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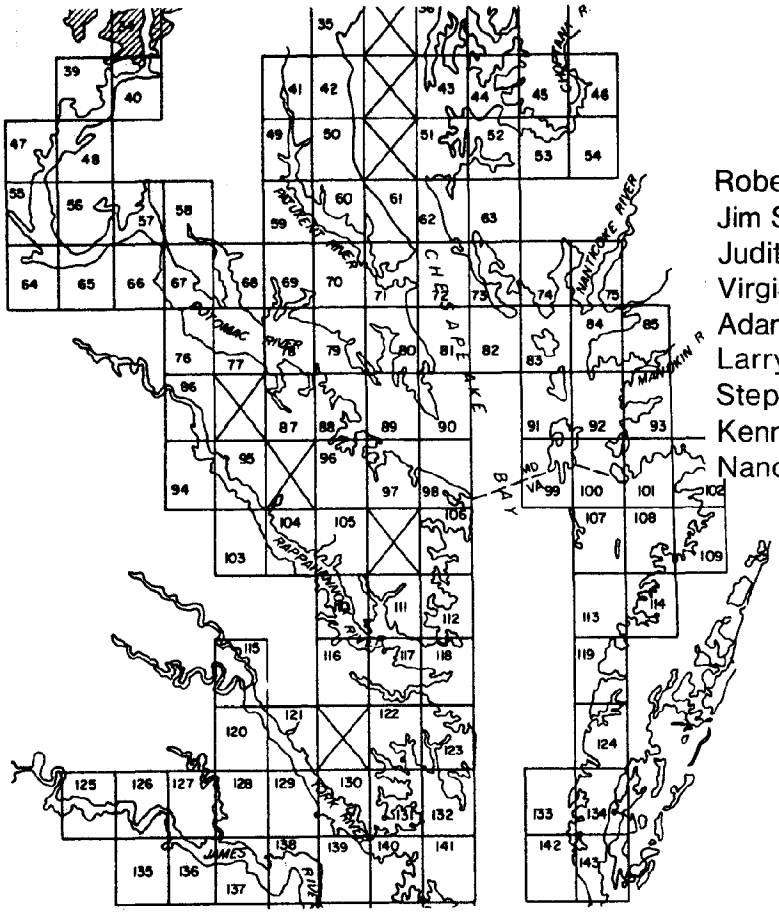

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Distribution of Submerged Aquatic Vegetation in the Chesapeake Bay and Tributaries and Chincoteague Bay - 1986

by

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EXECUTIVE SUMMARY

The distribution and abundance of submerged aquatic vegetation (SAV) was mapped in 1986 for the entire Chesapeake Bay and tributaries, and for Chincoteague Bay, using color aerial photography at a scale of 1:24,000. Ground truth information was available from USGS, Md.DNR, University of Maryland, Horn Point Laboratory, Harford Community College and VIMS. Citizen support via the Chesapeake Bay Foundation and the Citizens Program for the Chesapeake Bay as well as the Maryland Charterboat Association via the Maryland DNR Watermen's Assistance Program provided additional groundtruth support.

In 1986, the Chesapeake Bay (exclusive of Chincoteague Bay) had 19,166 hectares of SAV mapped from aerial photography, a decrease of 1.2% from the 19,390 hectares mapped in 1985. The Upper Bay zone had 2,742 hectares of SAV in 1986 (14.3% of the total SAV in the bay). This represents a decrease of 9.4% from that reported in 1985. Eighty-five percent of the SAV in this zone was located in the Susquehanna Flats section. Transplantation of *Vallisneria americana* and *Heteranthera dubia* to the Susquehanna Flats by Harford Community College scientists has proved successful and transplants are continuing to grow and spread. One section of the Upper Bay zone showed increased abundance of SAV (Susquehanna Flats), while three sections showed decreases in abundance (Upper Eastern Shore; Chester River; Upper Western Shore). Aerial photography for 1986 was unavailable for three quadrangles (Edgewood, Middle River, and Gunpowder Neck) which had 214 of the 239 hectares of SAV in the Upper Western Shore in 1985. While SAV beds were not mapped in 1986 in these three quadrangles, nor was acreage data collected, SAV presence was confirmed for each by ground truth surveys. Therefore,

total hectares reported here for the Upper Western Shore section and the Upper zone of the bay may underestimate SAV actually present. SAV beds in the Upper Bay zone consisted of 13 species. Dominant species in the Susquehanna Flats were Myriophyllum spicatum, Hydrilla verticillata, and Vallisneria americana, while the Chester River was dominated by Potamogeton perfoliatus and Ruppia maritima.

The Middle Bay zone had 4088 hectares of SAV in 1986 (21.3% of the total SAV in the bay), which represents a 18% decrease from that reported in 1985 but is still substantially more than what was reported in 1984 (984 hectares). Two sections in the zone showed an increase in SAV (Middle Eastern Shore; Upper Potomac River) while six sections showed decreases (Central Western Shore; Eastern Bay; Choptank River; Patuxent River; Middle Western Shore; Lower Potomac River).

SAV beds in the mainstem of the Middle Bay zone consisted principally of Ruppia maritima, with six other species being reported. The Potomac River SAV beds consisted of fourteen different species, with the most prevalent being Myriophyllum spicatum and Hydrilla verticillata.

SAV in the Upper Potomac River continues to increase in distribution and abundance. SAV has spread about 10 km further downstream from that observed in the tidal freshwater portion in 1985. Although H. verticillata is mainly the dominant species by abundance, other species coexist and, in some areas, are co-dominant with H. verticillata.

The Lower Bay zone had 12,336 hectares of SAV in 1986 (64.4% of the total SAV in the bay), an increase of 8.4% since 1985. Seventy-one percent of the SAV in this zone is found along the bayside of the Eastern Shore, with the major beds being located on the broad, shallow flats in and adjacent to Tangier and Smith Islands. The Tangier Island Complex

represents the largest concentration of SAV in the entire bay (33.5% of all the SAV noted in 1986 was located in this section). SAV beds are also concentrated at the mouths of the major bayside creeks, principally Cherrystone Inlet, Hungars Creek, Mattawoman Creek, Occahannock Creek, Craddock Creek, Pungoteague Creek and Onancock Creek. SAV has increased 52% along the Eastern Shore bayside since the first baywide survey was conducted in 1978. Along the western shore of the zone, SAV beds are found in the Back River, Drum Island Flats adjacent to Plum Tree Island, the mouth of the York River adjacent to the Guinea Marshes, along the shoreline of the Mobjack Bay and in a small band from New Point Comfort to Horn Harbor.

SAV beds here consist principally of two species, Zostera marina and Ruppia maritima. Zannichelia palustris has also been found in small isolated patches, but is not considered a dominant species.

SAV was still absent in two of the six historical areas (areas where SAV has been mapped dating back to 1937) from the lower Bay Zone (Mumfort Island and Parrott Island). SAV decreased in the Jenkins Neck area (13%) but increased in the East River (35%), Fleets Bay (14%) and Vaucluse Shores (11%) areas from that reported in 1985.

Zostera marina plants transplanted to unvegetated areas in the Piankatank and York Rivers between 1982 and 1985 have persisted, and in some cases, are rapidly expanding. These areas are being closely monitored by VIMS' scientists to assess overall changes in distribution of these transplants with time.

SAV in the Chincoteague Bay was mapped for the first time in 1986, with 2,134 hectares found in four areas along the eastern side of the bay west of Assateague Island: west of the northern end of Chincoteague Island, West Bay, Green Run Bay and the Tingles Island area. SAV beds cover

approximately 6.6% of the total bay bottom area from Ocean City, MD, to the southern end of Chincoteague Bay. *Z. marina* and *R. maritima* were the two species found growing in these areas.

SECTION 1

INTRODUCTION

A key component to understanding factor(s) affecting spatial and temporal changes in distribution and abundance of SAV is the documentation of annual patterns. Local SAV beds can change dramatically over relatively short periods of time (less than one year) in response to changes in temperature, salinity, light regime and aspects of the biology of a particular SAV species, e.g. success of seed production. Scientifically based monitoring surveys of living resources can allow a correlation of changes in these communities with environmental variables.

SAV communities in the Chesapeake Bay and tributaries have been photographed, mapped and digitized in 1978, 1984, and 1985 with portions of the upper bay mapped in 1979 and the lower bay mapped and digitized in 1980 and 1981 (Orth, et. al., 1979; Anderson and Macomber, 1980; Orth, et. al., 1985; 1986). Numerous SAV field surveys have been conducted but most have been limited to specific sections. No one field survey has delineated baywide SAV patterns. Aerial photography has proved to be a useful tool in examining SAV distribution patterns and, when combined with appropriate ground data, has provided an accurate, synoptic picture of baywide SAV distribution.

The first objective of the 1986 work was to accurately determine SAV distribution for the entire bay and tributaries using aerial photographic methods and to compare distribution patterns in discrete sections of the bay with past data. In particular, interest was centered in areas of the mid-section of the bay where a substantial increase of SAV was observed in 1985 (almost 400% increase) from that recorded in 1984. Also of interest was the

upper Potomac River where, in 1985, a total of 15 species of SAV occupied 1440 hectares of bottom which had no SAV in 1981.

A second objective was to determine the distribution of SAV in Chincoteague Bay which had never before been mapped and digitized from aerial photography. Previous ground surveys, faunal studies and personal observation had indicated the presence of large stands in various sections of the bay (Anderson, 1970; Orth 1973). This mapping effort is the first attempt to delineate the distribution of SAV in this region.

SECTION 2

SAV SPECIES

Ten species of submerged aquatic vegetation are commonly found in the Chesapeake Bay and its tributaries. Zostera marina (eelgrass) is dominant in the lower reaches of the bay. Myriophyllum spicatum (water milfoil), Potamogeton pectinatus (sago pondweed), Potamogeton perfoliatus (redhead grass), Zannichelia palustris (horned pondweed), Vallisneria americana (wild celery), Elodea canadensis (common elodea), Ceratophyllum demersum (coontail) and Najas guadalupensis (southern naiad) are less tolerant of high salinities and are found in the middle and upper reaches of the bay (Stevenson and Confer, 1978; Orth et al., 1979; Orth and Moore, 1981, 1983). Ruppia maritima (widgeongrass) is tolerant of a wide range of salinities and is found from the bay mouth to the Susquehanna Flats. Approximately eleven other species are only occasionally found and are present primarily in the middle and upper reaches of the bay and the rivers (Appendix A). Hydrilla verticillata (hydrilla), presently found in the Potomac River and Susquehanna Flats, has become the dominant species found there (Orth and Moore, 1984; Allaire et al., 1985; Rybicki et al., 1985, 1986). Data in this report confirm the continued spread and dominance of H. verticillata in the Potomac River. Zostera marina and Ruppia maritima are the two species currently found in Chincoteague Bay.

SECTION 3

METHODS

Aerial Photography

Color aerial photography was the principal method used to assess the distribution and abundance of SAV in the Chesapeake Bay and its tributaries and Chincoteague Bay in the 1986 study. Predetermined flight lines for photographing areas that either had SAV or could potentially have SAV (i.e., all areas where water depths were less than 2 m at mean low water) were drawn on 1:250,000 scale USGS maps to ensure both complete coverage of SAV beds and inclusion of land features as control points for mapping accuracy. All photography used in the study was at a scale of 1:24,000 except for the Upper Potomac River above the Route 301 Bridge. This area was flown at a scale of 1:12,000 by AeroEco under contract to the Corps of Engineers Waterways Experiment Station. Some areas in Virginia were not included because of the known lack of SAV in those areas. One area was missed in Maryland because of difficulty in getting clearance to fly in restricted airspace.

In addition to the aforementioned air photo sources, an additional source was utilized in mapping the Maryland waters. On July 4, 1986, NASA flew the entire Chesapeake Bay with U-2 aircraft using the IRIS-2 camera. The film used was color infrared. The photography was taken at 65,000 feet, resulting in a panoramic image with a scale at nadir of 1:32,500. Where possible, this film was used to augment that acquired for the project, in particular for those areas on the Eastern Shore, that were flown in mid-October, where SAV reportedly disappeared sometime in August. The NASA film

was utilized by rectifying it to a 1:24,000 black and white image, and using this 1:24,000 image as a mapping base while interpreting from the original color infrared photography.

The general guidelines used for mission planning and execution are given in Table 1. These guidelines, which address tidal stage, plant growth, sun elevation, water and atmospheric transparency, turbidity, wind, sensor operation and plotting, allowed for acquisition of photographs under near-optimal conditions. The guidelines are critical because significant variation of any one item could significantly decrease the ability to detect the SAV.

Aerial photography for SAV in Virginia was acquired by VIMS. The camera used for the aerial photography was a Fairchild CA-8 cartographic camera with a 152 mm (6 1/2 inch) focal length Bausch and Lomb Metrogon lens. Film was a Kodak 24 cm (9 1/2 inch) square positive Aerochrome MS type 2448. The camera was mounted in a camera port in the bottom fuselage of the VIMS single engine, fixed high wing De Havilland Beaver aircraft. A wratten 1A haze filter was used inside the cone of the camera to reduce the degrading effect of atmospheric haze on image quality. Flights were conducted at an altitude of approximately 12,000 ft yielding a scale of 1:24,000 for the photograph, approximating that of a standard U.S. topographic quadrangle.

The SAV photography for the Maryland waters was obtained by AeroEco under contract to the Bionetics Corporation (onsite contractor for EPA/EPIC). The camera used by AeroEco was a Zeiss Jena LMK 15/2323 with a 153 mm (6 inch) focal length Zeiss Jena Lamegon PI/C lens. The film used was Kodak 24 cm (9 1/2 inch) square positive Aerochrome MS type 2448. The camera was mounted in the bottom fuselage of AeroEco's Partenavia P68

TABLE 1. GUIDELINES FOLLOWED DURING ACQUISITION OF AERIAL PHOTOGRAPHS.

1. Tidal Stage - Photography was acquired at low tide, +/- 0-1.5 ft., as predicted by the National Ocean Survey tables.

2. Plant Growth - Imagery was acquired when growth stages ensured maximum delineation of SAV, and when phenologic stage overlap was greatest.

3. Sun Angle - Photography was acquired when surface reflection from sun glint did not cover more than 30 percent of frame. Sun angle was generally between 20° and 40° to minimize water surface glitter. At least 60 percent line overlap and 20 percent side lap was used to minimize image degradation due to sun glint.

4. Turbidity - Photography was acquired when clarity of water ensured complete delineation of grass beds. This was visually determined from the airplane to insure that SAV could be seen by the observer.

5. Wind - Photography was acquired during periods of no or low wind. Off-shore winds were preferred over on-shore winds when wind conditions could not be avoided.

6. Atmospherics - Photography was acquired during periods of no or low haze and/or clouds below aircraft. There could be no more than scattered or thin broken clouds, or thin overcast above aircraft, to ensure maximum SAV to bottom contrast.

7. Sensor Operation - Photography was acquired in the vertical mode with less than 5 degrees tilt. Scale/altitude/film/focal length combination permitted resolution and identification of one square meter area of SAV (surface).

8. Plotting - Each flight line included sufficient identifiable land area to assure accurate plotting of grass beds.

Observer, a twin engine high wing reconnaissance aircraft. The photography was acquired at an approximate altitude of 12,000 feet, yielding a photographic scale of 1:24,000.

Several problems were encountered during the acquisition of the 1986 aerial photography. Obtaining permission to fly in the restricted airspace over Aberdeen Proving Ground caused acquisition to be missed entirely over the Gunpowder, Bush, Back and Middle Rivers. Also, lateness in acquiring funding for the Maryland photography, along with the difficulty in getting good flying weather in the late summer, pushed acquisition of some areas into the middle of October. Because of the problems in the timing of the acquistion phase in these areas, i.e. imagery taken during parts of the SAV growing season, we approached the inter-year comparisons with caution recognizing the limitations of the data. Acquisition of the Virginia photography was hampered by camera malfunctions, but adequate photography of all Virginia areas were acquired.

Mapping Process

Fig. 1 gives the location of the topographic quadrangles in the study area. This area includes all regions with a potential for SAV growth. Most quadrangles are sequentially numbered to allow for more efficient access to the data. Table 2 gives the corresponding names of the 175 quadrangles shown in Fig. 1.

SAV beds were identified on the photographs using all available information, including knowledge of aquatic grass signatures on the film, areas of grass coverage from previous flights, ground information, and aerial visual surveys. Mylar topographic quadrangles (1:24,000 except for

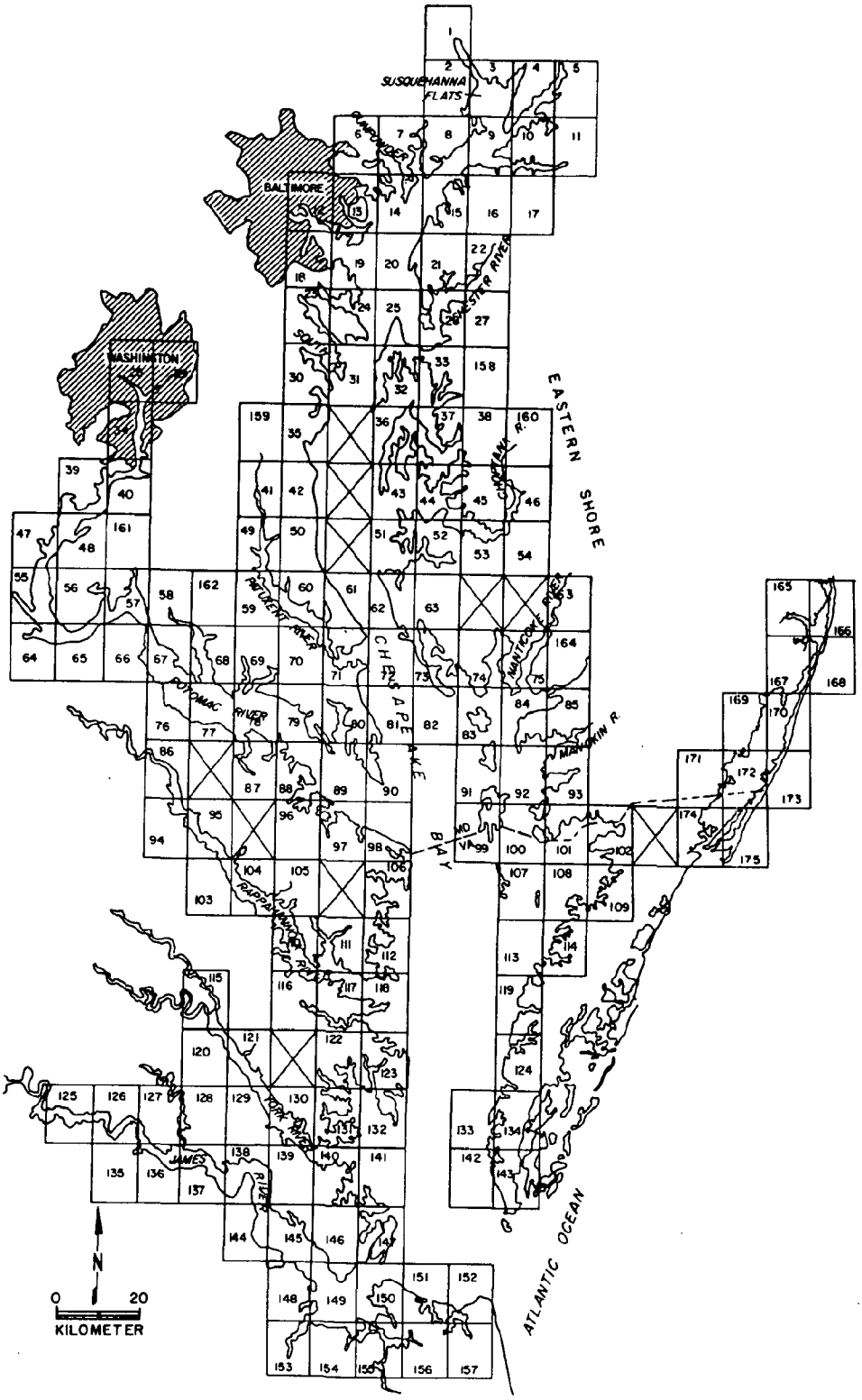

Figure 1. Location of topographic quadrangles in the Chesapeake Bay and tributaries and Chincoteague Bay for determining distribution of SAV.

TABLE 2. LIST OF USGS 7.5-MINUTE QUADRANGLES IN CHESAPEAKE BAY SAV STUDY ARE AND CORRESPONDING CODE NUMBERS (SEE FIG. 3 FOR LOCATION OF QUADRANGLES. THOSE TOPOGRAPHIC QUADRANGLES WITH SAV BEDS CAN BE FOUND IN APPENDIX C).

1. Conowingo Dam, Md.-Pa.
2. Aberdeen, Md.
3. Havre de Grace, Md.
4. NorthEast, Md.
5. Elkton, Md.
6. White Marsh, Md.
7. Edgewood, Md.
8. Perryman, Md.
9. Spesutie, Md.
10. Earleville, Md.
11. Cecilton, Md.
12. Baltimore East, Md.
13. Middle River, Md.
14. Gunpowder Neck, Md.
15. Hanesville, Md.
16. Betterton, Md.
17. Galena, Md.
18. Curtis Bay, Md.
19. Sparrows Point, Md.
20. Swan Point, Md.
21. Rock Hall, Md.
22. Chestertown, Md.
23. Round Bay, Md.
24. Gibson Island, Md.
25. Love Point, Md.
26. Langford Creek, Md.
27. Centreville, Md.
28. Washington West, Md.-D.C.-Va.
29. Washington East, D.C.-Md.
30. South River, Md.
31. Annapolis, Md.
32. Kent Island, Md.
33. Queenstown, Md.
34. Alexandria, Va.-D.C.-Md.
35. Deale, Md.
36. Claiborne, Md.
37. St. Michaels, Md.
38. Easton, Md.
39. Fort Belvoir, Va.-Md.
40. Mt. Vernon, Md.-Va.
41. Lower Marlboro, Md.
42. North Beach, Md.
43. Tilghman, Md.
44. Oxford, Md.
45. Trappe, Md.
46. Preston, Md.
47. Quantico, Va.-Md.
48. Indian Head, Va.-Md.
49. Benedict, Md.
50. Prince Frederick, Md.
51. Sharps Island, Md.
52. Church Creek, Md.
53. Cambridge, Md.
54. East New Market, Md.
55. Widewater, Va.-Md.
56. Nanjemoy, Md.
57. Mathias Point, Md.-Va.
58. Popes Creek, Md.
59. Mechanicsville, Md.
60. Broomes Island, Md.
61. Cove Point, Md.
62. Taylors Island, Md.
63. Golden Hill, Md.
64. Passapatanzy, Md.-Va.
65. King George, Va.-Md.
66. Dahlgren, Va.-Md.
67. Colonial Beach North, Md.-Va.
68. Rock Point, Md.
69. Leonardtown, Md.
70. Hollywood, Md.
71. Solomons Island, Md.
72. Barren Island, Md.
73. Honga, Md.
74. Wingate, Md.
75. Nanticoke, Md.
76. Colonial Beach South, Va.-Md.
77. Stratford Hall, Va.-Md.
78. St. Clements Island, Va.-Md.
79. Piney Point, Md.-Va.
80. St. Mary's City, Md.
81. Point No Point, Md.
82. Richland Point, Md.
83. Bloodsworth Island, Md.
84. Deal Island, Md.
85. Monie, Md.
86. Champlain, Va.
87. Machodoc, Va.
88. Kinsale, Va.-Md.
89. St. George Island, Va.-Md.
90. Point Lookout, Md.

TABLE 2. (continued)

91. Kedges Straits, Md.
92. Terrapin Sand Point, Md.
93. Marion, Md.
94. Mount Landing, Va.
95. Tappahannock, Va.
96. Lottsburg, Va.
97. Heathsville, Va.-Md.
98. Burgess, Va.-Md.
99. Ewell, Va.-Md.
100. Great Fox Island, Va.-Md.
101. Crisfield, Va.-Md.
102. Saxis, Va.-Md.
103. Dunnsville, Va.
104. Morattico, Va.
105. Lively, Va.
106. Reedville, Va.
107. Tangier Island, Va.
108. Chesconessex, Va.
109. Parksley, Va.
110. Urbanna, Va.
111. Irvington, Va.
112. Fleets Bay, Va.
113. Nandua Creek
114. Pungoteague, Va.
115. West Point, Va.
116. Saluda, Va.
117. Wilton, Va.
118. Deltaville, Va.
119. Jamesville, Va.
120. Toano, Va.
121. Gressitt, Va.
122. Ware Neck, Va.
123. Mathews, Va.
124. Franktown, Va.
125. Westover, Va.
126. Charles City, Va.
127. Brandon, Va.
128. Norge, Va.
129. Williamsburg, Va.
130. Clay Bank, Va.
131. Achilles, Va.
132. New Point Comfort, Va.
133. Cape Charles, Va.
134. Cheriton, Va.
135. Savedge, Va.
136. Claremont, Va.
137. Surry, Va.
138. Hog Island, Va.
139. Yorktown, Va.
140. Poquoson West, Va.
141. Poquoson East, Va.
142. Elliotts Creek, Va.
143. Townsend, Va.
144. Bacons Castle, Va.
145. Mulberry Island, Va.
146. Newport News North, Va.
147. Hampton, Va.
148. Benns Church, Va.
149. Newport News South, Va.
150. Norfolk North, Va.
151. Little Creek, Va.
152. Cape Henry, Va.
153. Chuckatuck, Va.
154. Bowers Hill, Va.
155. Norfolk South, Va.
156. Kempsville, Va.
157. Princess Anne, Va.
158. Wye Mills, Md.
159. Bristol, Md.
160. Fowling Creek, Md.
161. Port Tobacco, Md.
162. Charlotte Hall, Md.
163. Mardela Springs, Md.
164. Wetipquin, Md.
165. Selbyville, Md.
166. Assawoman Bay, Md.
167. Berlin, Md
168. Ocean City, Md.
169. Public Landing, Md.
170. Tingles Island, Md.
171. Girdle Tree, Md.-Va.
172. Boxiron, Md.-Va.
173. Whittington Point, Md.-Va.
174. Chincoteague West, Va.
175. Chincoteague East, Va.

1:12,000 for the Potomac River) were used as base maps in the mapping process. Delineation of SAV bed boundaries was facilitated by superimposing on a light table the appropriate mylar quadrangle with the transparent photograph. SAV boundaries were delineated on the mylar map with a pencil. Where minor scale differences were evident between the photograph and quadrangle or where significant shoreline erosion or accretion had occurred since production of the map, a best fit was obtained, or shoreline changes were noted on the quadrangle. Areas of SAV beds were derived from the topographic quadrangles. VIMS measurements for the lower bay were made on a Numonics Model 2200 DigiTablet Graphics Analysis System. Coordinates were transmitted to a PRIME 9955 computer for area calculations and data manipulation via software developed at VIMS. EPIC utilized a Calma Graphic Interactive Image Analysis System based on a Data General Eclipse S230 minicomputer for upper bay areas. Each SAV bed was digitized three times and the area reported as the average of the three. Each of the three measurements was generally within 5% of the mean.

In addition to the boundaries of the SAV bed, an estimate of percent cover within each bed was made visually in comparison with an enlarged Crown Density Scale, similar to those developed for estimating of forest tree crown cover from aerial photography (Fig. 2). Bed density was classified into one of four categories based on a subjective comparison with the density scale. These were: 1. very sparse, <10%, 2. sparse, 10 to 40%; 3. moderate, 40 to 70%; or 4. dense, 70-100%. Either the entire bed, or sub-sections within the bed, were assigned a number (1 to 4) corresponding to the above density categories. In addition to the density scale, each distinct SAV unit was given a letter designation for proper identification for future comparisons.

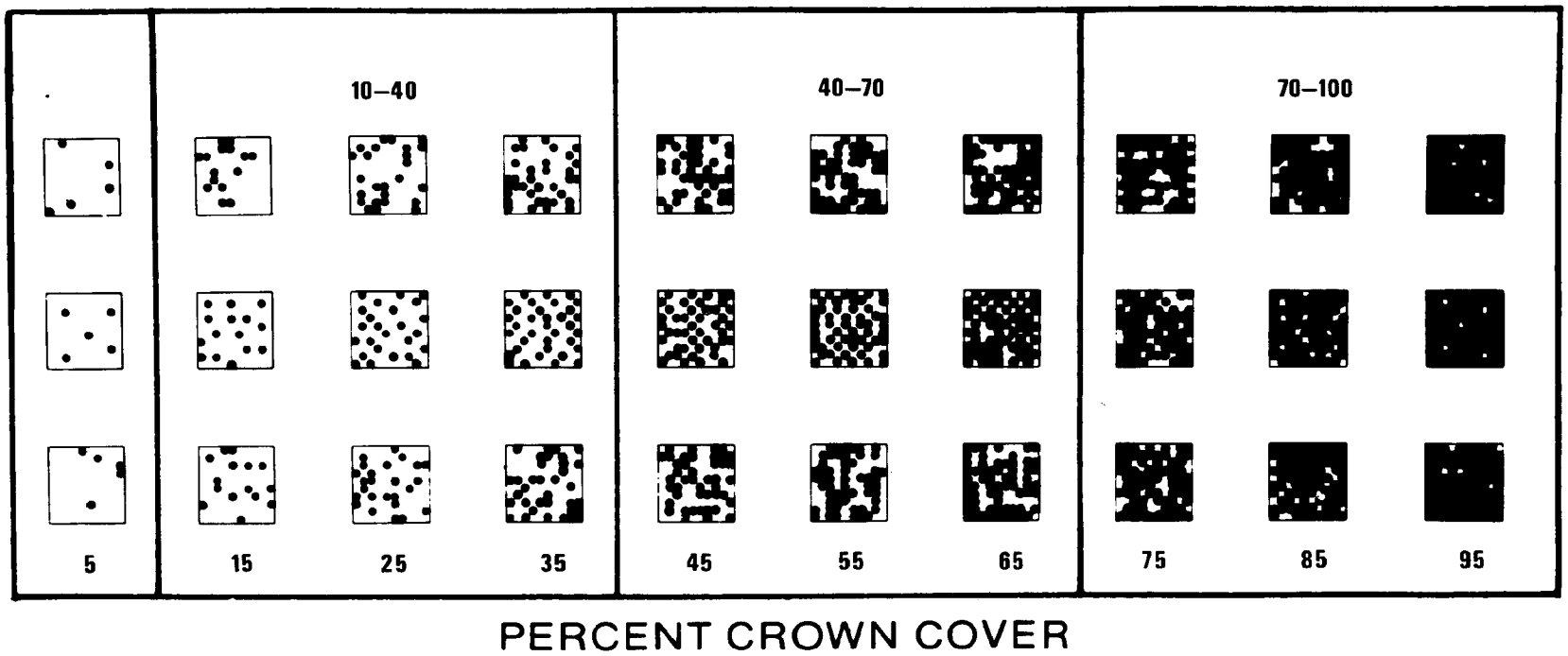

Figure 2. Crown density scale used for determining density of SAV beds: very sparse (1), 0-10%; sparse (2), 10-40%; moderate (3), 40-70%; dense (4), 70-100%.

In order to reduce interobserver variability in both the mapping and digitizing processes, steps were taken to ensure quality assurance. Sections from several areas in both Maryland and Virginia containing SAV were independently mapped and assigned a density classification. Results were compared for compatibility of the mapping efforts. In addition, mapped sections were independently digitized for similar comparisons.

The discussion of the distribution of SAV in the Chesapeake Bay and tributaries has been organized into three zones as established by Orth and Moore (1982). The area between the mouth of the bay to a line stretching from the mouth of the Potomac River at Smith Point in Virginia to just above Smith Island and extending across to the north shore at the mouth of the Big Annemessex River is referred to as the Lower Bay zone (Fig. 3). The area between the north shore of the Big Annemessex River and the south shore of the Potomac River to the Chesapeake Bay bridge at Kent Island is referred to as the Middle Bay zone. The area between the Chesapeake Bay bridge and the Susquehanna Flats is referred to as the Upper Bay zone. The salinity within each zone roughly coincides with the major salinity zones of estuaries: polyhaline (18-25°/oo), Lower zone; mesohaline (5-18°/oo), Middle zone; oligohaline (0.5-5°/oo), Upper zone. Although the major rivers and smaller tributaries of the bay have their own salinity regimes, the distributions of SAV in each river are discussed within the zone where it connects to the bay proper.

In addition, 21 major sections of the bay are identified for more detailed discussion of SAV distribution (Fig. 3, Table 3). These sections denote relatively distinct parts of the bay that are readily identifiable from a map. Sections 1 through 4 are located in the Upper Bay zone.

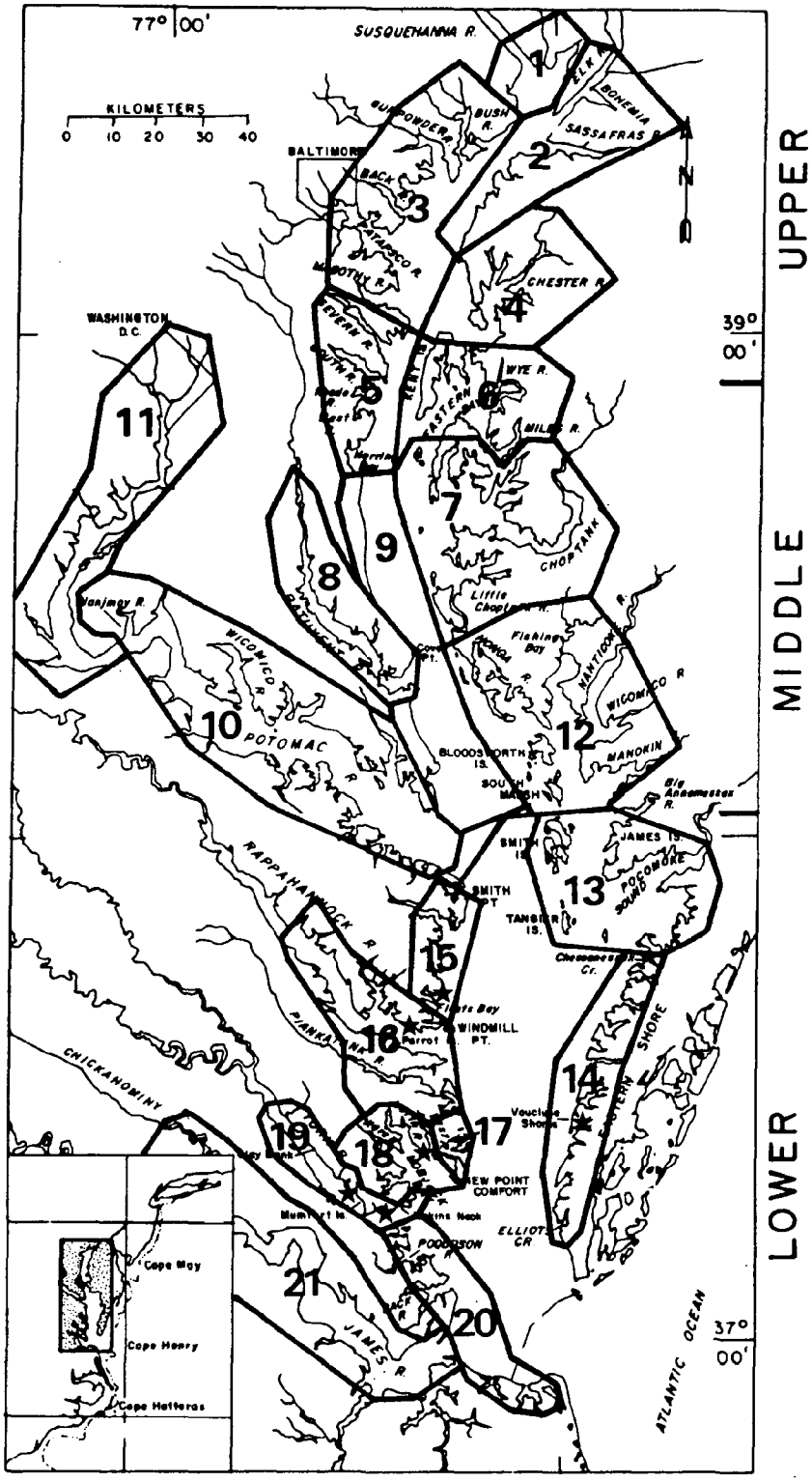

Figure 3. Location of upper, middle and lower zones of the Chesapeake Bay and the 21 major sections used for delineation of SAV distribution patterns (see Table 3 and text for exact boundaries. Stars in Lower Bay zone indicate areas where SAV has been mapped since 1937).

TABLE 3. AREA DESCRIPTION FOR EACH OF 21 MAJOR SECTIONS IN THE CHESAPEAKE BAY HAVING SAV.

Section 1.	Susquehanna Flats - all areas between and including Spesutie Island and Turkey Point at the mouth of the Elk River to include the Northeast River.
Section 2.	Upper Eastern Shore - all areas in the Elk, Bohemia and Sassafras Rivers and SAV in areas on the eastern shore above the Swan Point quadrangle.
Section 3.	Upper Western Shore - all areas south of Spesutie Island and north of the bay bridge to include the Bush, Gunpowder, Middle, Patapsco and Magothy Rivers.
Section 4.	Chester River - includes all of the Chester River, Eastern Neck, areas north of the bay bridge on Kent Island and south of Swan Point but to include SAV on the Swan Pt. quadrangle.
Section 5.	Central Western Shore - all areas south of the bay bridge and north of Holland Point on Herring Bay to include the Severn, South and West Rivers and Herring Bay.
Section 6.	Eastern Bay - all areas south of the bay bridge on Kent Island and north of Tilghman Island from Green Marsh Point to include the Wye, East and Miles Rivers, Crab Alley Bay, Prospect Bay and Poplar, Jefferson and Coaches Islands.
Section 7.	Choptank River - all areas south of Tilghman Island from Green Marsh Point and north of Taylor Island to include the Choptank and Little Rivers.
Section 8.	Patuxent River - all areas in the Patuxent River.
Section 9.	Middle Western Shore - all areas south of Holland Point at Herring Bay and north of Point Lookout on the Potomac River but not the mouth of the Patuxent River.
Section 10.	Lower Potomac River - all areas between the mouth of the Potomac River to a line extending from Maryland Point on the north shore, just above Nanjemoy Creek, to Somersett Beach on the south shore.
Section 11.	Upper Potomac River - all areas from upriver limit of the Lower Potomac River Section to Chain Bridge at Washington D.C.
Section 12.	Middle Eastern Shore - all areas south of Taylor Island and north of but not including the Big Annemessex River to include the Honga, Nanticoke, Wicomico and Manokin Rivers, Fishing Bay, Bloodsworth and South Marsh Islands.

continued

TABLE 3. (continued)

Section 13.	Tangier Island Complex - all areas south of and including the Big Annemessex River and north of but including the northern shore of Chesconessex Creek to include Smith and Tangier Islands, Little Anemessex River and Pocomoke Sound.
Section 14.	Lower Eastern Shore - all areas south of but including the southern shore of Chesconessex Creek and north of Elliotts Creek to include Cherrystone Inlet, Hungars, Nassawadox, Occohannock, Nandua, Pungoteague and Onancock Creeks.
Section 15.	Reedville - includes the area between Windmill Point on the Rappahannock River and Smith Point at the mouth of the Potomac River.
Section 16.	Rappahannock River Complex - includes the entire Rappahannock River, Piankatank River and Milford Haven area.
Section 17.	New Point Comfort Region - includes the area fronting the bay from the lighthouse at New Point Comfort north to, but not including, the bay entrance to Milford Haven.
Section 18.	Mobjack Bay Complex - includes the East, North, Ware and Severn Rivers, the north shore of the Mobjack Bay from New Pt. Comfort lighthouse to the North River, and the area around Guinea Neck to include all the SAV around the Guinea Marsh area from the New Point Comfort quadrangle.
Section 19.	York River - all areas along the north shore from Clay Bank to the Guinea Marsh area and includes SAV from the Achilles quadrangle facing the York River and along the south shore to Goodwin Island.
Section 20.	Lower Western Shore - includes all areas south of Goodwin Island to Broad Bay off Lynnhaven Inlet, excluding the James River.
Section 21.	James River - all SAV in the James River including the Chickahominy River.

Sections 5 through 12 are located in the Middle Bay zone, and sections 13 through 21 are located in the Lower Bay zone.

Orth et al. (1979) chose six sites in the Lower Bay zone to determine changes in SAV distribution starting in 1937. These sites are: Mumfort Island and Jenkins Neck in the York River; East River in the Mobjack Bay; Parrott Island in the Rappahannock River; Fleets Bay located between Windmill Point on the Rappahannock River and Smith Point on the Potomac River; and Vaucluse Shores, located on the bayside of the eastern shore just above Cape Charles (see Orth et al. (1979) for further details of these historical sites). Detailed mapping of each historical site was completed in this study similar to the earlier work to provide a 1986 update.

SAV distribution in Chincoteague Bay is presented and discussed as a separate section. SAV abundance here may be affected by a different set of parameters and changes occurring in this system may be unrelated to changes in the Chesapeake Bay SAV beds. It is the only bay in the Delaware, Maryland and Virginia barrier island system that presently has SAV.

Ground Truth and Other Data Bases

For those areas in Virginia where aerial photographic evidence of SAV beds was inconclusive, photo-verification was accomplished by ground truthing these sites. This was done principally by observations made from small boats and divers snorkeling over areas indicated from the photograph. Since SAV beds in this region contain primarily only one or two species and have not undergone drastic fluctuations since the first baywide survey in 1978, a great deal of ground truth information could be extrapolated from earlier studies (Orth et al., 1979; Orth and Moore, 1982). In addition,

VIMS is currently transplanting SAV (principally eelgrass) into several river systems included in this survey (York, Piankatank and Rappahannock rivers). These areas are checked carefully for any SAV when transplant sites are examined by divers.

SAV surveys in Chincoteague Bay were checked against the aerial photographic information. Presence-absence data were collected from multiple sites where SAV was known to occur.

In Maryland, ground truth data were provided principally from two SAV surveys conducted in 1986, from two SAV research and transplanting projects, and the Citizen and Charterboat Captain volunteer surveys. One field survey was conducted in the Potomac River by the USGS (Rybicki et al., 1987) and included the area from the Chain Bridge at Washington, D.C. to the mouth of the Potomac River (Figs. 4, 5 and 6). The 1986 USGS objectives were: 1. to collect and identify all species of SAV found in the tidal river and larger tributaries, 2. to determine the distribution and abundance of SAV using shoreline surveys and transects, 3. to compare 1986 data on species composition, standing crop and water quality with previous USGS surveys, and 4. to monitor the spread of H. verticillata.

The USGS shoreline survey was conducted in September and October, 1986, by boat, using rakes to collect samples to determine the presence or absence of SAV on both shorelines between Washington, D.C. and the 301 bridge. In addition, 186 transects from the 1978-81 surveys by the U.S.G.S. (Carter, et al., 1985) were resampled. The tidal river (Washington, D.C., to Quantico, VA) and transition zone of the estuary (Quantico, VA, to the 301 bridge) transects (Figs. 4 and 5) were sampled in June and again in September. The estuary (Rt. 301 bridge to the mouth) was sampled in July (Fig. 6). Transects had sampling stations at 5 m, 15 m and then at 15 m intervals

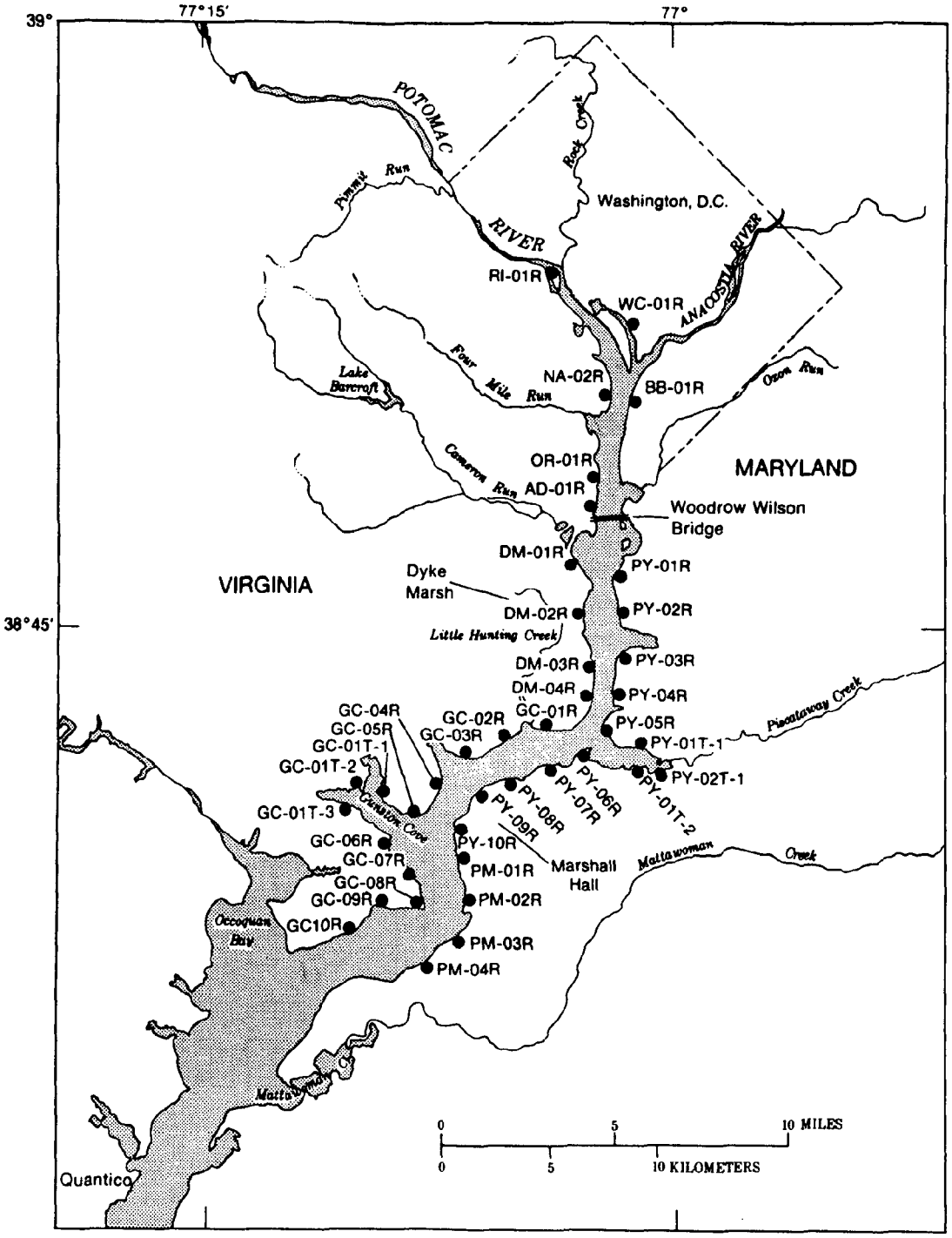

Figure 4. Location of vegetation sampling transects in the tidal Potomac River above Mattawoman Creek. Codes for transects give location and tributary or river-mile for each location. RI is Roosevelt Island, NA is National Airport, OR is Oronoco Bay, AD is Alexandria Dock, DM is the Dyke Marsh region, GC is the Gunston Cove region, BB is Bolling Air Force Base, PY is the Piscataway Creek region, PM is the Pomonkey Creek region.

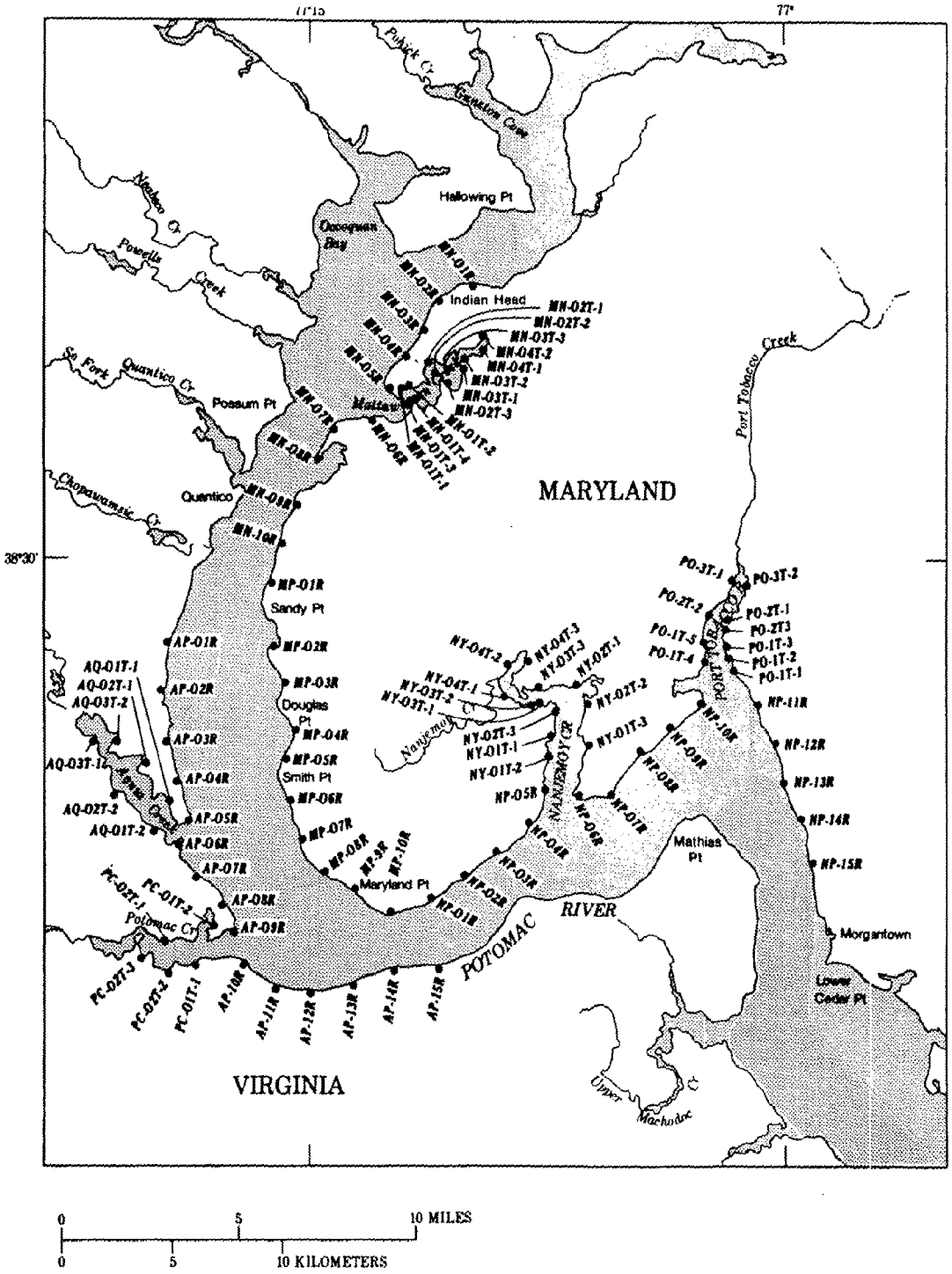

Figure 5. Location of vegetation sampling transects from Mattawoman Creek to Port Tobacco River. Codes for transects give location and tributary or river-mile for each location. MN is the Mattawoman Creek region, MP is the Maryland Point region, NP is the Nanjemoy Creek-Port Tobacco River region, PO is the Port Tobacco River region, AQ is the Aquia Creek region, PC is the Potomac Creek region, AP is the Aquia Creek-Potomac Creek region.

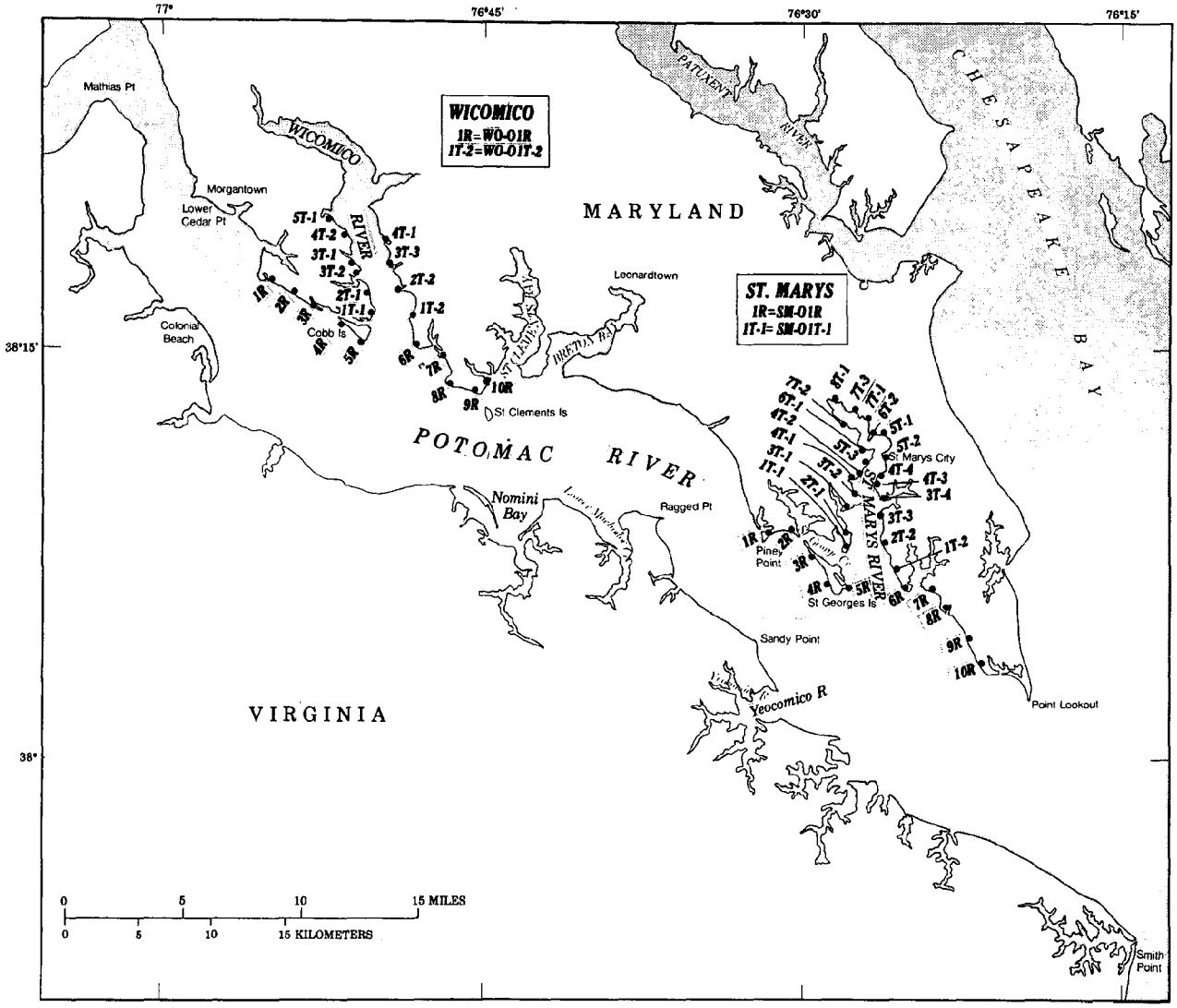

Figure 6. Location of vegetation sampling transects from the Wicomico River to St. Mary's River. WO is the Wicomico River region; SM is the St. Mary's River region.

perpendicular to shore. Transects were terminated at five stations (60 m) from shore when no SAV was present or at two stations (30 m) beyond the last vegetated station. Where water depth exceeded 2.0 m at 60 m of linear distance, the fixed interval was not used, and samples were taken at four stations along the transect corresponding with the depths of 0.5, 1.0, 1.5 and 2.0 m (see Rybicki, et al., 1987, for detailed smapling methods).

Codes for the transects in Figs. 4, 5 and 6 provide information on location and the river - or tributary - mile for each location. For example, in MN-01T-2, MN is Mattawoman Creek (Fig. 5), 01T is one nmi (nautical mile) up the tributary from the mouth, -2 is the second transect; in PY-06R, PY is Piscataway Creek (Fig. 4), 06R is the sixth transect on the edge of the main river.

All stations were sampled three times using modified oyster tongs. The area sampled with each grab was 930 cm^2. All species were identified. Samples were dried and standing crop expressed in g/sample and g/m^2 for each species. In the fall, because of increased biomass (~ 1000 g/m^2) sampling methods were altered to minimize time and labor. At stations where SAV formed a dense, tangled mass, visual estimates of the percent of each species in each grab were recorded, but the vegetation was not collected and weighed.

A second survey is the annual, large scale, multi-station survey conducted by the Md.DNR. This survey, conducted from July through August, samples 600+ randomly selected stations in certain areas of the bay from the Susquehanna Flats to Smith Island. At each station, samples are also collected with modified oyster tongs and species presence or absence, as well as standing crop, is recorded. Station locations were randomly

generated and were limited to areas 2.4 m (8 ft) or less in depth on the western shore of the bay and 3.7 m (12 ft) or less on the eastern shore.

One SAV transplanting project is being conducted on the Susquehanna Flats by Stan Kollar of HCC. Information provided by his work is in the form of species presence by percentage, primarily by visual estimates.

A SAV research group at HPL headed by Court Stevenson also provided ground truth data. Maps of their study sites on the Choptank River were annotated on the maps for this report indicating the status of SAV for 1986.

In addition to the scientific surveys, private citizens participated in identifying SAV beds by checking areas in the bay for SAV. Two groups were responsible for looking for SAV under the sponsorship of separate organizations.

The Maryland Charterboat Association participated in the baywide effort, funded by the Md.DNR's Watermen's Assistance Program. Boat captains were provided with reduced SAV quadrangle maps to aid in location of SAV beds and data sheets on which to record information on each SAV bed identified. Sampling of sites with SAV were undertaken at low tide. Samples were taken by hand, net or rake. Plants were identified as to species onsite or placed in zip-lock plastic bags and sent to the DNR for identification.

Private citizens volunteered to assist in the SAV ground survey under guidance of the CBF, CPCB and F&WS. This program entailed identifying and recording the location of SAV in the bay. Volunteers were recruited through press releases, newsletters and personal letters. Volunteers, provided with an identification guide of SAV, reduced 1986 SAV maps, and data sheets, visited numerous sites around the bay. Each volunteer was asked to identify the location where SAV was sighted, as well as water conditions,

how many and which kind of species, grass bed size, percentage area covered, and location description. All information from the Charterboat Captain and Citizen Surveys was sent to EPIC for processing.

All ground survey information was included on the topographic quadrangles to show positions of the survey stations in relation to the beds of SAV mapped from the aerial photographs. Each survey was designated by a unique symbol to eliminate confusion of the different methods. In most cases, the symbols on the SAV maps (Appendix C) have been enlarged and offset from the actual sampling point to avoid confusion with the mapped SAV bed. Where species information was available, it was included on the map unless it was redundant.

Data Presentation

SAV distribution data were analyzed by topographic quadrangle (Table 4), by section and zone (Table 5) and by quadrangles within a section (Table 6). Data for 1978, 1984 and 1985 by quadrangle, section and zone were included in Tables 4 and 5 for comparison. In addition, all the Md.DNR data for each river system from the first annual survey conducted in 1971 are included (Table 7).

TABLE 4. TOTAL AREA OF SAV IN HECTARES BY TOPOGRAPHIC QUADRANGLES FOR 1978, 1984, 1985 AND 1986.

	QUANDRANGLE	1978	1984	1985	1986
1.	Conowingo Dam, Md.-Pa.	-	-	0	0
2.	Aberdeen, Md.	-	0	6.34	5.77
3.	Havre de Grace, Md.	803.67	1741.85	1605.81	1977.42
4.	North East, Md.	5.62	13.31	29.46	6.95
5.	Elkton, Md.	0.75	0	0	0
6.	White Marsh, Md.	-	0	0	0
7.	Edgewood, Md.	10.48	49.81+	6.31	+++
8.	Perryman, Md.	-	2.01	4.64	0
9.	Spesutie, Md.	0.84	411.38	439.96	369.54
10.	Earleville, Md.	4.67	3.47	11.60	9.72
11.	Cecilton, Md.	-	0	0	0
12.	Baltimore East, Md.	-	0	0	0
13.	Middle River, Md.	90.06	0	74.80	+++
14.	Gunpowder Neck, Md.	200.71	183.99+	132.99	+++
15.	Hanesville, Md.	9.31	5.48	10.10	7.70
16.	Betterton, Md.	6.40	5.74	12.89	8.40
17.	Galena, Md.	1.46	11.88	0.61	10.91
18.	Curtis Bay, Md.	33.40	0	0	0
19.	Sparrows Pt., Md.	10.52	0	5.56	0
20.	Swan Point, Md.	29.86	18.65	10.25	3.33
21.	Rock Hall, Md.	127.25	30.13	14.71	5.97
22.	Chestertown, Md.	12.31	0	1.92	0
23.	Round Bay, Md.	137.15	0	0	0
24.	Gibson Island, Md.	139.45	7.61	16.07	4.09
25.	Love Point, Md.	11.81	0	3.94	0
26.	Langford Creek, Md.	1255.20	599.72	586.06	294.89
27.	Centreville, Md.	38.75	0	0	0.52
28.	Washington West, Md.-DC-Va.	-	0++	0	0
29.	Washington East, DC-Md.	-	0	0	0
30.	South River, Md.	15.14	0	0	0
31.	Annapolis, Md.	27.15	0	0.28	0.12
32.	Kent Island, Md.	513.68	26.28	48.36	30.80
33.	Queenstown, Md.	492.10	89.45	97.9	36.57
34.	Alexandria, Va.-DC-Md.	-	160.40	512.70	495.80
35.	Deale, Md.	61.51	0	2.43	0.57

TABLE 4. (continued)

36.	Claiborne, Md.	421.08	52.25	346.69	165.06
37.	St. Michaels, Md.	366.09	11.14	223.91	64.03
38.	Easton, Md.	1.19	0	14.33	0
39.	Fort Belvoir, Va.-Md.	-	0.91	1.73	7.16
40.	Mt. Vernon, Md.-Va.	-	420.34	857.81	1080.23
41.	Lower Marlboro, Md.	-	0	0	0
42.	North Beach, Md.	-	0	18.88	0
43.	Tilghman, Md.	478.15	6.87	253.74	37.48
44.	Oxford, Md.	562.96	23.25	329.10	51.91
45.	Trappe, Md.	64.75	0	33.16	0
46.	Preston, Md.	-	0	0	0
47.	Quantico, Va.-Md.	-	0	6.67	19.23
48.	Indian Head, Va.-Md.	-	0++	0.21	7.51
49.	Benedict, Md.	1.58	0	0	4.23
50.	Prince Frederick, Md.	-	0	0	0
51.	Sharps Island, Md.	377.08	4.42	229.75	193.59
52.	Church Creek, Md.	208.94	9.00	322.63	141.52
53.	Cambridge, Md.	48.96	0	0	0
54.	East New Market, Md.	-	0	0.75	0
55.	Widewater, Va.-Md.	-	4.59	38.21	39.36
56.	Nanjemoy, Md.	28.03	30.92	106.68	102.74
57.	Mathias Pt., Md.-Va.	194.12	121.11	228.66	210.70
58.	Popes Creek, Md.	-	0	0	0
59.	Mechanicsville, Md.	13.62	0	0	7.59
60.	Broomes Island, Md.	4.94	4.37	24.71	4.14
61.	Cove Pt., Md.	2.97	3.75	2.46	0.74
62.	Taylors Island, Md.	-	8.55	47.53	12.38
63.	Golden Hill, Md.	-	0.42	10.90	1.07
64.	Passapatanzy, Md.-Va.	-	0	0	0
65.	King George, Va.-Md.	2.25	13.44	22.15	22.95
66.	Dahlgren, Va.-Md.	8.32	2.67	1.97	2.41
67.	Colonial Beach North, Md.-Va.	87.44	25.63	15.66	18.42
68.	Rock Pt., Md.	22.85	0	0.27	0
69.	Leonardtown, Md.	2.44	0	0	0
70.	Hollywood, Md.	-	0	0	1.33
71.	Solomons Island, Md.	10.54	0.76	15.52	2.63
72.	Barren Island, Md.	-	0	264.99	177.17
73.	Honga, Md.	126.94	5.05	178.58	194.48
74.	Wingate, Md.	2.64	8.81	97.99	90.83

TABLE 4. (continued)

75.	Nanticoke, Md.	-	0	0	0
76.	Colonial Beach South, Va.-Md.	61.95	11.26	0	0
77.	Stratford Hall, Va.-Md.	5.53	2.16	0	0
78.	St. Clements Island, Va.-Md.	0.13	0	0	0
79.	Piney Point, Md.-Va.	-	-	0.51	1.51
80.	St. Marys City, Md.	-	-	19.01	16.66
81.	Point No Point, Md.	-	-	16.50	0
82.	Richland Pt., Md.	0.73	0.38	24.28	3.76
83.	Bloodsworth Island, Md.	66.07	18.29	285.53	385.28
84.	Deal Island, Md.	3.01	0	16.65	60.48
85.	Monie, Md.	9.15	0	1.93	18.69
86.	Champlain, Va.	-	-	0	-
87.	Machodoc, Va.	-	-	0	0
88.	Kinsale, Va.-Md.	-	-	0	0
89.	St. George Island, Va.-Md.	-	-	8.82	6.91
90.	Point Lookout, Md.	-	-	5.76	0.58
91.	Kedges Straits, Md.	156.09	366.42	474.91	637.99
92.	Terrapin Sand Point, Md.	314.48	187.00	180.48	209.35
93.	Marion, Md.	289.33	0	200.29	243.13
94.	Mount Landing, Va.	-	-	-	-
95.	Tappahannock, Va.	-	-	-	-
96.	Lottsburg, Va.	-	-	-	0
97.	Heathsville, Va.-Md.	-	-	-	0
98.	Burgess, Va.-Md.	-	-	-	0
99.	Ewell, Va.-Md.	1483.30	2308.58	2129.67	2324.36
100.	Great Fox Island, Va.-Md.	540.65	807.81	1074.25	1362.12
101.	Crisfield, Va.-Md.	7.48	113.01	79.22	180.46
102.	Saxis, Va.-Md.	-	-	-	-
103.	Dunnsville, Va.	-	-	-	-
104.	Morattico, Va.	-	-	0	-
105.	Lively, Va.	-	-	0	-
106.	Reedville, Va.	230.40	108.56	51.17	71.28
107.	Tangier Island, Va.	405.06	614.44	613.55	651.89
108.	Chesconessex, Va.	482.54	808.61	827.28	920.15
109.	Parksley, Va.	80.35	264.80	241.16	318.28
110.	Urbanna, Va.	-	-	-	-

TABLE 4. (continued)

111.	Irvington, Va.	5.31	9.33	8.26	7.50
112.	Fleets Bay, Va.	133.23	155.45	120.91	132.88
113.	Nandua Creek, Va.	184.86	345.10	350.51	375.97
114.	Pungoteague, Va.	401.63	716.76	691.94	706.23
115.	West Point, Va.	-	-	-	-
116.	Saluda, Va.	-	-	-	-
117.	Wilton, Va.	10.43	0	0	-
118.	Deltaville, Va.	59.43	6.62	0.70	0.52
119.	Jamesville, Va.	406.04	367.36	327.20	404.46
120.	Toano, Va.	-	-	-	-
121.	Gressitt, Va.	-	-	-	-
122.	Ware Neck, Va.	256.00	203.15	171.91	168.59
123.	Mathews, Va.	63.88	30.32	37.39	37.03
124.	Franktown, Va.	504.49	395.26	419.66	441.77
125.	Westover, Va.	-	-	-	-
126.	Charles City, Va.	-	-	-	-
127.	Brandon, Va.	-	-	-	++++
128.	Norge, Va.	46.48	46.48**	46.48**	13.66
129.	Williamsburg, Va.	-	-	-	-
130.	Clay Bank, Va.	-	-	-	-
131.	Achilles, Va.	797.92	741.50	710.16	702.91
132.	New Point Comfort, Va.	1096.31	1092.71	1154.55	1155.33
133.	Cape Charles, Va.	321.42	308.32	329.48	255.33
134.	Cheriton, Va.	85.20	55.99	63.58	72.74
135.	Savedge, Va.	-	-	-	-
136.	Claremont, Va.	-	-	-	-
137.	Surry, Va.	-	-	-	-
138.	Hog Island, Va.	-	-	-	-
139.	Yorktown, Va.	1.92	0.23	0.21	0.28
140.	Poquoson West, Va.	210.44	216.93	237.70	235.96
141.	Poquoson East, Va.	516.63	687.16	784.53	762.30
142.	Elliots Creek, Va.	44.58	14.48	8.41	19.91
143.	Townsend, Va.	42.70	4.80	17.72	14.42
144.	Bacons Castle, Va.	-	-	-	-
145.	Mulberry Island, Va.	-	-	-	-

TABLE 4. (continued)

146.	Newport News North, Va.	-	-	-	-
147.	Hampton, Va.	218.25	233.15	287.10	270.40
148.	Benns Church, Va.	-	-	-	-
149.	Newport News South, Va.	1.87	0	0	-
150.	Norfolk North, Va.	-	-	-	-
151.	Little Creek, Va.	-	0	0	-
152.	Cape Henry, Va.	*	37.87	36.76	43.31
153.	Chuckatuck, Va.	-	-	-	-
154.	Bowers Hill, Va.	-	-	-	-
155.	Norfolk South, Va.	-	-	-	-
156.	Kempsville, Va.	-	-	-	-
157.	Princess Anne, Va.	-	-	-	-
158.	Wye Mills, Md.	-	-	1.10	-
159.	Bristol, Md.	-	-	2.08	0
160.	Fowling Creek, Md.	-	-	0	0
161.	Port Tobacco, Md.	-	-	0	1.10
162.	Charlotte Hall, Md.	-	-	0	0
163.	Mardela Springs, Md.	-	-	0	0
164.	Wetipquin, Md.	-	-	0	0
165.	Selbville, Md.	-	-	-	-
166.	Assawoman Bay, Md.	-	-	-	-
167.	Berlin, Md.	-	-	-	-
168.	Ocean City, Md.	-	-	-	-
169.	Public Landing, Md.	-	-	-	-
170.	Tingles Island, Md.	-	-	-	852.47
171.	Girdle Tree, Md.-Va.	-	-	-	-
172.	Boxiron, Md.-Va.	-	-	-	687.95
173.	Whittington Point, Md.-Va.	-	-	-	189.94
174.	Chincoteague West, Va.	-	-	-	0
175.	Chincoteague East, Va.	-	-	0	403.57
	TOTAL SAV - Chesapeake Bay	16,622.40	15,399.70	19,390.64	19,165.44
	TOTAL SAV - Chincoteague Bay				2,133.93

NOTES: - indicates quadrangle not photographed and assumed to have no SAV
0 indicates quadrangle photographed and no SAV noted
* area not flown in 1978 but most likely had SAV in 1978 based on data collected in subsequent years

TABLE 4. (continued)

NOTES: (continued)

** Area not photographed in 1984. Area known to still have SAV. We made the assumption that the 1984 distribution would be similar to the 1978 distribution.

+ Information on SAV distribution taken from 1983 aerial photographs provided by Willie Burton of Martin Marietta Corp.

++ Presence of SAV beds not detected from 1984 aerial photography. Information provided by Virginia Carter of the USGS for the 1984 Potomac River Shoreline Survey indicated presence of SAV.

+++ Aerial photography unavailable in 1986, therefore, SAV acreage data not collected. SAV presence verified by ground truth surveys. See discussion of Section 2, Upper Eastern Shore, and Section 3, Upper Western Shore, in Results, and maps in APPENDIX C.

++++ Aerial photography unavailable in 1986, therefore, SAV acreage data not collected. SAV presence verified by ground truth surveys. See discussion of Section 21, James River, in Results.

TABLE 5. NUMBERS OF HECTARES OF BOTTOM COVERED WITH SUBMERGED AQUATIC VEGETATION IN 1978, 1984, 1985 AND 1986 FOR DIFFERENT SECTIONS WITHIN THE THREE ZONES IN THE CHESAPEAKE BAY (DATA FOR 1978 FROM ORTH *et al.* 1979, AND ANDERSON AND MACOMBER 1980. DATA FOR 1984 AND 1985 FROM ORTH ET AL. 1985, 1986, RESPECTIVELY).

Zone	Section		1978	1984	1985	1986
Upper	1.	Susquehanna Flats	804*	2,150	2,011	2,339
	2.	Upper Eastern Shore	29	43	105	58+++
	3.	Upper Western Shore	484	244	239	4++
	4.	Chester River	1,475	731	671	341
		TOTAL	2,792	3,168	3,025	2,742
Middle	5.	Central Western Shore	241	0	26	1
	6.	Eastern Bay	1,800	66	356	244
	7.	Choptank River	1,740	82	1,528	452
	8.	Patuxent River	34	9	44	19
	9.	Middle Western Shore	11	0	23	6
	10.	Lower Potomac River	410	194	381	356
	11.	Upper Potomac River	0**	600	1,439	1,673
	12.	Middle Eastern Shore	210	33	1,188	1,337
		Total	4,446	984	4,986	4,088
Lower	13.	Tangier Island Complex	3,759	5,447	5,504	6,423
	14.	Lower Eastern Shore	1,991	2,232	2,227	2,310
	15.	Reedville	364	264	172	204
	16.	Rappahannock River Complex	93	23	20	18
	17.	New Point Comfort Region	271	299	332	324
	18.	Mobjack Bay Complex	1,785	1,550	1,505	1,505
	19.	York River	157	238	258	257
	20.	Lower Western Shore	925	1,149	1,315	1,281
	21.	James River	54	46	46	14+
		Total	9,399	11,248	11,379	12,336
		TOTAL SAV FOR BAY	16,637	15,400	19,390	19,166

TABLE 5. (continued)

NOTES:

*1978 data for Susquehanna Flats remapped and digitized to allow for greater compatability to 1984 data.

**No aerial photography was taken of this area in 1978; the absence of SAV is based on ground survey observations by the USGS.

+Aerial photography unavailable for 1986 for Brandon quadrangle, therefore, hectares presented for 1986 represent only a portion of Section 21. SAV presence in quadrangle verified by ground truth surveys. See discussion of James River in Results.

++Aerial photography unavailable for 1986 for three quadrangles, therefore, hectares presented for 1986 represent only a portion of Section 3. See discussion of Upper Western Shore in Results, and maps in APPENDIX C. SAV presence in quadrangles not photographed was verified by ground truth surveys.

+++Aerial photography unavailable for 1986 for one quadrangle, therefore, hectares presented for 1986 represent only a portion of Section 2. See discussion of Upper Eastern Shore in Results, and maps in APPENDIX C. SAV presence in quadrangle not photographed was verified by ground truth surveys.

TABLE 6. NUMBER OF SQUARE METERS OF SAV IN EACH QUADRANGLE CONTAINED WITHIN THE 21 SECTIONS FOR THE CHESAPEAKE BAY 1986 AND CHINCOTEAGUE BAY. MAP CODE NUMBER FROM TABLE 2 IN PARENTHESIS.

SECTION	QUADRANGLE	AREA
Susquehanna Flats - 1	Conowingo Dam (1)	0
	Aberdeen (2)	57,659
	Havre de Grace (3)	19,774,206
	North East (4)	19,469
	Perryman (8)	0
	Spesutie (9)	3,539,915
		23,391,249 sq.m =
		2,339.12 hectares =
		5,780.07 acres
Upper Eastern Shore - 2	North East (4)	50,069
	Elkton (5)	0
	Perryman (8)	0
	Spesutie (9)	155,534
	Earleville (10)	97,230
	Cecilton (11)	0
	Gunpowder Neck (14)	*
	Hanesville (15)	77,033
	Betterton (16)	83,966
	Galena (17)	109,140
	Swan Point (20)	0
	Rock Hall (21)	5,575
		578,547 sq.m =
		57.85 hectares =
		142.95 acres**
Upper Western Shore - 3	White Marsh (6)	0
	Edgewood (7)	*
	Perryman (8)	0
	Spesutie (9)	0
	Baltimore East (12)	0
	Middle River (13)	*
	Gunpowder Neck (14)	*
	Hanesville (15)	0
	Curtis Bay (18)	0
	Sparrows Point (19)	0
	Round Bay (23)	0
	Gibson Island (24)	40,928
		40,928 sq.m =
		4.09 hectares =
		10.11 acres**

continued

TABLE 6. (continued)

Chester River - 4	Swan Point (20)	33,330
	Rock Hall (21)	54,148
	Chestertown (22)	0
	Love Point (25)	0
	Langford Creek (26)	2,948,925
	Centreville (27)	5,234
	Kent Island (32)	55,050
	Queenstown (33)	311,682
	Wye Mills (158)	0
		3,408,369 sq.m =
		340.84 hectares =
		842.23 acres
Central Western Shore - 5	Round Bay (23)	0
	Gibson Island (24)	0
	South River (30)	0
	Annapolis (31)	1,181
	Deale (35)	5,680
	North Beach (42)	0
		6,861 sq.m =
		0.69 hectares =
		1.71 acres
Eastern Bay - 6	Love Point (25)	0
	Annapolis (31)	0
	Kent Island (32)	252,931
	Queenstown (33)	54,046
	Claiborne (36)	1,507,277
	St. Michaels (37)	630,072
	Easton (38)	0
		2,444,326 sq.m =
		244.43 hectares =
		604.00 acres
Choptank River - 7	Claiborne (36)	143,330
	St. Michaels (37)	10,236
	Easton (38)	0
	Tilghman (43)	374,776
	Oxford (44)	519,069
	Trappe (45)	0
	Preston (46)	0
	Sharps Island (51)	1,935,923
	Church Creek (52)	1,415,180
	Cambridge (53)	0
	East New Market (54)	0
	Taylors Island (62)	123,849
	Fowling Creek (160)	0
		4,522,363 sq.m =
		452.24 hectares =
		1,117.50 acres

TABLE 6. (continued)

Patuxent River - 8	Lower Marlboro (41)	0
	Benedict (49)	42,345
	Mechanicsville (59)	75,895
	Broomes Island (60)	41,404
	Cove Point (61)	0
	Hollywood (70)	13,302
	Solomons Island (71)	20,983
	Bristol (159)	0
		193,929 sq.m =
		19.39 hectares =
		47.91 acres
Middle Western Shore - 9	North Beach (42)	0
	Prince Frederick (50)	0
	Broomes Island (60)	0
	Cove Point (61)	7,370
	Solomons Island (71)	5,332
	St. Marys City (80)	40,372
	Point No Point (81)	0
	Point Lookout (90)	5,786
		58,860 sq.m =
		5.89 hectares =
		14.55 acres
Lower Potomac River - 10	Nanjemoy (56)	1,027,402
	Mathias Point (57)	2,107,016
	Popes Creek (58)	0
	Dahlgren (66)	24,120
	Colonial Beach North (67)	184,220
	Rock Point (68)	0
	Leonardtown (69)	0
	Colonial Beach South (76)	0
	Stratford Hall (77)	0
	St. Clements Island (78)	0
	Piney Point (79)	15,096
	St. Marys City (80)	126,221
	Machodoc (87)	0
	Kinsale (88)	0
	St. George Island (89)	69,064
	Point Lookout (90)	5,786
	Lottsburg (96)	0
	Heathsville (97)	0
	Burgess (98)	0
	Charlotte Hall (162)	0
		3,558,925 sq.m =
		355.89 hectares =
		879.42 acres

TABLE 6. (continued)

Upper Potomac River - 11	Washington West (28)	0
	Washington East (29)	0
	Alexandria (34)	4,958,026
	Fort Belvoir (39)	71,638
	Mt. Vernon (40)	10,802,292
	Quantico (47)	192,317
	Indian Head (48)	75,120
	Widewater (55)	393,649
	Passapatanzy (64)	0
	King George (65)	229,500
	Port Tobacco (161)	11,032
		16,733,574 sq.m =
		1,673.36 hectares =
		4,134.95 acres
Middle Eastern Shore - 12	Taylors Island (62)	0
	Golden Hill (63)	10,706
	Barren Island (72)	1,771,662
	Honga (73)	1,944,805
	Wingate (74)	908,260
	Nanticoke (75)	0
	Richland Point (82)	37,607
	Bloodsworth Island (83)	3,852,761
	Deal Island (84)	604,751
	Monie (85)	186,921
	Kedges Straits (91)	1,564,884
	Terrapin Sand Point (92)	58,520
	Marion (93)	2,431,256
	Mardela Springs (163)	0
	Wetipquin (164)	0
		13,372,133 sq.m =
		1,337.21 hectares =
		3,304.30 acres
Tangier Island Complex - 13	Chesconessex (108)	9,011,201
	Parksley (109)	3,182,770
	Tangier Island (107)	6,518,931
	Ewell (99)	23,243,600
	Great Fox Island(100)	13,621,230
	Kedges Straits (91)	4,814,988
	Terrapin Sand Point (92)	2,034,988
	Crisfield (101)	1,804,570
	Marion (93)	0
	Saxis (102)	0
		64,232,278 sq.m =
		6,423.23 hectares =
		15,872.08 acres

continued

TABLE 6. (continued)

Lower Eastern Shore - 14	Elliotts Creek (142)	199,143	
	Townsend (143)	144,213	
	Cape Charles (133)	2,553,288	
	Cheriton (134)	727,388	
	Franktown (124)	4,417,725	
	Jamesville (119)	4,044,617	
	Nandua Creek (113)	3,759,666	
	Pungoteague (114)	7,062,269	
	Chesconessex (108)	190,303	
		23,098,612	sq.m =
		2,309.86	hectares =
		5,707.77	acres
Reedville - 15	Fleets Bay (112)	1,328,840	
	Reedville (106)	712,765	
	Burgess (98)	0	
		2,041,605	sq.m =
		204.16	hectares =
		504.49	acres
Rappahannock River Complex - 16	Mathews (123)	99,557	
	Wilton (117)	0	
	Deltaville (118)	5,181	
	Irvington (111)	75,006	
	Urbanna (110)	0	
	Champlain (86)	0	
	Mount Landing (94)	0	
	Tappahannock (95)	0	
	Dunnsville (103)	0	
	Morattico (104)	0	
	Lively (105)	0	
	Saluda (116)	0	
		179,744	sq.m =
		17.97	hectares =
		44.40	acres
New Point Comfort Region - 17	Mathews (123)	0	
	New Point Comfort (132)	3,235,840	
		3,235,840	sq.m =
		323.58	hectares =
		799.58	acres

continued

TABLE 6. (continued)

Mobjack Bay Complex - 18	Achilles (131)	4,772,311
	New Point Comfort (132)	8,317,503
	Ware Neck (122)	1,685,917
	Mathews (123)	270,770
		15,046,501 sq.m =
		1,504.65 hectares =
		3,718.06 acres
York River - 19	Poquoson West (140)	311,003
	Yorktown (139)	2,760
	Clay Bank (130)	0
	Achilles (131)	2,256,782
	West Point (115)	0
	Toano (120)	0
	Gressitt (121)	0
	Williamsburg (129)	0
		2,570,545 sq.m =
		257.05 hectares =
		635.18 acres
Lower Western Shore - 20	Cape Henry (152)	433,113
	Hampton (147)	2,704,022
	Poquoson East (141)	7,622,974
	Poquoson West (140)	2,048,572
	Norfolk North (150)	0
	Little Creek (151)	0
	Kempsville (156)	0
	Princess Anne (157)	0
		12,808,681 sq.m =
		1,280.87 hectares =
		3,165.09 acres
James River - 21	Hampton (147)	0
	Newport News South (149)	0
	Westover (125)	0
	Charles City (126)	0
	Brandon (127)	***
	Norge (128)	136,579
	Savedge (135)	0
	Claremont (136)	0
	Surry (137)	0
	Hog Island (138)	0

continued

TABLE 6. (continued)

	Yorktown (139)	0
	Bacons Castle (144)	0
	Mulberry Island (145)	0
	Newport News North (146)	0
	Benns Church (148)	0
	Norfolk North (150)	0
	Chuckatuck (153)	0
	Bowers Hill (154)	0
	Norfolk South (155)	0
	Kempsville (156)	0
		136,579 sq.m = 13.66 hectares = 33.75 acres**
Chincoteague Bay	Berlin (167)	0
	Public Landing (169)	0
	Tingles Island (170)	8,524,705
	Girdle Tree (171)	0
	Boxiron (172)	6,879,525
	Whittington Point (173)	1,899,433
	Chincoteague West (174)	0
	Chinoteague East (175)	4,035,734
		21,339,397 sq.m = 2,133.94 hectares = 5,273.06 acres

*Aerial photography unavailable, therefore, acreage data not collected. SAV presence in quadrangle verified by ground truth surveys. See maps in APPENDIX C, and discussion of Section 2, Upper Eastern Shore, and Section 3, Upper Western Shore, in Results.

**Acreage represents only a portion of section. See discussion in Results.

***Aerial photography unavailable, therefore, acreage data not collected. SAV presence in quadrangle verified by ground truth surveys. See discussion of Section 21 in Results.

TABLE 7. FREQUENCY OF STATIONS WITH ROOTED SUBMERGED AQUATIC VEGETATION ON THE CHESAPEAKE BAY SYSTEM, 1971-86 (Survey conducted annually by the Maryland Department of Natural Resources)

RIVER SYSTEM	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986
Elk & Bohemia Rivers	6.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sassafras	30.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	0.0	10.0	0.0	10.0
Howell-Swan Points	16.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chester River	61.1	36.1	26.5	23.5	25.0	25.7	38.9	44.4	33.3	38.9	13.9	0.0	1.1	19.4	22.0	11.0
Love-Kent Points	0.0	0.0	0.0	12.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Eastern Bay	34.0	46.5	34.0	36.2	21.7	42.2	28.3	26.1	17.3	34.8	4.4	4.3	17.4	6.5	17.4	9.0
Choptank River	35.0	39.7	19.3	27.6	1.7	39.0	25.8	28.3	26.7	25.0	1.7	6.7	5.0	1.7	11.7	5.0
Little Choptank River	21.0	21.0	0.0	0.0	0.0	15.8	5.3	5.3	5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
James-Barren Islands	44.1	35.3	2.9	5.9	8.8	2.9	0.0	0.0	0.0	0.0	0.0	2.9	0.0	0.0	2.9	0.0
Honga River	50.0	40.0	13.3	16.7	10.3	17.2	3.3	3.3	0.0	0.0	0.0	3.3	3.3	0.0	3.3	10.0
Fishing Bay	8.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nanticoke-Wicomico River	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Manokin River	40.0	46.7	13.3	20.0	7.1	6.7	20.0	0.0	0.0	0.0	6.7	13.3	0.0	6.7	13.3	13.3
Little & Big Annemessex R.	70.0	60.0	30.0	57.9	33.3	30.0	30.0	15.0	0.0	5.0	5.0	10.0	0.0	10.0	18.8	25.0
Pocomoke Sound	18.2	10.0	4.8	**	15.0	9.1	10.0	4.5	0.0	0.0	0.0	0.0	0.0	0.0	4.8	0.0
Bloodsworth-Sound Marsh Is.	37.5	22.7	10.9	11.6	7.0	2.2	4.4	0.0	0.0	2.2	11.1	2.2	4.3	0.0	2.4	4.4
Smith Island	64.7	45.5	25.0	35.3	22.2	35.3	23.5	5.8	17.6	47.1	47.1	41.2	35.3	29.4	23.5	29.4
Total Eastern Shore	36.4	28.5	13.3	18.0	9.7	17.7	13.9	11.6	9.0	12.4	5.4	4.5	5.6	4.5	8.3	6.5
Susquehanna Flats	44.4	2.7	0.0	13.5	11.1	8.1	11.1	2.7	8.1	0.0	2.7	13.5	5.4	0.0	2.7	2.7
Gunpowder-Bush Rivers	11.1	0.0	0.0	0.0	**	0.0	11.1	0.0	11.1	22.2	11.1	11.1	11.1	0.0	11.0	11.1
Back-Middle Rivers	13.6	4.6	4.6	4.6	9.1	4.6	9.1	4.5	4.5	9.1	4.5	0.0	19.0	17.6	19.0	19.0
Patapsco River	0.0	5.0	4.8	9.5	**	9.5	14.2	9.5	9.5	0.0	9.5	0.0	4.8	0.0	0.0	0.0
Magothy River	33.3	0.0	16.7	16.7	**	16.7	25.0	8.3	16.7	16.7	8.3	0.0	0.0	16.7	0.0	0.0
Severn River	40.0	20.0	26.7	26.7	0.0	46.2	20.0	26.7	20.0	13.3	6.6	0.0	6.7	0.0	0.0	0.0
South-West-Rhode River	0.0	0.0	0.0	0.0	0.0	12.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Curtis-Cove Points	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Patuxent River	2.0	4.3	0.0	4.0	0.0	2.1	2.0	2.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Western Shore	6.8	4.2	4.1	8.3	5.0	8.4	8.8	5.0	7.2	4.0	3.7	3.6	4.6	2.7	3.1	3.6
Percent of stations vegetated	28.5	21.0	10.5	14.9	8.7	14.9	12.4	9.5	8.4	9.7	4.9	4.2	5.3	4.0	5.7	5.6
Number of areas with no SAV recorded	5.0	9.0	12.0	9.0	11.0	8.0	8.0	12.0	13.0	16.0	12.0	16.0	15.0	17.0	13.0	14.0

**no stations sampled for this location

Results

1. SUSQUEHANNA FLATS

The abundance of SAV in this section increased by 16%, from 2011 hectares in 1985 to 2339 hectares in 1986 (Tables 4-6). This represents 68% of the SAV found in the Upper Bay zone. Mapping of SAV in this section was accomplished by use of aerial photography and, additionally, from information provided by Stan Kollar, of HCC, for areas where SAV was too sparse to be detected from aerial photography. More SAV was detected in the flats from aerial photography than in previous years, as the density appears to be increasing. Nine species of SAV were reported in 1986 with M. spicatum the most abundant and H. dubia, V. americana, H. verticillata and C. demersum also occurring in significant abundance. Species information and percent cover for specific beds in this area based on ground information from Stan Kollar are presented in Appendix B.

The Md.DNR survey found SAV at 5 of 37 stations they sample annually in the Susquehanna Flats. M. spicatum was the most abundant species, occurring at 3 stations (Table 7).

Transplantation efforts funded by the state of Maryland to Stan Kollar of HCC continues to be emphasized in this section. An SAV bed of approximately 1/2 acre planted in 1986 consisting of V. americana in shallow water and a fringing zone of H. dubia in slightly deeper water is growing very well. Greatest success appears to occur when plant spacings have been 1 meter or less.

2. UPPER EASTERN SHORE

Aerial photography for 1986 was unavailable for the Gunpowder Neck quadrangle, therefore, numerical data are unavailable. Presence of SAV in quadrangle was verified by ground truth surveys. Gunpowder Neck quadrangle had no SAV mapped in this section in 1985. Excluding a consideration of the Gunpowder Neck quadrangle, this section showed a 45% decrease in SAV from 1985 to 1986. A total of 58 hectares (2% of the SAV in the Upper Bay zone) were mapped in 1986 as compared to 105 in 1985 (Tables 4-6). The greatest decrease in this section occurred along the Elk River, while decreases were seen along other rivers. Conversely there was an increase in SAV in the Sassafras River in the Galena quadrangle.

The Md.DNR survey found no SAV at 15 stations in the Elk and Bohemia Rivers, or the 5 stations from Howell to Swan Point (Table 7). M. spicatum was found at one of the 10 stations on the Sassafras River. Four species of SAV were reported in this section by citizen and charterboat captain surveys. These species included V. americana, M. spicatum, E. canadesis and Trapa natans. T. natans is particularly significant because of previous infestations in portions of the Potomac River in the 1950's and early 1960's.

3. UPPER WESTERN SHORE

Aerial photography was unavailable in 1986 for three Upper Western Shore quadrangles (Edgewood, Middle River, and Gunpowder Neck) which had contained 214.11 hectares in 1985 (89.8% of the SAV present in Section 3 in 1985). Therefore, maps of SAV beds and numerical data for 1986 are

unavailable for these three quadrangles, and comparisons of these quadrangles', or the entire section's, total SAV acreages to previous years would be erroneous and are not made here. Of the nine remaining quadrangles in this section, SAV mapped from 1986 aerial photography totaled 4.09 hectares, all of it occurring in the Gibson Island (24) quadrangle. This contrasts with 1985 when these nine quadrangles had a total of 24.4 hectares SAV, of which 11.4 hectares occurred in the Gibson Island quadrangle.

Presence of SAV in 1986 in this section (including the Edgewood, Middle River, and Gunpowder Neck quadrangles) was verified by numerious sightings by the Citizens' and the Charter Boat Captains' Surveys. Five species were reported by these groups: M. spicatum, C. demersum, V. americana, P. pectinatus, E. canadensis with the former two most often reported. SAV sightings were principally in the lower portions of the Middle and Gunpowder Rivers, and Saltpeter and Seneca Creeks, and were principally in areas where SAV was reported in 1985.

The Md.DNR survey found no SAV at 42 stations located in the Gunpowder, Bush, Patapsco and Magothy Rivers while three of 21 stations in the Middle and Back Rivers section had SAV (M. spicatum) (Table 7).

4. CHESTER RIVER

In 1986, only 341 hectares of SAV (10% of the SAV in the Upper Bay zone) were mapped in the Chester River Section, a decrease of 49% from the 671 hectares mapped in 1985 (Tables 4-6). Most of the SAV (87%) once again occurred on the Langford Creek quadrangle. Seven species of SAV were reported in the Chester River Section by citizen, charterboat captain and

Md.DNR surveys. Species reported include, R. maritima, P. pectinatus, P. perfoliatus, Z. palustris, M. spicatum, V. americana and E. canadensis, with R. maritima and P. perfoliatus being most abundant.

The Md.DNR survey found SAV at only 4 (11%) of 36 sampling stations in 1986, compared to 8 (22%) in 1985 (Table 7).

5. CENTRAL WESTERN SHORE

There were only 0.7 hectares of SAV mapped in the Central Western Shore section in 1986, a 97.3% decrease from the 26.3 hectares mapped in 1985 (Tables 4-6). This is less than 1% of the SAV found in the Middle Bay zone. The large SAV bed present in Herring Bay in 1985 was absent in 1986. Citizen survey responses for the most part corroborated the paucity of SAV in this section. Species of SAV reported were R. maritima, P. pectinatus and Z. palustris.

The Md.DNR survey found no rooted SAV in the Severn, South, West and Rhode Rivers sections (Table 7).

6. EASTERN BAY

In 1986, 244 hectares of SAV (6% of the SAV in the Middle Bay zone) were mapped from aerial photography, a decrease of 31% from the 356 hectares reported in 1985 (Tables 4-6). R. maritima was the most prevalent species found in the Eastern Bay section, based on surveys by citizens, charterboat captains, and the Md.DNR. Other species reported were Z. palustris, M. spicatum, Najas sp., and P. pectinatus.

The Md.DNR survey again found no SAV at the Love Point to Kent Point stations. In the Eastern Bay they found only 4 (8.7%) of 46 stations vegetated, a decrease from the 8 stations vegetated in 1985 (Table 7). R. maritima was the only species found in the Md.DNR survey.

7. CHOPTANK RIVER

In 1986 there were 452 hectares of SAV (11% of the SAV in the Middle Bay zone) mapped in the Choptank River section (Tables 4-6). This represents a 70% decrease from 1,528 hectares reported in 1985. These results also corroborate reports from University of Maryland researchers at Horn Point which indicated less SAV in the Choptank River in 1986 than in 1985. Ground surveys on the river by citizens and charterboat captains located only 4 species of SAV in this section, with R. maritima being the most prevalent. Several surveys reported Z. marina, while Z. palustris was also found.

The Md.DNR survey found rooted SAV at only 3 (5%) of 60 stations on the Choptank River and Little Choptank River in 1986 (Table 7). This is a decrease from the 7 (11.6%) vegetated sites reported by the Md.DNR survey in 1985.

8. PATUXENT RIVER

In 1986 only 19 hectares of SAV (0.5% of the SAV in the Middle Bay zone) were noted on aerial photography of this section (Tables 4-6). This is 56% less than the 44 hectares mapped in 1985. There were sporadic sightings of 6 SAV species in the Patuxent River by citizens and charterboat

captains. Those species were: Z. palustris, V. americana, E. canadensis, N. quadalupensis, C. demersum, and R. maritima.

The Md.DNR survey found no SAV at 43 stations they surveyed (Table 7).

9. MIDDLE WESTERN SHORE

There were 6 hectares of SAV (0.1% of the SAV in the Middle Bay zone) mapped from aerial photography of this section in 1986, a decrease of 74% from the 23 hectares mapped in 1985 (Tables 4-6). As in 1985, most SAV detected on 1986 aerial photography was in small ponds and marshes that drain into the Bay. Species reported by citizens' ground survey were R. maritima, M. spicatum and V. americana.

The Md.DNR survey found no SAV at 10 stations sampled from Curtis to Cove Points (Table 7).

10. LOWER POTOMAC RIVER

In 1986 there were 356 hectares of SAV (9% of the SAV in the Middle Bay zone) mapped in the Lower Potomac River section, which is a 7% decrease from 381 hectares mapped in 1985 (Tables 4-6). Most (88%) SAV in this section occurs at the north end in the Nanjemoy and Mathias Point quadrangles within the transition zone in the Potomac River where salinity ranges from 4.0 to 11.0 ppt. Citizen surveys reported three species in this section, V. americana, M. spicatum and C. demersum.

The U.S. Geological Survey sampled 51 transects in the lower section and found trace amounts of R. maritima and Z. palustris on 3 transects in the estuary of the Wicomoco River (Tables 8 and 9). The upper Wicomoco

Table 8. Species of submersed aquatic vegetation found on vegetated transects in the estuary of the Potomac River, summer, 1986

Study area[1]	Species present
Wicomico River region below Chaptico Bay[2]	*Ruppia maritima* *Zannichella palustris*
St. Marys River region	no vegetation

[1]See Figure 6 for location of sampling transect in a study area and Table 9 for number of vegetated transects/total transects per study area.

[2]The Wicomico River maintains a freshwater to saltwater gradient and thus was partitioned into transition zone and estuary. Only the estuary was sampled.

Table 9. Relative occurrence of vegetated transects and grabs for the tidal Potomac River and Estuary, 1986
[Relative occurrence as vegetated transects/total transects per study area; n.d. is no data available]

Salinity zone/ study areas[1]	Sampling unit	1986 Spring	Summer	Fall
Tidal River				
Roosevelt Island to Wilson Bridge	Transects	3/6	n.d.	4/6
	Grabs	25/93	n.d.	31/105
Dyke Marsh	Transects	4/4	n.d.	4/4
	Grabs	130/183	n.d.	146/168
Gunston Cove	Transects	7/13	n.d.	4/13
	Grabs	67/266	n.d.	81/249
Piscataway Creek	Transects	13/13	n.d.	13/13
	Grabs	192/347	n.d.	324/444
Pomonkey Creek	Transects	1/4	n.d.	0/4
	Grabs	2/63	n.d.	0/120
Mattawoman Creek	Transects	2/22	n.d.	3/22
	Grabs	17/360	n.d.	16/327
Transition Zone				
Aquia and Potomac Creek region	Transects	n.d.	n.d.	0/26
	Grabs	n.d.	n.d.	0/390
Maryland Point	Transects	n.d.	n.d.	5/10
	Grabs	n.d.	n.d.	31/171
Nanjemoy Creek-Port Tobacco River region	Transects	24/37	n.d.	23/37
	Grabs	289/765	n.d.	231/612
Estuary				
Wicomico River region below Chaptico Bay[2]	Transects	n.d.	3/20	n.d.
	Grabs	n.d.	5/309	n.d.
St. Marys River region	Transects	n.d.	0/31	n.d.
	Grabs	n.d.	0/432	n.d.

[1]See Figs. 4, 5 and 6 for exact location of sampling transects in a study area.
[2]The Wicomico River maintains a freshwater to saltwater gradient and thus was partitioned into transition zone and estuary. Only the estuary was sampled.

above Chaptico Bay was not sampled in 1986 but had been reported vegetated in 1978-81.

The Maryland Point and Nanjemoy-Port Tobacco regions were vegetated but there was no vegetation in the Aquia-Potomac Creek region as reported by the USGS survey (Table 9). The most widely occurring species were V. americana, M. spicatum, P. perfoliatus, and R. maritima. These results are similar to those from the 1978-81 (USGS) surveys (Carter et al., 1985).

The Md.DNR survey found no SAV at 65 stations in the estuary portion of the Potomac River, from the Route 301 Bridge to Point Lookout, Md (Table 7). In the transition zone, part of which is in the Upper Potomac section, the Md.DNR survey found SAV at 7 (21%) of 34 stations. Species found in this zone were V. americana, M. spicatum, C. demersum, P. perfoliatus and R. martima.

11. UPPER POTOMAC RIVER

In 1986 there were 1673 hectares of SAV (41% of SAV in the Middle Bay zone) mapped from aerial photography (Tables 4-6). This is an 16% increase over 1439 hectares reported in 1985. The vegetation is still largely confined to the upper reaches of the section, as 94% of the vegetation was mapped on the Alexandria and Mt. Vernon quadrangles. There appeared to be a downriver spread of abundance, as SAV increased on the Mt. Vernon, Ft. Belvoir, Quantico, Indian Head, Widewater, Port Tobacco and King George quadrangles. This spread was confirmed by the USGS ground survey (see below).

USGS estimates of SAV acreage in this section in 1986 remained about the same as in 1985 (1457 hectares), which is 12.9% less than that estimated

from the aerial survey. Macrophyte species found on vegetated transects in the tidal Potomac River and transition zone are summarized in Table 10. The relative occurrence of SAV in vegetated transects and grabs by salinity zone is shown in Table 9. H. verticillata was found only in the tidal river (fresh water) and at Mallows Bay (near MP-02R) just inside the transition zone. H. verticillata does not appear to tolerate salinities greater than 5 ppt. (Carter, et al., 1987). In the tidal river, H. verticillata dominates the vegetated areas above Marshall Hall, Md. (Fig. 7) and the plants are very dense in that reach (Fig. 8). Below Marshall Hall, Md., M. spicatum becomes dominant and the vegetation is patchy (Fig. 8). Since 1985, vegetation has spread about 9 kilometers further downstream in the tidal river. The most abundant and most widely occurring species in the fall were H. verticillata, C. demersum, M. spicatum, and V. americana which composed 94 percent, 38 percent, 24 percent, and 18 percent, respectively, of the vegetated samples in 1986 (Table 11). The percent occurrence of H. verticillata has increased from 56 percent in 1984 to 79 percent in 1985, and to 94 percent in 1986.

The most abundant and widely occurring species reported by the citizens' survey were H. verticillata, M. spicatum, H. dubia, C. demersum, V. americana and N. quadalupensis.

The Md.DNR survey found 2 (6.9%) of 29 stations vegetated in the freshwater portions of the Potomac River. Species found were H. verticillata, M. spicatum, H. dubia and V. americana.

Table 10. Species of submersed aquatic vegetation found in vegetated transects in the tidal Potomac River and transition zone of the Estuary, 1986 [n.d. is no data available]

Salinity zone/ study area[1]	Species[2] present	
	Spring	Fall
Tidal River		
Roosevelt Island to Wilson Bridge	HYD, ZANN, VALL	HYD, MYRIO, P. PECT, VALL
Dyke Marsh	CERAT, HET, HYD, CHARA MYRIO, N. FLEX, VALL, N. GUAD, N. MIN, P. PECT, ZANN	CERAT, HET, HYD, MYRIO VALL, N. MIN
Gunston Cove	CERAT, HET, HYD, MYRIO, N. MIN, VALL P. PUS	CERAT, HET, HYD, MYRIO, N. MIN, VALL
Piscataway Creek	CERAT, MYRIO, HET, HYD, VALL, N. GUAD, N. MIN, ZANN, CHARA, N. FLEX	CERAT, HYD, MYRIO, VALL, HET, N. GUAD, N. MIN
Pomonkey Creek	HYD	no vegetation
Mattawoman Creek	VALL, ZANN, HYD	VALL, HYD
Transition Zone		
Aquia and Potomac Creek region	n.d.	no vegetation
Maryland Point	n.d.	VALL
Nanjemoy Creek-Port Tobaco River region	VALL, P. PECT, P. CRIS, P. PERF, ZANN, CERAT, MYRIO, CHARA	VALL, P. PECT, P. PERF, P. CRIS, CERAT, RUP, MYRIO

[1]See Fig. 4 and 5 for location of sampling transects in a study area and Table 9 for number of vegetated transects/total transects per study area.

[2]HYD = *Hydrilla verticillata*, MYRIO = *Myriophyllum spicatum*, VALL = *Vallisneria americana*, CERAT = *Ceratophyllum demersum*, HET = *Heteranthera dubia*, N. MIN = *Najas minor*, N. GUAD = *Najas guadalupensis*, ZANN = *Zannichellia palustris*, P. PERF = *Potamogeton perfoliatus*, P. PUS = *Potamogeton pusillus*, RUP = *Ruppia maritima*, N. FLEX = *Nitella flexilis*

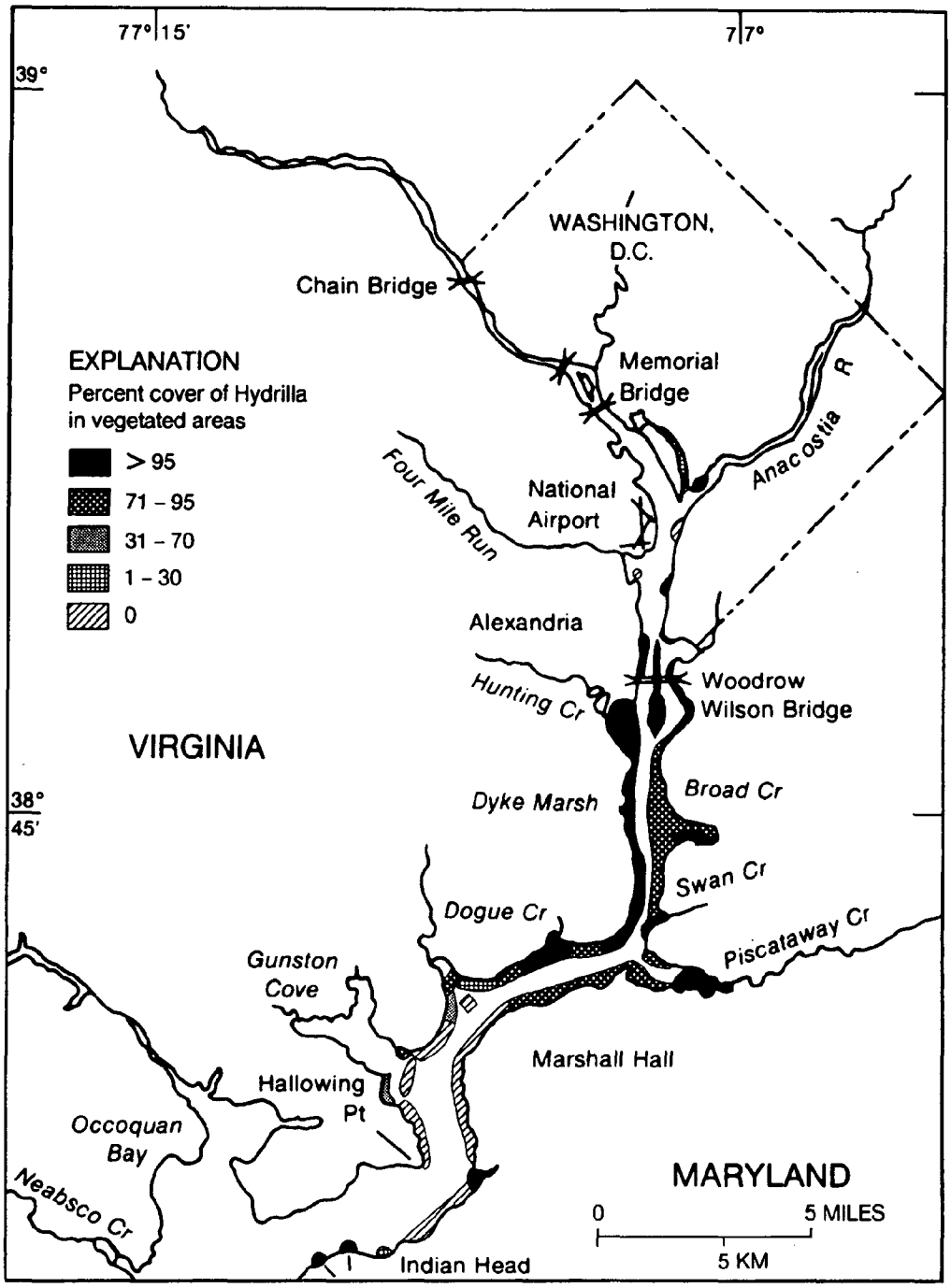

Figure 7. Percent cover of Hydrilla in vegetated areas in the tidal Potomac River in the fall, 1986 (from Rybicki et al., 1987).

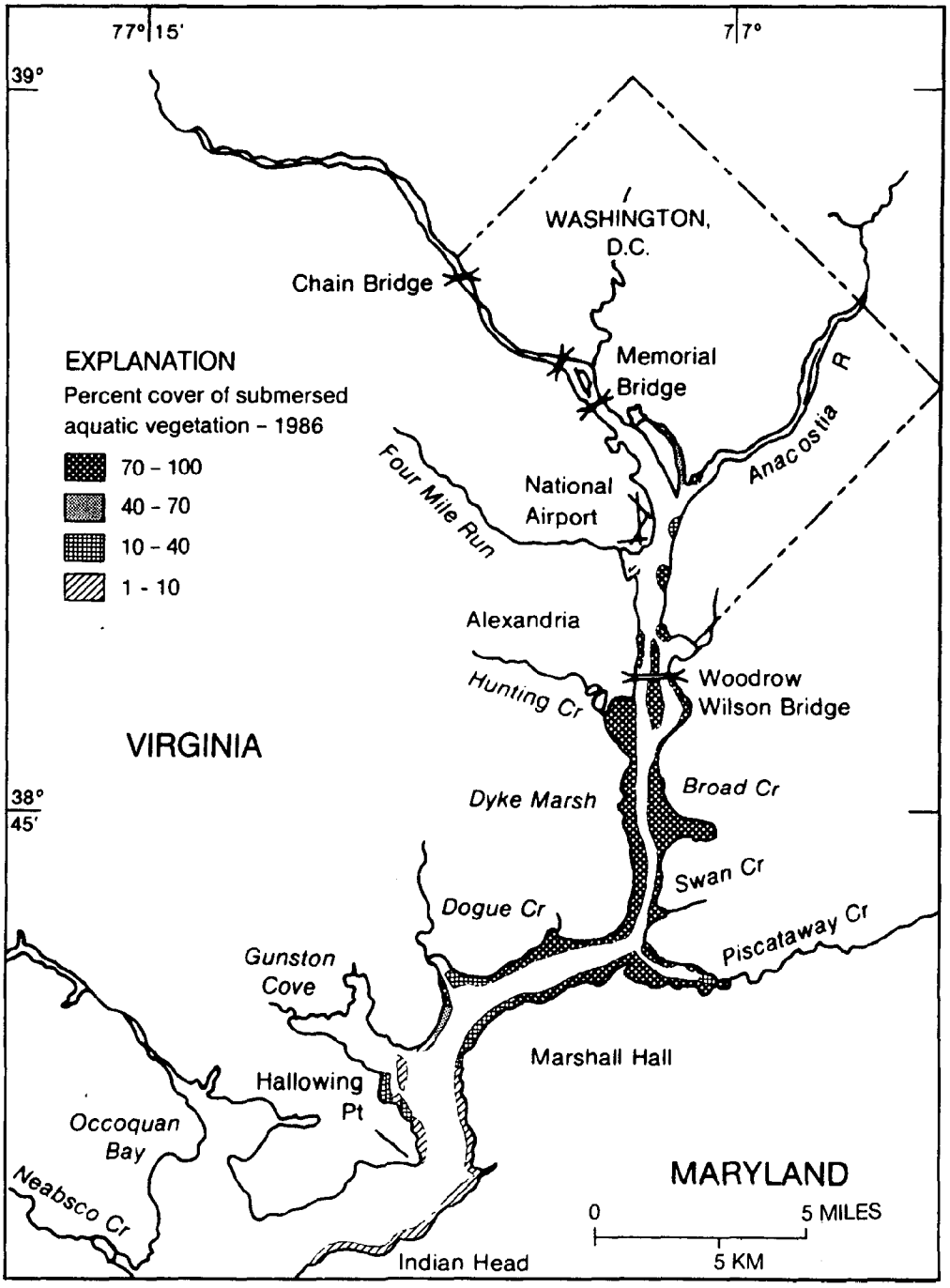

Figure 8. Percent cover of submersed aquatic vegetation in the tidal Potomac River in the fall, 1986 (from Rybicki et al., 1987).

Table 11. Frequency of individual species in vegetated grabs in the freshwater tidal Potomac River, 1984-1986, in percent (number of grabs with a species/number of vegetated grabs)

Species	1984 Spring	1984 Fall	1985 Spring	1985 Fall	1986 Spring	1986 Fall
Ceratophyllum demersum	6	22	17	47	49	38
Chara spp.	2	0	0	0	2	0
Heteranthera dubia	0	17	6	25	9	4
Hydrilla verticillata	32	56	39	79	72	94
Myriophyllum spicatum	11	31	52	55	34	24
Najas guadalupensis	0	19	7	13	4	<1
Najas minor	2	1	0	4	8	9
Nitella flexilis	0	3	2	0	3	0
Potamogeton crispus	2	0	0	0	0	0
Potamogeton pectinatus	17	0	5	0	<1	<1
Potamogeton pusillus	0	1	0	0	<1	0
Vallisneria americana	34	23	16	20	16	18
Zannichellia palustris	23	2	12	<1	9	0

Total vegetated grabs in 1984, Spring-47, Fall-165, 1985, Spring-252, Fall-363, 1986, Spring-432, Fall-598

12. MIDDLE EASTERN SHORE

In this section in 1986 there were 1337 hectares of SAV (33% of the SAV in the Middle Bay zone), which is an increase of 13% over 1188 hectares found in 1985 (Tables 4-6). This section has shown a tremendous increase in SAV since 1984, when only 33 hectares of SAV were reported. In general, the increase occurred in the southern half of the section, as all 6 quadrangles there showed increases in SAV, while 5 of 6 quadrangles in the north half of the section showed decreases. Charterboat captain surveys in this section found only R. maritima occurring.

The Md.DNR survey sampled 169 stations in this section, examining sites in the James-Barren Island system, Honga River, Fishing Bay, Barren Island/South Marsh Island, Naticoke-Wicomico River, Manokin River and Little/Big Annemessex River (Table 7). SAV was found at 2 stations each in the Bloodsworth/South Marsh Island and Manokin River sections. Three Honga River and 5 Little/Big Annemessex River stations were vegetated. No vegetation was reported for the James Island/Barren Island, Fishing Bay or Nanticoke/Wicomico River sections. R. maritima was the only species found at all of the vegetated stations.

13. TANGIER ISLAND COMPLEX

This section contains the greatest amount of SAV in the Lower Bay zone, with 6423 hectares or 52% of the total in this zone occurring in 5 quadrangles (Tables 4-6). The largest amount of SAV occurs in the Smith and Tangier Islands area. It is one of the more productive areas for SAV which

has been increasing in abundance since 1978 when 3759 hectares were found (71% less than reported for the 1986 survey). Other areas with significant stands of SAV include the Great Fox Island area, the Big Marsh area between Chesconessex and Deep Creeks, and the west side of Webb and Halfmoon Islands.

Although Z. marina and R. maritima are dominant species in this section, the results of the charterboat captains' survey and citizens' survey reported only R. maritima at all but two of the stations, where both species had been observed. The Md.DNR survey found SAV at only 2 of 54 stations. These stations were located on Smith Island and only R. maritima was present.

14. LOWER EASTERN SHORE

This section contained 2,310 hectares of SAV in 1986 (Tables 4-6) or 18.7% of the SAV in the Lower Bay zone. This was only a 3.7% increase over 1985 but is 16.0% more than that reported during the 1978 survey. Large, dense beds of Z. marina and R. maritima were present at the mouths of Cherrystone Inlet near Cape Charles, Hungars Creek, Mattawoman Creek, Occahannock Creek, Craddock Creek, Pungoteague Creek and Onancock Creek. Areas between these creeks are sparsely vegetated because of the dynamic and exposed nature of these sites.

SAV in the Vaucluse Shores historical area increased 11% from 1985 to 298.2 hectares (Table 12). 55% of these beds are considered dense (crown density scale, Fig. 2).

TABLE 12. AREAS OF SAV AT HISTORICAL MAPPING SITES (LOWER BAY ZONE) 1937-1986. FOR EACH OF THE FOUR DENISTY CLASSES: 1. VERY SPARSE, <10%, 2. SPARSE, 10-40%, 3. MODERATE, 40-70%, 4. DENSE, 70-100%.

Parrott Islands

Date	Area m^2 <10%	10-40%	40-70%	70-100%	Total
1937	0	297,024	1,598,268	0	1,895,292
1951	394,797	778,146	1,222,410	1,158,384	3,553,737
1960	411,306	631,566	547,014	1,947,372	3,537,258
1968	92,064	1,354,110	1,205,628	124,374	2,776,176
1974	0	2,922	7,710	0	10,632
1978	0	22,872	0	0	22,872
1980	0	0	0	0	0
1981	0	0	0	0	0
1984	0	0	0	0	0
1985	0	0	0	0	0
1986	0	0	0	0	0

Fleets Bay

Date	Area m^2 <10%	10-40%	40-70%	70-100%	Total
1937	0	1,385,424	548,076	744,864	2,678,364
1953	1,488,258	597,354	591,018	284,232	2,960,862
1961	1,572,612	1,330,140	1,643,892	884,280	5,430,924
1969	1,436,403	1,938,660	1,592,170	270,372	5,237,605
1974	105,714	1,624,884	1,325,040	0	3,055,638
1978	167,688	528,918	33,592	0	730,198
1980	0	121,890	26,040	2,472	150,402
1981	0	683,250	9,816	13,986	707,052
1984	232,164	730,680	33,318	14,556	1,010,718
1985	436,989	377,019	44,733	0	858,741
1986	753,278	49,268	93,640	0	896,186

Mumfort Islands

Date	Area m^2 <10%	10-40%	40-70%	70-100%	Total
1937	0	495,060	397,368	23,832	916,260
1953	151,728	699,252	106,356	1,461,846	2,419,182
1960	0	258,210	1,880,238	0	2,138,448
1971	0	685,536	1,088,976	0	1,774,512
1974	0	127,488	23,826	0	151,314
1978	0	0	0	0	0
1980	0	0	0	0	0
1981	0	0	0	0	0
1984	0	0	0	0	0
1985	0	0	0	0	0
1986	0	0	0	0	0

continued

TABLE 12. (continued)

Jenkins Neck

Date	<10%	10-40%	40-70%	70-100%	Total
	Area m^2				
1937	0	1,180,200	820,612	32,520	2,033,332
1953	426,480	647,112	717,180	1,811,832	3,602,604
1960	140,448	794,178	639,012	2,067,948	3,641,586
1971	0	278,586	2,350,380	33,792	2,662,758
1974	93,972	303,804	1,599,228	93,912	2,090,916
1978	132,714	299,760	671,616	162,408	1,266,498
1980	60,810	191,605	690,968	179,589	1,122,972
1981	0	0	763,194	309,012	1,072,206
1984	72,876	289,388	563,268	954,360	1,879,892
1985	32,988	247,934	496,543	1,416,525	2,193,991
1986	0	754,400	0	1,145,477	1,899,876

East River

Date	<10%	10-40%	40-70%	70-100%	Total
	Area m^2				
1937	1,024,010	809,770	1,357,790	85,530	3,277,100
1953	591,840	1,158,490	1,394,740	1,742,050	4,887,120
1963	31,032	1,916,530	2,340,480	0	4,288,042
1971	0	2,007,460	2,253,080	96,620	4,357,160
1974	509,730	348,820	1,955,130	0	2,813,680
1978	47,860	515,000	1,864,850	0	2,427,710
1980	191,520	451,351	808,842	158,634	1,610,347
1981	0	96,174	1,183,542	198,474	1,478,190
1984	181,626	633,012	1,050,666	139,326	2,004,630
1985	0	535,308	829,212	0	1,364,520
1986	95,683	1,000,136	653,318	98,701	1,847,838

Vaucluse Shores

Date	<10%	10-40%	40-70%	70-100%	Total
	Area m^2				
1938	0	1,120,284	1,451,392	1,480,128	4,051,804
1948	506,706	1,171,884	1,715,556	0	3,994,146
1955	1,938,258	0	528,996	1,238,124	3,705,378
1966	452,940	402,324	2,534,178	604,176	3,993,618
1972	286,554	364,764	2,515,740	391,770	3,558,828
1978	187,728	507,054	80,872	2,036,526	2,812,180
1980	359,551	7,098	697,842	1,783,938	2,848,429
1981	327,786	97,950	355,344	1,852,392	2,633,472
1984	0	15,792	1,137,882	1,731,678	2,885,352
1985	0	715,404	522,273	1,459,126	2,696,803
1986	178,241	460,125	687,700	1,655,950	2,982,014

15. REEDVILLE

The Reedville section (Tables 4-6) contained 204 hectares in 1986, an increase of 18.6% from 1985 but still less than the 364 hectares delineated during the first baywide survey in 1978. Only 1.7% of SAV in the Lower Bay zone is located in this section. There were 89.6 hectares in the Fleets Bay historical area, an increase of 4% from 1985 (Table 12). Most of the SAV beds in this section are in the very sparse (1) or sparse (2) category (Appendix C). 85% of the SAV in the historical site is very sparse. The citizens' SAV survey found R. maritima and Z. marina in Little Bay, Dymer Creek, Indian Creek, Ball Creek, Dameron Marsh, Fleeton Point and Taskmasker Creek. Most of these sites occurred where SAV beds were mapped in 1985, while several field observations indicated SAV at sites in Dymer Creek where no SAV was observed in the 1986 aerial survey.

16. RAPPAHANNOCK RIVER COMPLEX

This section contained only 17.97 hectares of SAV in 1986, 2 hectares less than in 1985. Less than 1% of the SAV in the Lower Bay zone is located in this section. The small, dense SAV beds in Milford Haven, consisting of Z. marina and R. maritima, have been relatively stable in the past few years. The bed at the mouth of Carter Creek in the Rappahannock River is still present, although smaller but more dense. A citizens' field report at this site indicated the presence of Z. marina. SAV continues to be absent from the Parrott Island historical site (Table 12).

Transplanting by VIMS scientists in 1986 was focused again in this section. Transplant sites were in Milford Haven near Hills Creek, Burton

Point at the mouth of the Piankatank River, Healy Creek in the Piankatank River and behind Parrott Island in the Rappahannock River. Z. marina has persisted from previous transplant efforts at Burton Point and Healy Creek, although the surviving material is very patchy. Several patches (2-4 m^2) of R. maritima were present at Burton Point. These have originated from plants that were transplanted with Z. marina in 1984 and 1985.

Field surveys in the late fall, 1986, revealed numerous, small patches (less than 1 m^2) of R. maritima in the Piankatank River near Healy Creek and behind Parrott Island. The 1986 photography did not indicate the presence of SAV, probably because of the small size of these patches. These areas should be intensively monitored in 1987 for persistance of these patches.

17. NEW POINT COMFORT REGION

This section contained 324 hectares of SAV in 1986 in an area principally along the shoreline fronting the Chesapeake Bay between New Point Comfort and just north of Horn Harbor (Tables 4-6). Only 2.6% of the SAV on the Lower Bay zone occurs in this section. This is only a 2.4% decrease from that observed in 1985 but is 19.6% more than what was reported in 1978. Z. marina and R. maritima are the SAV species occurring in this section.

18. MOBJACK BAY COMPLEX

This section contained 1505 hectares of SAV in 1986 (Tables 4-6), the same amount recorded in 1985, and is 18% of the total SAV in the Lower Bay zone. SAV beds, consisting of Z. marina and R. maritima, are most abundant

along the entire shoreline of the Mobjack Bay as well as in 3 of the 4 rivers: Severn, Ware and North. Several small beds of R. maritima were observed within the East River.

SAV in the East River historical area increased 35% from 1985 to 184.8 hectares (Table 12). All beds were either sparse or moderate. This amount is still less than the 435.7 hectares found in 1971.

The Mobjack Bay area continues to harbor some of the more extensive SAV beds on the western shore of the lower Chesapeake Bay.

19. YORK RIVER

This section contained 257 hectares of SAV in 1986 (Tables 4-6), 2.1% of the SAV in the Lower Bay zone. It is an amount similar to that reported for 1985. SAV beds, consisting of both Z. marina and R. maritima, are located principally along the north shore from Gloucester Point to the mouth of the river. The only beds present along the south shore are located on the north side of Goodwin Islands. SAV beds are absent above Gloucester Point except for small (<1 m^2) patches of Z. marina at Little Mumfort Island on the north shore, and just below the Naval Weapons Station on the south shore, that were transplanted in 1985 and have persisted through 1986. The SAV beds planted in 1982 and 1983 at Gloucester Point continue to thrive in 1986, similar to many of naturally expanding beds along the north shore.

SAV in the Jenkins Neck historical area decreased 13% from 1985 to 190.0 hectares (Table 12). Beds were either sparse or dense. SAV is still absent from the Mumfort Island historical area.

20. LOWER WESTERN SHORE

There were 1281 hectares of SAV in this section in 1986 (Tables 4-6), 2.6% less than that recorded in 1985 but 38.5% higher than that recorded for the 1978 survey. 10.4% of the SAV in the Lower Bay zone is located in this section. SAV beds, consisting of Z. marina and R. maritima, remain as dense beds in Broad Bay, Back River, Drum Island Flats and on the south side of Goodwin Island. Close to 60% of the SAV in this section is located in the Poquoson East Quadrangle. A citizens' report indicated the presence of the two SAV species in beds mapped from the aerial photography. No SAV is present in the southwest and northwest branches of Back River, or in the Poquoson River, Chisman Creek and Back Creek.

21. JAMES RIVER

The mainstem James River remains unvegetated in 1986. A small section of the Chickahominy was photographed that was identified as having SAV in 1978, in particular, Gordon and Nettles Creek, and Nayses Bay. The photography showed SAV beds in similar locations as in the 1978 data, indicating that these areas appear to be relatively stable. Although only 13.7 hectares were mapped, we believe this to be an underestimate, as many of these creeks contain SAV but beds are so small that they appear as thin lines both on photographs and on maps. Ground truth information from a graduate student of the University of Virginia, and from several citizens; indicated fringing SAV beds consisting of N. minor, N. quadalupensis, C. demersum and Z. palustris in Sunken Marsh, Morris Creek and the Chickahominy main stem, on the Brandon quadrangle, which was not photographed in 1986.

(Numerical data were not collected for Brandon quadrangle nor was a map included in Appendix C.) The student indicated that SAV abundance usually peaks in July and that SAV appeared to be more abundant in 1986 than in 1985. SAV species are probably distributed throughout the Chickahominy River system, occupying the fringes of many tidal creeks.

CHINCOTEAGUE BAY

The first aerial mapping survey of SAV in Chincoteague Bay delineated 2134 hectares in 1986 (Tables 4 and 6). SAV was concentrated in four quadrangles. Beds were mostly moderate (40-70% coverage) to dense (70-100% coverage): Chincoteague East - 403.57 ha (all moderately dense), Whittington Point - 189.94 ha (53% moderate, 13% dense), Boxiron - 687.95 ha (79% moderate, 16% dense), and Tingles Island - 852.47 ha (all dense). Two SAV species were found in this bay with Z. marina predominating in the southern part of the bay and R. maritima in the northern half. In addition, all of the SAV was found on the eastern side of the bay west of Assateague Island in water depths of less than 1 meter (MLW). They were concentrated in four relatively distinct areas (Fig. 9): west of the northern end of Chincoteague Island - 737.60 ha, West Bay - 226.70 ha, Green Run Bay - 317.20 ha, Tingles Island area - 852.40 ha. SAV beds cover approximately 6.6% of the total bottom area found from Ocean City Inlet to a line from Gunboat Point on Wallops Island to Fishing Point on the south end of Assateague Island (total bottom area of approximately 32,536 ha (Pritchard, 1960).

Anderson (1970) in an earlier study of SAV in 1970, found abundant SAV between West Bay and Green Run, and between Tingles Island and Goose Point,

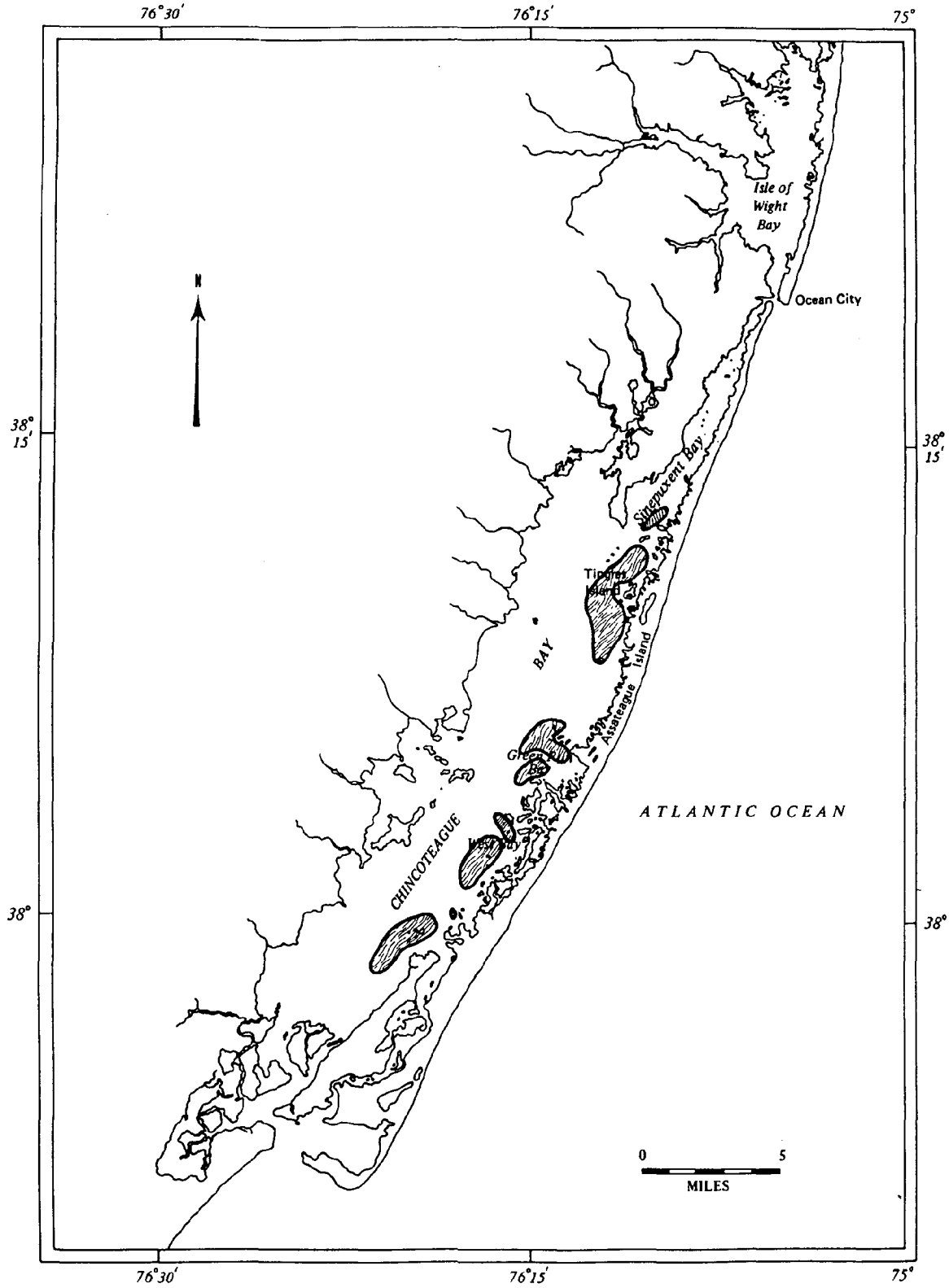

Figure 9. Location of major SAV areas in Chincoteague Bay - 1986.

and scarce SAV between Sugar Point north to below Tingles Island. In areas where the species co-occurred, R. maritima was found in the shallower, muddier bottoms, while Z. marina predominated in sandier, deeper bottoms. Similar trends along depth gradients were found for these two species in the Chesapeake Bay (Orth, et al., 1979).

The presence today of these large stands of SAV has raised questions as to how SAV populations became so abundant given their past history in Chincoteague Bay. Zostera marina was abundant here in the early 1900's but apparently declined to very low levels (if not totally disappearing) during the worldwide eelgrass epidemic in the early 1930's (Rasmussen, 1977; Orth and Moore, 1984). Eelgrass populations along the entire east coast of the United States and the west coast of Europe declined during this period. Anecedotal information indicated some attempt to transplant eelgrass in Chincoteague Bay in the 1940's from existing stands in the Chesapeake Bay. However, there is no confirming documentation, nor are there any subsequent surveys to determine if the transplant material survived. Examination of aerial photographs taken by the Soil Conservation Service in 1937 revealed what appeared to be SAV (no ground truth information was available) in the lower portion of Sinepuxent Bay entering Chincoteague Bay. The presence of large stands of eelgrass and widgeon grass today may have resulted from early transplants surviving and spreading to form current beds, or from spread of small, remnant beds that may have survived the 1930's decline. Given the lack of supporting documentation for the transplant work, the more tenable hypothesis is that the current abundance is a result of the spread of small stands of SAV that survived the decline in the 1930's.

SECTION 5

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APPENDIX A

SPECIES OF SUBMERGED AQUATIC PLANTS FOUND IN THE CHESAPEAKE BAY AND TRIBUTARIES (CLASSIFICATION AND NOMENCLATURE DERIVED FROM: GODFREY AND WOOTEN, 1979, 1981; HARVILL, ET AL., 1977, 1981; KARTESZ AND KARTESZ, 1980; RADFORD, ET AL., 1968; WOOD AND IMAHORI, 1965, 1965)

Family	Species	Common name
Characeae (muskgrass)	Chara braunii Gm.	Muskgrass
	Chara zeylanica Klein. ex Willd., em.	
	Nitella flexilis (L). Ag., em.	
Potamogetonaceae (pondweed)	Potamogeton perfoliatus L. var. bupleuroides (Fernald) Farwell	Redhead grass
	Potamogeton pectinatus L.	Sago pondweed
	Potamogeton crispus L.	Curly pondweed
	Potamogeton pusillus L.	Slender pondweed
Ruppiaceae	Ruppia maritima L.	Widgeongrass
Zannichelliaceae	Zannichellia palustris L.	Horned pondweed
Najadaceae	Najas guadalupensis (Sprengel) Magnus	Southern naiad
	Najas gracillima (A. Braun) Magnus	Naiad
	Najas minor Allioni	
Hydrocharitaceae (frogbit)	Vallisneria americana Michaux	Wild celery
	Elodea canadensis (Michaux)	Common elodea
	Egeria densa Planchon	Water-weed
	Hydrilla verticillata (L.f.) Boyle	Hydrilla
Pontedariaceae (pickerelweed)	Heteranthera dubia (Jacquin) MacMillian	Water stargrass
Ceratophyllaceae (coontail)	Ceratophyllum demersum L.	Coontail
Trapaceae	Trapa natans L.	Water chestnut
Haloragaceae (water milfoil)	Myriophyllum spicatum L.	Eurasian water milfoil
Zosteraceae	Zostera marina (L.)	Eelgrass

APPENDIX B

PERCENT COVER FOR SAV SPECIES PRESENT IN BEDS IDENTIFIED IN THE ABERDEEN, HAVRE DE GRACE AND SPESUTIE QUADRANGLES BASED ON FIELD OBSERVATIONS MADE BY STAN KOLLAR (HARFORD COMMUNITY COLLEGE) (MS - MYRIOPHYLLUM SPICATUM; VA - VALLISNERIA AMERICANA; HV - HYDRILLA VERTICILLATA; HD - HETERANTHERA DUBIA; CD - CERATOPHYLLUM DEMERSUM; N - NAIAD SPP.; PPC - POTOMOGETON PECTINATUS

Bed #'s	Species Present	Percent Cover
	Aberdeen	
FA3, GA4, HA3, IA3	Ms	70
	Cd	<5
	N	<1
	Havre de Grace	
EA4, DA4	Ms	70
	Cd	5
	Hv	5
PA4, QA4, RA2	MS	70
	Hd	5
	Va	5
	Hv	5
GA3, HA3, IA4, JA3	Ms	60
	Cd	5
	Hv	1
KA3, LA2, MA3, NA4	Ms	65
	Cd	<1
	Hv	<1
	N	<1
DB3	Ms	70
	Hv	15
	Hd	5
	Va	5
	Cd	5
HB4, GB2	Ms	60
	Hd	20
	Va	5
	Cd	5
	N	<1
	Hv	<1

APPENDIX B. (continued)

Bed #'s	Harve de Grace Species Present	Percent Cover
OA4, SA2, TA3, UA4	Ms	80
	Hd	5
	Va	<5
	Cd	<5
SB2	Ms	45
	Cd	5
RB1, QB2, VB2	Ms	
	Cd	2
	Hd	2
	Va	2
	Ppc	2
XA4	Ms	40
	Va	20
	Hv	15
	Cd	10
	Hd	5
LB3, MB2, N134 (north of Perry Point)	Ms	25
	Hd	25
	Va	15
	Cd	10
	Hv	5
MB2, NB4 (south of Perry Point)	Hd	45
	Ms	10
	Cd	5
	Va	5
	N	5
HC2 (north half)	Va	70
	Ms	5
	Hv	5
	Cd	5
HC2 (south half)	Va	25
	Ms	20
	Hv	5
	Cd	5
AC3, BC3	Ms	50
	Va	20
	Hv	15
	Hd	5
	Cd	5

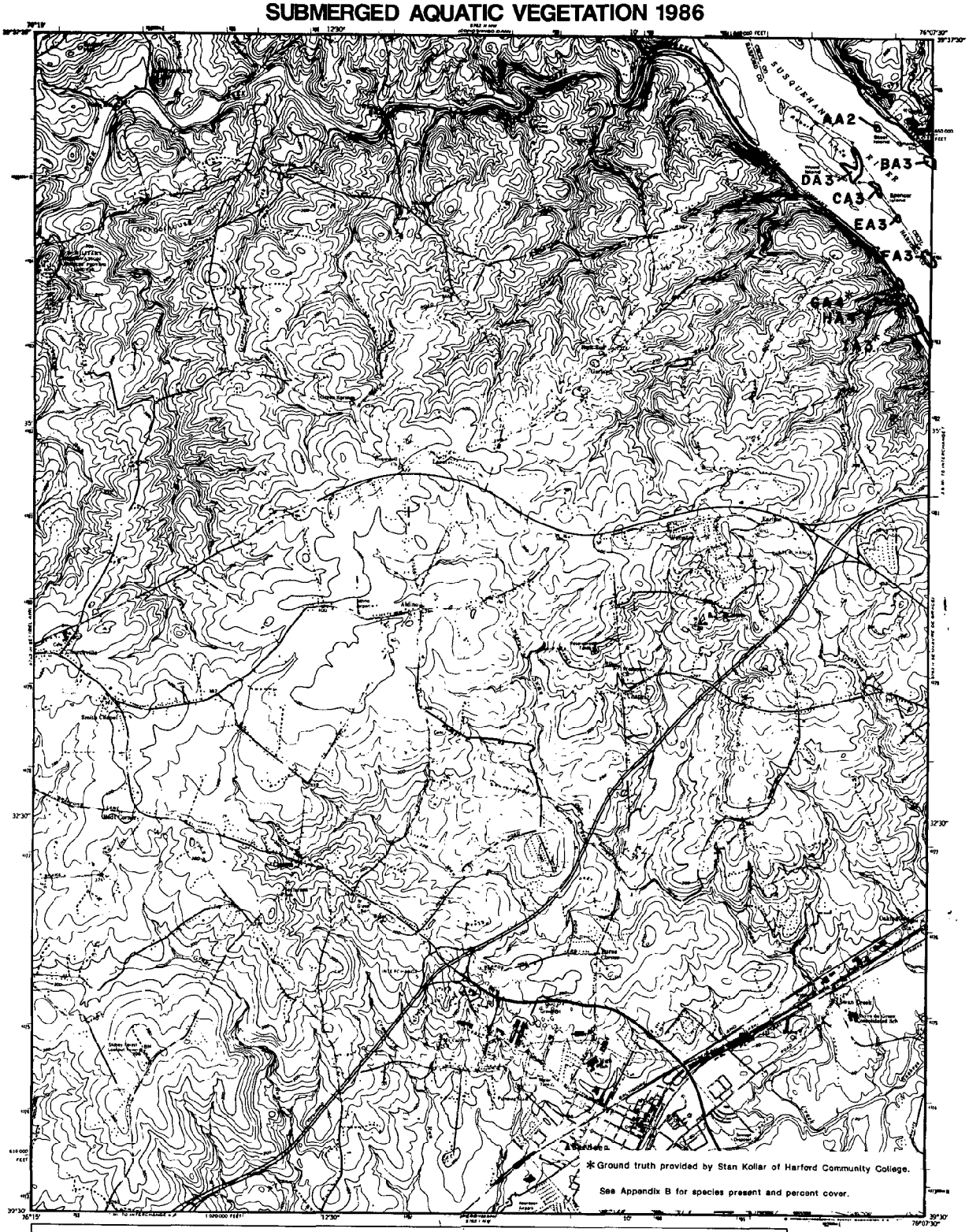
APPENDIX B. (continued)

Bed #'s	Harve de Grace Species Present	Percent Cover
CC3, DC3	Ms	65
	Va	15-25
	Hv	10
	Hd	5
	Cd	5
	N	1
YC3	Ms	45
	Cd	5
EC3, FC4	Va	40-60
	Ms	10
LC4, NC2, MC1	Ms	40-60
	Va	25
	Hv	10-20
	Hd	5
	Cd	<5
	N	<1
KC4 (north half)	Ms	30
	Hv	50
KC4 (south half)	Ms	20
	Hv	60-70
OC4	Ms	60
	Hv	10
	Va	5
QC3	Ms	70-80
	Va	<5
	Hv	<1
RC3	Ms	80
	Va	5
VC4, WC3	Ms	80
UC2	Ms	
	Va	
	Spesutie	
FA3	Ms	
	Hv	
	Cd	

APPENDIX C

TOPOGRAPHIC QUADRANGLES SHOWING THE DISTRIBUTION AND ABUNDANCE OF SAV (BOUNDARIES OF INDIVIDUAL SAV BEDS ARE DELINEATED BY SOLID LINES. EACH BED IS IDENTIFIED WITH A LETTER (A-Z) AND A NUMBER (1-4). THESE NUMBERS REPRESENT THE DENSITY CLASSIFICATION DISCUSSED IN THE TEXT AND FIG. 2, I.E., 1 = <10%; 2 = 10-40%; 3 = 40-70%; 4 = 70-100%).

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

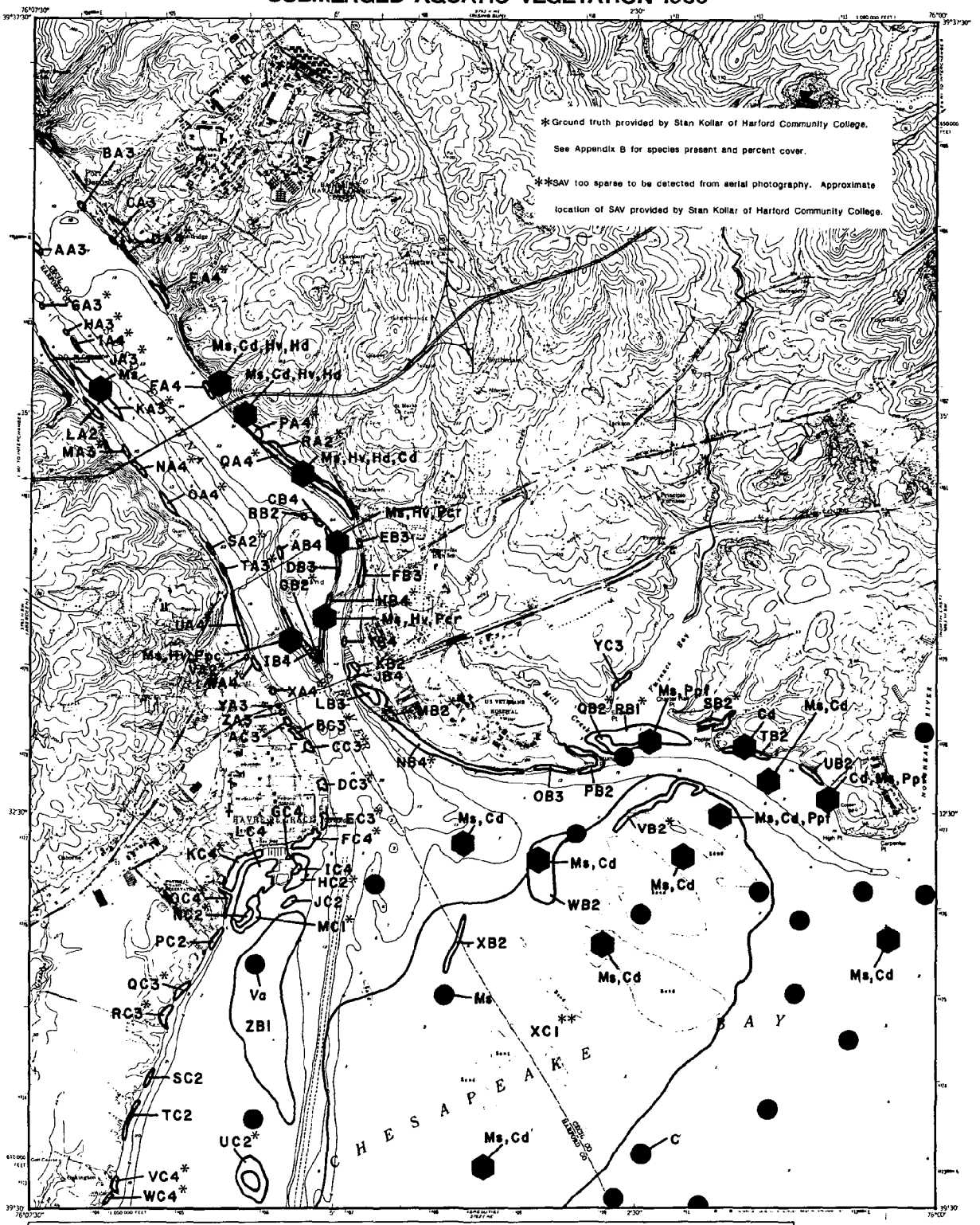
.5 0 1 KILOMETER

ABERDEEN, MD

2

DATE FLOWN 9/9/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

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SURVEY STATIONS

- MD-DNR Survey Station
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- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

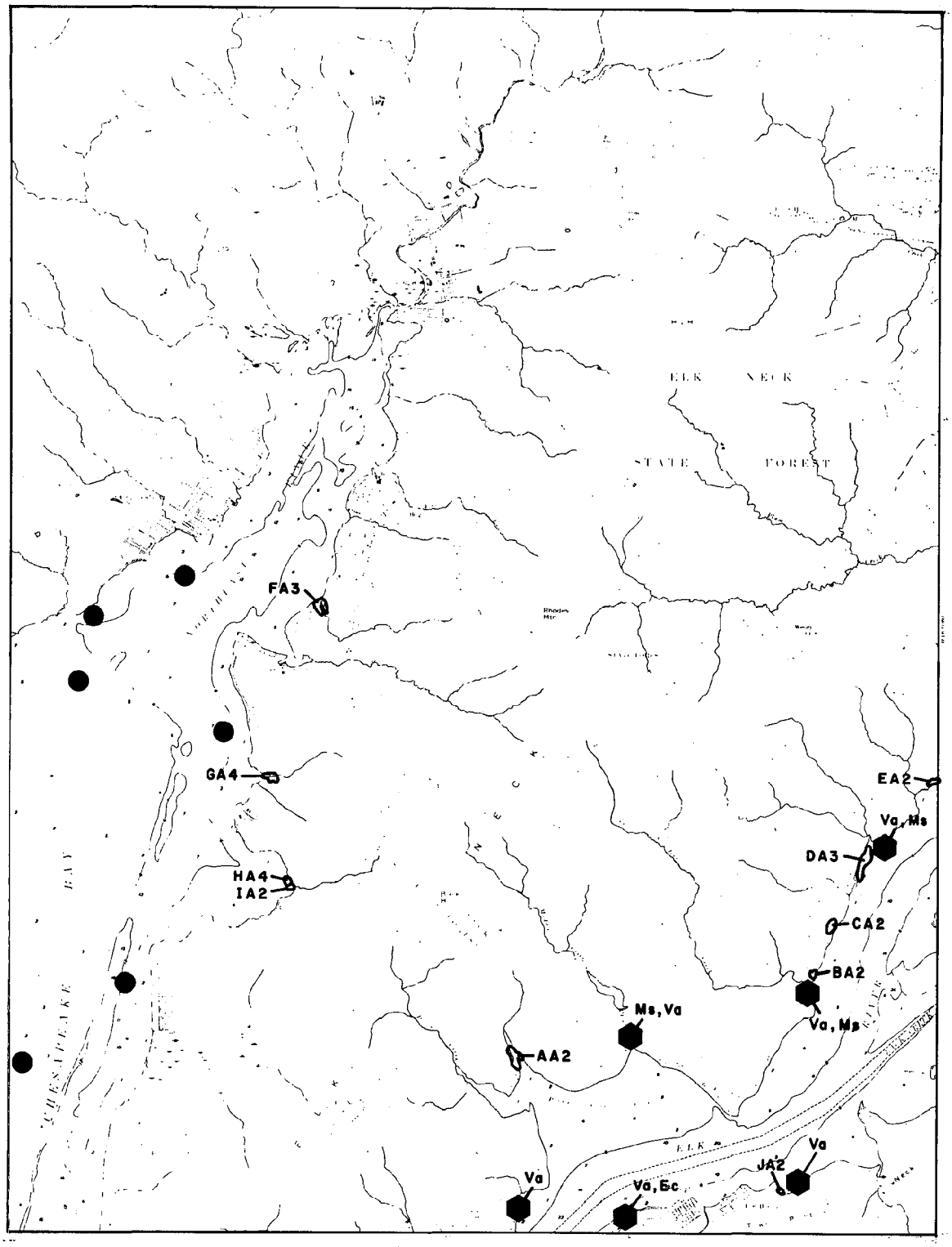
1 .5 0 1 KILOMETER

HAVRE DE GRACE, MD

3

DATE FLOWN 9/9/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
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N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S.

SCALE 1:24,000

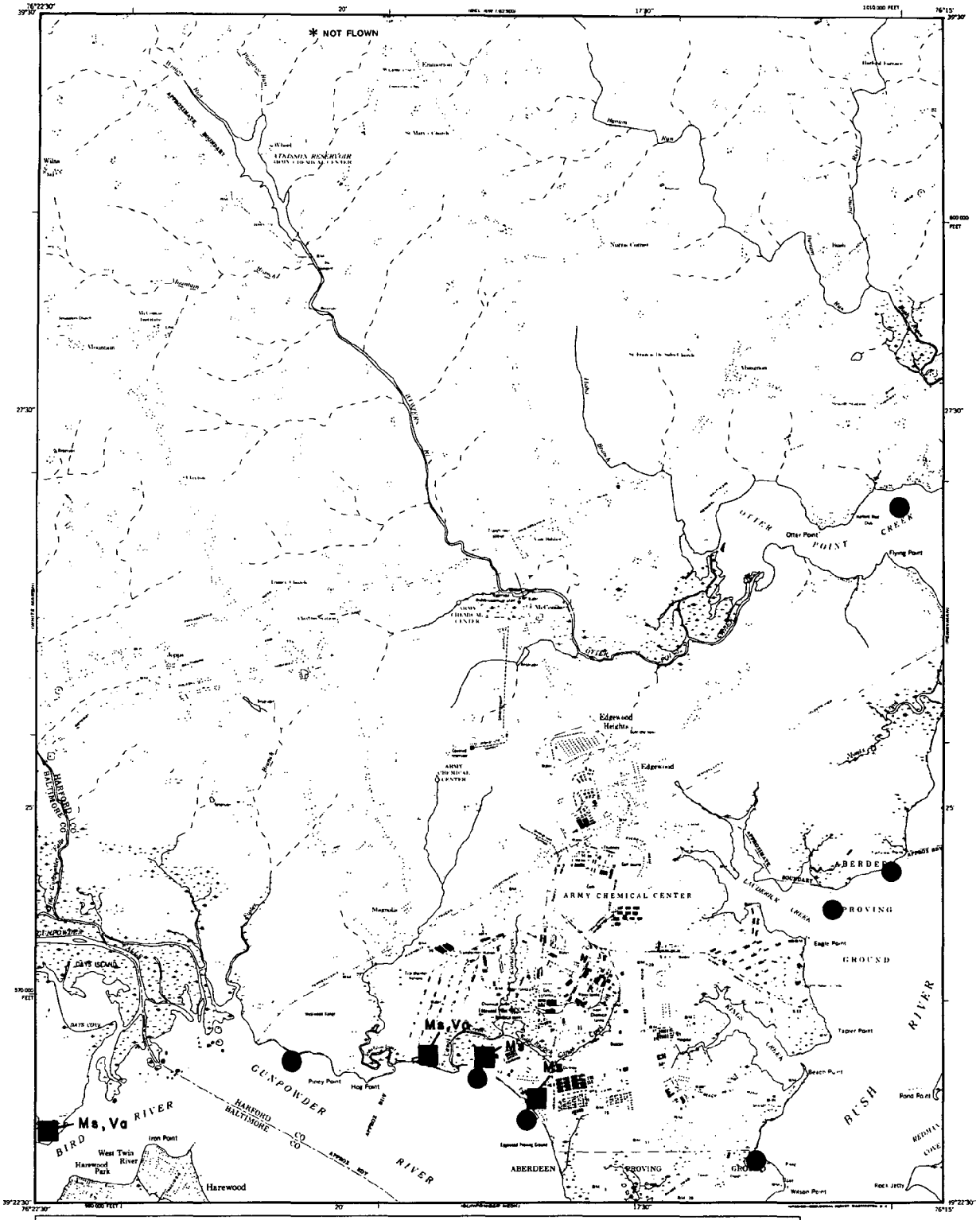
1 .5 0 1 MILE

1 .5 0 1 KILOMETER

NORTHEAST, MD 4

DATE FLOWN 9/9/86

SUBMERGED AQUATIC VEGETATION 1986*



SPECIES

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Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Pof	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
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- ▲ VIMS Field Survey
- ◆ U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

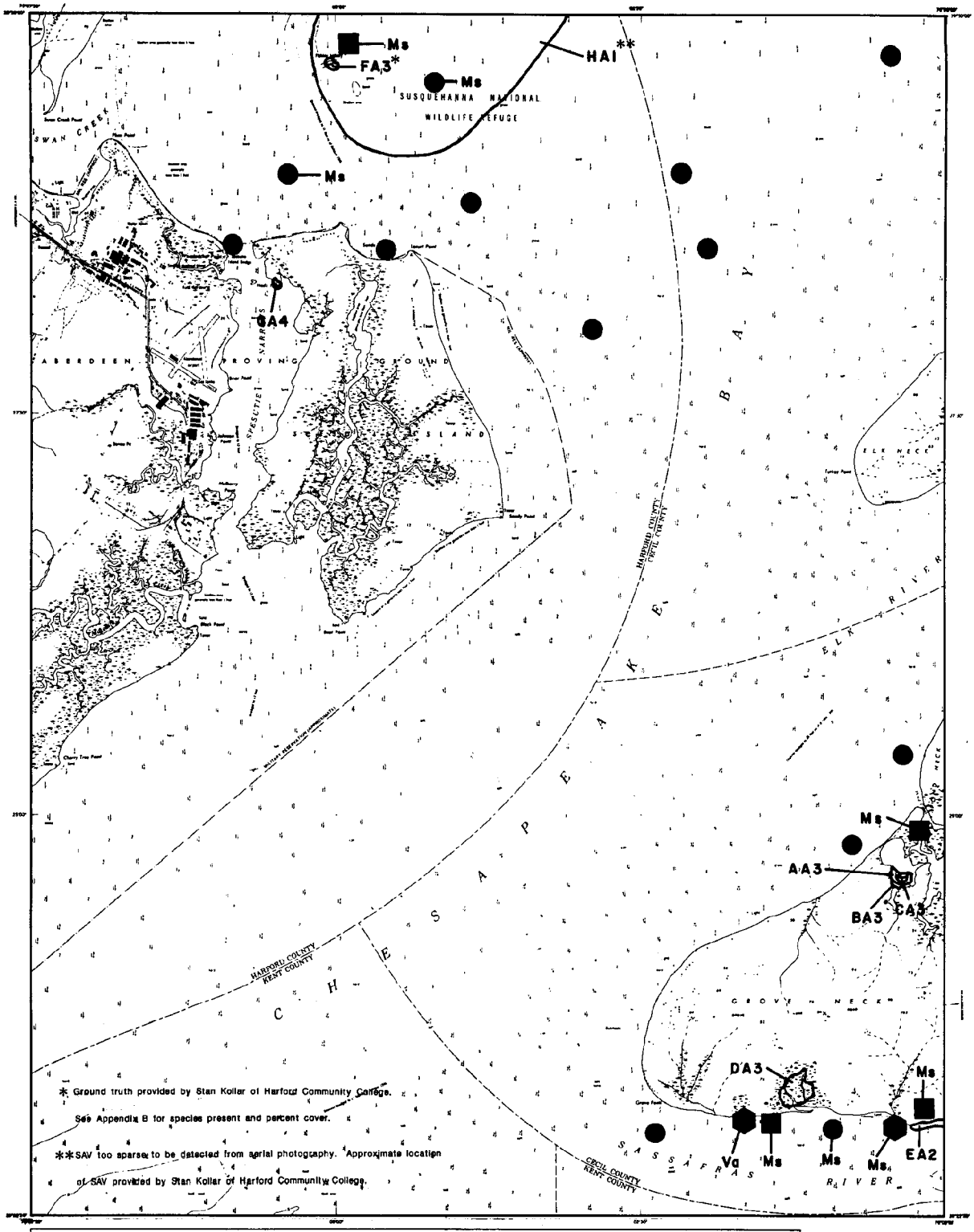
1 .5 0 1 KILOMETER

EDGEWOOD, MD

7

*NOT FLOWN

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Pdf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

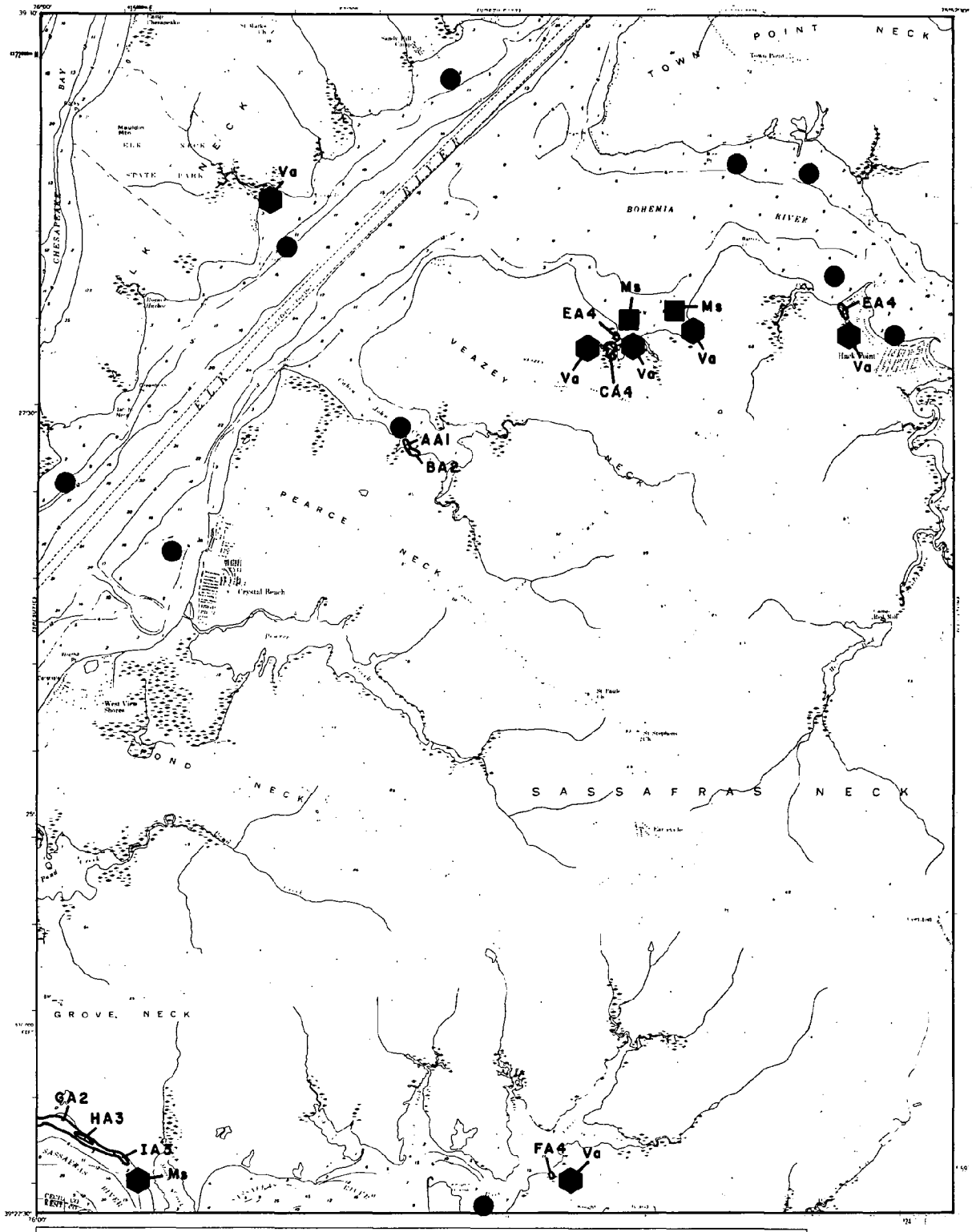
1 .5 0 1 KILOMETER

SPESUTIE, MD

9

DATE FLOWN 9/9/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)	
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)	
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)	
Pcf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)	
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)	
Zp	*Zannichellia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)	
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)	
Ec	*Elodea canadensis* (common elodea)	C	*Ceratophyllum sp.* (muskgrass)	
Va	*Vallisneria americana* (wild celery)			

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- USGS

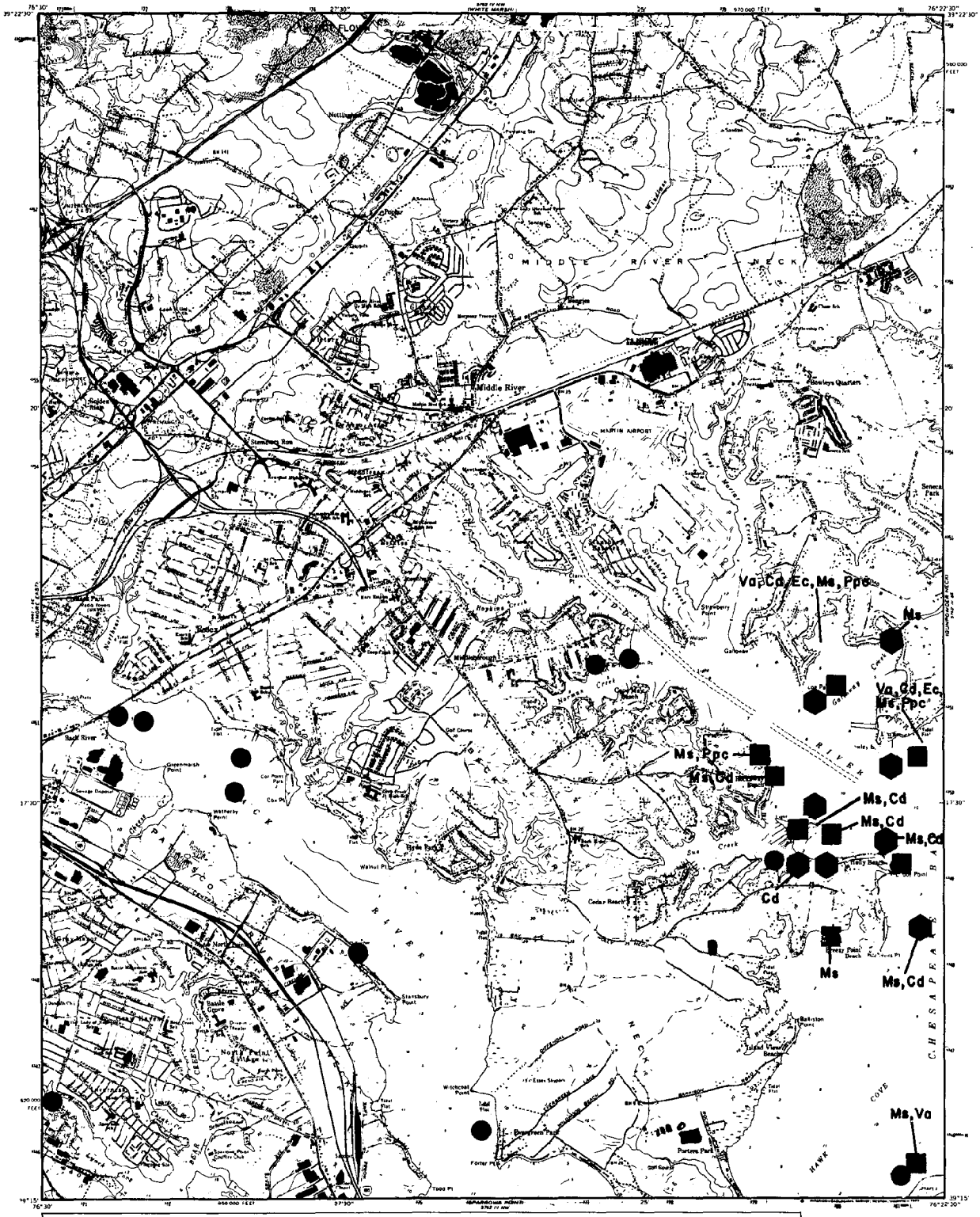
SCALE 1:24 000

EARLEVILLE, MD

10

DATE FLOWN 9/9/86

SUBMERGED AQUATIC VEGETATION 1986*



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichellia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ U.S.G.S.

SCALE 1:24,000

.5 0 1 MILE

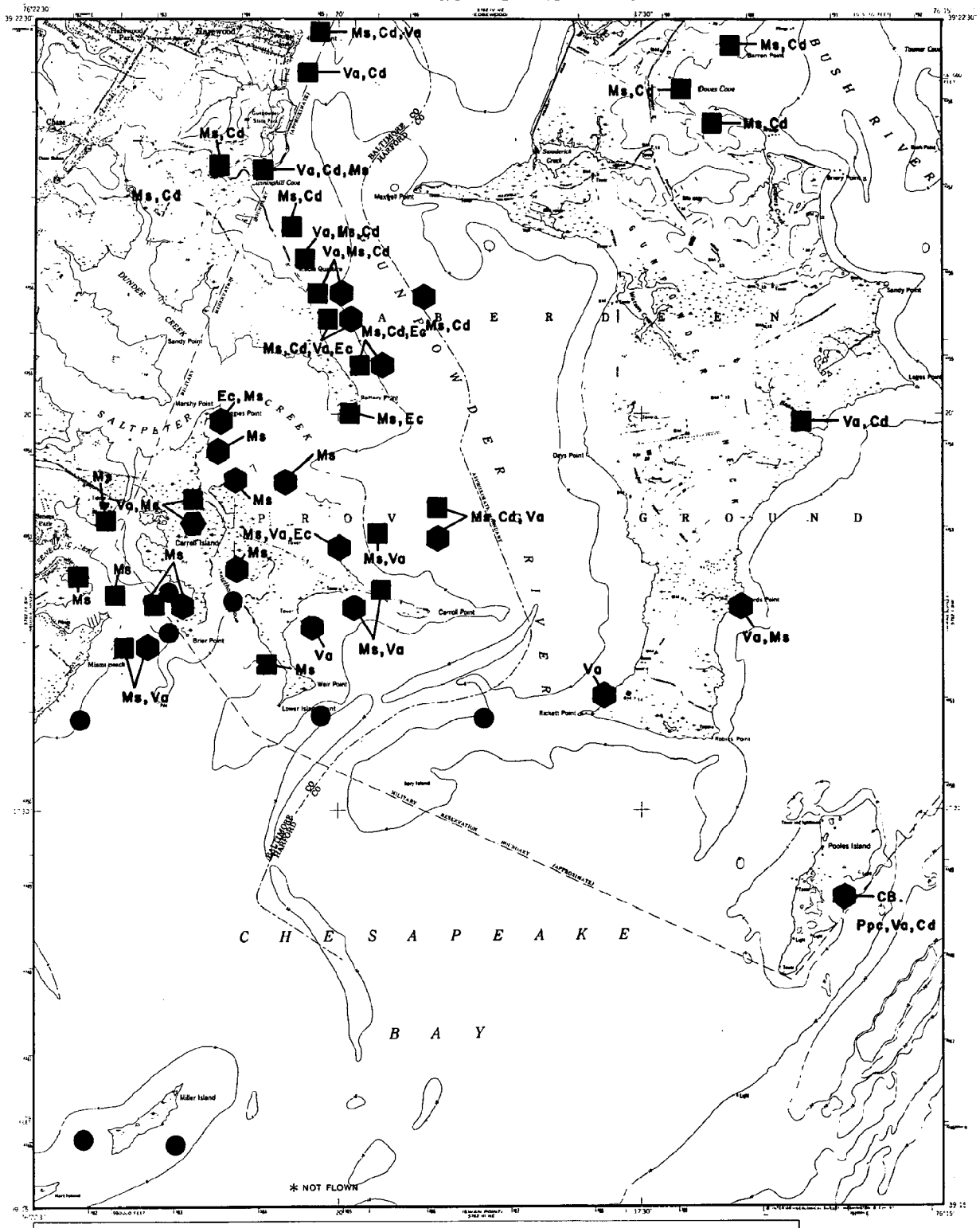
.5 0 1 KILOMETER

MIDDLE RIVER, MD

13

*NOT FLOWN

SUBMERGED AQUATIC VEGETATION 1986*



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Pof	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichellia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S

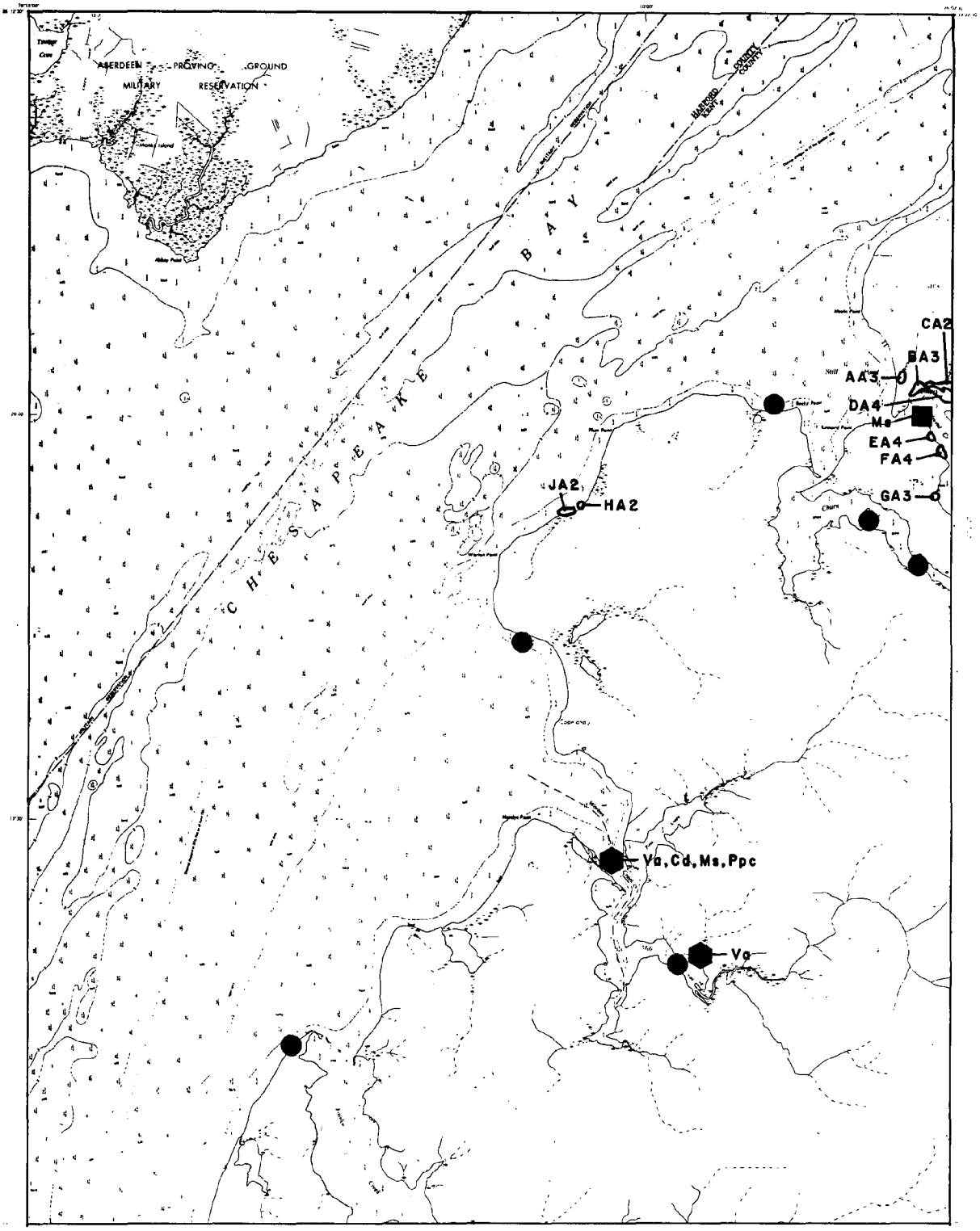
SCALE 1:24,000

GUNPOWDER NECK, MD

14

*NOT FLOWN

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

5 0 1 MILE

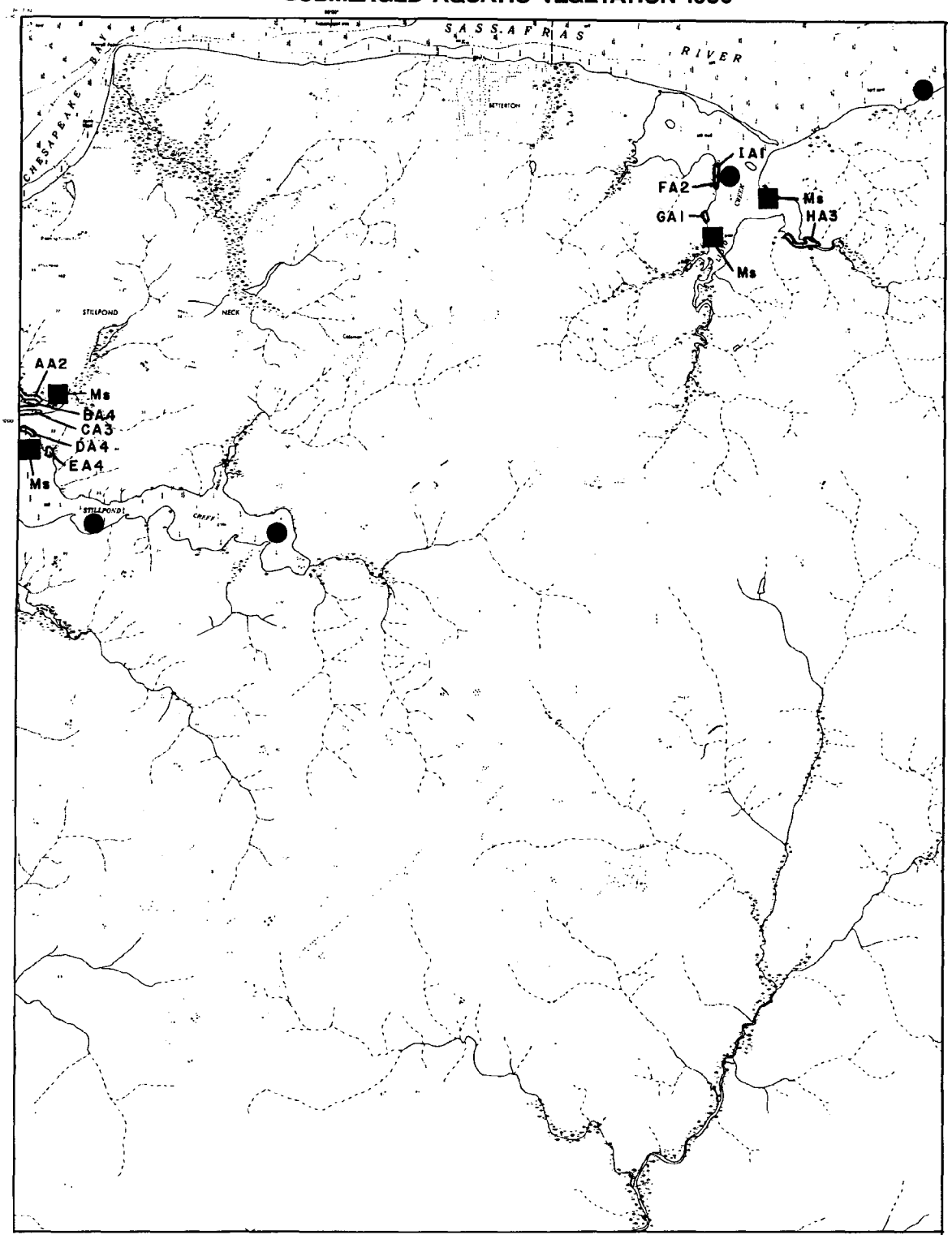
5 0 1 KILOMETER

HANESVILLE, MD

15

DATE FLOWN 9/13/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)		
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)		
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)		
Pol	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)		
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)		
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)		
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)		
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)		
Va	*Vallisneria americana* (wild celery)				

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S.

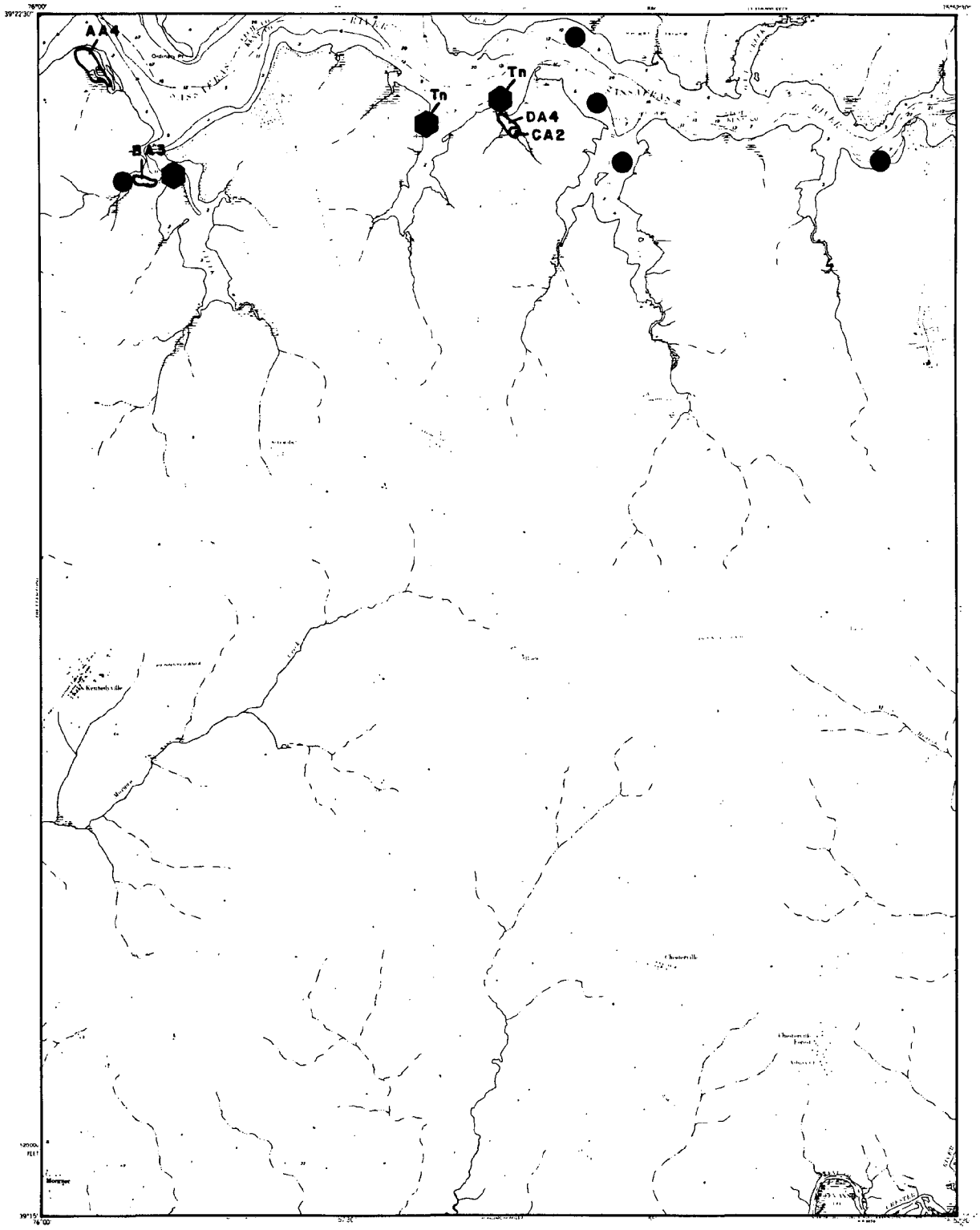
SCALE 124,000

BETTERTON, MD

16

DATE FLOWN 9/9/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichella palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ U.S.G.S.

SCALE 1:24,000

1 MILE

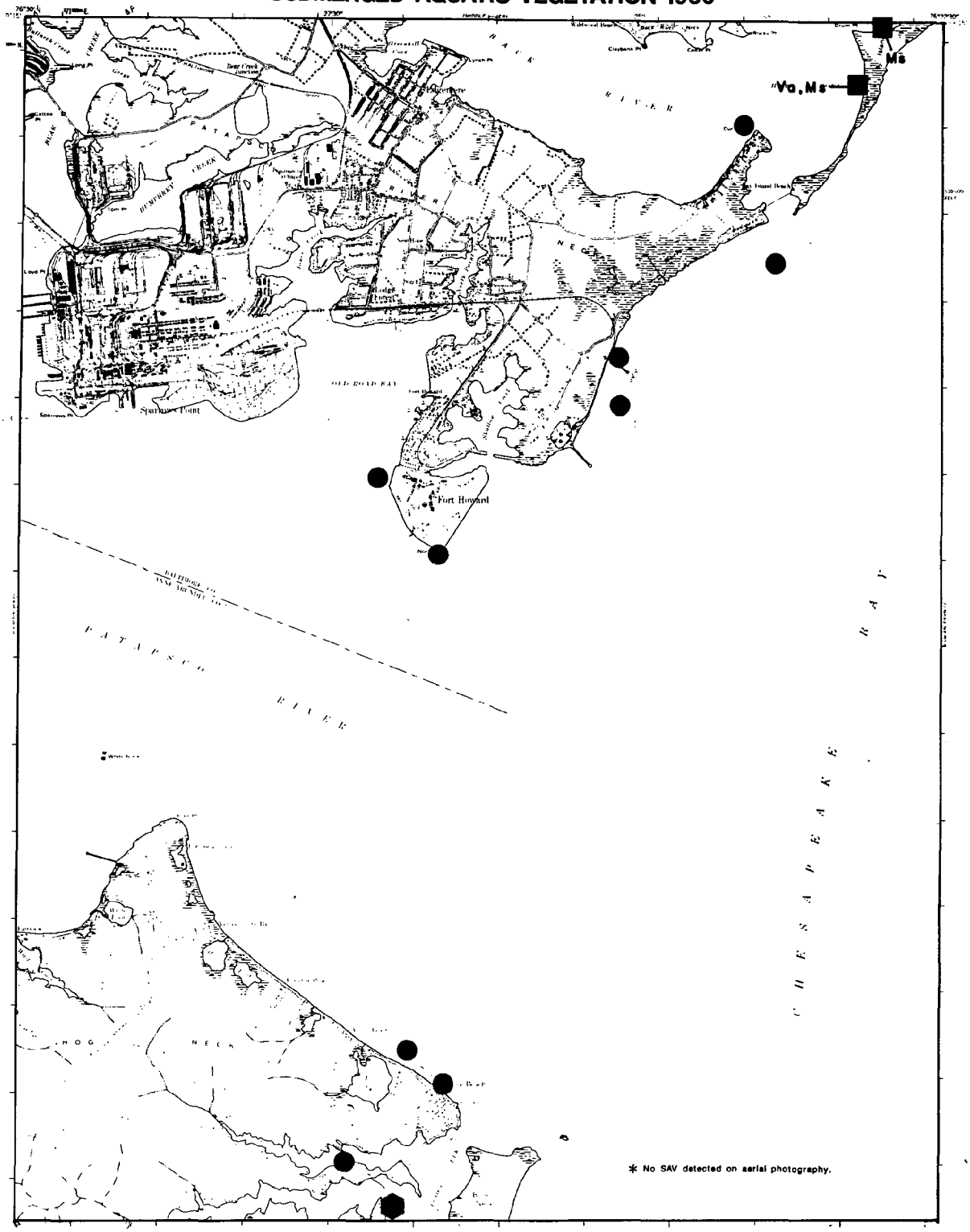
1 KILOMETER

GALENA, MD

17

DATE FLOWN 9/9/86

SUBMERGED AQUATIC VEGETATION 1986*



* No SAV detected on aerial photography.

SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S.

N

SCALE 1:24,000

1 .5 0 1 MILE

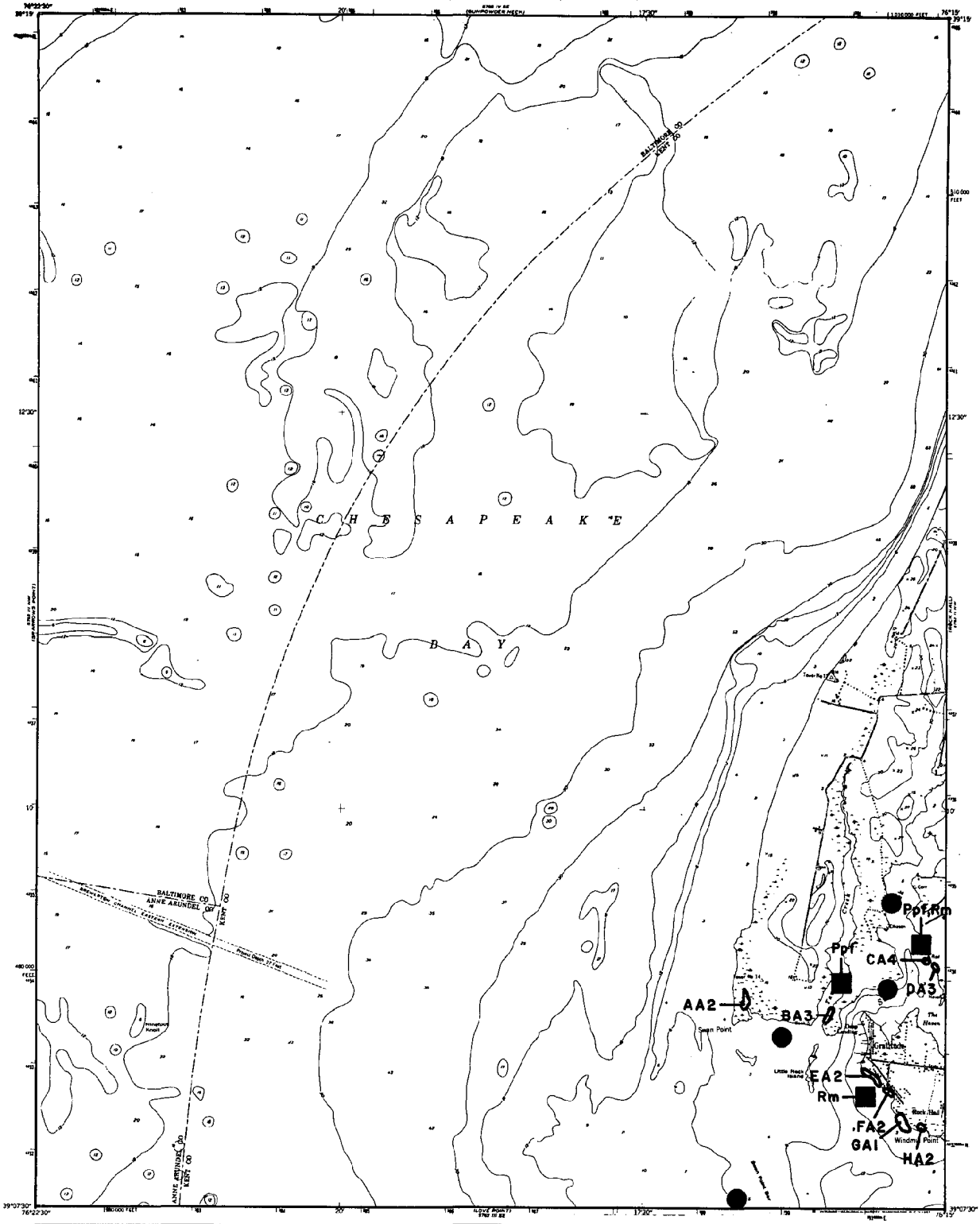
1 .5 0 1 KILOMETER

SPARROWS POINT,

MD 19

DATE FLOWN 9/13/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ U.S.G.S.

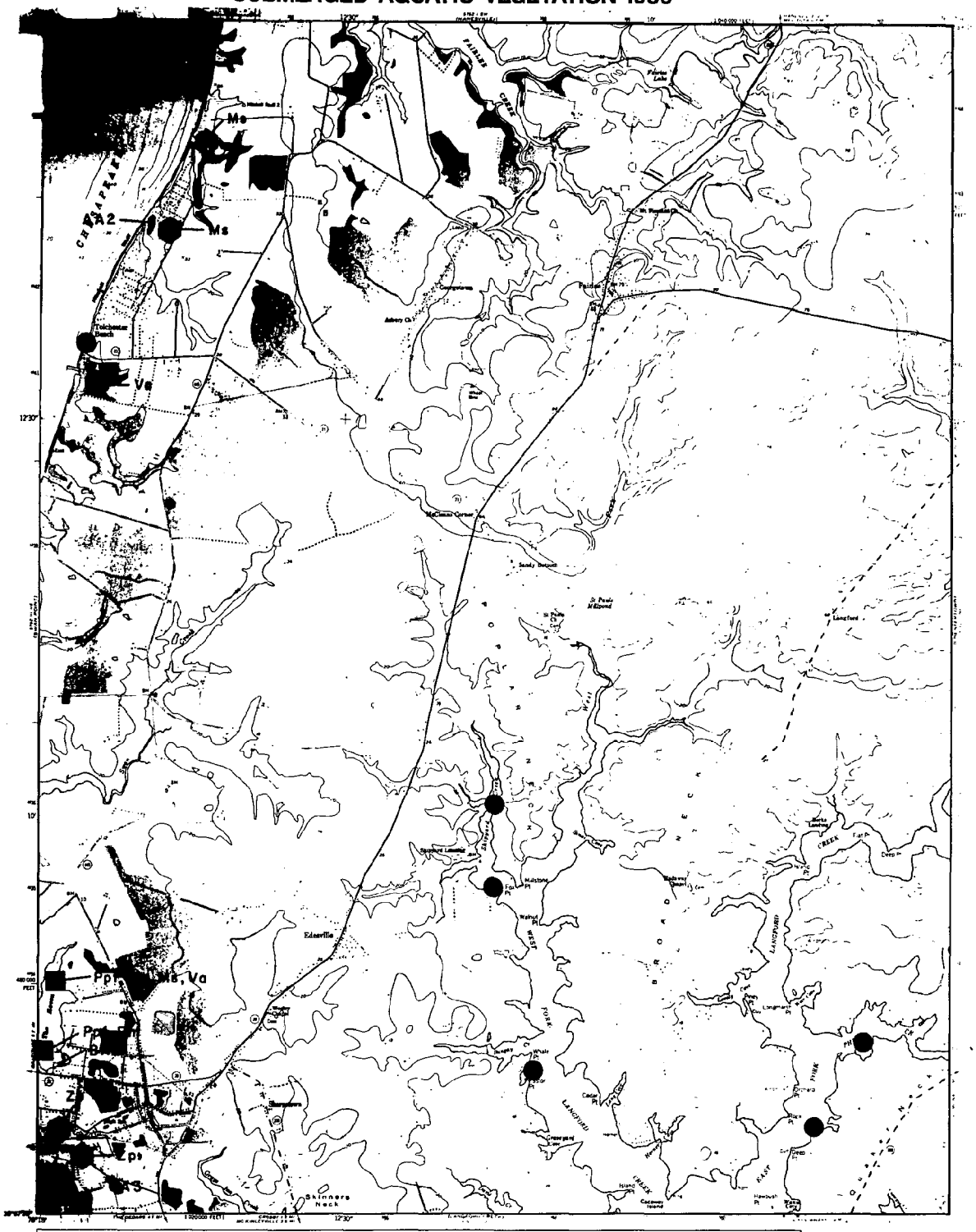
SCALE 1:24,000

SWAN POINT, MD

20

DATE FLOWN 9/13/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichellia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

ROCK HALL, MD 21

DATE FLOWN 9/13/86

SUBMERGED AQUATIC VEGETATION 1986

SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)		
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)		
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)		
Pof	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)		
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)		
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)		
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)		
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)		
Va	*Vallisneria americana* (wild celery)				

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ U.S.G.S.

SCALE 1:24,000

MILE

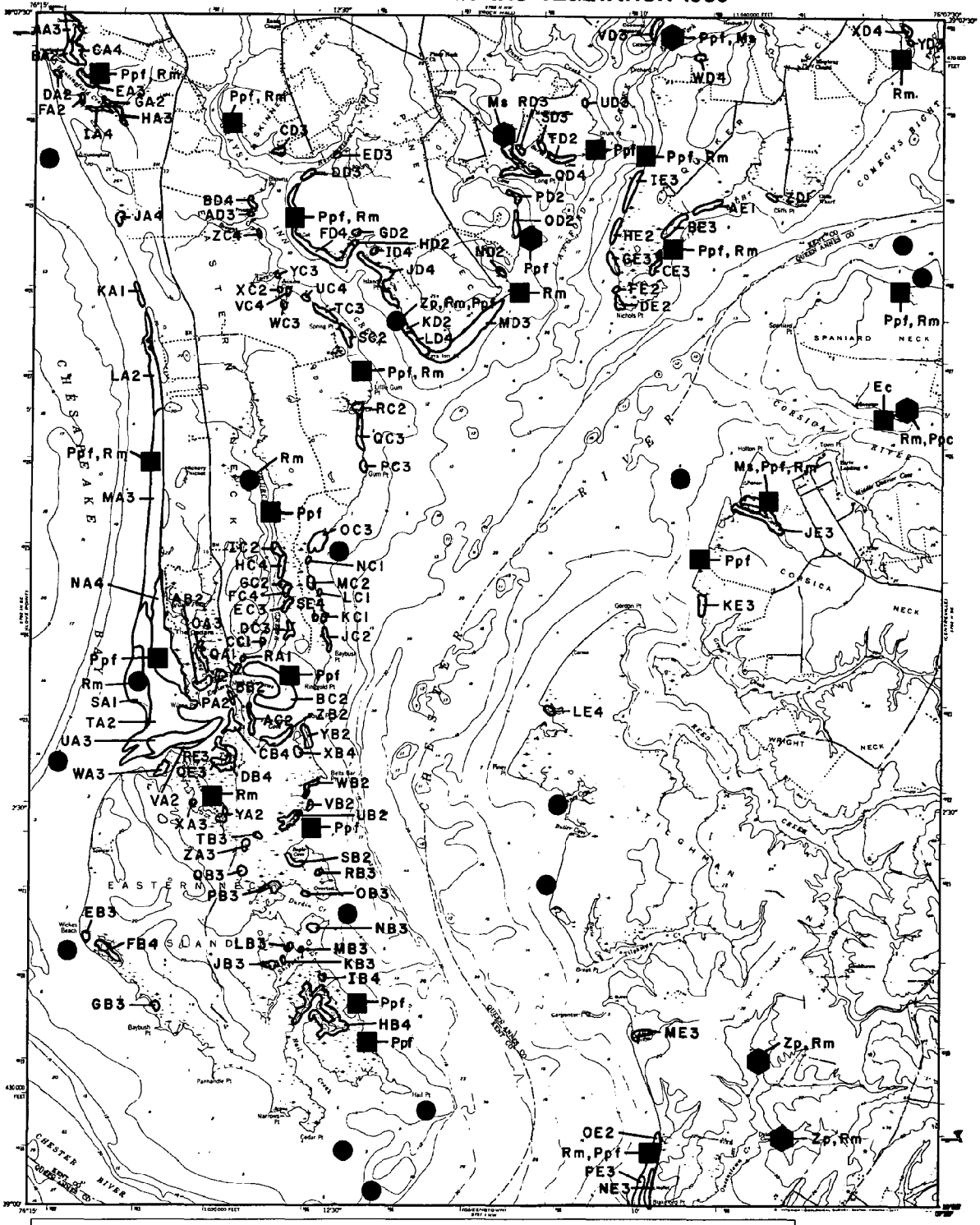
KILOMETER

GIBSON ISLAND, MD

24

DATE FLOWN 9/13/86

SUBMERGED AQUATIC VEGETATION 1986

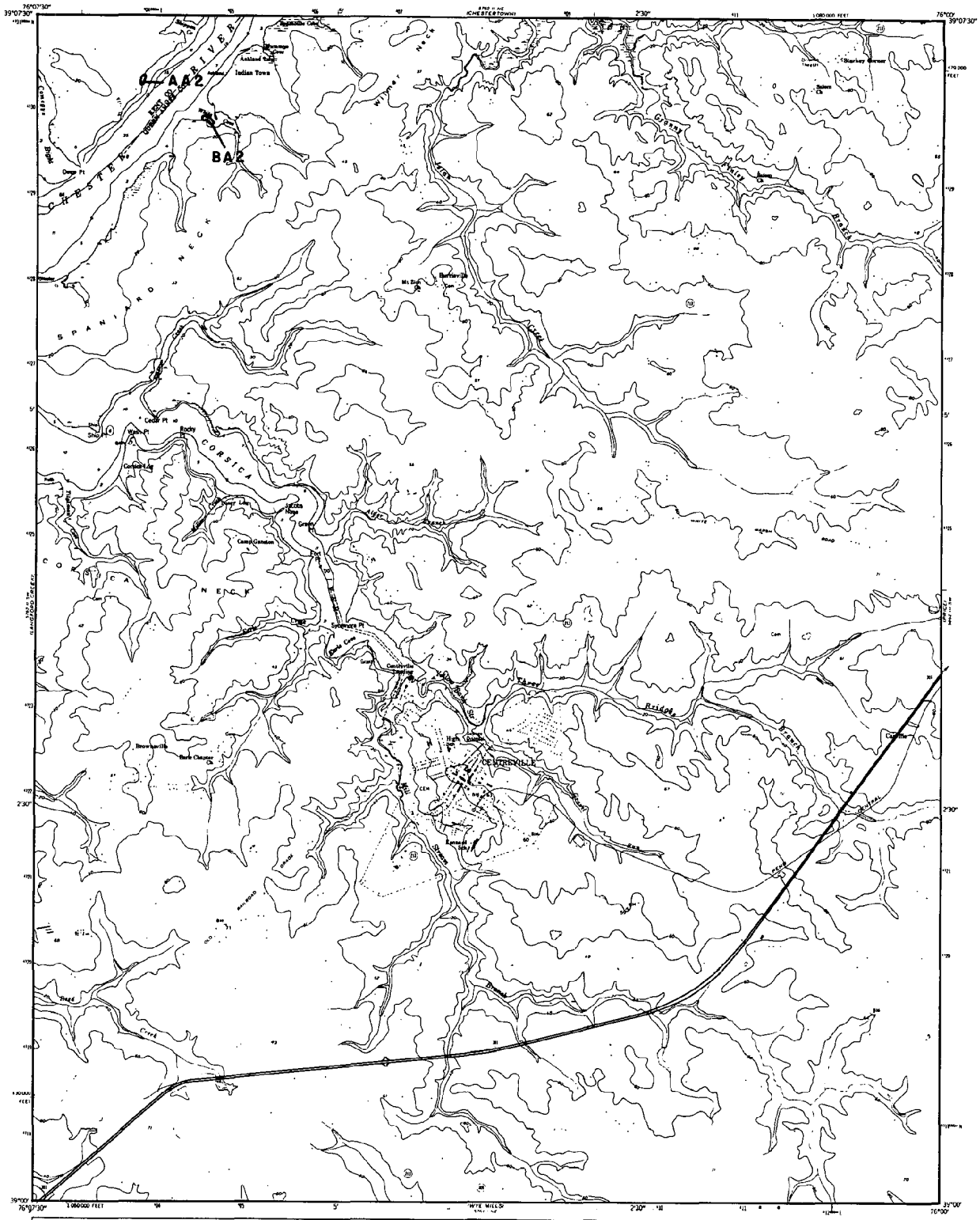


LANGFORD CREEK, MD

26

DATE FLOWN 9/13/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S.

N

SCALE 1:24,000

1 MILE

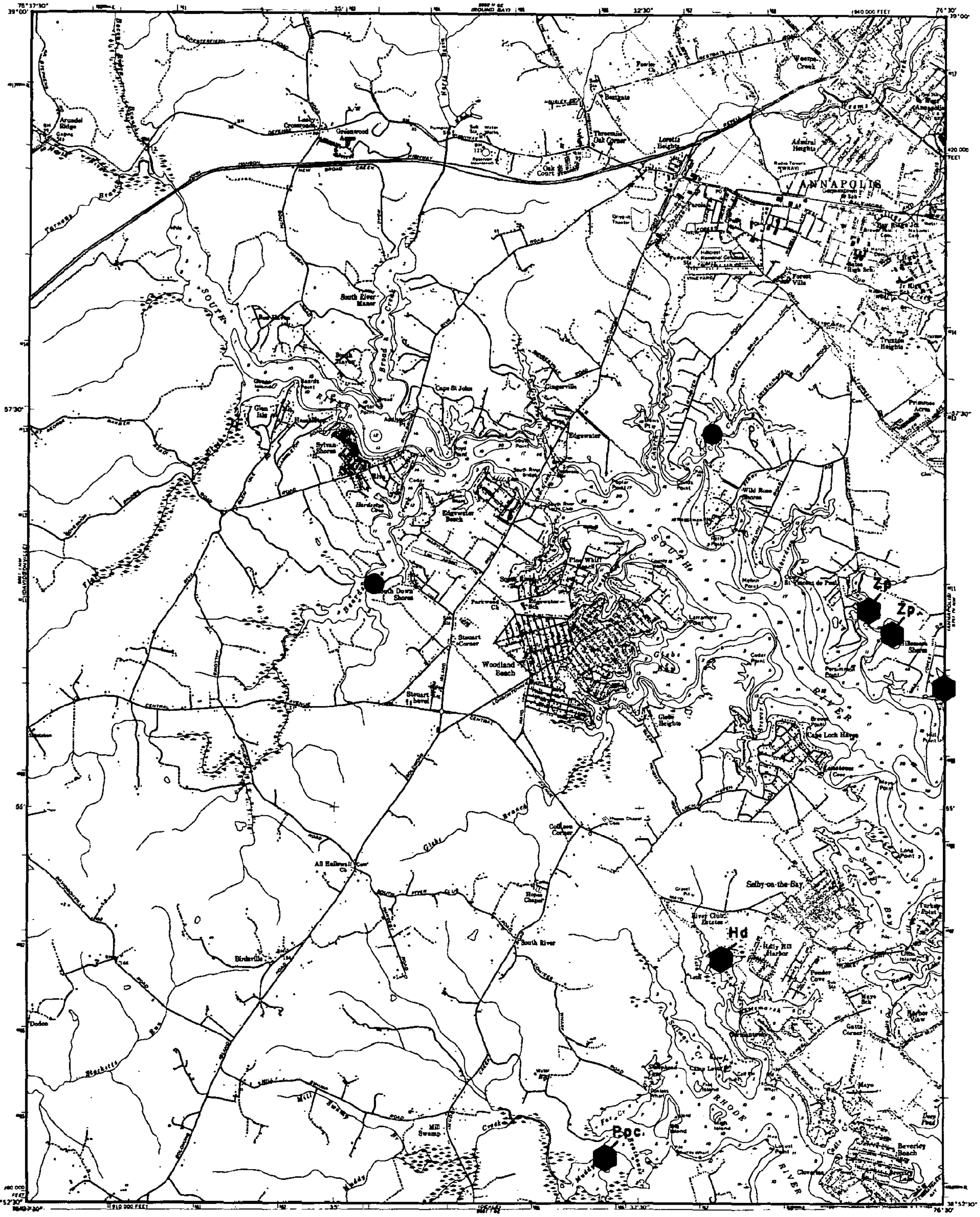
1 KILOMETER

CENTREVILLE, MD

27

DATE FLOWN 9/9/86

SUBMERGED AQUATIC VEGETATION 1986*



SPECIES			
Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichellia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

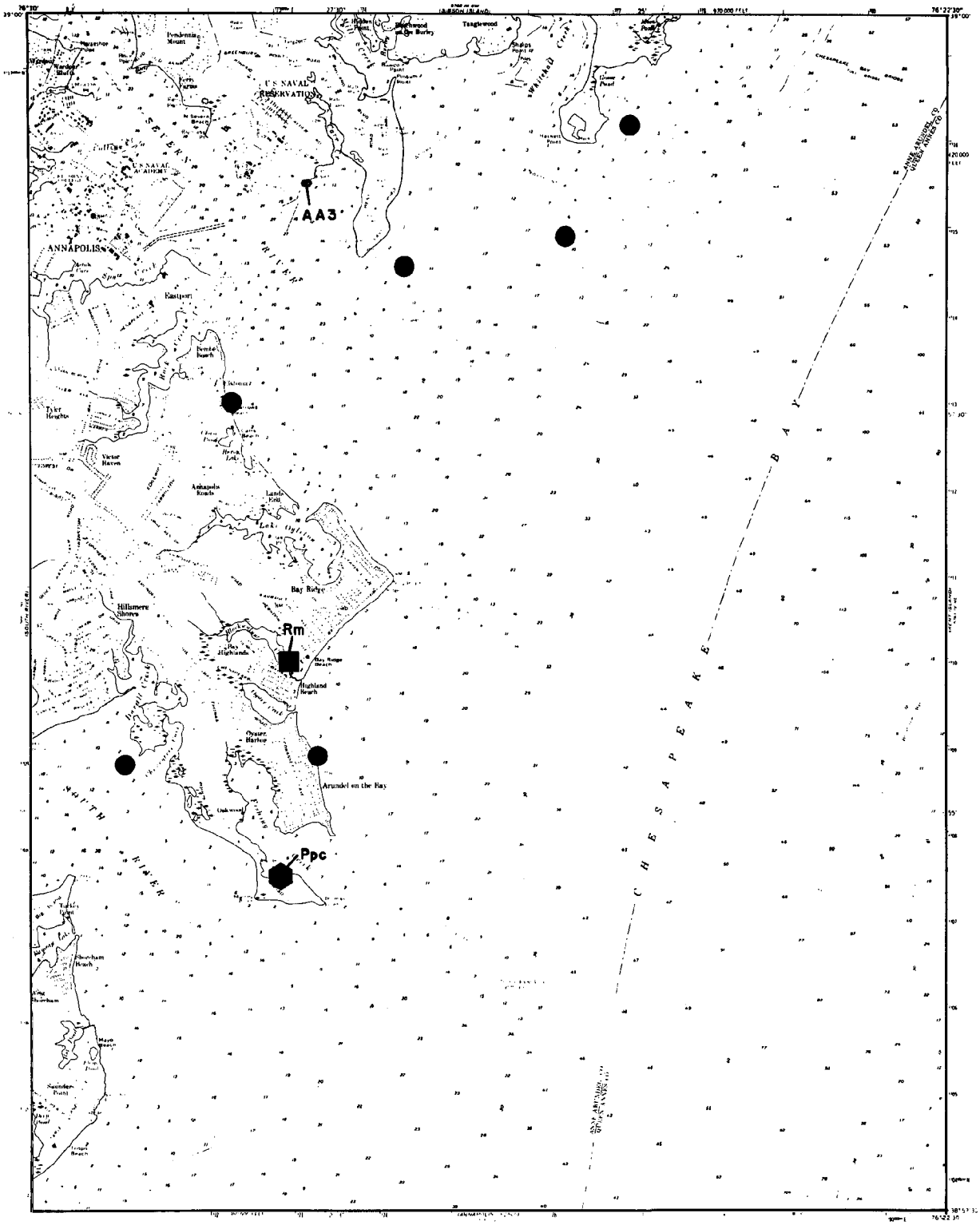
SOUTH RIVER, MD

30

DATE FLOWN 9/13/86

* No SAV detected on aerial photography.

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

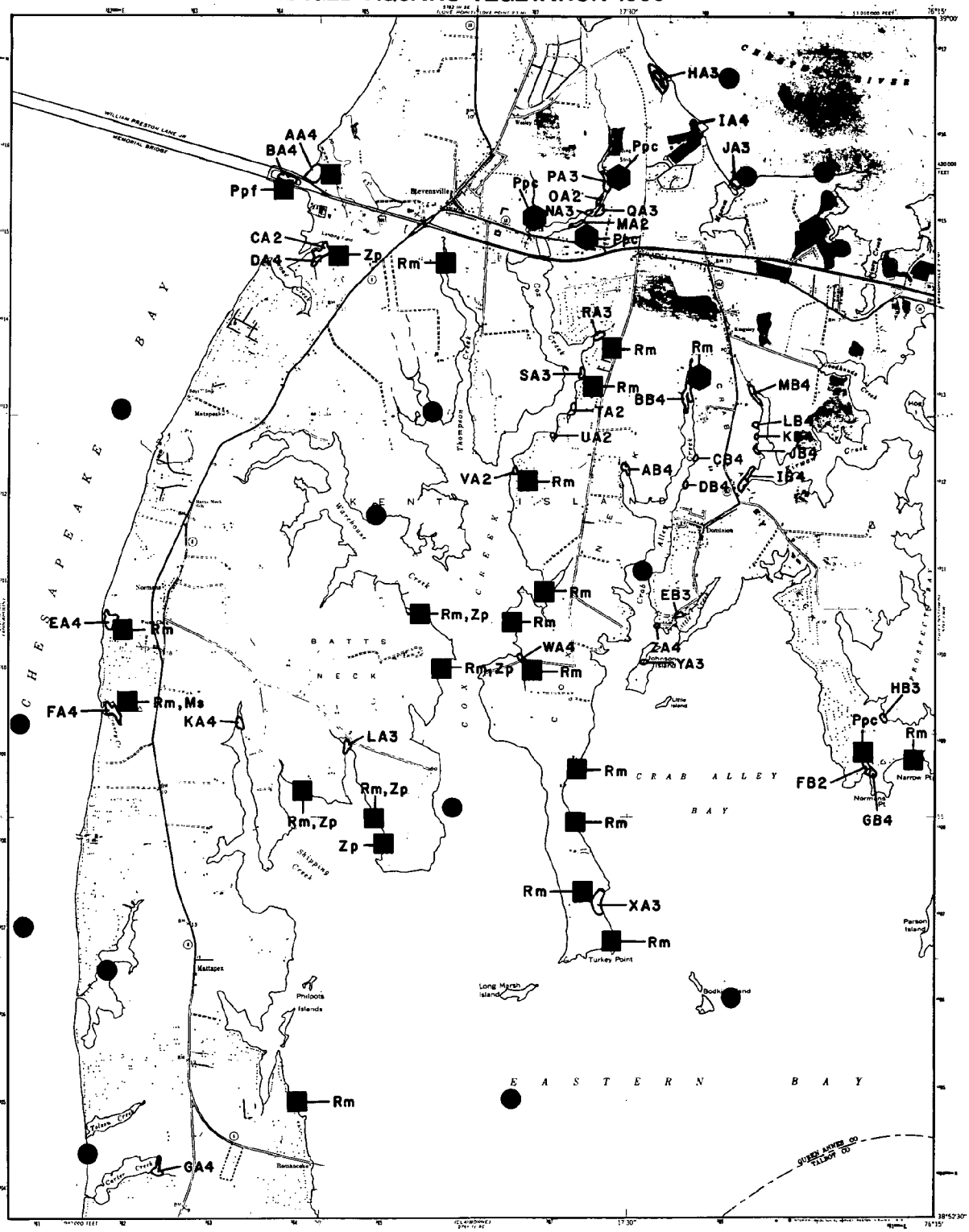
1 .5 0 1 KILOMETER

ANNAPOLIS, MD

31

DATE FLOWN 9/13/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES			
Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

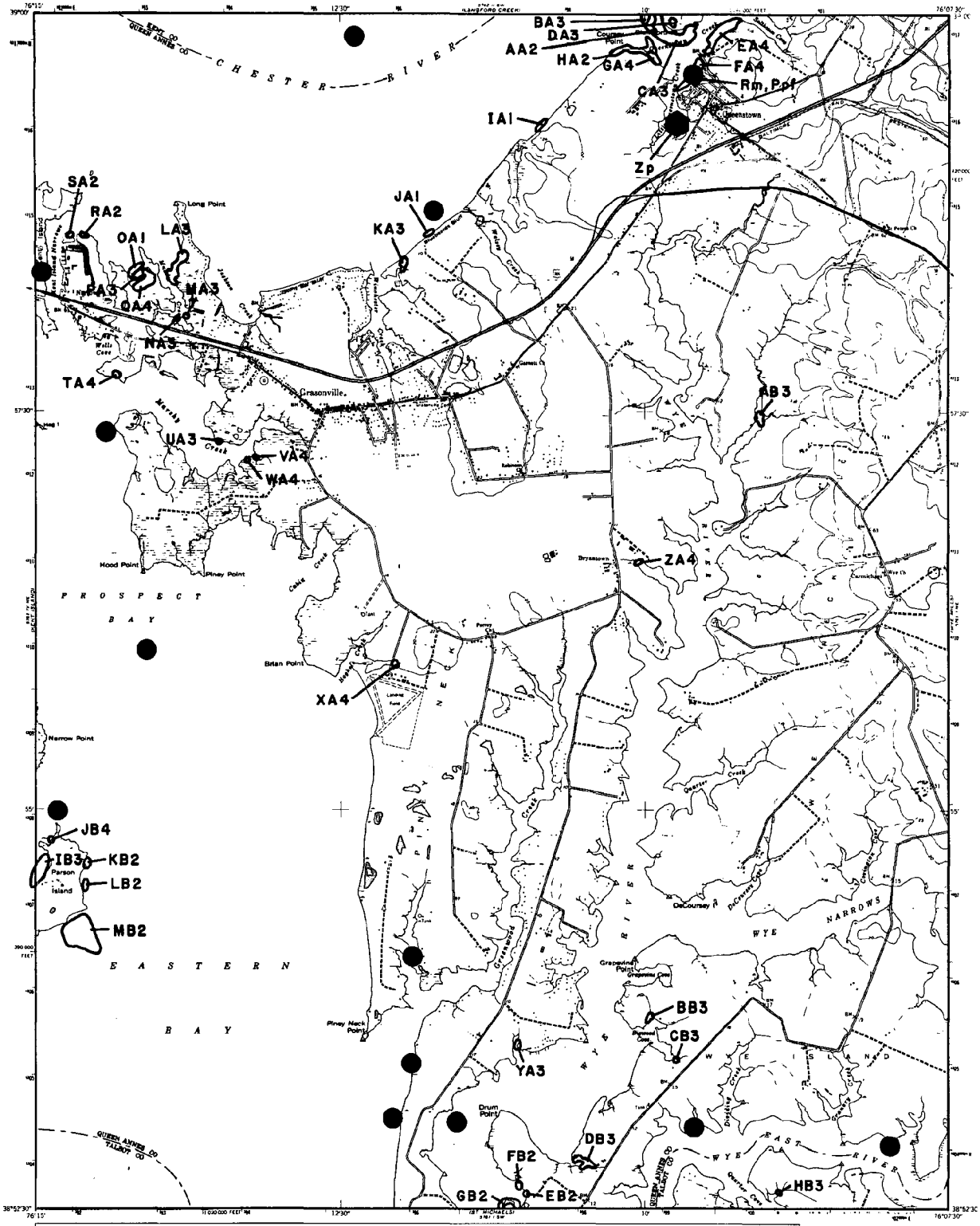
1 .5 0 1 KILOMETER

KENT ISLAND, MD

32

DATE FLOWN 6/25/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

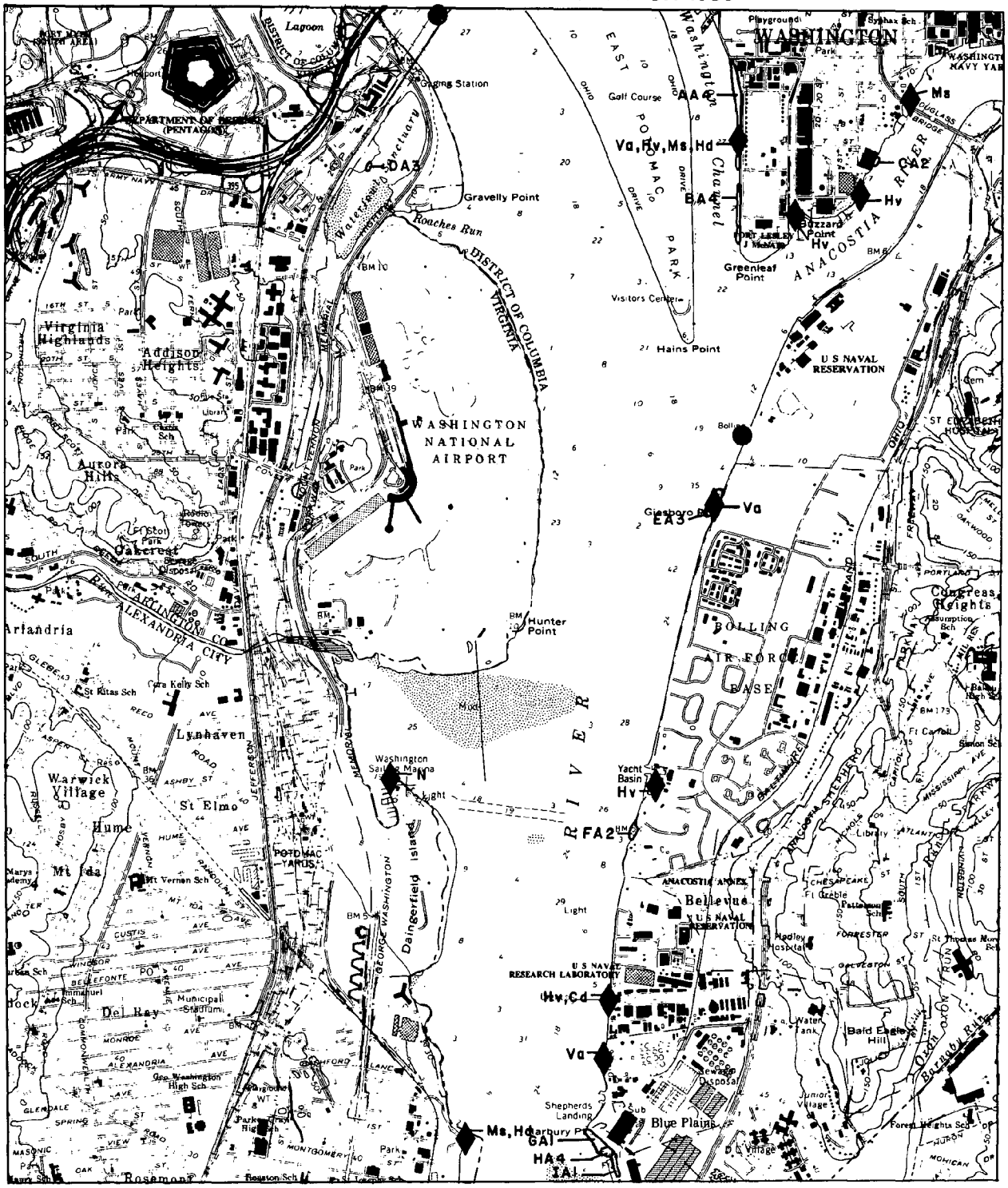
SCALE 1:24,000

QUEENSTOWN, MD

33

DATE FLOWN 6/25/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES			
Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Pnf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ U.S.G.S.

SCALE 1:12,000

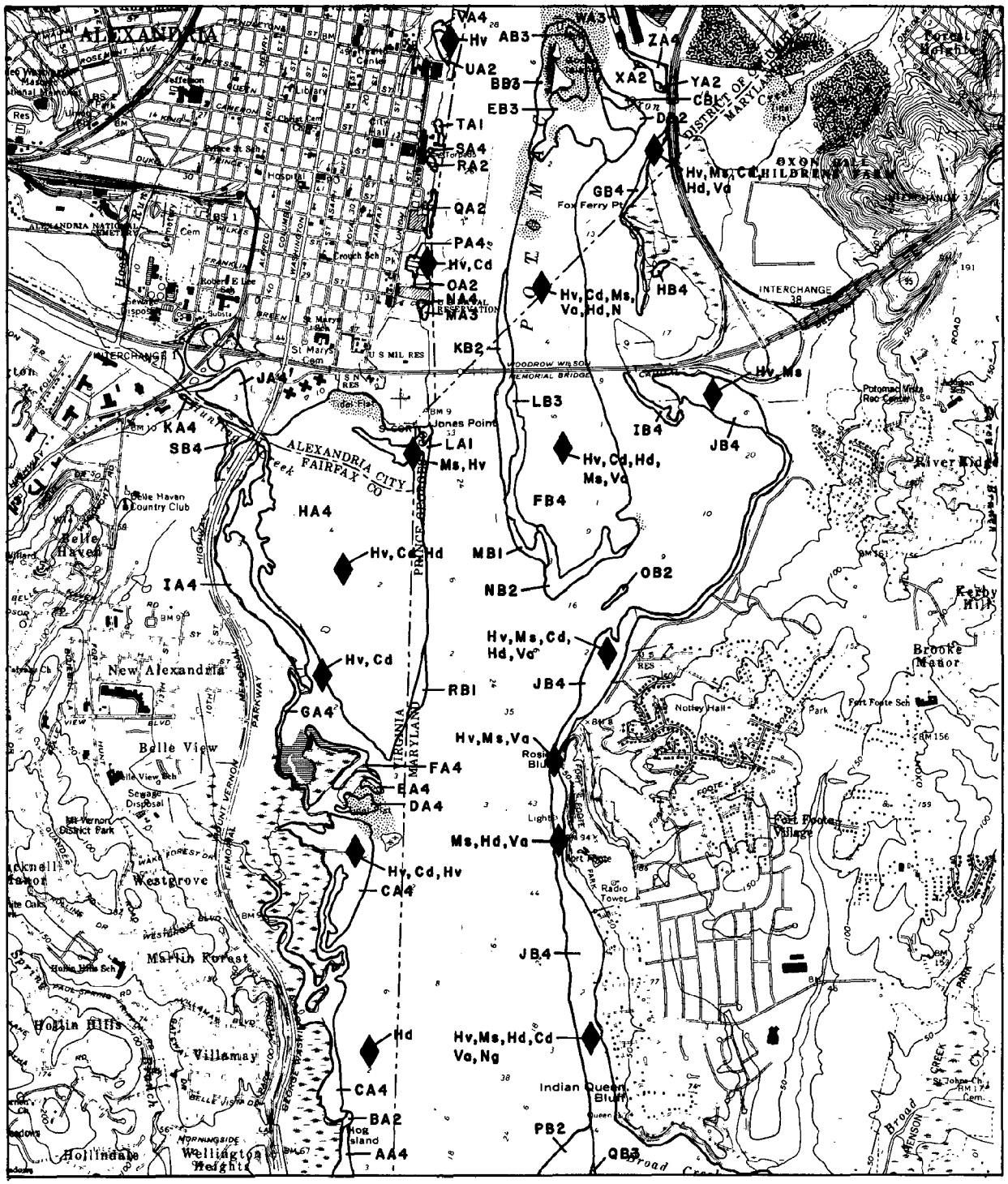
ALEXANDRIA, VA–MD

Northeast Quarter

34

DATE FLOWN 10/16/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S.

SCALE 1:12,000

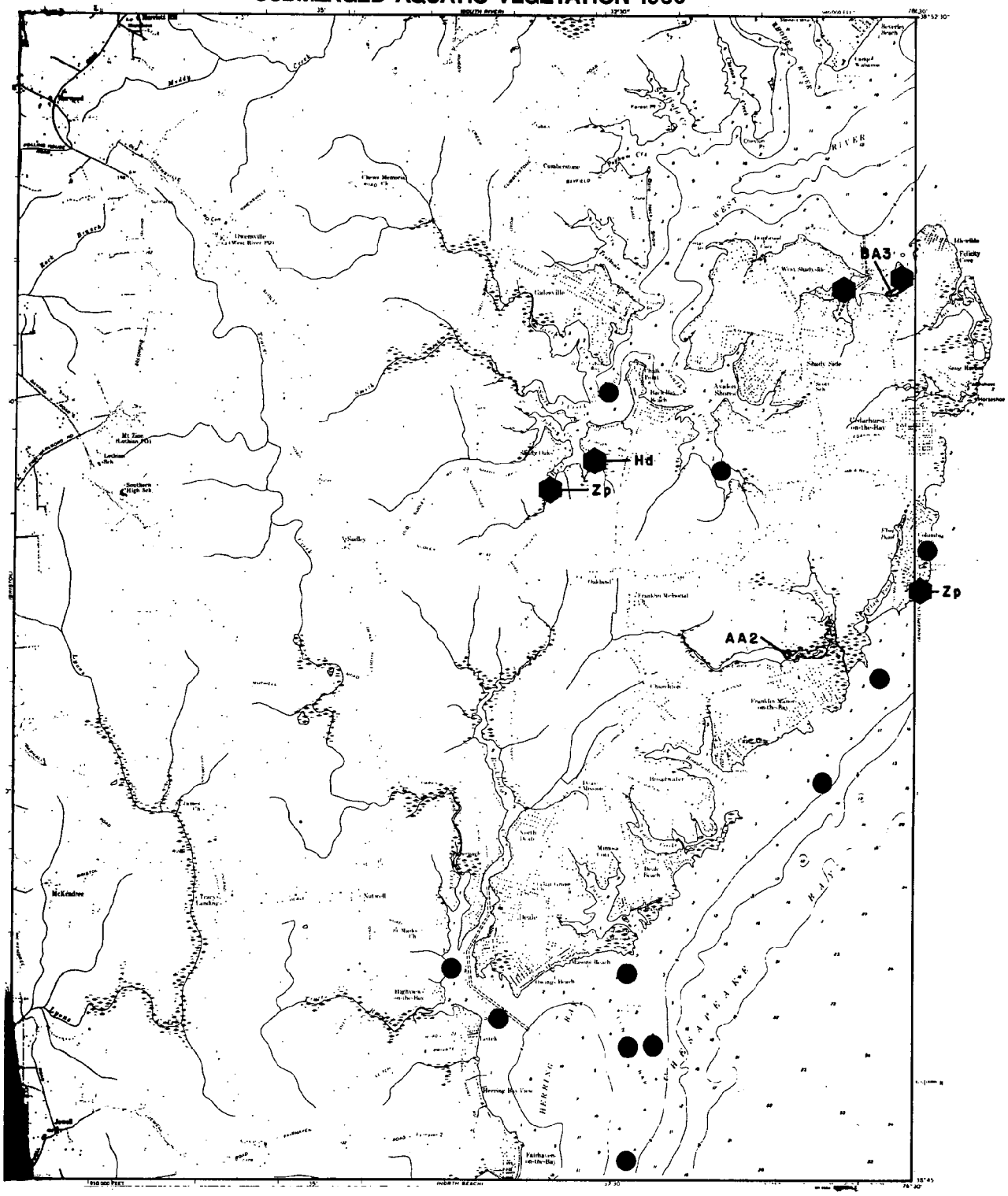
ALEXANDRIA, VA–MD

Southeast Quarter

34

DATE FLOWN 10/16/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES			
Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Pof	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

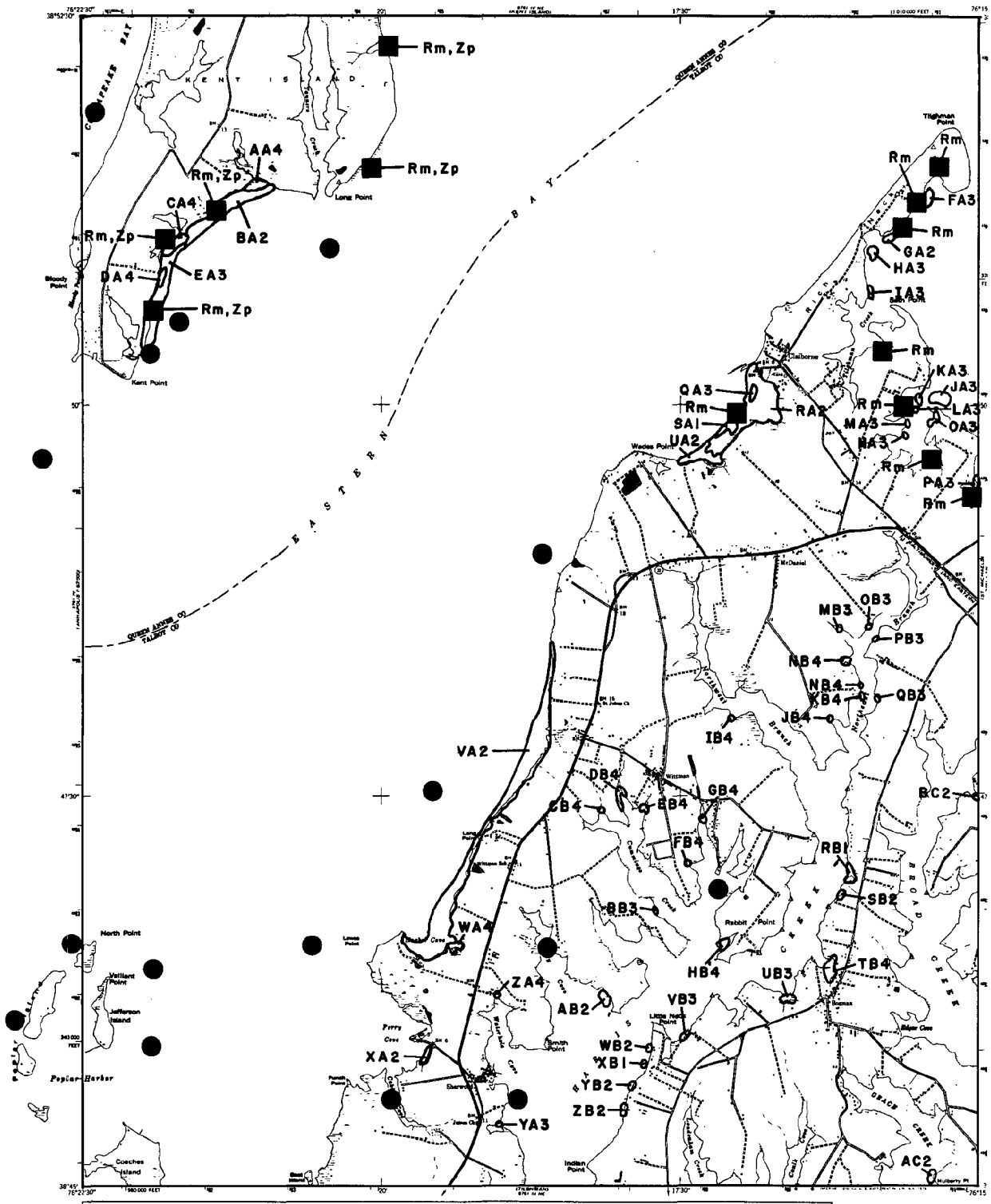
1 .5 0 1 KILOMETER

DEALE, MD

35

DATE FLOWN 9/13/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ U.S.G.S.

SCALE 1:24,000

1 MILE

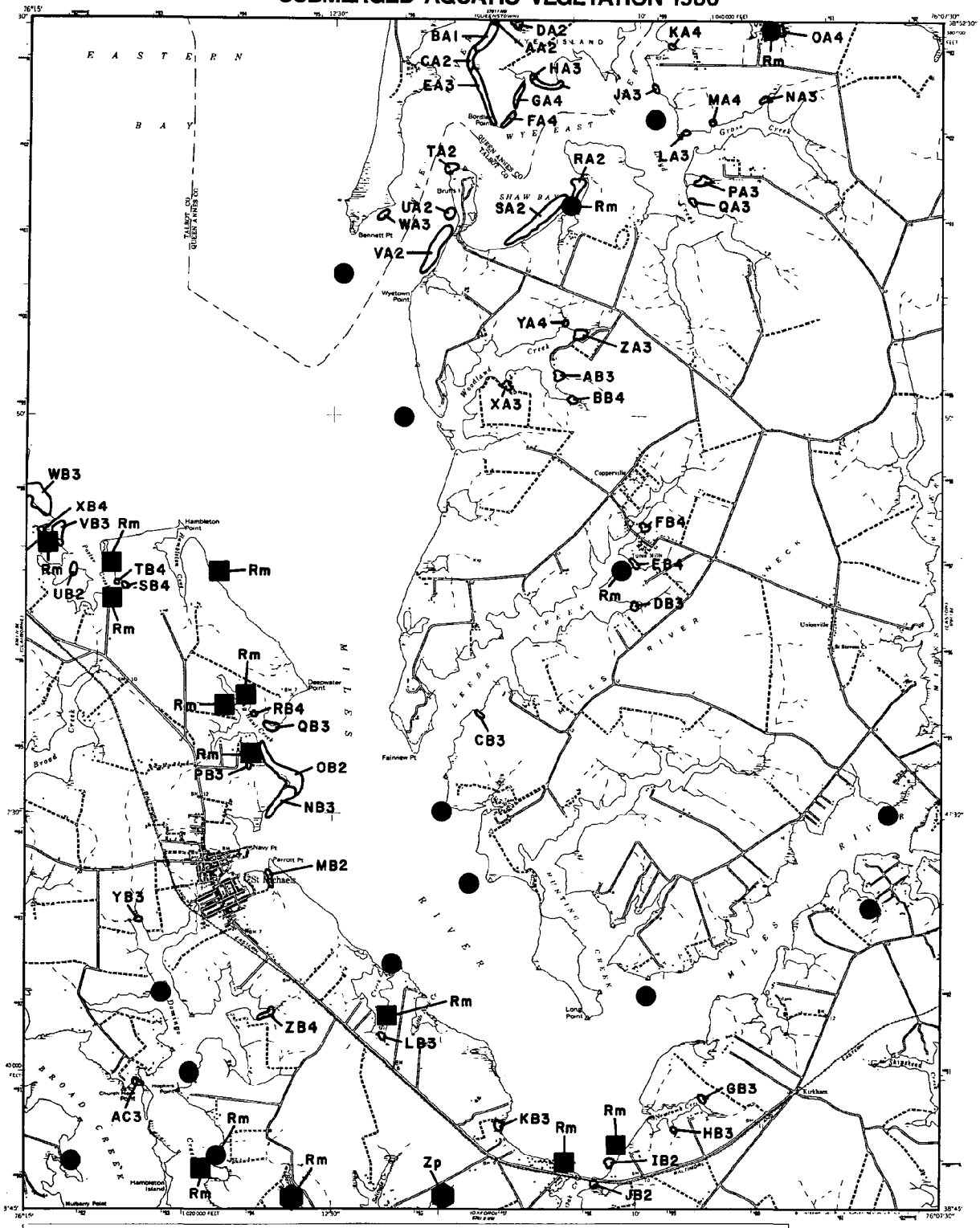
1 KILOMETER

CLAIBORNE, MD

36

DATE FLOWN 6/25/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

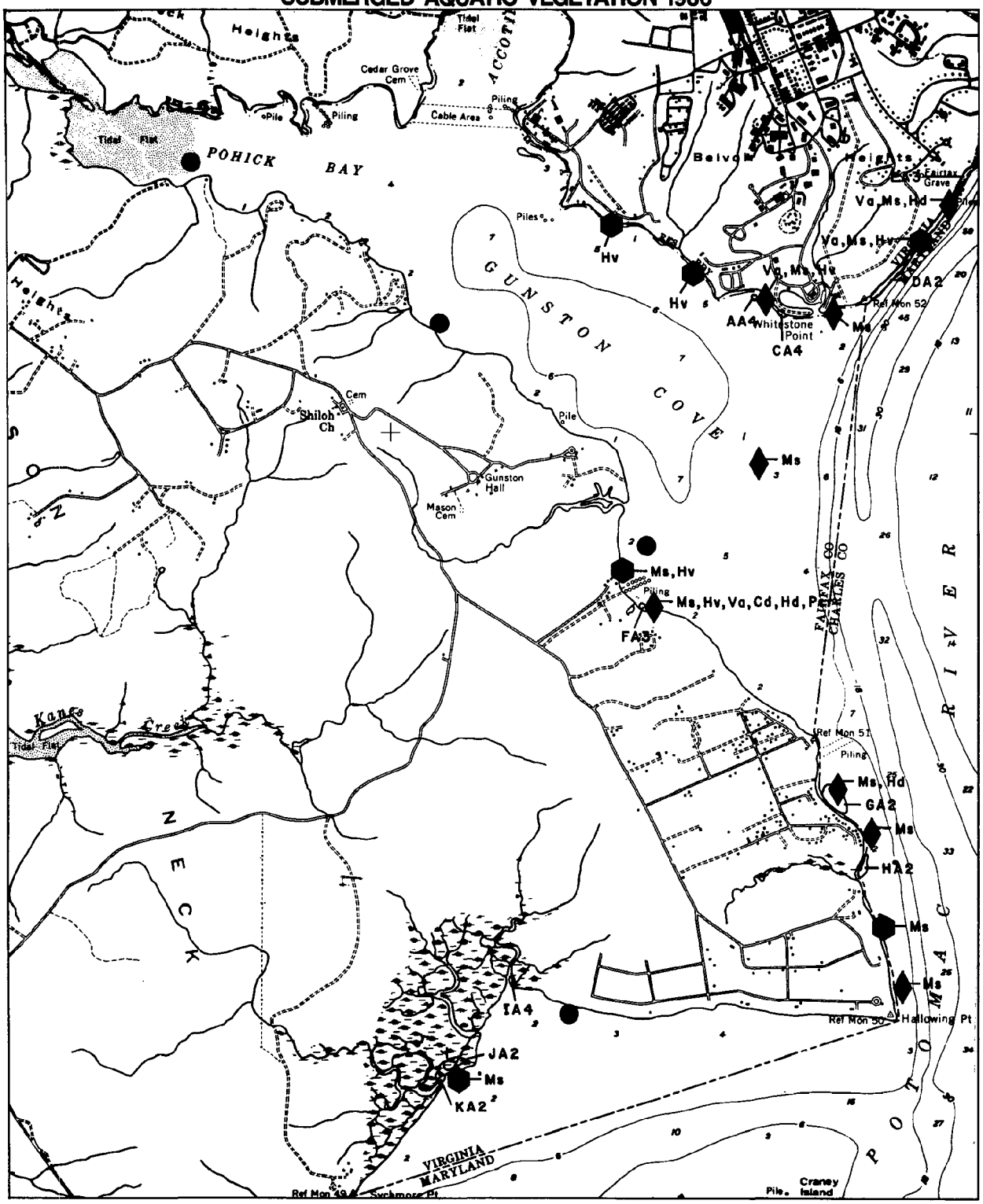
- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

ST. MICHAELS, MD 37

DATE FLOWN 6/25/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ U.S.G.S.

SCALE 1:12,000

0 1 2 MILE

0 .5 1 KILOMETER

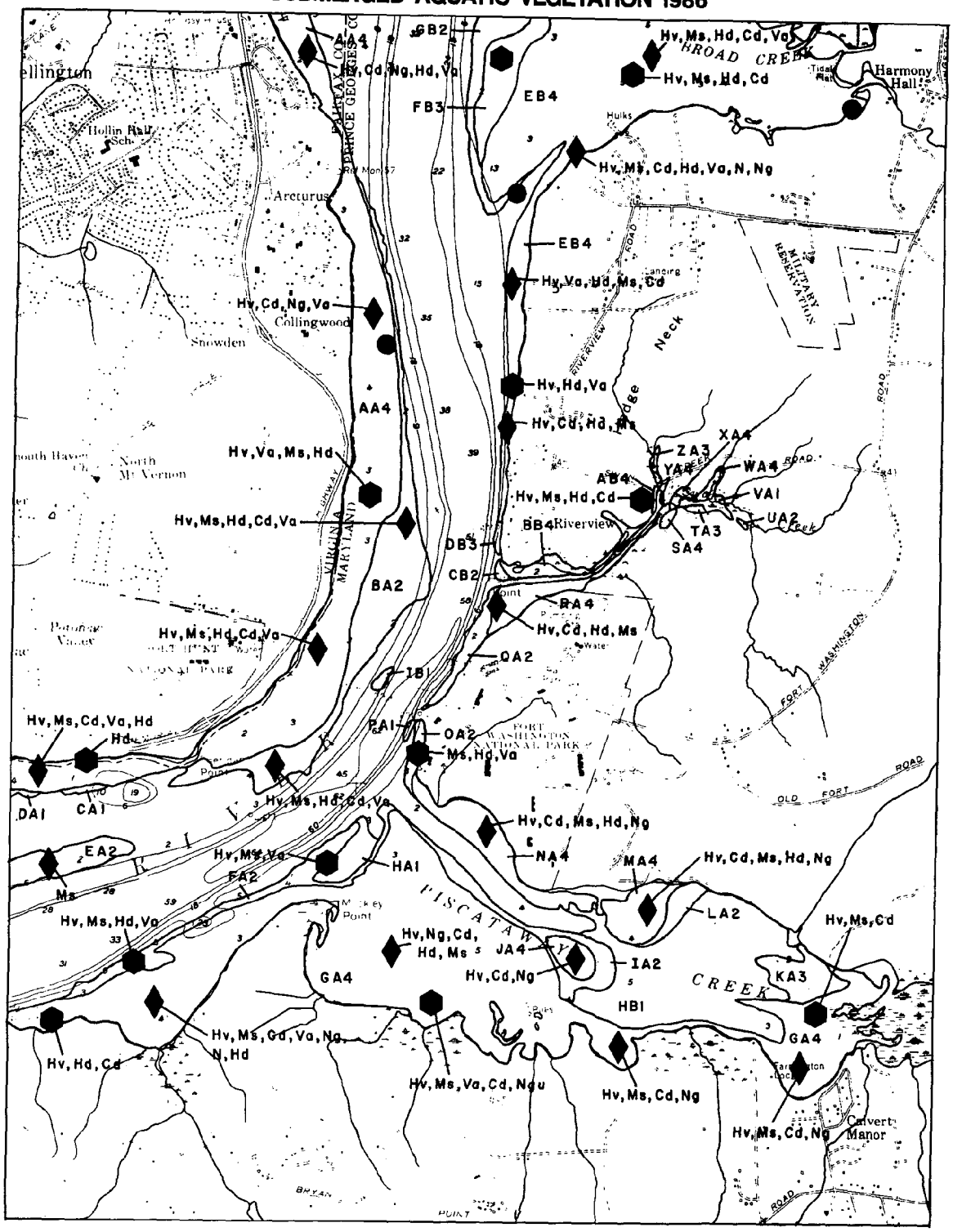
FORT BELVOIR, VA–MD

Southeast Quarter

39

DATE FLOWN 9/14/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppl	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S.

SCALE 1:12,000

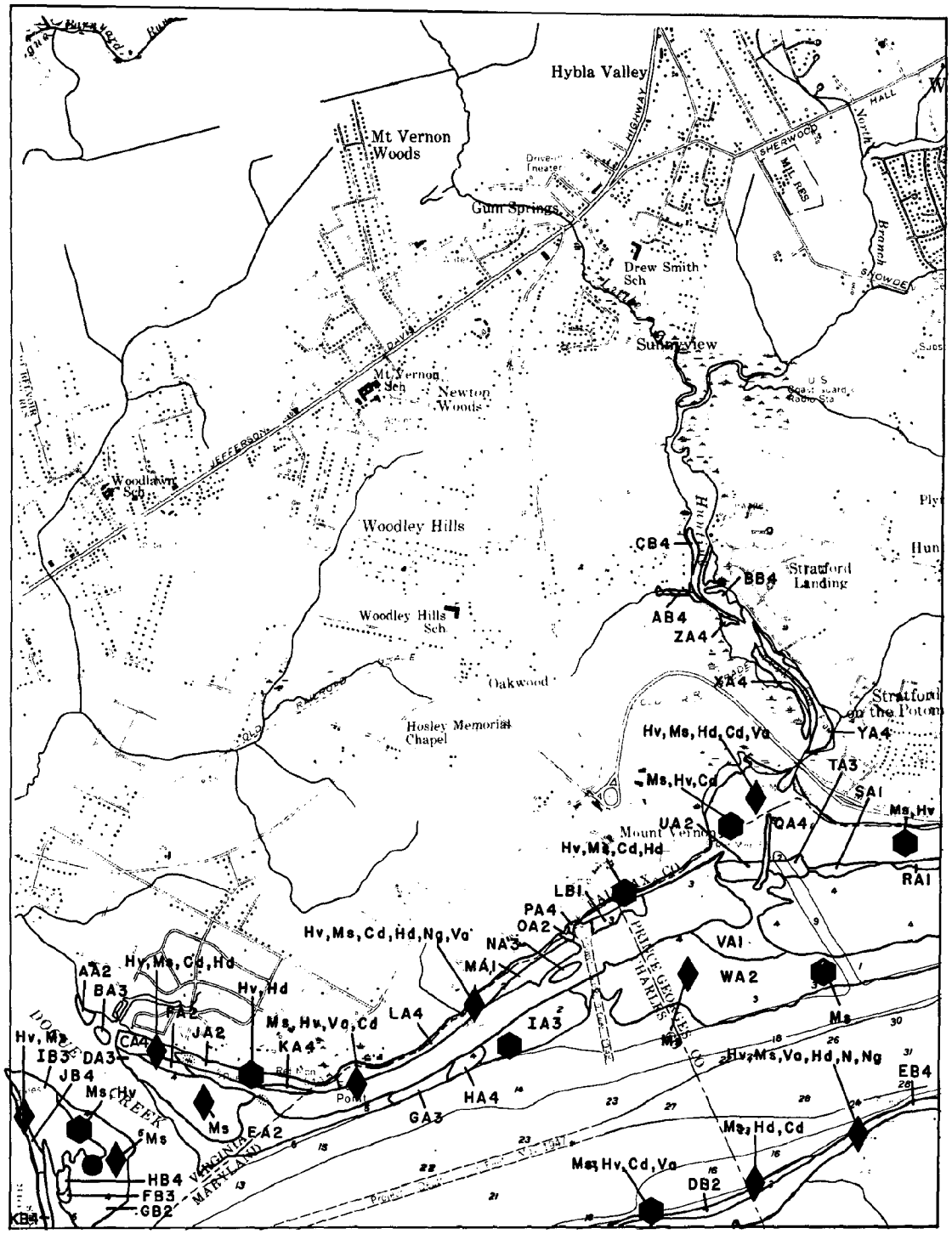
0 1 2 MILE

0 1 2 KILOMETER

MT. VERNON, VA-MD
Northeast Quarter
40

DATE FLOWN 9/14/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:12,000

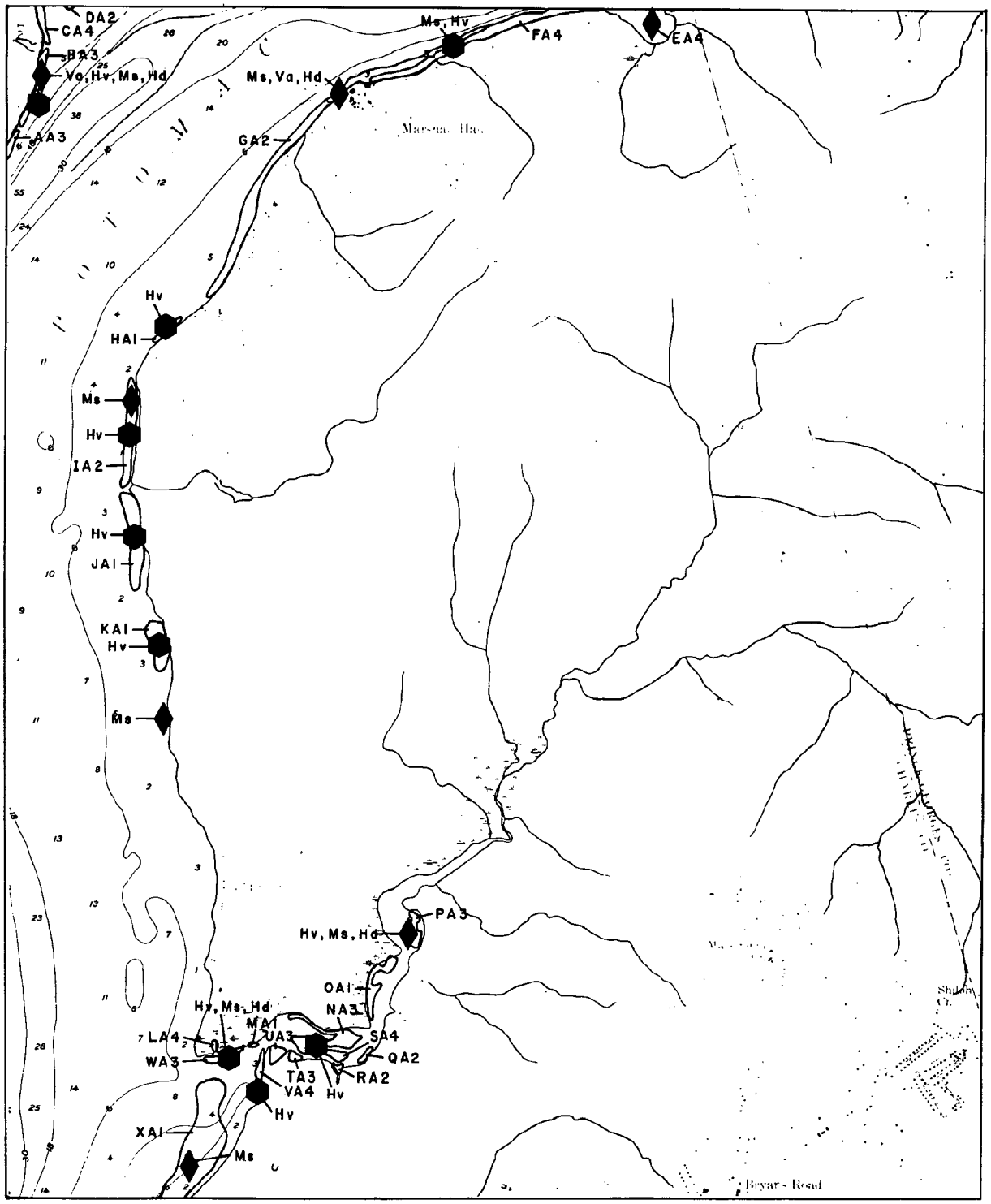
0 .5 1 MILE

0 .5 1 KILOMETER

MT. VERNON, VA-MD
Northwest Quarter
40

DATE FLOWN 9/14/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES			
Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Pof	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Poc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S.

SCALE 1:12,000

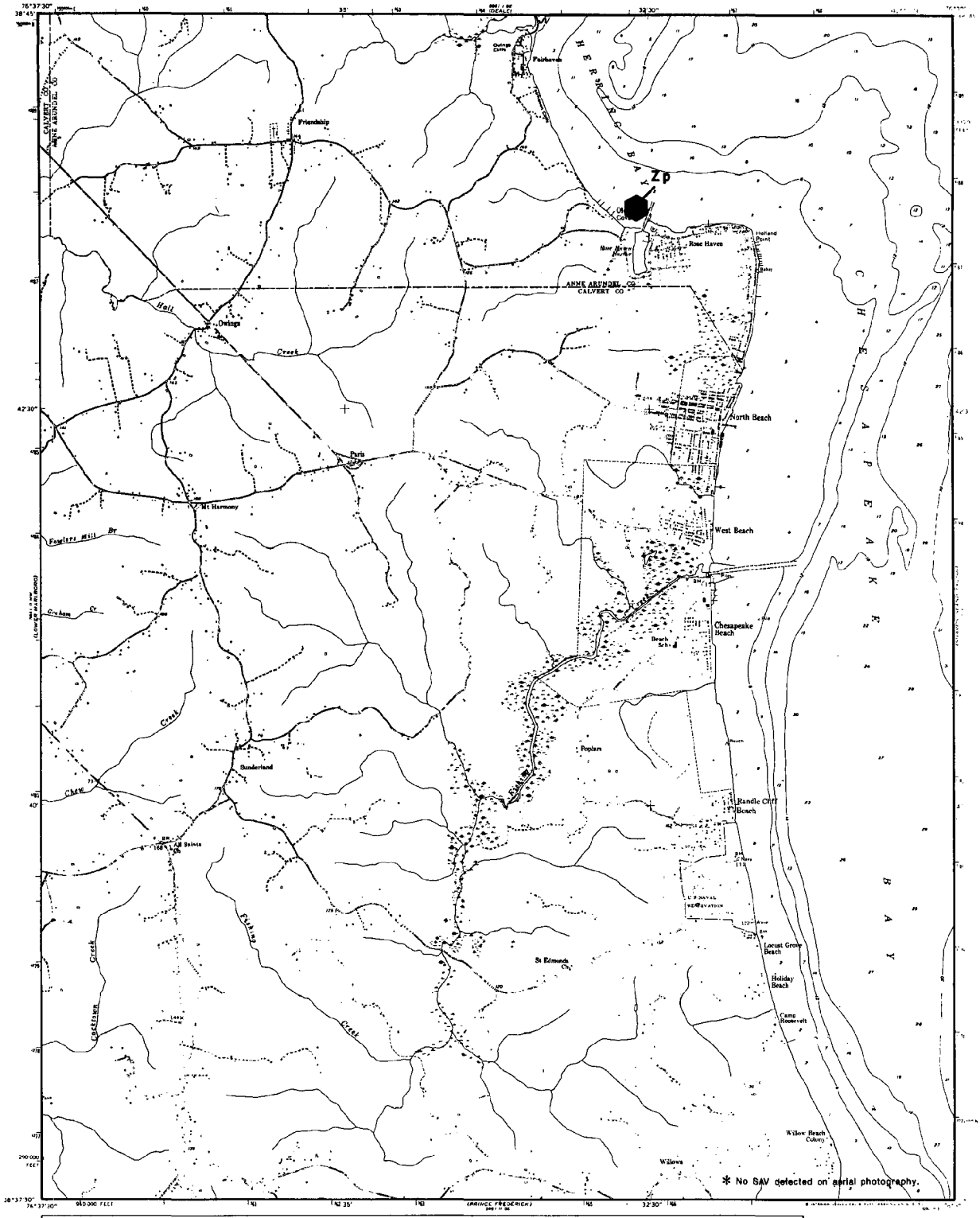
0 1 MILE

0 1 KILOMETER

MT. VERNON, VA–MD
Southwest Quarter
40

DATE FLOWN 9/14/86

SUBMERGED AQUATIC VEGETATION 1986*



SPECIES			
Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichella palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ U.S.G.S.

SCALE 1:24,000

.5 0 1 MILE

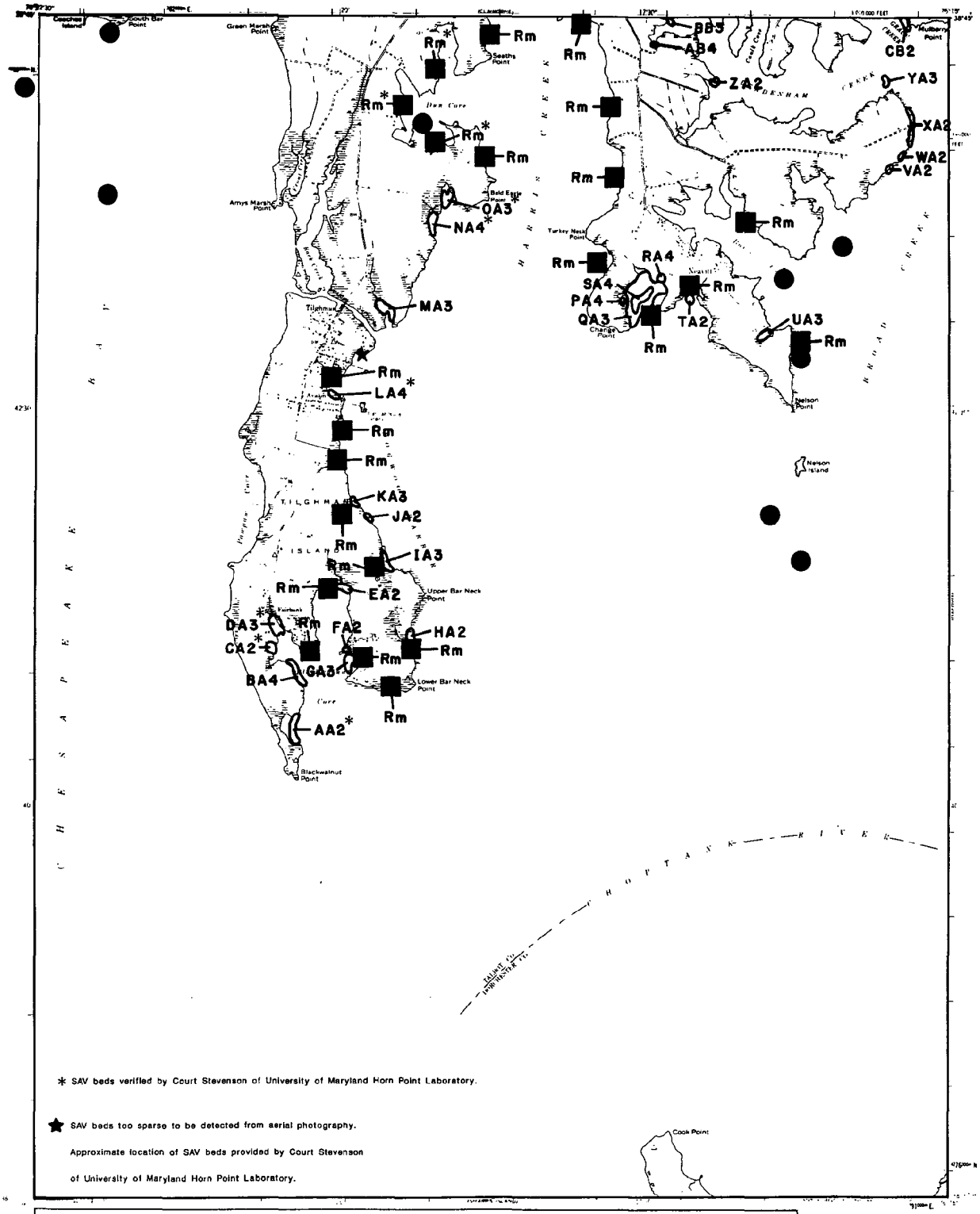
.5 0 1 KILOMETER

NORTH BEACH, MD

42

DATE FLOWN 9/13/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

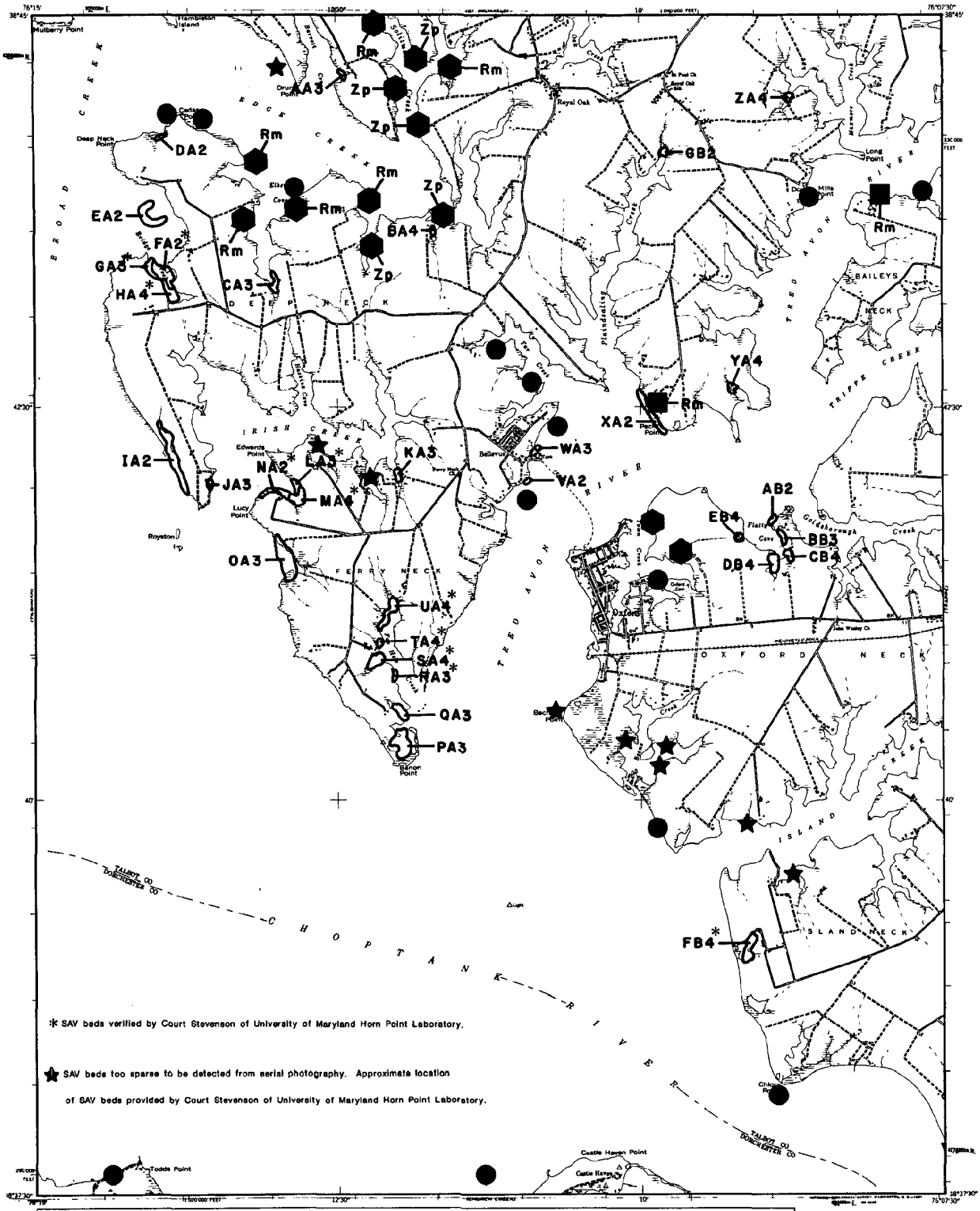
SCALE 1:24,000

TILGHMAN, MD

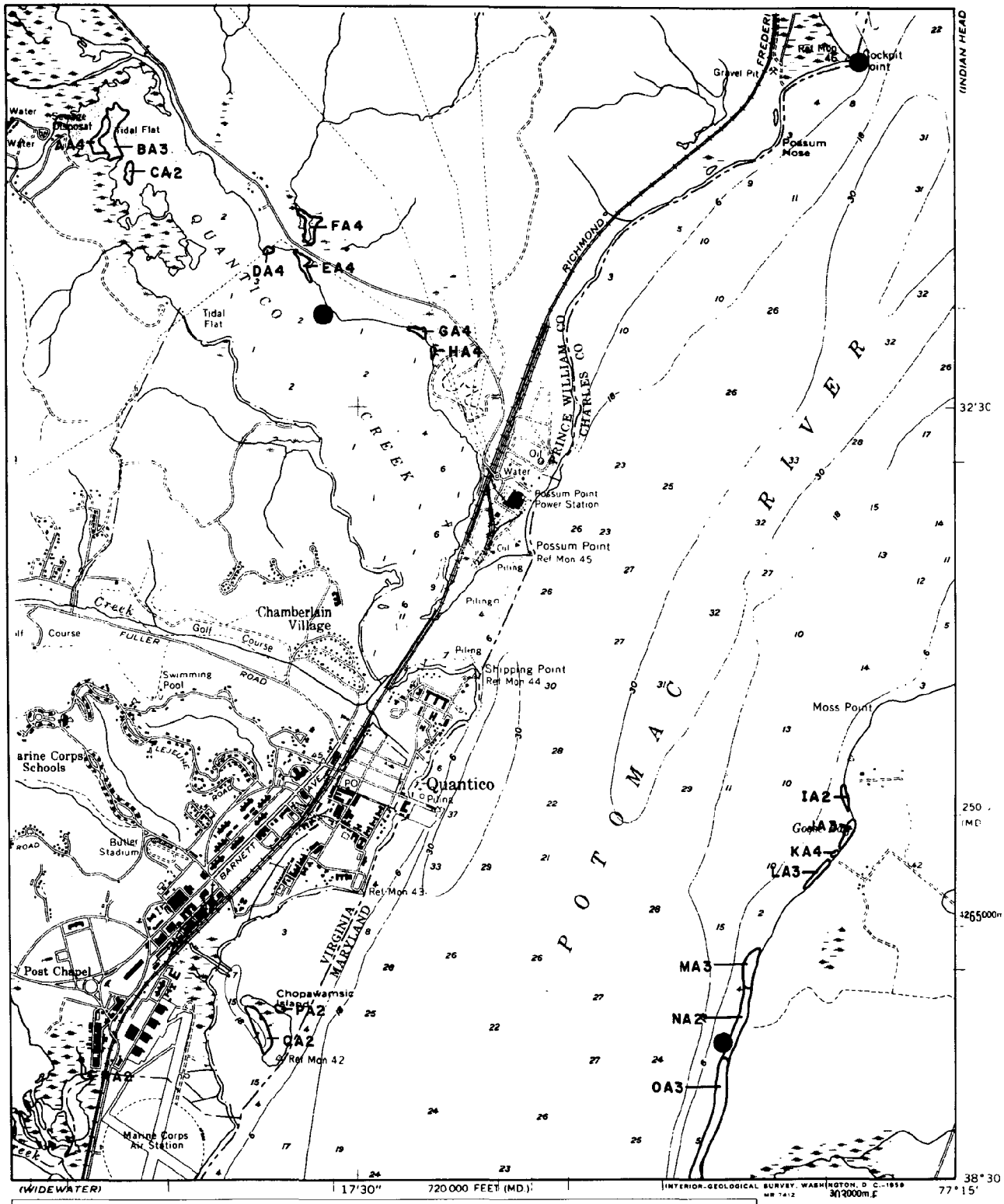
43

DATE FLOWN 8/25/86

SUBMERGED AQUATIC VEGETATION 1986



SUBMERGED AQUATIC VEGETATION 1986



SPECIES			
Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S.

SCALE 1:12,000

0 1 MILE

0 1 KILOMETER

QUANTICO, VA-MD

Southeast Quarter

47

DATE FLOWN 10/15/86

SUBMERGED AQUATIC VEGETATION 1986

SPECIES			
Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Pol	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ U.S.G.S.

SCALE 1:12,000

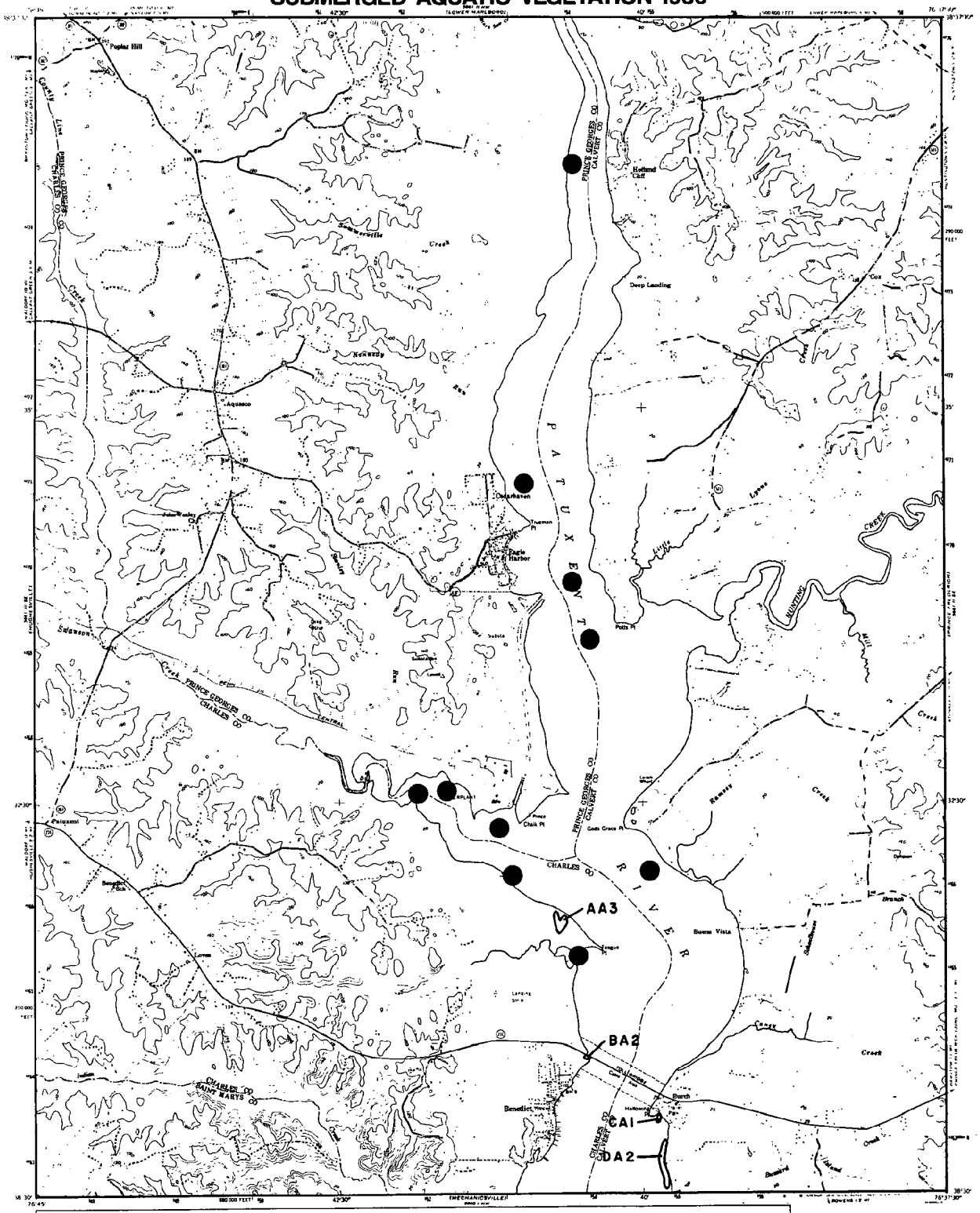
0 — 5 MILE

0 — 1 KILOMETER

INDIAN HEAD, VA-MD
Northeast Quarter
48

DATE FLOWN 10/15/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (rechead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

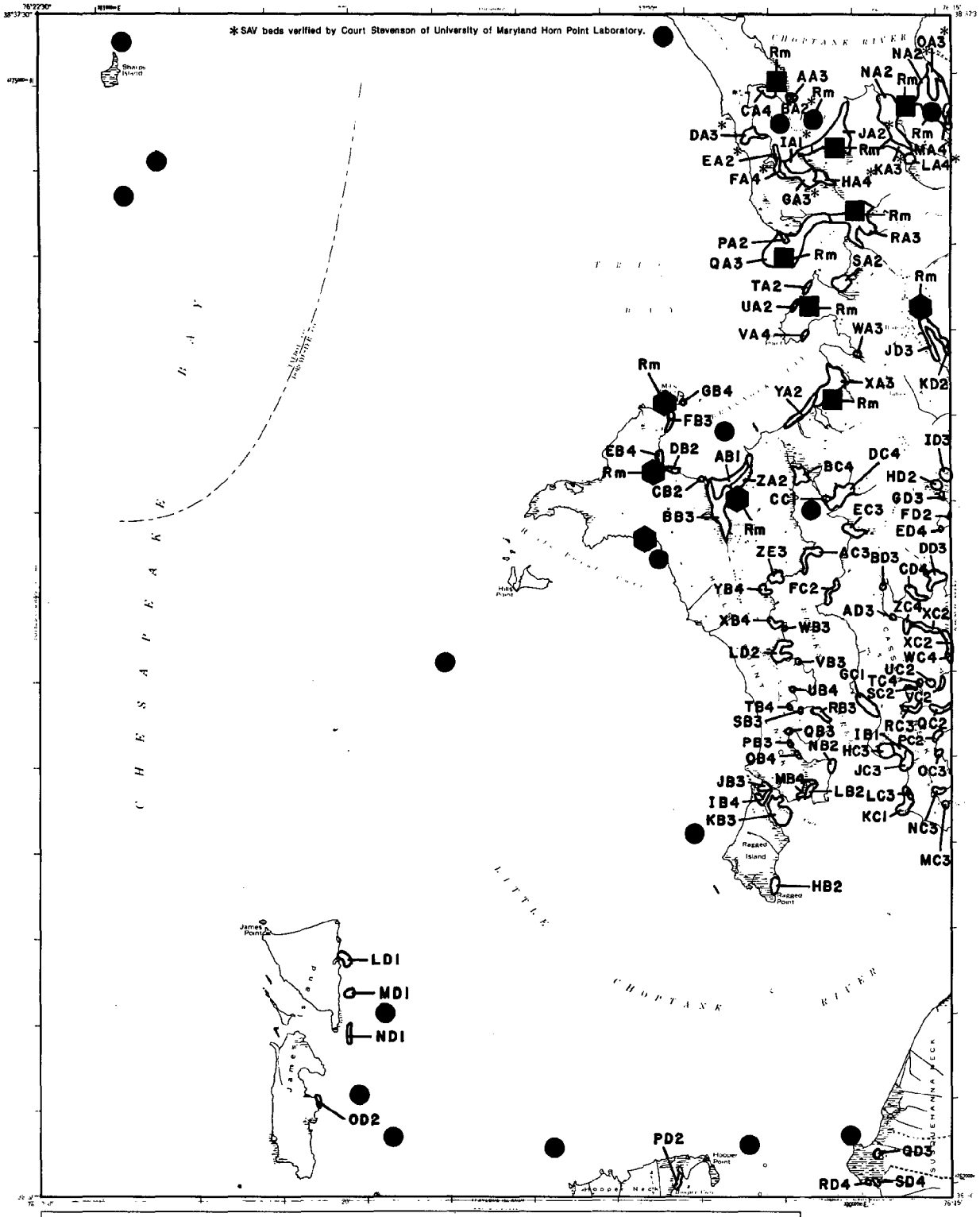
1 .5 0 1 KILOMETER

BENEDICT, MD

49

DATE FLOWN 9/13/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES			
Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

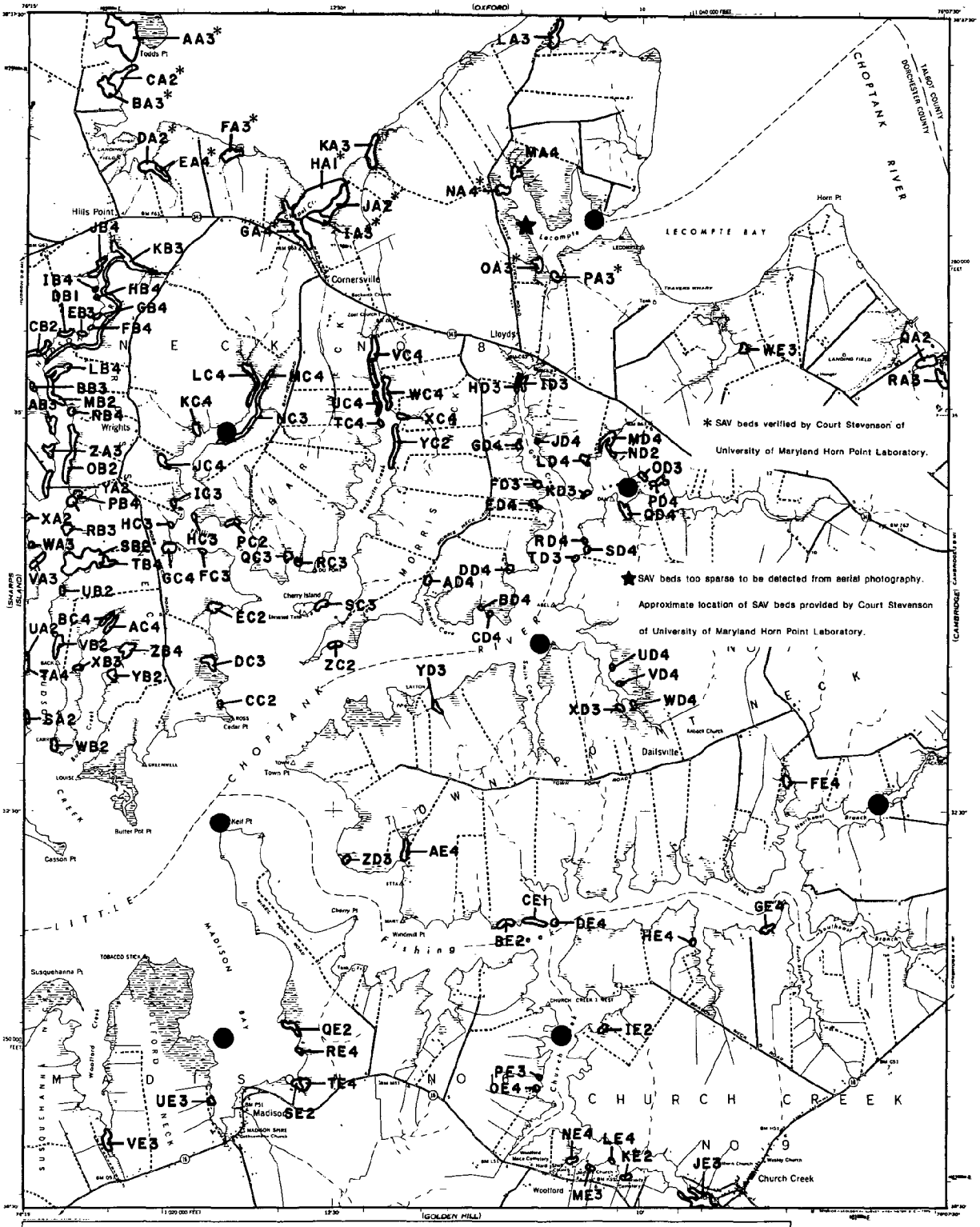
1 .5 0 1 KILOMETER

SHARPS ISLAND, MD

51

DATE FLOWN 6/25/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S.

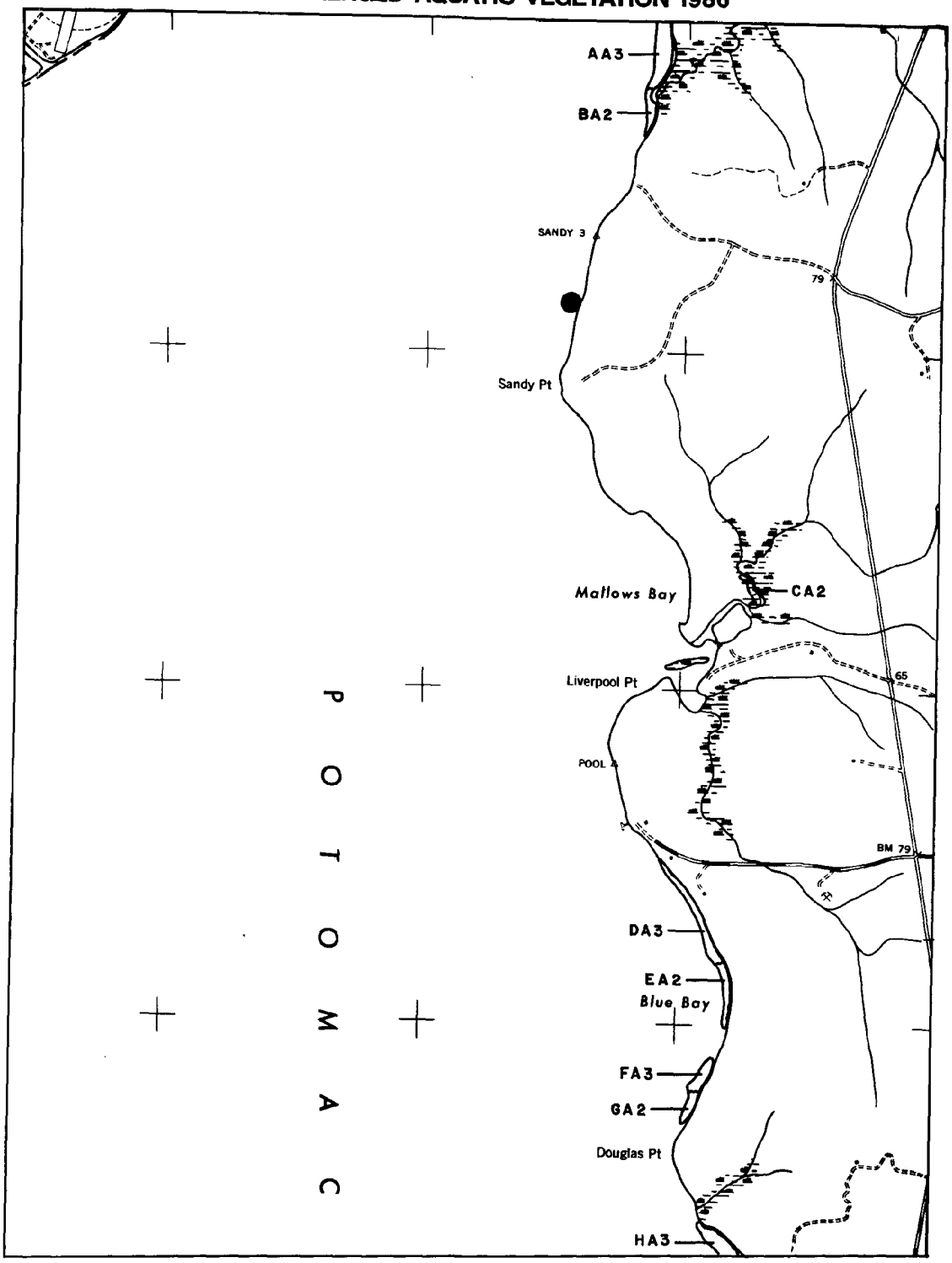
SCALE 1:24,000

CHURCH CREEK, MD

52

DATE FLOWN 6/25/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)		
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)		
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)		
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)		
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)		
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)		
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)		
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)		
Va	*Vallisneria americana* (wild celery)				

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S.

SCALE 1:12,000

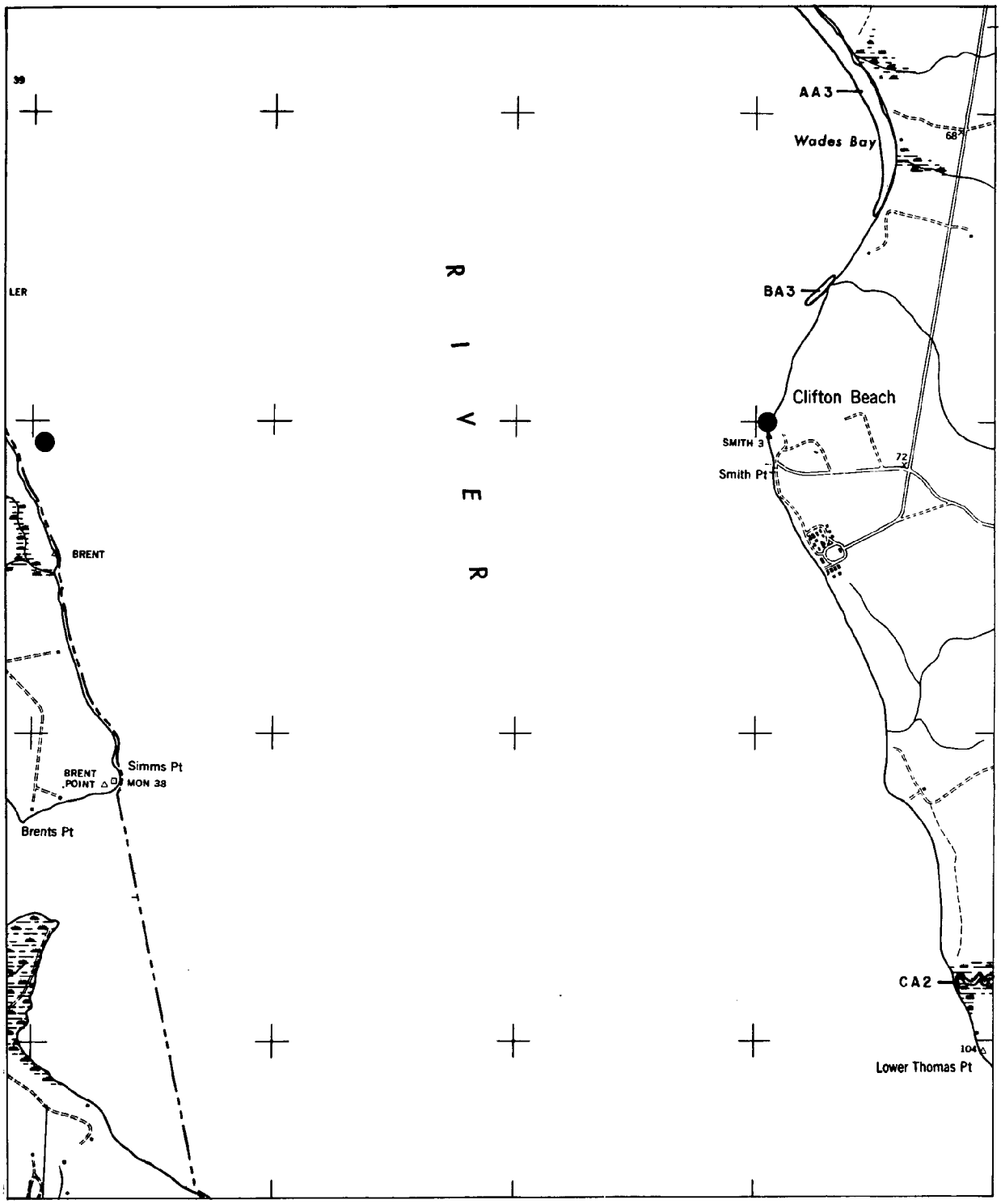
0 1 2 MILE

0 1 2 3 KILOMETER

WIDEWATER, VA–MD
Northeast Quarter
55

DATE FLOWN 10/15/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:12,000

0 1 MILE

0 1 KILOMETER

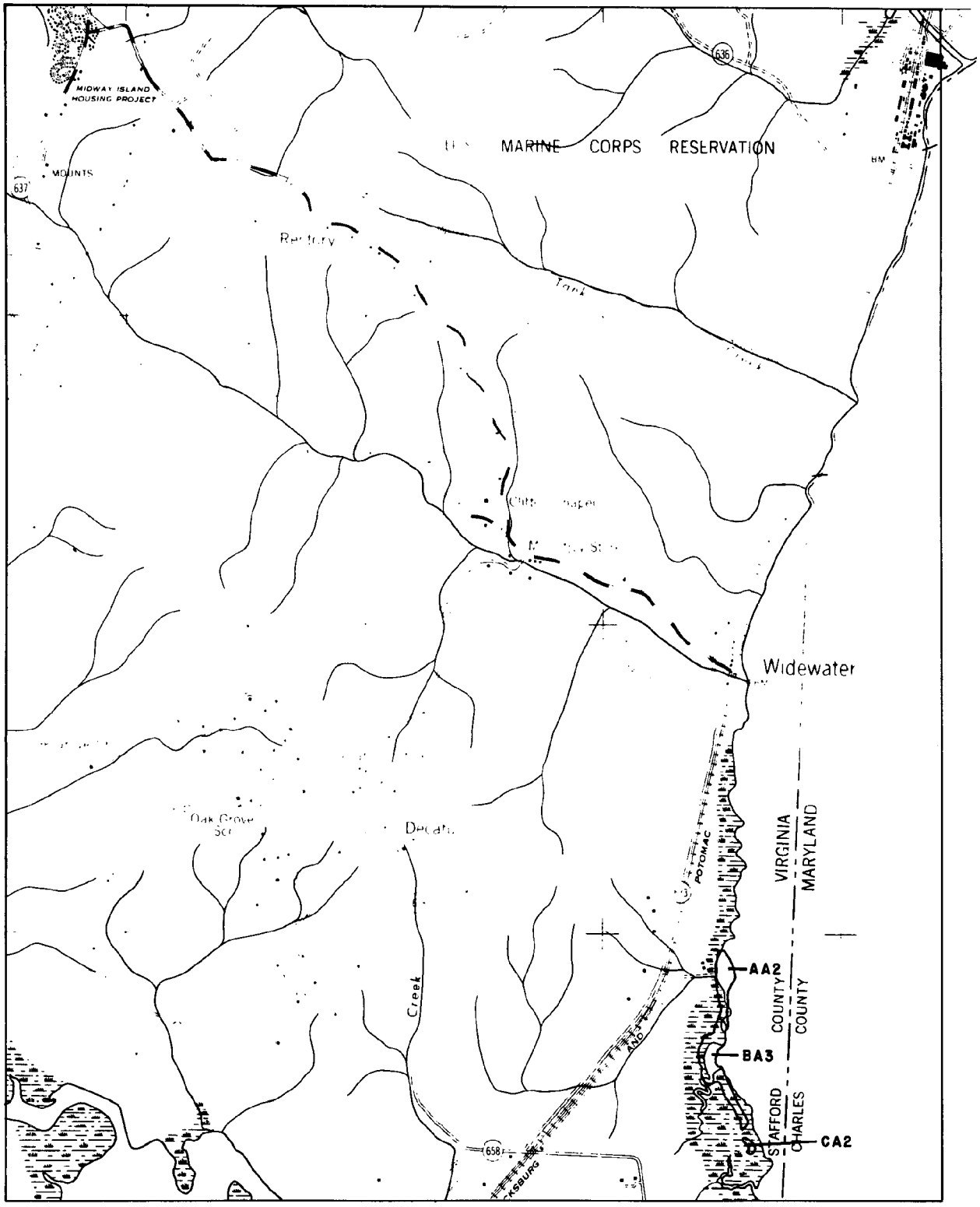
WIDEWATER, VA–MD

Southeast Quarter

55

DATE FLOWN 10/15/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES					
Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)		
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)		
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)		
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)		
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)		
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)		
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)		
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)		
Va	*Vallisneria americana* (wild celery)				

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S.

SCALE 1:12,000

0 1 MILE

0 1 KILOMETER

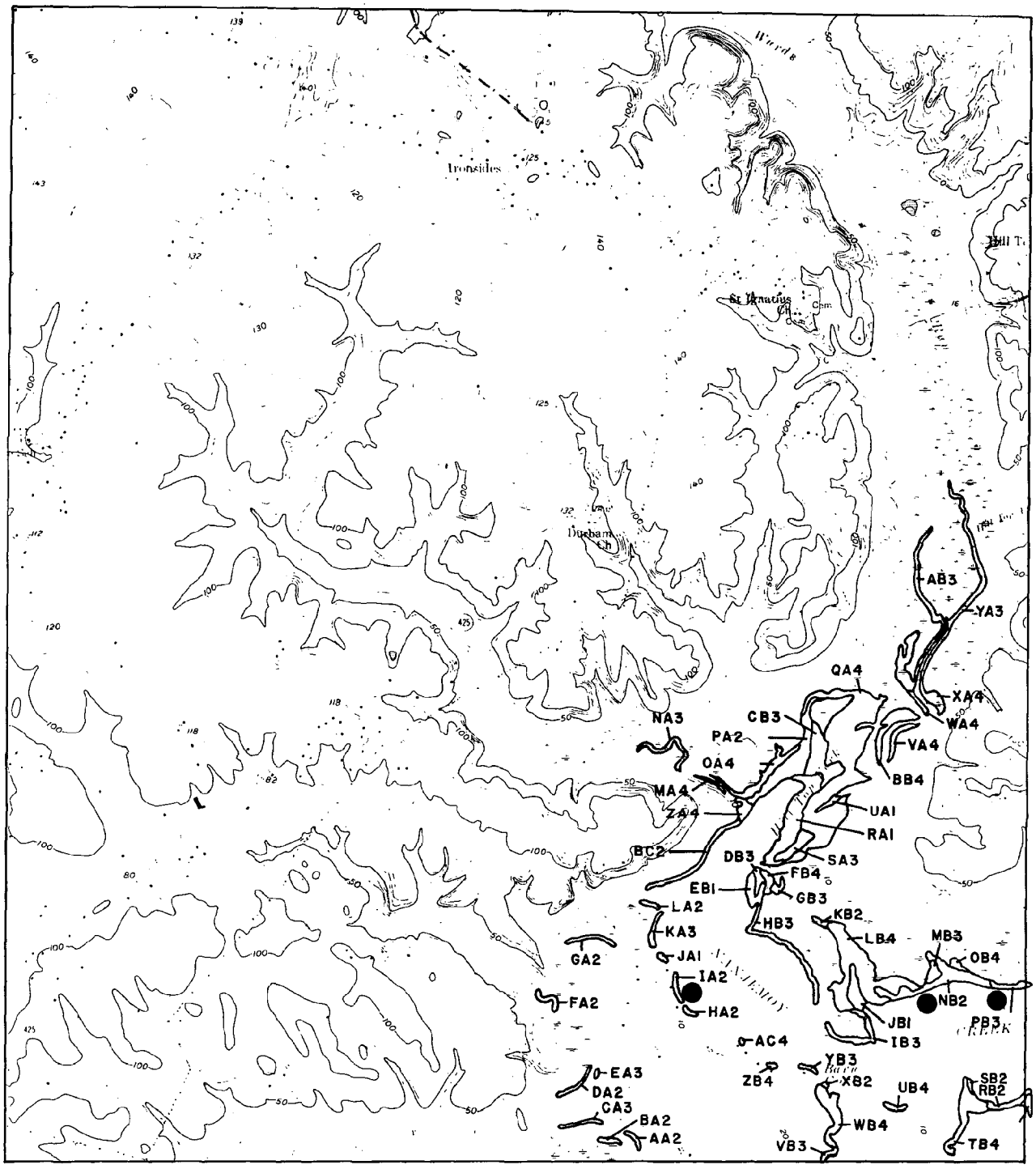
WIDEWATER, VA–MD

Northwest Quarter

55

DATE FLOWN 10/16/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES			
Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S.

SCALE 1:12,000

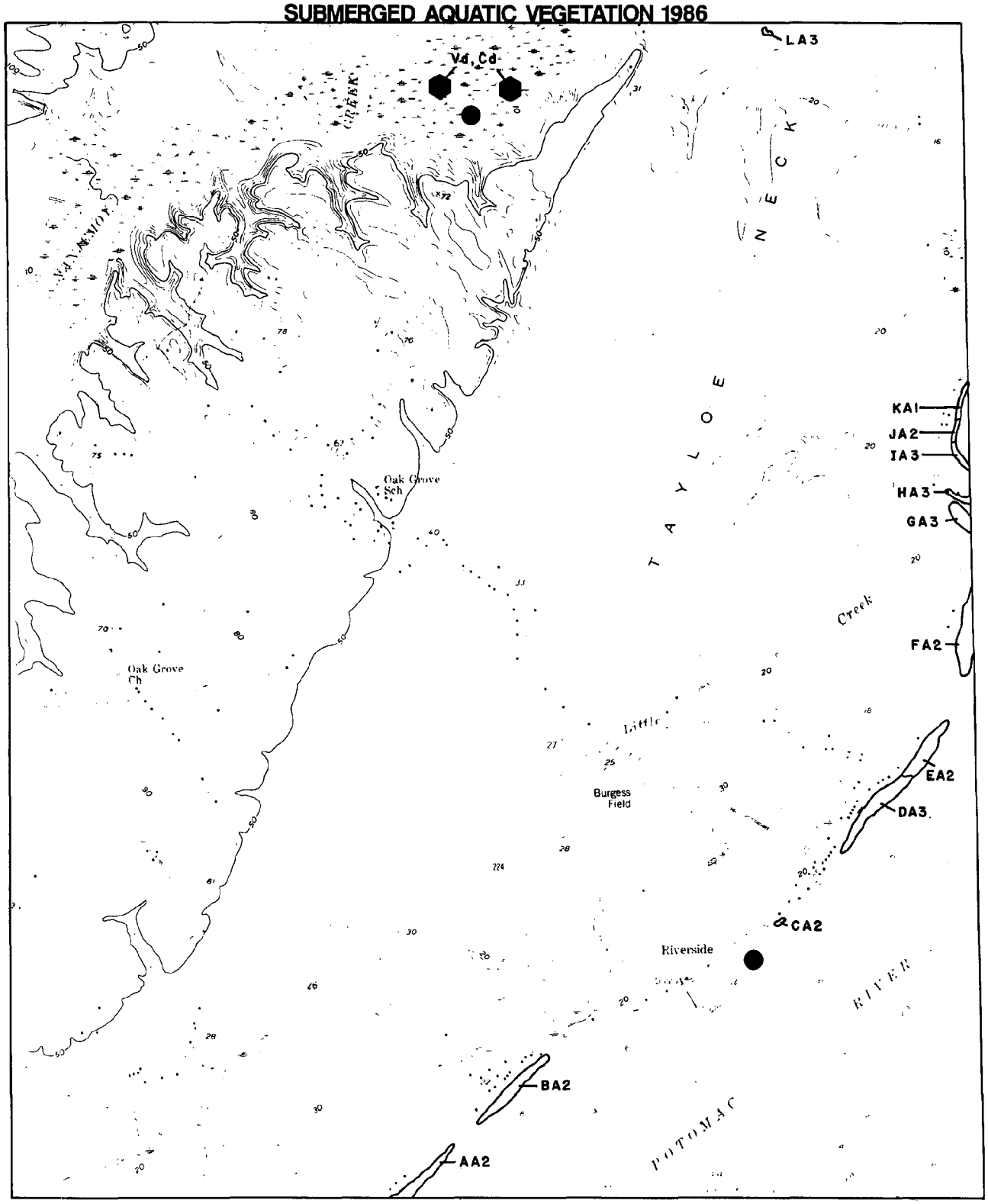
0 1 MILE

0 1 KILOMETER

NANJEMOY, MD
Northeast Quarter
56

DATE FLOWN 10/16/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES			
Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Pof	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:12,000

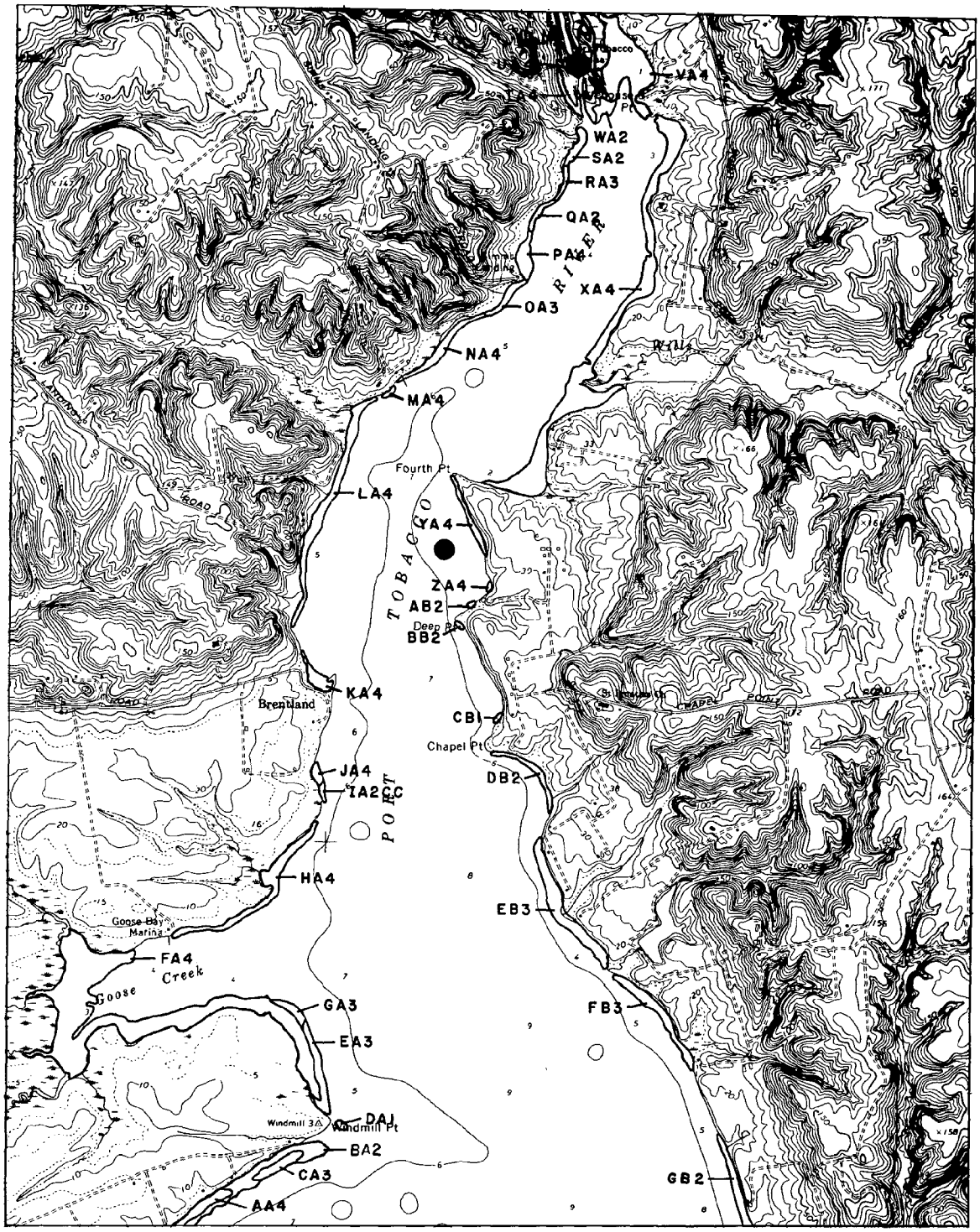
NANJEMOY, MD

Southeast Quarter

56

DATE FLOWN 10/16/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S.

SCALE 1:12,000

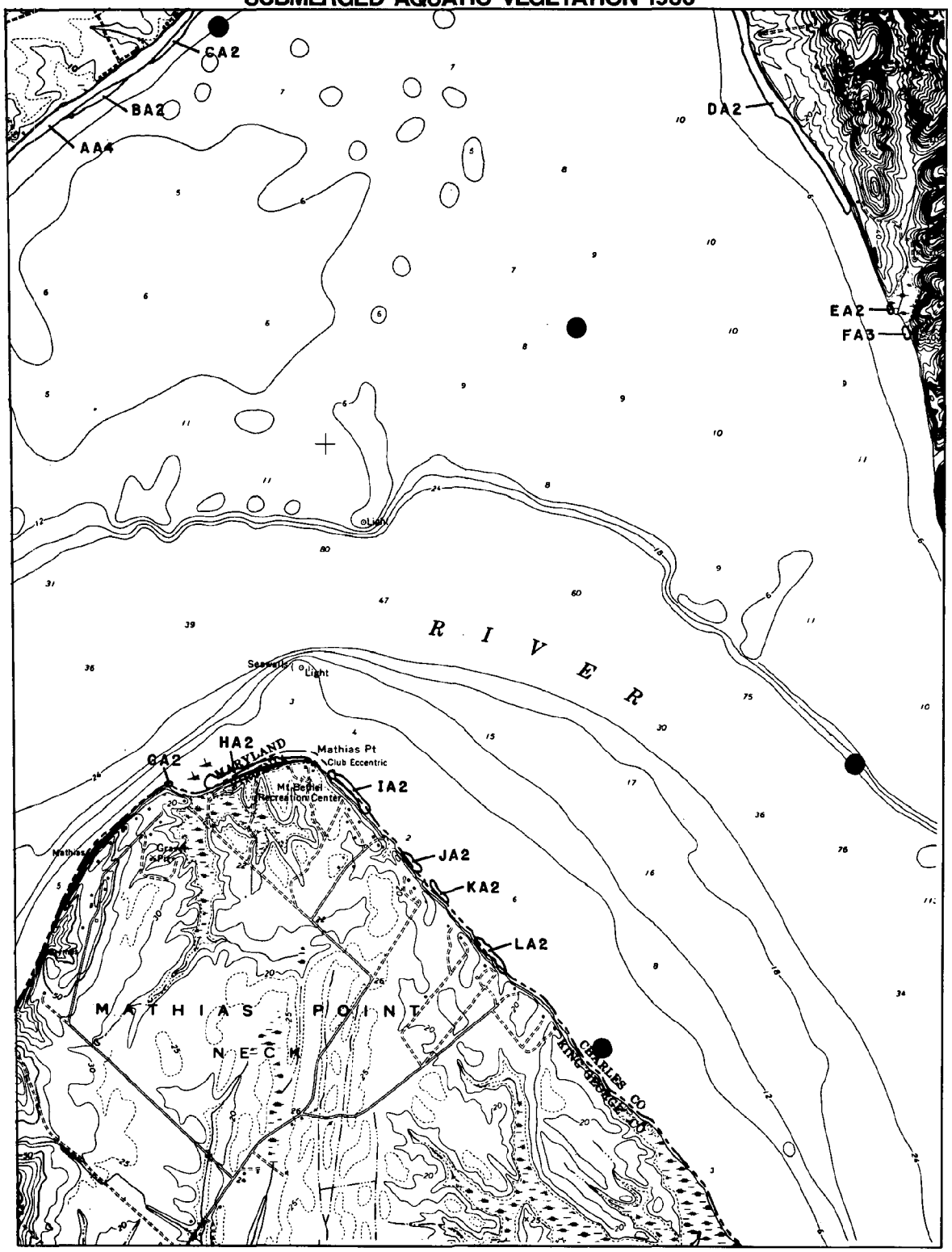
0 .5 1 MILE

0 .5 1 KILOMETER

MATHIAS POINT,
MD-VA
Northeast Quarter
57

DATE FLOWN 10/16/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:12,000

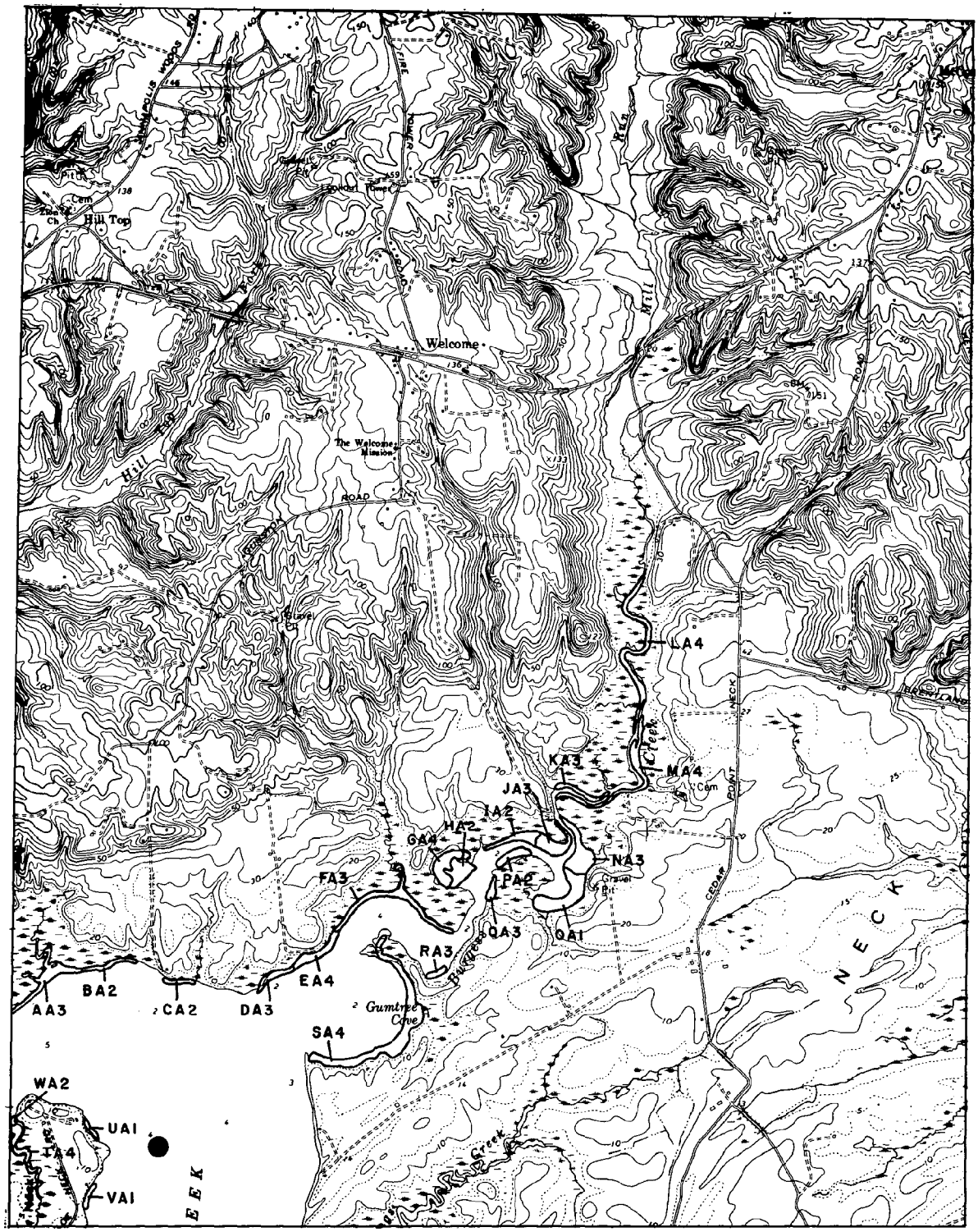
0 1 MILE

0 1 KILOMETER

MATHIAS POINT,
MD–VA
Southeast Quarter
57

DATE FLOWN 9/13/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

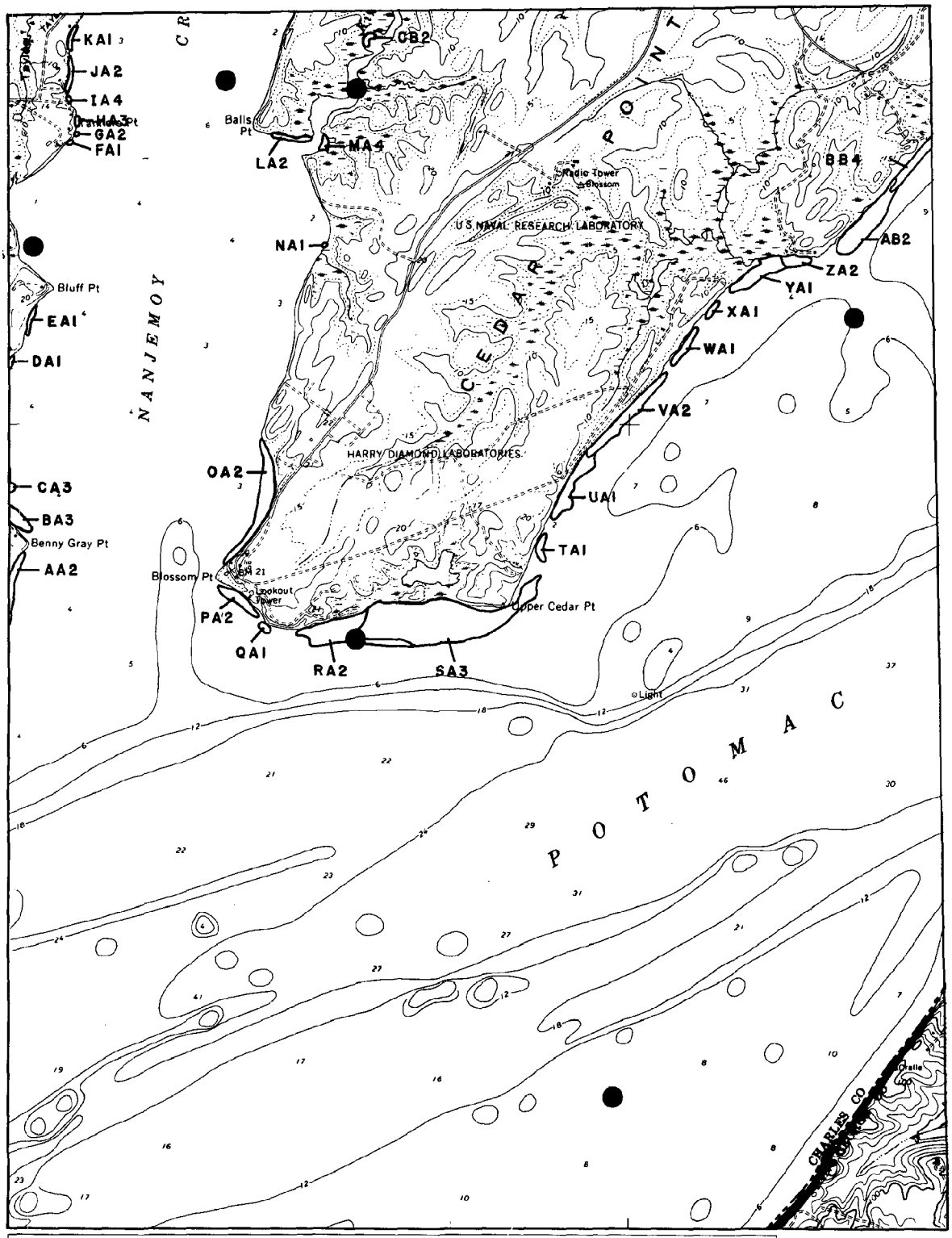
- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S.

SCALE 1:12,000

MATHIAS POINT, MD-VA
Northwest Quarter
57

DATE FLOWN 10/16/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES			
Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ U.S.G.S.

N

SCALE 1:12,000

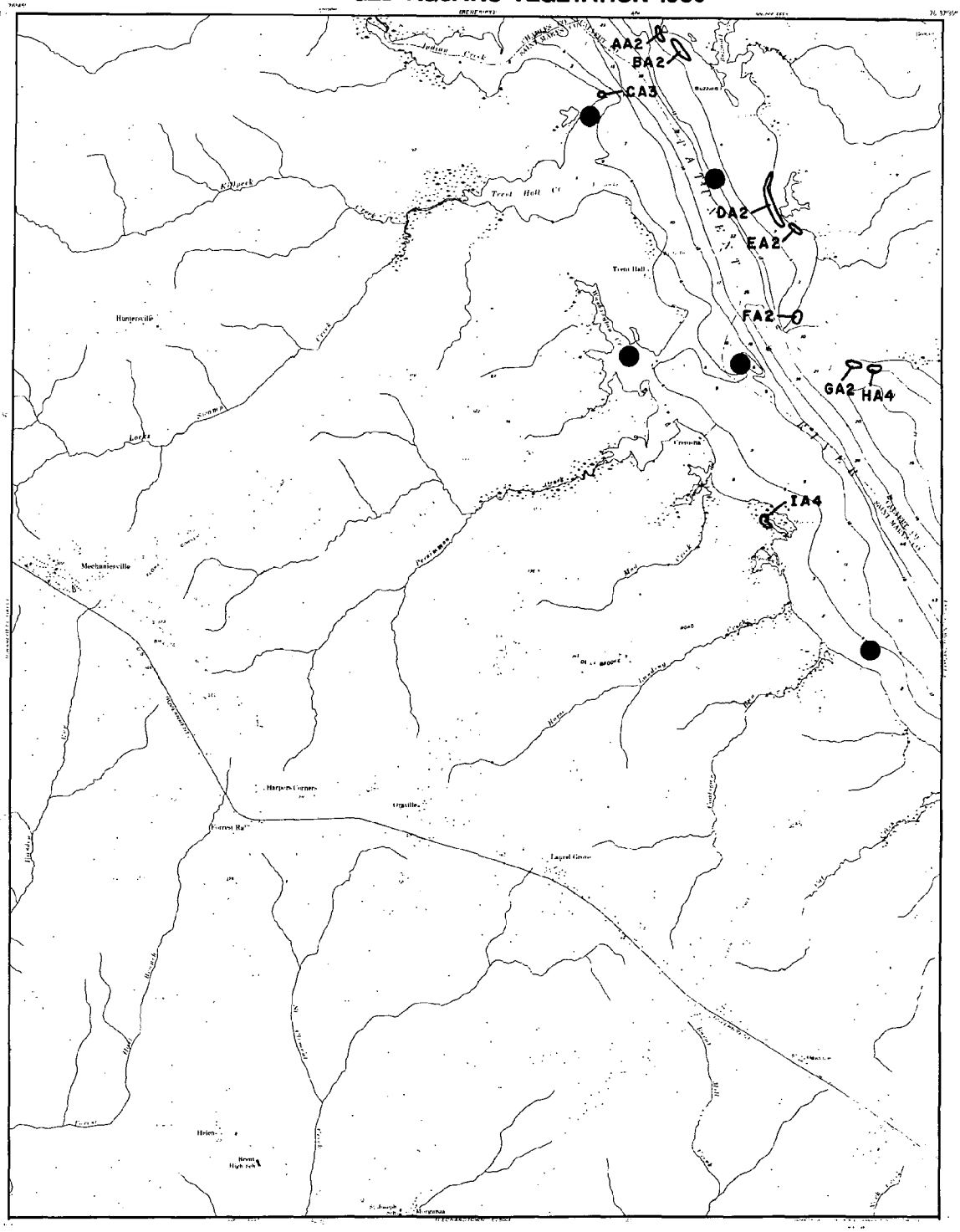
0 1 2 3 MILE

0 1 2 3 4 5 KILOMETER

MATHIAS POINT,
Southwest Quarter
MD–VA
57

DATE FLOWN 10/16/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichellia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

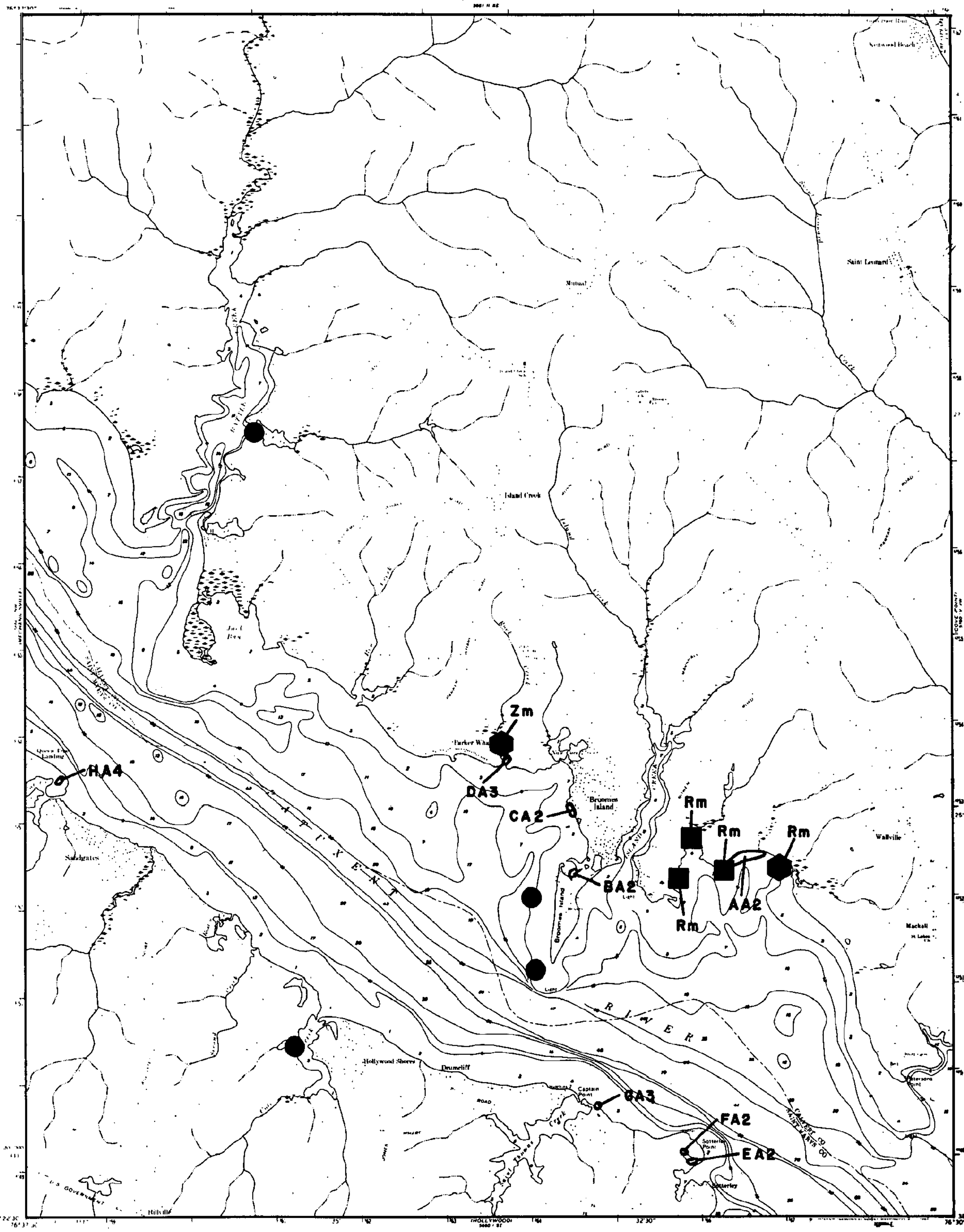
1 .5 0 1 KILOMETER

MECHANICSVILLE, MD

59

DATE FLOWN 9/13/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

- Zm *Zostera marina* (eelgrass)
- Rm *Ruppia maritima* (widgeon grass)
- Ms *Myriophyllum spicatum* (Eurasian watermilfoil)
- Ppf *Potamogeton perfoliatus* (redhead-grass)
- Ppc *Potamogeton pectinatus* (sago pondweed)
- Zp *Zannichellia palustris* (horned pondweed)
- N *Najas spp.* (naiad)
- Ec *Elodea canadensis* (common elodea)
- Va *Vallisneria americana* (wild celery)
- Hv *Hydrilla verticillata* (hydrilla)
- Hd *Heteranthera dubia* (water stargrass)
- Pcr *Potamogeton crispus* (curly pondweed)
- Cd *Ceratophyllum demersum* (coontail)
- Ppu *Potamogeton pusillus* (slender pondweed)
- Ngu *Najas guadalupensis* (southern naiad)
- Ngr *Najas gracillima* (naiad)
- C *Chara sp.* (muskgrass)

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

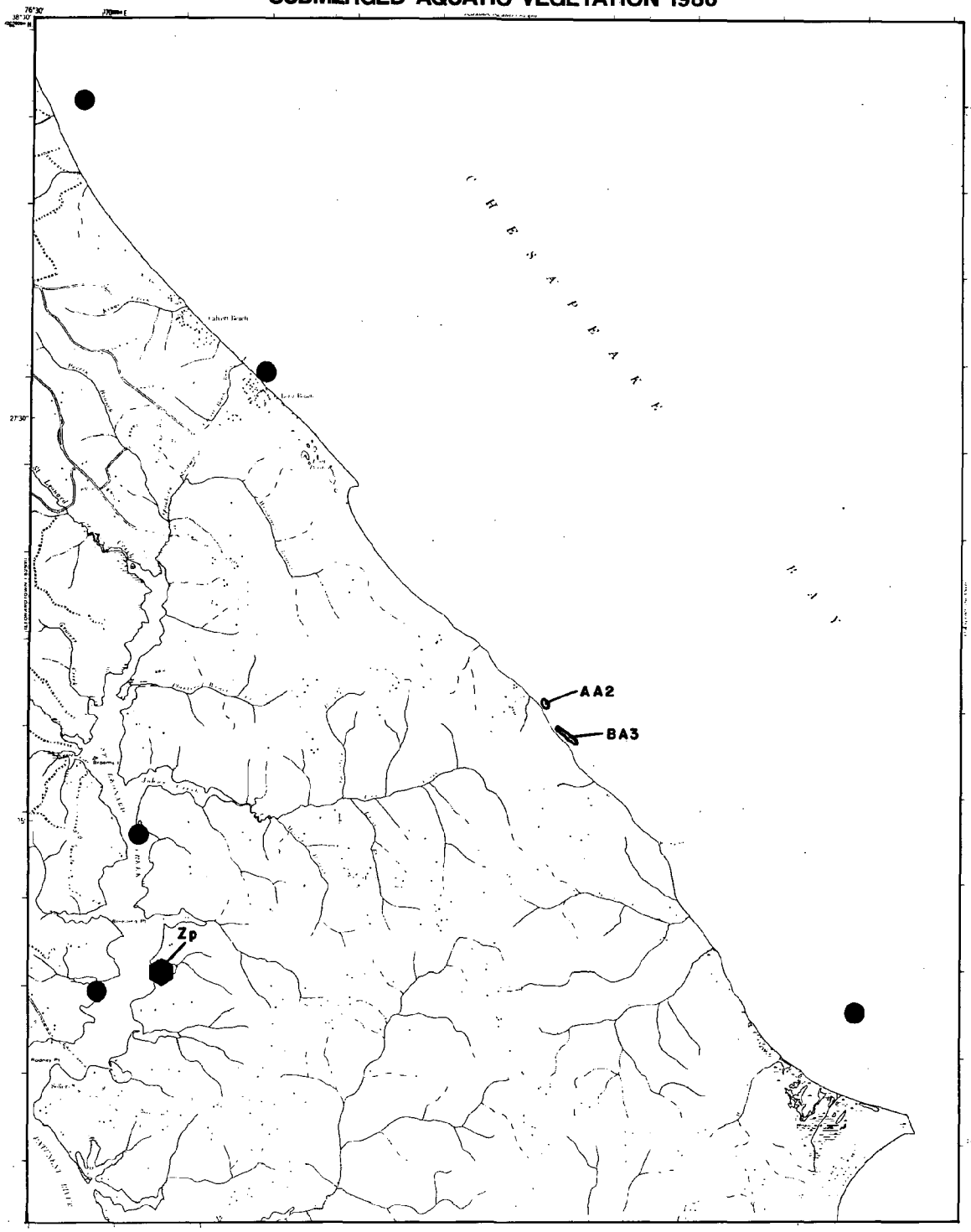
1 .5 0 1 KILOMETER

BROOMES ISLAND, MD

60

DATE FLOWN 9/13/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)		
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)		
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)		
Pof	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)		
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)		
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)		
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)		
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)		
Va	*Vallisneria americana* (wild celery)				

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ U.S.G.S.

SCALE 1:24,000

1 MILE

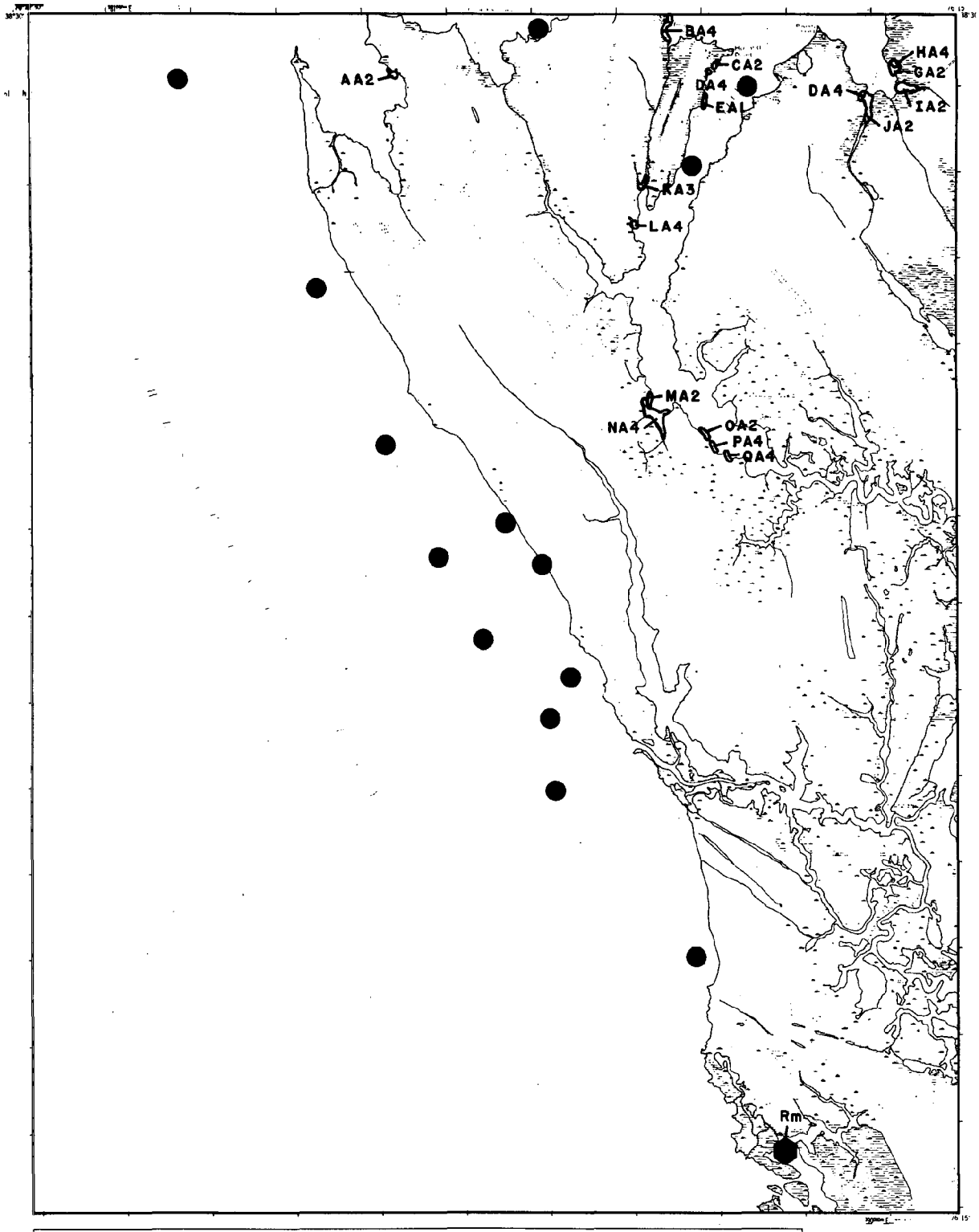
1 KILOMETER

COVE POINT, MD

61

DATE FLOWN 9/13/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

MILE

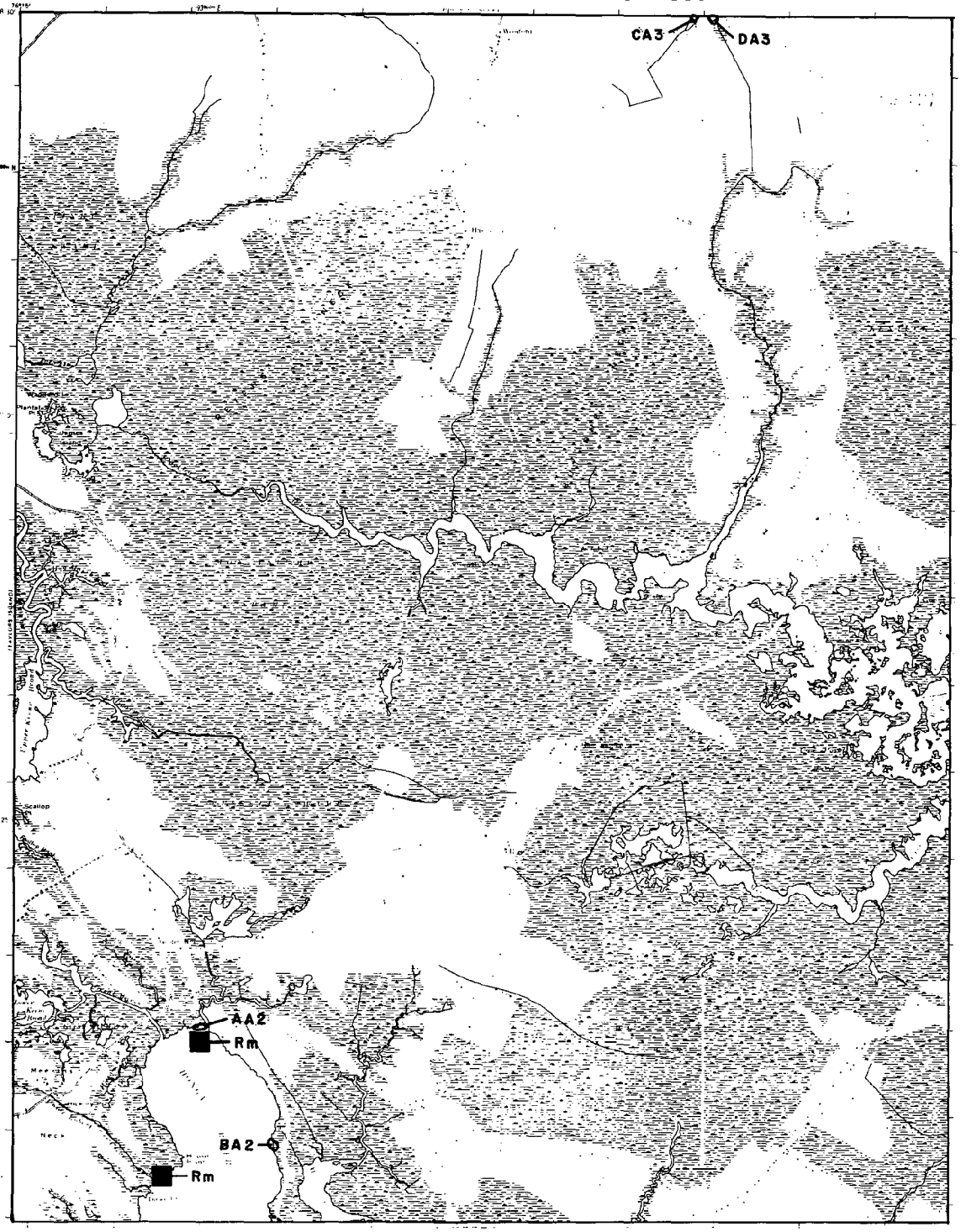
KILOMETER

TAYLORS ISLAND, MD

62

DATE FLOWN 10/19/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)		
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)		
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)		
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)		
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)		
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)		
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)		
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)		
Va	*Vallisneria americana* (wild celery)				

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

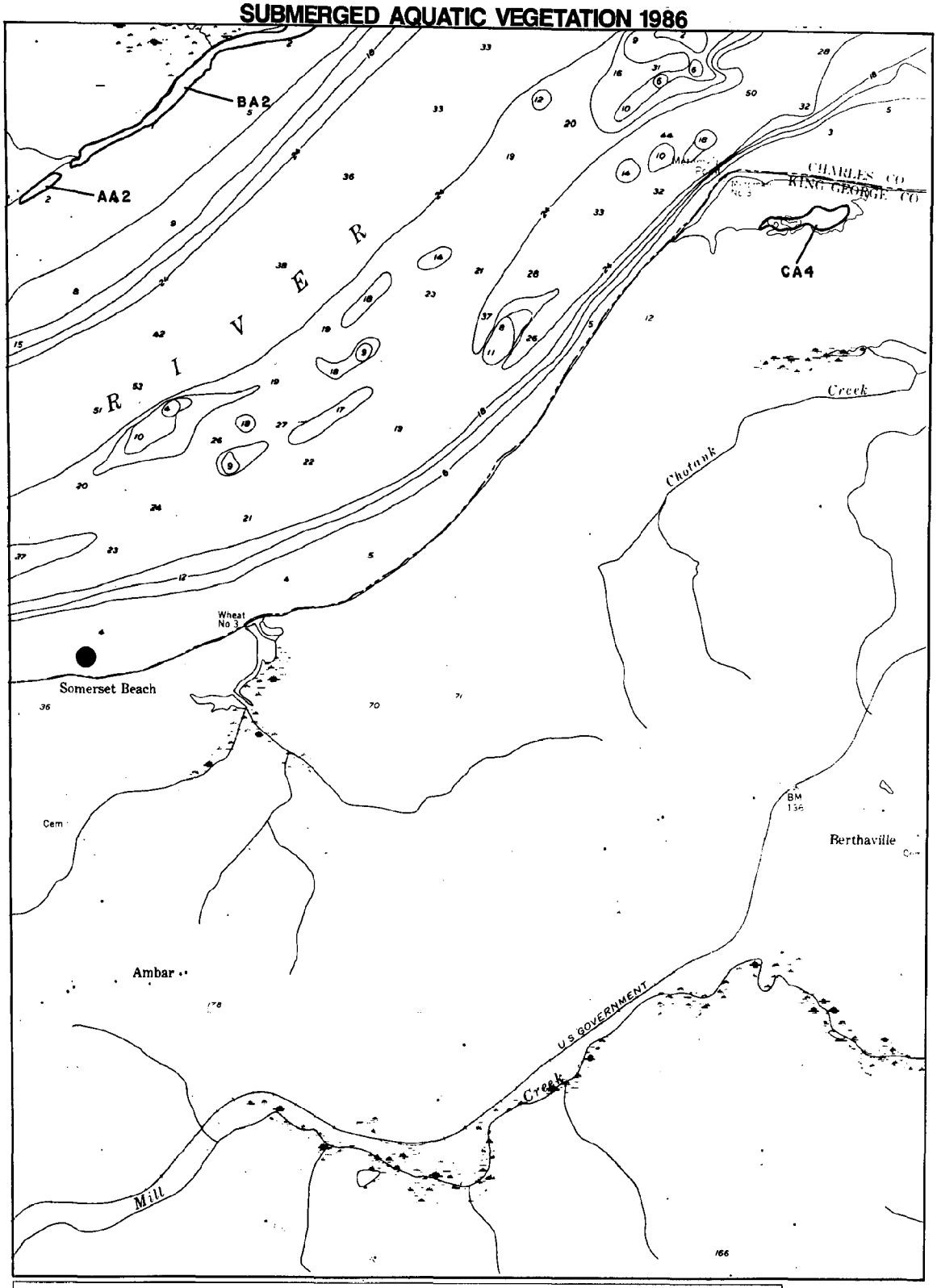
1 .5 0 1 MILE

1 .5 0 1 KILOMETER

GOLDEN HILL, MD 63

DATE FLOWN 10/19/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)		
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)		
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)		
Pcf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)		
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)		
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)		
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)		
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)		
Va	*Vallisneria americana* (wild celery)				

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ U.S.G.S.

N

SCALE 1:12,000

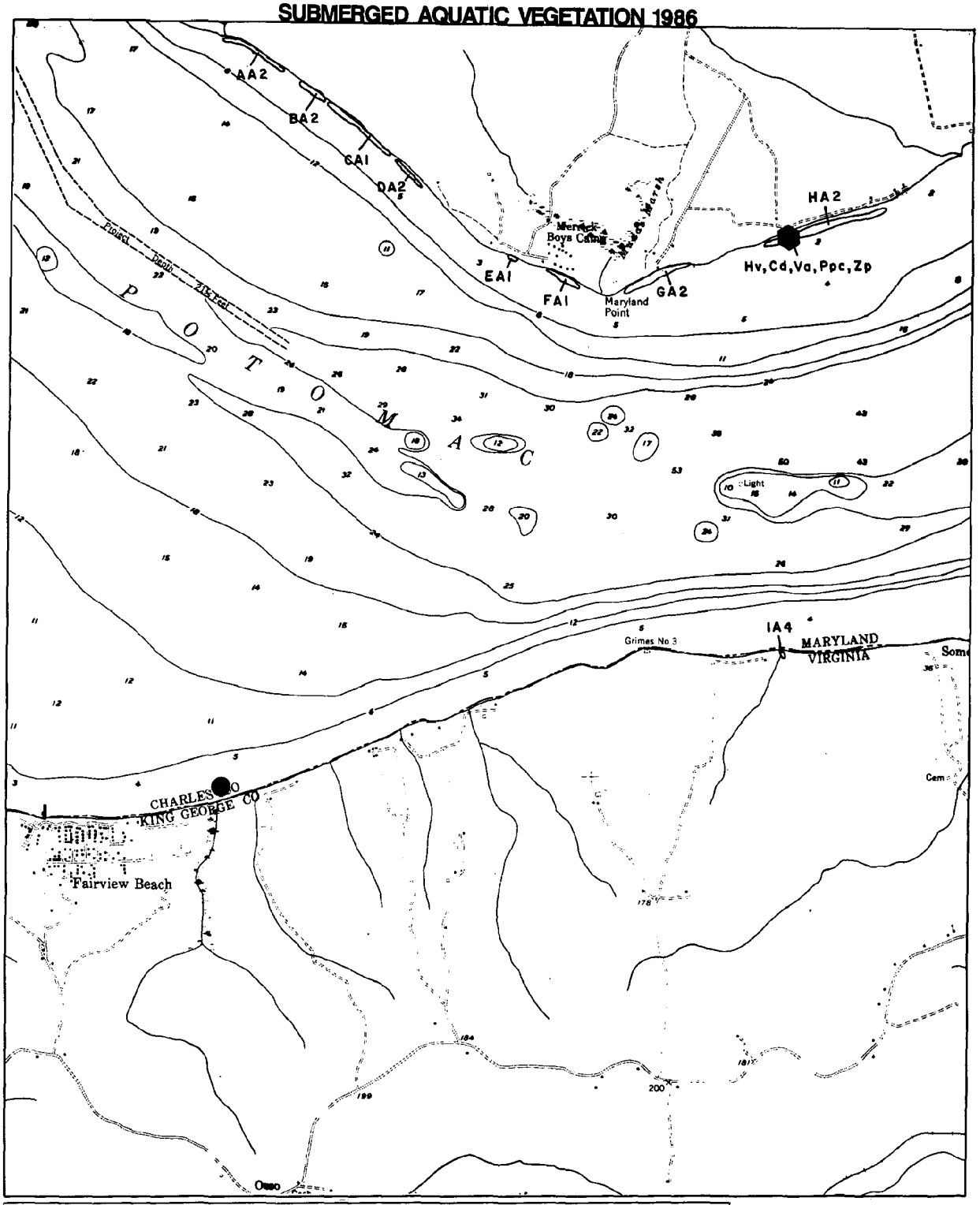
0 .5 1 MILE

0 .5 1 KILOMETER

KING GEORGE, VA–MD
Northeast Quarter
65

DATE FLOWN 10/16/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichellia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:12,000

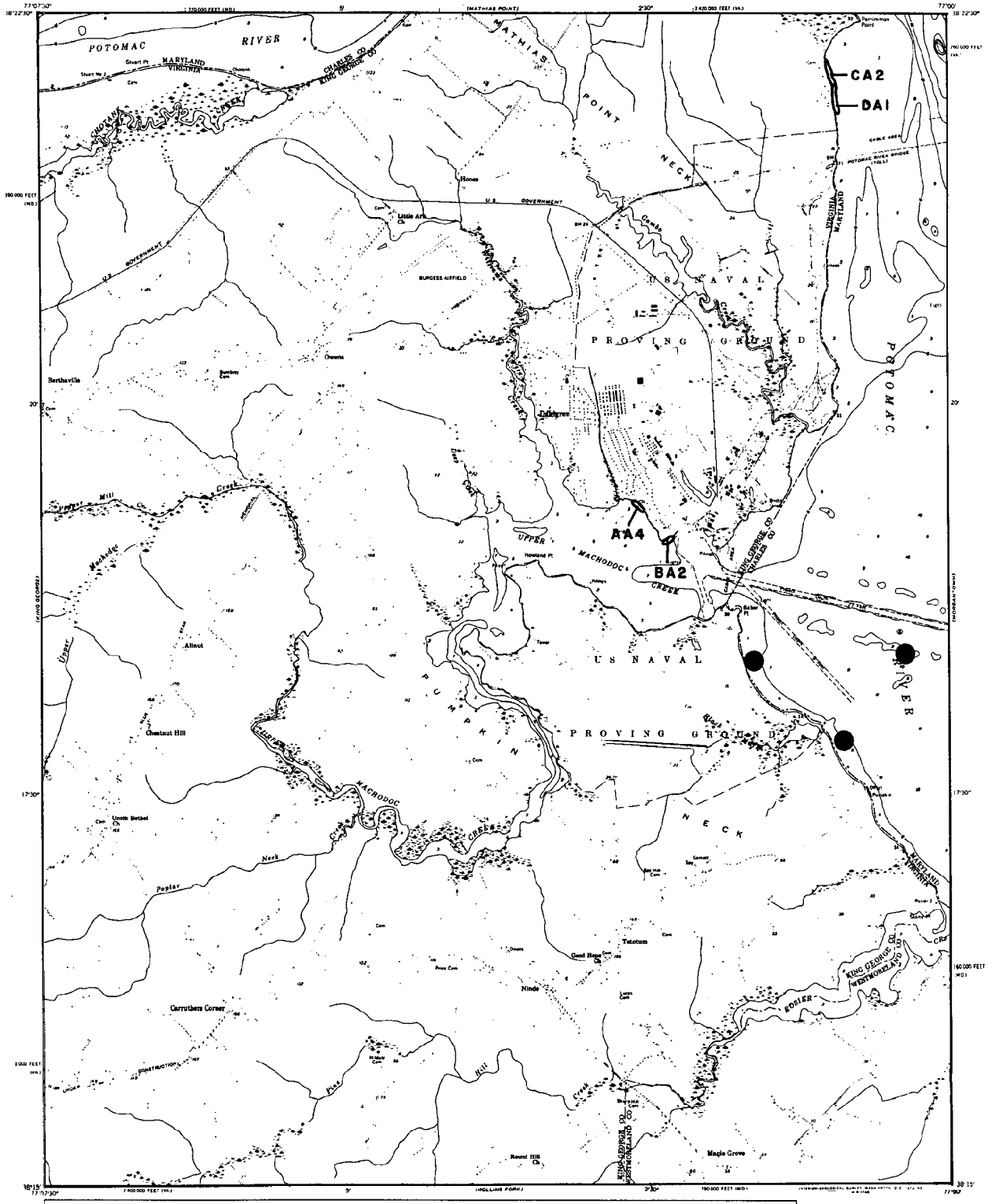
0 1 MILE

0 5 1 KILOMETER

KING GEORGE, VA–MD
Northwest Quarter
65

DATE FLOWN 10/16/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES			
Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Pof	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ U.S.G.S.

SCALE 1:24,000

.5 0 1 MILE

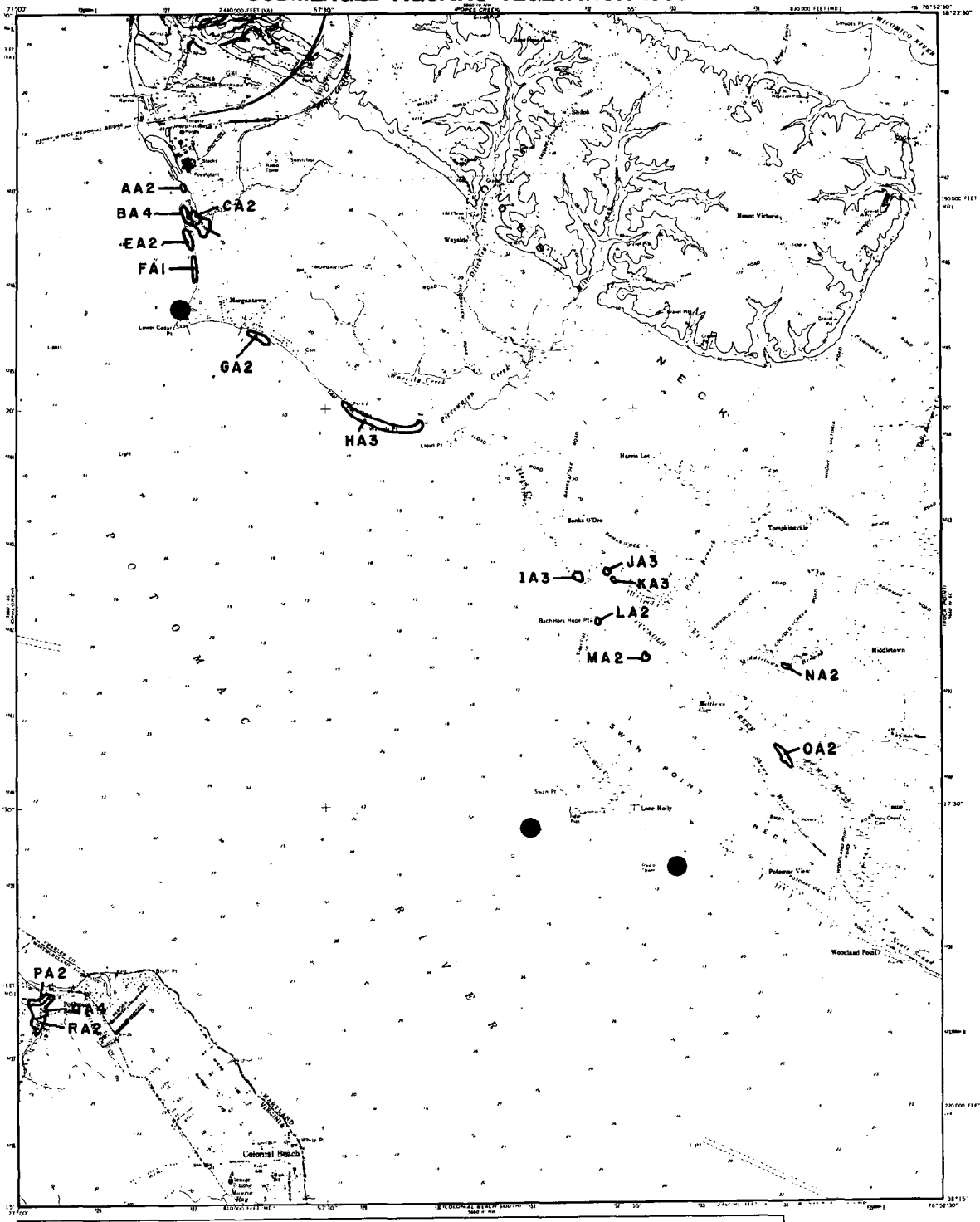
.5 0 1 KILOMETER

DAHLGREN, VA–MD

66

DATE FLOWN 9/13/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ U.S.G.S.

SCALE 1:24,000

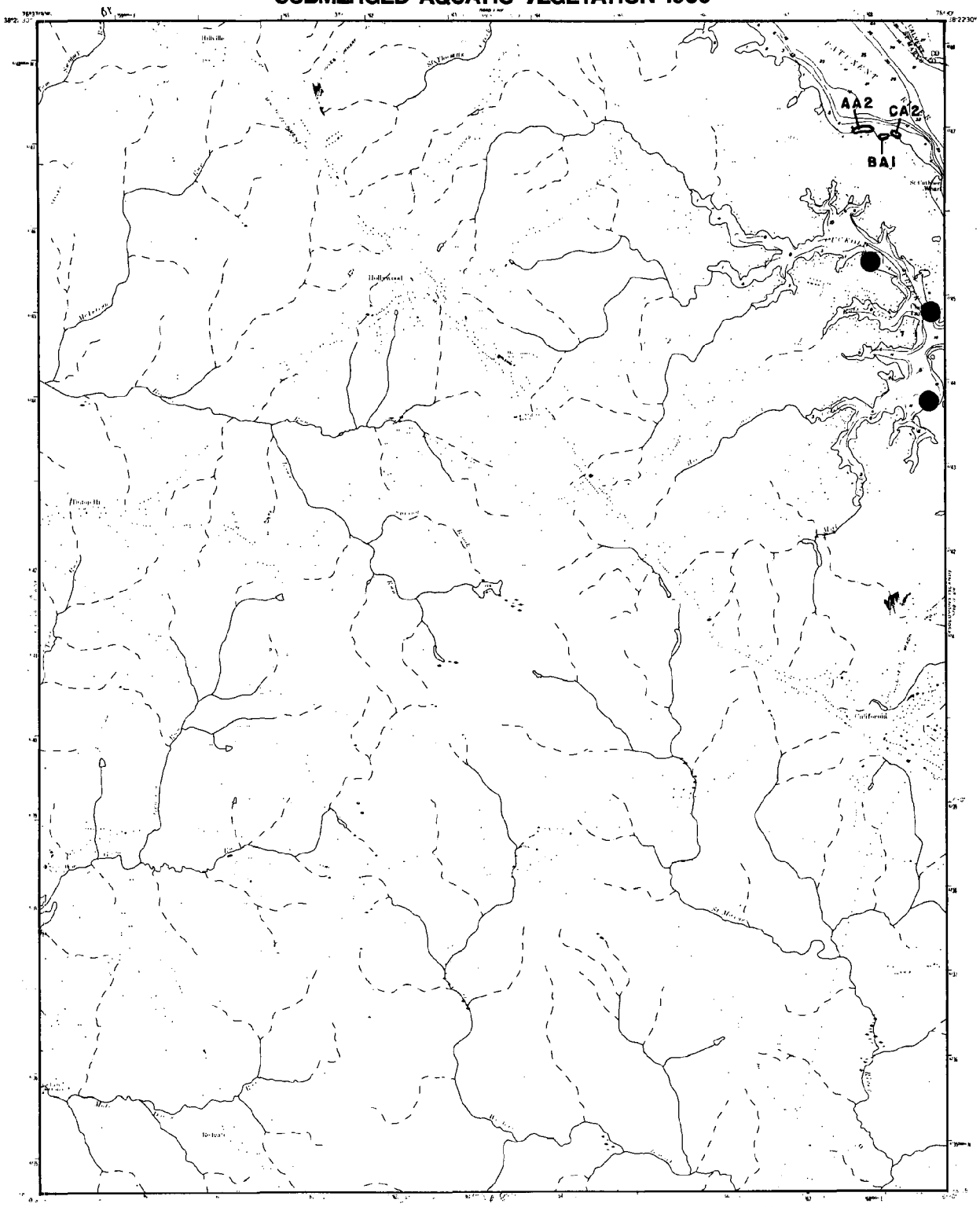
1 .5 0 1 MILE

1 .5 0 1 KILOMETER

COLONIAL BEACH
NORTH, VA–MD
67

DATE FLOWN 9/13/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

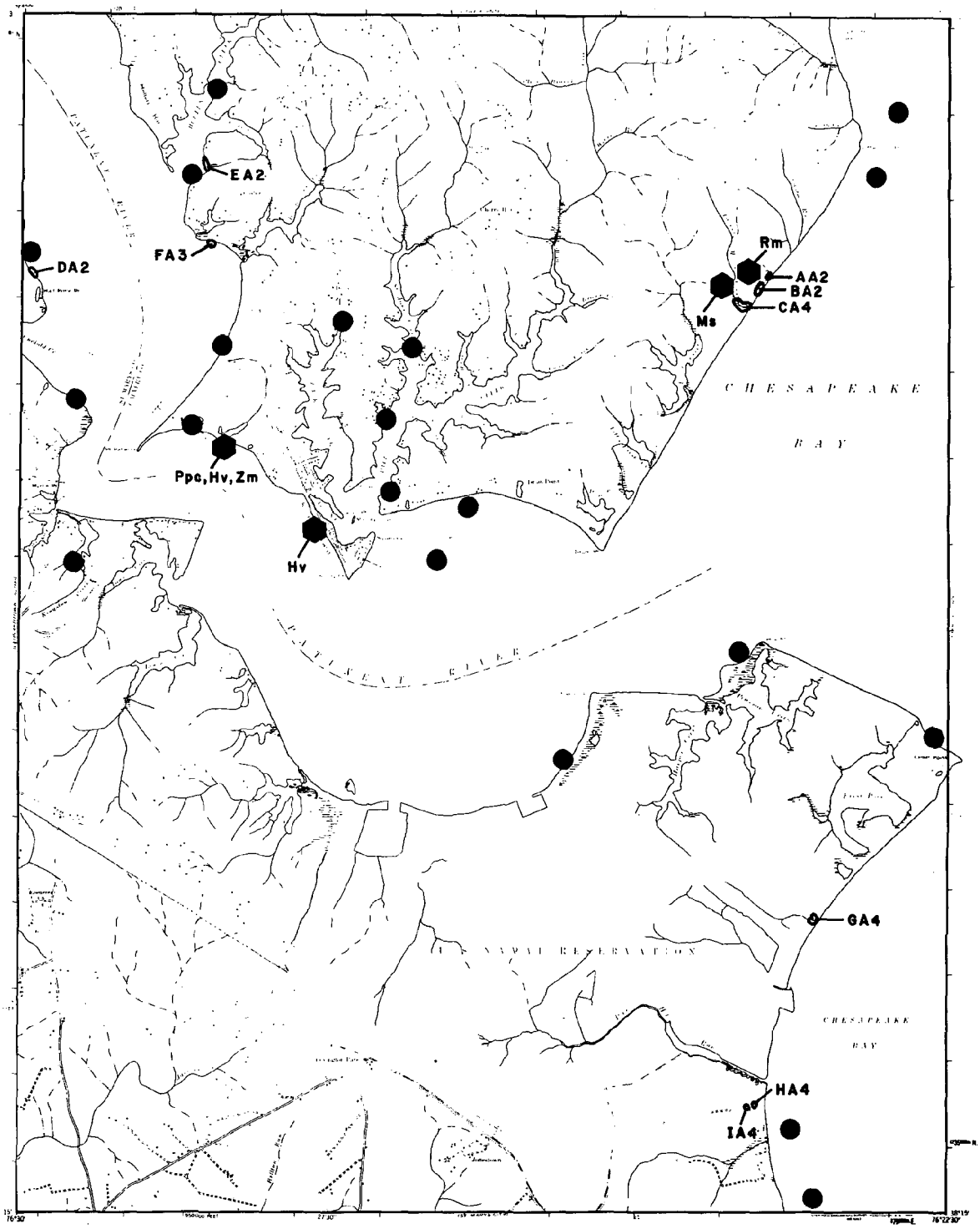
1 .5 0 1 KILOMETER

HOLLYWOOD, MD

70

DATE FLOWN 9/13/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

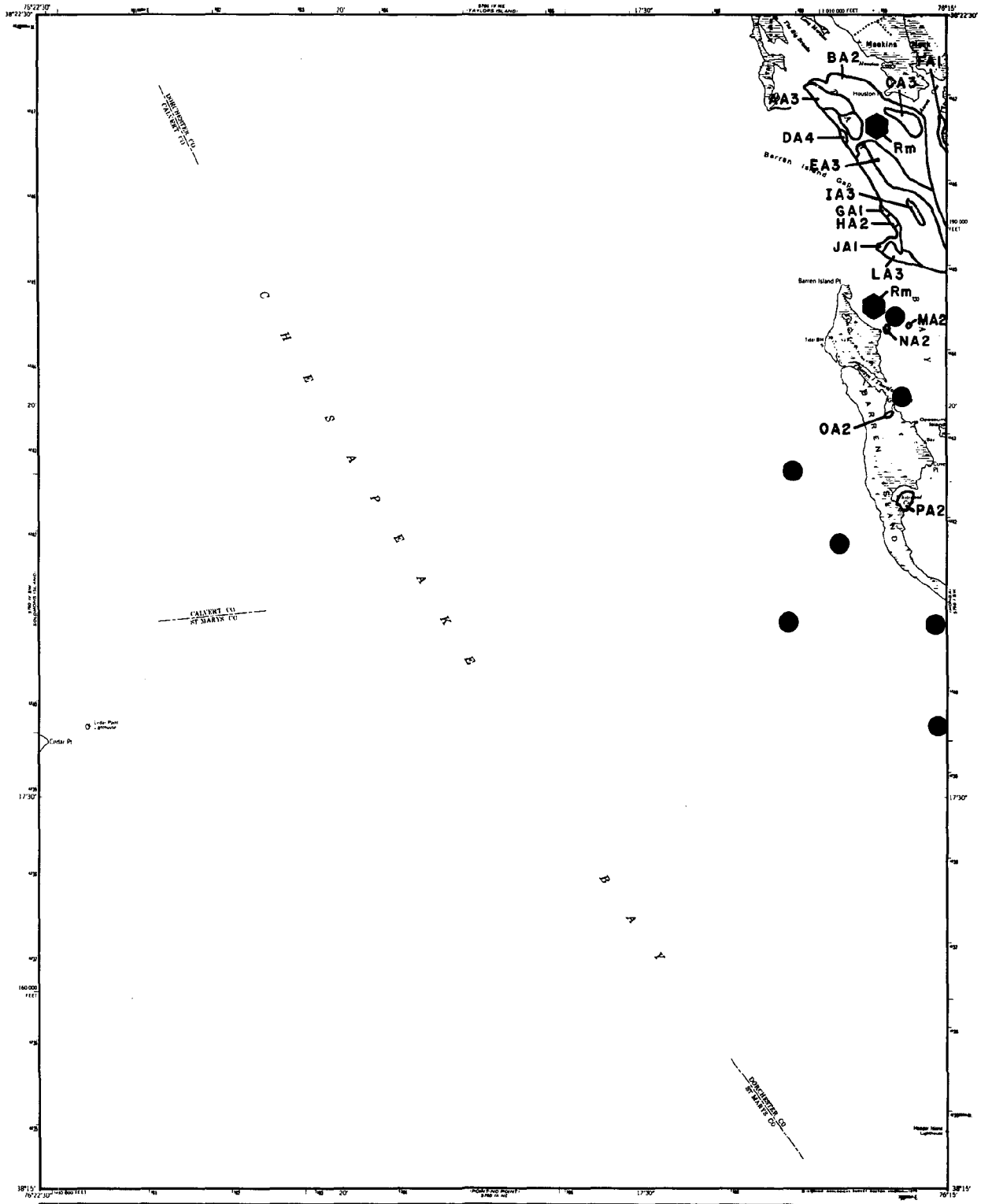
SCALE 1:24,000

SOLOMONS ISLAND, MD

71

DATE FLOWN 9/13/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichella palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

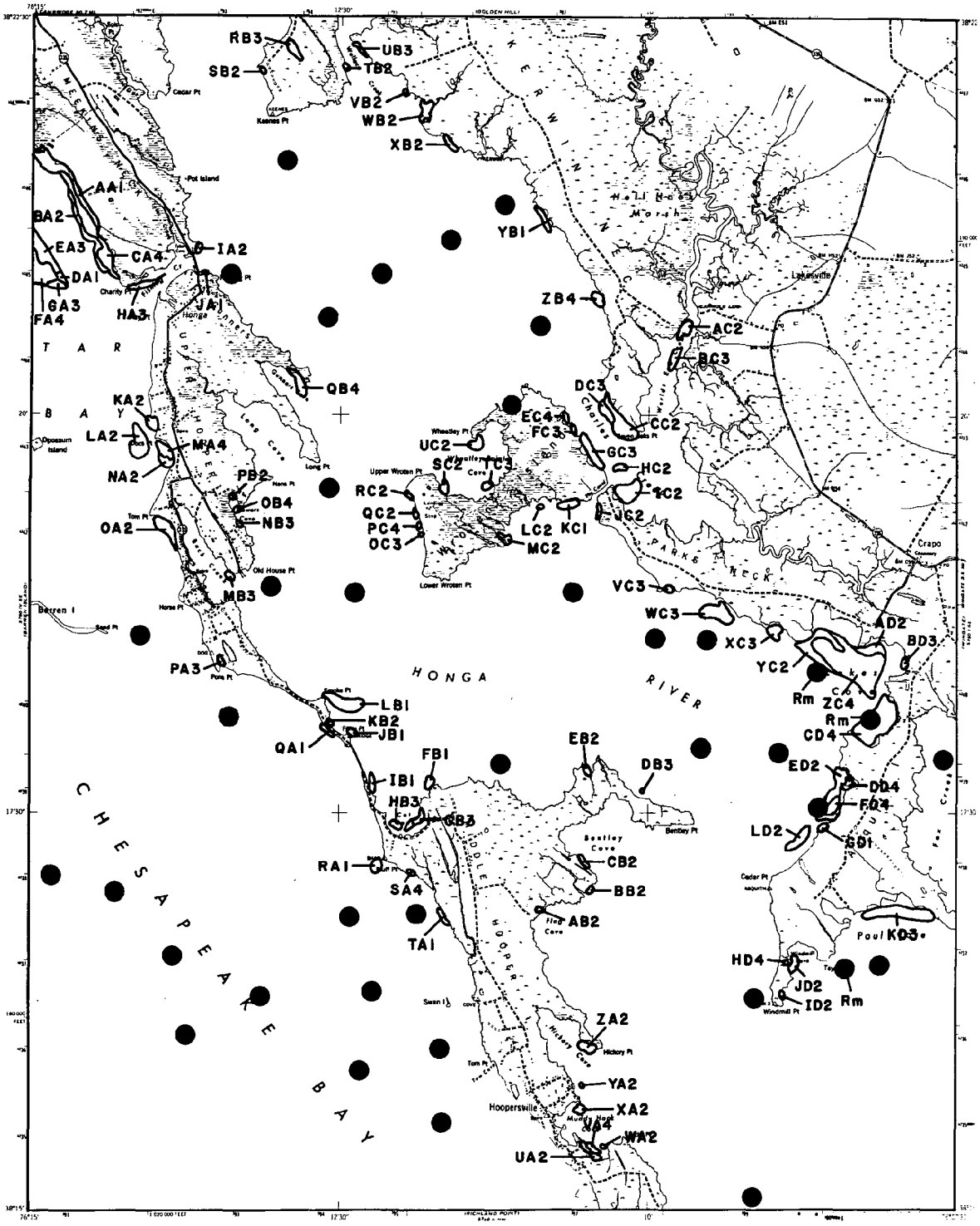
1 .5 0 1 KILOMETER

BARREN ISLAND, MD

72

DATE FLOWN 10/19/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichella palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

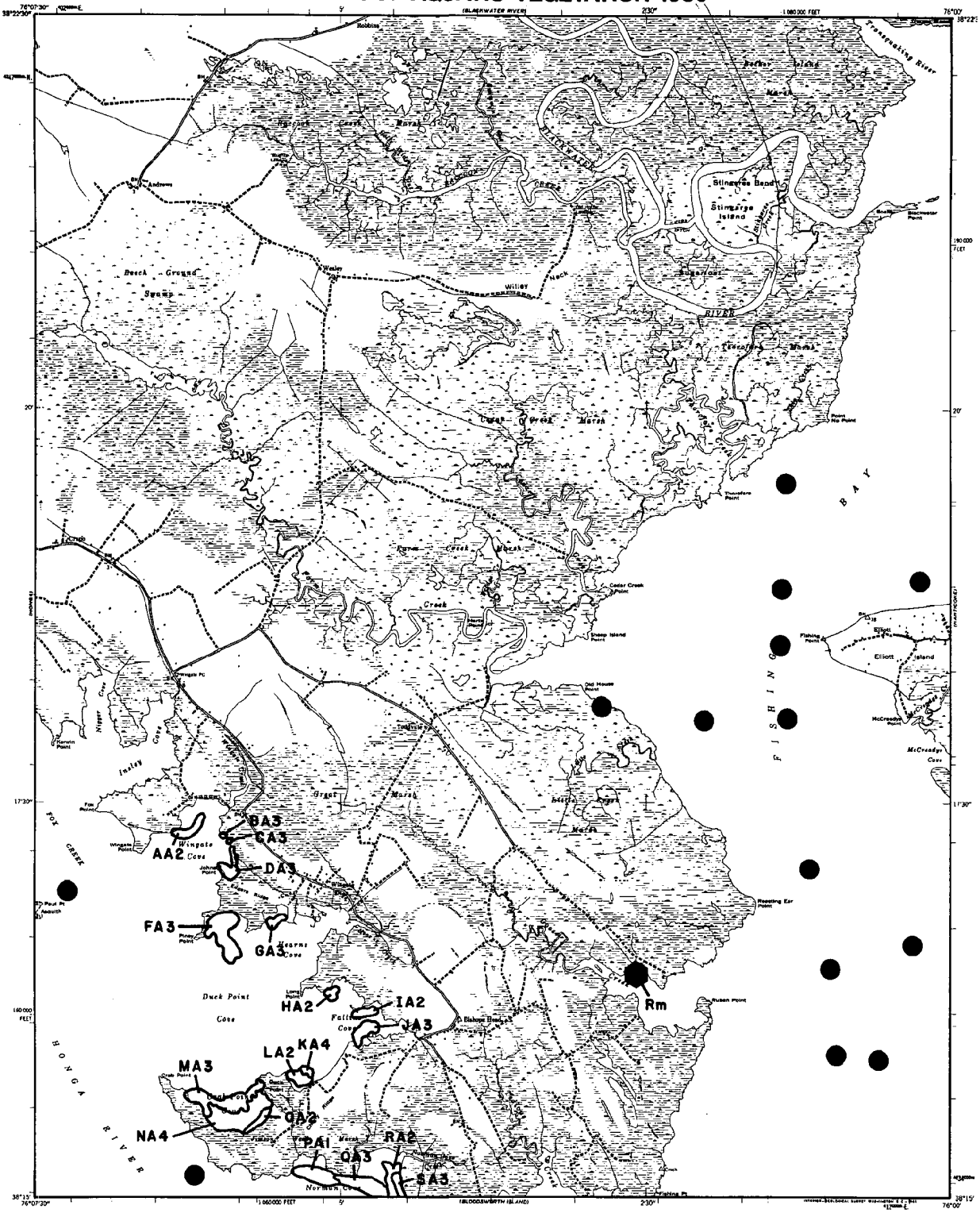
SCALE 1:24,000

HONGA, MD

73

DATE FLOWN 10/19/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES			
Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

1 MILE

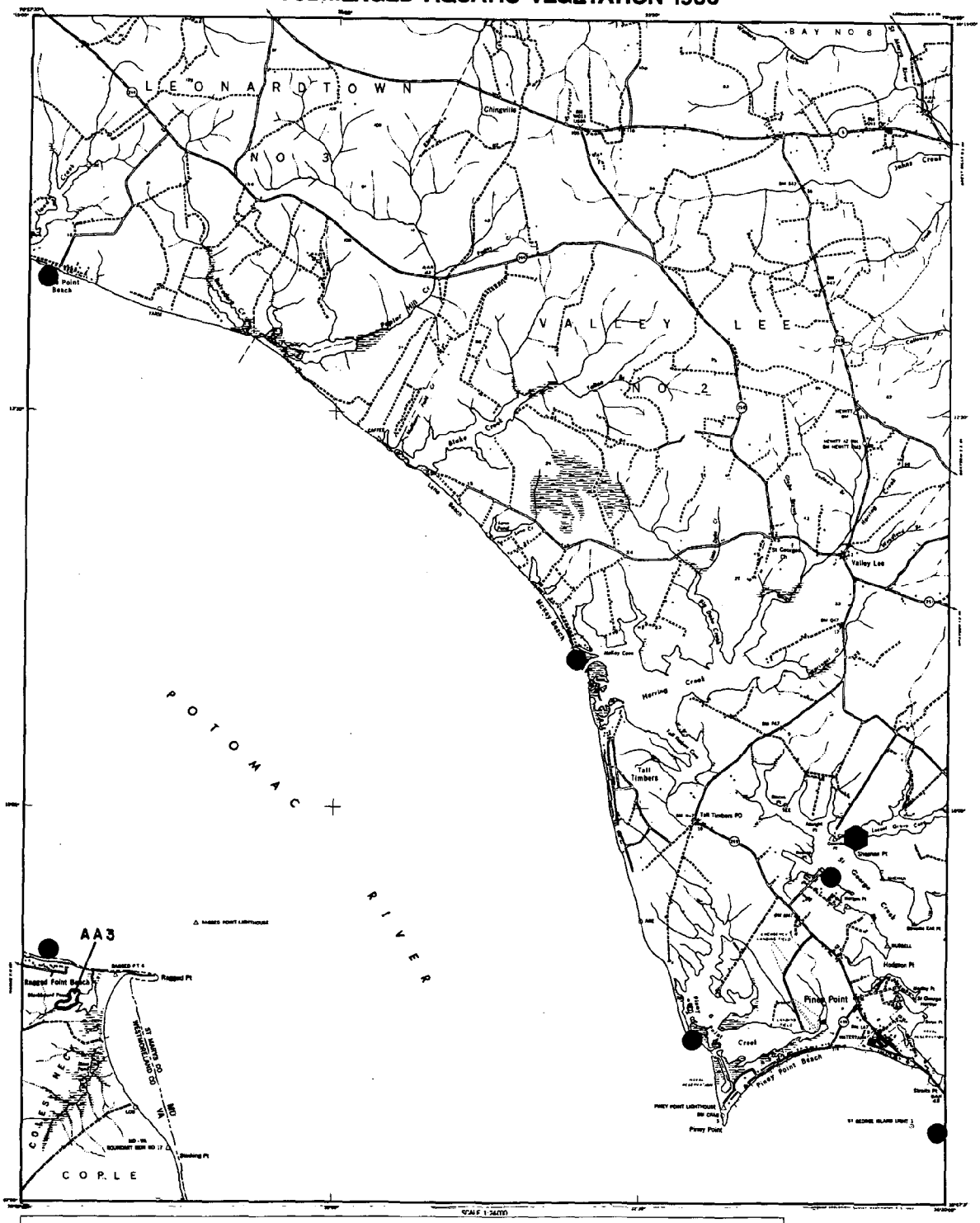
1 KILOMETER

WINGATE, MD

74

DATE FLOWN 10/19/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S.

SCALE 1:24,000

1 MILE

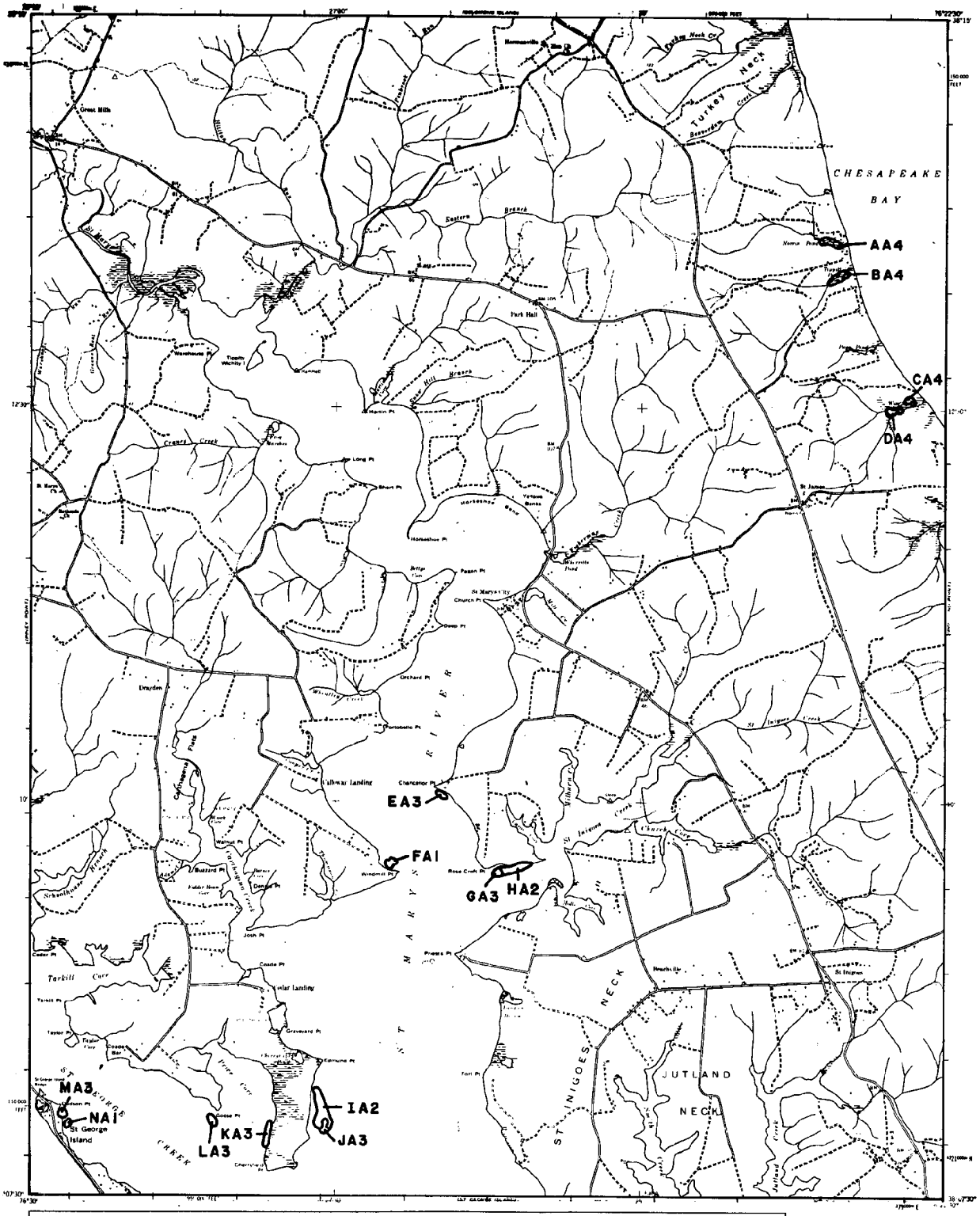
1 KILOMETER

PINEY POINT, VA–MD

79

DATE FLOWN 10/19/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ U.S.G.S.

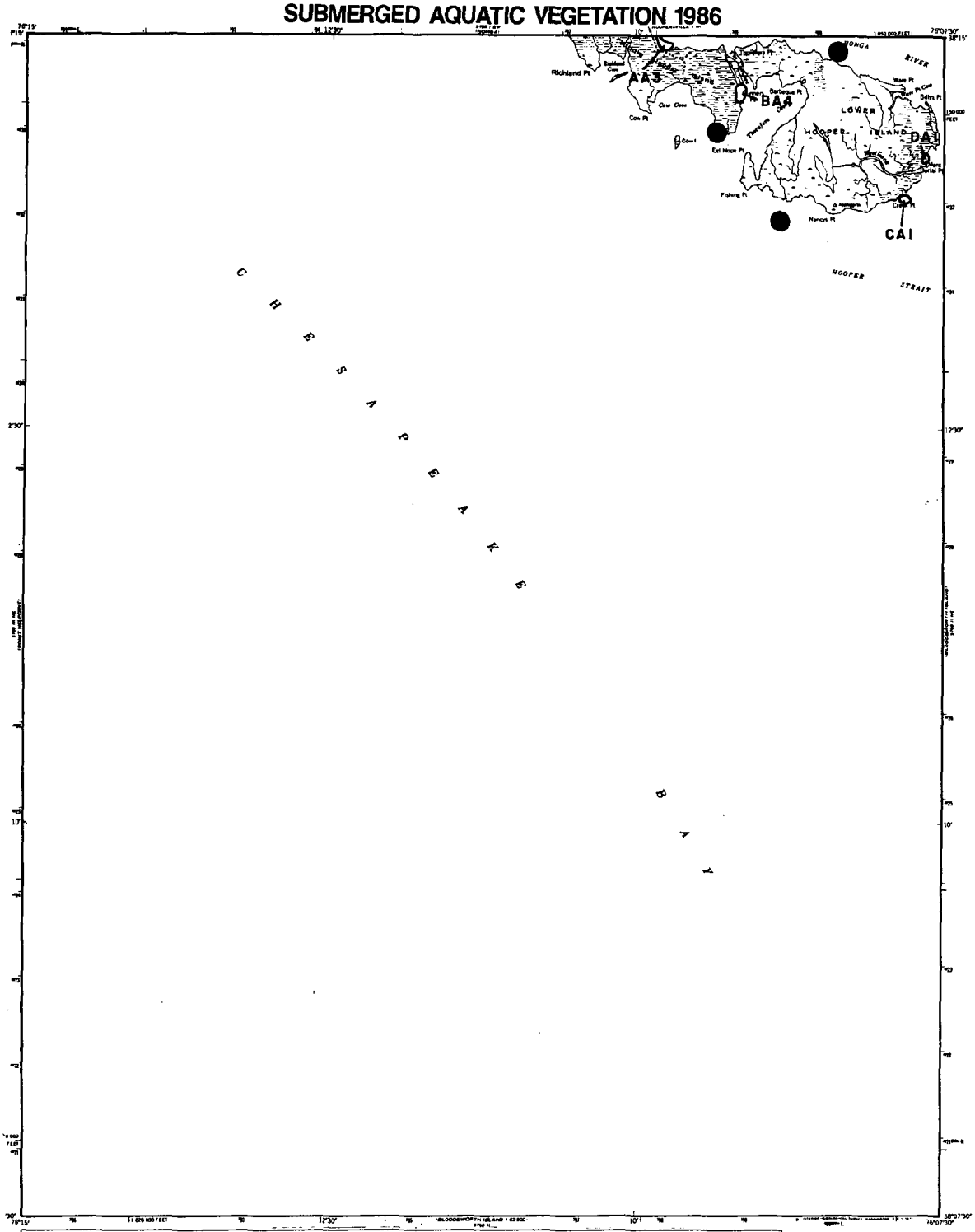
SCALE 1:24,000

ST. MARYS CITY, MD

80

DATE FLOWN 10/19/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ U.S.G.S.

SCALE 1:24,000

1 MILE

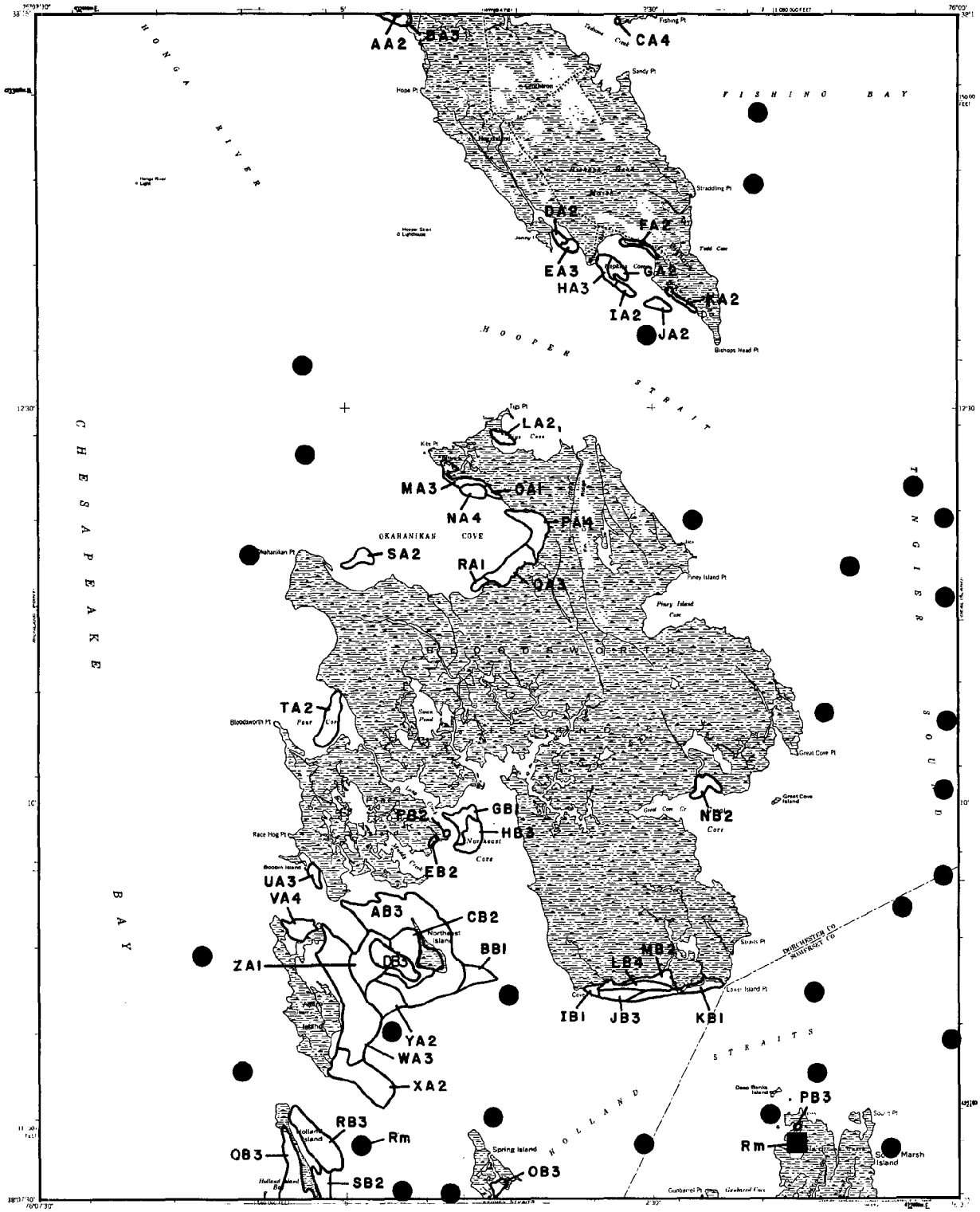
1 KILOMETER

RICHLAND POINT, MD

82

DATE FLOWN 10/19/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

.5 0 1 MILE

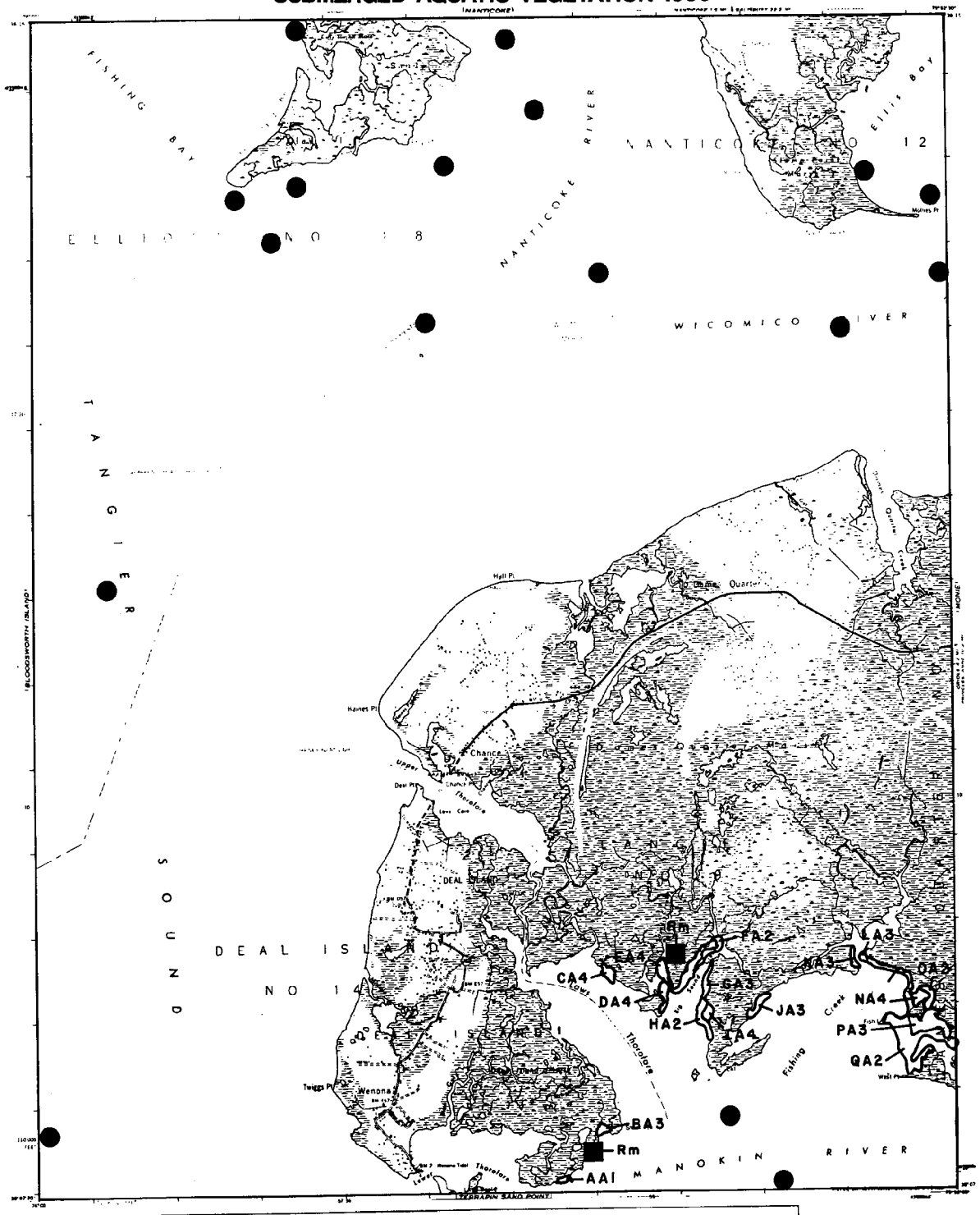
.5 0 1 KILOMETER

BLOODSWORTH ISLAND, MD

83

DATE FLOWN 10/19/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)		
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)		
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)		
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)		
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)		
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)		
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)		
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)		
Va	*Vallisneria americana* (wild celery)				

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

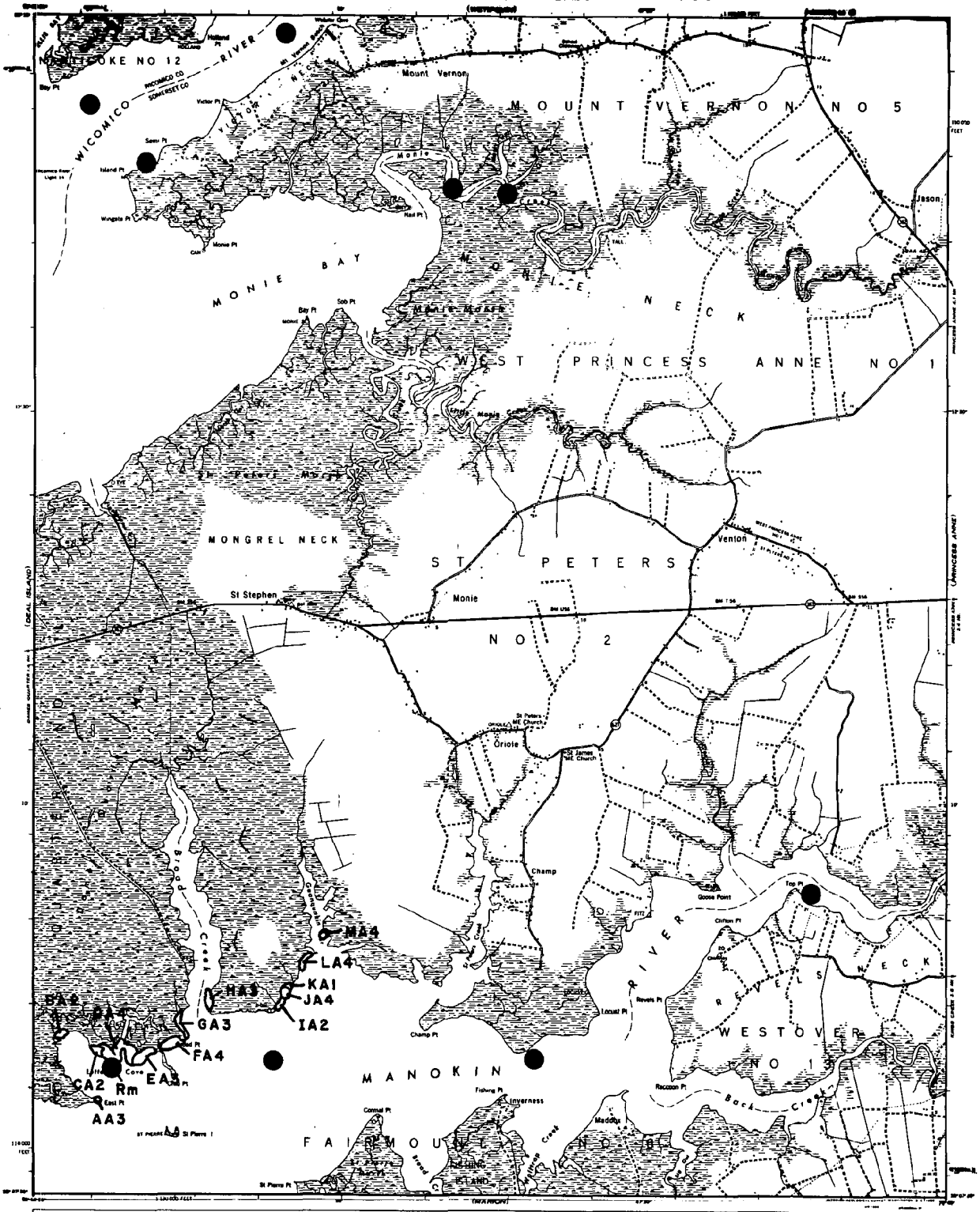
SCALE 1:24,000

DEAL ISLAND, MD

84

DATE FLOWN 10/19/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES			
Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Pdf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S.

SCALE 1:24,000

MILE .5 0

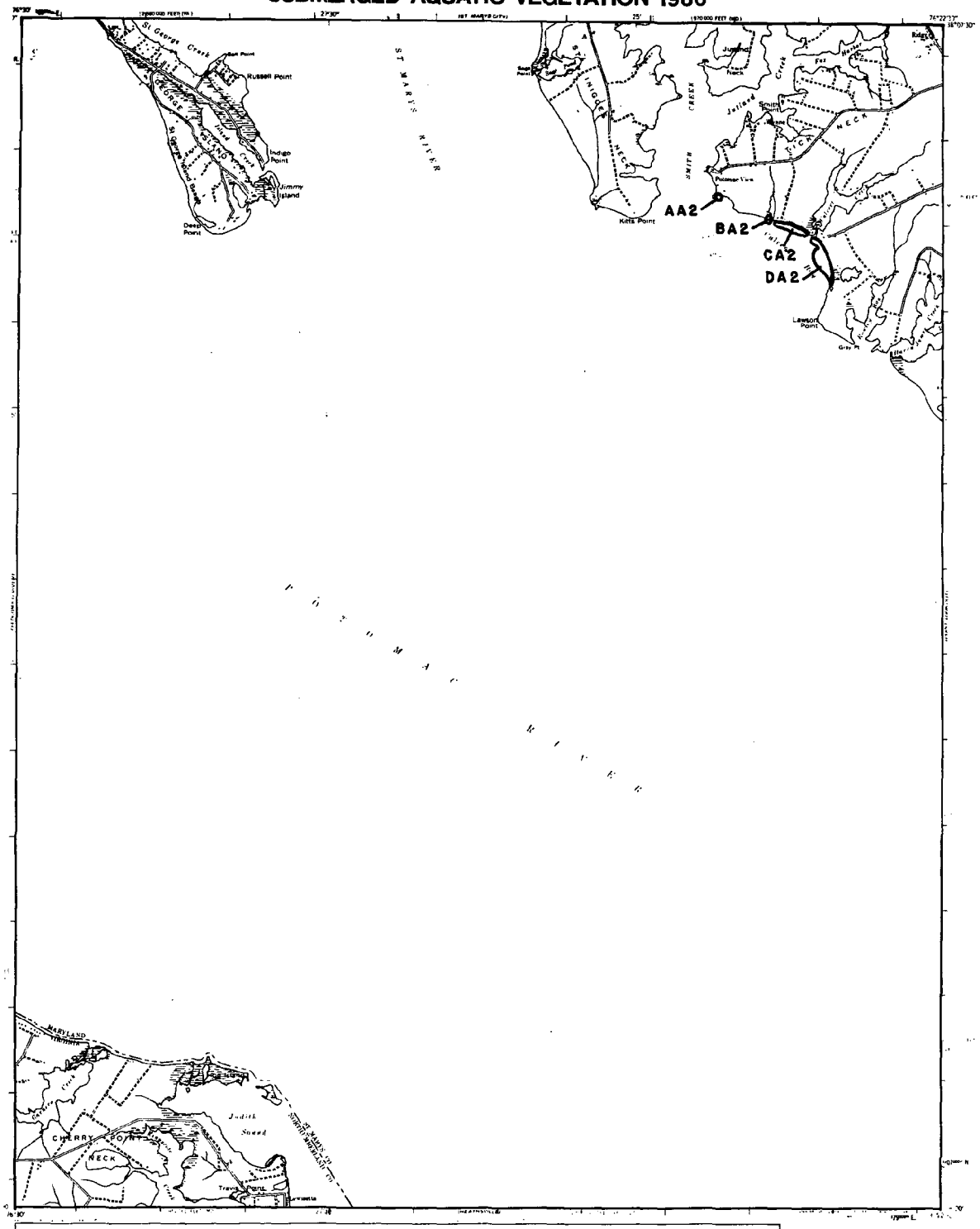
KILOMETER .5 0

MONIE, MD

85

DATE FLOWN 10/19/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)		
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)		
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)		
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)		
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)		
Zp	*Zannichella palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)		
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)		
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)		
Va	*Vallisneria americana* (wild celery)				

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

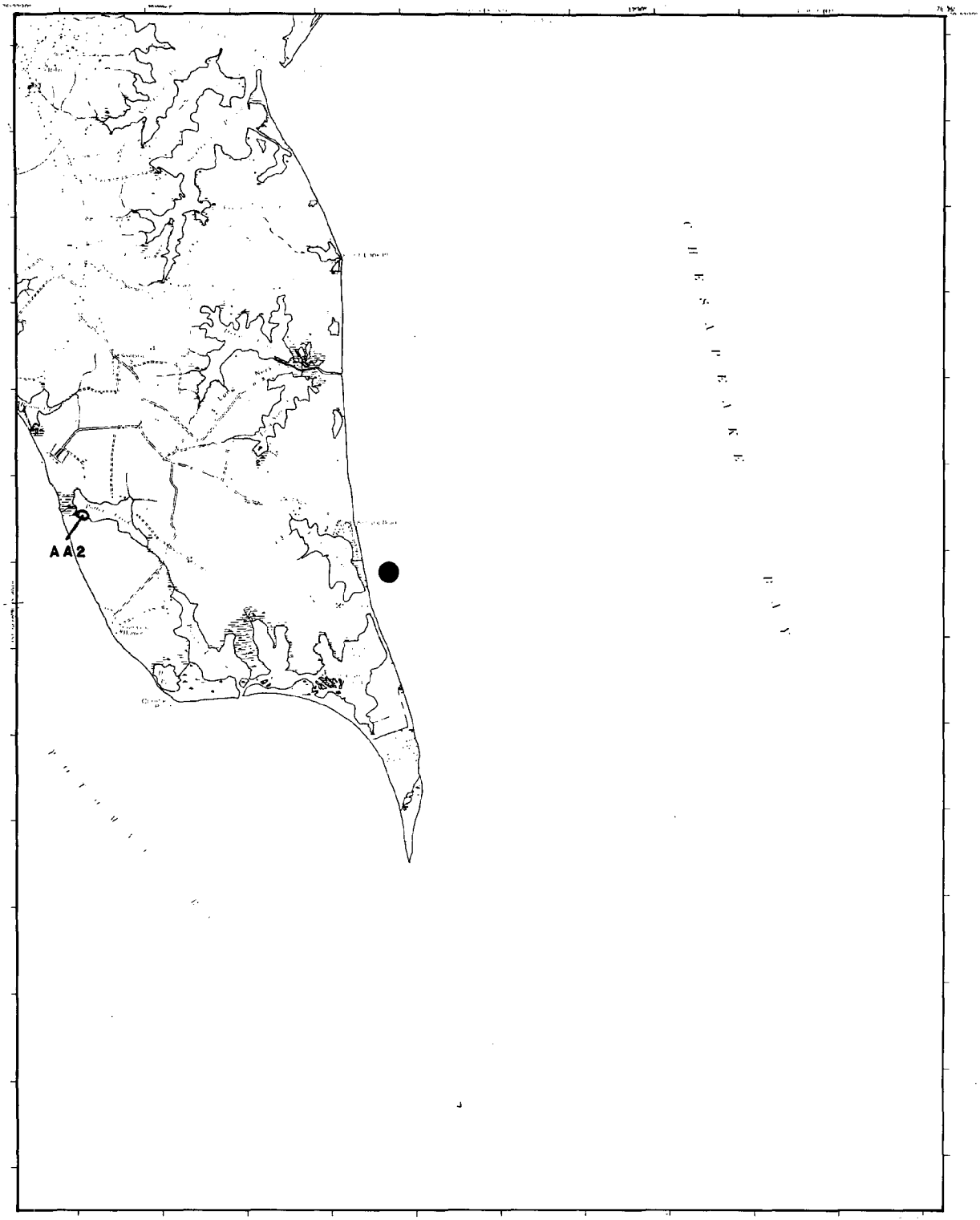
1 .5 0 1 KILOMETER

ST. GEORGE ISLAND, MD

89

DATE FLOWN 10/19/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)		
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)		
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)		
Pdf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)		
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)		
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)		
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)		
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)		
Va	*Vallisneria americana* (wild celery)				

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

POINT LOOKOUT, MD

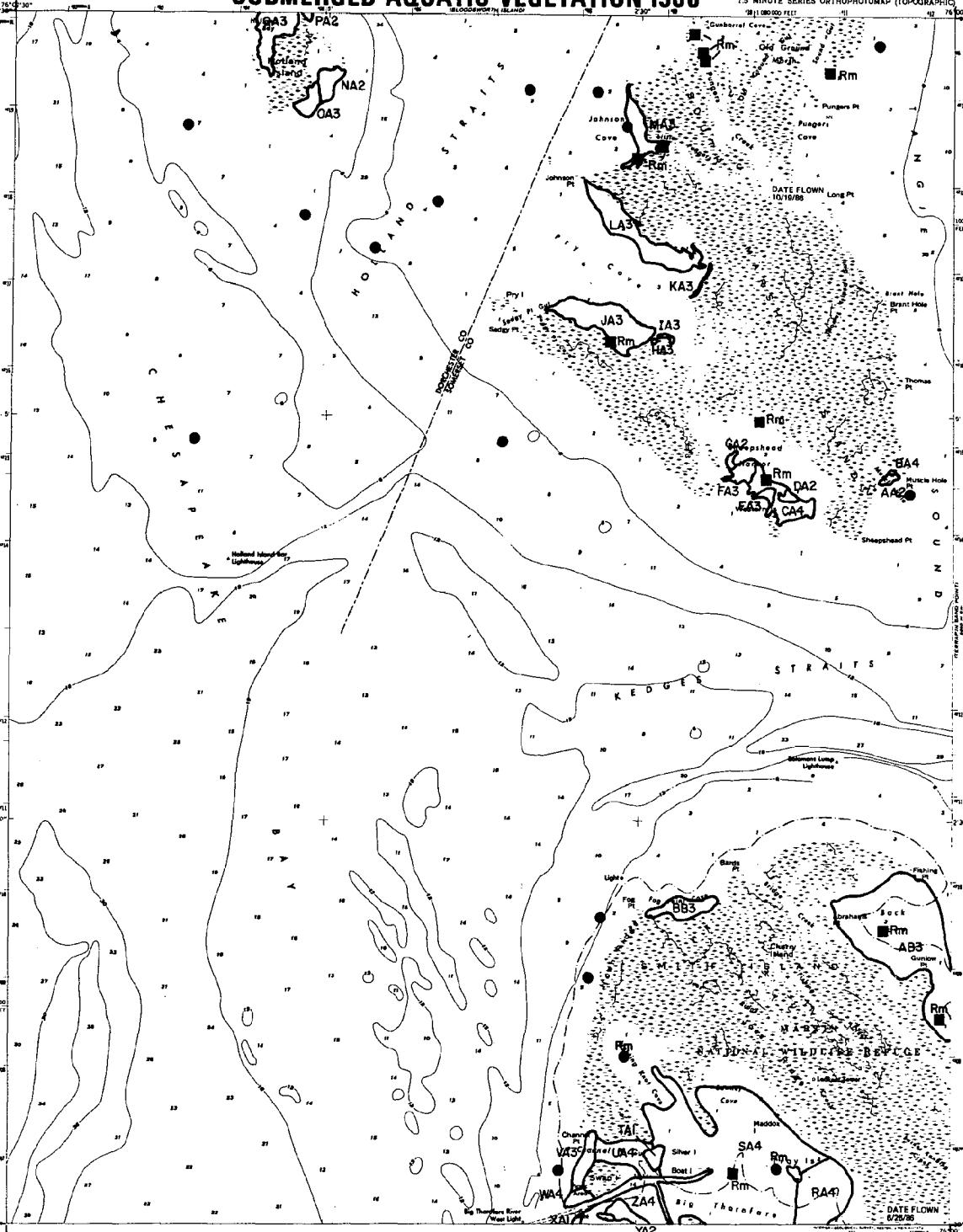
90

DATE FLOWN 10/19/86

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMERGED AQUATIC VEGETATION 1986

KEDGES STRAITS QUADRANGLE
MARYLAND
7.5 MINUTE SERIES ORTHOPHOTOMAP (TOPOGRAPHIC)



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichella palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIMS

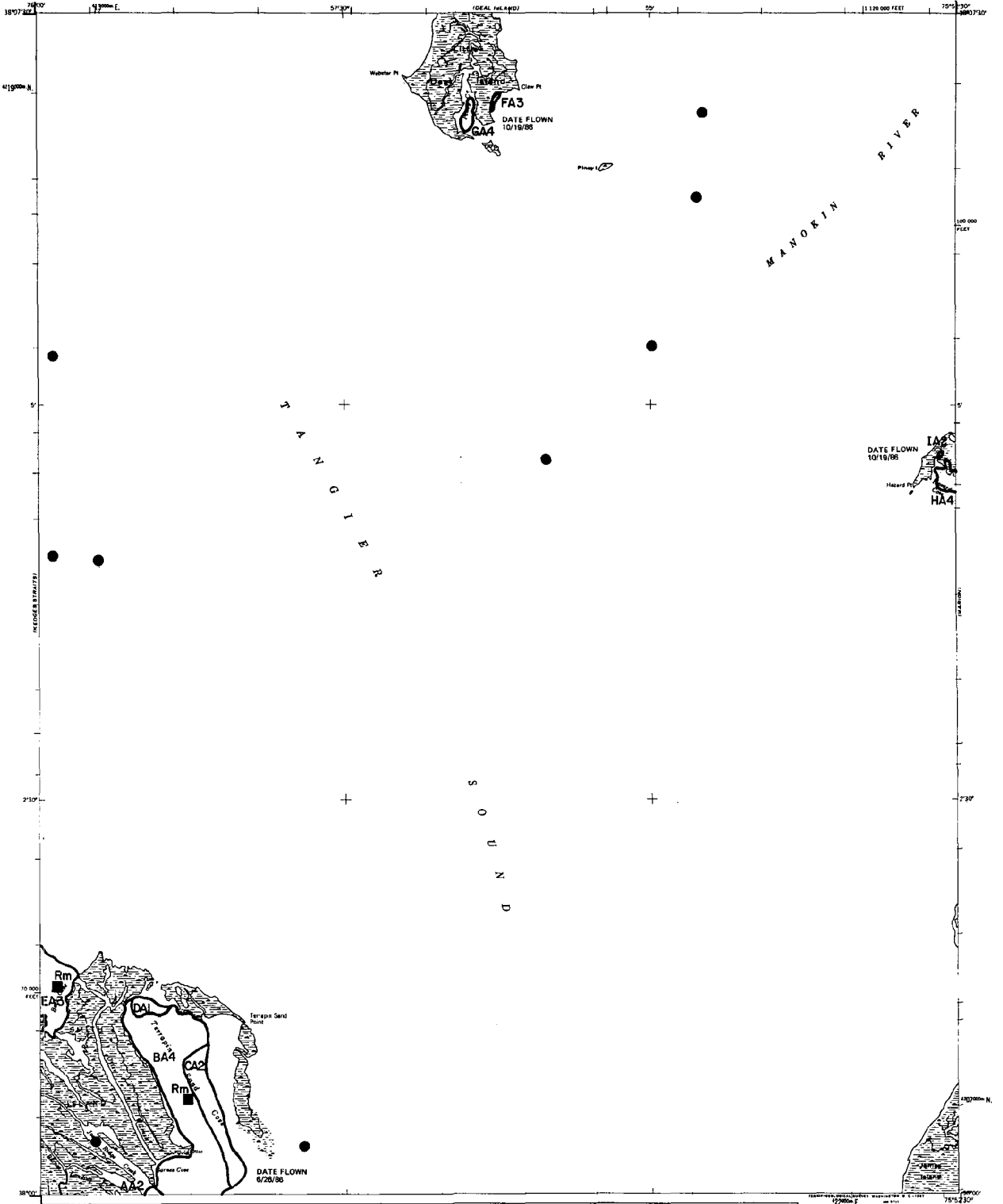
KEDGES STRAITS, MD.

KEDGES STRAITS, MD.
N3800—W7600/7.5
91
ANS 5760 I IES V8330

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMERGED AQUATIC VEGETATION 1986

TERRAPIN SAND POINT QUADRANGLE
MARYLAND-SOMERSET CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
SW/4 DEAL ISLAND 15' QUADRANGLE



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

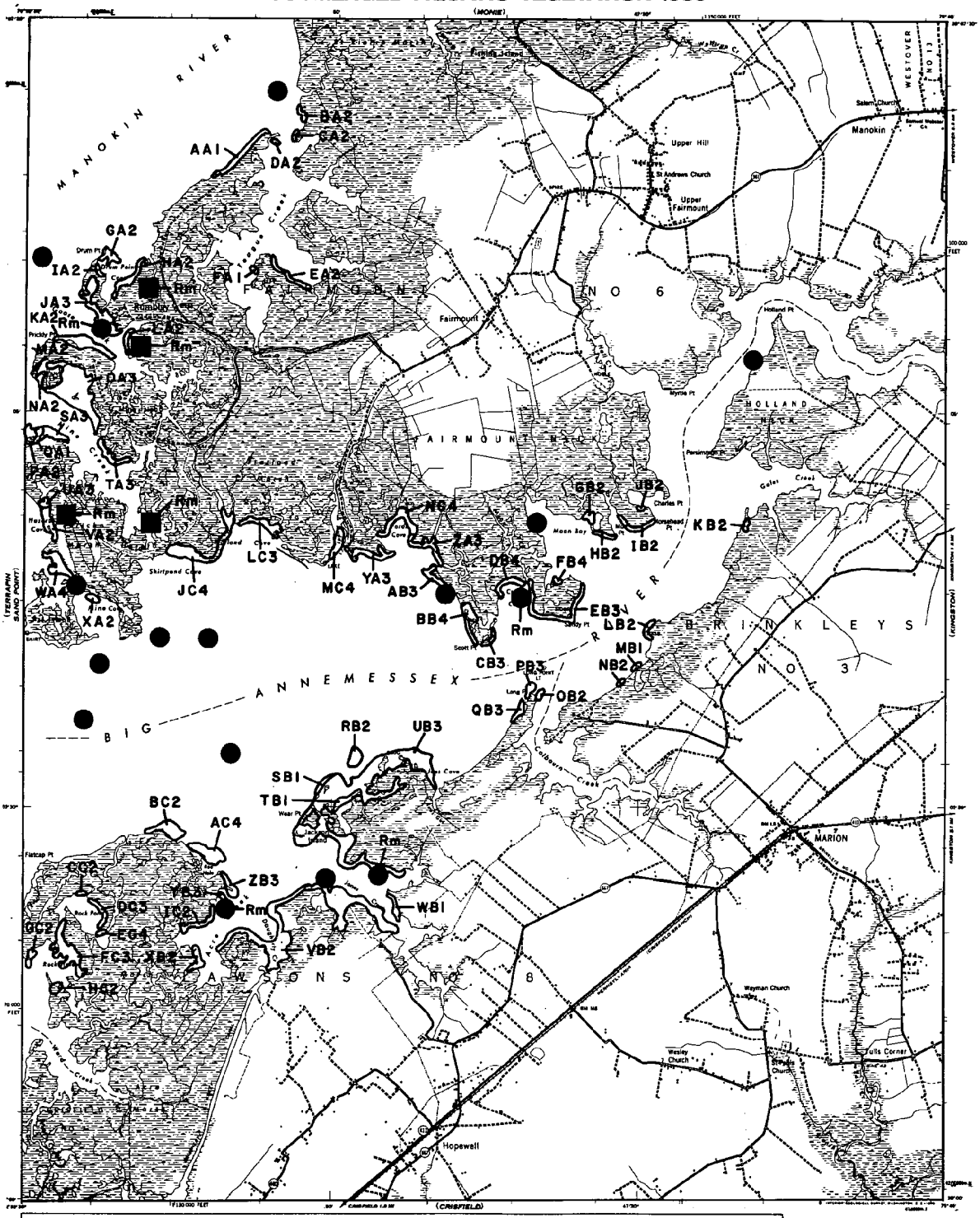
VIMS

TERRAPIN SAND POINT, MD.

TERRAPIN SAND POINT, MD.
SW/4 DEAL ISLAND 15' QUADRANGLE
N3800—W7552.5/7.5

92

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichellia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ U.S.G.S.

SCALE 1:24,000

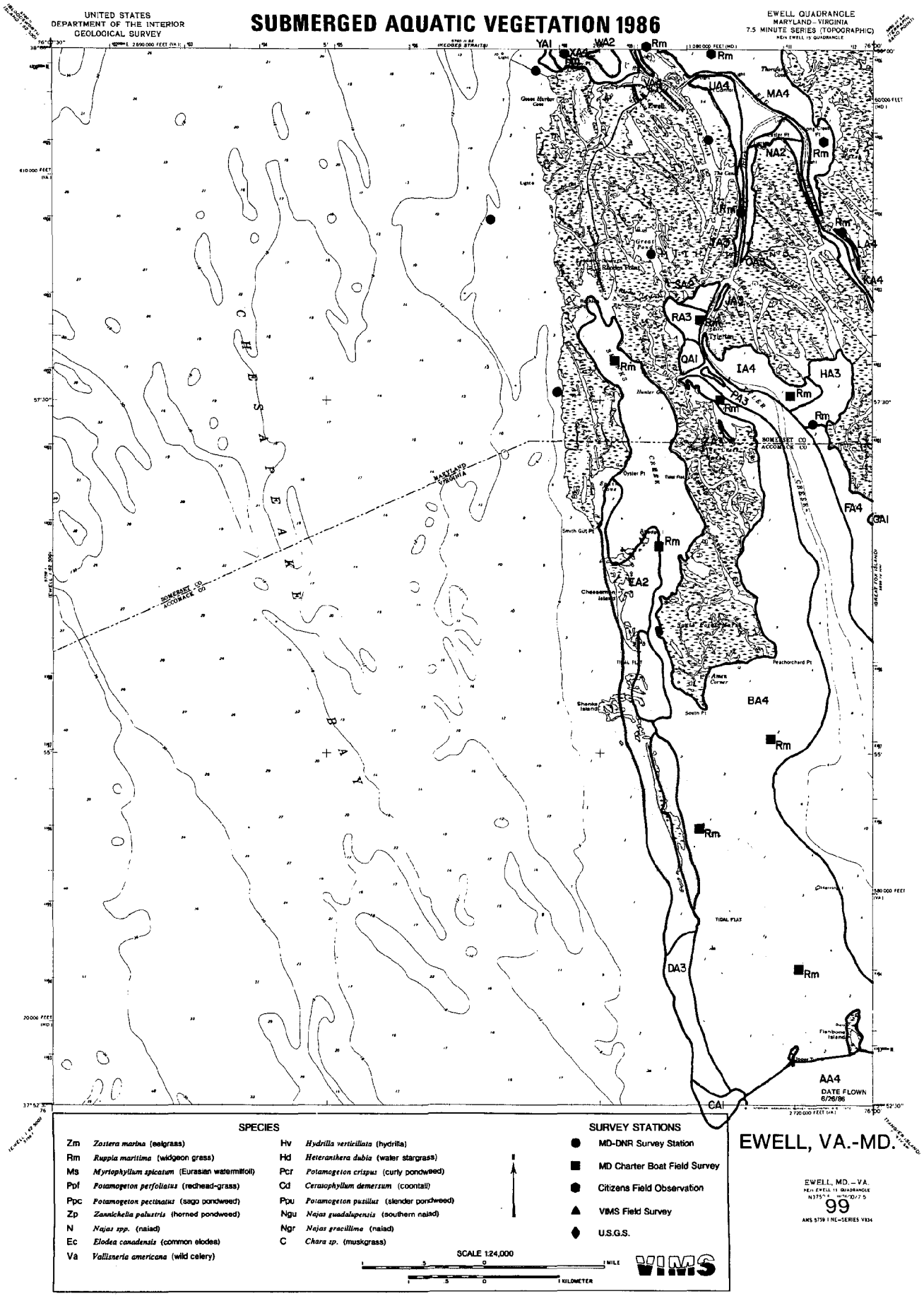
1 .5 0 1 MILE

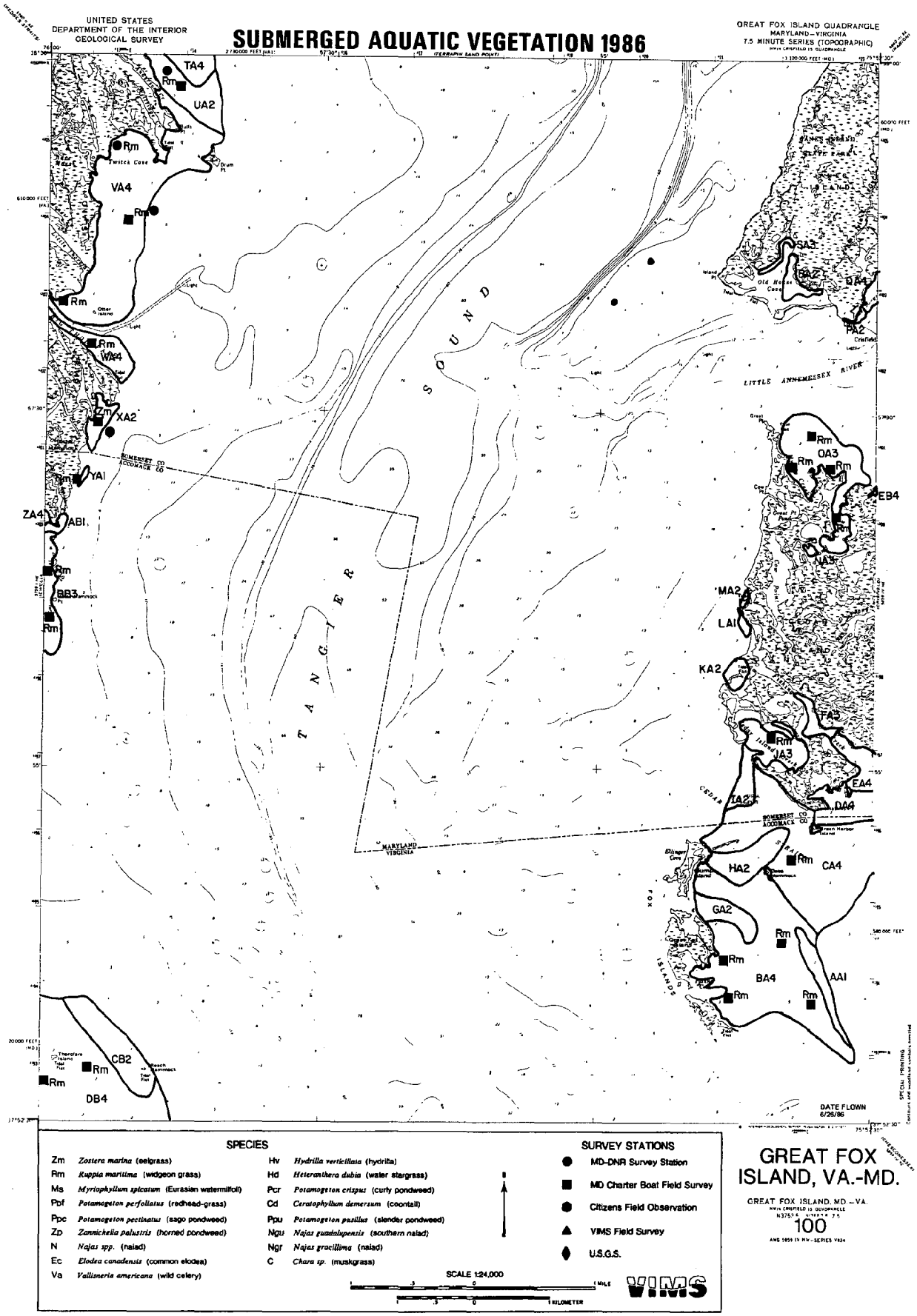
1 .5 0 1 KILOMETER

MARION, MD

93

DATE FLOWN 10/19/86

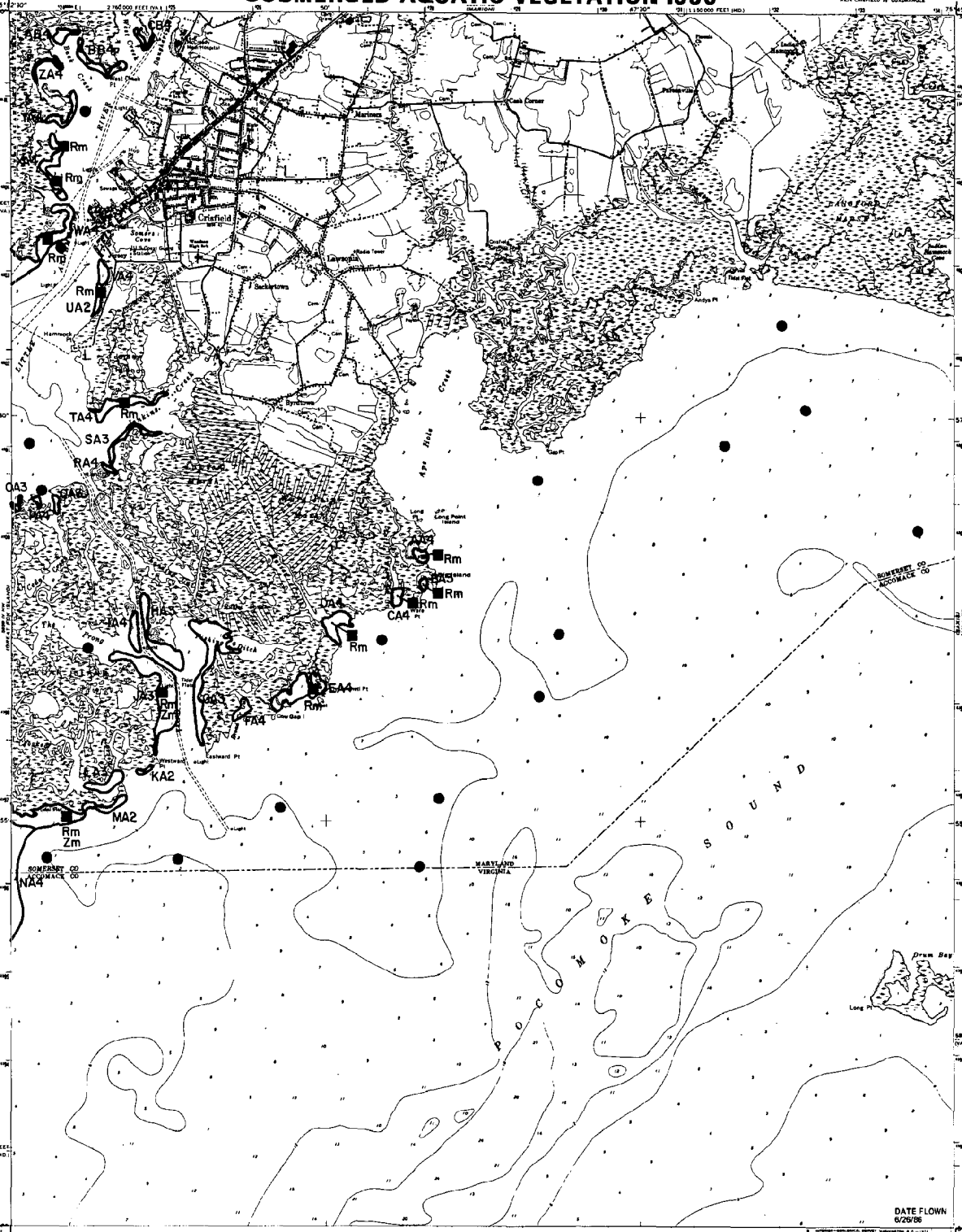

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
SUBMERGED AQUATIC VEGETATION 1986
EWELL QUADRANGLE
MARYLAND-VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)
YA1
WA2
Rm
UA4
MA4
NA2
LA4
KA4
RA3
QA1
IA4
HA3
FA4
GA1
EA2
BA4
DA3
AA4
CA1
CHESAPEAKE BAY
MARYLAND
VIRGINIA
SOMERSET CO
ACCOMACK CO
DATE FLOWN
6/26/86
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichelia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
SURVEY STATIONS
MD-DNR Survey Station
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S.
SCALE 1:24,000
1 MILE
1 KILOMETER
VIMS
EWELL, VA.-MD.
EWELL, MD.-VA.
99


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
SUBMERGED AQUATIC VEGETATION 1986
GREAT FOX ISLAND QUADRANGLE
MARYLAND–VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)
TA4
UA2
VA4
WA4
XA2
YA1
ZA4
AB1
BB3
CB2
DB4
SA3
BA2
DA4
PA2
OA3
EB4
NA3
MA2
LA1
KA2
FA3
JA3
EA4
DA4
IA2
HA2
CA4
GA2
BA4
AA1
TANGIER SOUND
LITTLE ANNEMESSEX RIVER
SOMERSET CO
ACCOMACK CO
MARYLAND
VIRGINIA
CEDAR
FOX ISLANDS
DATE FLOWN
6/26/86
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichelia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
SURVEY STATIONS
MD-DNR Survey Station
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S.
SCALE 1:24,000
1 MILE
1 KILOMETER
VIMS
GREAT FOX
ISLAND, VA.-MD.
GREAT FOX ISLAND, MD.–VA.
100

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMERGED AQUATIC VEGETATION 1986

CRISFIELD QUADRANGLE
MARYLAND–VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)



DATE FLOWN
6/26/86

ROAD CLASSIFICATION

CRISFIELD, VA.-MD.

CRISFIELD, MD.–VA.
NE/1 CRISFIELD 1V QUADRANGLE
N3752.5—W7545/7.5

101 1969 IV NE–SERIES V833

SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

1 MILE

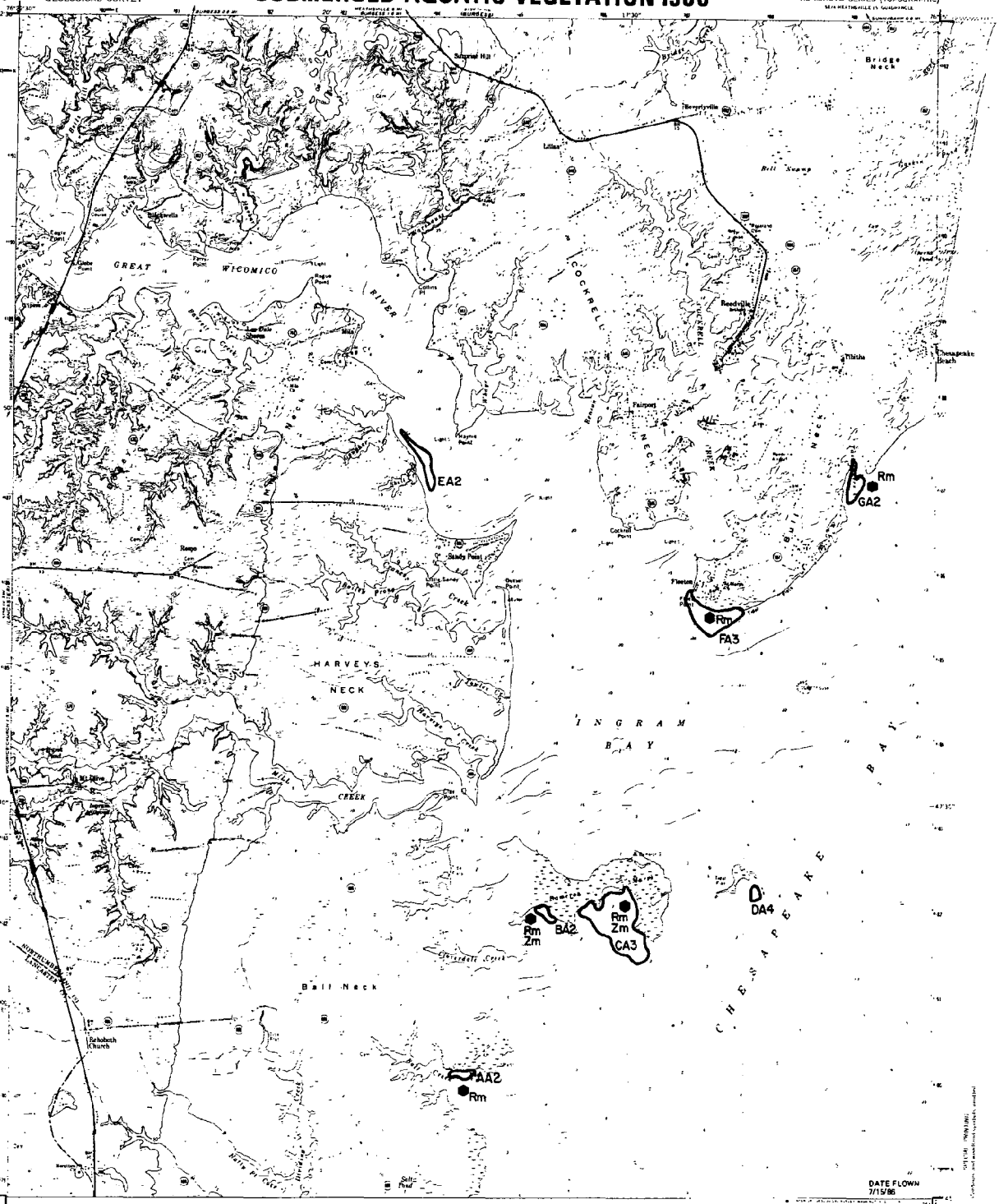
1 KILOMETER

VIMS

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMERGED AQUATIC VEGETATION 1986

REEDVILLE QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)



DATE FLOWN
7/15/86

ROAD CLASSIFICATION

REEDVILLE, VA.

REEDVILLE, VA.

106

SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

1 MILE

1 KILOMETER

VIMS

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMERGED AQUATIC VEGETATION 1986

TANGIER ISLAND QUADRANGLE
VIRGINIA–ACCOMACK CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichella palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

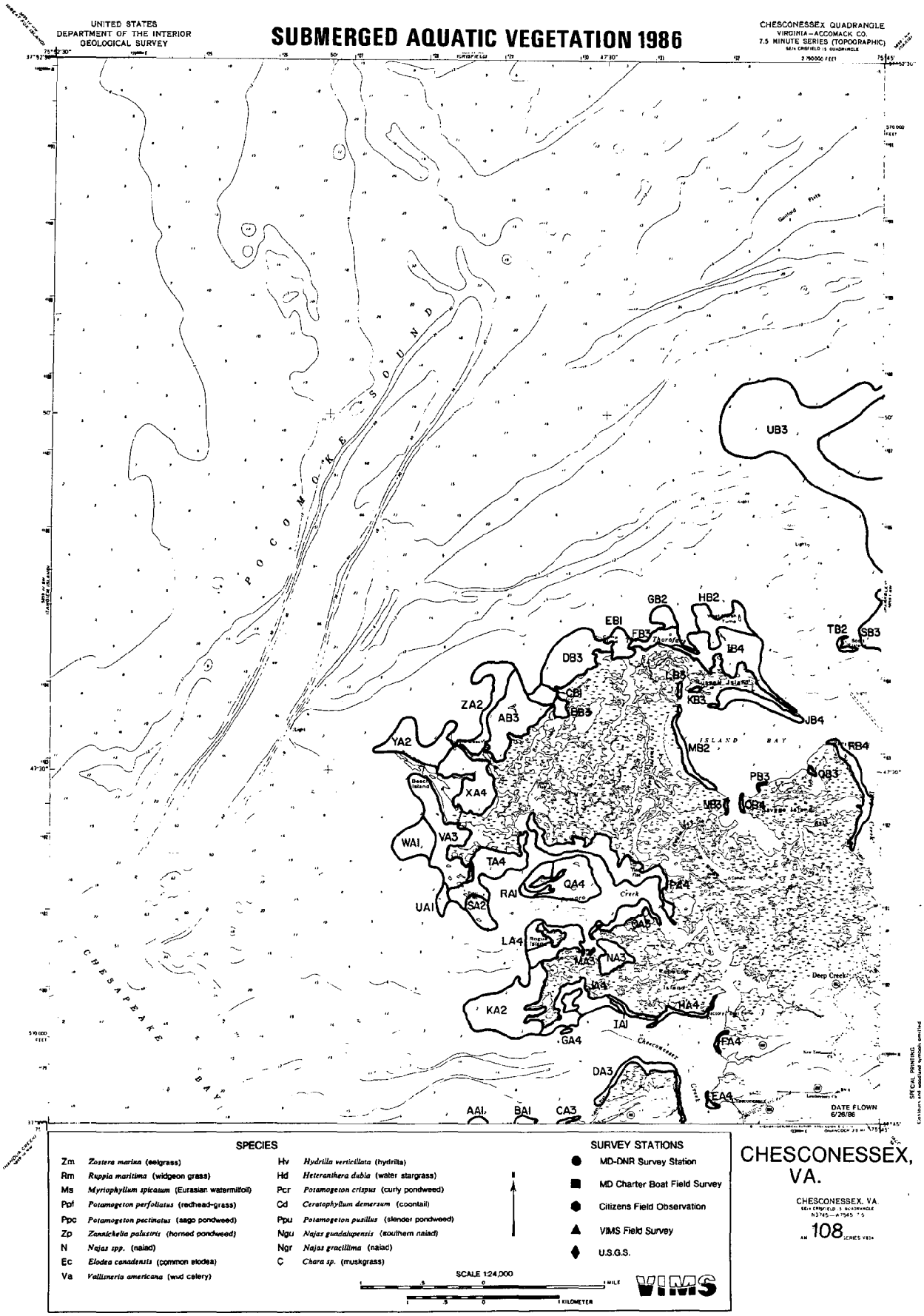
- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

VIMS

ROAD CLASSIFICATION
Light-duty road, all weather, improved surface

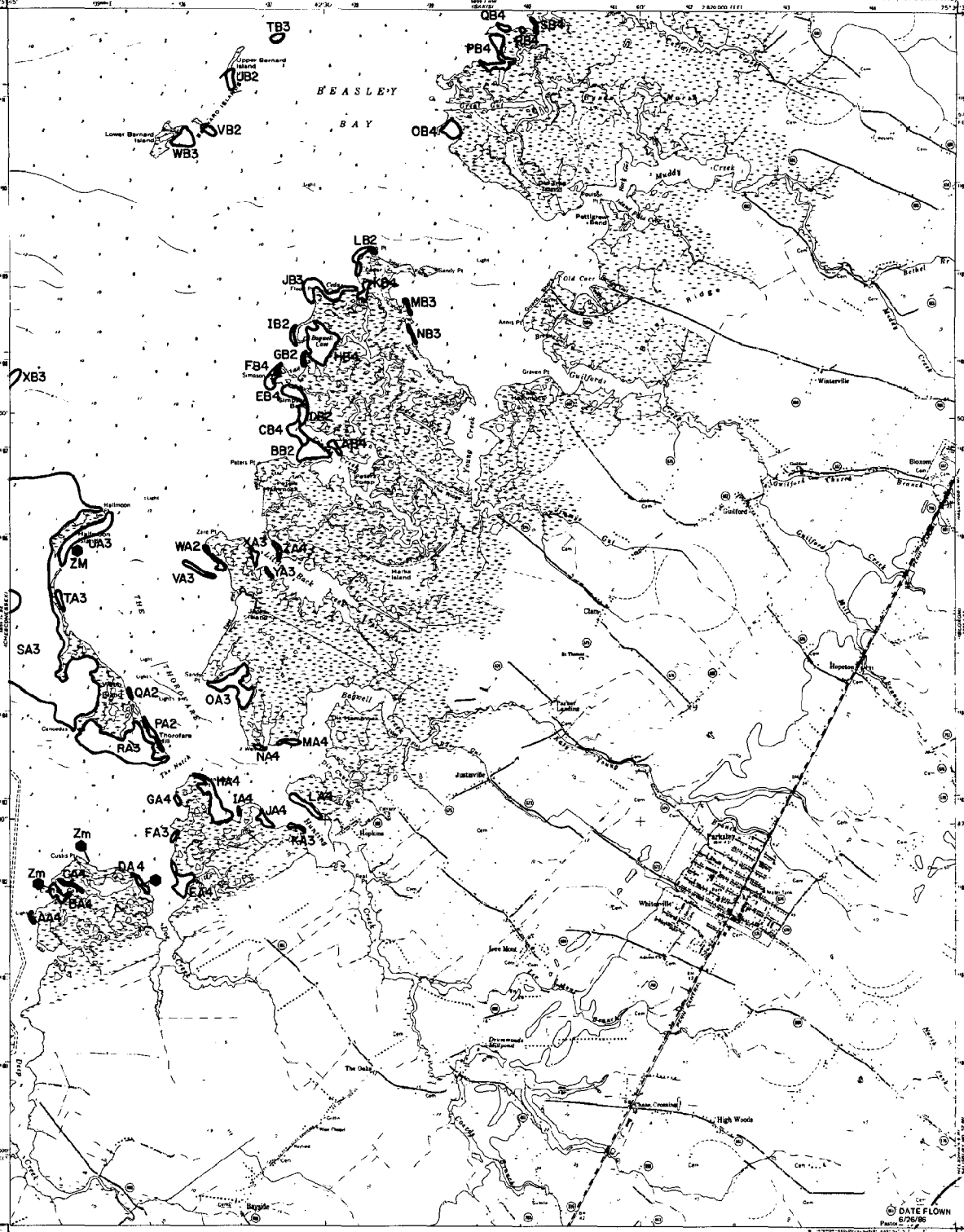
TANGIER ISLAND, VA.
107


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
SUBMERGED AQUATIC VEGETATION 1986
CHESCONESSEX QUADRANGLE
VIRGINIA—ACCOMACK CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
POCOMOKE SOUND
CHESAPEAKE BAY
ISLAND BAY
UB3
GB2
HB2
EB1
FB3
DB3
IB4
TB2
SB3
LB3
KB3
CB1
BB3
ZA2
AB3
JB4
YA2
MB2
RB4
PB3
QB3
XA4
NB3
OB4
WA1
VA3
TA4
QA4
RA1
PA4
UA1
SA2
LA4
MA3
NA3
JA4
HA4
KA2
IA1
GA4
FA4
DA3
EA4
AA1
BA1
CA3
Deep Creek
DATE FLOWN
6/26/86
SPECIAL PRINTING
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichelia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
SURVEY STATIONS
MD-DNR Survey Station
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S.
SCALE 1:24,000
1 MILE
1 KILOMETER
VIMS
CHESCONESSEX, VA.
CHESCONESSEX, VA.
108

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMERGED AQUATIC VEGETATION 1986

PARKSLEY QUADRANGLE
VIRGINIA–ACCOMACK CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIMS

ROAD CLASSIFICATION

Light duty road all weather improved surface

PARKSLEY, VA.

PARKSLEY, VA.
N3745—W7517.5 7.5

109 V-SERIES V834

SPECIAL PRINTING
Contours and woodland symbols omitted

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMERGED AQUATIC VEGETATION 1986

IRVINGTON QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)

SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)		
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)		
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)		
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)		
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)		
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)		
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)		
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)		
Va	*Vallisneria americana* (wild celery)				

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S.

SCALE 1:24,000

1 MILE

1 KILOMETER

VIMS

ROAD CLASSIFICATION

Light-duty road, all weather, unimproved surface

Unimproved road, fair or dry

IRVINGTON, VA.

IRVINGTON, VA.
N3737.5—W7622.5/7.5

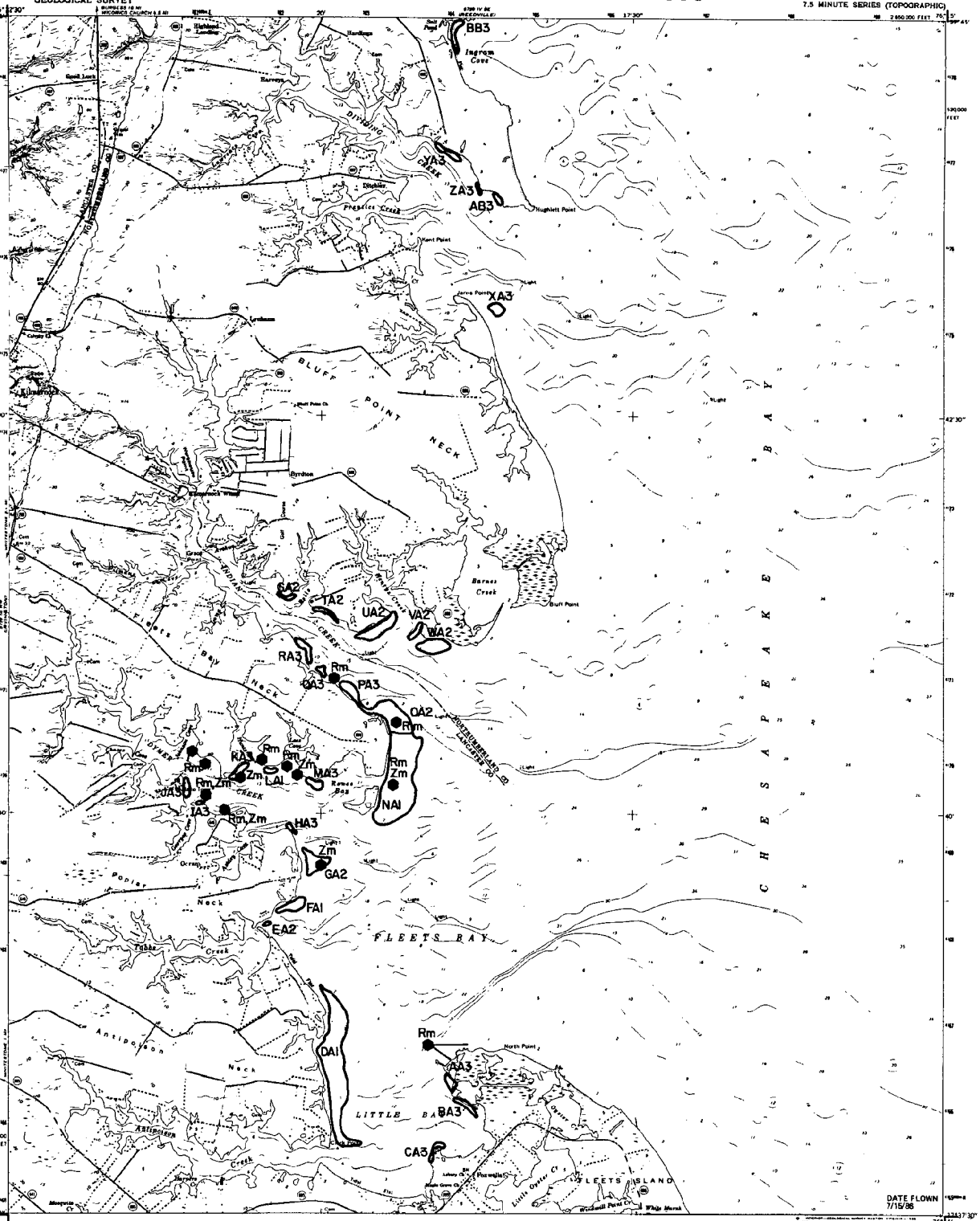
111

1968
REVISED 1979
I NW-SERIES V834

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMERGED AQUATIC VEGETATION 1986

FLEETS BAY QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichella palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIMS

ROAD CLASSIFICATION
Hy highway, all weather surface — Light-duty road, all weather, improved surface

FLEETS BAY, VA.

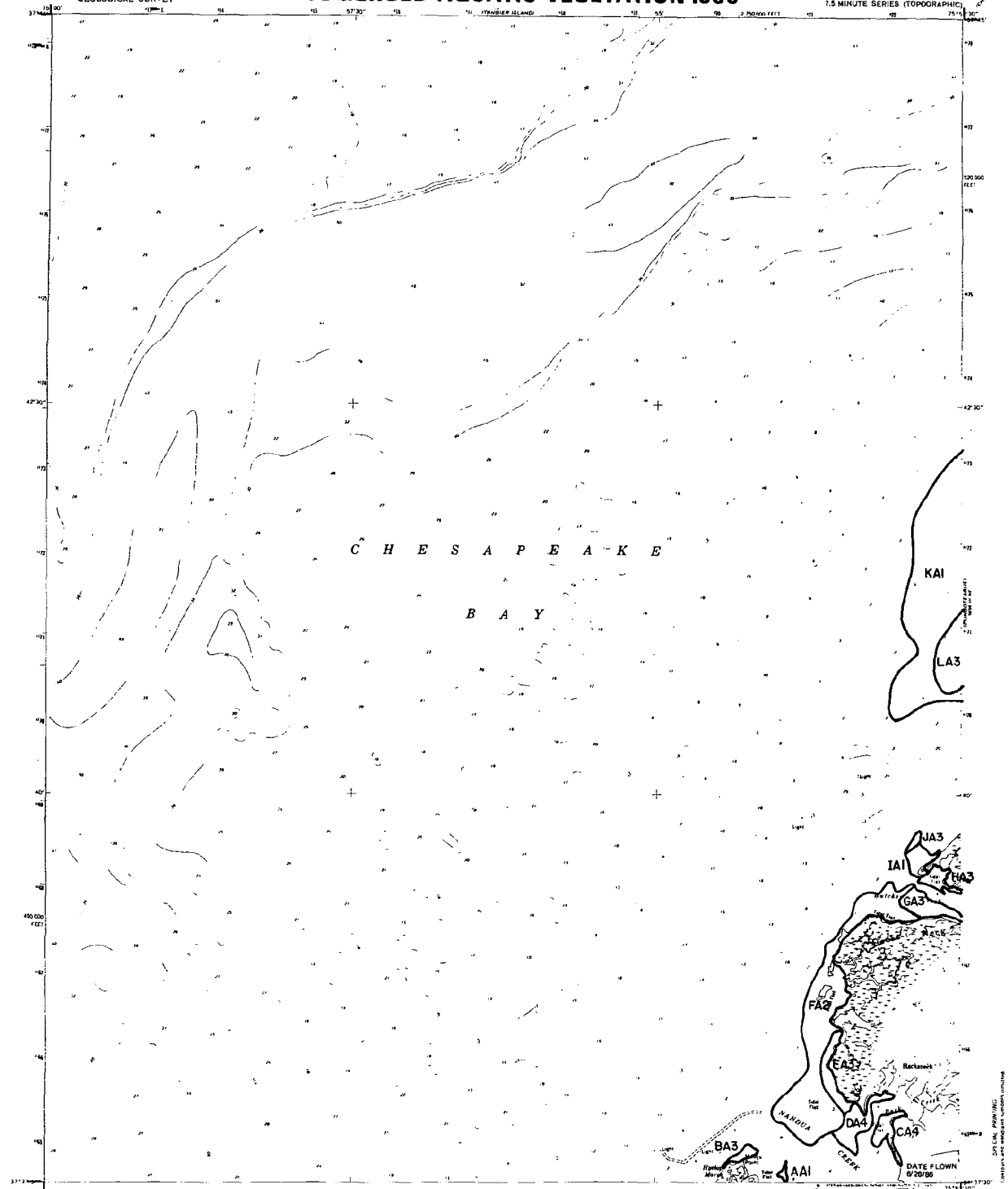
FLEETS BAY, VA.
N37°37'5—W76°15'7'5

112 1968 PECTED 1978 YE-SERIES 1984

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMERGED AQUATIC VEGETATION 1986

NANDUA CREEK QUADRANGLE
VIRGINIA–ACCOMACK CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppl	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichella palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

VIMS

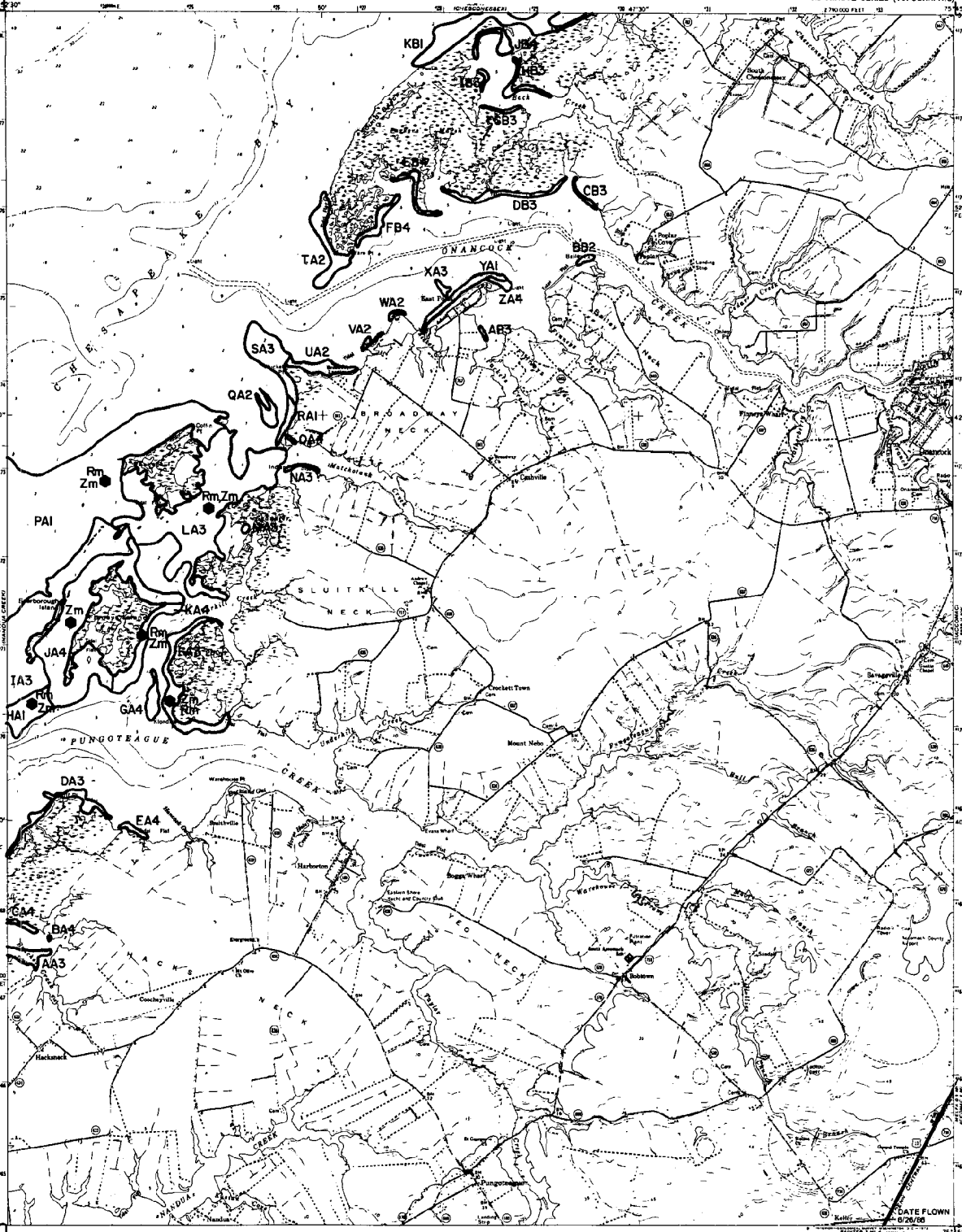
NANDUA CREEK, VA.

NANDUA CREEK, VA.
113

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMERGED AQUATIC VEGETATION 1986

PUNGOTEAGUE QUADRANGLE
VIRGINIA—ACCOMACK CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichella palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIMS

ROAD CLASSIFICATION

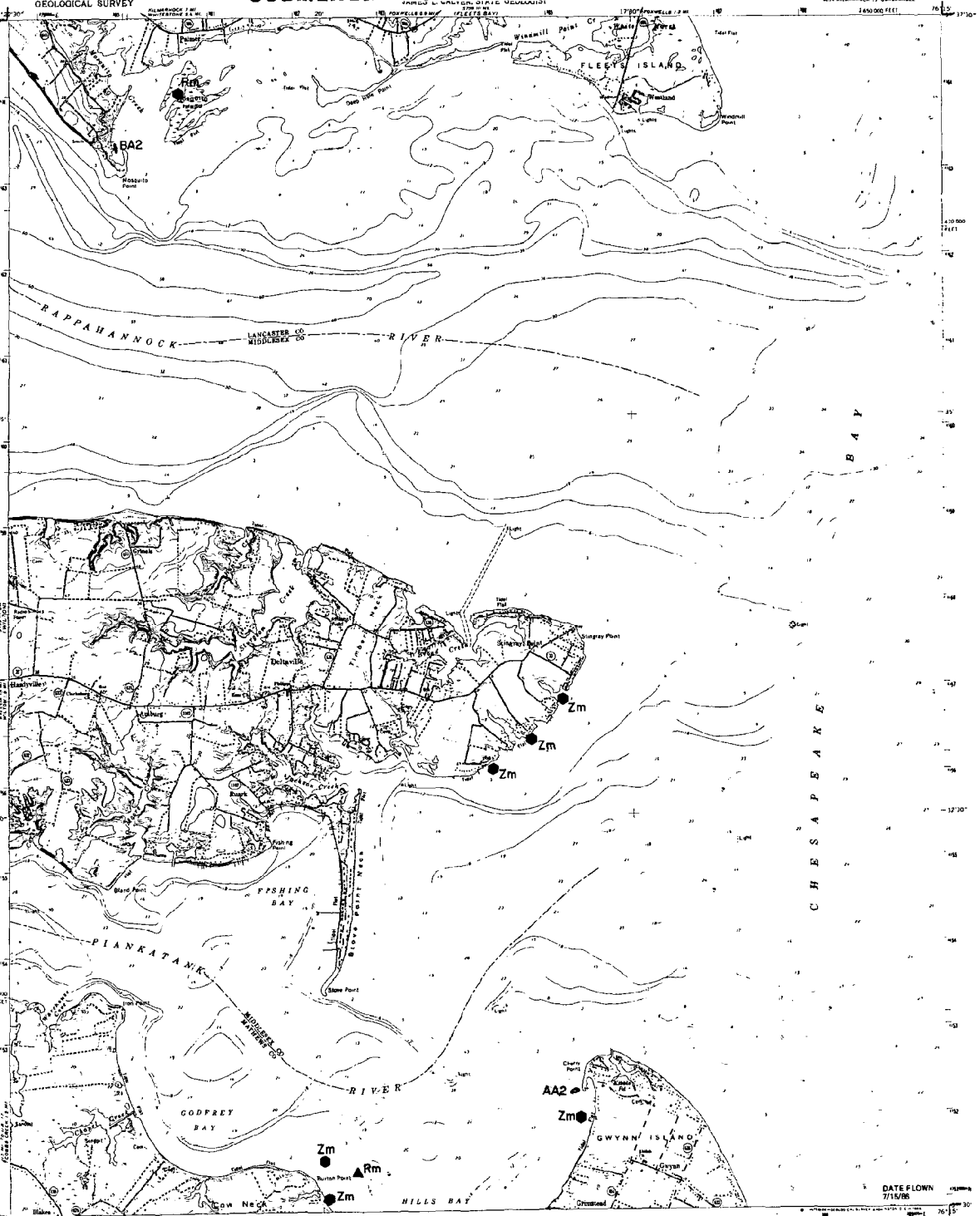
PUNGOTEAGUE, VA.

PUNGOTEAGUE, VA.
N3737.5—W7545/7.5
114

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMERGED AQUATIC VEGETATION 1986

DELTAVILLE QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)



DATE FLOWN
7/15/86

SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichellia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

ROAD CLASSIFICATION

DELTAVILLE, VA.

DELTAVILLE, VA.
NEW KILMARNOCK 15' QUADRANGLE
N3730—W7615/7.5

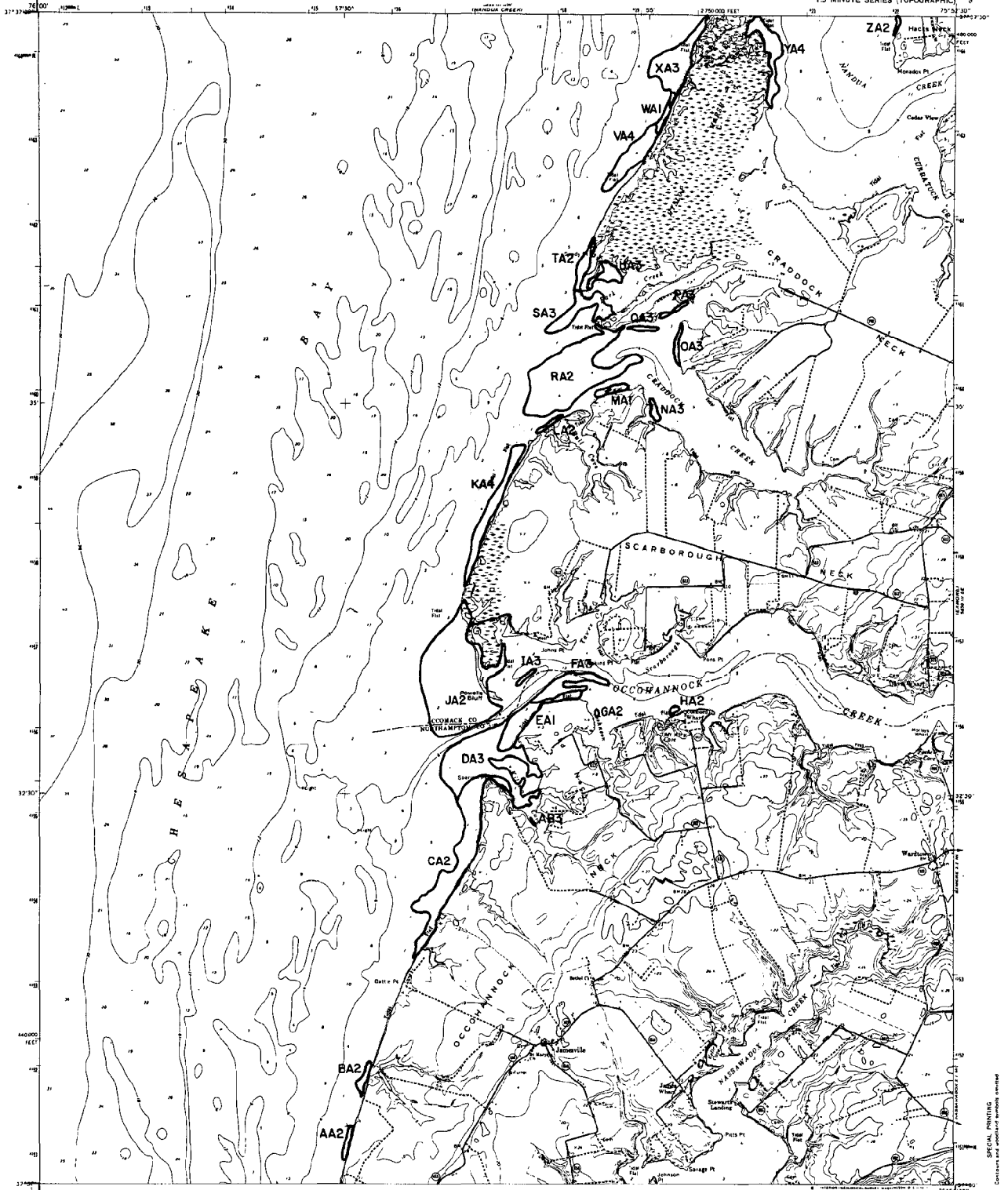
118 1964 SE-SERIES V834

VIMS

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMERGED AQUATIC VEGETATION 1986

JAMESVILLE QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichellia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

.5 0 1 MILE

.5 0 1 KILOMETER

VIMS

ROAD CLASSIFICATION

Primary highway, all weather surface — Light duty road, all weather improved surface — Unimproved road, fair or dry

JAMESVILLE, VA.

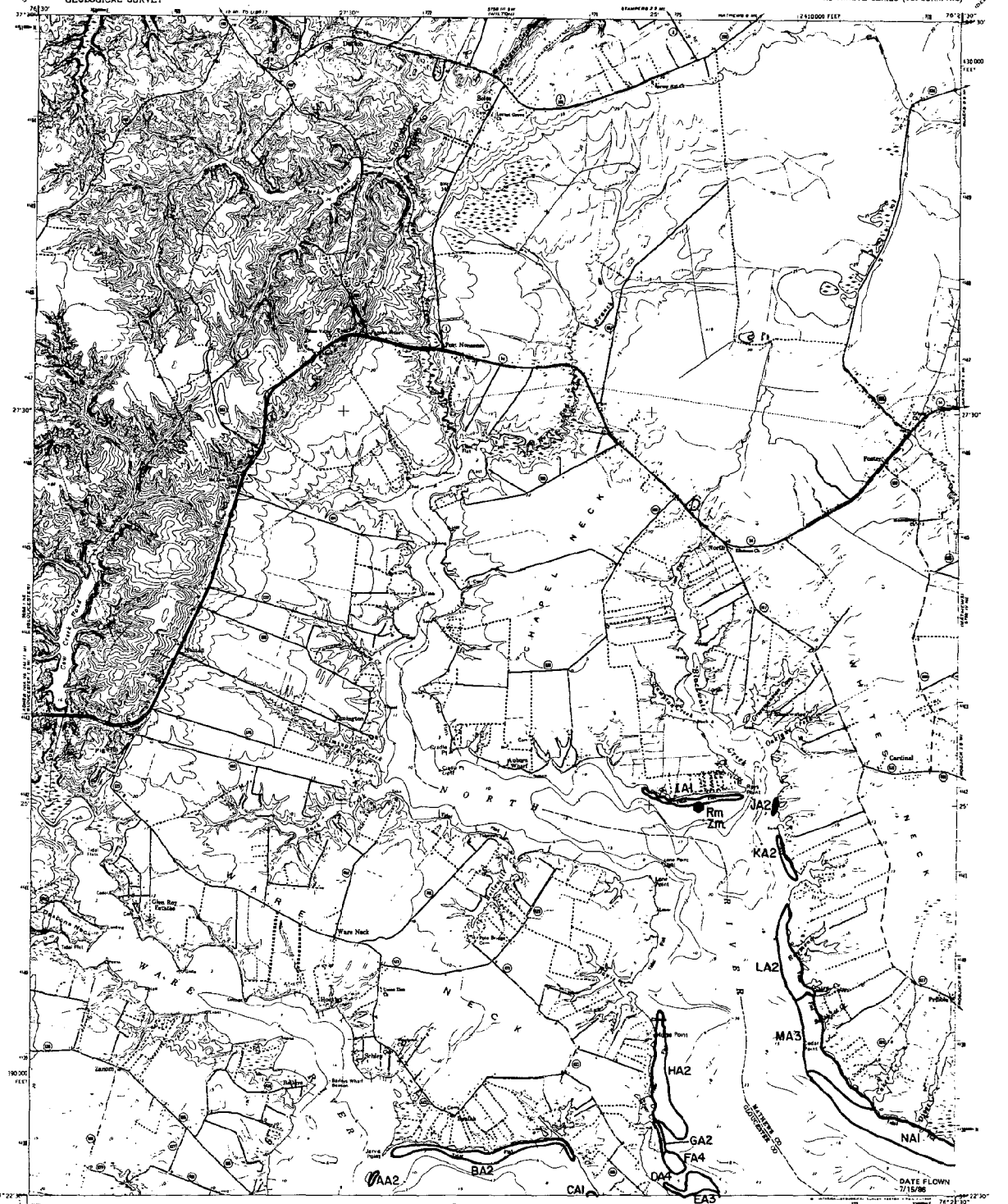
JAMESVILLE, VA.
N3730—W7552.5/7.5
119 1968
III SW—SERIES V834

SPECIAL PRINTING
Contours and underlined symbols omitted

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMERGED AQUATIC VEGETATION 1986

WARE NECK QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Pof	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

VIMS

ROAD CLASSIFICATION
Heavy-duty — Light-duty
Medium-duty — Unimproved dirt

WARE NECK, VA.

WARE NECK, VA.

N3722.5—W7622.5/7.5

122 1955 REVISED 1980
7 NW—SERIES V834

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMERGED AQUATIC VEGETATION 1986

MATHEWS QUADRANGLE
VIRGINIA–MATHEWS CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppl	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichellia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIMS

ROAD CLASSIFICATION
Heavy-duty — Light duty
Medium-duty — Unimproved dirt

MATHEWS, VA.

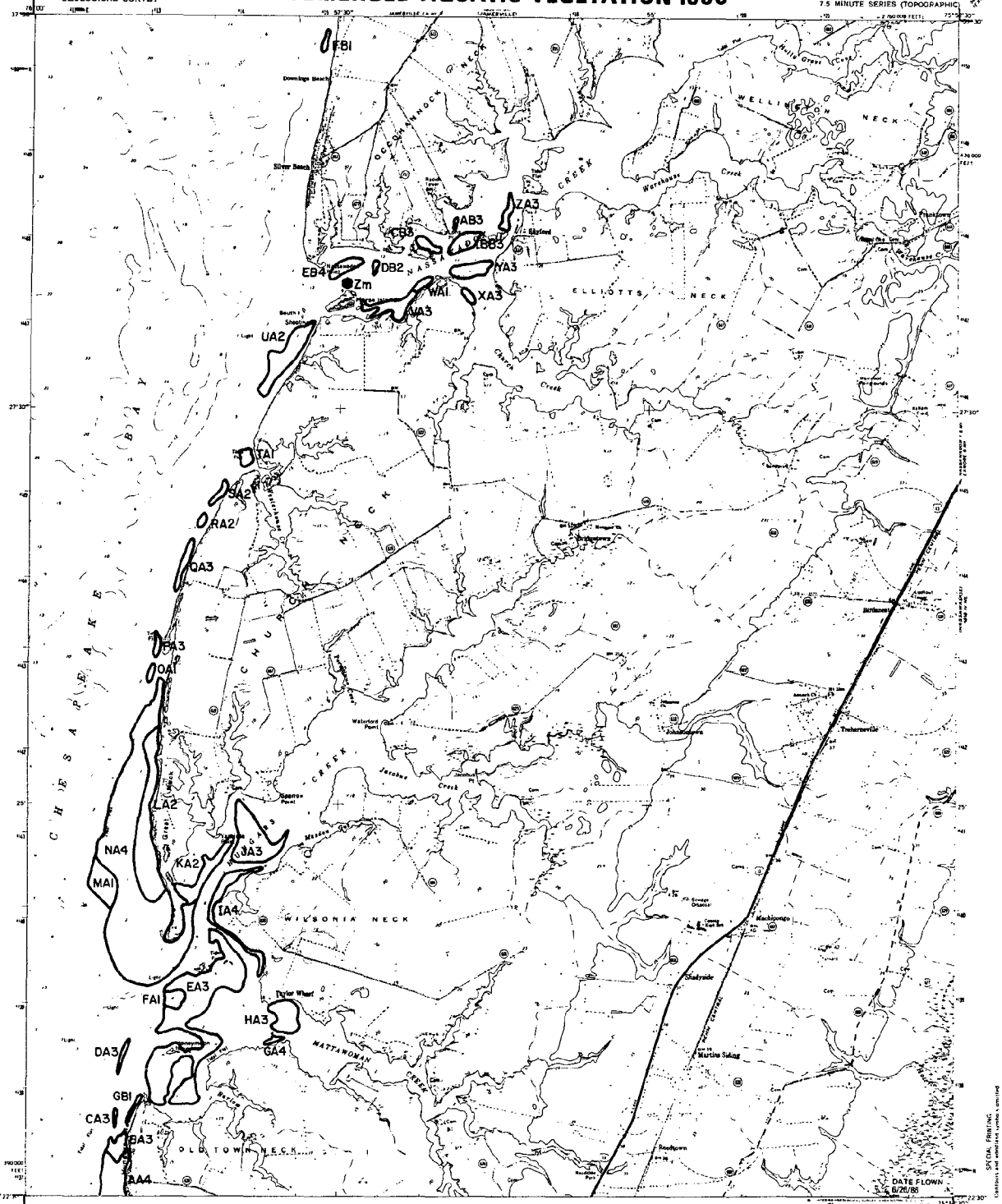
MATHEWS, VA.
NE/4 MATHEWS 15 QUADRANGLE
N3722.5—W7615/7.5

123 1965
NE—SERIES V834

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMERGED AQUATIC VEGETATION 1986

FRANKTOWN QUADRANGLE
VIRGINIA–NORTHAMPTON CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S.

SCALE 1:24,000

1 MILE

1 KILOMETER

VIMS

ROAD CLASSIFICATION

ary highway surface — all weather — Light duty road improved surface — all weather

ndary highway surface — all weather — Unimproved road weather — fair or dry

FRANKTOWN, VA.

FRANKTOWN, VA.
N3722.5—W7552.5-7.5

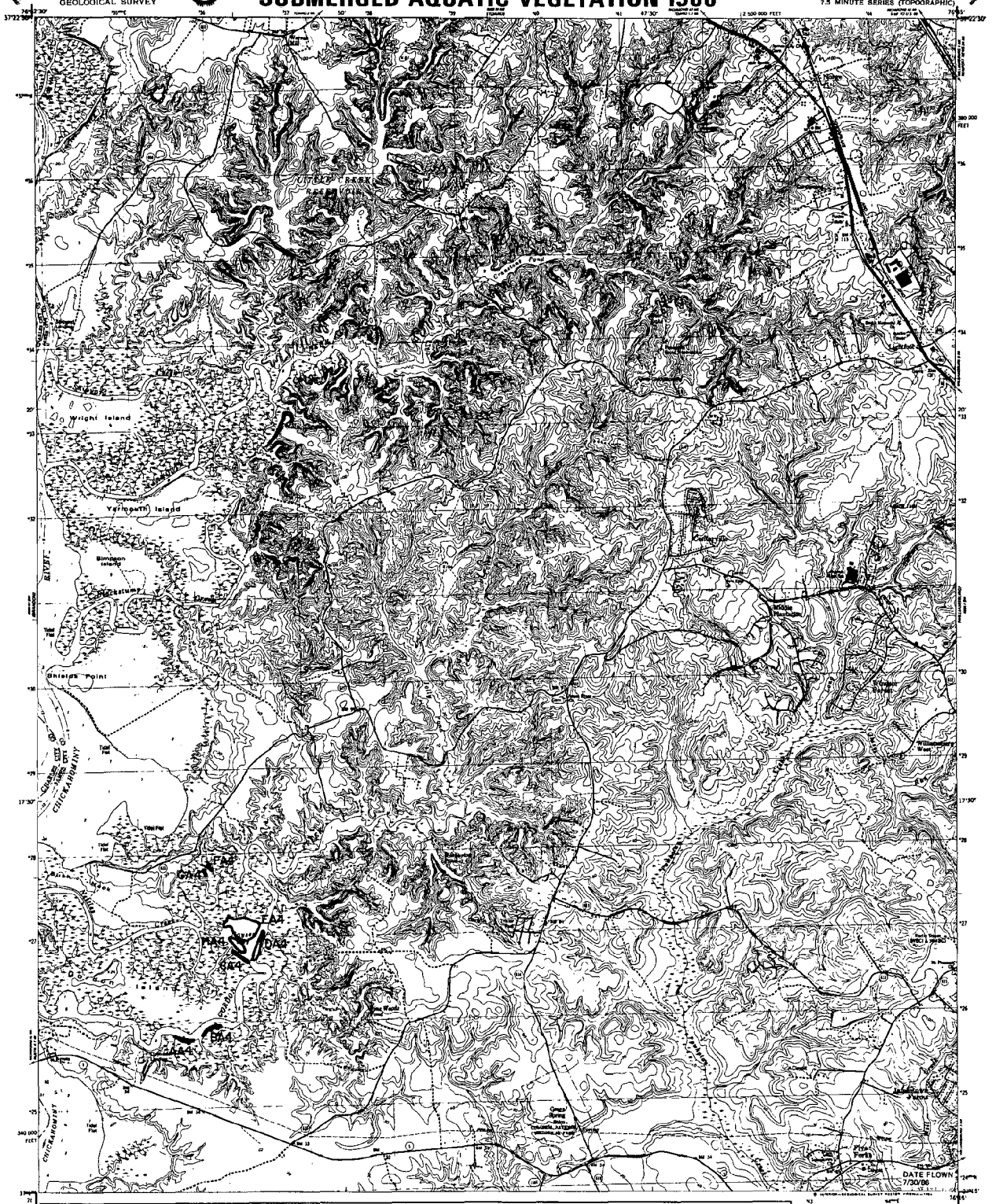
124 1968 NW—SERIES V834

SPECIAL PRINTING
Contours and woodland symbols omitted

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMERGED AQUATIC VEGETATION 1986

NORGE QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)



ROAD CLASSIFICATION

NORGE, VA.

Interstate Route · U. S. Route · State Route

NORGE, VA.
37076-C7-TF-024

128

SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIMS

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMERGED AQUATIC VEGETATION 1986

ACHILLES QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)

SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIMS

ROAD CLASSIFICATION

Heavy-duty — Light-duty
Medium-duty — Unimproved dirt

ACHILLES, VA.

ACHILLES, VA.

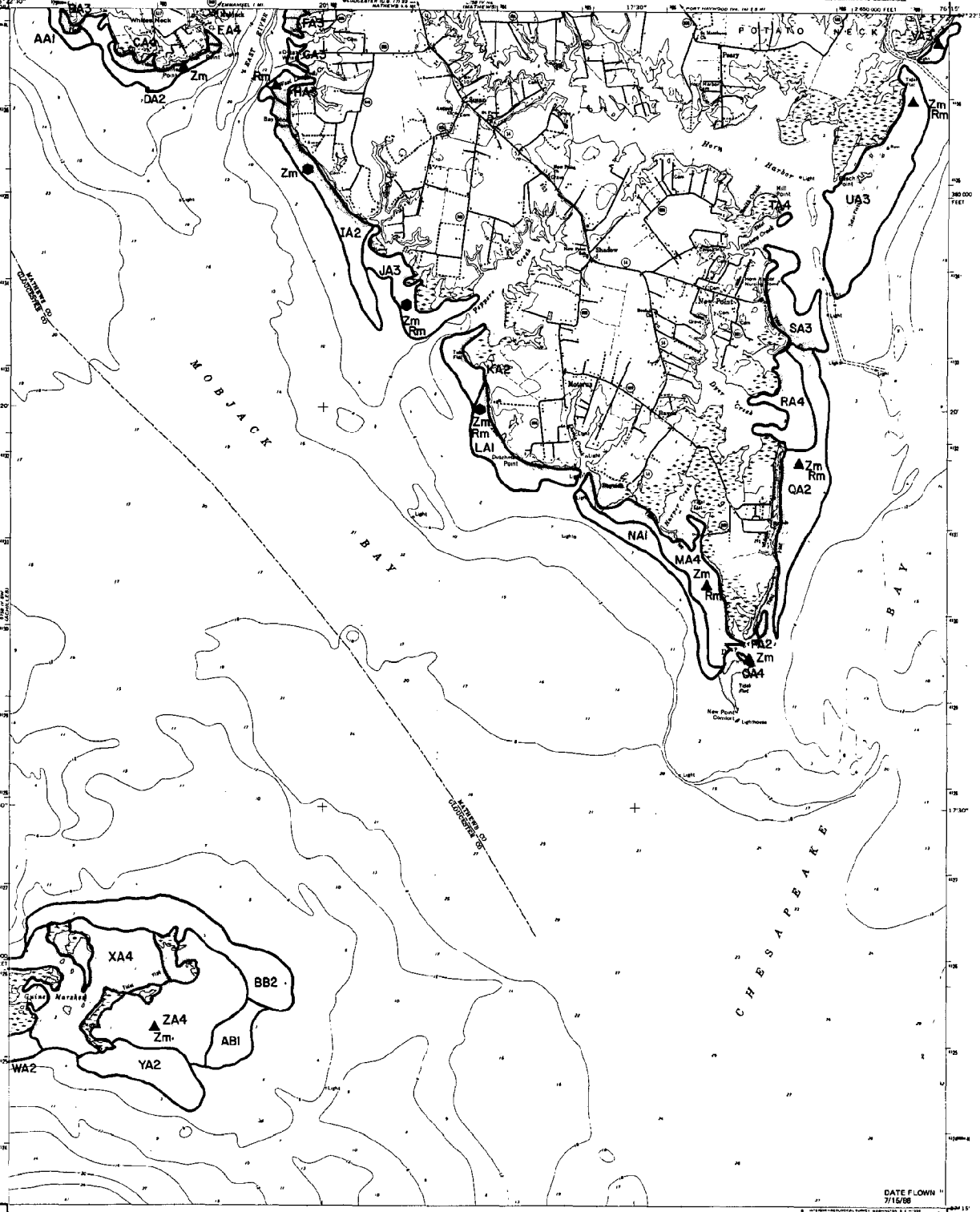
N3715—W7622 5-7.5

131 1965 INSPECTED 1973 IV SW—SERIES V834

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMERGED AQUATIC VEGETATION 1986

NEW POINT COMFORT QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichellia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ U.S.G.S.

SCALE 1:24,000

.5 0 1 MILE

.5 0 1 KILOMETER

VIMS

ROAD CLASSIFICATION

NEW POINT — COMFORT, VA.

NEW POINT COMFORT, VA.
SE/4 MATHEWS 15' QUADRANGLE
N3715—W7615/7.5

132 SE
E-SERIES V834

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMERGED AQUATIC VEGETATION 1986

CAPE CHARLES QUADRANGLE
VIRGINIA–NORTHAMPTON CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichella palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIMS

ROAD CLASSIFICATION

Primary highway all weather Light-duty road all weather
Hard surface improved surface
Unimproved road fair or dry weather

CAPE CHARLES, VA.

CAPE CHARLES, VA.
N3715—N7600/7.5

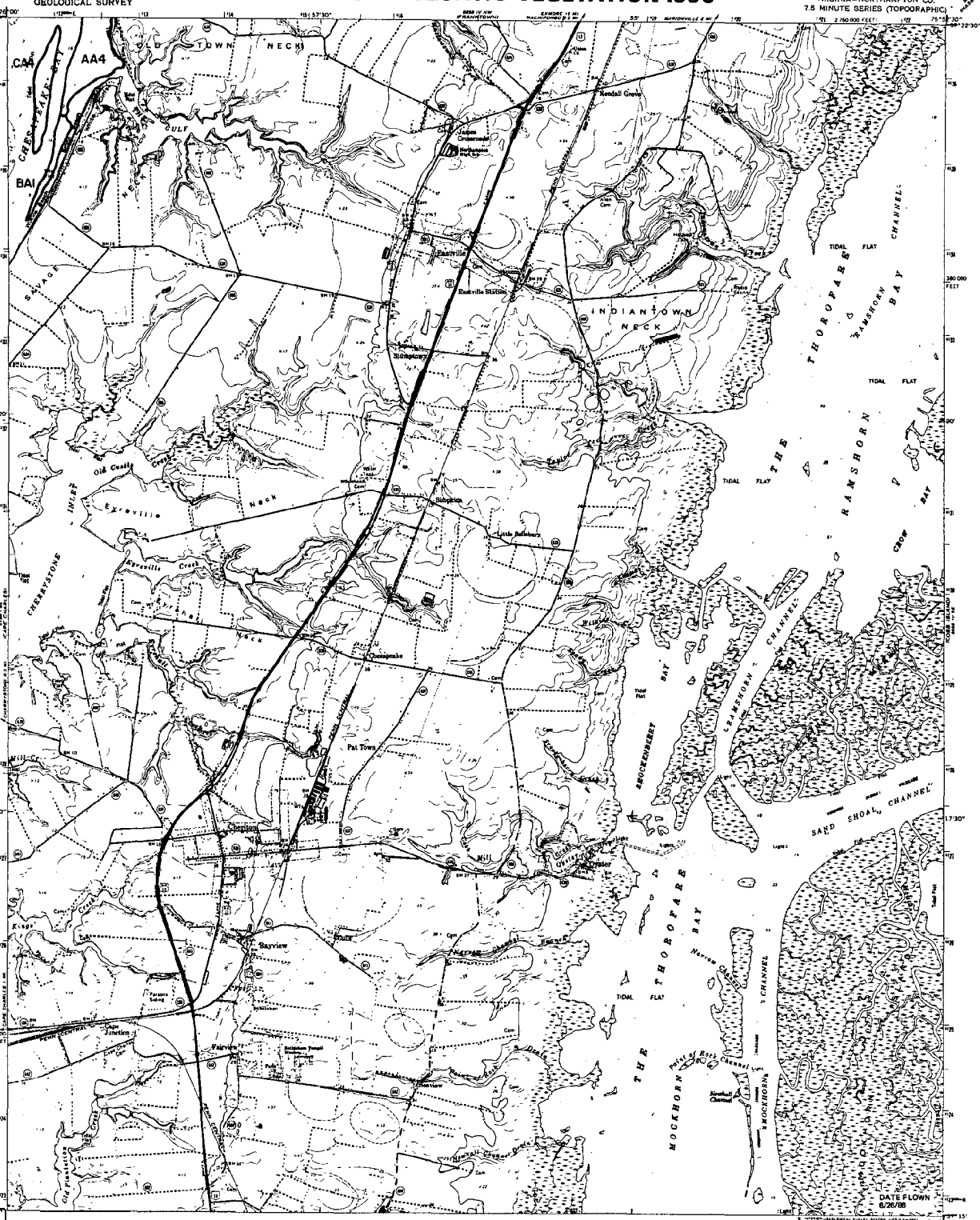
133 1968 SE-SERIES V834

SPECIAL PRINTING
Contours and woodland symbols omitted

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMERGED AQUATIC VEGETATION 1986

CHERITON QUADRANGLE
VIRGINIA—NORTHAMPTON CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichella palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIMS

ROAD CLASSIFICATION

...ary highway, all weather, surface — Light-duty road, all weather, improved surface

...ndary highway, all weather, surface — Unimproved road, fair or dry weather

CHERITON, VA.

CHERITON, VA.
N3715—W7552.5/7.5
SUBTOWNSHIP DATED 1973

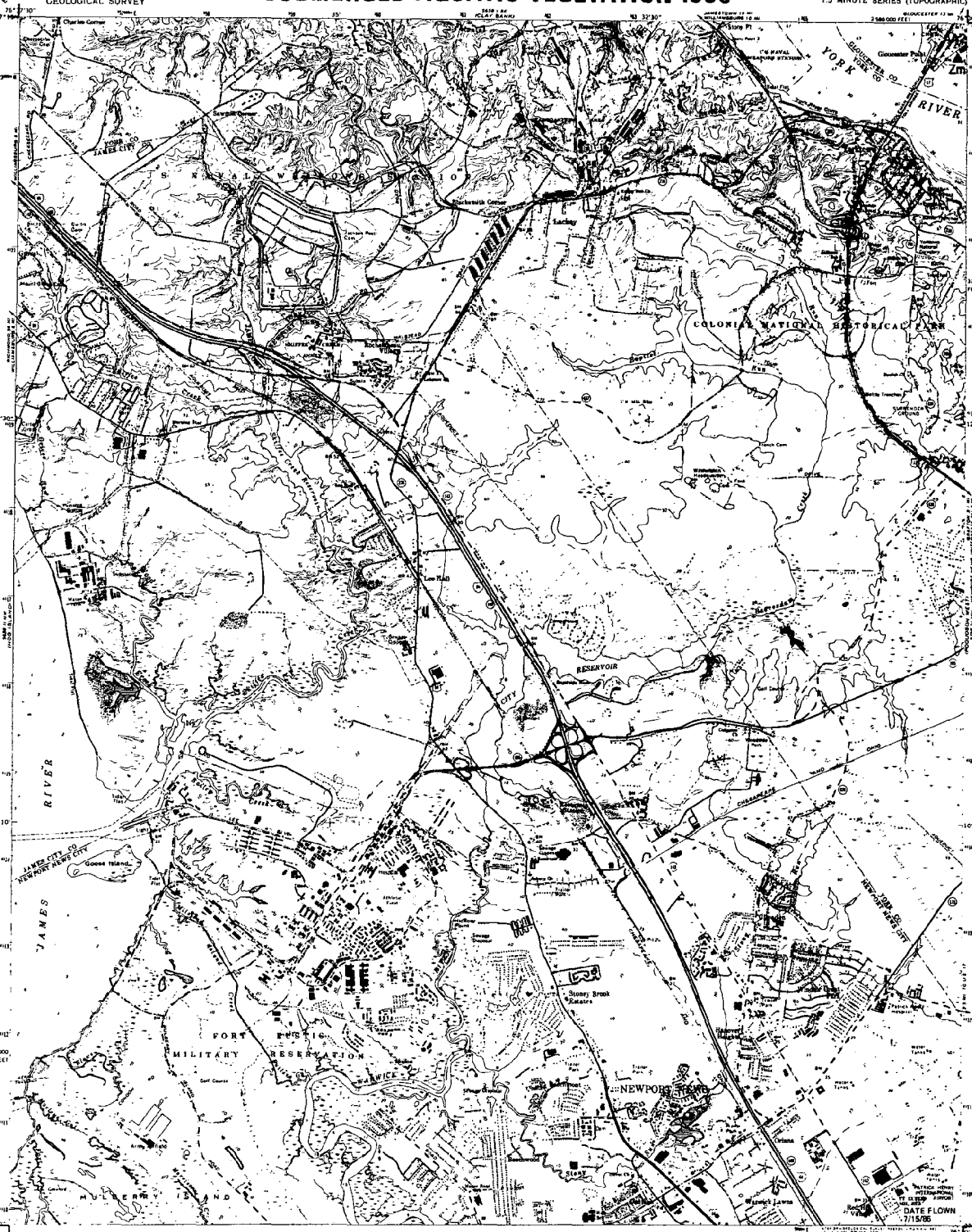
134

ERIES V834

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMERGED AQUATIC VEGETATION 1986

YORKTOWN QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichella palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIMS

ROAD CLASSIFICATION

Heavy duty — Light duty
Medium duty — Unimproved dirt

YORKTOWN, VA.

YORKTOWN, VA.

N3707.5—W7630/7.5

PHOTO 139 1990

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMERGED AQUATIC VEGETATION 1986

POQUOSON WEST QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)

SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichella palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ U.S.G.S.

SCALE 1:24,000

ROAD CLASSIFICATION

POQUOSON
WEST, VA.

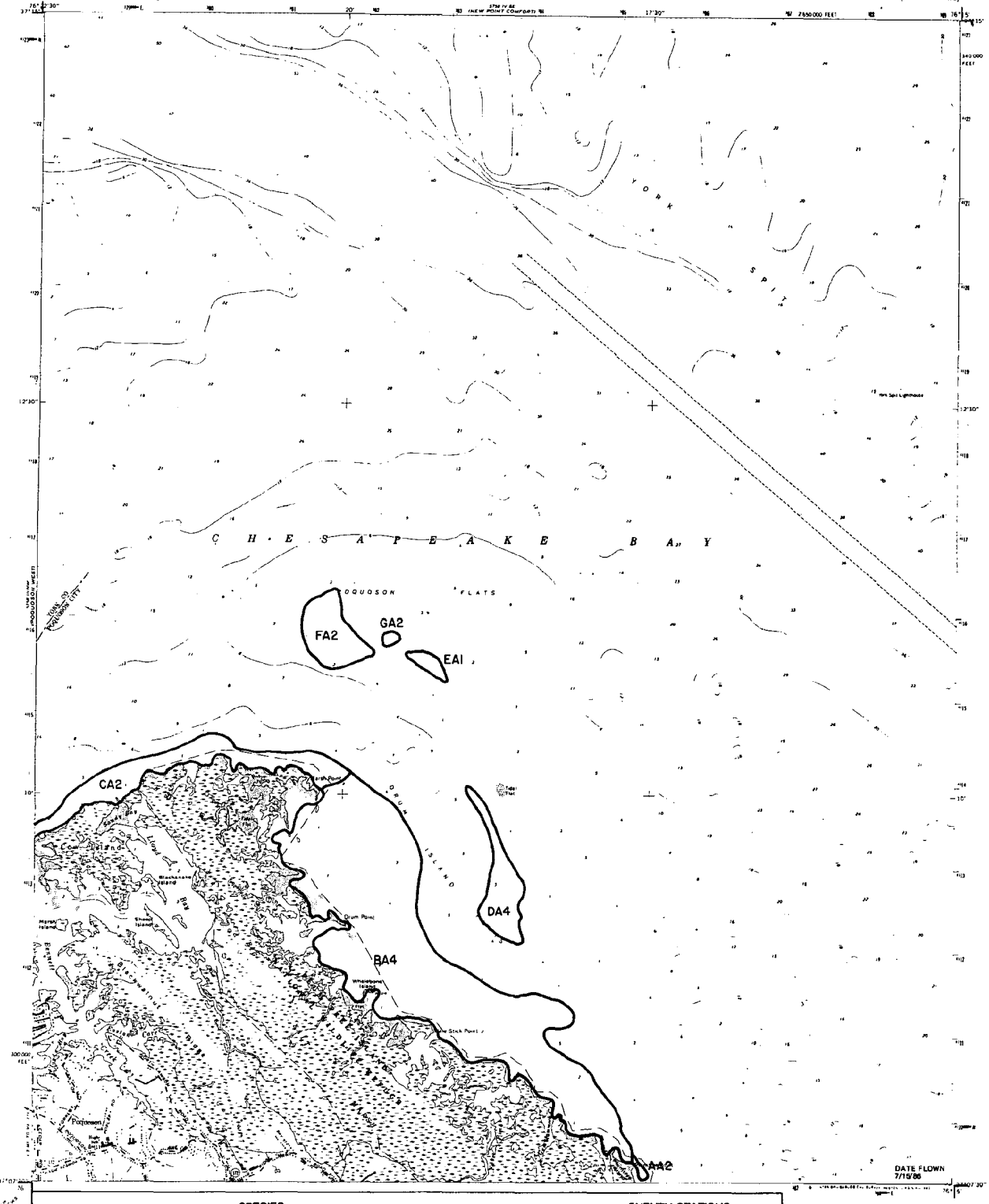
POQUOSON WEST, VA.
140
1965
PHOTOREVISED 1979
DMA 3756 III NW-SERIES V814

VIMS

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMERGED AQUATIC VEGETATION 1986

POQUOSON EAST QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIMS

POQUOSON–EAST, VA.

POQUOSON EAST, VA.

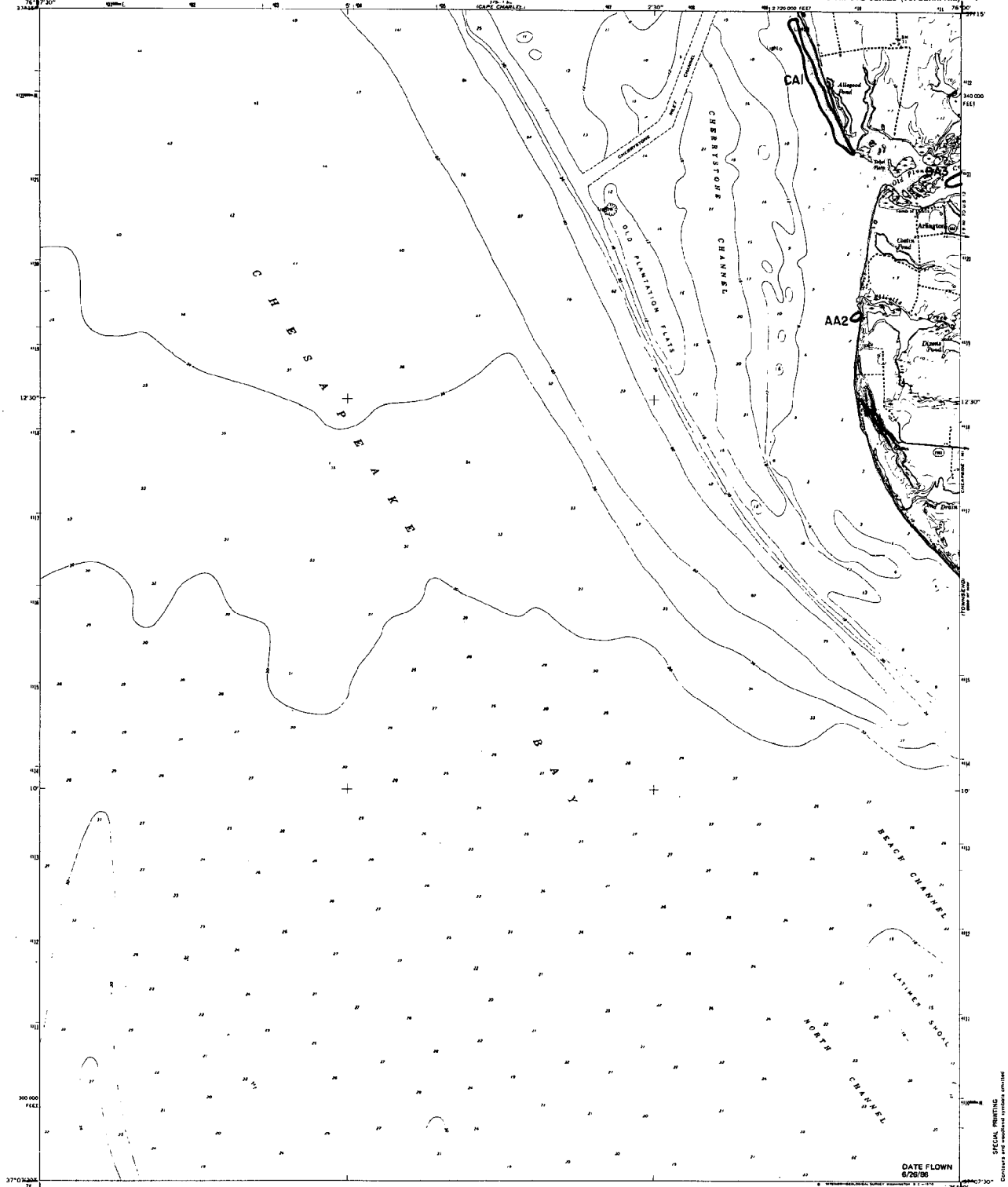
N3707.5—W7615/7.5

141 1964 REVISED 1970

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMERGED AQUATIC VEGETATION 1986

ELLIOTTS CREEK QUADRANGLE
VIRGINIA – NORTHAMPTON CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)



SPECIAL PRINTING
Contours and woodland symbols omitted

SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIMS

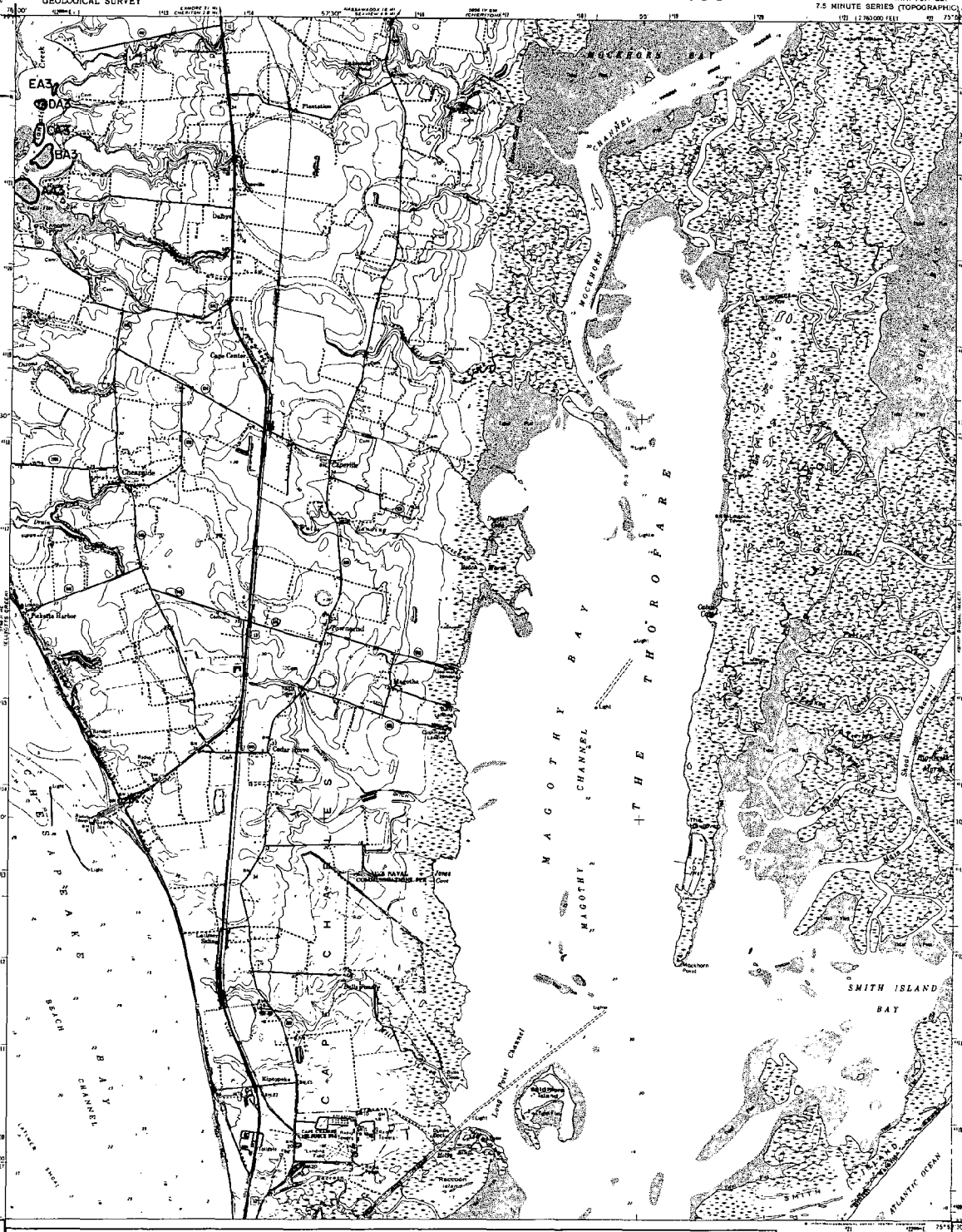
ELLIOTTS CREEK, VA.

ELLIOTTS CREEK, VA.
N3707.5—W7600/7.5
142 1968 NE—SERIES V634

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMERGED AQUATIC VEGETATION 1986

TOWNSEND QUADRANGLE
VIRGINIA–NORTHAMPTON CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Pdf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichella palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIMS

ROAD CLASSIFICATION

TOWNSEND, VA.

U.S. Route — State Route

TOWNSEND, VA.
N3707.5—W7552.5/7.5
143 1968 REVISED 1980

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMERGED AQUATIC VEGETATION 1986

HAMPTON QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)

SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichella palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIMS

ROAD CLASSIFICATION

Heavy-duty ——— Light-duty ———

HAMPTON, VA.

HAMPTON, VA.

N3700—W7615/7.5

147 1968 REVISED 1980 SE-SERIES V834

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMERGED AQUATIC VEGETATION 1986

CAPE HENRY QUADRANGLE
VIRGINIA–VIRGINIA BEACH CITY
7.5 MINUTE SERIES (TOPOGRAPHIC)

SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichellia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

1 MILE

1 KILOMETER

VIMS

ROAD CLASSIFICATION

Heavy-duty — Light-duty
Medium-duty — Unimproved dirt

CAPE HENRY, VA.

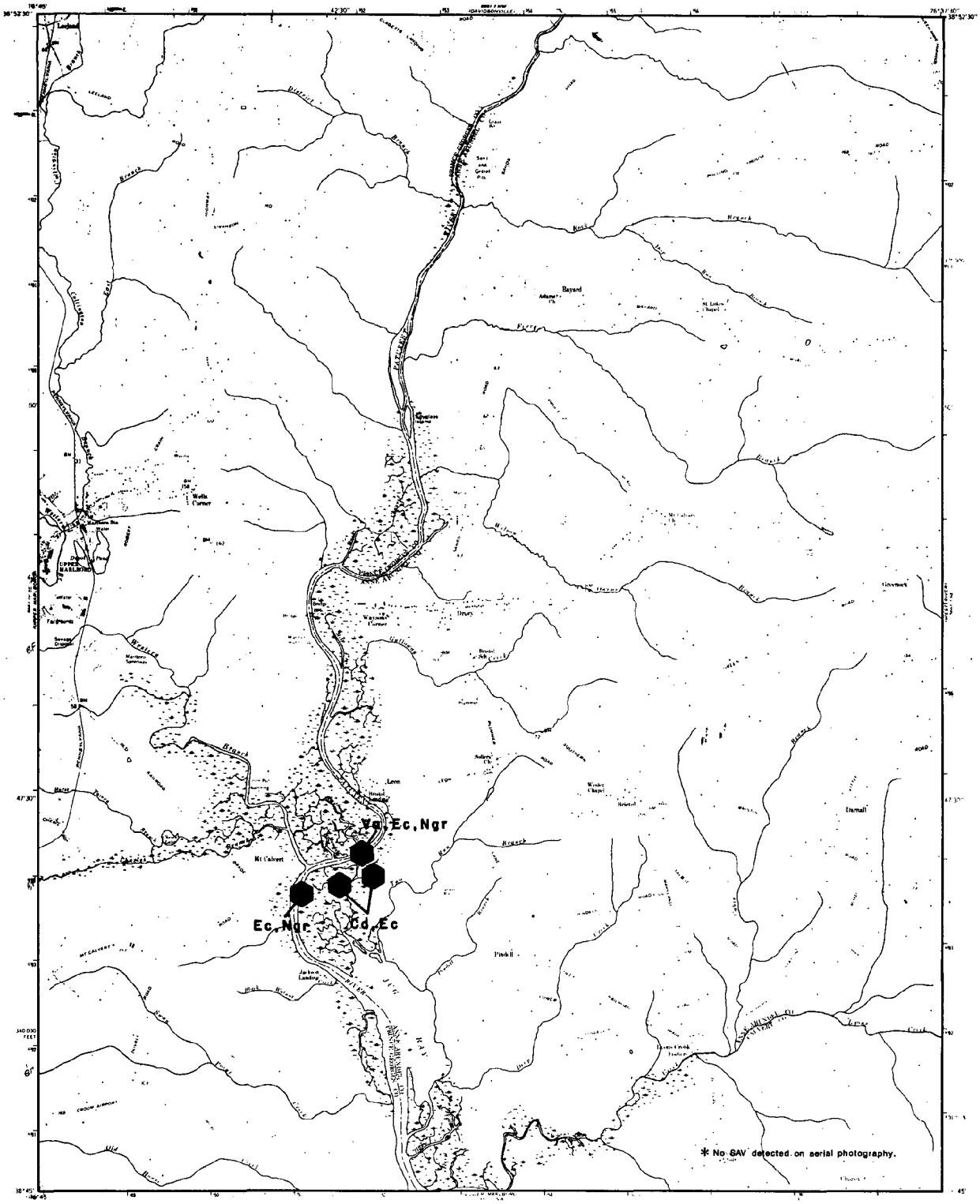
CAPE HENRY, VA.

N3652.5—W7600/7.5

1979

152 1964 REVISED 1979 NE—SERIES V834

SUBMERGED AQUATIC VEGETATION 1986*



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Pof	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S.

N

SCALE 1:24,000

1 .5 0 1 MILE

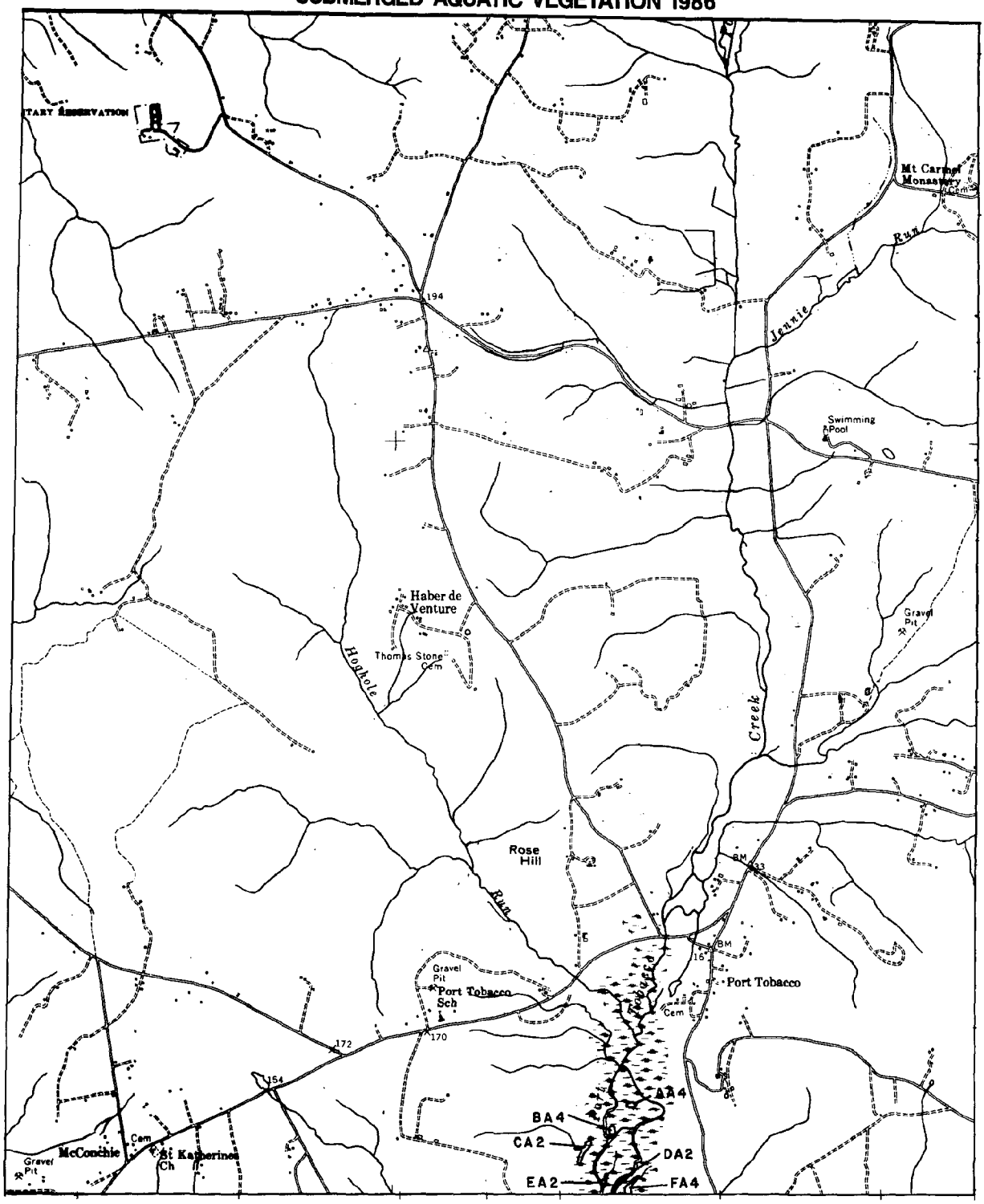
1 .5 0 1 KILOMETER

BRISTOL, MD

159

DATE FLOWN 9/13/86

SUBMERGED AQUATIC VEGETATION 1986



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichellia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- ● MD-DNR Survey Station
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S.

SCALE 1:12,000

0 1 MILE

0 1 KILOMETER

PORT TOBACCO, MD

Southeast Quarter

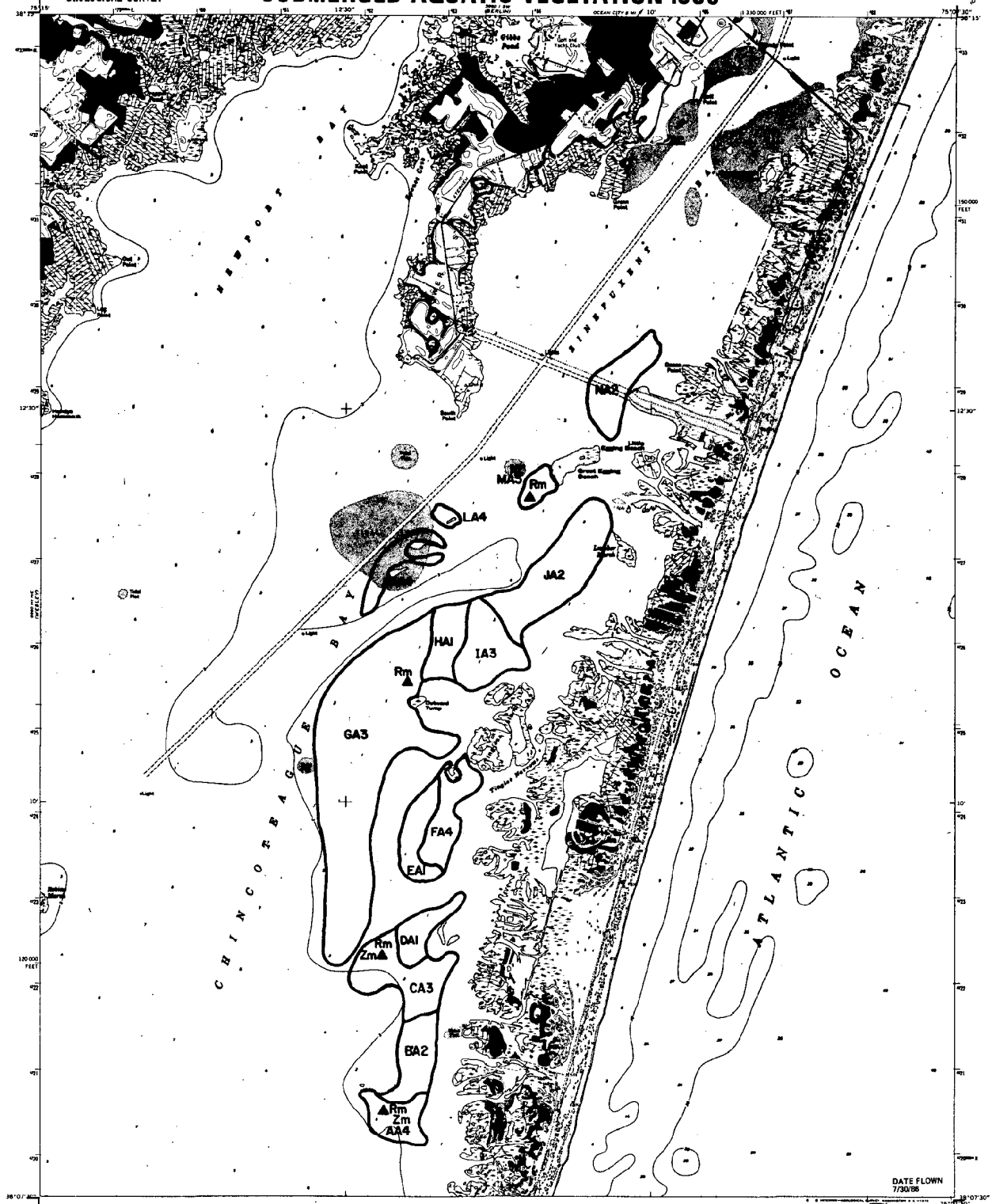
161

DATE FLOWN 10/16/86

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMERGED AQUATIC VEGETATION 1986

TINGLES ISLAND QUADRANGLE
MARYLAND-WORCESTER CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichellia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIMS

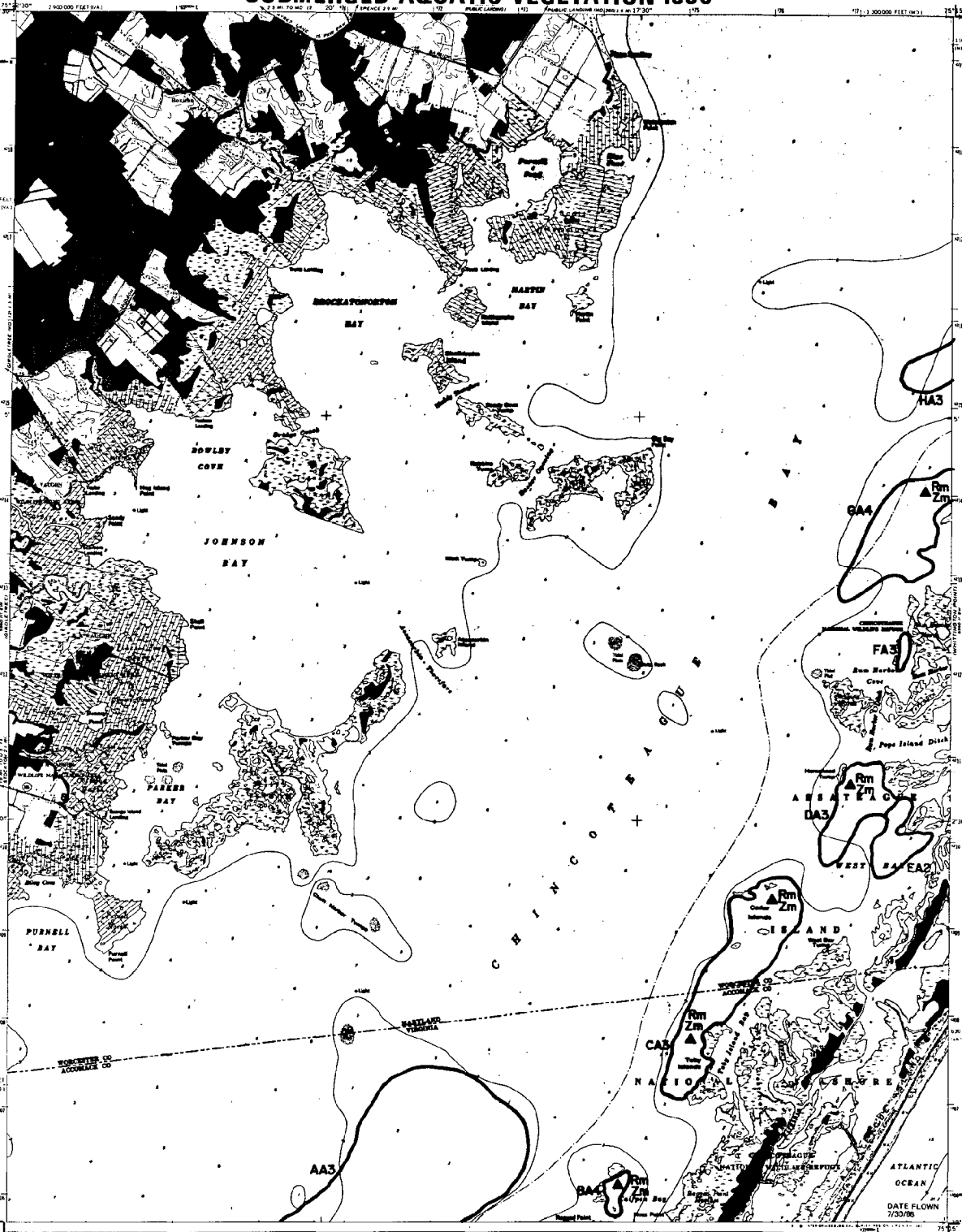
TINGLES ISLAND, MD.

TINGLES ISLAND, MD.
N380 170 1/7.5
PHOTOREVISED 1972
AMS 3980 II NW—SERIES V833

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMERGED AQUATIC VEGETATION 1986

BOXIRON QUADRANGLE
MARYLAND–VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichelia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

- MD-DNR Survey Station
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S.

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State Route

BOXIRON, MD.–VA.

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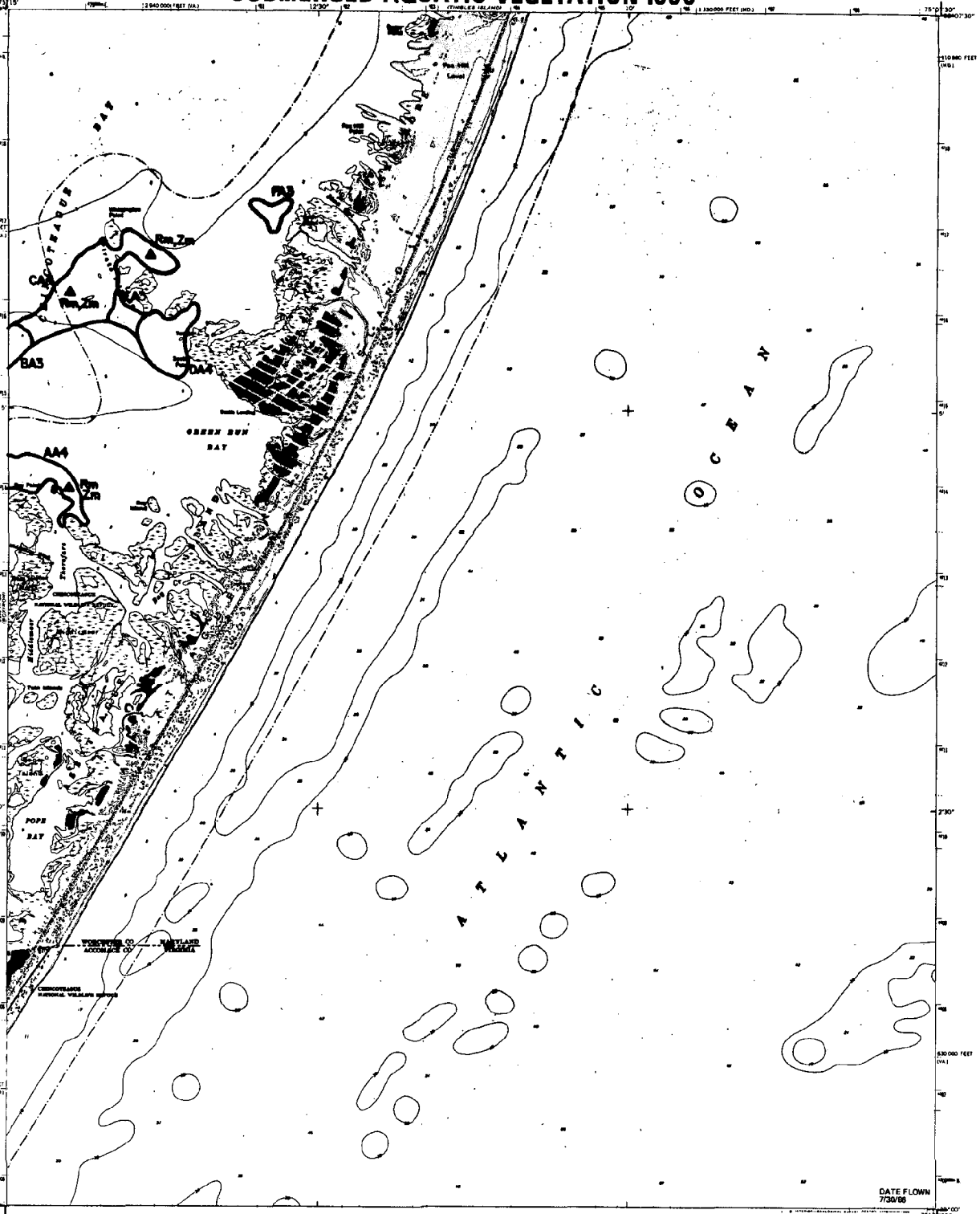
Revealed thru 1980

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SUBMERGED AQUATIC VEGETATION 1986

WHITTINGTON POINT QUADRANGLE
MARYLAND–VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)	Pcr	*Potamogeton crispus* (curly pondweed)
Ppf	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)
Zp	*Zannichellia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
N	*Najas spp.* (naiad)	Ngr	*Najas gracillima* (naiad)
Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)		

SURVEY STATIONS

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WHITTINGTON POINT, MD.-VA.

WHITTINGTON POINT, MD.–VA.

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UNITED STATES
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CHINCOTEAGUE EAST QUADRANGLE
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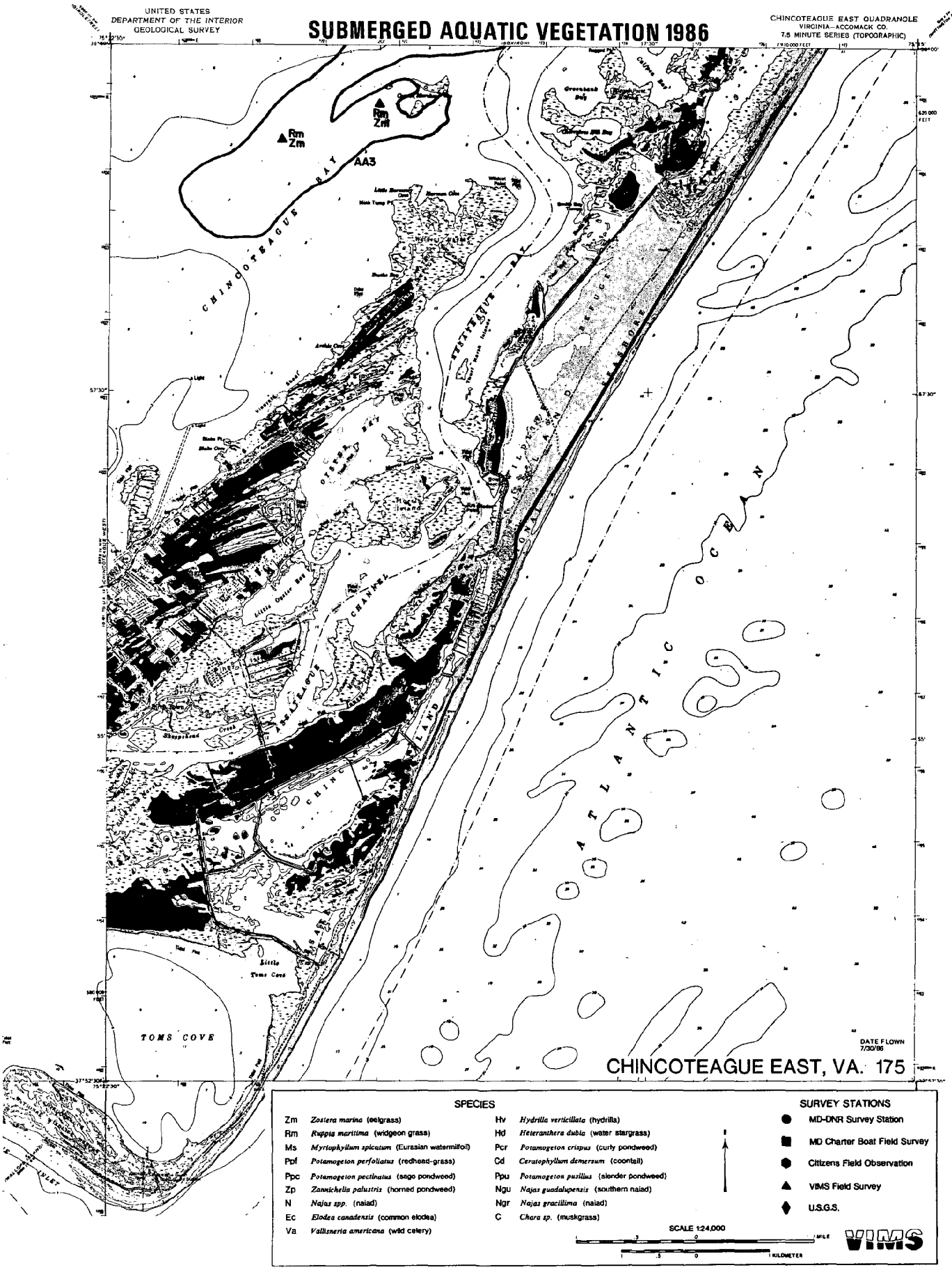

SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
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