** N/A
18. **Land Extent From Primary Crest (ft):** N/A
19. **Second Crest – Landward (ft):** N/A

Vegetation Communities

20. **Primary Dune:** *Spartina patens* (saltmeadow hay)
21. **Secondary Dune:** N/A

22. **Remarks:**
MA 23 is located along the downstream flank of Roane Point. It is part of a spit that has widened allowing the low backshore has become vegetated.

Not intended for use in determining legal jurisdictional limits