Distribution of Submerged Aquatic Vegetation in the Chesapeake Bay

Virginia Institute of Marine Science
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Distribution of Submerged Aquatic Vegetation in the Chesapeake Bay and Tributaries and Chincoteague Bay - 1989

by

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Cover Photograph: Eelgrass beds in lower York River, Virginia. (Photograph by Damon Delistraty, Virginia Institute of Marine Science, School of Marine Science, College of William and Mary.)

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EXECUTIVE SUMMARY

The distribution of submerged aquatic vegetation, principally rooted vascular macrophytes, during May to October 1989 in the Chesapeake Bay, its tributaries and Chincoteague Bay was mapped at a scale of 1:24,000 using black and white aerial photography. SAV bed perimeter information was digitized and stored in a computerized data base. Ground truth information was obtained from the U. S. Geological Survey (USGS), the U. S. Fish and Wildlife Service (USFWS), the University of Maryland Horn Point Environmental Laboratories, Harford Community College and the College of William and Mary's Virginia Institute of Marine Science/School of Marine Science. Citizen support via the U. S. Fish and Wildlife Service and Chesapeake Bay Foundation, as well as the Maryland Charterboat Association via the Maryland Department of Natural Resources Watermen's Assistance Program, provided additional ground truth information.

In 1989 the Chesapeake Bay had 24,134 hectares of SAV with 2,458 (10%), 11,507 (48%) and 10,169 (42%) hectares occurring in the Upper, Middle and Lower Bay zones, respectively (Figs. 1 and 2).

Seventy-nine percent (1,945 hectares) of the SAV in the Upper Bay zone was located in the Susquehanna Flats section (Fig. 3, Section 1). Nine species of SAV were documented by ground truth surveys in this section, with *Myriophyllum spicatum* being dominant. *Hydrilla verticillata,* a recently introduced exotic species, was also found in the Flats but occurred in small isolated beds. Total hectares of SAV were reduced from that in 1987 in the Susquehanna Flats section and beds were generally much less dense. Ninety-five percent of all SAV beds were classified as very sparse (0-10% coverage) and no beds were classified as dense (70-100% coverage). The Upper Eastern Shore section (Fig. 3, Section 2) had 308 hectares SAV located principally in the Elk and lower Sassafras Rivers, Swan, Stillpond and Churn Creeks with many of the same species being reported as in the Susquehanna Flats section. The Upper Western Shore section (Fig. 3, Section 3) had 38 hectares SAV which was concentrated in Saltpeter and Seneca Creeks with *M. spicatum* and *Vallisneria americana* being most abundant. The Chester River section (Fig. 3, Section 4) had 167 hectares SAV which was most abundant adjacent to Eastern Neck and Eastern Neck Island, and in the lower Chester River. In this region *Ruppia maritima* was the most abundant of six species which were reported.

Forty-five percent (5,196 hectares) of the SAV in the Middle Bay zone was found in the broad shoal area between Smith and Tangier islands in the Mid-Bay Island Complex (Tangier, Smith, Southmarsh and Bloodsworth Islands - Fig. 3, Section 13) where *R. maritima* and *Zostera marina* were present. Seventeen percent (1,998 hectares) of the SAV was present in the Middle Eastern Shore section (Fig. 3, Section 12) primarily in the Barren Island-Honga River area, the Big and Little Annemessex Rivers, and the lower section of the Manokin River. *Ruppia maritima* was the dominant species reported for this area. Little or no SAV was mapped or reported from the Central Western Shore, Middle Western Shore and Patuxent River sections (Fig 3, Sections 5, 9 and 8, respectively).

The Middle Bay zone also includes the entire Potomac River where 2,614 hectares of SAV were present in 1989. The Upper Potomac River section, including the tidal freshwater region (Fig. 3, Section 11) had 1,998 hectares SAV with *H. verticillata* remaining the numerically

dominant species. Eight other species were recorded from the USGS and Citizen's surveys. The Lower Potomac River section (Fig. 3, Section 10) had 616 hectares SAV with *V. americana* and *M. spicatum* being the most frequently occurring species. Although the total abundance of SAV in the upper Potomac River section increased from the 1987 level of 1,665 hectares, many of the very dense beds declined from the Woodrow Wilson bridge to just below Piscataway Creek. This decline was offset by large increases in SAV along both shores from Quantico Creek to Aquia Creek.

SAV was abundant throughout the entire Lower Bay zone except for the James River. Forty-five percent of SAV in the Lower Bay zone was found in the Lower Eastern Shore section (Fig. 3, Section 14) around the Fox Islands and the mouths of major creeks (i.e. Cherrystone Inlet, Hungars Creek, Mattawoman Creek, Occahannock Creek, Craddock Creek, Pungoteague Creek and Onancock Creek). Along the western shore SAV was abundant in Mobjack Bay, the Lower York River, Back River and the Drum Island Flats area adjacent to Plum Tree Island. Both *R. maritima* and *Z. marina* were abundant throughout the Lower Bay zone. *Ruppia maritima* continued to increase in abundance in both the Piankatank and Rappahannock rivers while *Z. marina* was present at several sites in both rivers resulting from previously successful transplant efforts.

There were 2,310 hectares SAV in Chincoteague Bay in 1989 similar to 2,310 hectares in 1987. All of the SAV consisted of *R. maritima* and *Z. marina* which was located along the eastern side of the bay behind Assateague Island.

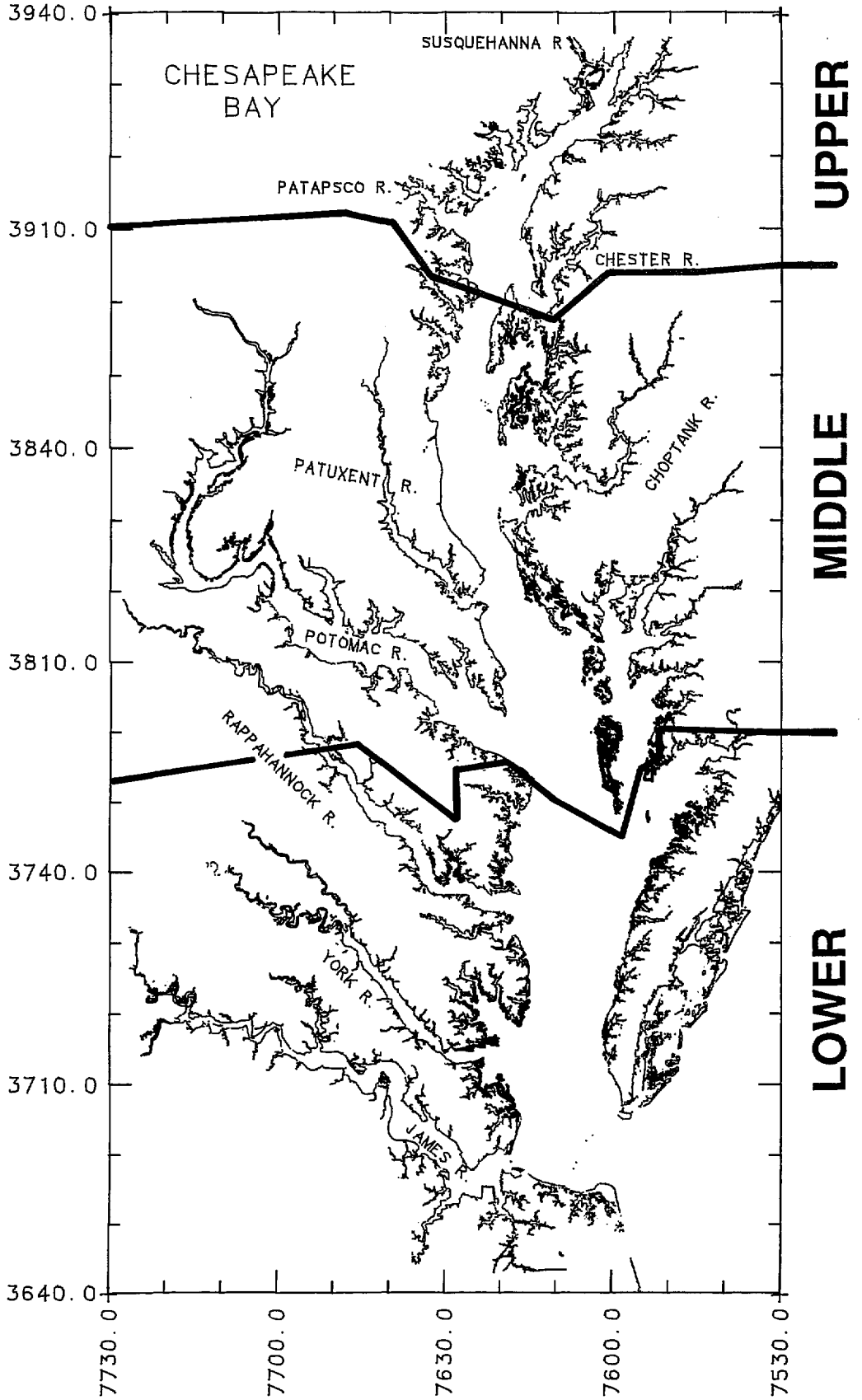

Figure 1. Map of the Chesapeake Bay and tributaries with Upper, Middle and Lower zones and locations of all SAV beds in 1989. (SAV is shown in red. Latitude and longitude are in decimal degrees along the vertical and horizontal axes, respectively.)

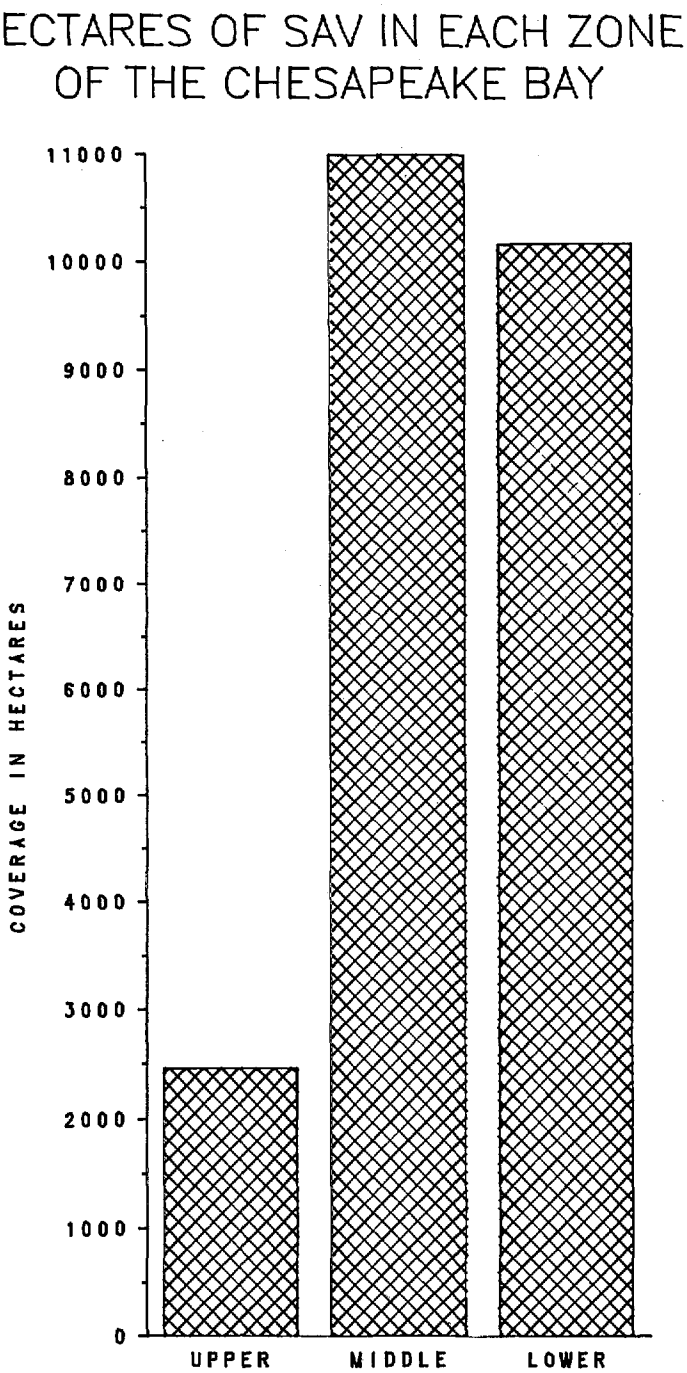

Figure 2. Total hectares of SAV for the Upper, Middle and Lower zones of the Chesapeake Bay in 1989. (Refer to Figures 1 and 7 for zone locations.)

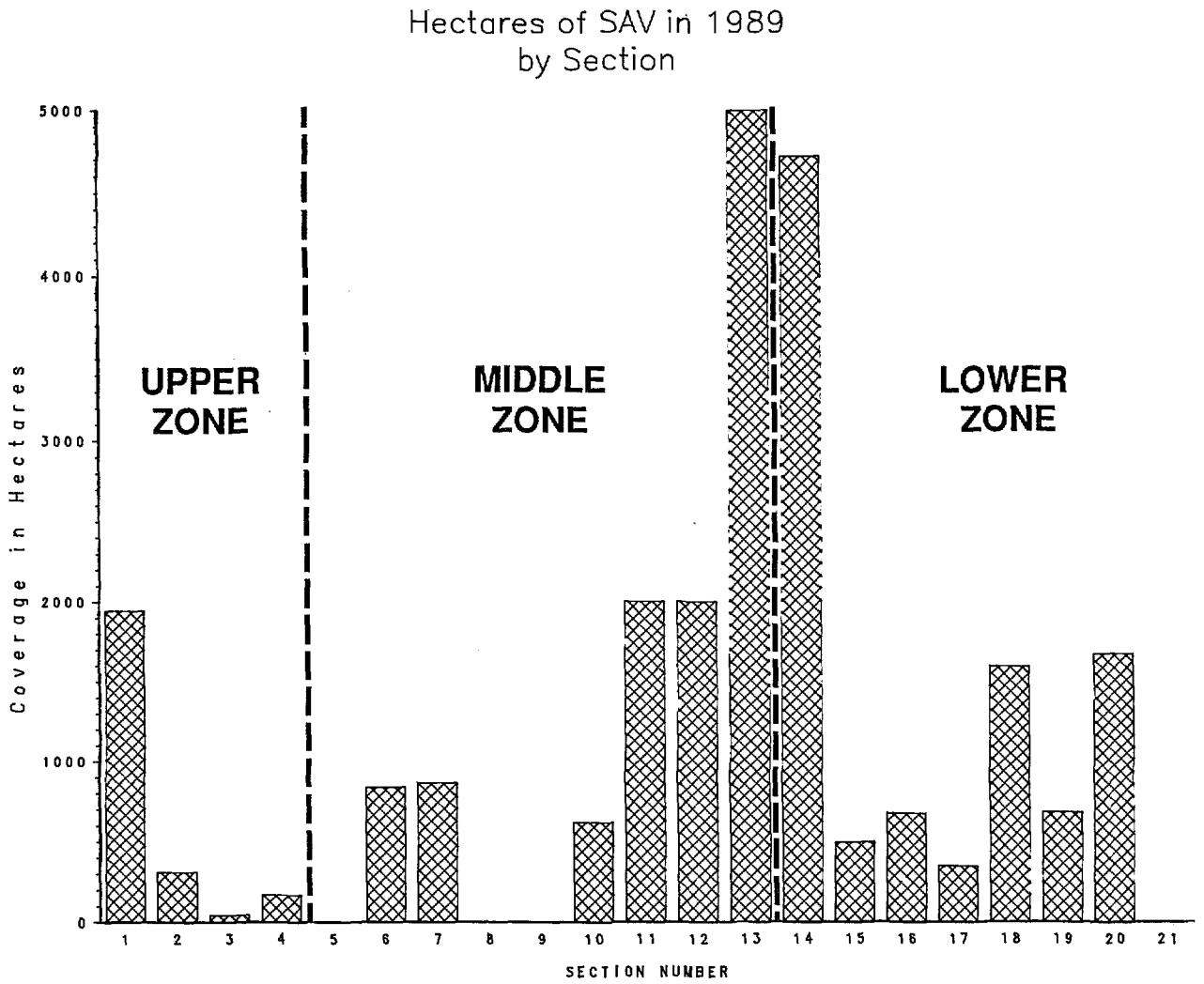

Figure 3. Total hectares of SAV in 1989 by section of the Chesapeake Bay. (Refer to Figure 7, Table 3 and Appendix B for section locations and boundaries.)

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Acknowledgement would not be complete without commendation for the groups which provided ground truthing of SAV beds which was used in conjunction with interpretation of the 1989 photography. USFWS conducted a survey and with the Chesapeake Bay Foundation (CBF) also organized citizens to report locations and species composition of grassbeds around the bay. In addition, members of the Maryland Charterboat Association were funded by the MD-DNR to participate in the ground truthing program and contributed valuable information on location and species composition of SAV beds in Maryland waters. J. Court Stevenson, Bill Dennison, and Lori Staver of the University of Maryland, Horn Point Environmental Laboratories (HPEL), and Stan Kollar of Harford Community College (HCC) provided ground truth information for certain specific regions of the Maryland portion of the Bay. Nancy Rybicki, R.T. Anderson and Virginia Carter of the U. S. Geological Survey (USGS) provided ground truth information from the Potomac River. Ken Moore, Sheryl Robertson, Sharon Dewing, Gene Silberhorn, Curtis Harper and Betty Berry of VIMS provided ground truth information for the lower bay.

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INTRODUCTION

Submerged aquatic vegetation (SAV) continues to be one of the important living resources of the Chesapeake Bay receiving considerable attention by bay scientists and managers. The recent signing of an SAV management policy by the governors of Virginia, Maryland, and Pennsylvania, the mayor of Washington, D. C., the EPA Administrator, and the Chesapeake Bay Commission Chairman (CEC, 1989), and the drafting of an SAV implementation plan for this baywide policy (CEC, 1990), indicate the commitment of the bay community to preserving, protecting, and enhancing these important systems.

Monitoring of this resource on an annual basis, one aspect supported by the SAV policy, has revealed the dramatic changes occurring with SAV and has served to provide scientists and managers with a synoptic overview of the current abundance on a baywide basis. SAV communities in the entire Chesapeake Bay and tributaries have been photographed, mapped and the areas of the beds digitized in 1978, 1984, 1985, 1986, 1987, and 1989 while portions of the upper bay were mapped and digitized in 1979 and the lower bay was mapped and digitized in 1980 and 1981 (Orth et al., 1979; Anderson and Macomber, 1980; Orth et al., 1985, 1986, 1987, and 1989). The bay shoreline was photographed in 1988, but was not mapped; sections of the lower bay were mapped and digitized in 1971 and 1974.

Numerous SAV ground surveys have been conducted but most have been limited to specific sections. No one ground 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 goal of the 1989 work was to continue the annual monitoring of SAV on a baywide basis using aerial photographic methods with appropriate ground truth to substantiate presence or absence of SAV in particular sections.

SAV SPECIES

The term "submerged aquatic vegetation" for the purpose of this report encompasses 18 taxa from 10 vascular macrophyte families and 3 taxa from 1 freshwater macrophytic algal family, the Characeae, but excludes all other algae, both benthic and planktonic, which occur in the Chesapeake Bay and tributaries (Appendix A). For instance, benthic marine algae, including many macrophytes, sometimes co-occur in the same beds with vascular plants, even as epiphytes on vascular plants (Humm, 1979). Although outside the scope of this study, the algal component does constitute a portion of the SAV biomass in the Chesapeake Bay and tributaries. However, except for the Characeae, this study has not attempted to identify, delineate or discuss the algal component of the vegetation nor its relative importance in the flora.

Ten species of submerged aquatic vegetation exclusive of the algae are commonly found in the Chesapeake Bay and its tributaries. *Zostera marina* (eelgrass) is dominant in the lower reaches of the bay. *Myriophyllum spicatum* (Eurasian watermilfoil), *Potamogeton pectinatus* (sago pondweed), *Potamogeton perfoliatus* (redhead grass), *Zannichellia 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* (widgeon grass) 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 when present, occur primarily in the middle and upper reaches of the bay and the tidal rivers (Appendix A). *Hydrilla verticillata* (hydrilla), a recently introduced species, presently dominates SAV beds in the tidal freshwater reaches of the Potomac River. It has also been reported again in 1989 in the Susquehanna Flats where its growth has not been as widespread as in the Potomac River (Kollar, pers. comm.).

METHODS

Introduction

Black and white aerial photography at a scale of 1:24,000 was the principal source of information used to assess the distribution and abundance of SAV in the Chesapeake Bay, its tributaries, and Chincoteague Bay in 1989. SAV beds mapped from photographs onto USGS 7.5 minute topographic quadrangles were then digitized, providing a digital data base for analysis of bed area and location. Ground truth information collected in 1989 was mapped onto the same topographic quadrangles.

Aerial Photography

The 1989 SAV photography was obtained by Air Photographics (Martinsburg, West Virginia) using a Wild RC-20 camera, with a 153 mm (6 inch) focal length Aviogon lens, and Agfa Pan 200 film. The camera was mounted in the bottom fuselage of the Air Photographics' Piper Aztec, a twin engine reconnaissance aircraft. Photography was acquired at approximately 12,000 feet altitude, yielding a 1:24,000 photographic scale.

Flight lines for photography, which were drawn on 1:250,000 scale USGS maps, were predetermined by Air Photographics to include all areas known to have SAV, as well as those areas which could potentially have SAV (i.e. all areas where water depths were less than 2 m at mean low water). Flightlines also included land features that are necessary as control points for accurate mapping (Fig. 4). Sections of the upper Rappahannock, upper York and most of the James Rivers were not flown because the historical absence of SAV in these areas.

Flight lines were prioritized by major sections. Dates of flight windows for aerial photography were timed to occur at peak standing crop of species known to occur in the sections. In addition, specific areas with significant coverage were given priority. Prior documentation and approval by the funding agencies was required to extend dates of flight windows if necessary. Actual dates of acquisition of photography are noted on each quadrangle map in Appendix C.

General guidelines for mission planning and execution (Table 1) address tidal stage, plant growth, sun elevation, water and atmospheric transparency, turbidity, wind, sensor operation, and plotting. Adherence to these guidelines assured acquisition of photography under nearly optimal conditions for detection of SAV, thus insuring accurate photo interpretation.

Quality assurance and calibration procedures were consistently followed. The altimeter was calibrated by the Federal Aviation Administration annually. Photographic settings were selected with an automatic exposure control. Sun angle was measured with an indicator on the plane. Flight lines were plotted on 1:250,000 scale maps to allow for

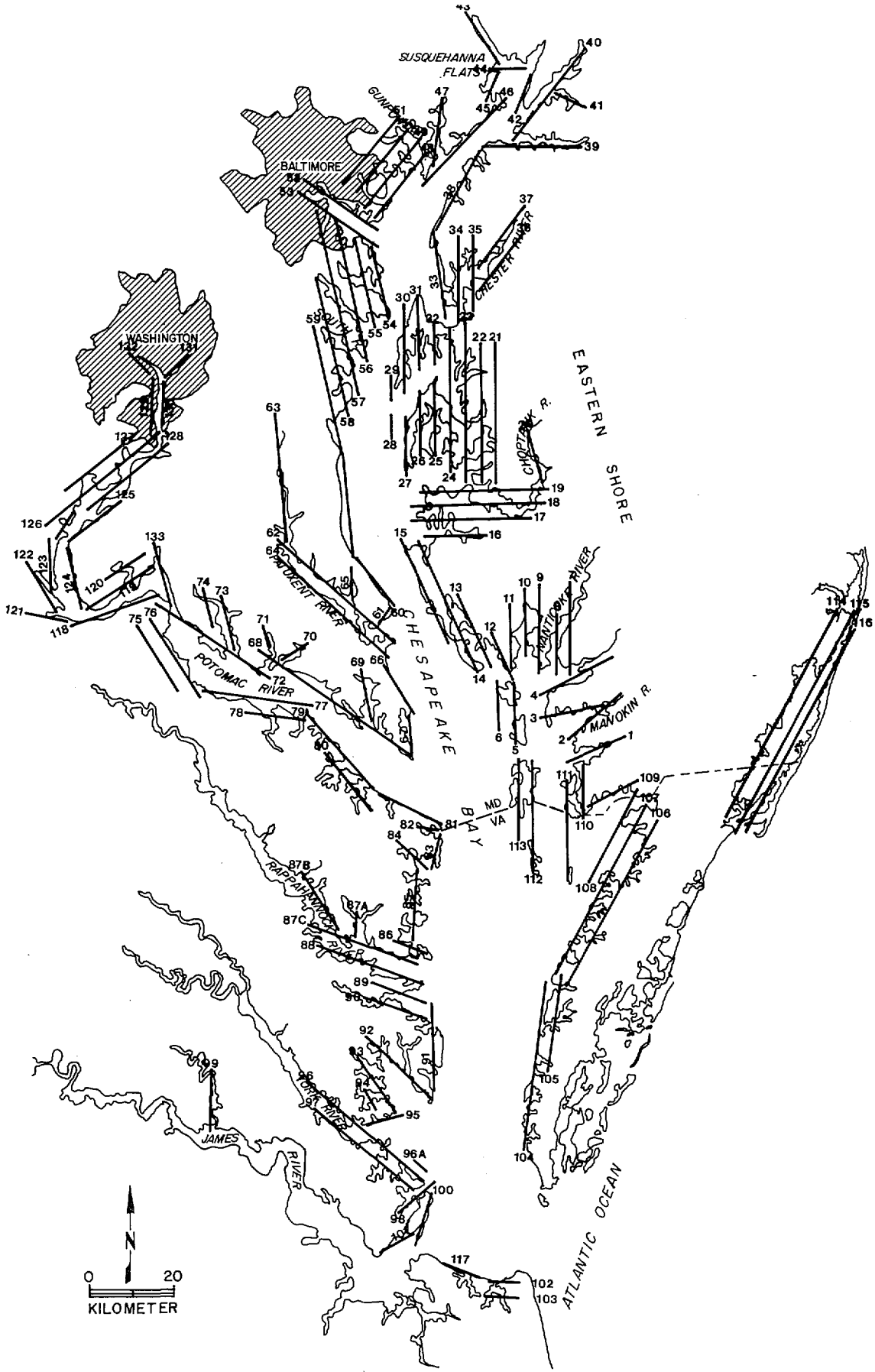

Figure 4. Map of the Chesapeake Bay, its tributaries and Chincoteague Bay with approximate locations of flight lines for 1989 SAV photography.

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.

overlap of photography. To minimize image degradation due to sun glint, the camera was equipped with a computer controlled intervalometer which established 60% line overlap and 20% sidelap. An automatic bubble level held the camera to within one degree tilt. The scale/altitude/film/focal length combination was coordinated to produce two foot resolution. Wind speed was monitored hourly from the flight service available in the region. Under normal operating conditions, flights were usually conducted under wind speeds less than 10 mph. (Above this, wind generated waves stir the bottom sediments which can easily obscure SAV beds in less than one hour.) Pilot experience determined what acceptable level of turbidity would insure complete delineation of SAV beds. At low tide the pilot should have been able to distinguish bottom features such as SAV or algae. When turbid conditions prevailed photography did not commence. Cloud cover did not exceed 5% of the area covered by the camera frame. Determination of cloud cover was based on pilot experience. Records of this parameter were kept in a flight notebook. Every attempt was made to acquire photographs with no cloud cover below 12,000 feet. A thin haze layer above 12,000 feet was generally acceptable. Experience has shown that the optimal conditions given above generally occur two to three days following passage of a cold front when winds have shifted from north-northwest to south and moderated to less than 10 mph. Where possible, and within the guidelines given for prioritizing and executing the photography, flights were planned to coincide with these atmospheric conditions.

Exposed film was processed by Air Photographics. A contact print was produced for each exposed frame. Each photograph was labeled with date of acquisition as well as flight line number. Film and photographs were stored under appropriate environmental conditions to prevent degradation of the product.

Mapping Process

This study utilized USGS 7.5 minute topographic quadrangle maps as a basis for mapping SAV beds from aerial photography, for digitizing the SAV beds, and for compiling SAV bed area measurements. Figure 5 gives locations of topographic quadrangles in the study area which includes all regions with potential for SAV growth. Most quadrangles are sequentially numbered for efficient access to data. The name corresponding to each quadrangle in Figure 5 is listed in Table 2.

Photo-interpretation to identify and delineate SAV beds utilized all available information including knowledge of aquatic grass signatures on film, distribution of SAV in 1989 from aerial photography, 1989 ground truth information, and aerial site surveys. USGS-published 7.5 minute topographic quadrangle masters (1:24,000 scale) printed by the Mid-continent Mapping Center of the USGS on stable transparent mylar were used as base maps. Identical copies of these base maps were made at the same scale on stable transparent mylar by the Virginia Department of Highways using a diazo process. SAV from the 1989 aerial photographs

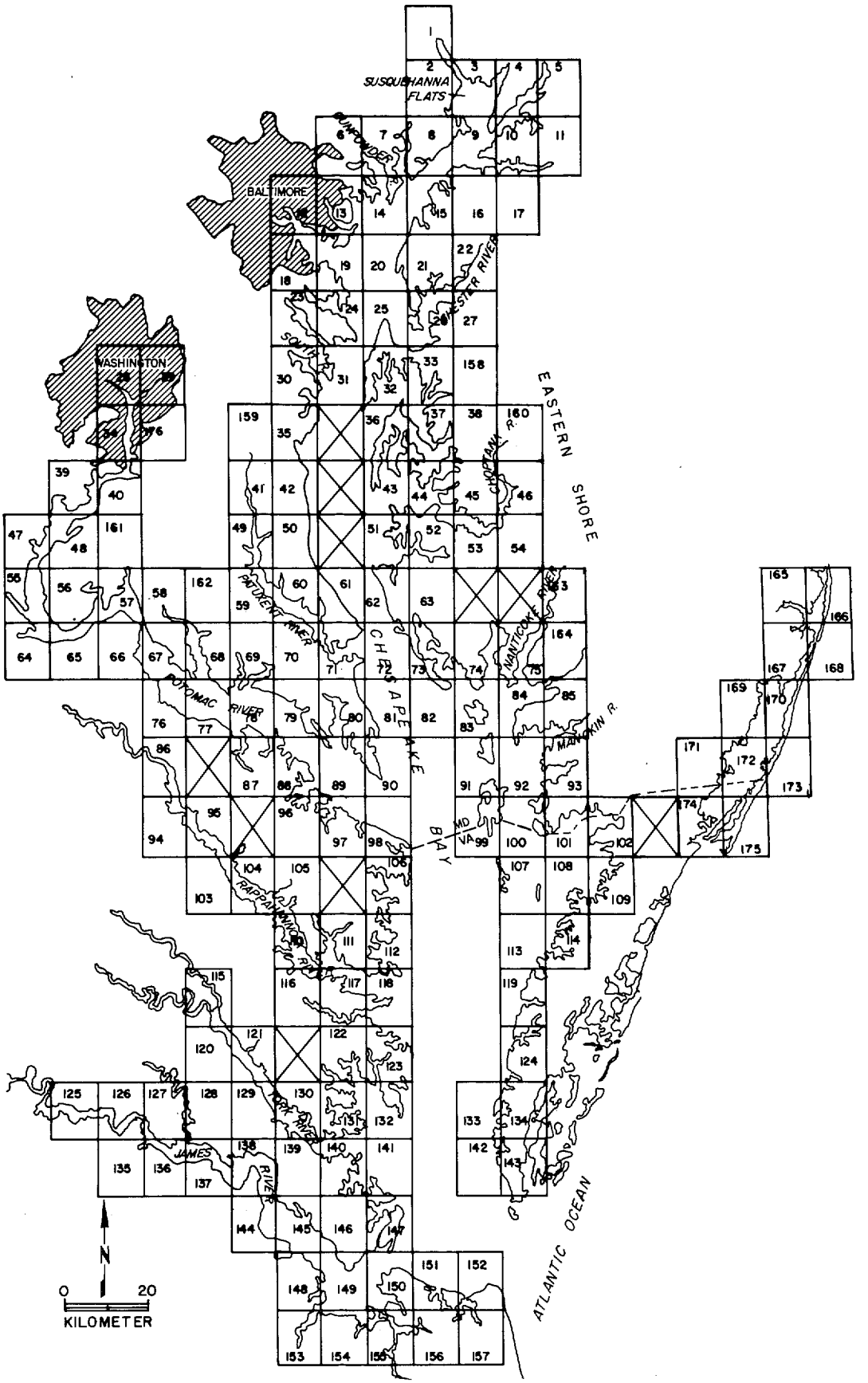

Figure 5. Location of USGS 7.5 minute topographic quadrangles for the Chesapeake Bay, its tributaries and Chincoteague Bay with corresponding code numbers. (See Table 2 for quad names.)

Table 2

List Of USGS 7.5 Minute Topographic Quadrangles For The Chesapeake Bay And Chincoteague Bay SAV Study Areas With Corresponding Code Numbers. (See Fig. 5 for location of quadrangles. 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. North East, Md.
5. Elkton, Md.-Del.
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. Hudson, 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. Marys 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, Md.-Va.
100. Great Fox Island, Va.-Md.
101. Crisfield, Md.-Va.
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.
176. Anacostia, D.C.-Md.

was mapped onto these diazo copies of USGS topographic quadrangles. Delineation of SAV bed boundaries onto the topographic quadrangle maps was facilitated by superimposing the photographic print with the appropriate mylar quadrangle on a light table. SAV boundaries were then traced directly onto the mylar quadrangle with a pencil. Where minor scale differences were evident between a photograph and a quadrangle, or where significant shoreline erosion or accretion had occurred since USGS publication of a map, either a best fit was obtained or shoreline changes were noted on the quadrangle.

In addition to delineating SAV bed boundaries, 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. 6). Bed density was classified into one of four categories based on a subjective comparison with the density scale. These were: 1, very sparse (<10% coverage); 2, sparse (10 to 40%); 3, moderate (40 to 70%); or 4, dense (70-100%). Either the entire bed or subsections within the bed were assigned a number (1 to 4) corresponding to the above density categories. Additionally, each distinct SAV unit (bed or bed subsection) was assigned an identifying two letter designation unique to its map. Subsections of beds were further identified as being part of a contiguous bed by the addition of two letters unique to each contiguous bed. These contiguous bed descriptions aid the tracking of a single bed between quad sheets as well as the analysis of those beds that had to be separated due to variation in SAV density.

SAV Perimeter Digitization and Area Calculation

The perimeters of all SAV beds mapped from the aerial photography were digitized in a clockwise direction using a Numonics Model 2400/2200 DigiTablet Graphics Analysis System having a resolution of .001 inches (.00254 cm) and an accuracy of .005 inches (.0127 cm). Coordinates were transmitted to a PRIME 9955 computer for area calculations and data manipulation via software developed at VIMS. Each SAV bed was digitized at least four times and the area reported as a mean of three. The perimeter of each SAV bed was defined by a polygon with a linear data point density of 127 per chart inch (50 per cm, 5 meter ground resolution). The total number of points defining any SAV bed is dependent on overall bed size. The SAV bed perimeter was stored as X and Y coordinates in centimeters from the quadrangle origin (lower left corner).

Any "island" within a polygon (digitized SAV perimeter) was disregarded as long as a line was drawn from the outside of the polygon to the "island" and the resulting polygon was digitized in a clockwise direction. The line connecting the "island" polygon to the larger surrounding polygon was drawn in by the digitizer operator.

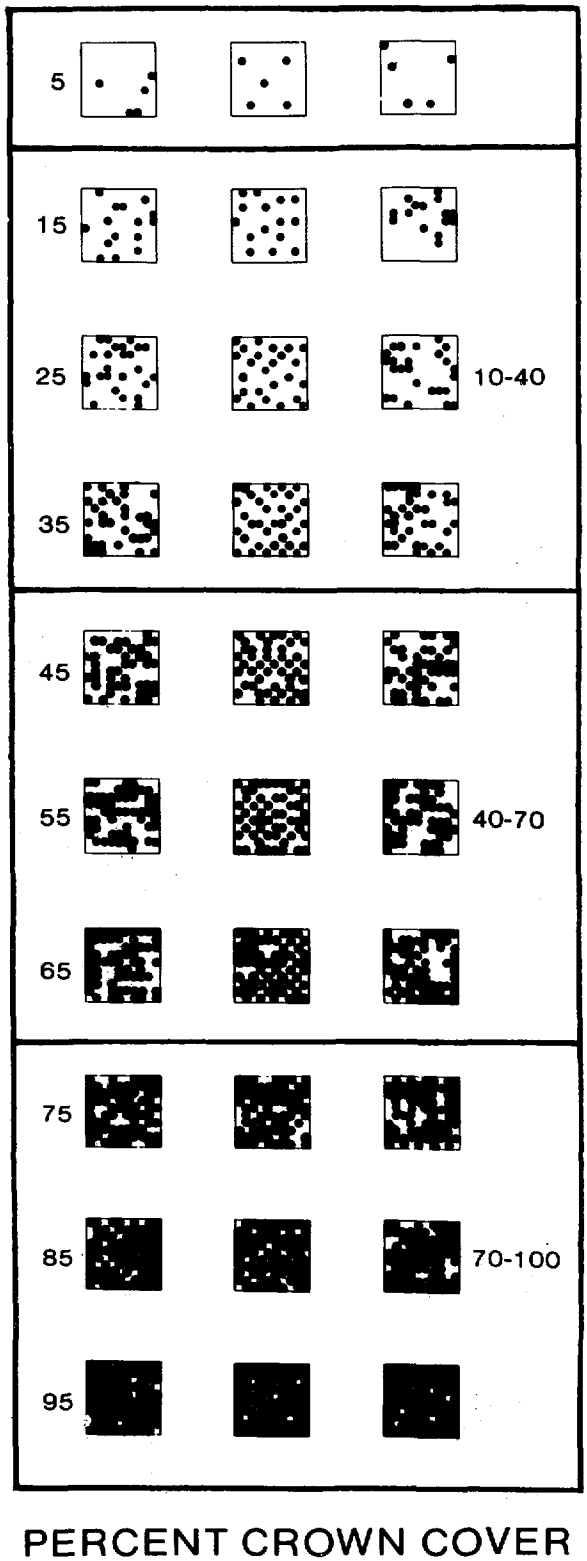

Figure 6. Crown density scale used for determining density of SAV beds: (1) Very sparse, 0-10%; (2) Sparse, 10-40%; (3) Moderate, 40-70%; (4) Dense, 70-100%.

SAV bed area in square centimeters on the chart was calculated via the following equation:

$$A = 1/2 \mid (X_1 * Y_2 - X_2 * Y_1) + (X_2 * Y_3 - X_3 * Y_2) + \ldots + (X_n * Y_1 - X_1 * Y_n) \mid$$

where X_n and Y_n are the nth digitized perimeter points in centimeters.

The area is then converted from square centimeters on the chart to square meters on the ground. This is done via the following conversion based on a chart scale of 1:24,000:

$$A_g(m^2 \text{ on ground}) = A_c(cm^2 \text{ on chart}) * 57600 \ (m^2 \text{ on ground} / cm^2 \text{ on chart})$$

where A_g is the area on the ground of each SAV bed and A_c is the area on the chart. The area on the ground is then stored for later use.

Tests of Precision and Accuracy

Prior to each digitization session, the Numonics instrument was checked manually against a digitizing standard. After a map had been secured to the digitizing tablet, the standard was secured to the map and digitized four times. The information from digitizing the standard was transmitted to the beginning of the SAV bed Perimeter File on the PRIME computer. This same procedure was followed at the end of each digitizing session. When this file was processed by the computer, the digitized area of each standard was compared to the known area of the standard. If a variation between the known and the mean of the observed areas exceeded 1.0%, a warning was printed advising the operator to check the digitizing system. In addition, checks were made with respect to the absolute location of the digitizing standard as secured to the map. A comparison was made between the location of the standard before and after the digitizing session. If the absolute location differed by more then 0.10 cm another warning to check the system was printed. Any movement in absolute location can be indicative of digitizer instrument drift or chart movement during the digitization session. These checks assure that the final calculated bed locations are as accurate as possible.

Maximum accuracy was maintained by exclusively using mylar topographic quadrangles rather than paper ones which can change scale as a function of changes in air temperature and humidity in the digitizer room .

Calculation of SAV Bed Mean Area and Choice of Representative SAV Bed

Every SAV bed mean area was the result of at least four independent digitizations of the outline of each SAV bed. The computer made an area calculation of each replication and the three bed outlines or perimeters most similar in terms of area were then used for the calculation of a mean area. The perimeter defining the area most similar to the mean area was

then saved by the computer program as the representative perimeter for this specific SAV bed. Representative perimeters for all 1989 SAV beds were later converted to latitude and longitude and a copy of each on computer tape was then sent to the EPA Chesapeake Bay Program Computer Center for incorporation into the ARC INFO Geographical Information System. The areas used in the mean area calculation do not by contract requirements have a range in excess of 5% of the mean area. All bed areas having an error rate in excess of 5% are flagged by the VIMS quality assurance quality control computer program for additional error assesment. The VIMS error rate is normally less than 1%.

A complete outline of the digitization procedure can be found in Orth et al., 1988.

Standard Operating Procedures for Quality Assurance/Quality Control

Standard operating procedures (SOPs) were developed to facilitate orderly and efficient processing of the 1989 SAV maps and the SAV bed perimeter computer files produced from them, and to comply with the need for consistency, quality assurance and quality control. SOPs developed include: a detailed procedure outlining 46 steps for digitization of SAV maps; a 47 step checklist for editing SAV perimeter computer files to insure completeness and accuracy; a digitizer log in which all operations were recorded and dated, and which was used to guide and record editing operations; and a flow chart used to track progress of all operations including all changes in file names. Examples of these SOPs are in Orth et al., 1988.

Conversion of SAV Perimeter Points from X,Y Centimeters to Latitude and Longitude

Before SAV perimeter information was to be exported to the EPA Chesapeake Bay Program Computer Center, the perimeter points had to be converted from X,Y centimeters to the more generally applicable latitude and longitude. This is done via a three step two dimensional linear interpolation between the four corner points of every quadrangle. At the start of digitization of every chart, the location of each corner point in X,Y cm and in latitude and longitude is recorded at the head of the data file. The corners are numbered:

1 = lower left corner or chart origin
2 = upper left corner
3 = upper right corner
4 = lower right corner

These corner points are then used to convert each individual X,Y perimeter point to latitude and longitude. If additional files are needed for a given chart, a new set of corner points are digitized and stored at the head of these files.

The steps for the conversion from X,Y cm to latitude and longitude are:

1. Transpose each X,Y perimeter point from the original, non orthogonal (not at right angles) chart axes defined by the original four corner points to a new set of orthogonal chart axes and defined by a new set of four corner points.

2. Calculate centimeter to latitude and longitude linear conversion factors from the transposed chart corner points via:

   XCONV = 0.125 / (XCORNERPOINT(4) - XCORNERPOINT(1))
   YCONV = 0.125 / (YCORNERPOINT(2) - YCORNERPOINT(1))

Where : XCONV is the X cm to lat,lon conversion factor.
YCONV is the Y cm to lat,lon conversion factor.
0.125 is a constant representing the distance in decimal degrees latitude or longitude between each successive chart corner point.
XCORNERPOINT(#) is the X value in centimeters of the numbered chart corner point.
YCORNERPOINT(#) is the Y value in centimeters of the numbered chart corner point.

3. Perform linear conversions from orthogonal X,Y cm perimeter point to latitude and longitude via the following equations:

   YLAT = YCHART(1) + (YPORTH * YCONV)
   XLON = XCHART(1) - (XPORTH * XCONV)

Where : YLAT is the new Y point in decimal degrees latitude.
XLON is the new X point in decimal degrees longitude.
YCHART(#) is the latitude of the chart corner point.
XCHART(#) is the longitude of the chart corner point.
YPORTH is the Y perimeter point in cm from the orthogonal chart coordinate system.
XPORTH is the X perimeter point in cm from the orthogonal chart coordinate system.

These new latitude and longitude perimeter points are then stored in a special EPA submission file for VIMS SAV Data. The submission file structure is fully documented in Orth et al., 1988.

Organizational Provinces for Analysis and Discussion

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) and modified by Orth et al., 1989 (Fig. 7). 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 approximately 3 nautical miles south of Tangier Island then extending to the eastern side of the bay to an area just south of the mouth of the Little Annemessex River is referred to as the Lower Bay zone.

The area between the south shore of the Little 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 distribution of SAV in each river is 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. 7, Table 3). These sections, which were first delineated for the 1984 survey (Orth et al., 1985) and had been slightly modified for the 1987 survey (Orth et al., 1989), denote relatively distinct parts of the bay and its tributaries that are readily identifiable from a map. The section boundaries used for analysis and discussion of the 1989 SAV distribution and abundance data are those used for the 1987 report (Orth et al., 1989). Sections 1 through 4 are located in the Upper Bay zone. Sections 5 through 13 are located in the Middle Bay zone, and sections 14 through 21 are located in the Lower Bay zone. Appendix B gives the latitude and longitude of the boundary points of each Chesapeake Bay section and Chincoteague Bay in decimal degrees. SAV distribution in Chincoteague Bay is presented and discussed separately from the Chesapeake Bay.

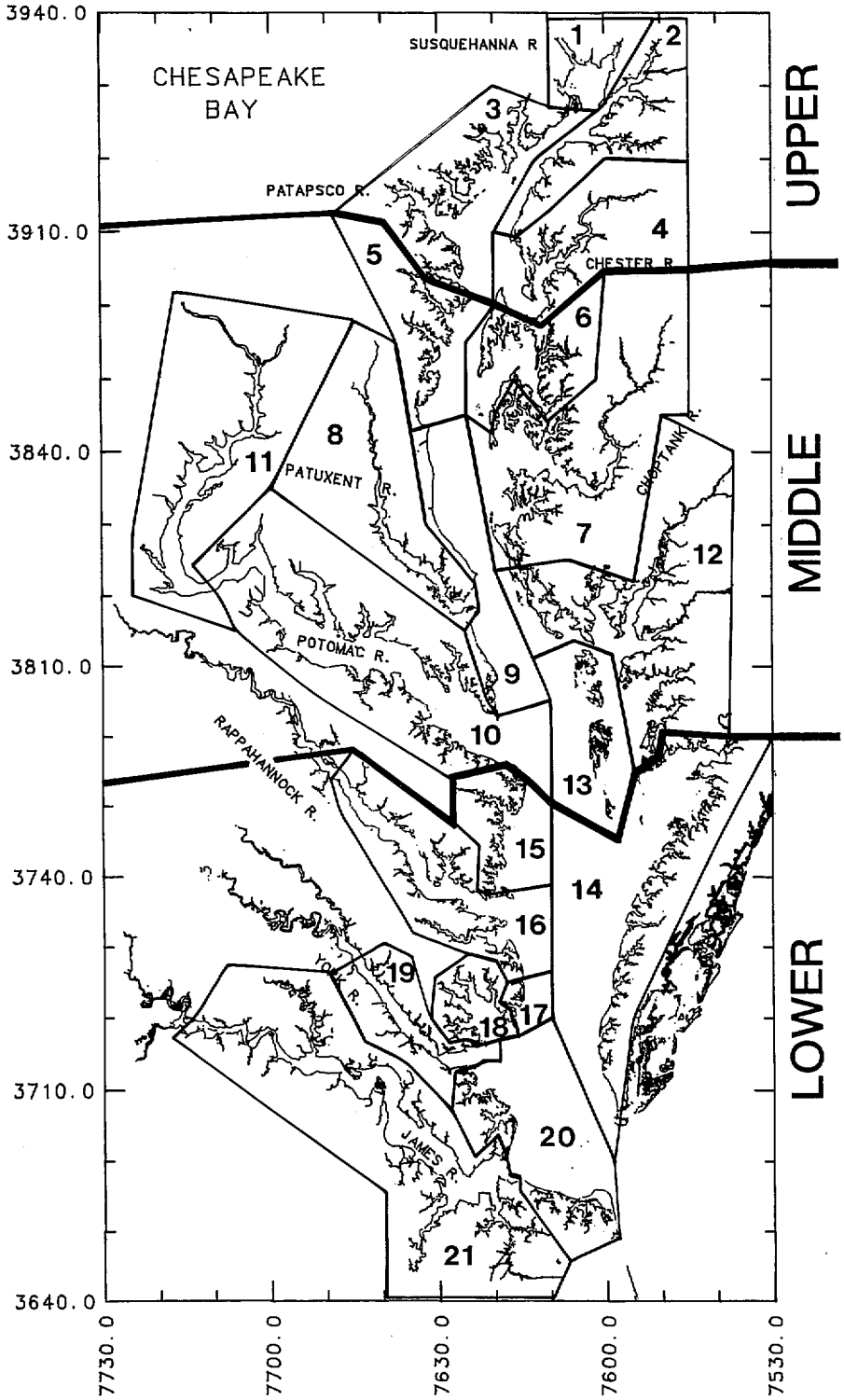

Figure 7. Location of Upper, Middle and Lower zones of the Chesapeake Bay and the 21 major sections used for delineation of SAV distribution patterns. (Latitude and longitude are in decimal degrees along the vertical and horizontal axes, respectively. See Table 3 and Appendix B for exact boundary positions.)

Table 3

Area Descriptions For Each Of The 21 Major Sections Of The Chesapeake Bay SAV Study Area.**

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, and to include SAV on the Swan Point 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 Choptank 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.

Table 3 (continued)

Section 12. Middle Eastern Shore - all areas south of Taylor Island and north of a line bisecting Cedar Island to include the Big and Little Annemessex Rivers, Fishing Bay, and the Honga, Nanticoke, Wicomico and Manokin Rivers.

Section 13. Mid-bay Island Complex - all areas in and adjacent to Bloodsworth, South Marsh, Smith and Tangier Islands.

Section 14. Lower Eastern Shore - all areas south of a line bisecting Cedar Island and located just above the Maryland-Virginia line to Fisherman's Island.

Section 15. Reedville Region - 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 north of a line bisecting the large shoal area around the Guinea Marsh area.

Section 19. York River - all areas along the north shore from Clay Bank to the Guinea Marsh area and south of a line bisecting the large shoal area around the Guinea Marsh area, and along the south shore to include the north shore of 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 12, 13, 14, 18, 19 and 20 were given new boundaries for the 1987 report (Orth et al., 1989) which also changed the delineation of the three major zones. These new boundaries have been retained for this report. (Refer to Figure 7 and Appendix B for boundary locations).

Ground Truth and Other Data Bases

Ground truthing was accomplished by cooperative efforts of a number of agencies and individuals. Although incomplete for most areas, ground truthing confirmed the existence of some SAV beds mapped from 1989 aerial photography, located a few 1989 SAV beds not visible from the photography, and provided species data for many of these beds. Ground truth survey information supplied to VIMS researchers was included on the SAV distribution and abundance maps reproduced in Appendix C to show positions of the survey stations in relation to the 1989 beds of SAV mapped from the aerial photographs. Each survey was designated by a unique symbol to identify the different methods of sampling. 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. Additionally, all ground truth data supplied to VIMS referenced on copies of 1987 SAV maps was tabulated in Appendix E and cross-referenced at VIMS by 1989 bed locations.

For those areas in Virginia waters where aerial photographic evidence of SAV beds was inconclusive, photo-verification was accomplished by ground truthing. Observations were principally made from small boats and by divers snorkeling over areas indicated from the photographs. In several river systems included in this survey (York, Piankatank and Rappahannock) where VIMS researchers transplanted SAV (principally eelgrass), transplant sites also were examined carefully by divers for any extant SAV. Citizen Field Observation data for Virginia waters (compiled by the USFWS) were also added to the 1989 Virginia SAV maps reproduced in Appendix C. In addition, a great deal of ground truth information could be extrapolated from earlier studies (Orth et al., 1979; Orth and Moore, 1982) since SAV beds in this region contain primarily one or two species and have not undergone drastic fluctuations in distribution and abundance since the first bay-wide survey in 1978.

In Maryland, ground truth data were obtained in 1989 by the USGS Potomac River survey, two SAV research and transplanting projects, a USFWS survey, and the Citizen's and Charterboat Captain's volunteer surveys (both data sets compiled by the USFWS along with their own survey data). USFWS personnel surveyed selected locations in the upper bay by boat using rakes to collect samples to determine presence or absence of SAV. Plants collected were identified to species when possible. SAV sightings were referenced on USGS 7.5 minute topographic maps. USFWS staff transferred data from these surveys to full-scale copies of 1987 SAV distribution maps (USGS 7.5 minute topographic quads with 1987 SAV beds). These USFWS-prepared survey maps were supplied to VIMS SAV researchers and survey data were transferred by VIMS staff to the 1989 SAV distribution maps reproduced in Appendix C. USFWS survey data was tabulated, locating each SAV siting by listing its associated 1987 bed. This table was supplied to VIMS where additional survey data were added and it became the basis for the corrected and

much expanded table published in Appendix E. In this latter VIMS version of the USFWS table, all ground truth data were added from the additional surveys, as noted in this report, and all were cross-referenced by 1989 bed locations.

The field study in the Potomac River by the USGS, which covered the shoreline areas from the District of Columbia (D.C.) to the Route 301 bridge near Morgantown, Md., used shoreline surveys to document the distribution of SAV in the tidal freshwater and transition zones of the Potomac River. The USGS conducted shoreline surveys in the tidal freshwater portion of the river and tributaries, specifically the reach between Washington, D.C., and Indian Head (quads 40, 34, 28 and 48), from June to August, and in selected locations further south to Aquia Creek (quad 55) in October of 1989. The transition zone was surveyed in August for SAV by spot-checking in the Port Tobacco quad (161) and Nanjemoy quad (56). These surveys were done by boat, using rakes to collect samples to determine presence or absence of SAV. Plants were identified by species and the proportion of each was estimated for vegetated areas. Each vegetated area with species proportions was referenced on USGS 7.5 minute topographic maps by the surveyors. USGS survey maps were supplied to VIMS SAV researchers and survey data were transferred by VIMS staff to the 1989 SAV distribution maps (reproduced in Appendix C) and were tabulated in Appendix E.

One 1989 SAV transplanting project being conducted on the Susquehanna Flats by Stan Kollar of Harford Community College provided data in the form of species presence by percentage, primarily by visual estimates. Species locations from these data were added to the 1989 SAV maps reproduced in Appendix C and were tabulated in Appendix E by VIMS staff.

A SAV research group at University of Maryland Horn Point Environmental Laboratories (HPEL), headed by Court Stevenson, also provided 1989 ground truth data. Maps of their study sites on the Choptank River were provided to VIMS researchers and were annotated on the maps for this report (Appendix C) indicating the species reported for 1989. This ground truth data was also tabulated in Appendix E.

In addition to the scientific surveys, private citizens participated in identifying 1989 SAV beds by checking certain areas in the bay for the previous years SAV bed locations for presence of SAV and by locating SAV bed locations new in 1989. 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 Maryland Department of Natural Resources (MD DNR) Watermen's Assistance Program. Boat captains were provided with reduced 1987 SAV quadrangle maps to aid in location of 1989 SAV beds and with data sheets on which to record information on each 1989 SAV bed identified. Sampling of SAV sites was 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 MD DNR for identification.

Private citizens volunteered to assist in the 1989 SAV ground survey under guidance of the USFWS and the Chesapeake Bay Foundation (CBF). This program entailed identifying and recording the location of SAV in the bay in 1989. Volunteers who were recruited through press releases, newsletters and personal letters were provided with a SAV identification guide, reduced 1987 SAV maps to aid in location of SAV beds and data sheets for visits to numerous sites around the bay. Each volunteer was asked to identify the location where SAV was sighted, and the species identified were counted. All information from the Charterboat Captain's survey and Citizen's survey was submitted to Linda Hurley and Kathy Reshetiloff (USFWS) for processing. SAV sitings reported by the Citizen's and Charterboat Captain's surveys were mapped on 1987 SAV maps. As previously explained, USFWS personnel also tabulated data from most of the 1989 Citizen's and Charterboat Captain's surveys along with their own survey's data, listing each SAV siting by 1987 bed location. VIMS staff mapped these data on maps reproduced in Appendix C, and data were tabulated in Appendix E.

RESULTS

Data Presentation

SAV distribution data are presented by topographic quadrangle (Table 4), by section and zone (Table 5), and by quadrangles within a section (Table 6). Topographic quadrangle maps annotated with all SAV beds are presented in Appendix C, while individual bed areas for each quadrangle are given in Appendix D. Appendix E tabulates all ground truth data for 1989. 1989 SAV distribution data and species occurrences are first discussed relative to the Upper, Middle, and Lower Bay zones, respectively. The 21 sections of the Chesapeake Bay, and Chincoteague Bay, are then discussed individually and the data compared to results from the 1987 survey (Orth et al., 1989) of SAV distribution and abundance. SAV is plotted for each section and for Chincoteague Bay in Figures 8 through 29. (SAV is plotted in red, a starred line represents a section boundary, latitude and longitude are in decimal degrees along the vertical and horizontal axes, respectively, and USGS 7.5 minute topographic quadrangles are represented by a grid of numbered rectangles. Refer to Table 2 for quadrangle names listed by map number.)

1989 SUMMARY

In 1989, the Chesapeake Bay had 24,134 hectares of SAV, compared to 20,119 hectares in 1987, with 2,458 (10%), 11,507 (48%) and 10,169 (42%) hectares occurring in the Upper, Middle and Lower Bay zones, respectively (Figs. 1 and 2).

Upper Bay Zone

Seventy-nine percent of the SAV within the Upper Bay zone was located in the Susquehanna Flats section (1,945 hectares). Nine species of SAV were documented by ground truth surveys in this section, with *M. spicatum* being the dominant species. *Hydrilla verticillata* was found in the Flats but occurred in small isolated beds. In addition to the reduced overall abundance of SAV from 1987 (2,219 hectares), beds were generally much less dense, with 95% of all SAV beds classified as very sparse (0-10% coverage), and no beds classified as dense (70-100% coverage). There were 308 hectares SAV in the Upper Eastern Shore section located principally in the Elk and lower Sassafras Rivers, Swan, Stillpond and Churn Creeks, with many of the same species as reported in the Susquehanna Flats section. In the Upper Western Shore section (38 hectares) SAV was concentrated in Saltpeter and Seneca Creeks, with *M. spicatum* and *V. americana* being most abundant. In the Chester River section (167 hectares) SAV was most abundant adjacent to Eastern Neck and Eastern Neck Island and in the lower Chester River. In this region *R. maritima* was the most abundant of six species which were reported.

Middle Bay Zone

Forty-five percent of the SAV in the Middle Bay Zone (5,196 hectares) was found in the Mid-bay Island Complex where *R. maritima* and *Z. marina* were present, in

Table 4

Total Area Of SAV In Hectares By USGS 7.5 Minute Topographic Quadrangles For 1987 And 1989.

QUADRANGLE	1987	1989
1. Conowingo Dam, Md.-Pa.	-	0
2. Aberdeen, Md.	4.18	0.66
3. Havre de Grace, Md.	1857.89	1835.50
4. North East, Md.	5.99	105.51
5. Elkton, Md.-Del.	0	5.70
6. White Marsh, Md.	0	0
7. Edgewood, Md.	0.52	#
8. Perryman, Md.	2.93	0
9. Spesutie, Md.	379.65	187.85
10. Earleville, Md.	4.69	97.87
11. Cecilton, Md.	0	0
12. Baltimore East, Md.	0	0
13. Middle River, Md.	22.04	3.61
14. Gunpowder Neck, Md.	90.54	34.55
15. Hanesville, Md.	42.35	12.66
16. Betterton, Md.	19.81	1.09
17. Galena, Md.	7.57	2.79
18. Curtis Bay, Md.	0	#
19. Sparrows Pt., Md.	#	#
20. Swan Point, Md.	1.60	5.24
21. Rock Hall, Md.	5.31	19.16
22. Chestertown, Md.	0	0
23. Round Bay, Md.	0	#
24. Gibson Island, Md.	0.26	#
25. Love Point, Md.	0	0
26. Langford Creek, Md.	499.17	138.92
27. Centreville, Md.	1.45	0
28. Washington West, Md.-DC-Va.	0	0
29. Washington East, DC-Md.	0	0
30. South River, Md.	#	#
31. Annapolis, Md.	#	0

Table 4 (Continued)

QUADRANGLE	1987	1989
32. Kent Island, Md.	322.50	327.06
33. Queenstown, Md.	216.74	128.33
34. Alexandria, Va.-DC-Md.	470.96	368.44
35. Deale, Md.	#	#
36. Claiborne, Md.	136.89	381.68
37. St. Michaels, Md.	231.60	172.44
38. Easton, Md.	0	0
39. Fort Belvoir, Va.-Md.	19.35	63.48
40. Mt. Vernon, Md.-Va.	1056.79	334.61
41. Lower Marlboro, Md.	0	0
42. North Beach, Md.	#	0
43. Tilghman, Md.	85.45	231.11
44. Oxford, Md.	5.51	95.94
45. Trappe, Md.	#	0
46. Preston, Md.	0	0
47. Quantico, Va.-Md.	46.27	533.16
48. Indian Head, Va.-Md.	17.59	184.01
49. Benedict, Md.	1.27	#
50. Prince Frederick, Md.	0	0
51. Hudson, Md.	167.74	331.36
52. Church Creek, Md.	49.46	18.99
53. Cambridge, Md.	#	0
54. East New Market, Md.	#	0
55. Widewater, Va.-Md.	39.17	466.64
56. Nanjemoy, Md.	108.45	149.61
57. Mathias Pt., Md.-Va.	284.18	346.69
58. Popes Creek, Md.	#	6.20
59. Mechanicsville, Md.	2.08	0
60. Broomes Island, Md.	20.20	#
61. Cove Pt., Md.	4.62	0.48
62. Taylors Island, Md.	47.47	16.17

Table 4 (Continued)

QUADRANGLE	1987	1989
63. Golden Hill, Md.	2.53	2.49
64. Passapatanzy, Md.-Va.	0	0
65. King George, Va.-Md.	16.10	52.24
66. Dahlgren, Va.-Md.	14.29	65.33
67. Colonial Beach N., Md.-Va.	17.79	28.46
68. Rock Point, Md.	0	0
69. Leonardtown, Md.	0	#
70. Hollywood, Md.	4.97	#
71. Solomons Island, Md.	8.33	2.96
72. Barren Island, Md.	269.81	301.43
73. Honga, Md.	632.04	773.43
74. Wingate, Md.	171.97	369.33
75. Nanticoke, Md.	0	5.02
76. Colonial Beach S., Va.-Md.	0	0
77. Stratford Hall, Va.-Md.	0	0
78. St. Clements Is., Va.-Md.	0	0
79. Piney Point, Md.-Va.	0	0
80. St. Marys City, Md.	10.48	#
81. Point No Point, Md.	0	0
82. Richland Point, Md.	42.46	24.02
83. Bloodsworth Island, Md.	555.76	686.80
84. Deal Island, Md.	60.24	27.38
85. Monie, Md.	24.60	17.84
86. Champlain, Va.	-	-
87. Machodoc, Va.	0	0
88. Kinsale, Va.-Md.	0	0
89. St. George Island, Va.-Md.	5.73	2.84
90. Point Lookout, Md.	0	0
91. Kedges Straits, Md.	693.37	781.25
92. Terrapin Sand Point, Md.	93.26	218.21
93. Marion, Md.	160.14	199.80

Table 4 (Continued)

QUADRANGLE	1987	1989
94. Mount Landing, Va.	-	-
95. Tappahannock, Va.	-	-
96. Lottsburg, Va.	-	0
97. Heathsville, Va.-Md.	0	0
98. Burgess, Va.-Md.	0	0
99. Ewell, Va.-Md.	2012.93	2423.98
100. Great Fox Is., Va.-Md.	1089.95	1381.77
101. Crisfield, Va.-Md.	123.22	202.04
102. Saxis, Va.-Md.	0	2.08
103. Dunnsville, Va.	-	-
104. Morattico, Va.	0	0
105. Lively, Va.	0	0
106. Reedville, Va.	87.99	157.87
107. Tangier Island, Va.	499.15	696.03
108. Chesconessex, Va.	911.70	972.11
109. Parksley, Va.	235.80	320.18
110. Urbanna, Va.	36.16	200.66
111. Irvington, Va.	97.34	245.45
112. Fleets Bay, Va.	235.67	334.59
113. Nandua Creek, Va.	378.70	406.21
114. Pungoteague, Va.	696.73	795.10
115. West Point, Va.	-	-
116. Saluda, Va.	0	19.08
117. Wilton, Va.	26.75	43.07
118. Deltaville, Va.	18.88	81.06
119. Jamesville, Va.	419.53	496.40
120. Toano, Va.	-	-
121. Gressitt, Va.	-	-
122. Ware Neck, Va.	194.32	278.06
123. Mathews, Va.	58.08	110.18
124. Franktown, Va.	392.70	435.88

Table 4 (Continued)

QUADRANGLE	1987	1989
125. Westover, Va.	-	-
126. Charles City, Va.	-	-
127. Brandon, Va.	0	#
128. Norge, Va.	0**	0**
129. Williamsburg, Va.	-	-
130. Clay Bank, Va.	0	#
131. Achilles, Va.	755.41	957.95
132. New Point Comfort, Va.	1048.89	1273.85
133. Cape Charles, Va.	266.42	271.66
134. Cheriton, Va.	73.50	73.21
135. Savedge, Va.	-	-
136. Claremont, Va.	-	-
137. Surry, Va.	-	-
138. Hog Island, Va.	-	-
139. Yorktown, Va.	0.98	1.58
140. Poquoson West, Va.	290.53	411.99
141. Poquoson East, Va.	752.42	994.84
142. Elliotts Creek, Va.	9.43	15.90
143. Townsend, Va.	11.97	12.55
144. Bacons Castle, Va.	-	-
145. Mulberry Island, Va.	-	-
146. Newport News North, Va.	0	-
147. Hampton, Va.	283.99	304.06
148. Benns Church, Va.	-	-
149. Newport News South, Va.	0	0
150. Norfolk North, Va.	0	0
151. Little Creek, Va.	0	0
152. Cape Henry, Va.	40.50	36.47
153. Chuckatuck, Va.	-	-
154. Bowers Hill, Va.	-	-
155. Norfolk South, Va.	-	-

Table 4 (Continued)

QUADRANGLE	1987	1989
156. Kempsville, Va.	-	-
157. Princess Anne, Va.	-	0
158. Wye Mills, Md.	-	0
159. Bristol, Md.	#	#
160. Fowling Creek, Md.	-	0
161. Port Tobacco, Md.	5.64	12.09
162. Charlotte Hall, Md.	0	0
163. Mardela Springs, Md.	0	0
164. Wetipquin, Md.	0	0
165. Selbyville, Md.	0	0
166. Assawoman Bay, Md.	0	0
167. Berlin, Md.	7.06	4.98
168. Ocean City, Md.	8.42	3.45
169. Public Landing, Md.	0	0
170. Tingles Island, Md.	1020.60	820.82
171. Girdle Tree, Md.-Va.	0	0
172. Boxiron, Md.-Va.	664.94	653.88
173. Whittington Point, Md.-Va.	207.90	161.79
174. Chincoteague West, Va.	0	0
175. Chincoteague East, Va.	401.00	665.58
176. Anacostia, D.C.-Md.	#	0
TOTAL SAV - Chesapeake Bay	20,119.39	24,134.28
TOTAL SAV - Chincoteague Bay	2,309.91	2,310.50

NOTES:

- \- Indicates quadrangle not photographed and assumed to have no SAV.
- 0 Indicates quadrangle photographed and no SAV noted.
- ** Area was photographed in 1987 and 1989, and was known to have SAV both years but was not mapped because SAV beds were too narrow and obscured by the shoreline at 1:24,000 scale. Ground truthing revealed narrow beds fringing the shoreline of small tributaries of the Chickahominy River (see map, Appendix C).
- # SAV beds not detected from aerial photography. Ground truth information indicated presence of SAV.

Table 5

Number Of Hectares Of SAV In 1987 and 1989 For The 21 Major Sections And Three Zones Of The Chesapeake Bay And For Chincoteague Bay. (Section boundaries redefined for 1987 (Orth et al., 1989) and retained for 1989. See Figure 7, Table 3 and Appendix B for boundary locations.)

ZONE	SECTION	AREA (HECTARES) 1987	1989
Upper	1. Susquehanna Flats	2219	1945
	2. Upper Eastern Shore	103	308
	3. Upper Western Shore	117	38
	4. Chester River	515	167
	Zone Total	2,954	2,458
Middle	5. Central Western Shore	0	0
	6. Eastern Bay	900	831
	7. Choptank River	356	865
	8. Patuxent River	41	3
	9. Middle Western Shore	0	0
	10. Lower Potomac River	458	616
	11. Upper Potomac River	1655	1998
	12. Middle Eastern Shore	1527	1998
	13. Mid-Bay Island Complex	4265	5196
	Zone Total	9,202	11,507
Lower	14. Lower Eastern Shore	4036	4718
	15. Reedville	324	492
	16. Rappahannock River Complex	208	669
	17. New Point Comfort Region	238	346
	18. Mobjack Bay Complex	1227	1593
	19. York River	608	677
	20. Lower Western Shore	1322	1670
	21. James River	0	4
	Zone Total	7,963	10,169
TOTAL SAV FOR CHESAPEAKE BAY		20,119	24,134
TOTAL SAV FOR CHINCOTEAGUE BAY		2,310	2,310

Table 6

Number Of Square Meters Of SAV In 1989 For Each Quadrangle Of The 21 Sections In The Chesapeake Bay And Of Chincoteague Bay. (Map code numbers from Table 2 in parentheses.)

SECTION	QUADRANGLE	AREA
Susquehanna Flats - 1	Conowingo Dam (1)	0
	Aberdeen (2)	6,603
	Havre de Grace (3)	18,355,000
	North East (4)	0
	Elkton (5)	0
	Perryman (8)	0
	Spesutie (9)	1,087,980
	Earleville (10)	0
		19,449,583 sq.m
		1,944.96 hectares
		4,805.93 acres
Upper Eastern Shore - 2	North East (4)	1,055,036
	Elkton (5)	56,999
	Perryman (8)	0
	Spesutie (9)	790,514
	Earleville (10)	978,677
	Cecilton (11)	0
	Gunpowder Neck (14)	0
	Hanesville (15)	126,610
	Betterton (16)	10,861
	Galena (17)	27,884
	Swan Point (20)	0
	Rock Hall (21)	30,621
		3,077,202 sq.m
		307.72 hectares
		760.37 acres
Upper Western Shore - 3	White Marsh (6)	0
	Edgewood (7)	0
	Perryman (8)	0
	Spesutie (9)	0
	Baltimore East (12)	0
	Middle River (13)	36,119
	Gunpowder Neck (14)	345,545

Table 6 (Continued)

SECTION	QUADRANGLE	AREA
Upper Western Shore - 3 (continued)		
	Hanesville (15)	0
	Curtis Bay (18)	0
	Sparrows Point (19)	0
	Swan Point (20)	0
	Round Bay (23)	0
	Gibson Island (24)	0
	Love Point (25)	0
		381,664 sq.m
		38.17 hectares
		94.32 acres
Chester River - 4	Betterton (16)	0
	Galena (17)	0
	Swan Point (20)	52,410
	Rock Hall (21)	160,956
	Chestertown (22)	0
	Love Point (25)	0
	Langford Creek (26)	1,389,220
	Centreville (27)	0
	Kent Island (32)	0
	Queenstown (33)	69,033
		1,671,619 sq.m
		167.16 hectares
		413.06 acres
Central Western Shore - 5	Curtis Bay (18)	0
	Round Bay (23)	0
	Gibson Island (24)	0
	South River (30)	0
	Annapolis (31)	0
	Deale (35)	0
	North Beach (42)	0
		0 sq.m
		0 hectares
		0 acres
Eastern Bay - 6	Annapolis (31)	0
	Kent Island (32)	3,270,646
	Queenstown (33)	1,214,290

Table 6 (Continued)

SECTION	QUADRANGLE	AREA
Eastern Bay - 6 (continued)		
	Claiborne (36)	2,196,050
	St. Michaels (37)	1,633,851
	Easton (38)	0
	Tilghman (43)	0
	Oxford (44)	0
		8,314,837 sq.m
		831.48 hectares
		2,054.56 acres
Choptank River - 7	Centreville (27)	0
	Claiborne (36)	1,620,778
	St. Michaels (37)	90,522
	Easton (38)	0
	Tilghman (43)	2,311,104
	Oxford (44)	959,387
	Trappe (45)	0
	Preston (46)	0
	Hudson (51)	3,313,614
	Church Creek (52)	189,937
	Cambridge (53)	0
	East New Market (54)	0
	Taylors Island (62)	161,654
	Golden Hill (63)	0
	Nanticoke (75)	0
	Wye Mills (158)	0
	Fowling Creek (160)	0
		8,646,996 sq.m
		864.70 hectares
		2,136.64 acres
Patuxent River - 8	Deale (35)	0
	Lower Marlboro (41)	0
	North Beach (42)	0
	Benedict (49)	0
	Prince Frederick (50)	0
	Mechanicsville (59)	0
	Broomes Island (60)	0
	Cove Point (61)	4,774

Table 6 (Continued)

SECTION	QUADRANGLE	AREA
Patuxent River - 8 (continued)		
	Hollywood (70)	0
	Solomons Island (71)	29,595
	Bristol (159)	0
		34,369 sq.m
		3.44 hectares
		8.50 acres
Middle Western Shore - 9	North Beach (42)	0
	Prince Frederick (50)	0
	Hudson (51)	0
	Broomes Island (60)	0
	Cove Point (61)	0
	Taylors Island (62)	0
	Solomons Island (71)	0
	Barren Island (72)	0
	St. Marys City (80)	0
	Point No Point (81)	0
	Richland Point (82)	0
	Point Lookout (90)	0
		0 sq.m
		0 hectares
		0 acres
Lower Potomac River - 10	Nanjemoy (56)	1,496,087
	Mathias Point (57)	3,466,882
	Popes Creek (58)	61,980
	Mechanicsville (59)	0
	King George (65)	147,817
	Dahlgren (66)	653,264
	Colonial Beach North (67)	284,567
	Rock Point (68)	0
	Leonardtown (69)	0
	Hollywood (70)	0
	Solomons Island (71)	0
	Colonial Beach South (76)	0
	Stratford Hall (77)	0
	St. Clements Island (78)	0

Table 6 (Continued)

SECTION	QUADRANGLE	AREA
Lower Potomac River - 10 (continued)		
	Piney Point (79)	0
	St. Marys City (80)	0
	Machodoc (87)	0
	Kinsale (88)	0
	St. George Island (89)	28,412
	Point Lookout (90)	0
	Lottsburg (96)	0
	Heathsville (97)	0
	Burgess (98)	0
	Port Tobacco (161)	17,165
	Charlotte Hall (162)	0
		6,156,173 sq.m
		615.62 hectares
		1,521.18 acres
Upper Potomac River - 11	Washington West (28)	0
	Washington East (29)	0
	Alexandria (34)	3,684,377
	Fort Belvoir (39)	634,806
	Mt. Vernon (40)	3,346,067
	Quantico (47)	5,331,609
	Indian Head (48)	1,840,069
	Widewater (55)	4,666,357
	Nanjemoy (56)	0
	Mathias Point (57)	0
	Passapatanzy (64)	0
	King George (65)	374,611
	Dahlgren (66)	0
	Port Tobacco (161)	103,741
		19,981,637 sq.m
		1,998.16 hectares
		4,937.39 acres
Middle Eastern Shore - 12	Taylors Island (62)	0
	Golden Hill (63)	24,915
	Barren Island (72)	3,014,329
	Honga (73)	7,734,303
	Wingate (74)	3,693,340
	Nanticoke (75)	50,162

Table 6 (Continued)

SECTION	QUADRANGLE	AREA
Middle Eastern Shore - 12 (continued)		
	Richland Point (82)	240,230
	Bloodsworth Island (83)	782,926
	Deal Island (84)	273,834
	Monie (85)	178,367
	Terrapin Sand Point (92)	118,454
	Marion (93)	1,998,027
	Great Fox Island (100)	1,287,123
	Crisfield (101)	583,880
	Mardela Springs (163)	0
	Wetipquin (164)	0
		19,979,890 sq.m
		1,997.99 hectares
		4,936.97 acres
Mid-Bay Island Complex - 13	Richland Point (82)	0
	Bloodsworth Island (83)	6,085,106
	Deal Island (84)	0
	Kedges Straits (91)	7,812,500
	Terrapin Sand Point (92)	2,063,618
	Ewell (99)	24,239,820
	Great Fox Is. (100)	5,314,576
	Tangier Island (107)	6,441,350
		51,956,970 sq.m
		5,195.70 hectares
		12,838.40 acres
Lower Eastern Shore - 14	Great Fox Island(100)	7,216,001
	Crisfield (101)	1,436,492
	Saxis (102)	20,778
	Tangier Island (107)	518,914
	Chesconessex (108)	9,721,082
	Parksley (109)	3,201,755
	Nandua Creek (113)	4,062,056
	Pungoteague (114)	7,950,993
	Jamesville (119)	4,963,965
	Franktown (124)	4,358,834
	Cape Charles (133)	2,716,621
	Cheriton (134)	732,110

Table 6 (Continued)

SECTION	QUADRANGLE	AREA
Lower Eastern Shore - 14 (continued)		
	Elliotts Creek (142)	158,983
	Townsend (143)	125,531
		47,184,115 sq.m
		4,718.41 hectares
		11,659.03 acres
Reedville Region - 15	Heathsville (97)	0
	Burgess (98)	0
	Reedville (106)	1,578,740
	Irvington (111)	0
	Fleets Bay (112)	3,344,656
		4,923,396 sq.m
		492.34 hectares
		1,216.56 acres
Rappahannock River Complex - 16	Tappahannock (95)	0
	Dunnsville (103)	0
	Morattico (104)	0
	Lively (105)	0
	Urbanna (110)	2,006,645
	Irvington (111)	2,454,461
	Fleets Bay (112)	1,212
	Saluda (116)	190,787
	Wilton (117)	430,676
	Deltaville (118)	810,599
	Ware Neck (122)	0
	Mathews (123)	797,841
		6,692,221 sq.m
		669.22 hectares
		1,653.62 acres
New Point Comfort Region - 17	Mathews (123)	0
	New Point Comfort (132)	3,457,814
		3,457,814 sq.m
		345.78 hectares
		854.41 acres

Table 6 (Continued)

SECTION	QUADRANGLE	AREA
Mobjack Bay Complex - 18	Ware Neck (122)	2,780,630
	Mathews (123)	303,970
	Achilles (131)	6,650,301
	New Point Comfort (132)	6,190,963
		15,925,864 sq.m
		1,592.59 hectares
		3,935.24 acres
York River - 19	Toano (120)	0
	Gressitt (121)	0
	Williamsburg (129)	0
	Clay Bank (130)	0
	Achilles (131)	2,929,149
	New Point Comfort (132)	3,089,733
	Hog Island (138)	0
	Yorktown (139)	15,826
	Poquoson West (140)	734,147
	Poquoson East (141)	0
		6,768,855 sq.m
		676.89 hectares
		1,672.57 acres
Lower Western Shore - 20	Poquoson West (140)	3,385,727
	Poquoson East (141)	9,948,414
	Elliotts Creek (142)	0
	Newport News North (146)	0
	Hampton (147)	3,001,969
	Norfolk North (150)	0
	Little Creek (151)	0
	Cape Henry (152)	364,695
	Kempsville (156)	0
	Princess Anne (157)	0
		16,700,805 sq.m
		1,670.08 hectares
		4,126.71 acres

Table 6 (Continued)

SECTION	QUADRANGLE	AREA
James River - 21	Toano (120)	0
	Westover (125)	0
	Charles City (126)	0
	Brandon (127)	0
	Norge (128)	0
	Williamsburg (129)	0
	Savedge (135)	0
	Claremont (136)	0
	Surry (137)	0
	Hog Island (138)	0
	Yorktown (139)	0
	Bacons Castle (144)	0
	Mulberry Island (145)	0
	Newport News North (146)	0
	Hampton (147)	38,602
	Benns Church (148)	0
	Newport News South (149)	0
	Norfolk North (150)	0
	Little Creek (151)	0
	Chuckatuck (153)	0
	Bowers Hill (154)	0
	Norfolk South (155)	0
	Kempsville (156)	0
		38,602 sq.m
		3.86 hectares
		9.54 acres
Chincoteague Bay	Berlin (167)	49,775
	Ocean City (168)	34,490
	Public Landing (169)	0
	Tingles Island (170)	8,208,195
	Girdle Tree (171)	0
	Boxiron (172)	6,538,836
	Whittington Point (173)	1,617,855
	Chincoteague West (174)	0
	Chinoteague East (175)	6,655,790
		23,104,941 sq.m
		2,310.49 hectares
		5,709.14 acres

particular, the broad shoal area between Smith and Tangier Islands. Eighteen percent (1,998 hectares) of the SAV in this zone was present in the Middle Eastern Shore section, primarily in the Barren Island-Honga River area, the Big and Little Annemessex Rivers, and the lower section of the Manokin River, with *R. maritima* being the dominant species reported for this area. Little or no SAV was mapped or reported from the Central Western Shore, Middle Western Shore, and Patuxent River sections.

The Middle Bay zone also includes the entire Potomac River, where 2,614 hectares of SAV were present in 1989. SAV was concentrated in two distinct zones: 1. the tidal freshwater region (the Upper Potomac River section with 1,998 hectares) where *H. verticillata* remained the numerically dominant species (eight other species were recorded from the USGS and Citizen's surveys); and 2. the region around the Route 301 bridge (the upper portion of the Lower Potomac River section with 616 hectares), including Nanjemoy Creek and Port Tobacco River, with *V. americana* and *M. spicatum* being the most frequently reported species in this area. Although the total abundance of SAV in the upper section increased from 1987 (1,665 hectares), many of the very dense beds from the Woodrow Wilson bridge to just below Piscataway Creek declined. The decline was offset by the large increases in SAV from Quantico Creek to Aquia Creek, along both shores.

Lower Bay Zone

SAV was abundant throughout the entire Lower Bay zone except for the James River. Forty-five percent of SAV in the Lower Bay zone was found in the Lower Eastern Shore section, around the Fox Islands and the mouths of major creeks (i.e. Cherrystone Inlet, Hungars Creek, Mattawoman Creek, Occahannock Creek, Craddock Creek, Pungoteague Creek and Onancock Creek). Along the western shore, SAV was abundant in Mobjack Bay (15% of SAV in the Lower Bay zone), lower York River, Back River and Drum Island Flats area adjacent to Plum Tree Island. Both *R. maritima* and *Z. marina* were abundant throughout this zone. *Ruppia maritima* continued to increase in abundance in both the Piankatank and Rappahannock Rivers. *Zostera marina* is present in several sections resulting from previously successful transplant efforts.

Chincoteague Bay

SAV in Chincoteague Bay was little changed in distribution from 1987, with 2,310 hectares reported in 1989. All of the SAV consisted of *R. maritima* and *Z. marina*, and was located along the eastern side of the bay behind Assateague Island.

1. SUSQUEHANNA FLATS

There were 1,945 hectares of SAV in the Susquehanna Flats section in 1989 (Tables 4-6; Fig. 8; Appendix C, Maps 2, 3 and 9) compared to 2,219 hectares mapped in 1987. In addition to the reduced overall abundance of SAV from 1987, beds were generally much less dense as compared to 1987 densities (95% of the beds are classified as very sparse, and no beds were classified as dense). SAV beds were located principally in two main areas: 1. very sparse to moderate fringing beds in the Susquehanna River consisting primarily of *M. spicatum*, with *P. pectinatus*, *C. demersum*, *V. americana*, *H. dubia* and *N. guadalupensis* in lesser amounts from Spencer Island to the river mouth at Havre de Grace on the west side, and to Stump Point at the mouth of Mill Creek on the north side; and 2. a large area of very sparse SAV located in the broad shoal area at the river mouth. This broad shoal consisted primarily of small patches of *M. spicatum*, with *P. pectinatus*, *V. americana*, *C. demersum* and *N. guadalupensis*.

A total of nine species (*M. spicatum*, *H. dubia*, *V. americana*, *H. verticillata*, *C. demersum*, *P. pectinatus*, *N. guadalupensis*, *P. perfoliatus*, and *Najas* spp.) have been reported either by Stan Kollar of Harford Community College, the Citizen's or the Charterboat Captain's surveys. SAV beds consisted of up to five species, with *M. spicatum* being dominant. *Heteranthera dubia*, *V. americana*, *H. verticillata* and *C. demersum* also occurred in significant amounts. SAV remains virtually absent from Mill Creek, Furnace Bay, Northwest River, Swan Creek, Spesutie Island and western Elk Neck.

2. UPPER EASTERN SHORE

There were 308 hectares of SAV mapped for the Upper Eastern Shore section in 1989 (Tables 4-6; Fig. 9; Appendix C, Maps 4, 5, 9, 10, 15, 16, 17 and 21), compared to 103 hectares mapped for 1987, consisting of very sparse to sparse beds (35% and 63%, respectively, of the total coverage within section 2). Principal locations of beds were in the Elk River, Swan Creek, lower Sassafras River, Stillpond Creek and the mouth of Churn Creek. Very little SAV was mapped in the Bohemia River and along the mainstem of the bay from Stillpond Creek to Swan Point. This section has contained relatively little SAV since the baywide SAV survey program began in 1978 although, historically this section has contained abundant SAV (Stevenson and Confer, 1978).

Myriophyllum spicatum and *V. americana* were the two most commonly reported species, with seven other species (*H. verticillata*, *C. demersum*, *P. pectinatus*, *E. canadensis*, *Z. palustris*, *P. crispus and R. maritima*) reported in lesser amounts as determined by the Citizen's and Charterboat Captain's surveys.

3. UPPER WESTERN SHORE

There were 38 hectares of SAV mapped from the aerial photographs in 1989 for the Upper Western Shore section (Tables 4-6; Fig. 10; Appendix C, Maps 13 and 14) compared to 117 hectares in 1987. SAV beds were concentrated in Saltpeter and Seneca Creeks. Very little or no SAV was reported in the Back, Patapsco, Bush, Gunpowder, Middle and Magothy Rivers.

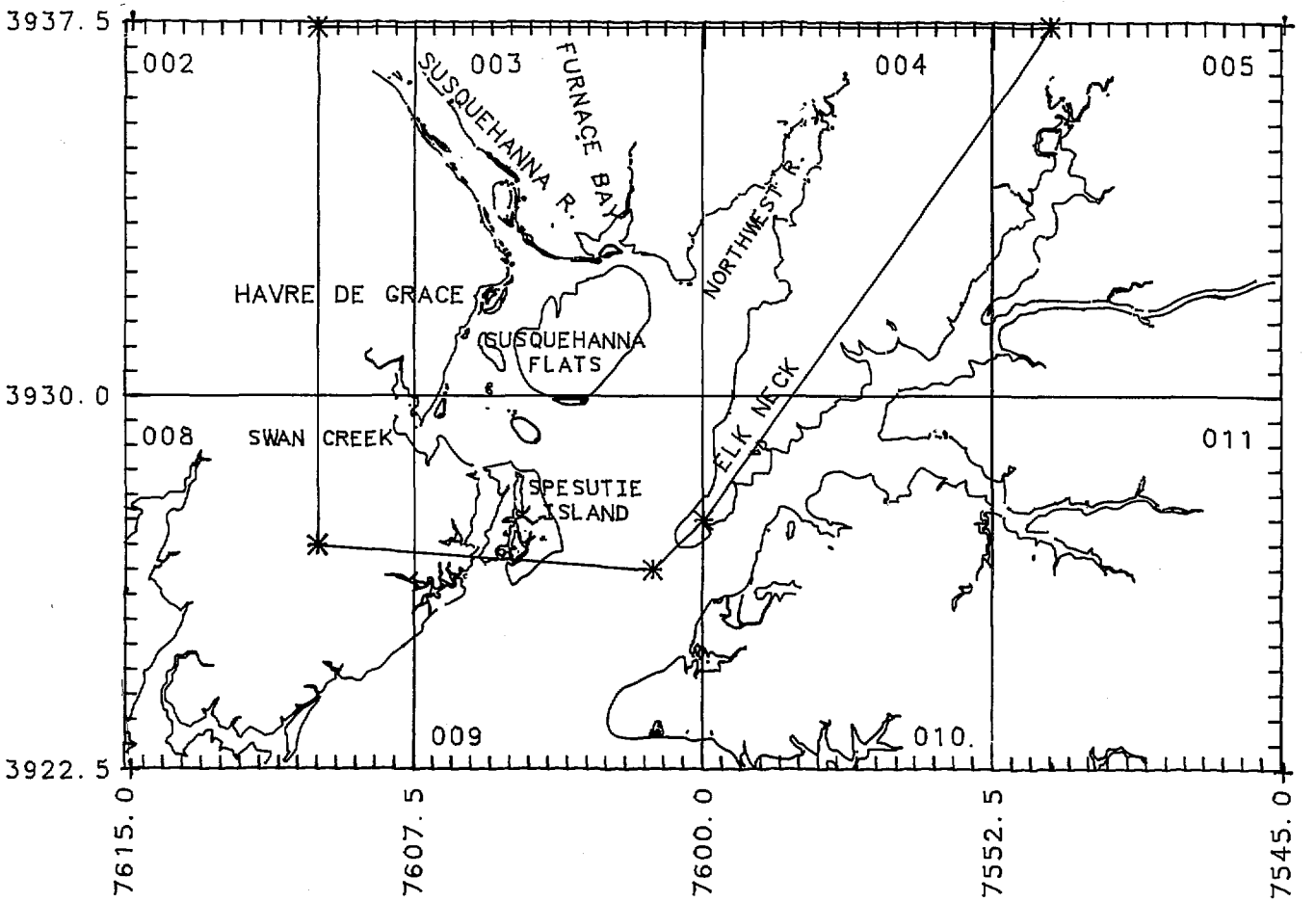

Figure 8. Distribution of SAV in the Susquehanna Flats (Section 1).

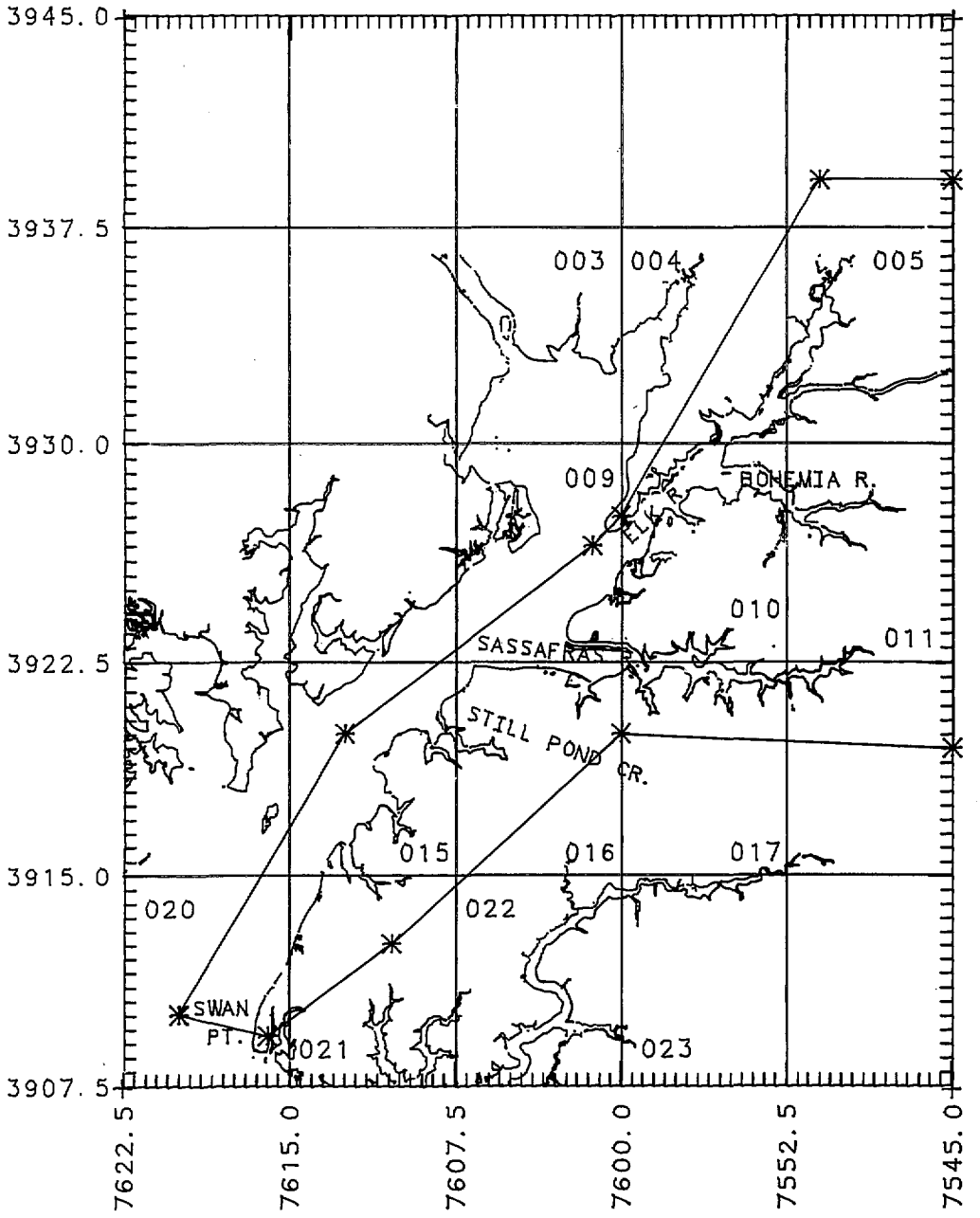

Figure 9. Distribution of SAV in the Upper Eastern Shore (Section 2).

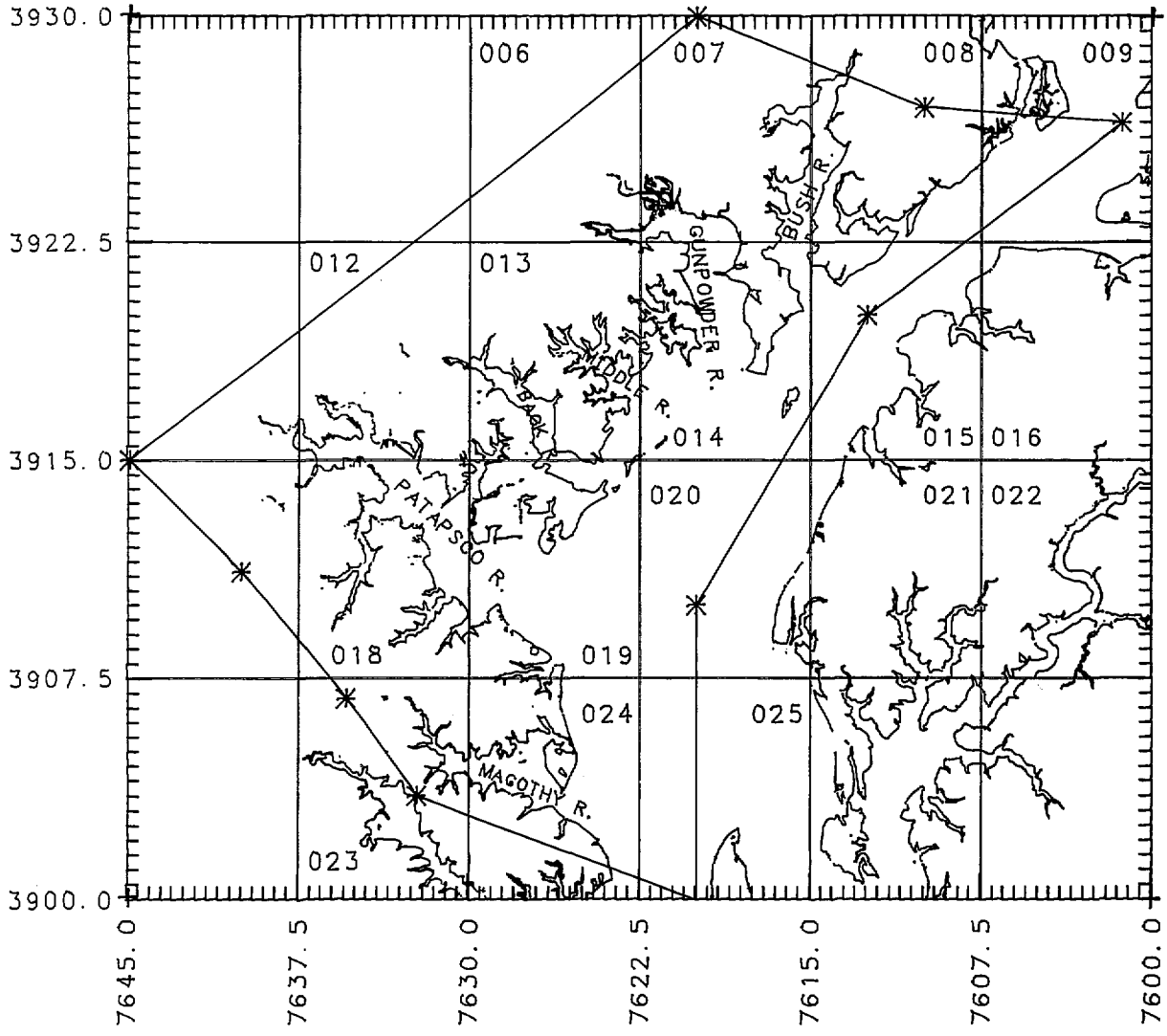

Figure 10. Distribution of SAV in the Upper Western Shore (Section 3).

Myriophyllum spicatum, *E. canadensis*, *Z. palustris*, *P. pectinatus* and *C. demersum* were reported by the Citizen's and Charterboat Captain's surveys (maps 7, 18, 19, 23 and 24).

4. CHESTER RIVER

There were 167 hectares of SAV in the Chester River section in 1989 (Tables 4-6; Fig. 11; Appendix C, Maps 20, 21, 26 and 33) compared to 515 hectares in 1987. Most of the SAV was located adjacent to Eastern Neck and Eastern Neck Island, and in the Chester River. Additional beds are found in Rock Hall Harbor, The Haven, Swan and Huntingfield Creeks, located above Eastern Neck on the Chesapeake Bay.

Six species of SAV were reported from this section in 1989 by the Citizen's, Charterboat Captain's and USFWS surveys (maps 21 and 26). *Ruppia maritima* and *P. perfoliatus* were by far the most commonly reported species in this section with *P. pectinatus*, *M. spicatum*, *E. canadensis* and *Z. palustris* being reported less frequently.

5. CENTRAL WESTERN SHORE

There was no SAV observed from the aerial photography in the Central Western Shore section in 1989 (Tables 4-6; Fig. 12) which was similar to 1987. Although not evident in the aerial photography, the Citizen's survey reported SAV, primarily *P. pectinatus*, *Z. palustris* and *R. maritima*, from a few sites in this section (maps 23, 30, 35).

6. EASTERN BAY

There were 831 hectares of SAV identified from the Eastern Bay section in 1989 (Tables 4-6; Fig. 13; Appendix C, Maps 32, 33, 36 and 37) compared to 900 hectares reported in 1987. SAV occurred as very sparse to sparse beds throughout this section (14% and 72% of the total SAV coverage within section 6, respectively). In 1989 SAV was identified as being particularly abundant along both shorelines in Crab Alley Bay, Prospect Bay, Parson Island, Piney Neck and the lower portion of the Miles River. Little SAV was present from Punch Point on the Western shore of Eastern Bay to Pawpaw Cove on Tilghman Island, as well as in the Miles and Wye River. *Ruppia maritima*, *P. pectinatus* and *Z. palustris* were reported by the Citizen's survey (maps 32, 33 and 37). However, field information from this source as well as the Charterboat Captain's survey was very limited compared to previous years.

7. CHOPTANK RIVER

There were 865 hectares of SAV observed in the Choptank River section in 1989 (Tables 4-6; Fig. 14; Appendix C, Maps 43, 44, 51, 52 and 62) compared to 356 hectares in 1987. Most of the SAV occurred in sparse to moderate beds in only a few areas (24% and 64% of the total coverage within section 7, respectively). Most of the SAV was found in Harris Creek and Brannock Bay. Other areas were principally along the eastern side of Tilghman Island, the mouth of Chapel Creek, Cook Point Cove, Covey Creek and Cators Cove. There was little or no SAV in Broad Creek,

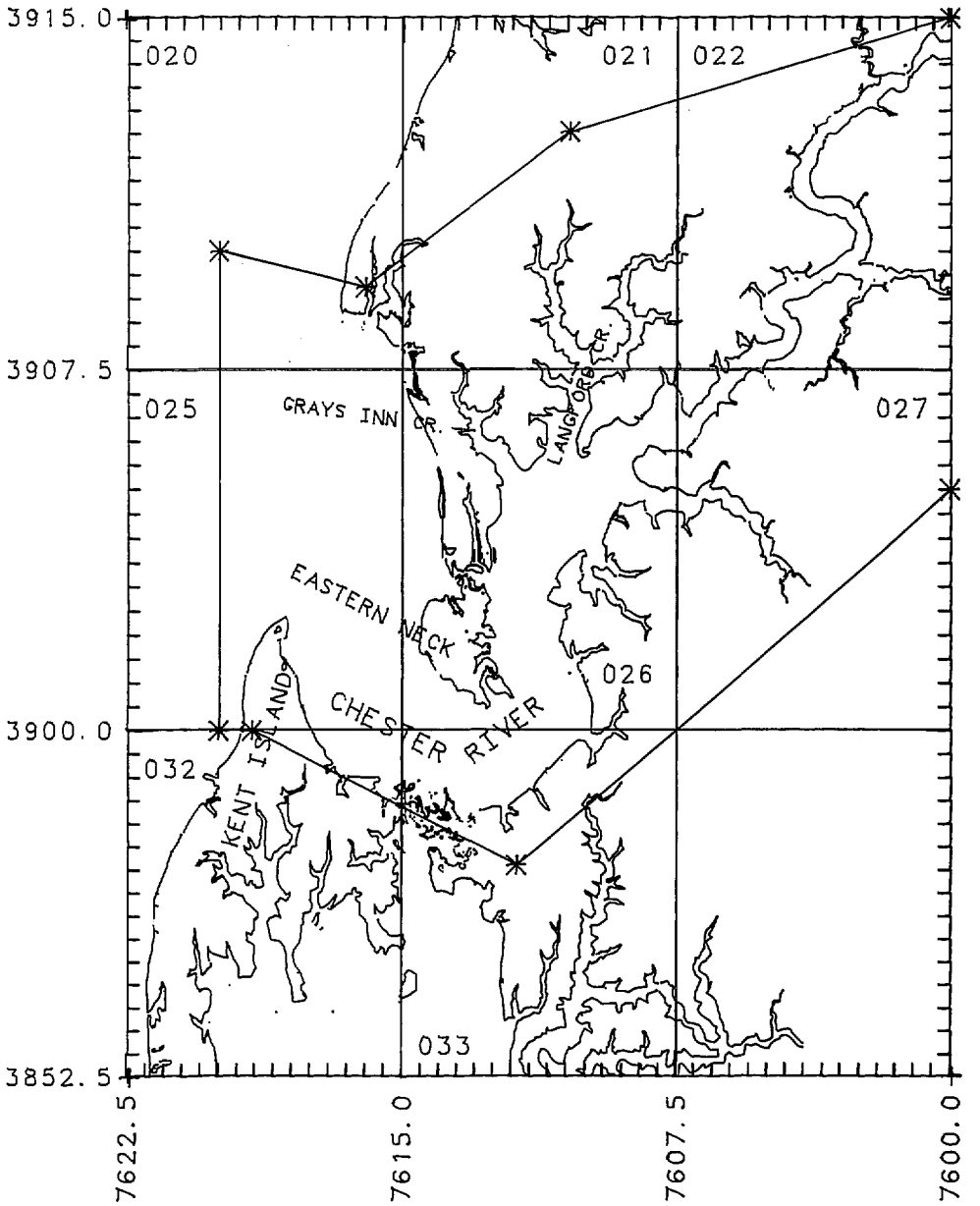

Figure 11. Distribution of SAV in the Chester River (Section 4).

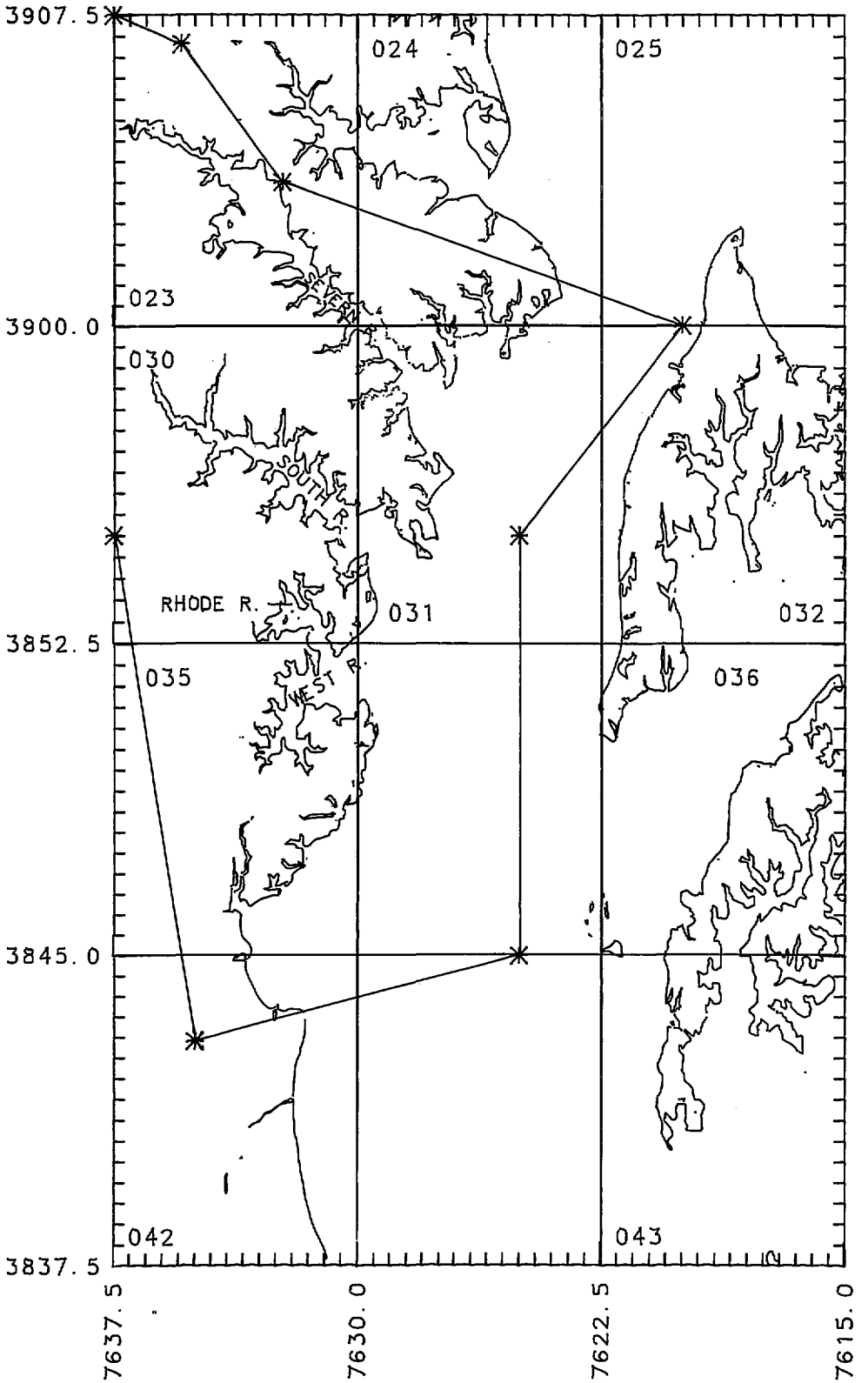

Figure 12. Distribution of SAV in the Central Western Shore (Section 5).

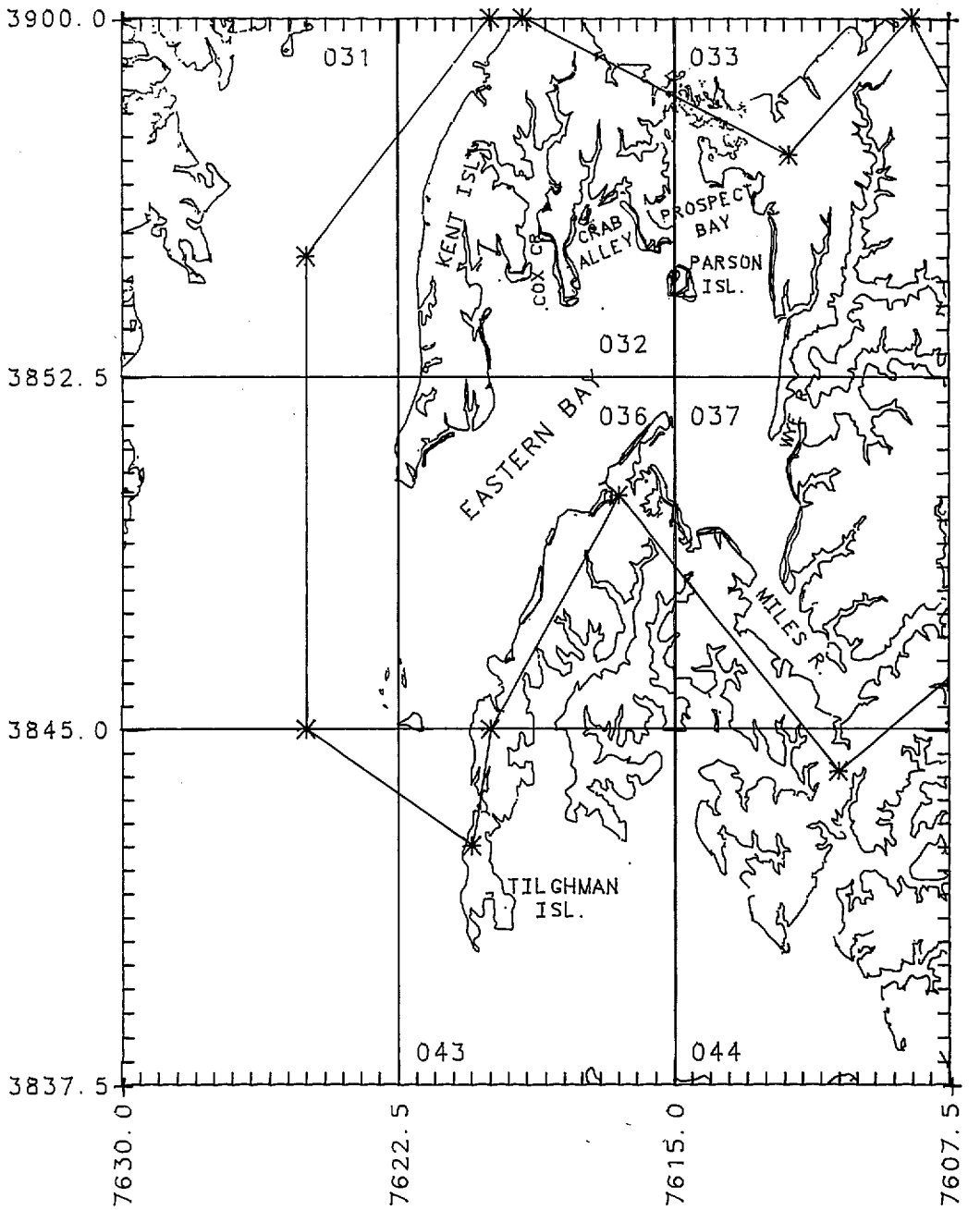

Figure 13. Distribution of SAV in the Eastern Bay (Section 6).

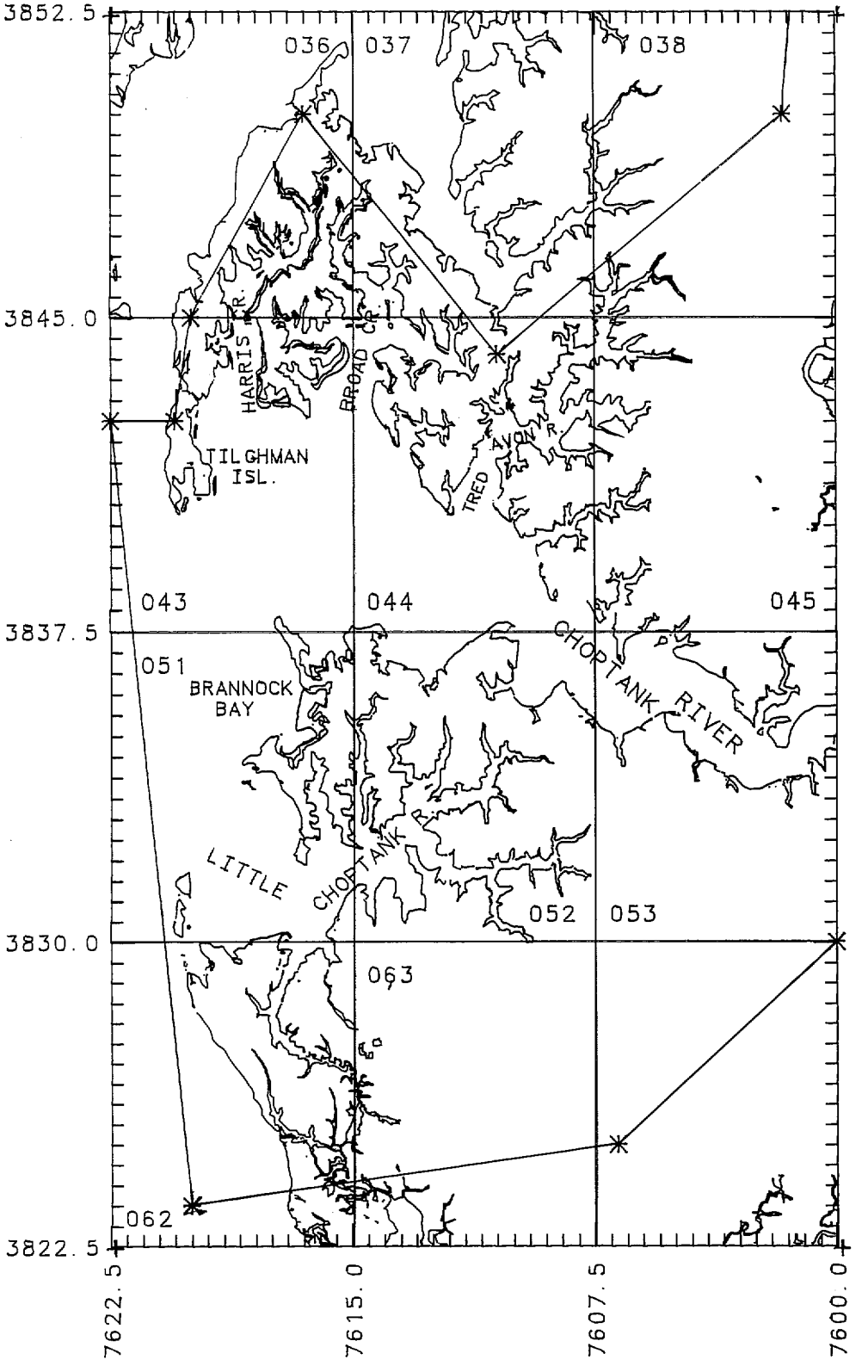

Figure 14. Distribution of SAV in the Choptank River (Section 7).

Tred Avon River and much of the Little Choptank River. Vegetation above Chapel Creek in the Choptank River is sparse but not completely absent.

Ground surveys by Citizens and Charterboat Captains, as well as scientists from the University of Maryland's Horn Point Environmental Laboratories, located three species of SAV in this section (maps 36, 43, 44, 51, 52, 62) with *R. maritima* being the most prevalent. *Potamogeton pectinatus* and *Z. palustris* were observed in scattered locations.

8. PATUXENT RIVER

There were 3 hectares of SAV reported in the Patuxent River section in 1989 (Tables 4-6; Fig. 15) compared to 41 hectares reported in 1987. SAV in the Patuxent River has always been at very low levels of abundance and has not exceeded 50 hectares in any year since the baywide effort began in 1978. There were sporadic sightings of four SAV species in the Patuxent River by the Citizen's and Charterboat Captain's surveys (maps 49, 60, 61, 70, 71, 159). Those species reported from the lower sections of the river were: *Z. palustris*, *P. pectinatus*, *M. spicatum* and *R. maritima*. Species found from the upper sections of the river were *V. americana*, *C. demersum*, *P. pectinatus*, *N. guadalupensis*, *E. canadensis*, *P. crispus*, *P. pusillus* and *Najas* spp.

9. MIDDLE WESTERN SHORE

There were no SAV beds identified in the Middle Western Shore section in 1989 (Tables 4-6; Fig. 16) which was similar to 1987. There were no observations from ground surveys in 1989. Most of the littoral area in this broad section of the bay is composed of exposed beaches of high energy that are unsuitable for SAV growth. Therefore, we would not expect large expanses of SAV, rather only small pockets of SAV in creeks or ponds that empty into the bay. Previous surveys have reported no more than 23 hectares of SAV.

10. LOWER POTOMAC RIVER

There were 616 hectares of SAV identified in the Lower Potomac River section from the 1989 aerial photography (Tables 4-6; Fig. 17; Appendix C, Maps 56, 57, 65, 66, 67 and 161) compared to 458 hectares reported in 1987. All of the SAV, except for a small bed near the mouth of the St. Mary's River, occurred in the region near the Route 301 bridge, in Nanjemoy Creek and Port Tobacco River, and in the shoreline adjacent to these two creeks. A majority of SAV beds were densely vegetated with 71% of the total SAV within section 10 in density class 4. SAV beds were fringing along the eastern side of Mathias Point Neck to the Route 301 bridge. Several small beds were observed in Machodoc, Rosier and Cuckhold Creeks, just below the Route 301 bridge.

Citizen's survey observations were made only in the St. Mary's River (map 80) where *R. maritima* was the only species present, Herring Creek (Piney Point, map 79) where *R. maritima* and *Z. marina* were reported, and in Breton Bay (Leonardtown Quad, map 69) where *E. canadensis* and *P. perfoliatus* were observed. USFWS and USGS surveys were made in the Port Tobacco River and Nanjemoy Creek (maps 56

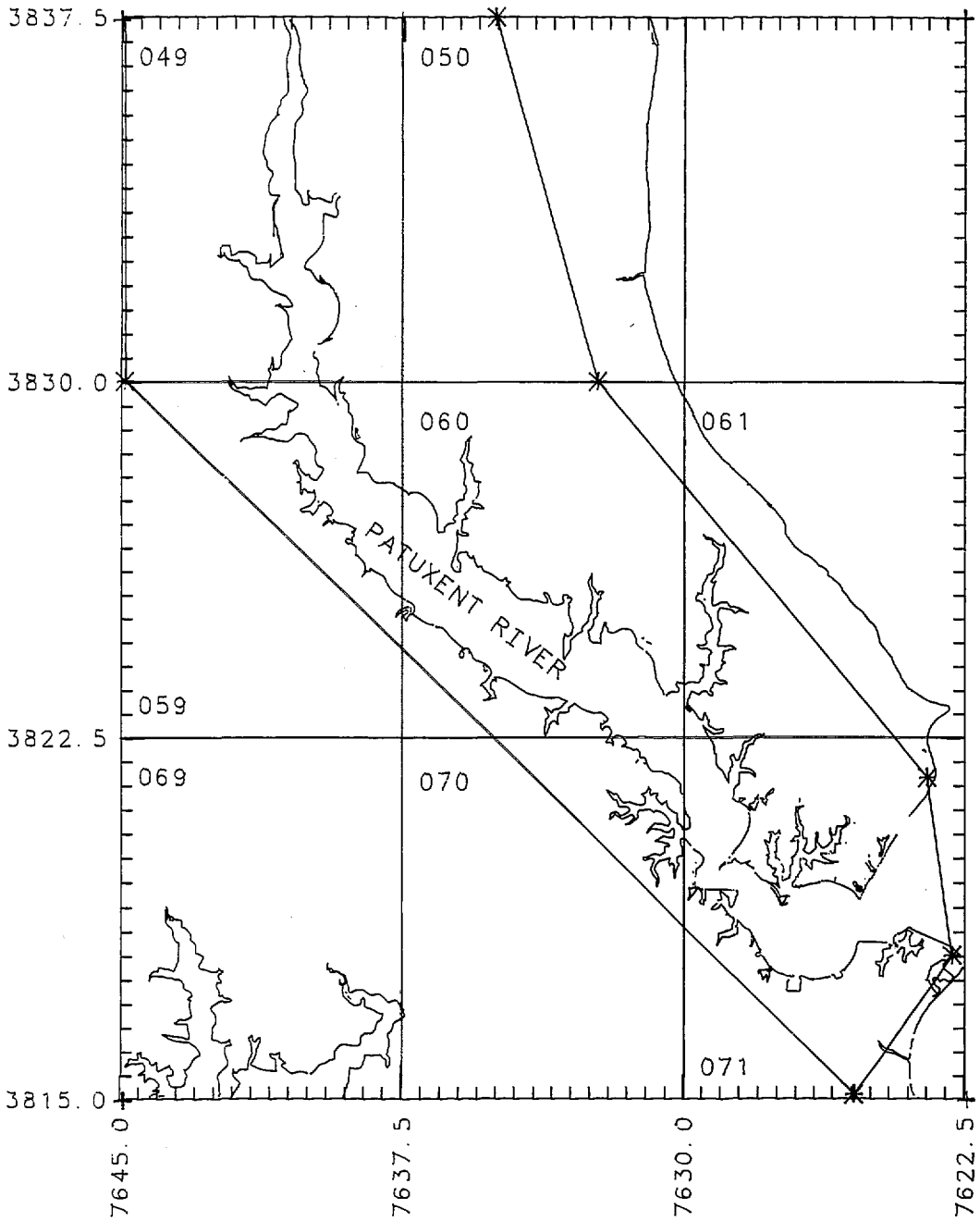

Figure 15. Distribution of SAV in the Patuxent River (Section 8).

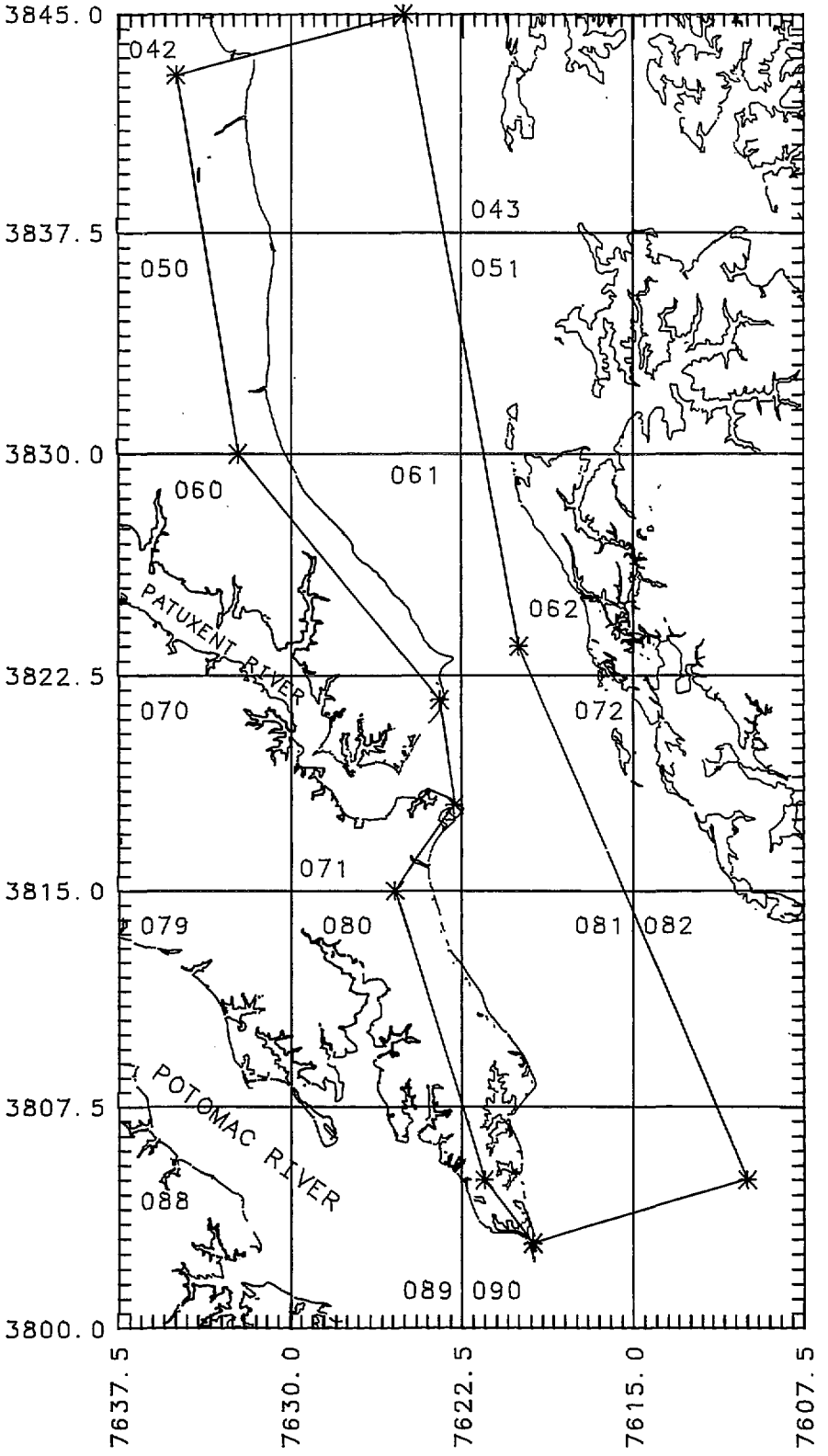

Figure 16. Distribution of SAV in the Middle Western Shore (Section 9).

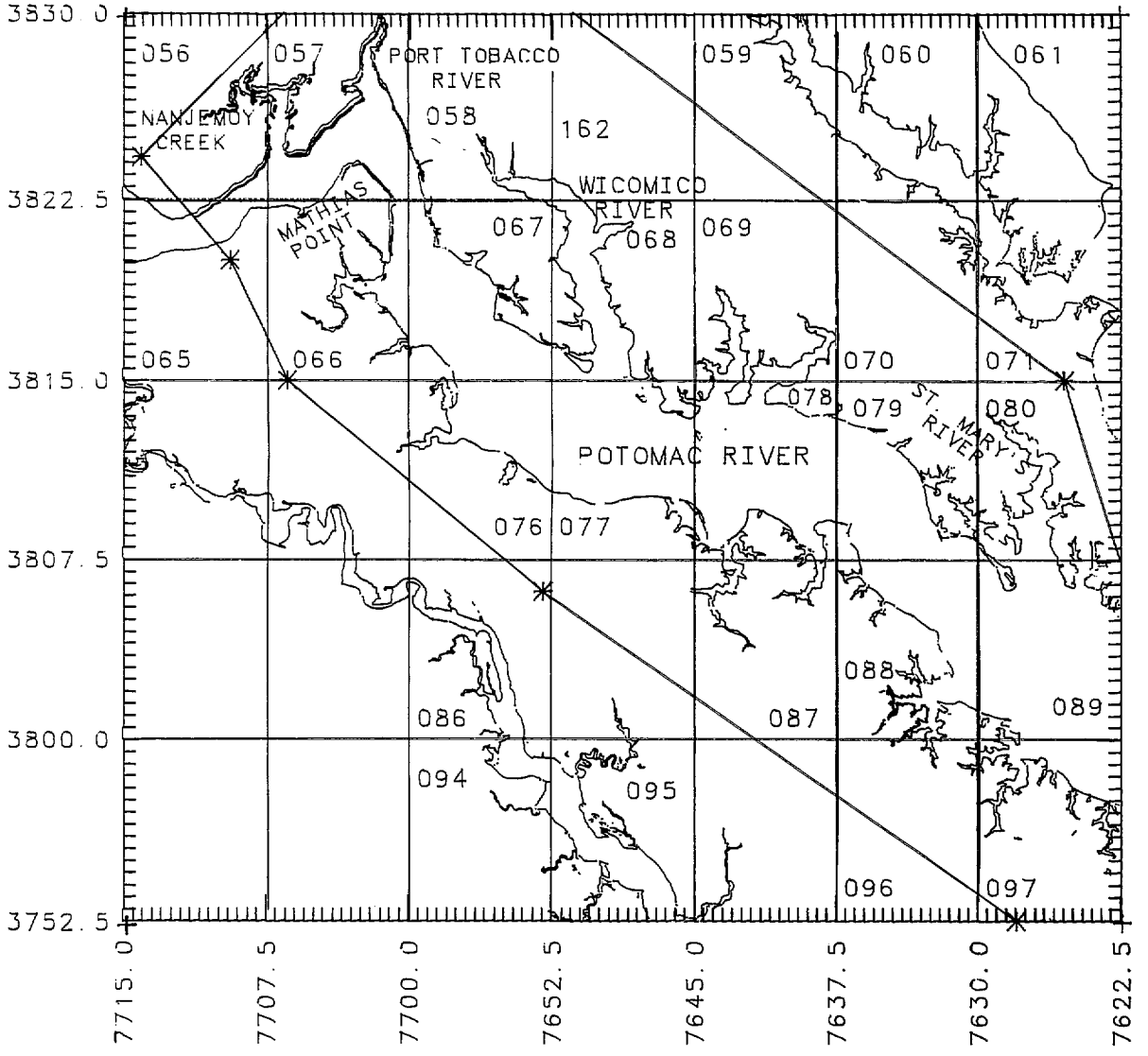

Figure 17. Distribution of SAV in the Lower Potomac River (Section 10).

and 57). They reported *V. americana, M. spicatum, P. perfoliatus, C. demersum, P. pectinatus, Najas* spp., *P. pusillus, P. crispus and R. maritima.* The USGS also reported *P. perfoliatus* near the Route 301 bridge on the Virginia side of the Potomac River.

11. UPPER POTOMAC RIVER

There were 1,998 hectares of SAV mapped in the Upper Potomac River section (Tables 4-6; Fig. 18; Appendix C, Maps 34, 39, 40, 47, 48, 55, 65 and 161) compared to 1,655 hectares reported in 1987. A total of 69% of the SAV beds were densely vegetated (density class 4). Although the total coverage of SAV in this section had increased, many of the dense beds from the Woodrow Wilson Bridge (except the one in the middle of the river) to just below Piscataway Creek were no longer present or reduced in coverage. SAV distribution in the Alexandria and Mount Vernon Quadrangles declined 21% and 68% from 1987, respectively. SAV increased from Quantico to Aquia Creek, along both shores, with large increases in the Indian Head (17.6 to 184.0 hectares), Widewater (39.2 to 466.6 hectares), King George (3.6 to 37.4 hectares) and Fort Belvoir (19.3 to 63.5 hectares) quadrangles. SAV is still absent from Occoquan Bay, Belmont Bay and Aquia Creek.

Numerous SAV species were reported by the Citizen's survey (maps 39, 40 and 48) which included *H. verticillata, M. spicatum, C. demersum, H. dubia, N. minor, V. americana, P. pectinatus* and *P. pusillus.*

Results from the USGS survey of this region (maps 34, 39, 40, 48 and 55), which was less quantitative than in previous years, were very similar to that reported from the Citizen's survey but also included *N. guadalupensis.*

12. MIDDLE EASTERN SHORE

There were 1,998 hectares of SAV identified in the Middle Eastern Shore section (Tables 4-6; Fig. 19; Appendix C, Maps 63, 72, 73, 74, 82, 83, 84, 85, 92, 93, 100 and 101) compared to 1,527 hectares reported in 1987. SAV beds, of which 65% were dense (class 4), 17% moderate (class 3), and 17% sparse (class 2), were very abundant in: 1. the lower Honga River adjacent to Middle Hooper Island, Wroten Island, Parks Neck and Asquith Island; 2. between Barren Island and Meekins Neck-Upper Hooper Island; and 3. the lower Manokin and the Big and Little Annemessex Rivers. Few SAV beds were observed in Fishing Bay and in the Nanticoke and Wicomico Rivers.

Ruppia maritima was the predominant species found by the Citizen's and Charterboat Captain's surveys (maps 72, 73, 74, 75, 82, 83, 84, 85, 91, 92, 100 and 101). *Zostera marina* was reported from several locations on the Great Fox Island (map 100) and Crisfield (map 101) quadrangles.

13. MID-BAY ISLAND COMPLEX

There were 5,196 hectares of SAV mapped in the Mid-Bay Island Complex in 1989 (Tables 4-6; Fig. 20; Appendix C, Maps 83, 91, 92, 99, 100 and 107) compared to 4,265 hectares reported in 1987. This section contains 21.2% of the SAV in the entire Chesapeake Bay. The broad, expansive shoal area between Tangier Island and Smith Island continued to be densely vegetated by both *R. maritima* and *Z. marina,*

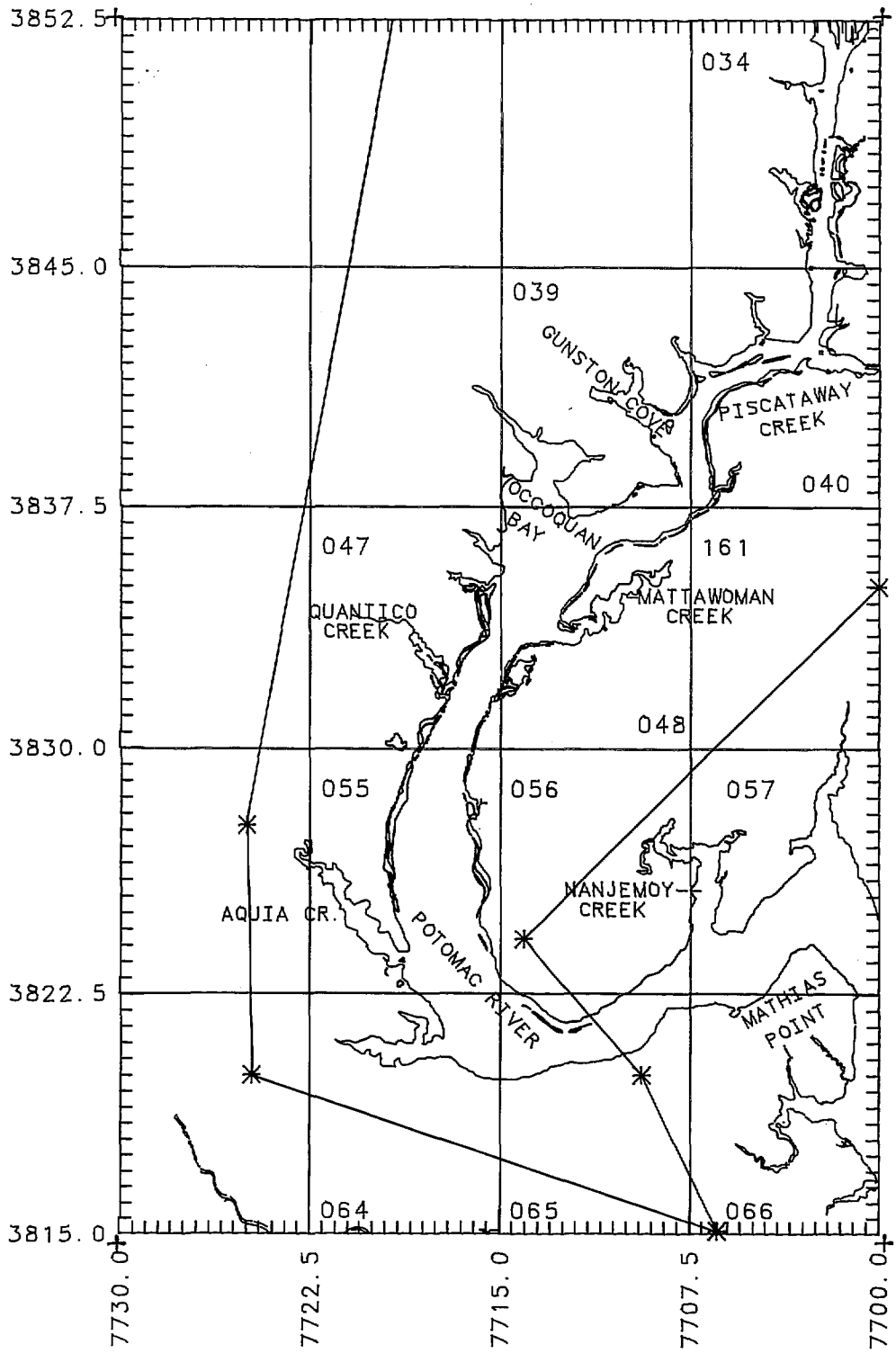

Figure 18. Distribution of SAV in the Upper Potomac River (Section 11).

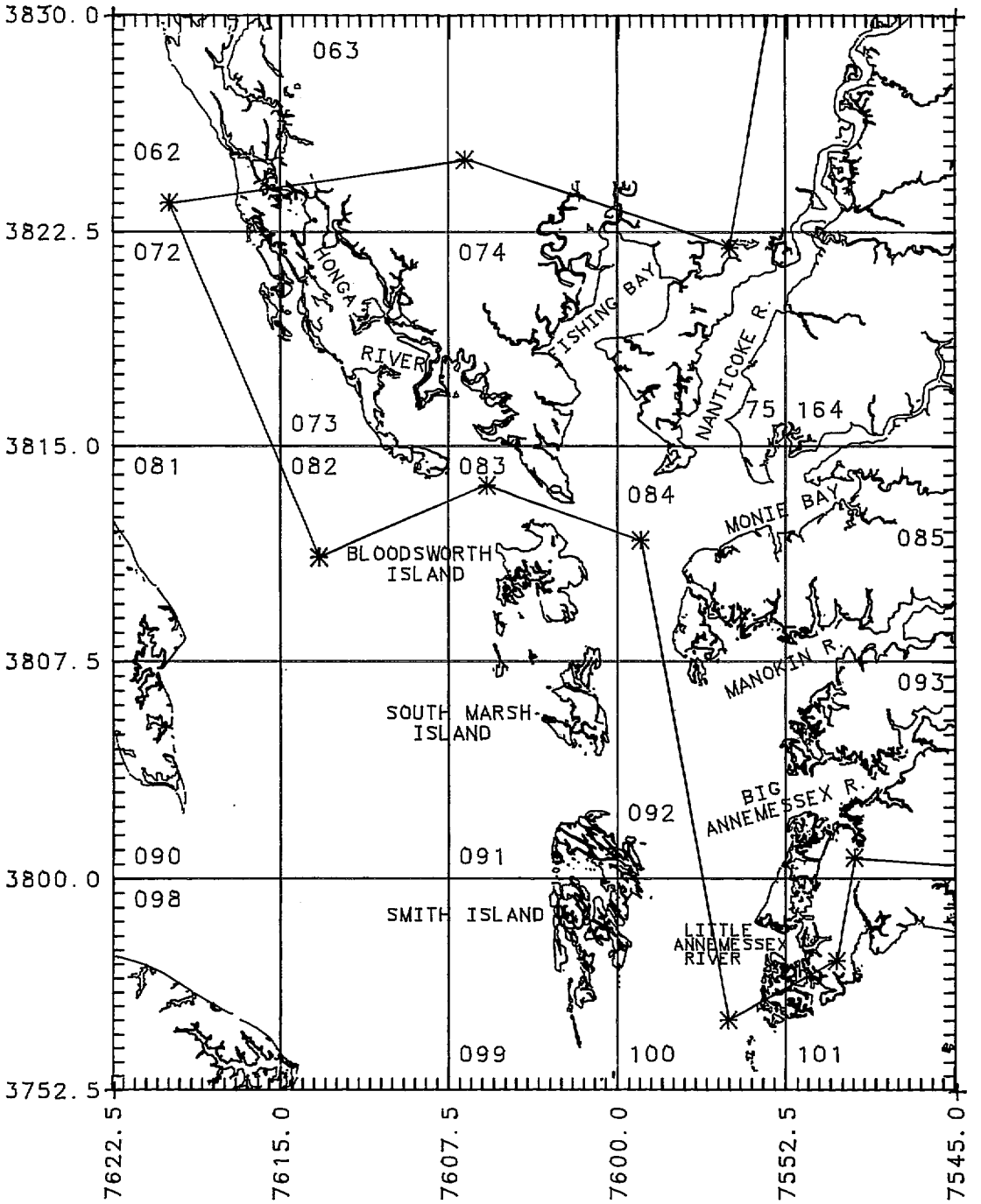

Figure 19. Distribution of SAV in the Middle Eastern Shore (Section 12).

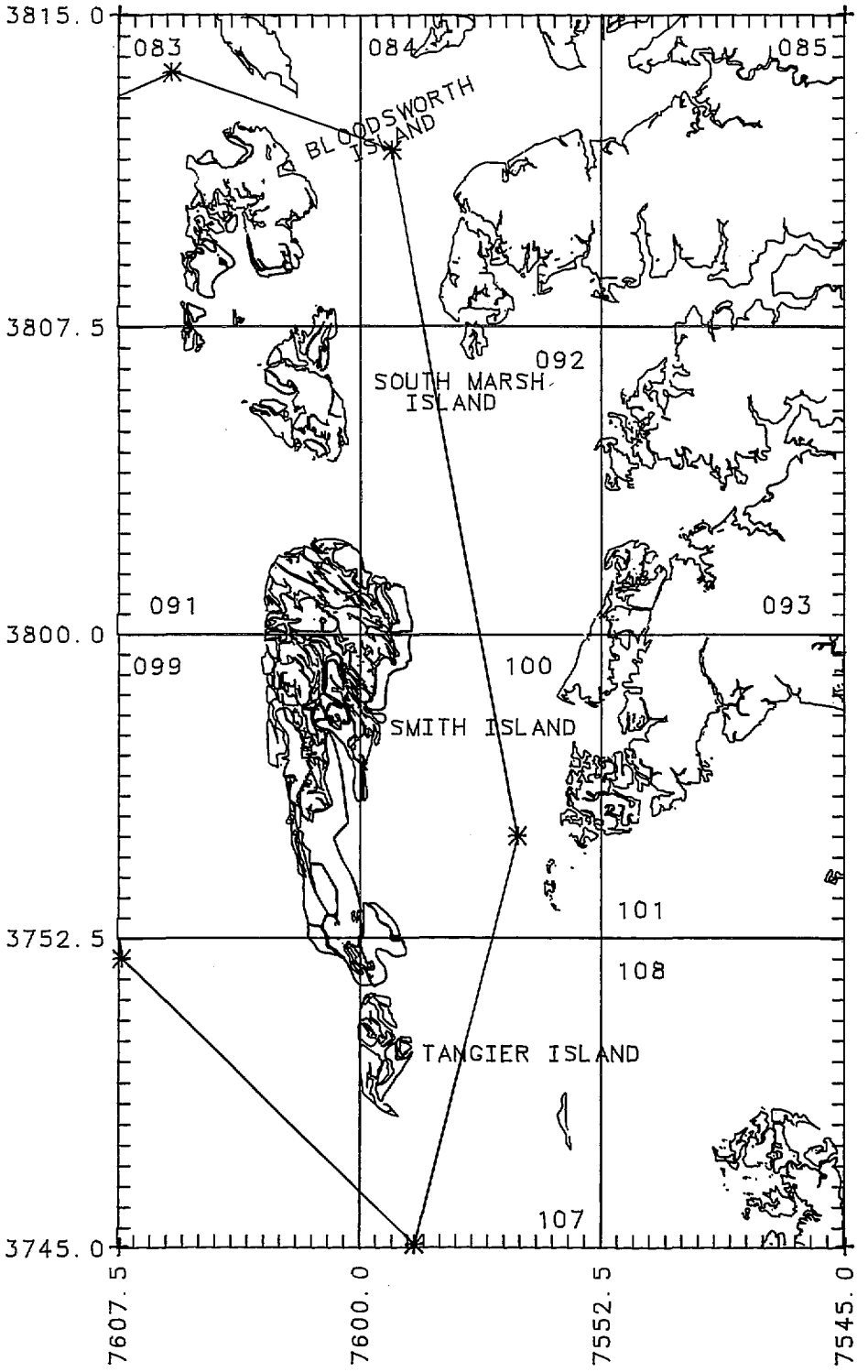

Figure 20. Distribution of SAV in the Mid-Bay Island Complex (Section 13).

and was by far the largest bed in the Chesapeake Bay. Eighty percent of the SAV within this section was in density class 4.

Ruppia maritima was the species most often reported by the Charterboat Captain's survey around these islands, with one report of *Z. marina*. Previous VIMS surveys had documented much more extensive occurrences of *Z. marina*.

14. LOWER EASTERN SHORE

There were 4,718 hectares of SAV observed in the Lower Eastern Shore section in 1989 (Tables 4-6; Fig. 21; Appendix C, Maps 100, 101, 107, 108, 109, 113, 114, 119, 124, 133, 134, 142 and 143) compared to 4,036 hectares reported in 1987. Large, dense beds (50% of the total SAV is in density class 4) of *Z. marina* and *R. maritima* (includes observations from both the Citizen's and Charterboat Captain's surveys; maps 100, 101 and 133) continue to persist at the mouth of Cherrystone Inlet near Cape Charles, at the mouths of Hungars Creek, Mattawoman Creek, Occohannock Creek, Craddock Creek, Pungoteague Creek, Onancock Creek and Chesconessex Creek, at the Big Marsh area near Chesconessex Creek, at Webb Island off the mouth of Deep Creek, and on the large shoal area on the eastern side of the Fox Islands. Those areas between the above mentioned creeks were sparsely vegetated. This was due largely to the dynamic and exposed nature of these sites. There was very little SAV in the Pocomoke Sound area, and there was no SAV south of Old Plantation Creek just below Cape Charles.

15. REEDVILLE REGION

There were 492 hectares of SAV identified in the Reedville Region in 1989 (Tables 4-6; Fig. 22; Appendix C, Maps 106 and 112) compared to 324 hectares reported in 1987. SAV beds consisted of sparse, moderate and dense beds (19%, 47% and 21% of the total SAV within this section in density classes 2, 3 and 4, respectively) of *R. maritima* and *Z. marina*. (Species identification was based on prior years scientific and Citizen's information since there was no ground truthing here for 1989.) Most beds were found in Little Bay, Dymer Creek, Indian Creek, Ball Creek, Dameron Marsh, Fleeton Point and Taskmasker Creek.

16. RAPPAHANNOCK RIVER COMPLEX

There were 669 hectares of SAV observed in the Rappahannock River Complex in 1989 (Tables 4-6; Fig. 23; Appendix C, Maps 110, 111, 116, 117, 118 and 123) compared to 208 hectares reported in 1987. SAV beds consisted mostly of sparse to moderate beds (77% in density classes 2 and 3). SAV has continued to rapidly increase in this system since 1986 when only 18 hectares were mapped. *Ruppia maritima* continues to be the dominant species in both the Rappahannock and Piankatank Rivers. In particular, dense beds of *R. maritima* were again present in the Corrotoman River (includes obervations from the Citizen's and VIMS surveys). *Ruppia maritima* is now present in small scattered patches along the north shore of the Rappahannock River above Towles Point. *Zostera marina*, once a dominant species in this section similar to the other sections in the lower bay but rare since 1971, is now present in small patches in both rivers. This is a result of successful transplant efforts

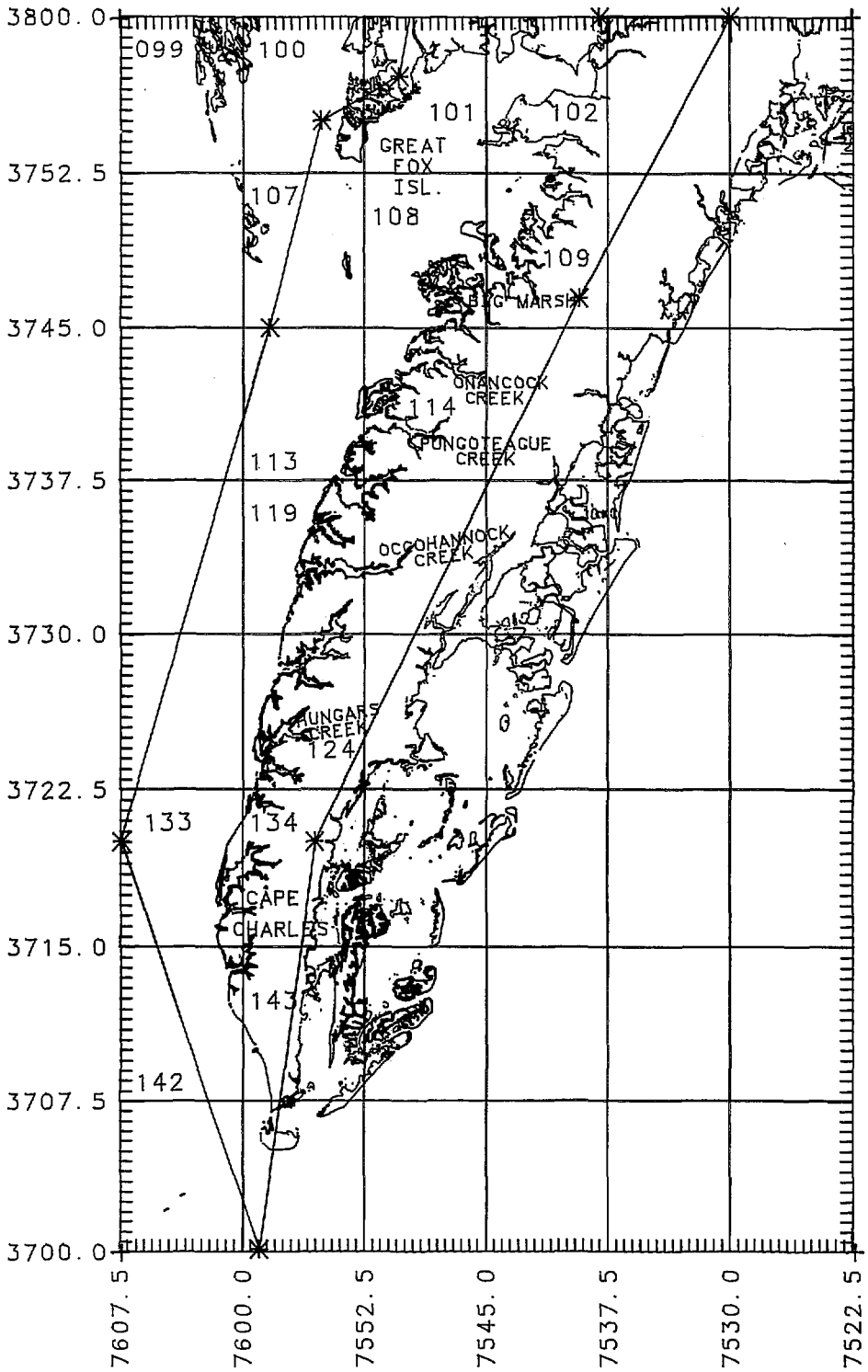

Figure 21. Distribution of SAV in the Lower Eastern Shore (Section 14).

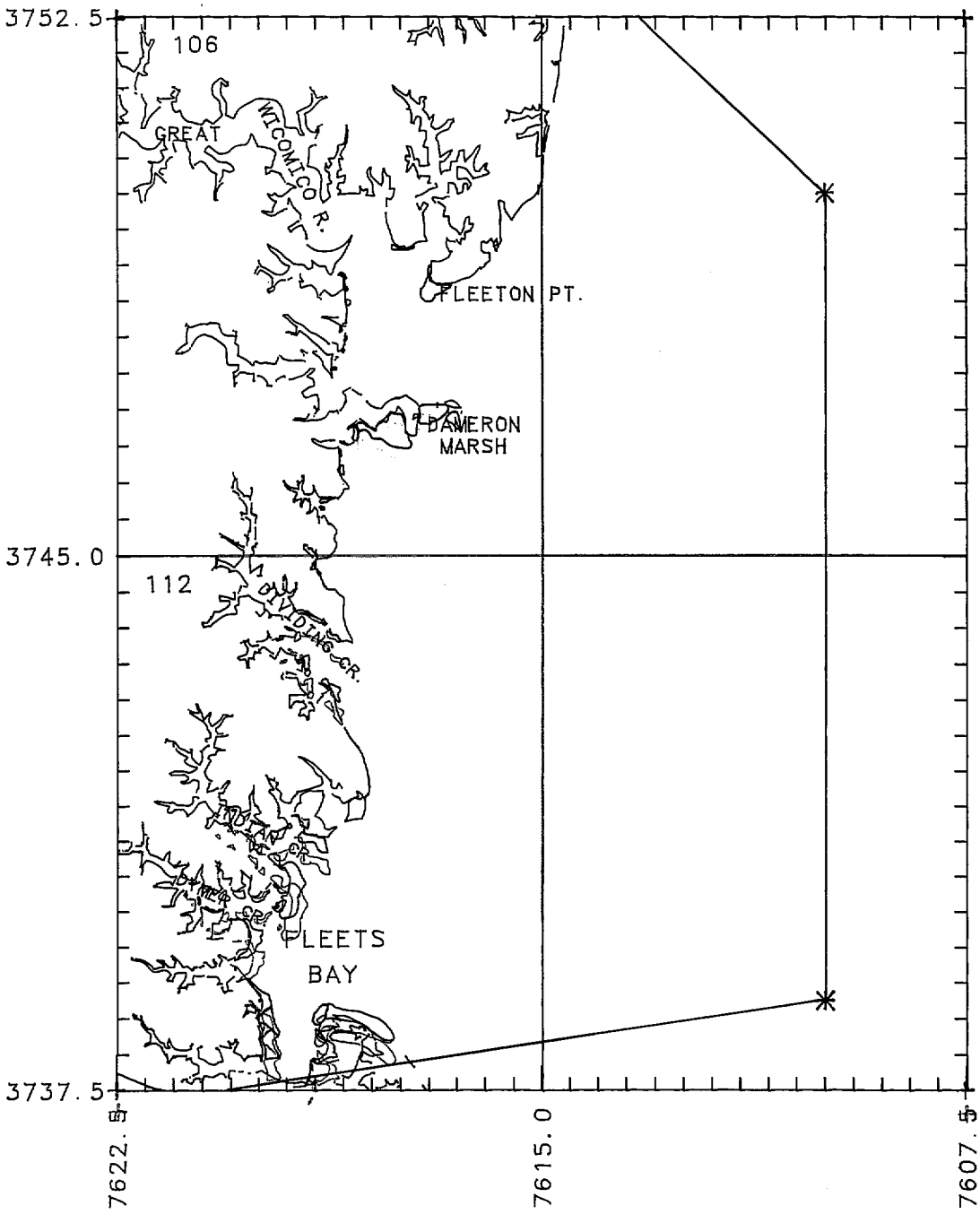

Figure 22. Distribution of SAV in the Reedville Region (Section 15).

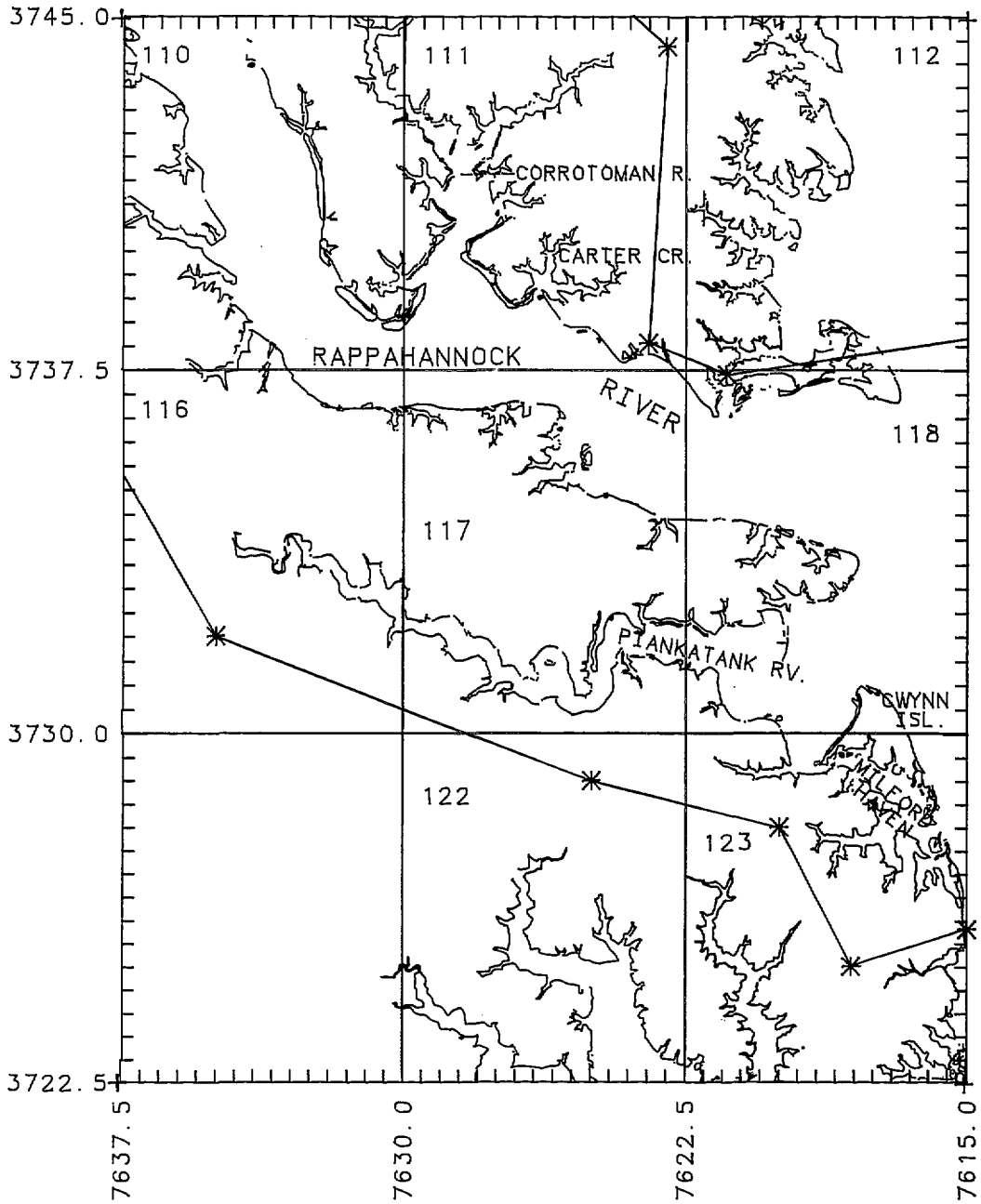

Figure 23. Distribution of SAV in the Rappahannock River Complex (Section 16).

using both seeds and whole plants in a number of different areas since 1984 (VIMS, unpublished data). In the Rappahannock River transplanted *Z. marina* is present adjacent to Parrott Island, off Sanders Cove just above the bridge, at the mouth of Carters Creek, Ball Point, off Wharton Grove and adjacent to Towles Point. In the Piankatank River and Milford Haven area transplanted *Z. marina* is present off Burton Point, along the northeast side of Gwynn Island and at the mouth of Healy and Hills Creek. Naturally occurring *Z. marina* is present on the west side of Gwynn Island off The Hole in the Wall and off the northeast tip of the island, and in the Willis Wharf area.

17. NEW POINT COMFORT REGION

There were 346 hectares of SAV identified in the New Point Comfort Region in 1989 (Tables 4-6; Fig. 24; Appendix C, Map 132) compared to 238 hectares reported in 1987. SAV consisted of dense beds (68% is in density class 4) of *Z. marina* and *R. maritima* (observations include those from the Citizen's and VIMS surveys) between New Point Comfort and just north of Horn Harbor.

18. MOBJACK BAY COMPLEX

The Mobjack Bay Complex contained 1,593 hectares of SAV in 1989 (Tables 4-6; Fig. 25; Appendix C, Maps 122, 123, 131 and 132) compared to 1,227 hectares reported in 1987. SAV beds consisting of *Z. marina* and *R. maritima* (observations include those from the Citizen's and VIMS surveys) were most abundant along the entire shoreline of Mobjack Bay as well as in three of four tributary rivers: Severn, Ware and North. Several small beds of *R. maritima* were observed within the East River. The Mobjack Bay area continued to harbor some of the more extensive SAV beds on the western shore of the lower Chesapeake Bay. Sixty-four percent of the total coverage of SAV in this section is in density class 4.

19. YORK RIVER

There were 677 hectares of SAV observed in the York River section in 1989 (Tables 4-6; Fig. 26; Appendix C, Maps 130, 131, 132, 139 and 140) compared to 608 hectares reported in 1987. Dense SAV beds (80% of the total coverage in this section is in density class 4) consisting of both *Z. marina* and *R. maritima* (observations include those from the Citizen's and VIMS surveys) were located principally along the north shore from Gloucester Point to the mouth of the river. The only beds present along the south shore were located on the north side of Goodwin Islands. SAV beds were absent upstream of Gloucester Point on the north shore except for a small area of *Z. marina* (less than 0.5 hectares) adjacent to Big Mumfort Island. This area was planted from seeds broadcast in the fall, 1988 (VIMS, unpublished data). Small patches of *Z. marina* (approximately 1 - 2m^2) are present just below the Naval Weapons Station on the south shore. These were transplanted in the fall of 1985, 1986, 1987 and 1988 (VIMS, unpublished data) and have persisted through 1989. *Ruppia maritima* is also present in this transplant area, but unlike *Z. marina*, has re-established naturally. The SAV beds planted at Gloucester Point in 1982 and 1983, as well as the smaller areas planted immediately adjacent to these larger areas from

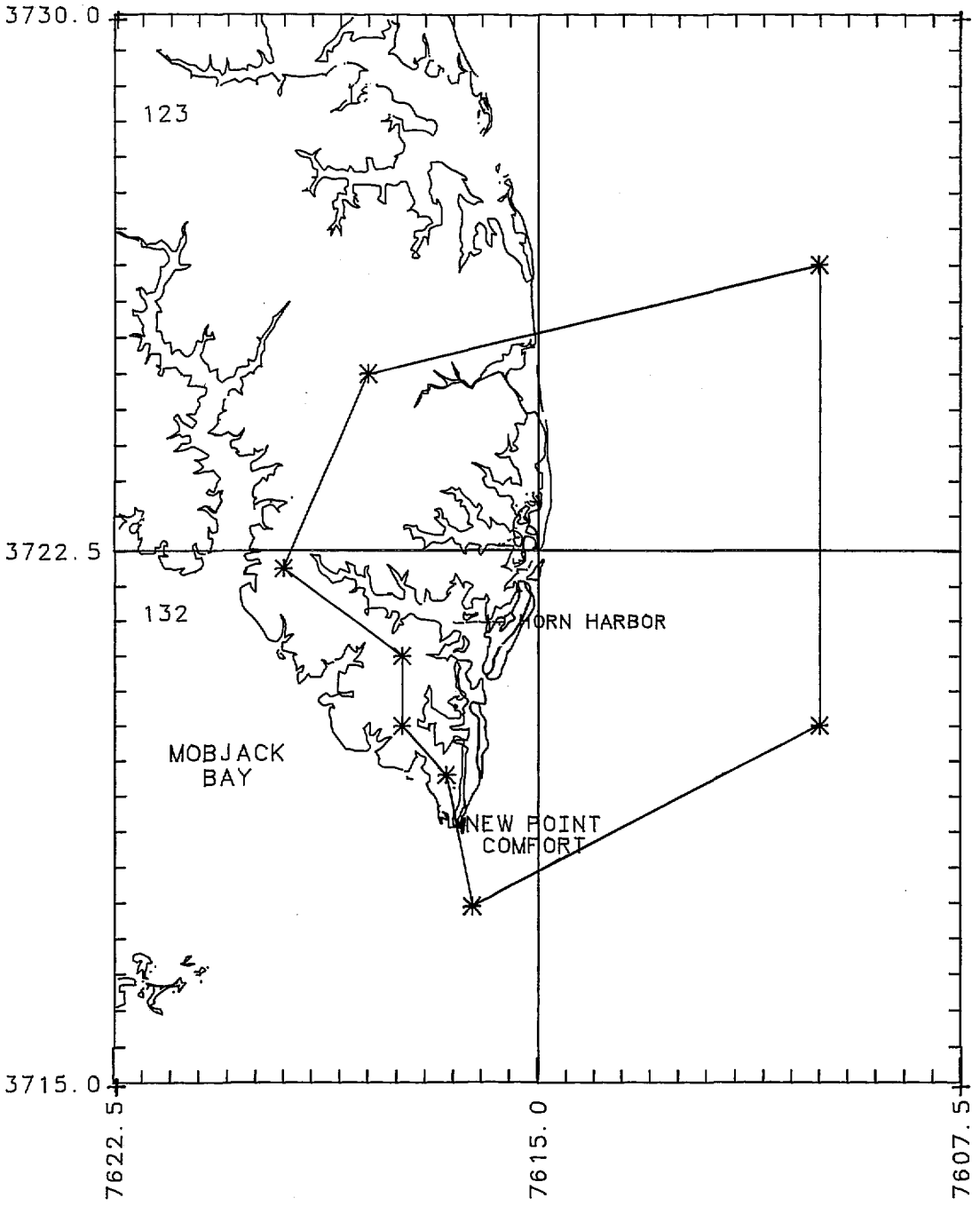

Figure 24. Distribution of SAV in the New Point Comfort Region (Section 17).

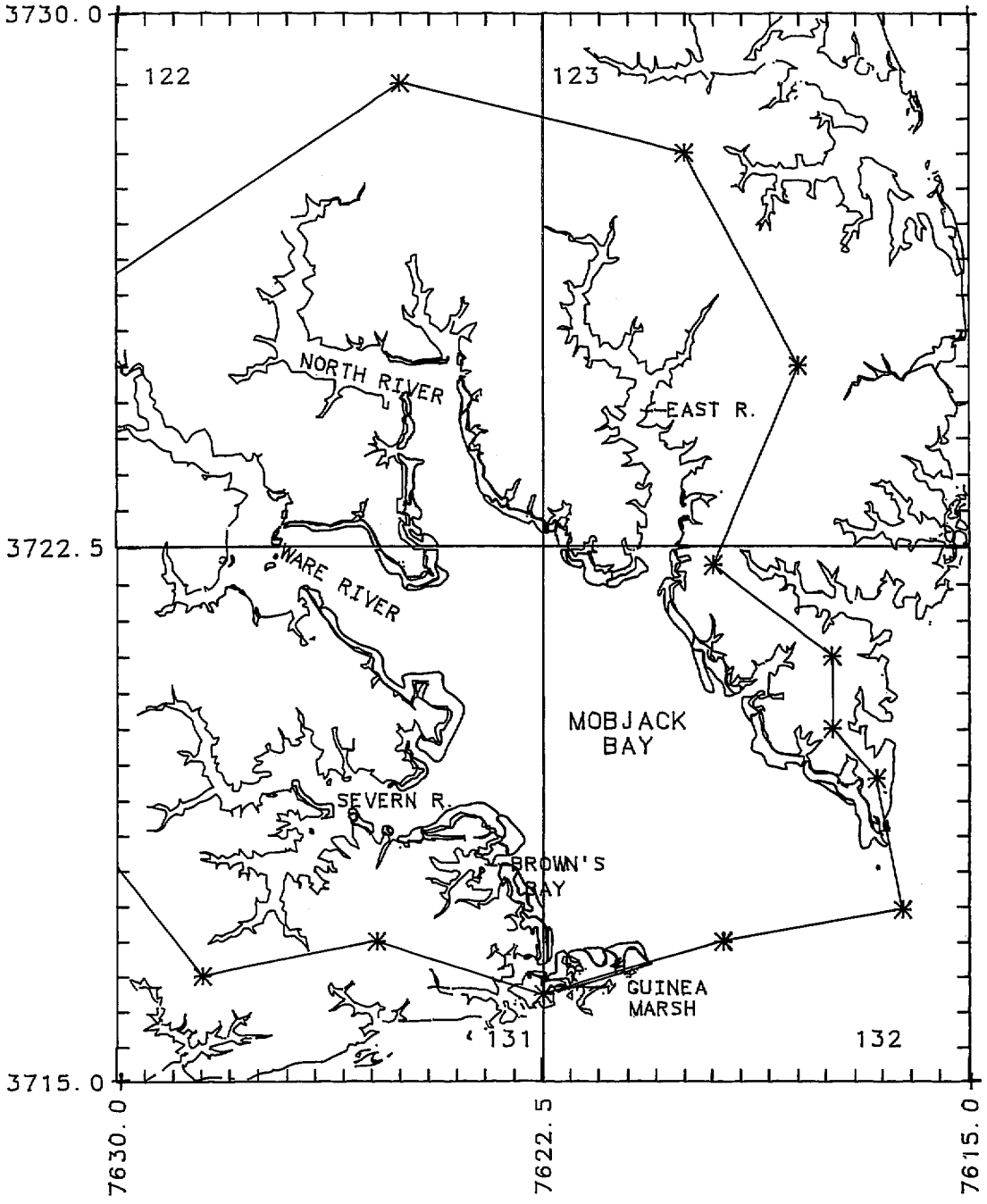

Figure 25. Distribution of SAV in the Mobjack Bay Complex (Section 18).

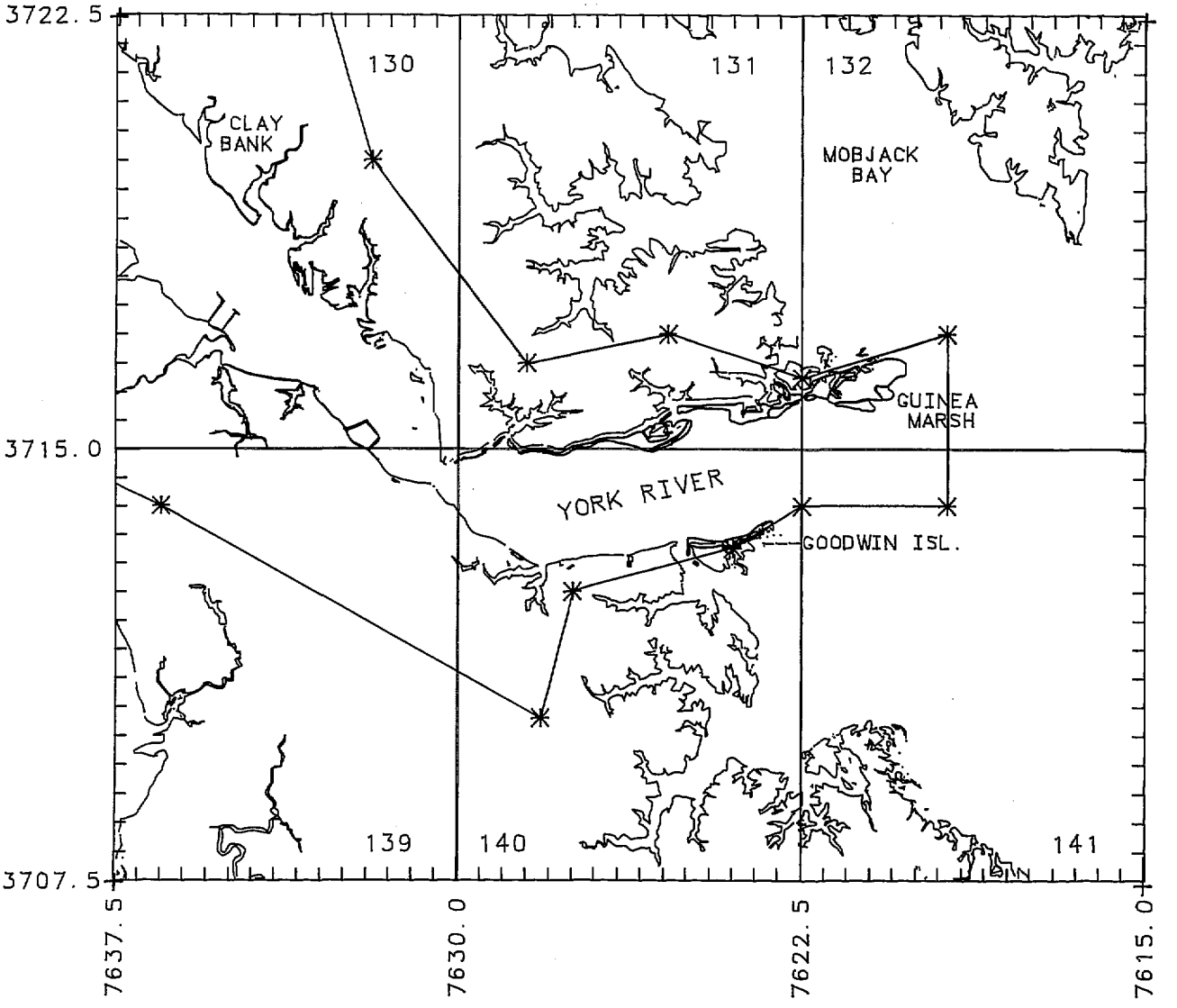

Figure 26. Distribution of SAV in the York River (Section 19).

1984 through 1988, continue to thrive in 1989 similar to many naturally expanding beds along the north shore.

20. LOWER WESTERN SHORE

There were 1,670 hectares of SAV mapped in the lower Western Shore section in 1989 (Tables 4-6; Fig. 27; Appendix C, Maps 140, 141, 147 and 152) compared to 1,322 hectares reported in 1987. SAV consisting of *Z. marina* and *R. maritima* (Citizen's and VIMS surveys) remained as dense beds. Sixty percent of the total coverage in this section is in density class 4 in Broad Bay, Back River, the mouth of Poquoson River off Pasture and Hunts Neck, Drum Island Flats, adjacent to Crab Neck just south of Goodwin Island, and on the south side of Goodwin Island. No SAV was present in the southwest and northwest branches of Back River, or in the Poquoson River, Chisman Creek and Back Creek.

21. JAMES RIVER

There were 4 hectares of SAV in the mainstem James River in 1989 (Tables 4-6; Fig. 28; Appendix C, Map 147). This small, 3.8 hectare (9 acre) dense bed located at the mouth of Hampton Creek adjacent to the Veteran's Hospital consisted predominantly of *Z. marina*.

A small section of the Chickahominy that was identified as having SAV in 1989 was photographed. It included Cordon and Nettles Creek, and Nayses Bay. The photography showed SAV beds occurring in locations similar to previous aerial surveys indicating that these beds are relatively stable. However, SAV beds were not mapped because the observed beds occurred in small creeks and could only have been represented by a thin line on a 1:24,000 scale topographic quadrangle. Tracing and digitizing a single line rather than a polygon-shaped bed would have resulted in large errors, thereby compromising our quality control standards. Citizen's survey information from the Brandon quadrangle indicated fringing SAV beds consisting of *N. quadalupensis*, *C. demersum* and *Chara* sp. along Parsons Creek in Sunken Marsh by the Chickahominy main stem. SAV species are probably distributed throughout the Chickahominy River system occupying the fringes of many tidal creeks.

CHINCOTEAGUE BAY

There were 2,310 hectares of SAV identified in Chincoteague Bay in 1989 (Tables 4-6; Fig. 29; Appendix C, Maps 167, 168, 170, 172, 173 and 175) compared to 2,310 hectares reported in 1987. Seventy-four percent of the beds were moderate coverage and 21% were dense coverage. The Citizen's and Charter Boat Captain's surveys found both *Z. marina* and *R. maritima* throughout the bay (maps 167, 168, 170, 172 and 173). All of the SAV continues to be present on the eastern side of the bay adjacent to Assateague Island in water depths of less than 1 meter (MLW). The vegetation was concentrated in four relatively distinct areas identical to that reported in the 1986 and 1987 surveys. They were located west of the northern end of Chincoteague Island, and west of West Bay, Green Run Bay and the Tingles Island area. Seven percent of the total bottom of this region (32,536 hectares) supports SAV.

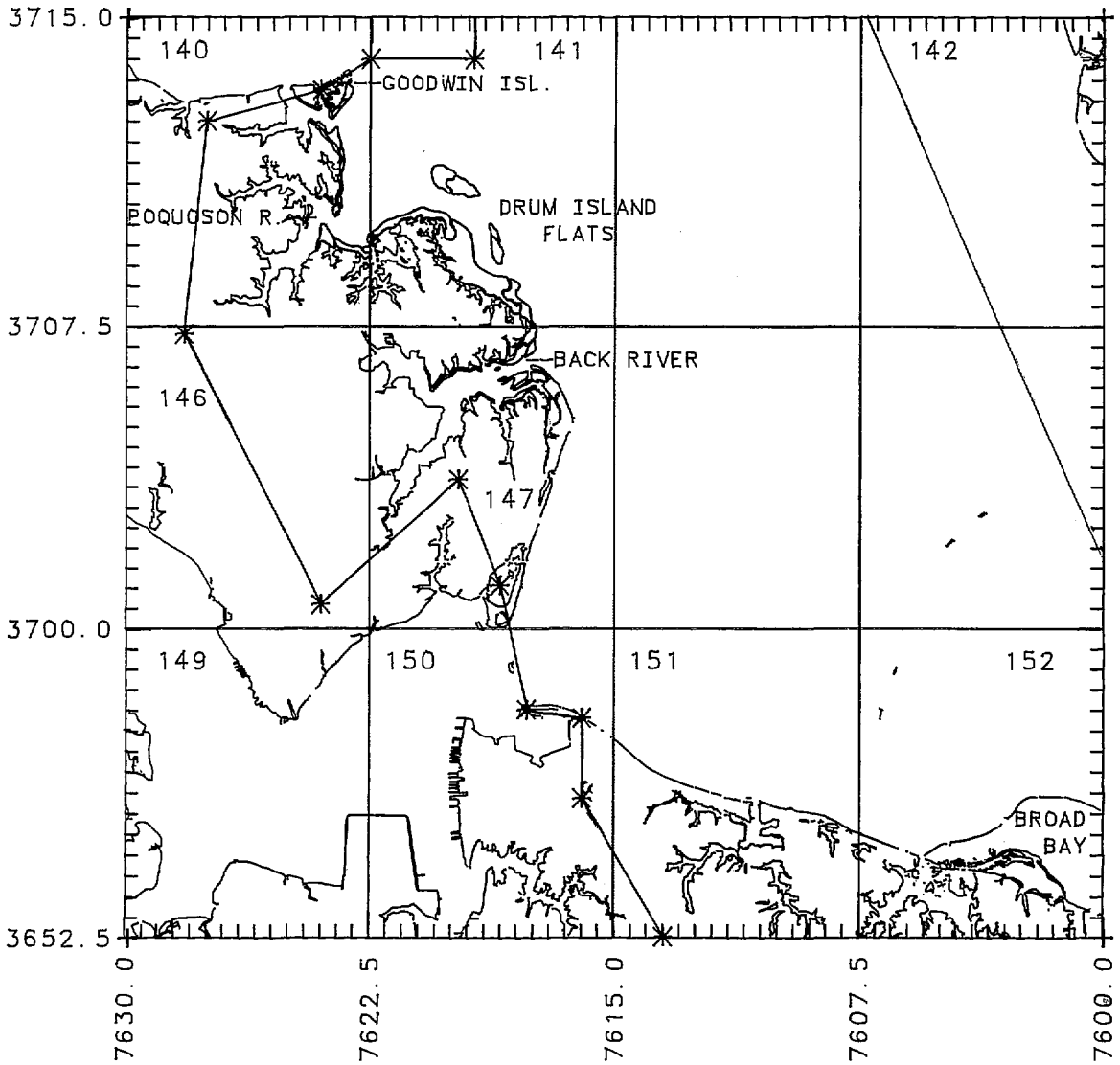

Figure 27. Distribution of SAV in the Lower Western Shore (Section 20).

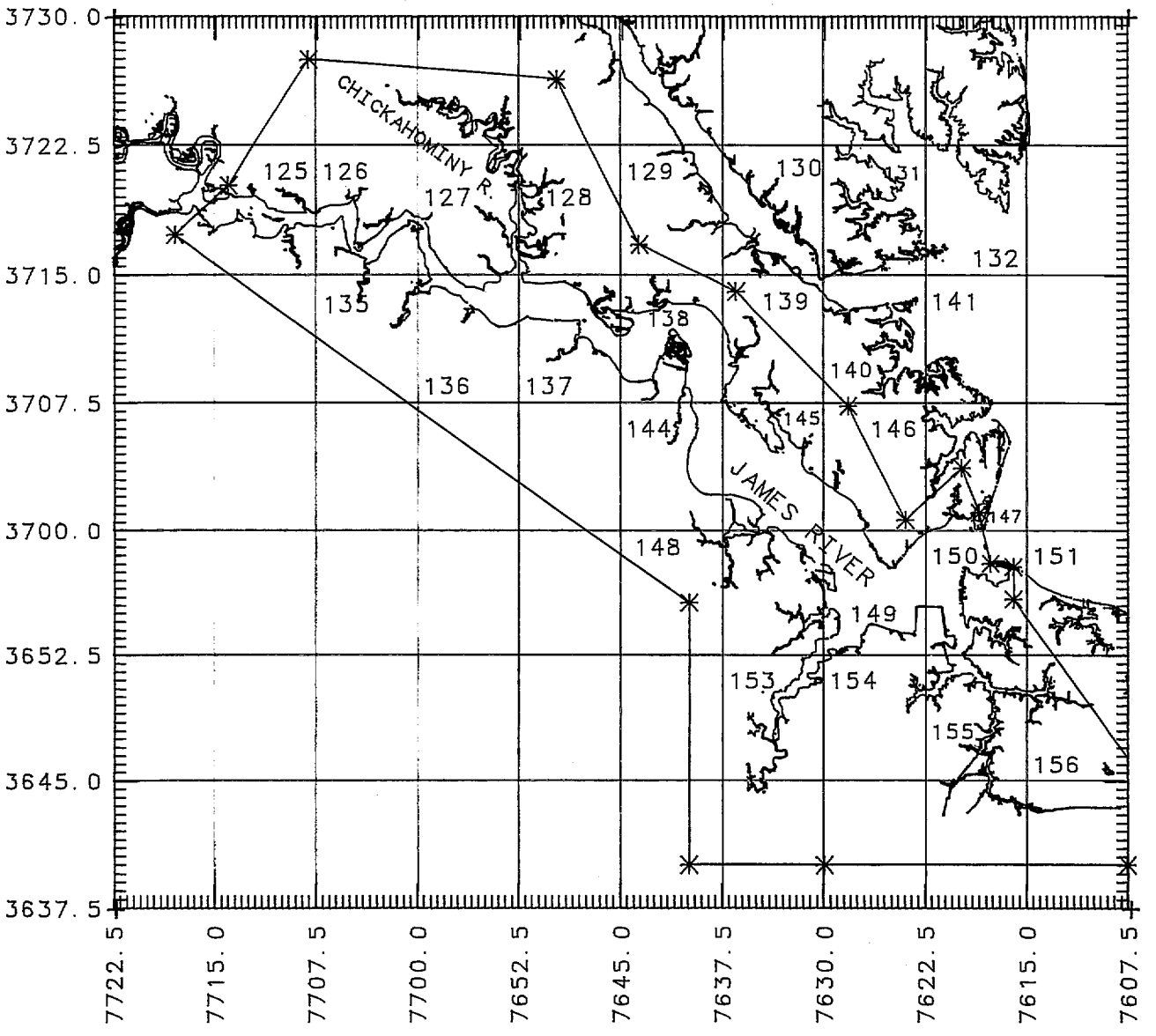

Figure 28. Distribution of SAV in the James River (Section 21).

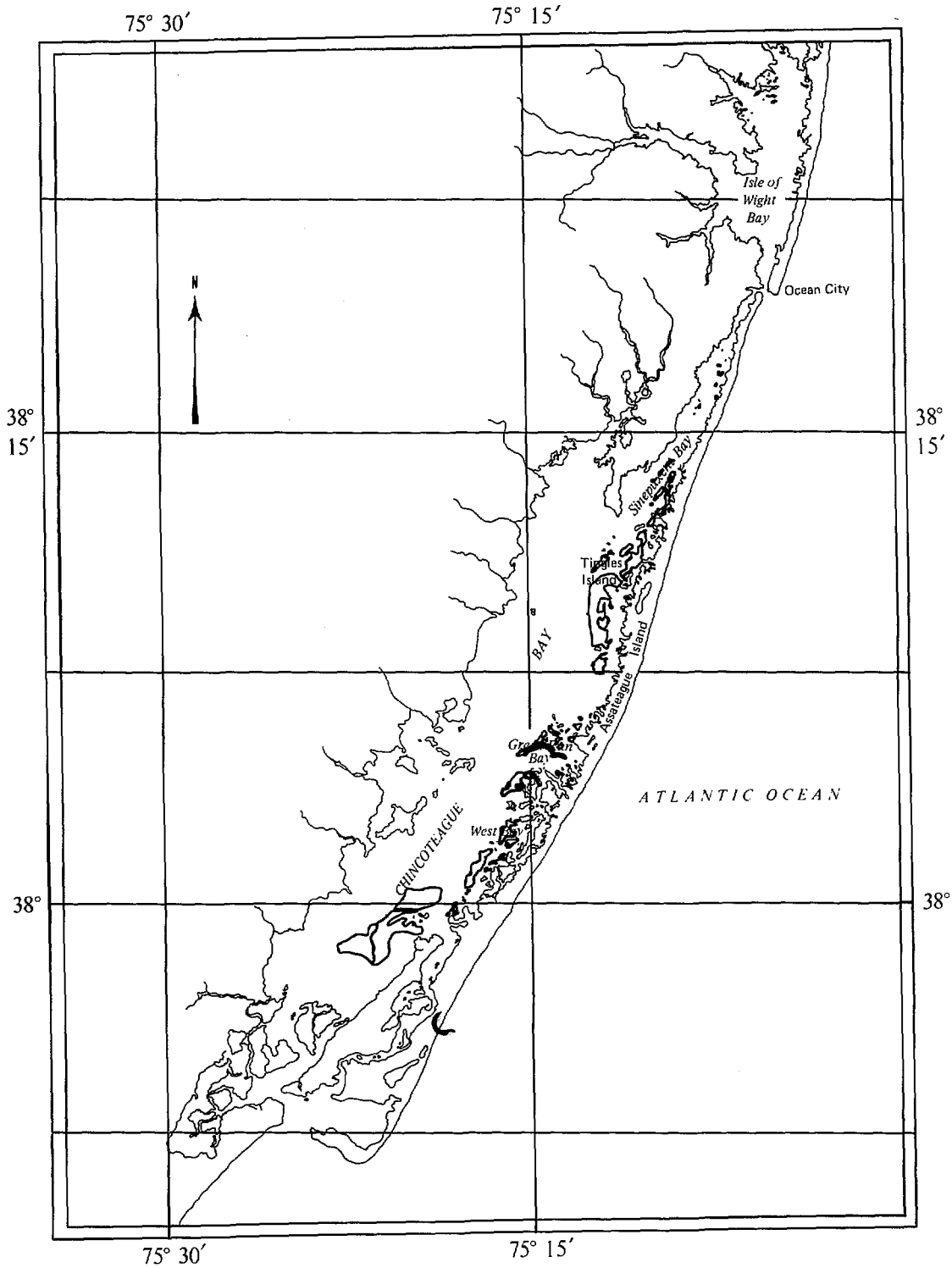

Figure 29. Distribution of SAV in Chincoteague Bay.

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APPENDICES

APPENDIX A

Species Of Submerged Aquatic Plants Found In The Chesapeake Bay And Tributaries Exclusive of the Marine Algae (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.	Widgeon grass
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

Latitude And Longitude Coordinate Points Defining the 21 Major Chesapeake Bay Sections and Chincoteague Bay. (For section locations and descriptions see Fig. 7 and Table 3.)

SEC. 1. Susquehanna Flats

Latitude Deg Min	Longitude Deg Min
39 27.00	76 10.00
39 39.15	76 10.00
39 39.15	75 51.00
39 27.50	76 00.00
39 26.50	76 01.31

SEC. 2. Upper Eastern Shore

Latitude Deg Min	Longitude Deg Min
39 10.00	76 20.00
39 20.00	76 12.50
39 26.50	76 01.31
39 27.50	76 00.00
39 39.15	75 51.00
39 39.15	75 45.00
39 19.50	75 45.00
39 20.00	76 00.00
39 12.55	76 10.40
39 09.25	76 16.00

SEC. 3. Upper Western Shore

Latitude Deg Min	Longitude Deg Min
39 12.40	76 49.00
39 30.00	76 20.00
39 27.00	76 10.00
39 26.50	76 01.31
39 20.00	76 12.50
39 10.00	76 20.00
39 00.00	76 20.00
39 03.50	76 32.30
39 06.82	76 35.40
39 11.15	76 40.00

SEC. 4. Chester River

Latitude Deg Min	Longitude Deg Min
39 00.00	76 20.00
39 10.00	76 20.00
39 09.25	76 16.00
39 12.55	76 10.40
39 20.00	76 00.00
39 19.50	75 45.00
39 05.00	75 45.00
39 05.00	76 00.00
38 57.10	76 11.85
39 00.00	76 19.10

SEC. 5. Central Western Shore

Latitude Deg Min	Longitude Deg Min
38 42.90	76 35.00
38 55.00	76 37.50
39 12.40	76 49.00
39 11.15	76 40.00
39 06.82	76 35.40
39 03.50	76 32.30
39 00.00	76 20.00
38 55.00	76 25.00
38 45.00	76 25.00

SEC. 6. Eastern Bay

Latitude Deg Min	Longitude Deg Min
38 45.00	76 25.00
38 55.00	76 25.00
39 00.00	76 20.00
39 00.00	76 19.10
38 57.10	76 11.85
39 05.00	76 00.00
38 50.00	76 01.65
38 44.10	76 10.50
38 50.00	76 16.50
38 45.00	76 20.00
38 42.50	76 20.50

SEC. 7. Choptank River

Latitude Deg Min	Longitude Deg Min
38 23.50	76 20.00
38 45.00	76 25.00
38 42.50	76 20.50
38 45.00	76 20.00
38 50.00	76 16.50
38 44.10	76 10.50
38 50.00	76 01.65
39 05.00	76 00.00
39 05.00	75 45.00
38 45.00	75 45.00
38 45.00	75 50.00
38 21.93	75 55.00
38 25.00	76 06.80

	Latitude Deg Min	Longitude Deg Min
SEC. 8. Patuxent River		
	38 15.00	76 25.45
	38 35.00	77 00.00
	38 58.00	76 45.00
	38 55.00	76 37.50
	38 42.90	76 35.00
	38 30.00	76 32.30
	38 21.66	76 23.50
	38 18.00	76 22.83
SEC. 9. Middle Western Shore		
	38 02.85	76 19.40
	38 05.00	76 21.54
	38 15.00	76 25.45
	38 18.00	76 22.83
	38 21.66	76 23.50
	38 30.00	76 32.30
	38 42.90	76 35.00
	38 45.00	76 25.00
	38 23.50	76 20.00
	38 05.00	76 10.00
SEC. 10. Lower Potomac River		
	37 53.40	76 14.45
	37 55.50	76 18.15
	37 53.85	76 28.00
	38 06.15	76 53.00
	38 15.00	77 06.40
	38 20.00	77 09.40
	38 24.20	77 14.08
	38 35.00	77 00.00
	38 15.00	76 25.45
	38 05.00	76 21.54
	38 02.85	76 19.40
	38 05.00	76 10.00
	37 50.00	76 10.00

	Latitude Deg Min	Longitude Deg Min
SEC. 11. Upper Potomac River		
	38 15.00	77 06.40
	38 20.00	77 24.80
	38 27.65	77 25.00
	39 01.80	77 17.10
	38 58.00	76 45.00
	38 35.00	77 00.00
	38 24.20	77 14.08
	38 20.00	77 09.40
SEC. 12. Middle Eastern Shore		
	38 11.10	76 13.30
	38 23.50	76 20.00
	38 25.00	76 06.80
	38 21.93	75 55.00
	38 45.00	75 50.00
	38 40.00	75 37.00
	38 00.00	75 38.00
	38 00.73	75 49.50
	37 57.10	75 50.30
	37 55.00	75 55.10
	38 11.70	75 59.00
	38 13.60	76 05.83
SEC. 13. Mid-Bay Island Complex		
	37 45.00	75 58.30
	37 50.00	76 10.00
	38 05.00	76 10.00
	38 11.10	76 13.30
	38 13.60	76 05.83
	38 11.70	75 59.00
	37 55.00	75 55.10
SEC. 14. Lower Eastern Shore		
	37 00.00	75 58.95
	37 20.00	76 10.00
	37 38.75	76 10.00
	37 50.00	76 10.00
	37 45.00	75 58.30
	37 55.00	75 55.10
	37 57.10	75 50.30
	38 00.73	75 49.50
	38 00.00	75 38.00
	38 00.00	75 30.00
	37 46.45	75 39.30
	37 20.00	75 55.50

	Latitude Deg Min	Longitude Deg Min
SEC. 15. Reedville		
	37 38.75	76 10.00
	37 37.40	76 21.40
	37 38.05	76 23.50
	37 44.35	76 23.00
	37 48.00	76 28.00
	37 53.85	76 28.00
	37 55.50	76 18.15
	37 53.40	76 14.45
	37 50.00	76 10.00
SEC. 16. Rappahannock River Complex		
	37 26.50	76 10.00
	37 25.00	76 18.08
	37 28.00	76 20.00
	37 29.00	76 25.00
	37 32.00	76 35.00
	37 49.15	76 48.00
	37 53.73	76 49.65
	37 58.00	76 45.45
	37 48.00	76 28.00
	37 44.35	76 23.00
	37 38.05	76 23.50
	37 37.40	76 21.40
	37 38.75	76 10.00
SEC. 17. New Point Comfort Region		
	37 17.45	76 16.16
	37 19.45	76 16.62
	37 20.00	76 17.40
	37 21.00	76 17.40
	37 22.25	76 19.50
	37 25.00	76 18.00
	37 26.50	76 10.00
	37 20.00	76 10.00

	Latitude Deg Min	Longitude Deg Min
SEC. 18. Mobjack Bay Complex		
	37 17.00	76 19.33
	37 16.25	76 22.50
	37 17.00	76 25.42
	37 16.50	76 28.50
	37 20.00	76 31.88
	37 25.75	76 31.00
	37 29.00	76 25.00
	37 28.00	76 20.00
	37 25.00	76 18.00
	37 22.25	76 19.50
	37 21.00	76 17.40
	37 20.00	76 17.40
	37 19.30	76 16.62
	37 17.45	76 16.16
SEC. 19. York River		
	37 14.00	76 22.50
	37 13.25	76 24.00
	37 12.50	76 27.50
	37 07.30	76 28.20
	37 14.00	76 36.50
	37 16.72	76 43.65
	37 26.29	76 49.77
	37 30.55	76 40.00
	37 28.56	76 35.00
	37 20.00	76 31.88
	37 16.50	76 28.50
	37 17.00	76 25.42
	37 16.25	76 22.50
	37 17.00	76 19.33
	37 14.00	76 19.33

Latitude Deg Min	Longitude Deg Min

SEC. 20. Lower Western Shore

Latitude Deg Min	Longitude Deg Min
36 49.11	75 58.05
36 45.75	76 07.00
36 55.85	76 16.00
36 57.79	76 16.00
36 58.00	76 17.70
37 01.05	76 18.52
37 03.68	76 19.80
37 00.60	76 24.00
37 07.30	76 28.20
37 12.50	76 27.50
37 13.25	76 24.00
37 14.00	76 22.50
37 14.00	76 19.33
37 17.00	76 19.33
37 17.45	76 16.16
37 20.00	76 10.00
37 00.00	75 58.95

SEC. 21. James River

Latitude Deg Min	Longitude Deg Min
36 45.75	76 07.00
36 40.00	76 10.00
36 40.00	76 30.00
36 40.00	76 40.00
36 55.63	76 40.00
37 17.30	77 18.00
37 20.15	77 14.00
37 27.45	77 08.10
37 26.29	76 49.77
37 16.72	76 43.65
37 14.00	76 36.50
37 07.30	76 28.20
37 00.60	76 24.00
37 03.68	76 19.80
37 01.05	76 18.52
36 58.00	76 17.70
36 57.79	76 16.00
36 55.85	76 16.00

Chincoteague Bay

Latitude Deg Min	Longitude Deg Min
37 52.50	75 30.00
38 00.00	75 30.00
38 07.50	75 22.50
38 15.00	75 17.50
38 15.00	75 15.00
38 22.50	75 15.00
38 30.00	75 10.00
38 30.00	75 02.50
38 22.50	75 02.50
38 15.00	75 07.50
38 07.50	75 10.00
38 00.00	75 15.00
37 52.50	75 20.00
37 51.00	75 22.30
37 51.00	75 30.00

APPENDIX C

Topographic Quadrangles For The Chesapeake Bay And Chincoteague Bay Showing The 1989 Distribution And Abundance of SAV. (Boundaries Of Individual SAV Beds Are Delineated By Solid Lines. Each Is Identified With A Letter (a-z) And A Number (1-4). These Numbers Represent The Density Classification Discussed In The Text And Fig. 6, i.e. 1 = <10%; 2 = 10-40%; 3 = 40-70%; 4 = 70-100%. Ground Truthing Is Represented By Symbols And Species Codes Which Are Explained In The Legend On Each Map.)

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ABERDEEN QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989

SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia marinma* (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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

DATE FLOWN
8-8-89

ABERDEEN,
MD
002

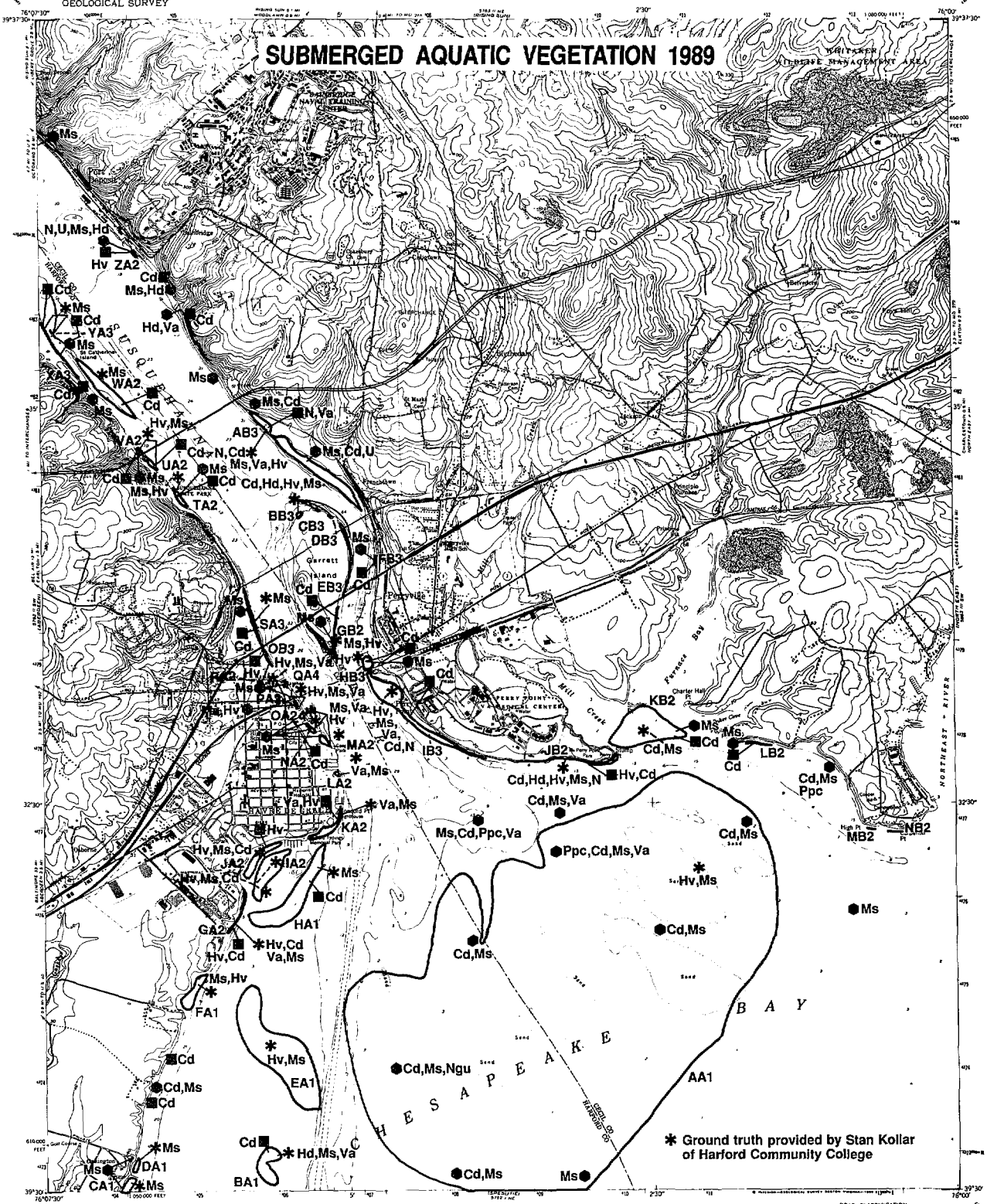
1953
PHOTOREVISED 1985

VIRGINIA INSTITUTE
OF MARINE SCIENCE

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

HAVRE DE GRACE QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

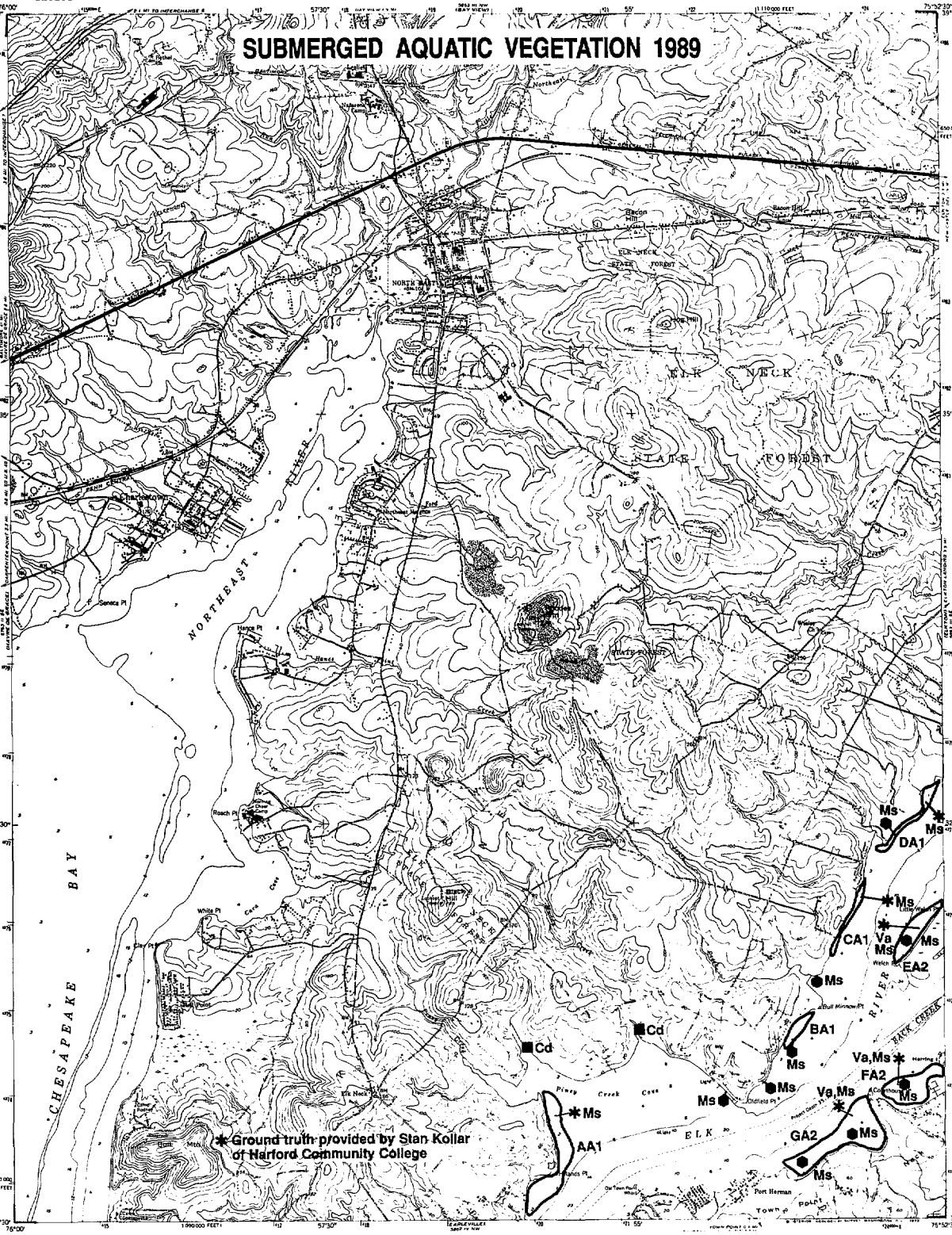
DATES FLOWN
8-8-89
8-31-89

HAVRE DE GRACE, MD
003

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

NORTH EAST QUADRANGLE
MARYLAND CECIL COUNTY
7.5 MINUTE SERIES (TOPOGRAPHIC)
SW/4 ELKTON 15' QUADRANGLE

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)		
Tn	*Trapa natans* (water chestnut)				
U	Unknown species composition				

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
8-8-89

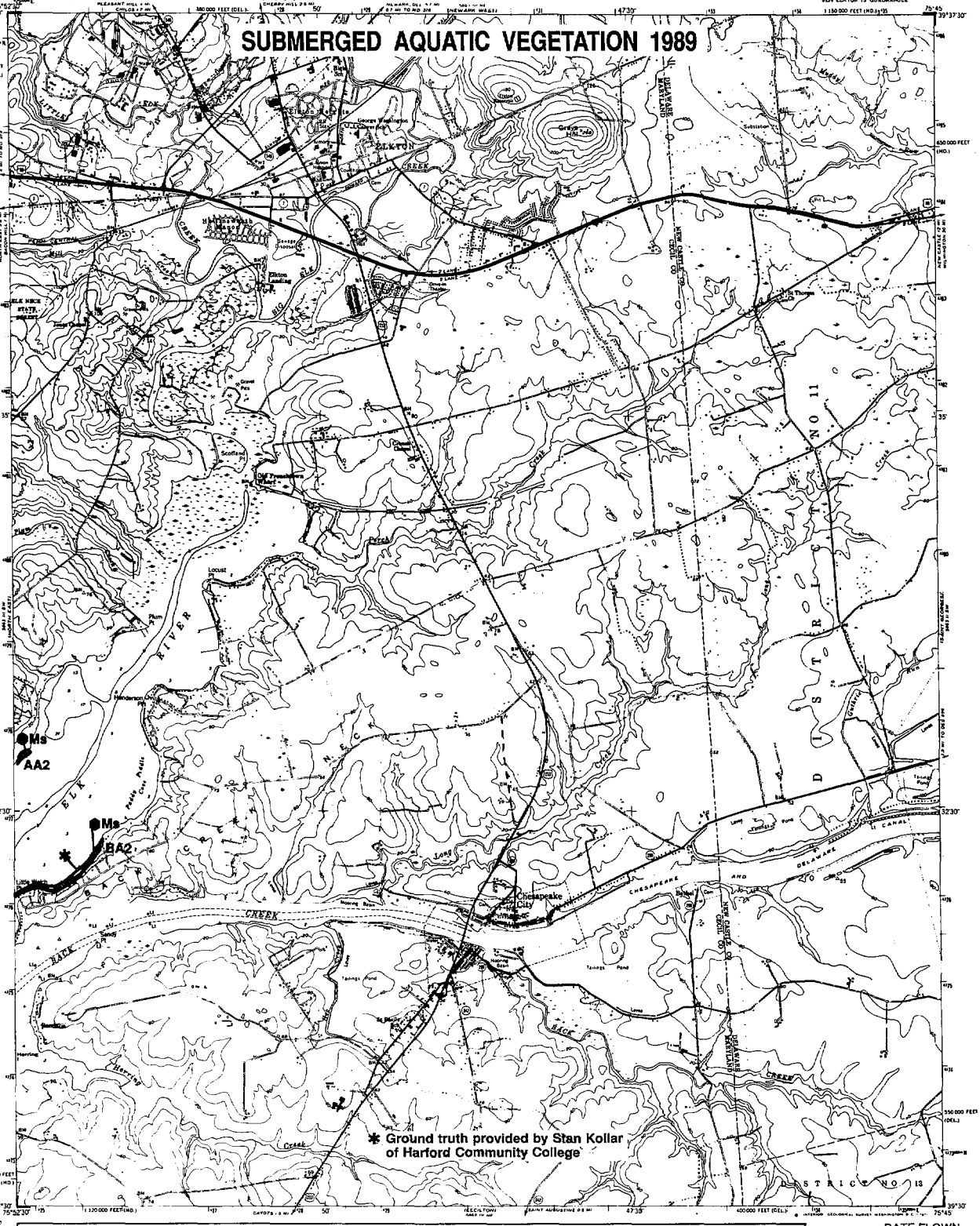
NORTH EAST, MD
004

1984
PHOTOREVISED 1970
AMS 5863 III SW SERIES V833

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ELKTON QUADRANGLE
MARYLAND—DELAWARE
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

N

SCALE 1:24,000

1 MILE

1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
8-8-89

ELKTON,
MD
005

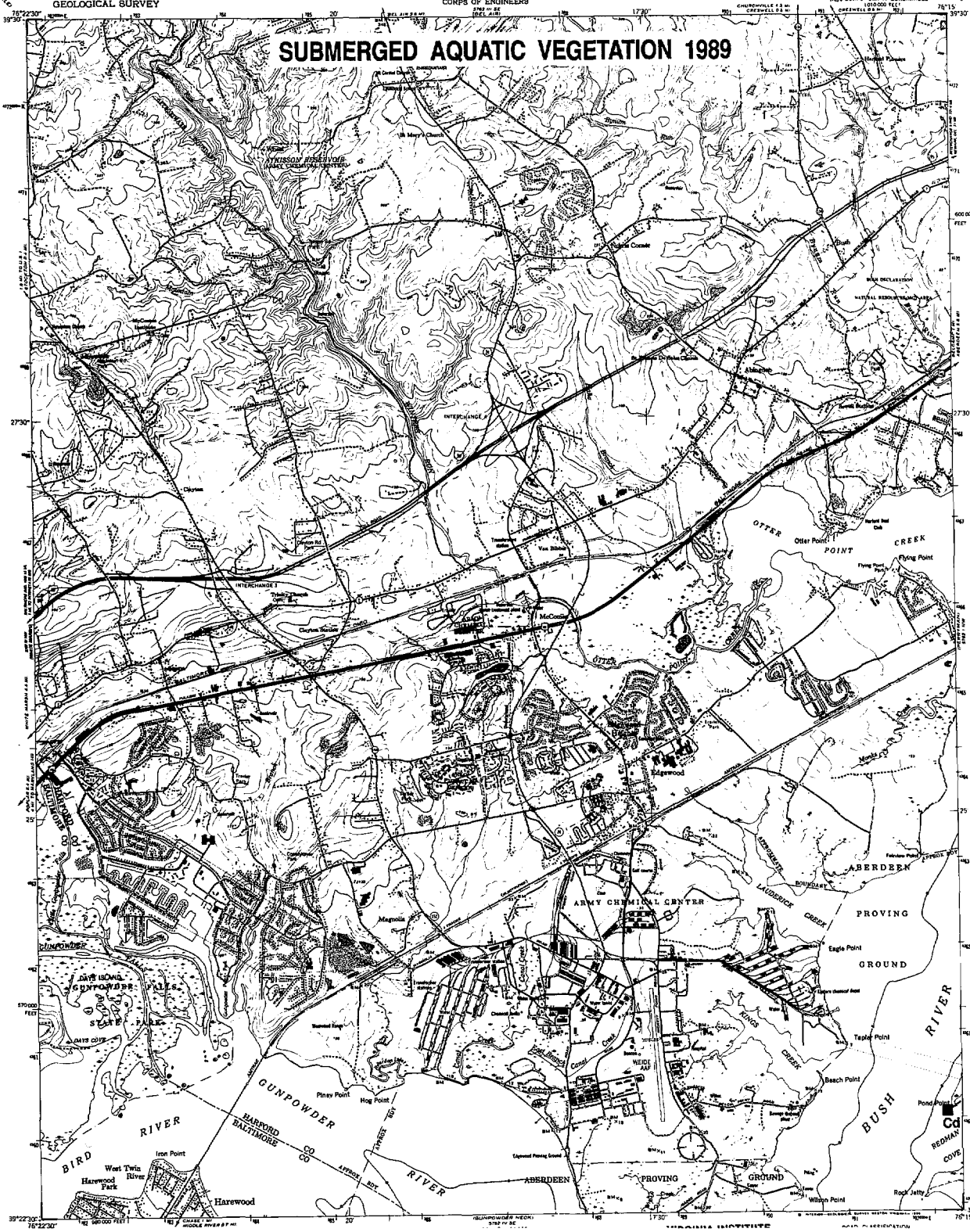
1953
PHOTOREVISED 1970
AMS 5863 III SE SERIES V833

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

EDGEWOOD QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 MILE

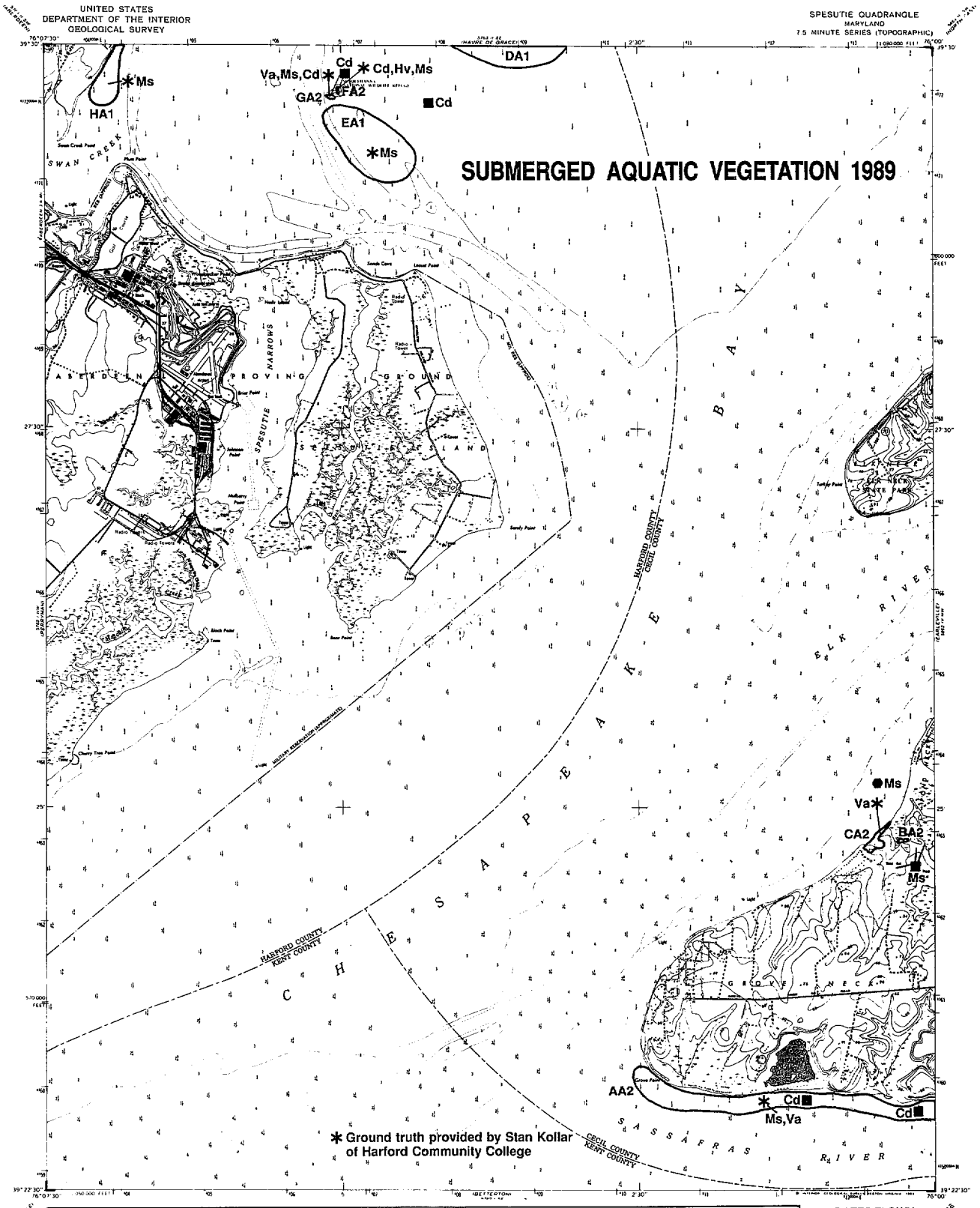
1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
8-31-89

EDGEWOOD, MD
007

PHOTOREVISED 1985



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SCALE 1:24,000

1 MILE

1 KILOMETER

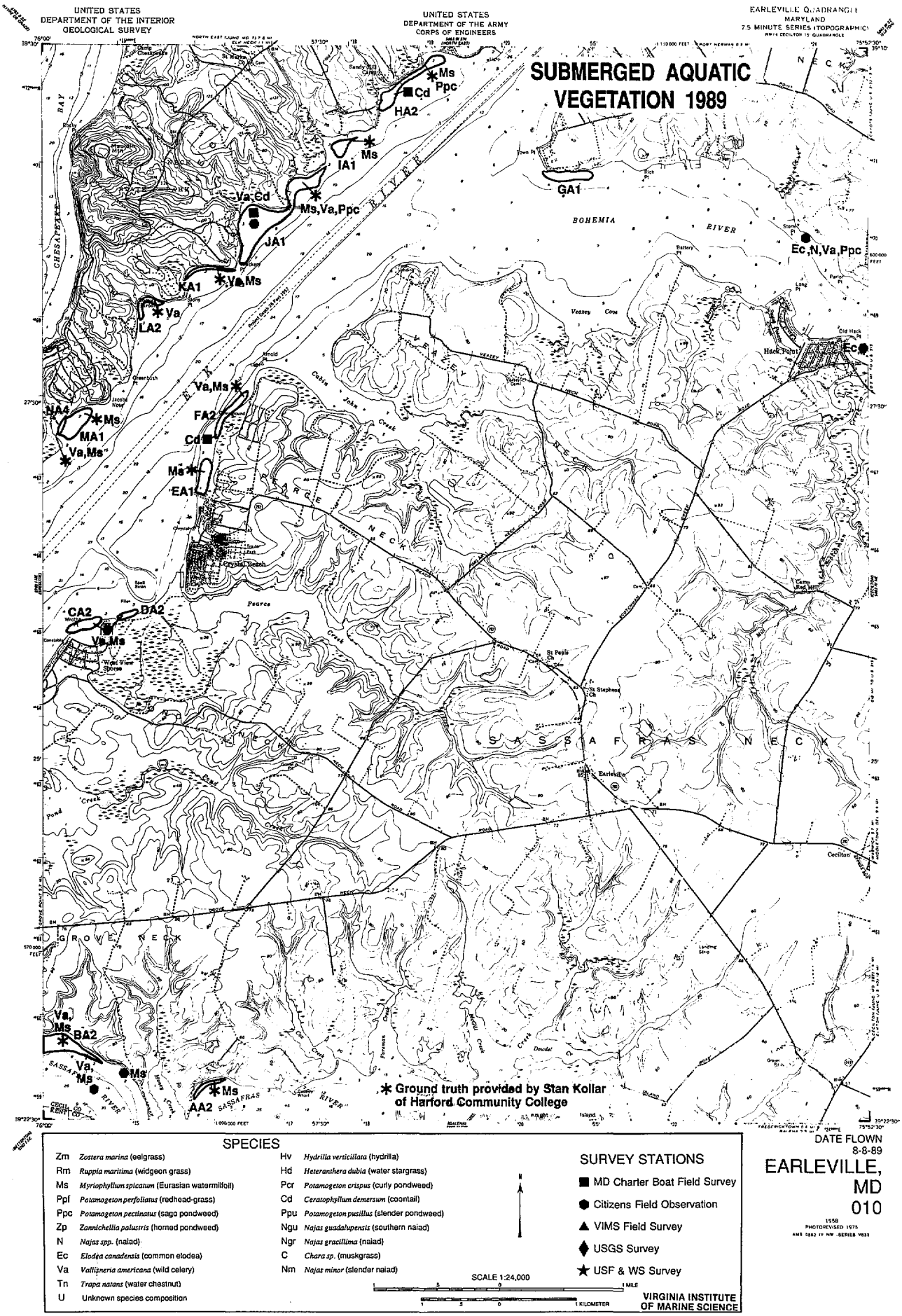
SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATES FLOWN
8-8-89
8-31-89

SPESUTIE, MD
009


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
EARLEVILLE QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION 1989
Ms
Ppc
Cd
HA2
Ms
IA1
GA1
Va,Cd
Ms,Va,Ppc
JA1
KA1
Va,Ms
Va
LA2
Ec,N,Va,Ppc
Ec
Va,Ms
FA2
Cd
NA4
Ms
MA1
Va,Ms
Ms
EA1
CA2
DA2
Va,Ms
Va,
Ms
BA2
Va,
Ms
Ms
AA2
BOHEMIA
RIVER
CHESAPEAKE
BAY
Veazey Cove
Hack Point
Cabin John Creek
PEARCE NECK
Pearce Creek
Crystal Beach
West View Shores
St Paul's Ch
St Stephens Ch
SASSAFRAS NECK
Earleville
Cecilton
GROVE NECK
SASSAFRAS RIVER
Ground truth provided by Stan Kollar of Harford Community College
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)
Tn Trapa natans (water chestnut)
U Unknown species composition
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)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
USGS Survey
USF & WS Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
VIRGINIA INSTITUTE OF MARINE SCIENCE
DATE FLOWN
8-8-89
EARLEVILLE, MD
010
1958
PHOTOREVISED 1975

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

MIDDLE RIVER QUADRANGLE
MARYLAND - BALTIMORE CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989

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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	*Unknown species composition*		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

.5 0 1 MILE

1 .5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
8-31-89

MIDDLE RIVER, MD
013

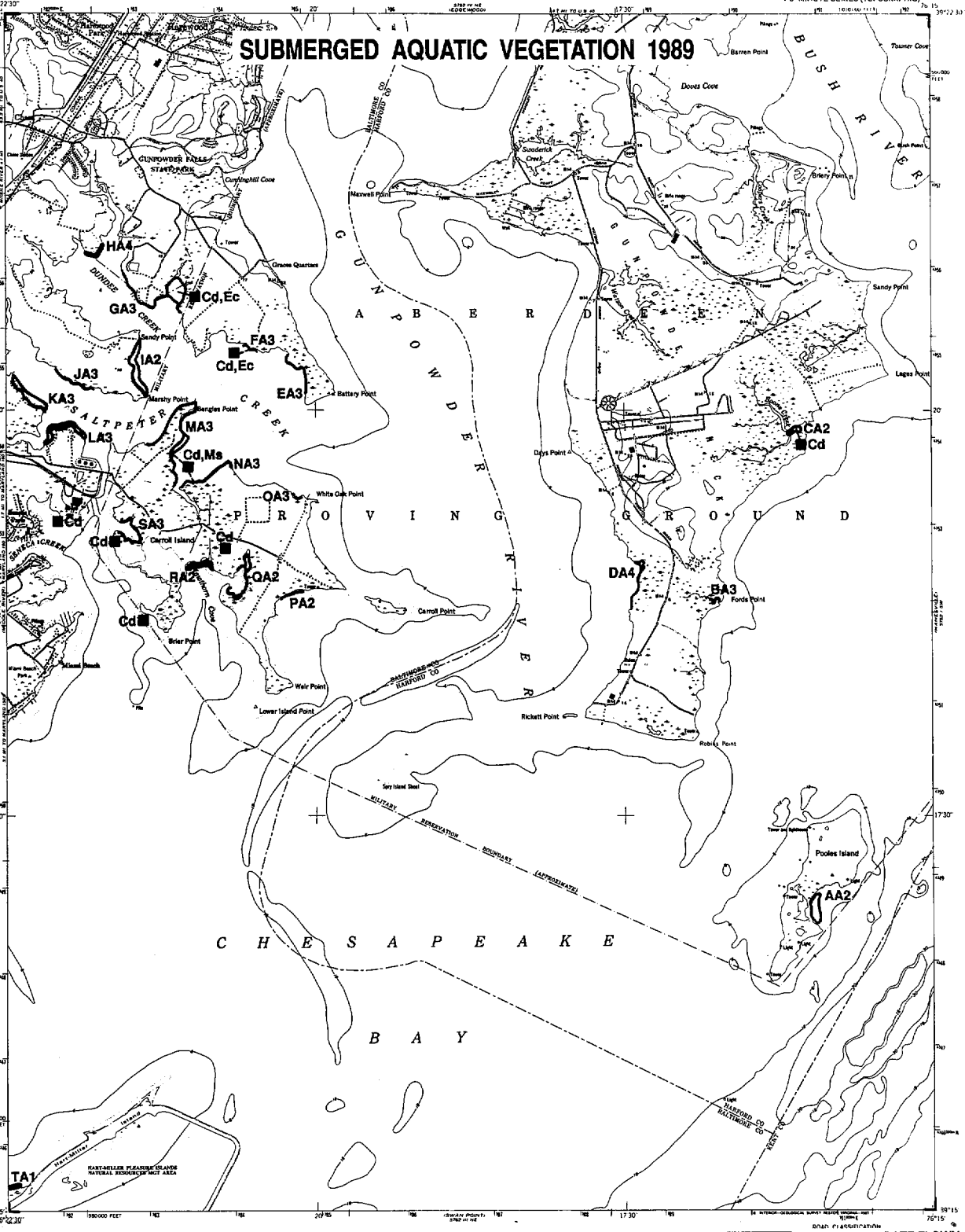
1989
PHOTOREVISED 1986
DMA 5782 IV SW - SERIES V833

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

GUNPOWDER NECK QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

VIRGINIA INSTITUTE OF MARINE SCIENCE

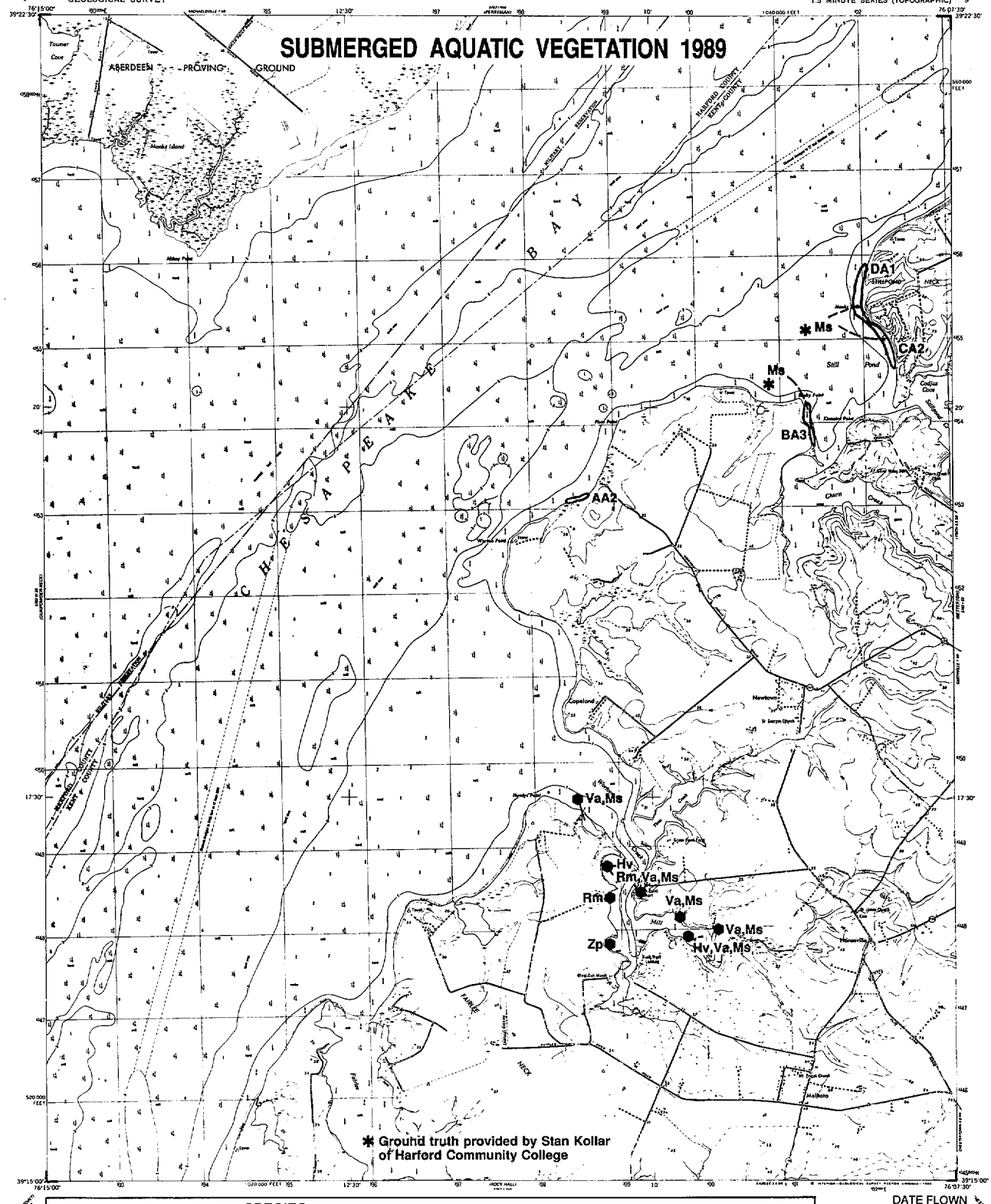
DATE FLOWN
8-31-89

GUNPOWDER NECK, MD
014

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

HANESVILLE QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)		
Tn	*Trapa natans* (water chestnut)				
U	Unknown species composition				

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 MILE

1 KILOMETER

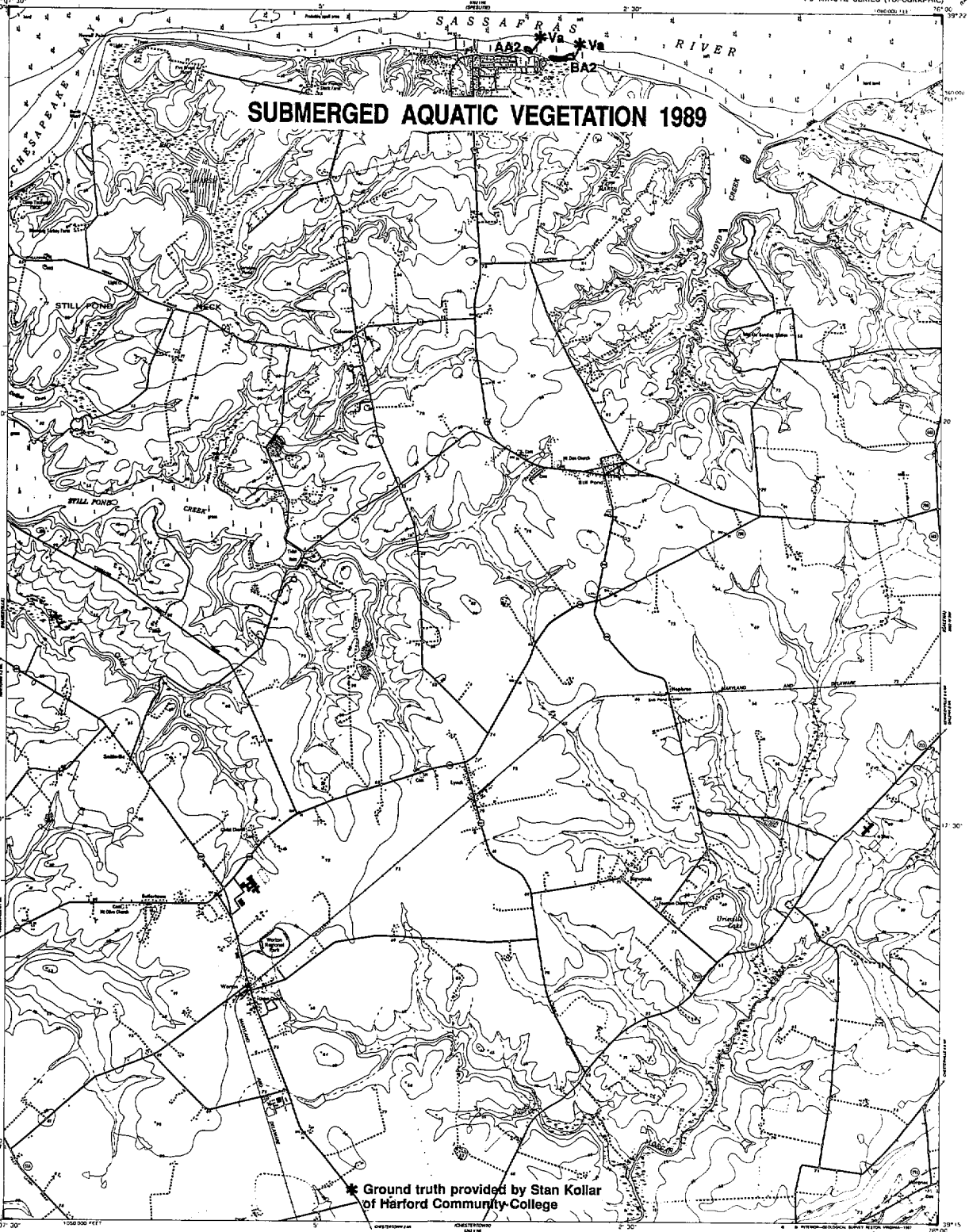
VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
8-8-89

HANESVILLE,
MD
015

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

BETTERTON QUADRANGLE
MARYLAND - KENT 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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 MILE

1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
8-8-89

BETTERTON, MD
016

1948
PHOTOREVISED 1986

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

GALENA QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989

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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 MILE

1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
8-8-89

GALENA, MD
017

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

CURTIS BAY QUADRANGLE
MARYLAND
7.5 MINUTE SERIES

SUBMERGED AQUATIC VEGETATION 1989

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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

N

SCALE 1:24,000

1 MILE

1 KILOMETER

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

VIRGINIA INSTITUTE OF MARINE SCIENCE

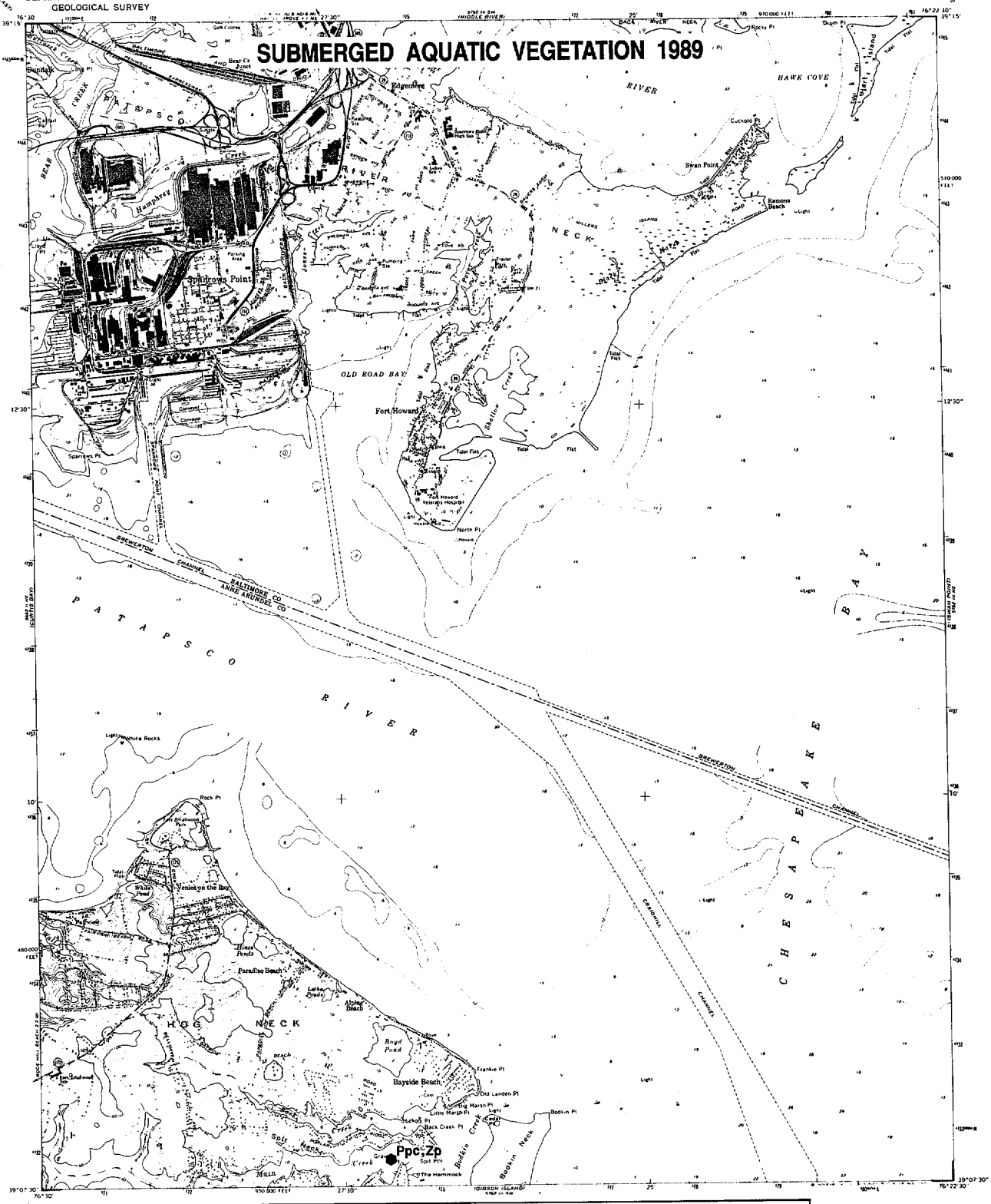
DATES FLOWN
8-25-89
10-5-89

CURTIS BAY, MD
018

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SPARROWS POINT QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)		
Tn	*Trapa natans* (water chestnut)				
U	Unknown species composition				

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

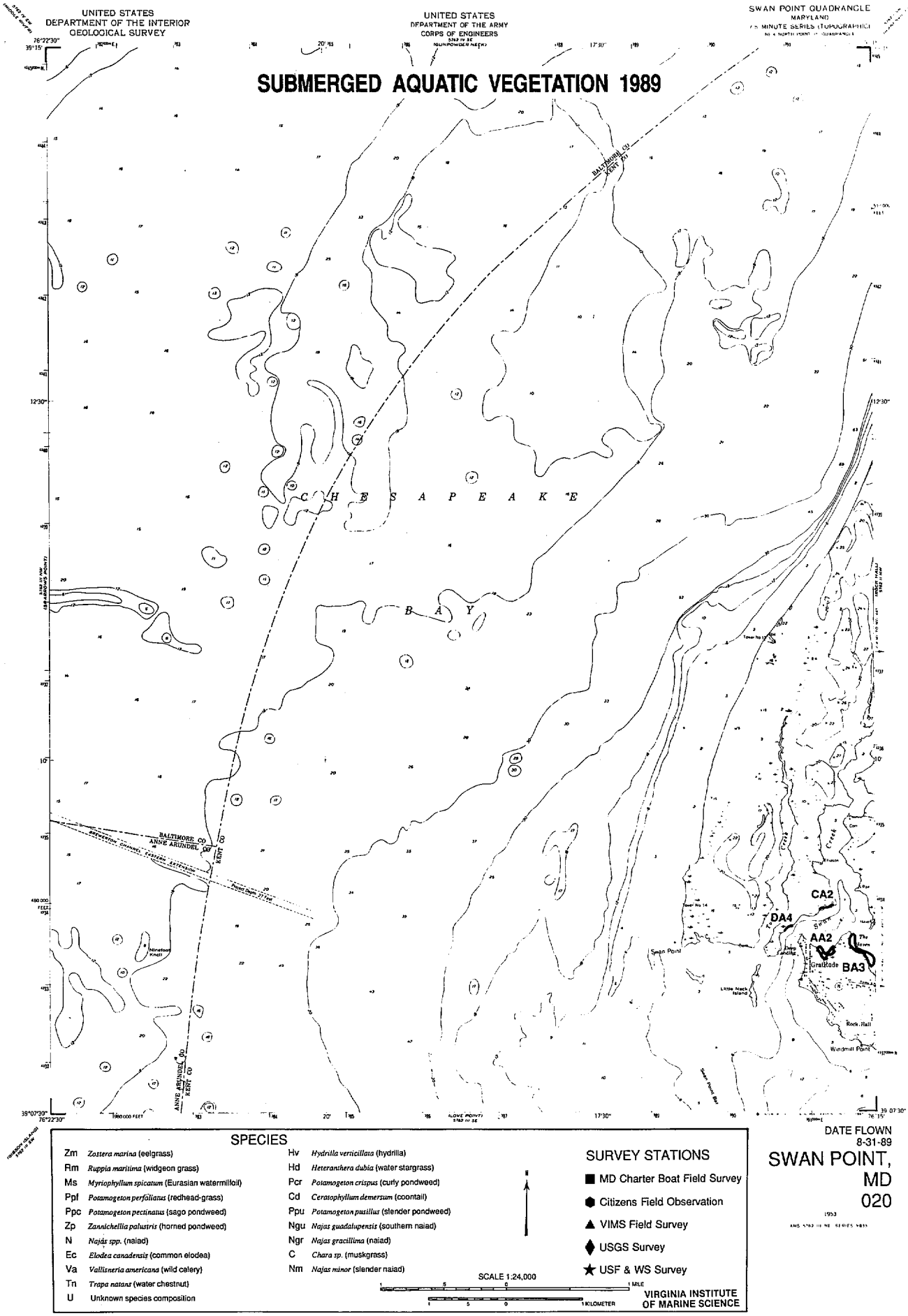
1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATES FLOWN
8-25-89
10-5-89

SPARROWS POINT, MD
019



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SCALE 1:24,000

1 MILE

1 KILOMETER

SURVEY STATIONS

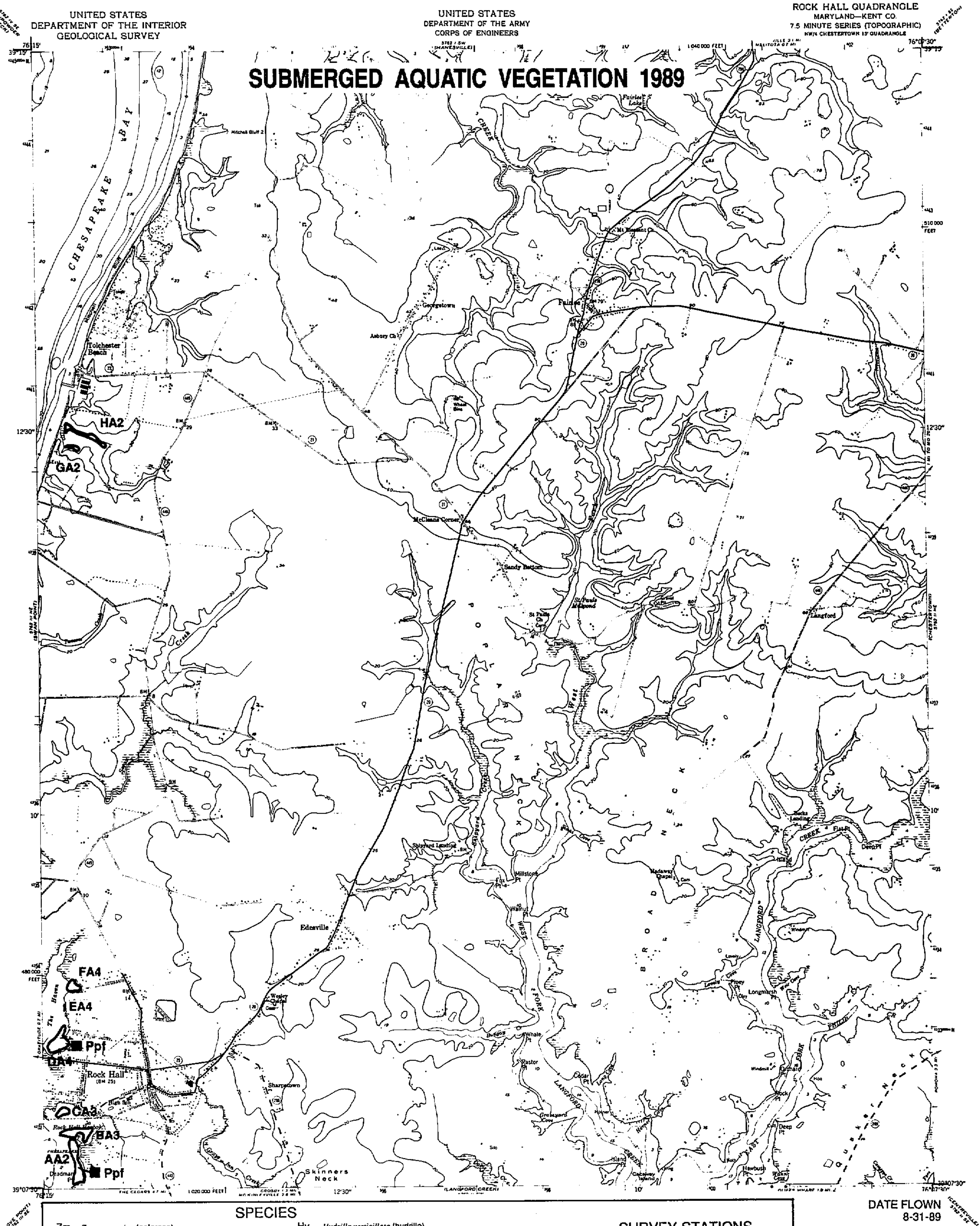
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
8-31-89

SWAN POINT, MD
020

1953



DATE FLOWN
8-31-89

ROCK HALL, MD
021

PHOTOREVISED 1973
AMS 5762 II NW SERIES V833

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)
Tn	*Trapa natans* (water chestnut)
U	Unknown species composition
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)
Nm	*Najas minor* (slender naiad)

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000
1 MILE
1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

ROUND BAY QUADRANGLE
MARYLAND - ANNE ARUNDEL CO
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989

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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 MILE

1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATES FLOWN
8-25-89
10-5-89

ROUND BAY, MD
023

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

GIBSON ISLAND QUADRANGLE
MARYLAND--ANNE ARUNDEL CO
7.5 MINUTE SERIES (TOPOGRAPHIC)
SW 4 NORTH POINT 15' QUADRANGLE

SUBMERGED AQUATIC VEGETATION 1989

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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- USGS Survey
- USF & WS Survey

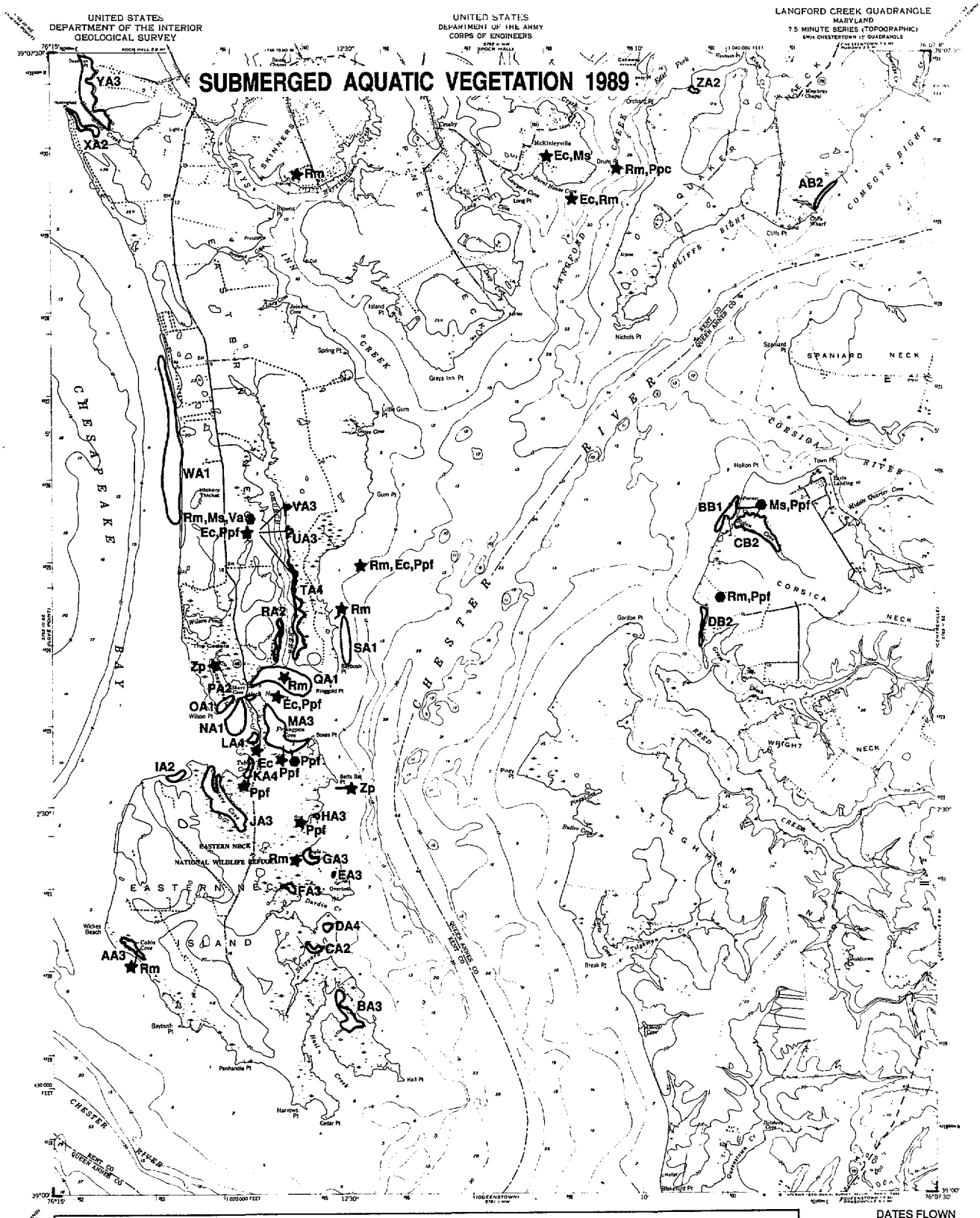
SCALE 1:24,000

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
8-25-89

GIBSON ISLAND, MD
024

1954
PHOTOREVISED 1979
AMS 5763 III SW 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	*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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

DATES FLOWN
8-8-89
8-31-89

LANGFORD CREEK, MD
026

PHOTOREVISED 1988
DMA 5762 II SW SERIES V833

VIRGINIA INSTITUTE OF MARINE SCIENCE

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVE

UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

SOUTH RIVER QUADRANGLE
MARYLAND-ANNE ARUNDEL CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989

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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

N

SCALE 1:24,000

1 MILE

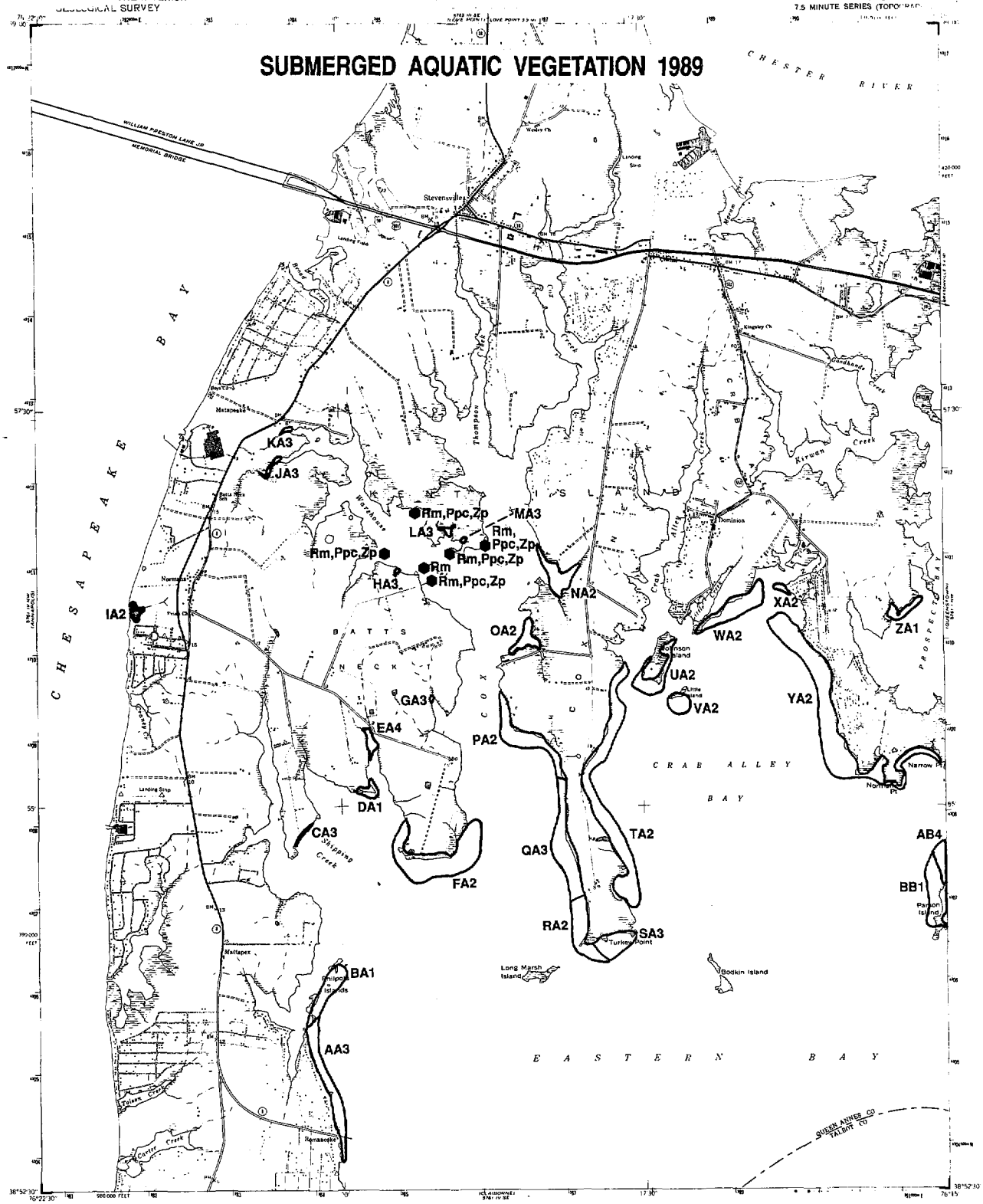
1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATES FLOWN
8-25-89
10-5-89

SOUTH RIVER, MD
030

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 MILE

1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

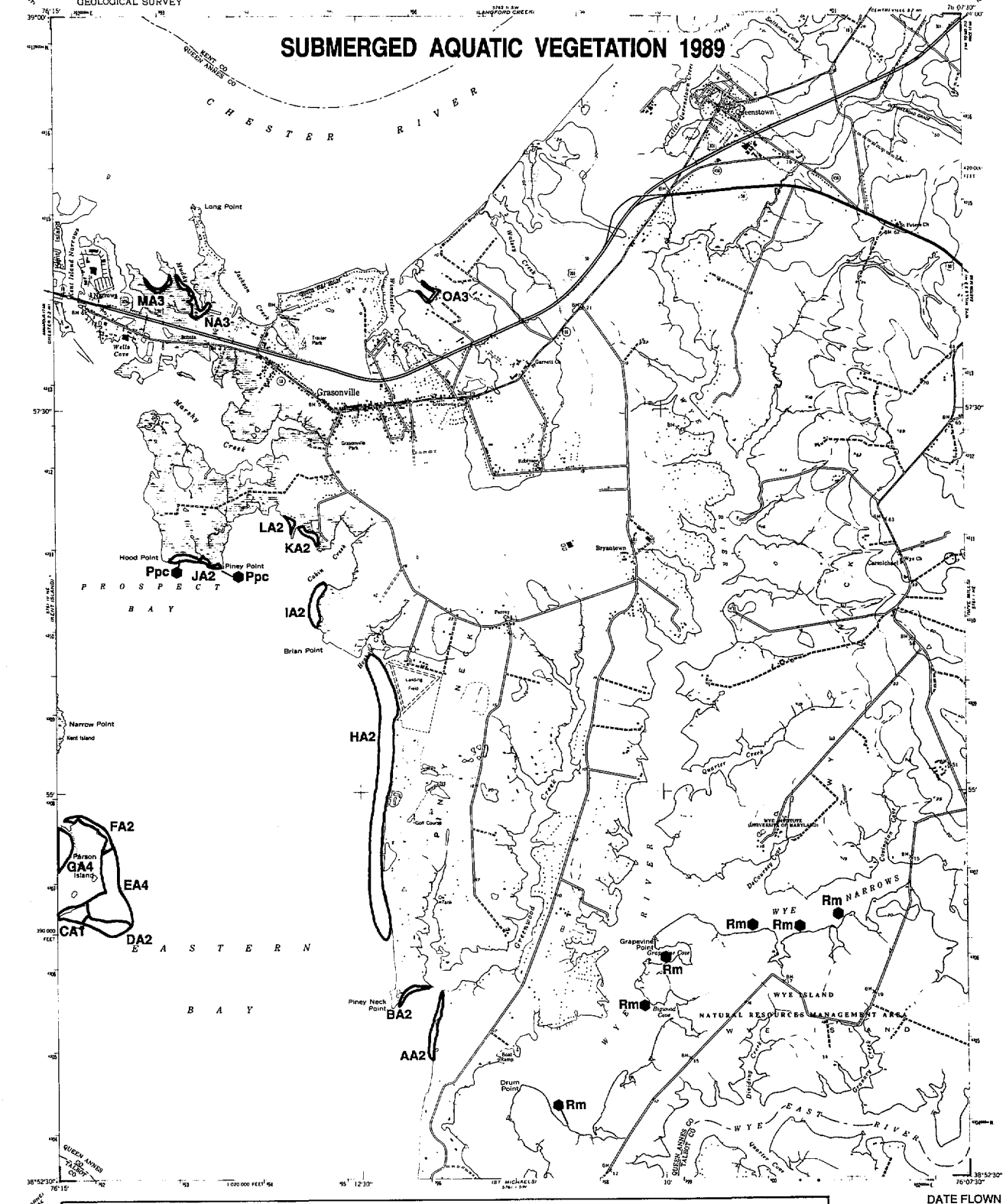
DATE FLOWN
7-15-89

KENT ISLAND, MD
032

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

QUEENSTOWN QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 MILE

1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
7-15-89

QUEENSTOWN, MD
033

1942
PHOTOREVISED 1966
DMA 5761 I NW SERIES V833

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ALEXANDRIA QUADRANGLE
VIRGINIA-DISTRICT OF COLUMBIA-MARYLAND
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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
10-10-89

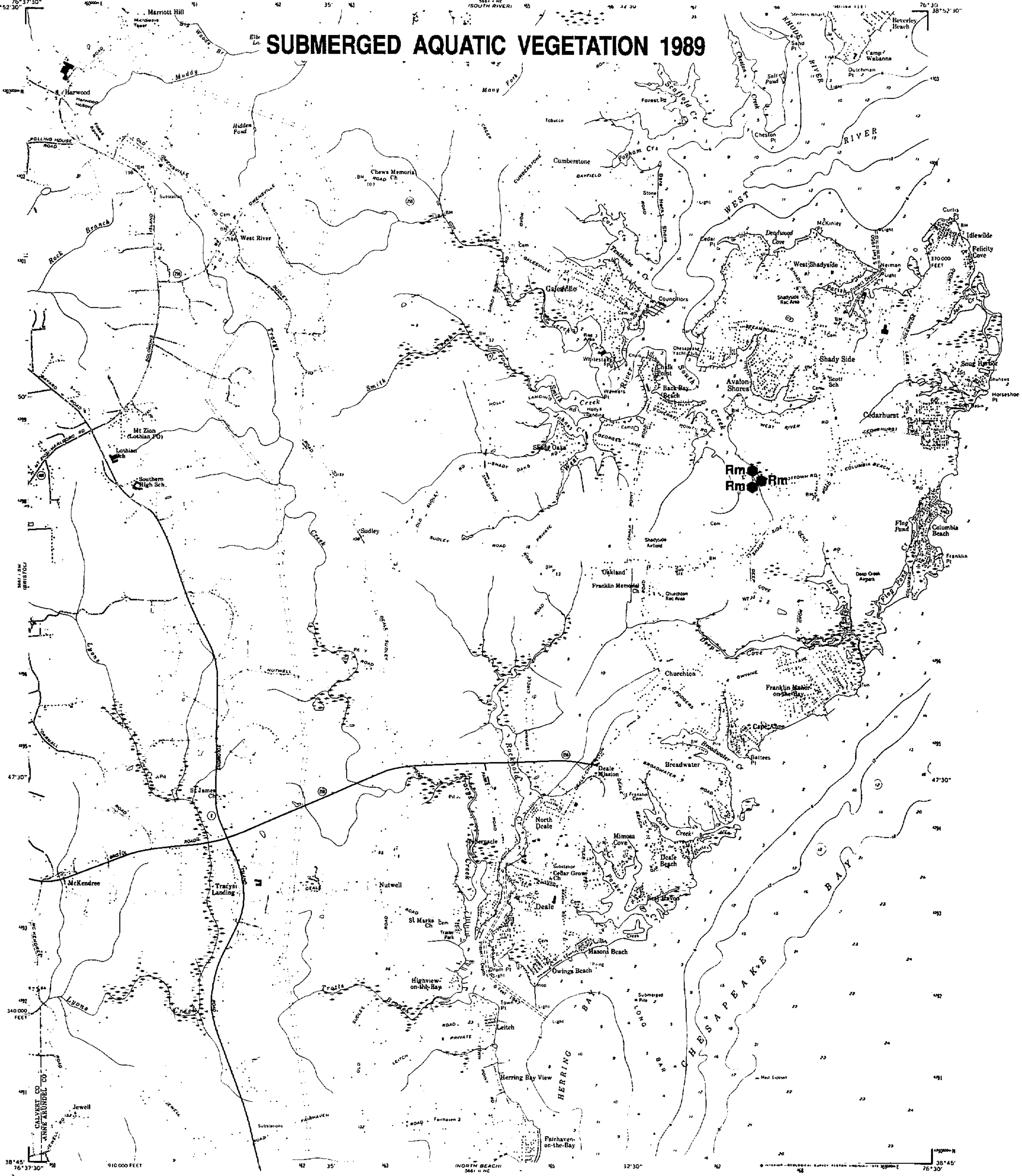
ALEXANDRIA,
VA-DC-MD
034

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

DEALE QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

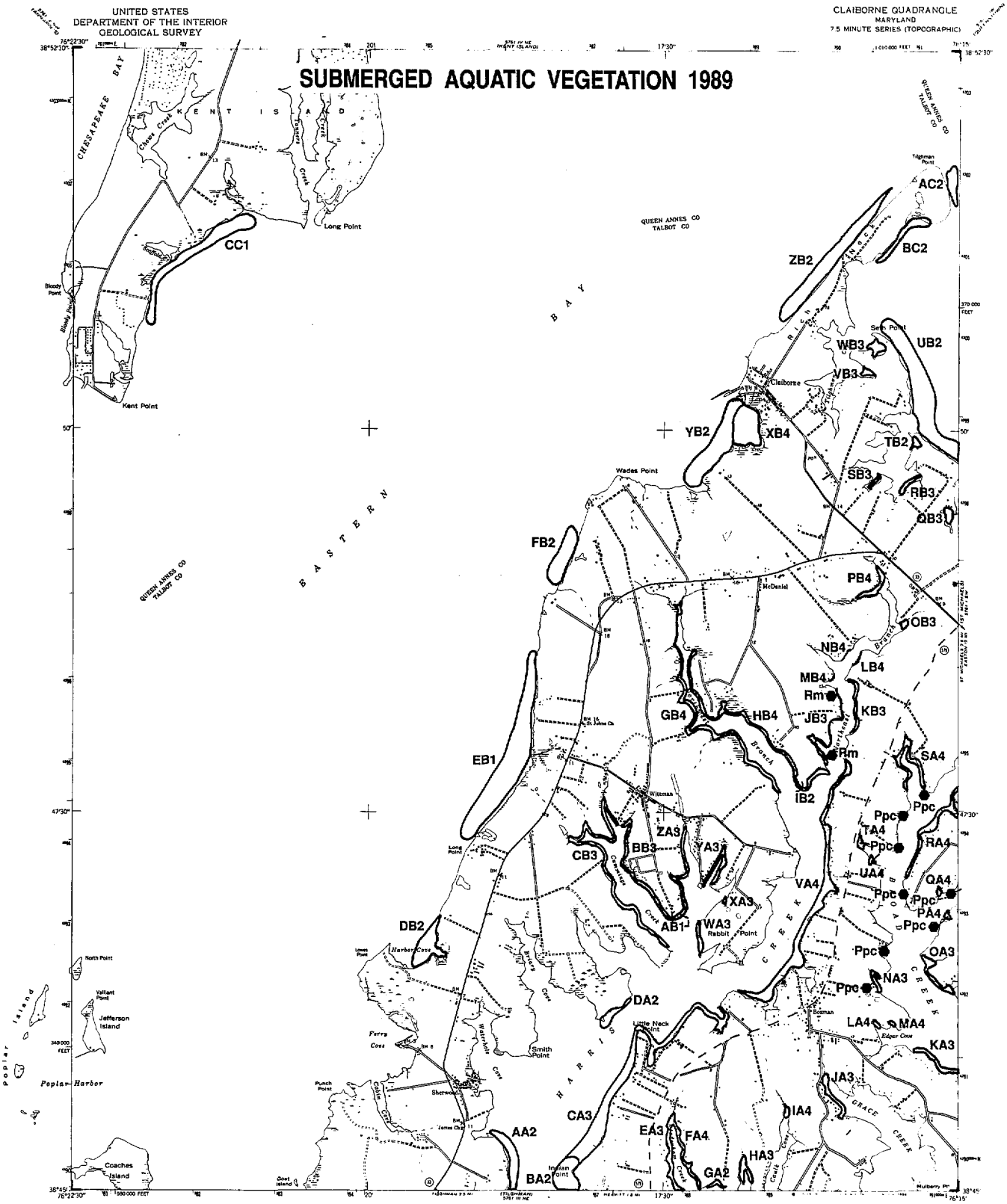
SCALE 1:24,000

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
9-28-89

DEALE, MD
035

1957
PHOTOREVISED 1979
AMS 5661 I SE–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	*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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

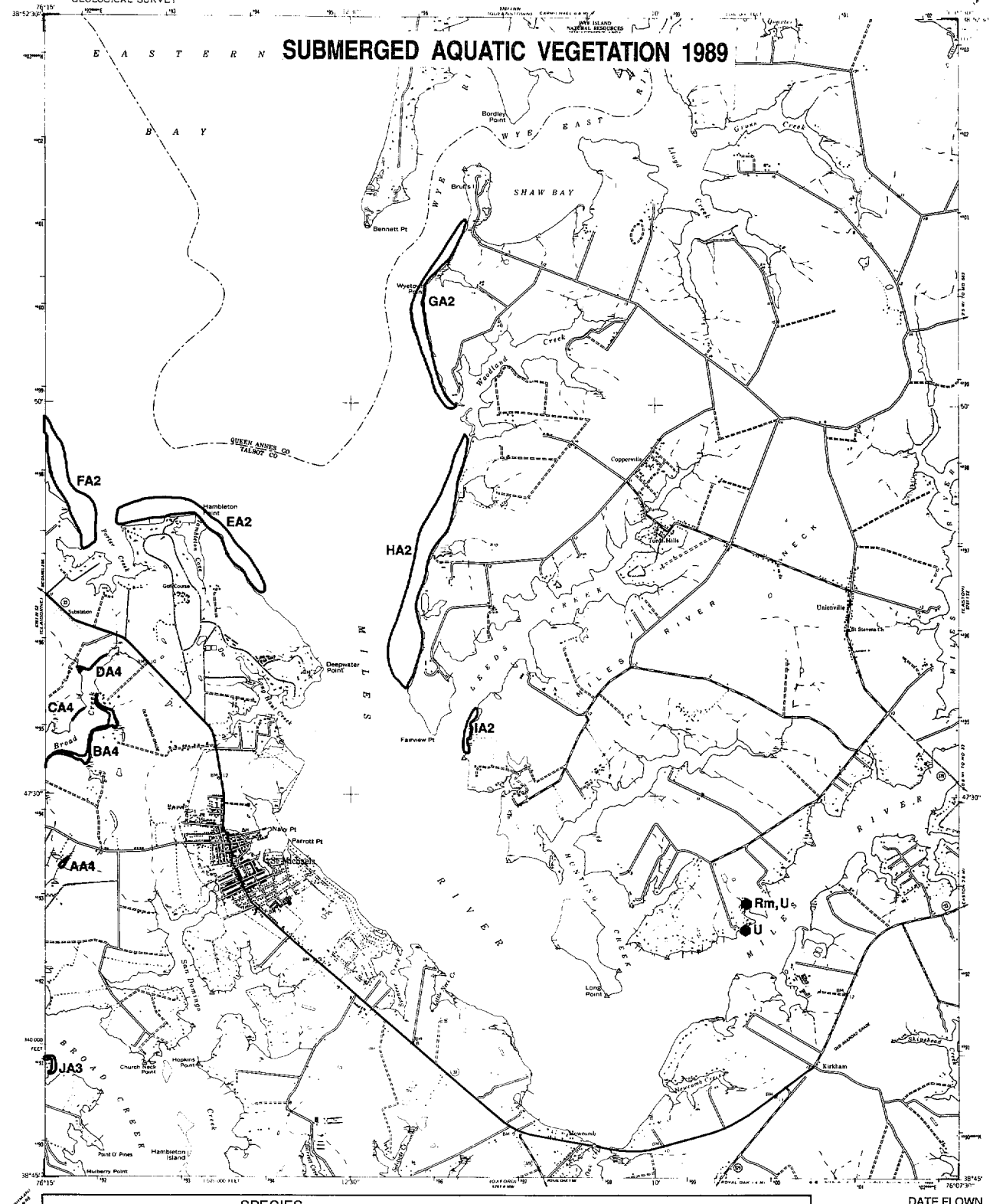
DATES FLOWN
7-15-89
KENT ISLAND
8-25-89

CLAIBORNE, MD
036

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ST MICHAELS QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- USGS Survey
- USF & WS Survey

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
7-15-89

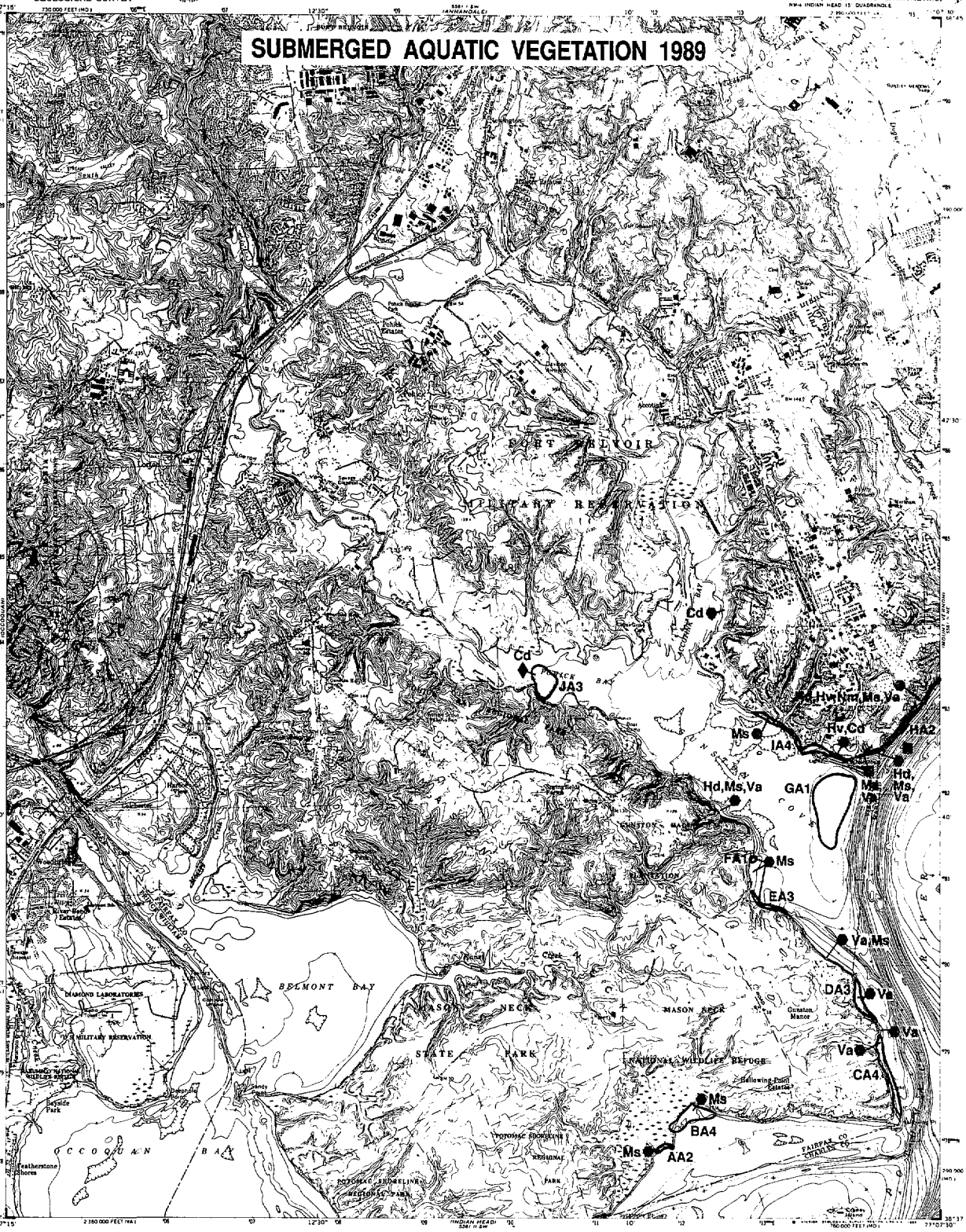
ST. MICHAELS,
MD
037

1942
PHOTOREVISED 1986
DMA 5761 I SW SERIES V833

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

FORT BELVOIR QUADRANGLE
VIRGINIA - MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC - BATHYMETRIC)

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 .5 0 1 MILE

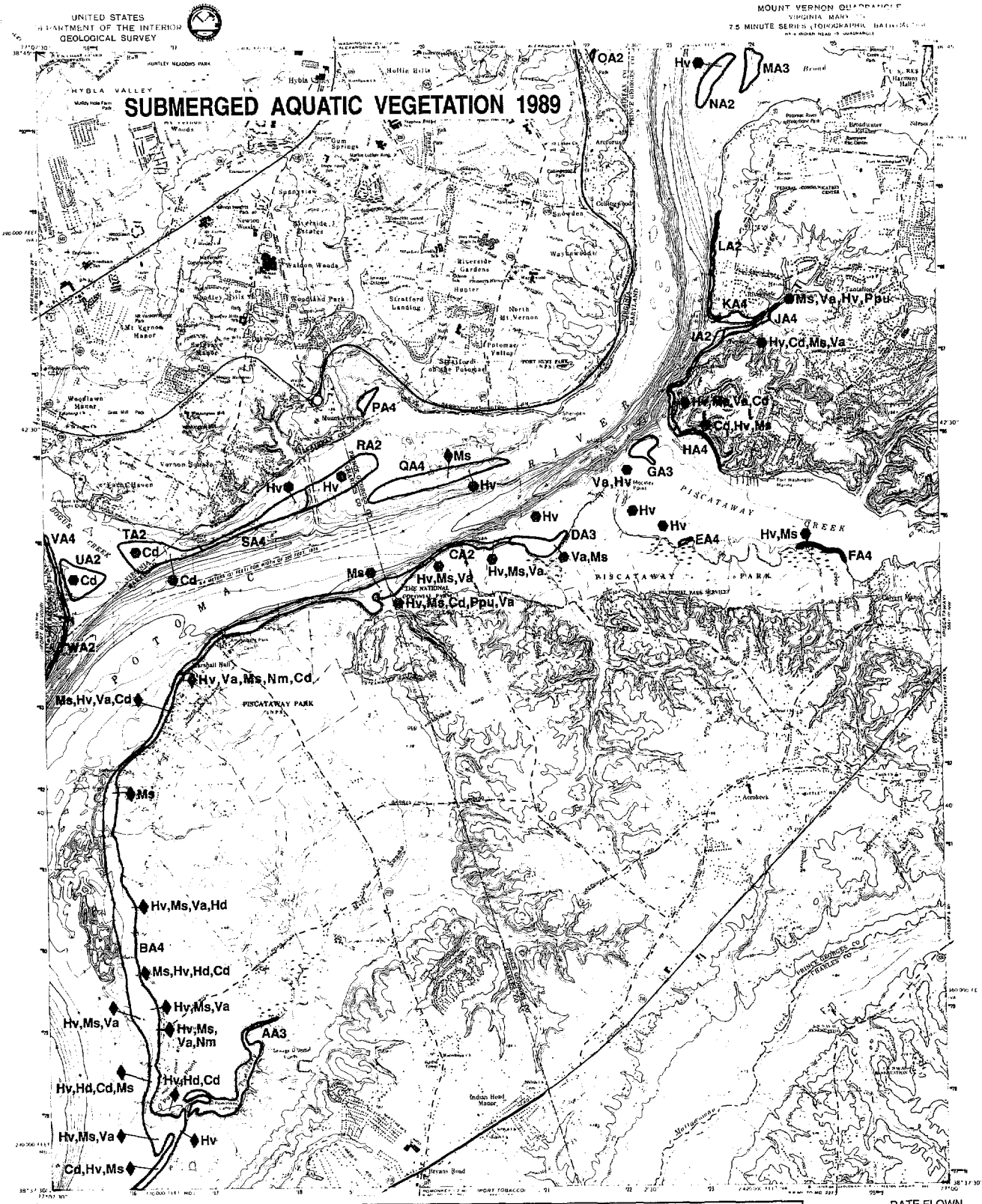
1 .5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
10-10-89

FORT BELVOIR,
VA-MD
039

PHOTOREVISED 1983
BATHYMETRY ADDED 1987



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 MILE

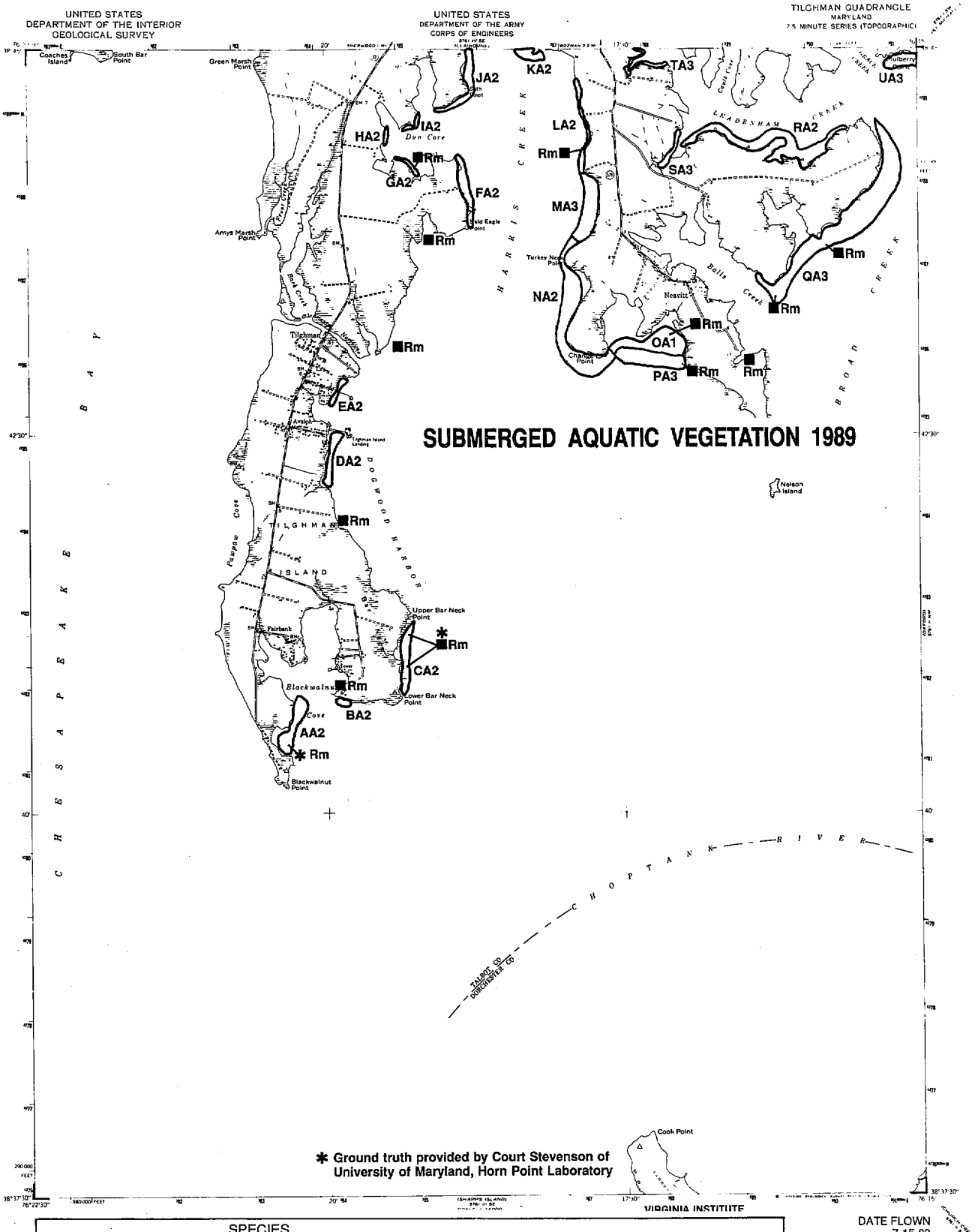
1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
10-10-89

MT. VERNON, VA-MD 040

1966
PHOTOREVISED 1983
BATHYMETRY ADDED 1982
DMA 5561 II 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	*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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 MILE

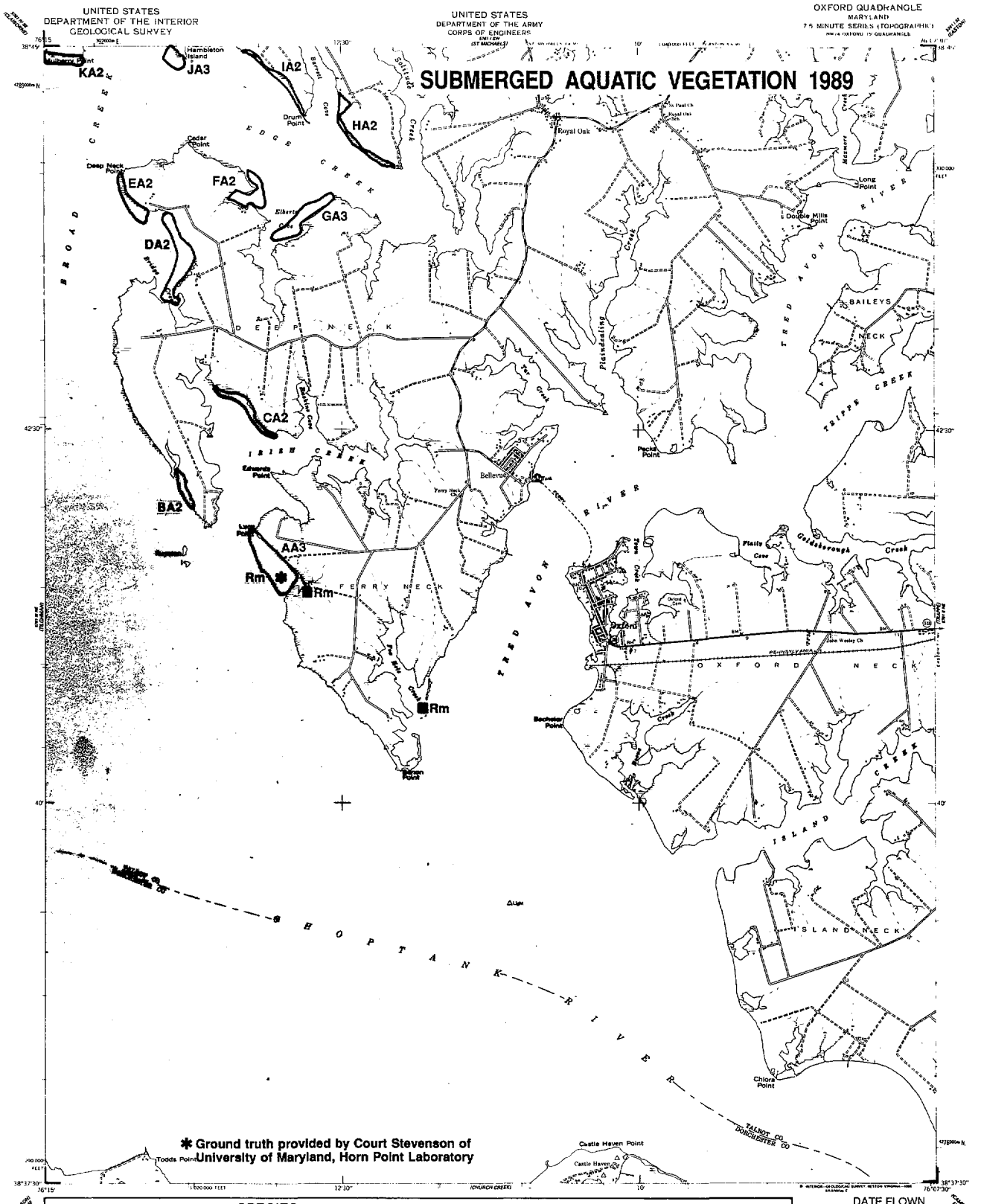
1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
7-15-89

TILGHMAN, MD
043

PHOTOINSPECTED 1974
AMS 5761 III 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	*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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 MILE

1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
7-15-89

OXFORD, MD
044

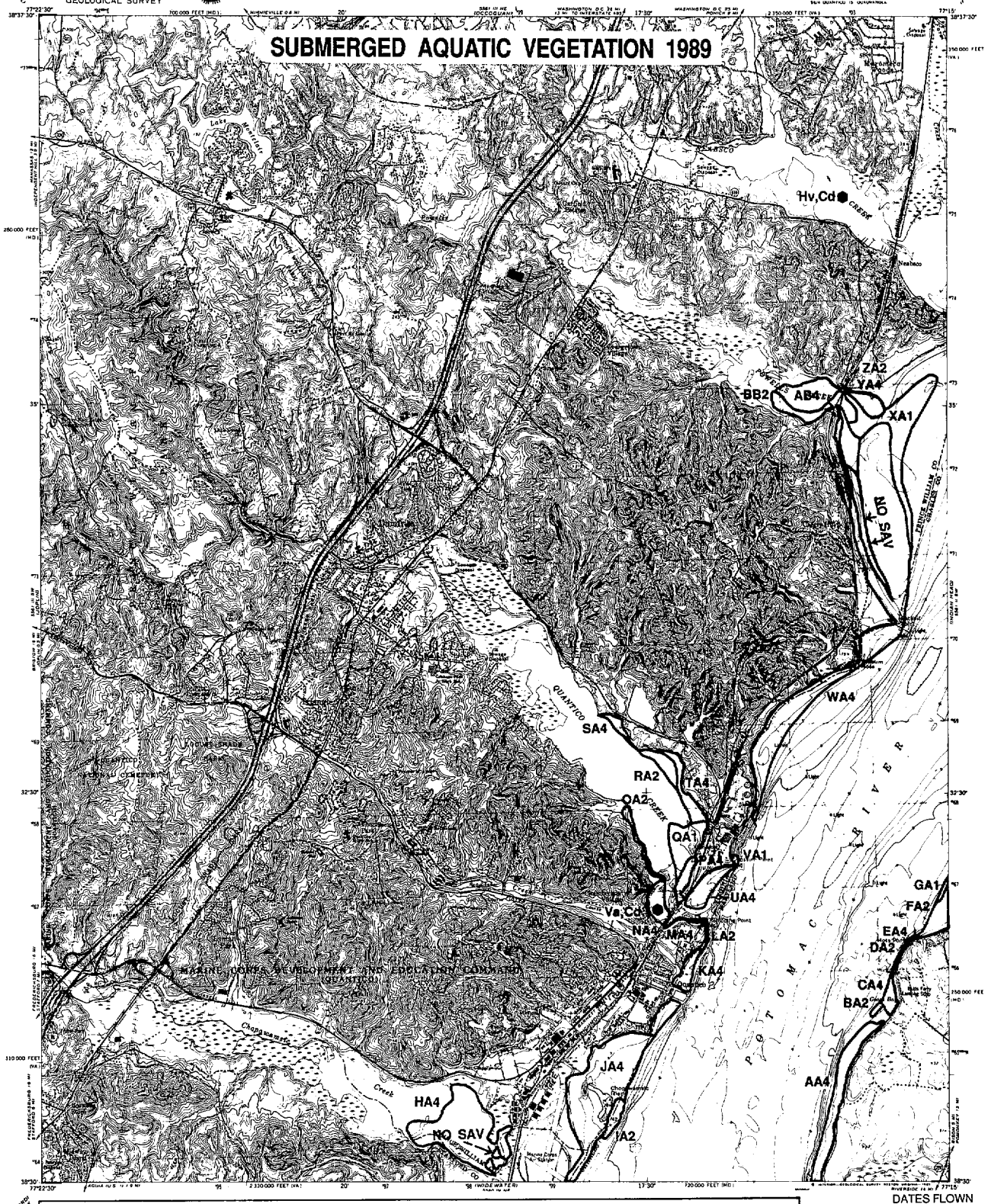
1942

DMA 5761 II NW-SERIES V833

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

QUANTICO QUADRANGLE
VIRGINIA—MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC—BATHYMETRIC)

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)		
Tn	*Trapa natans* (water chestnut)				
U	Unknown species composition				

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATES FLOWN
9-28-89
10-5-89

QUANTICO,
VA-MD
047

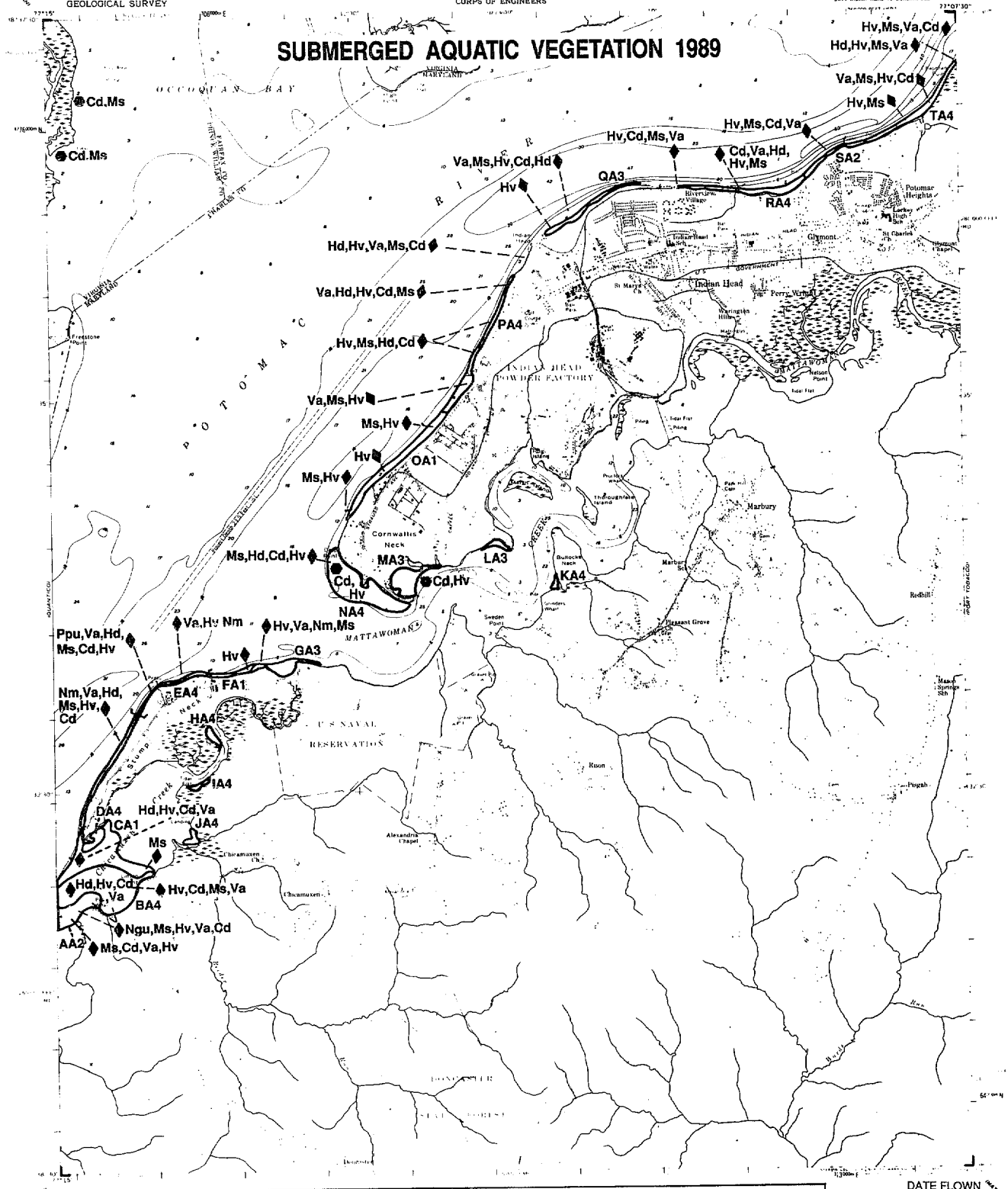
1965
PHOTOREVISED 1983
BATHYMETRY ADDED 1982

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

INDIAN HEAD QUADRANGLE
MARYLAND-VIRGINIA
7.5 MINUTE SERIES

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

N

SCALE 1:24,000

1 5 0 1 MILE

1 5 0 1 KILOMETER

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

VIRGINIA INSTITUTE OF MARINE SCIENCE

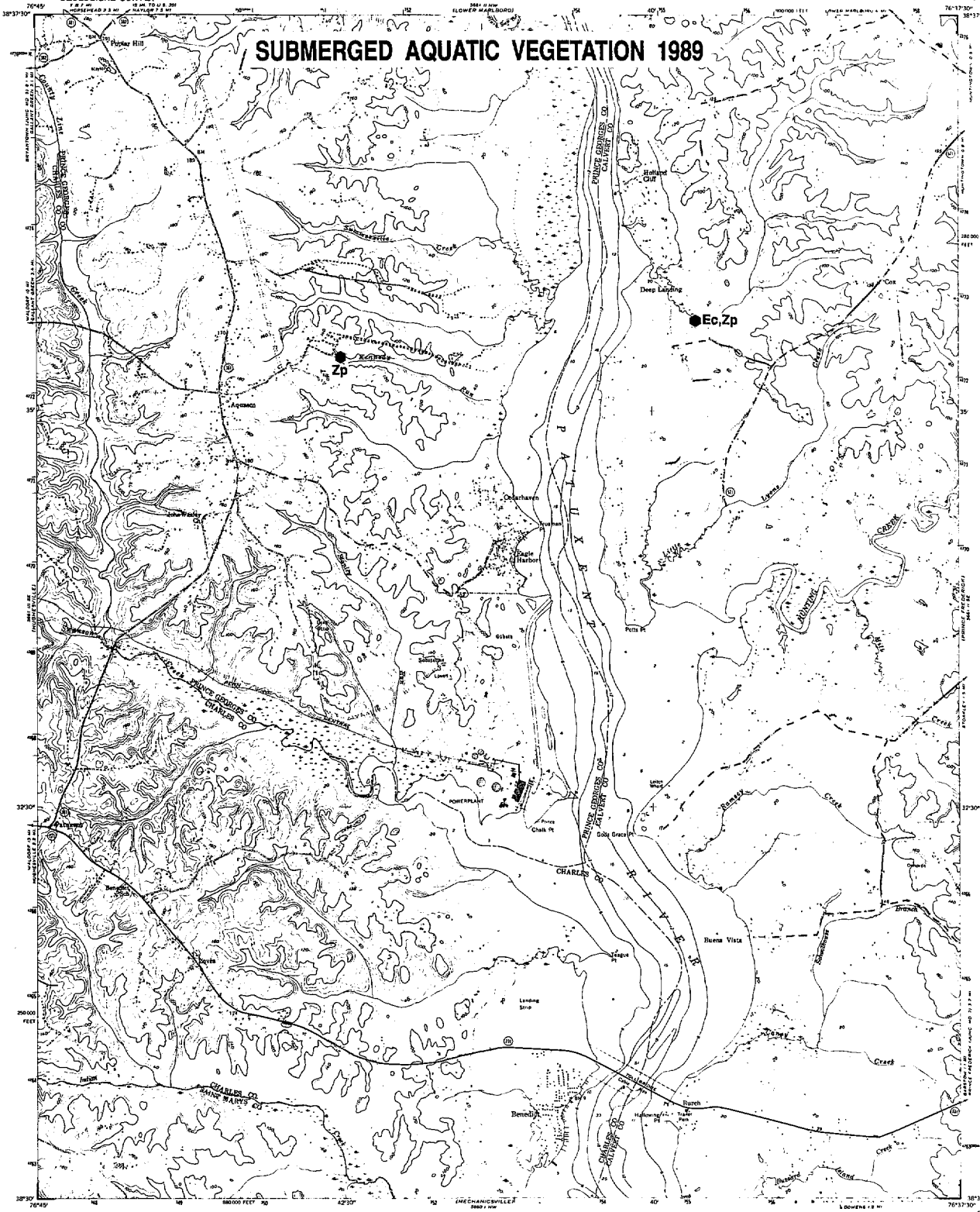
DATE FLOWN
10-5-89

INDIAN HEAD,
MD-VA
048

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

BENEDICT QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)		
Tn	*Trapa natans* (water chestnut)				
U	Unknown species composition				

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
9-3-89

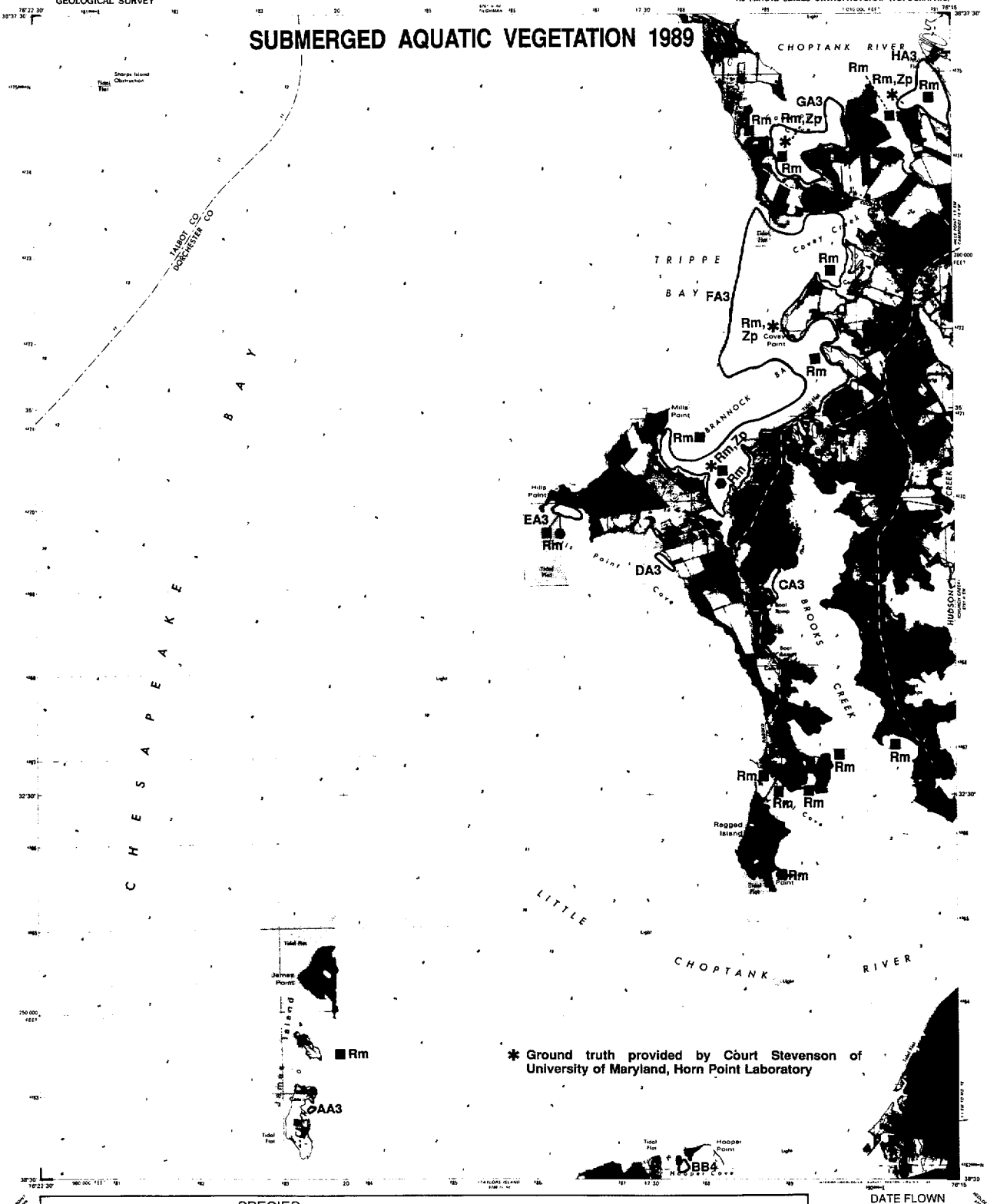
BENEDICT,
MD
049

PHOTOREVISED 1974
ANS 5661 II SW SERIES V833

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

HUDSON QUADRANGLE
MARYLAND
7.5 MINUTE SERIES ORTHOPHOTOMAP (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989



* Ground truth provided by Court Stevenson of University of Maryland, Horn Point Laboratory

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	*Vallisnera americana* (wild celery)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 MILE

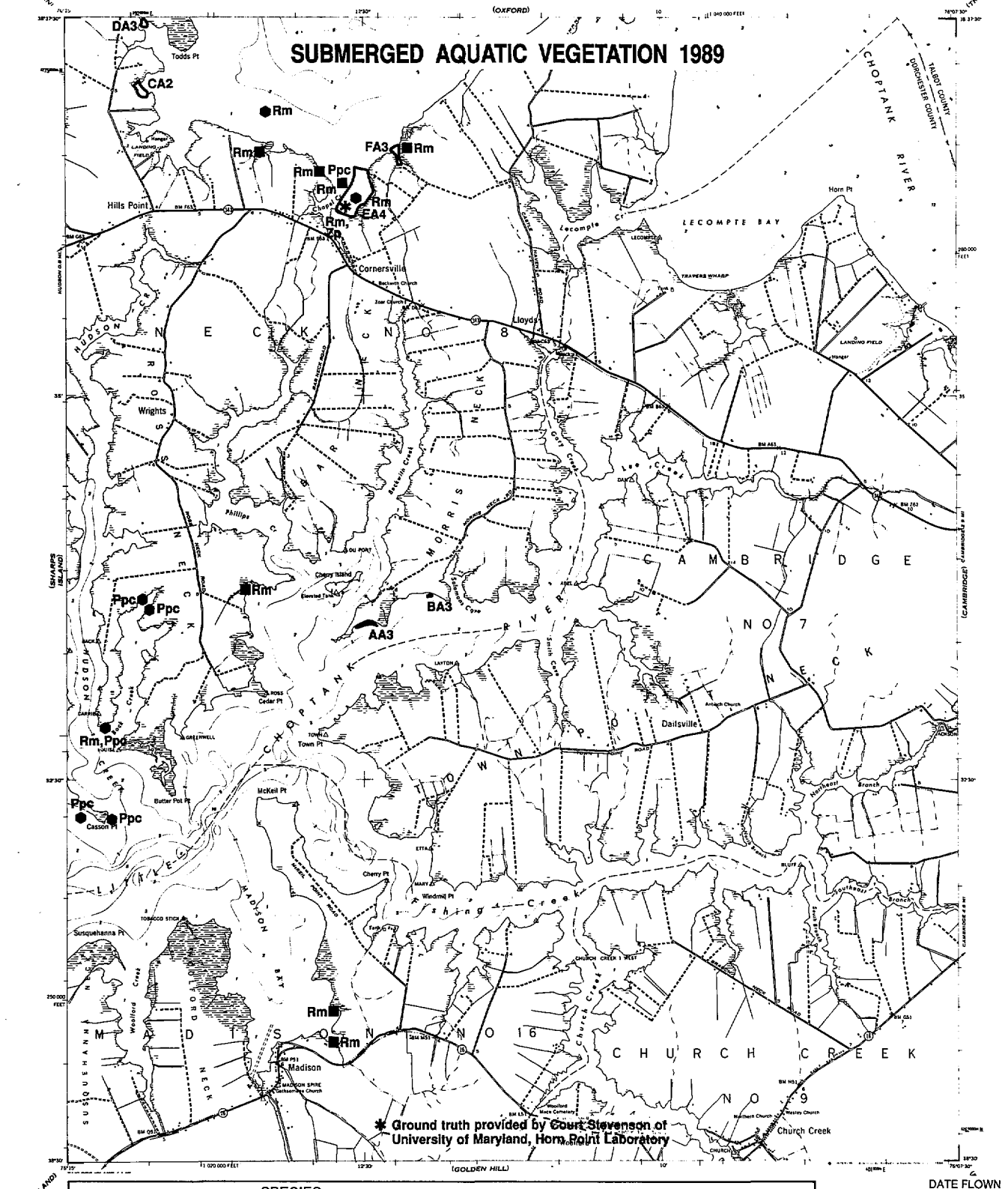
1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
7-15-89

HUDSON, MD
051
1982

DMA 5761 III SE 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)
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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
7-15-89

CHURCH CREEK, MD
052

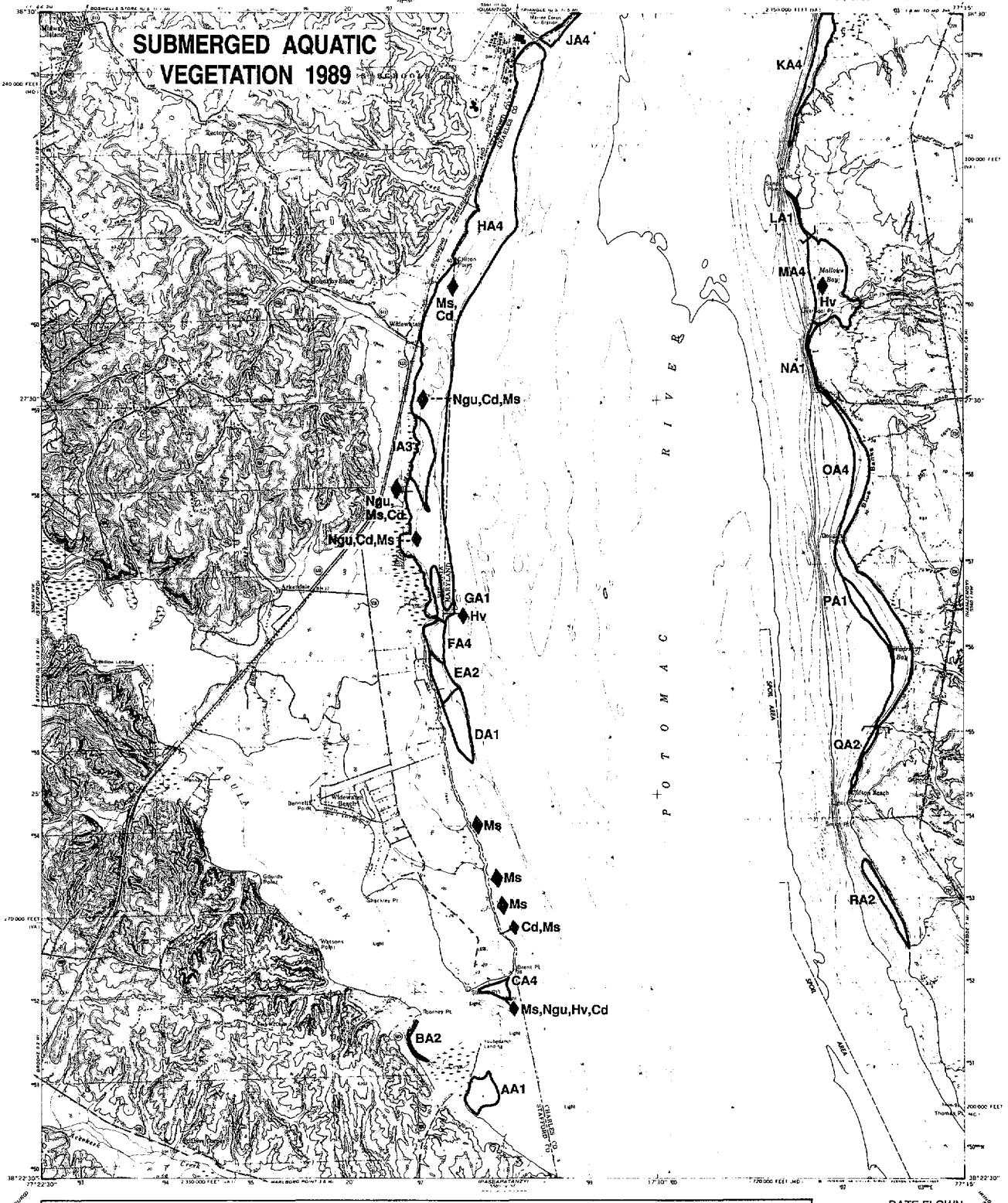
N3830 - W7607.5/7.5
1942

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES

WIDEWATER QUADRANGLE
VIRGINIA - MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
9-28-89

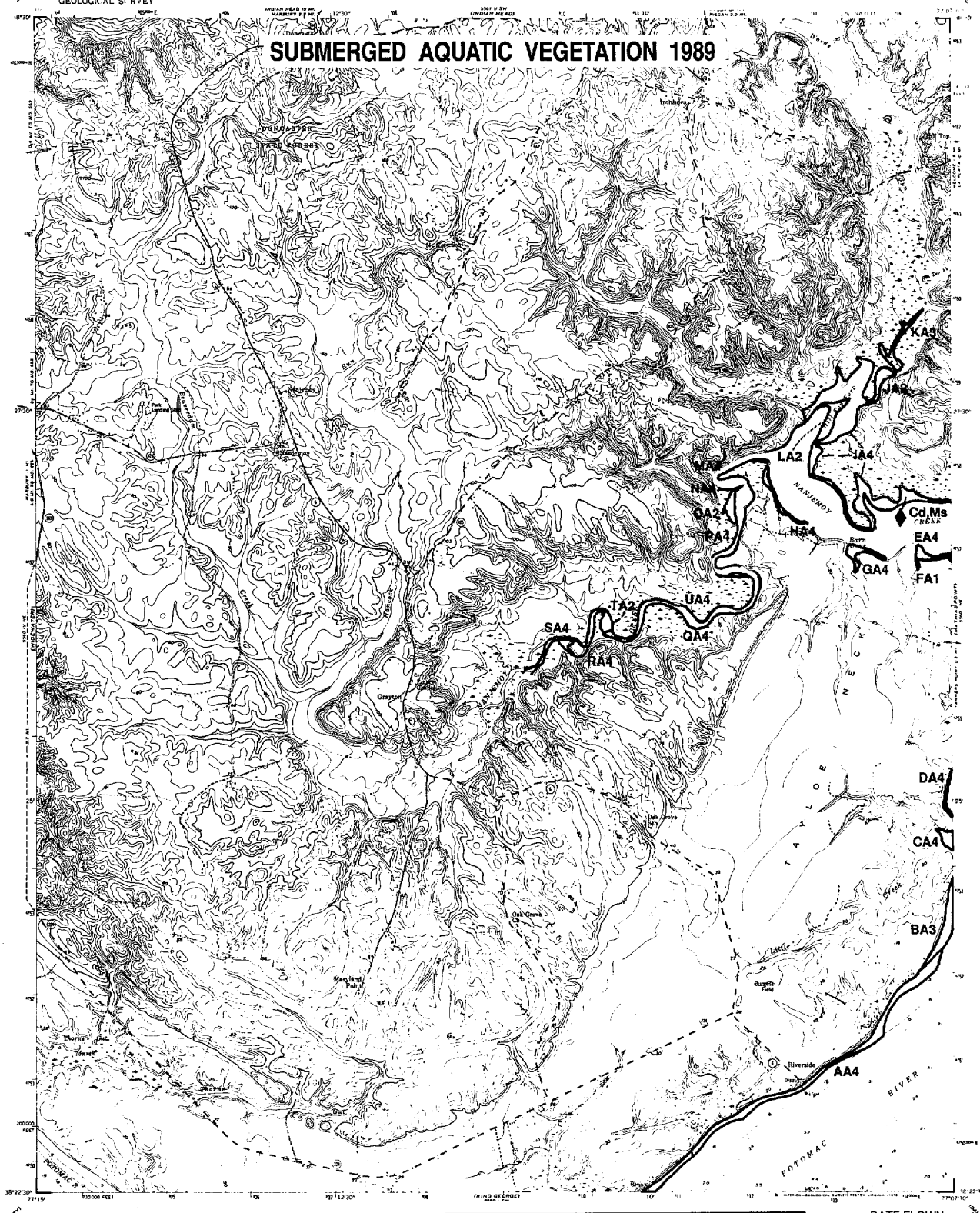
WIDEWATER, VA-MD 055

PHOTOREVISED 1978
BATHYMETRY ADDED 1982
DMA 5860 IV NE SERIES V834

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

NANJEMOY QUADRANGLE
MARYLAND-CHARLES CO.

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

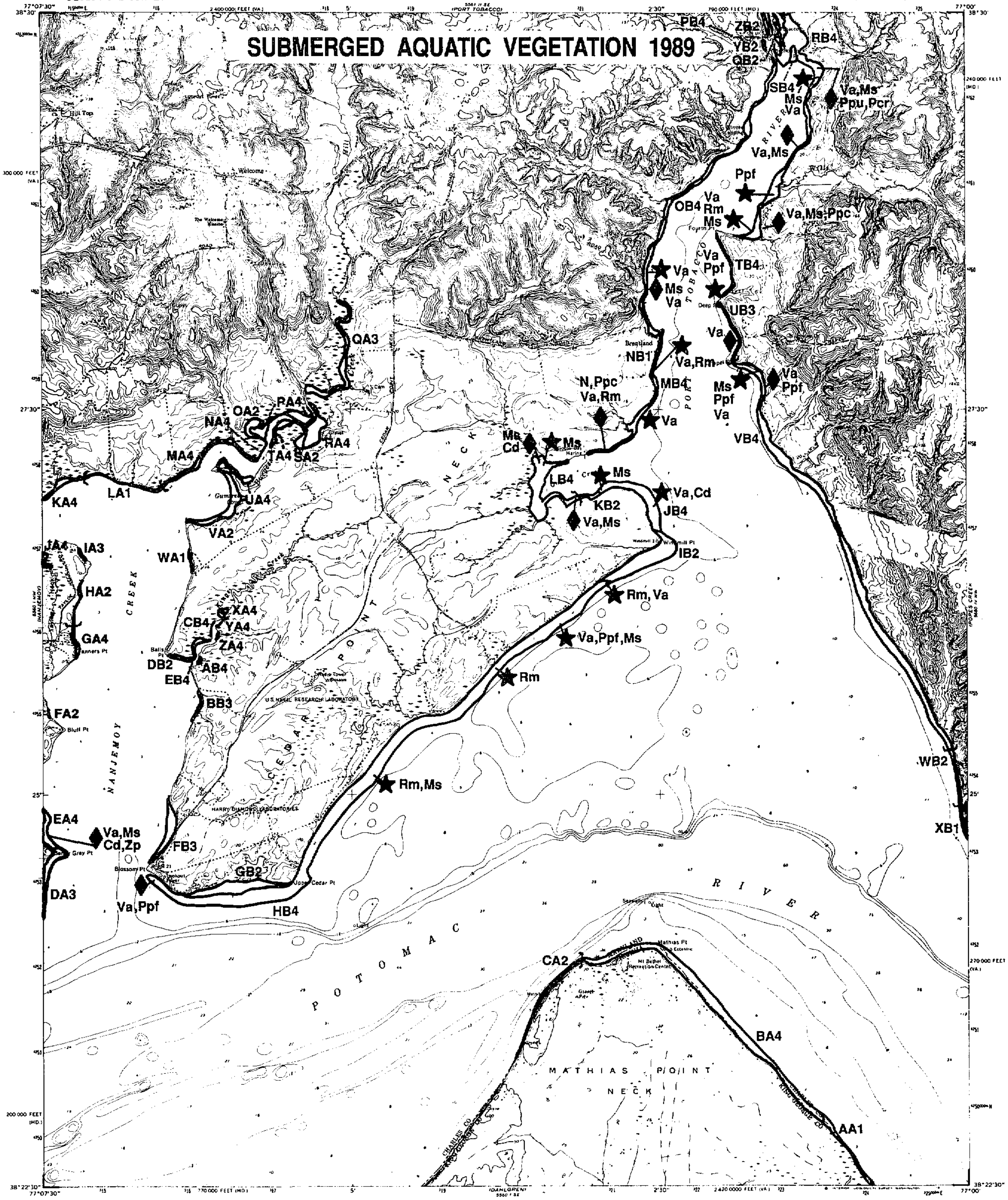
DATE FLOWN
9-28-89

NANJEMOY, MD
056

PHOTOREVISED 1978
AMS Y842 I NW SERIES V831

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

MATHIAS 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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
9-28-89

MATHIAS POINT, MD-VA
057

1968
AMS 5560 II NE-SERIES V833

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

POPES CREEK QUADRANGLE
MARYLAND-CHARLES COUNTY
7.5 MINUTE SERIES (TOPOGRAPHIC-BATHYMETRIC)

SUBMERGED AQUATIC VEGETATION 1989

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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
8-31-89

POPES CREEK,
MD
058

PHOTOREVISED 1974
BATHYMETRY ADDED 1982

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

BROOMES ISLAND QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989

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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- USGS Survey
- USF & WS Survey

SCALE 1:24,000

1 MILE

1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
9-3-89

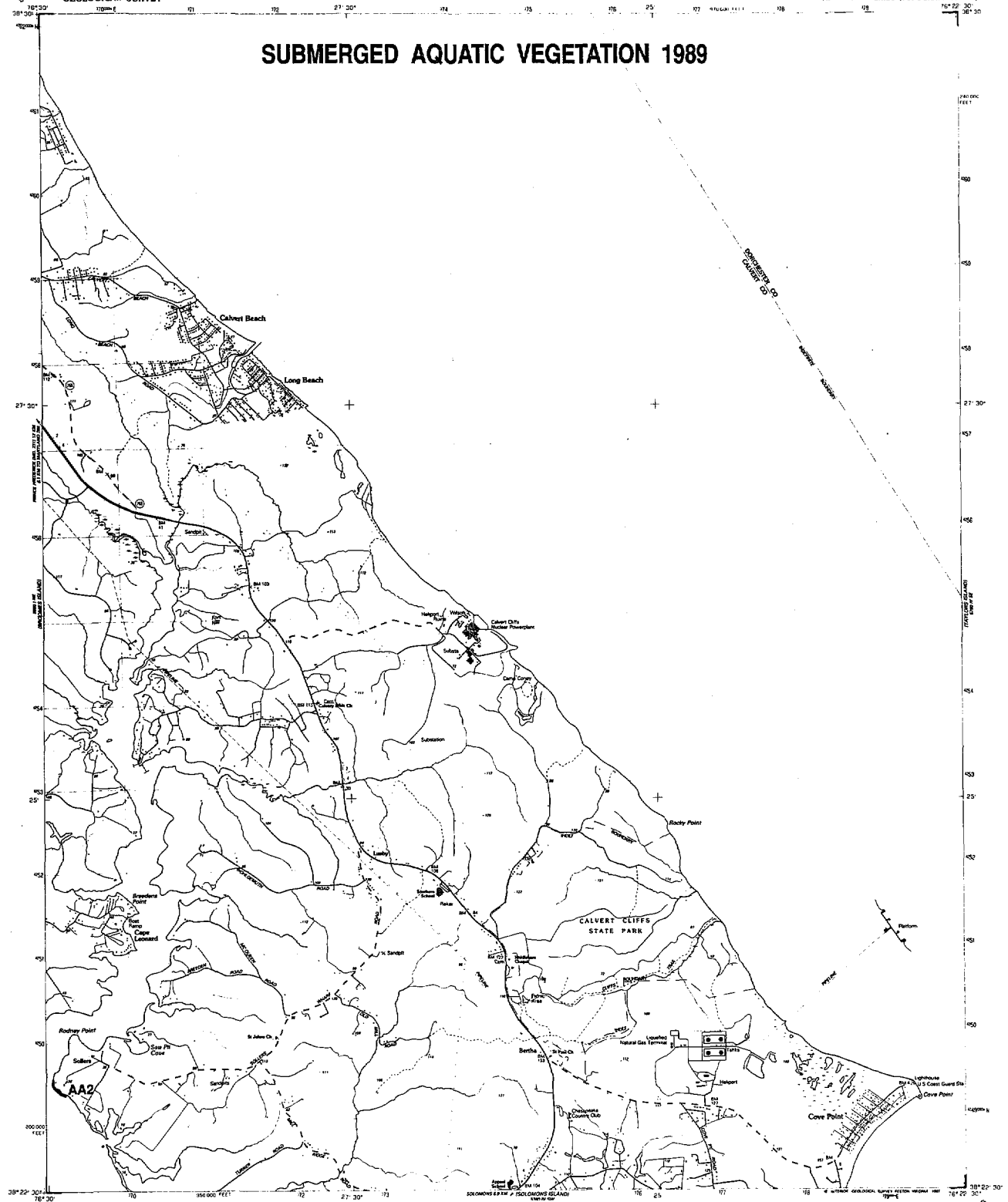
BROOMES ISLAND, MD
060

1963
PHOTOREVISED 1986

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COVE POINT QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 MILE

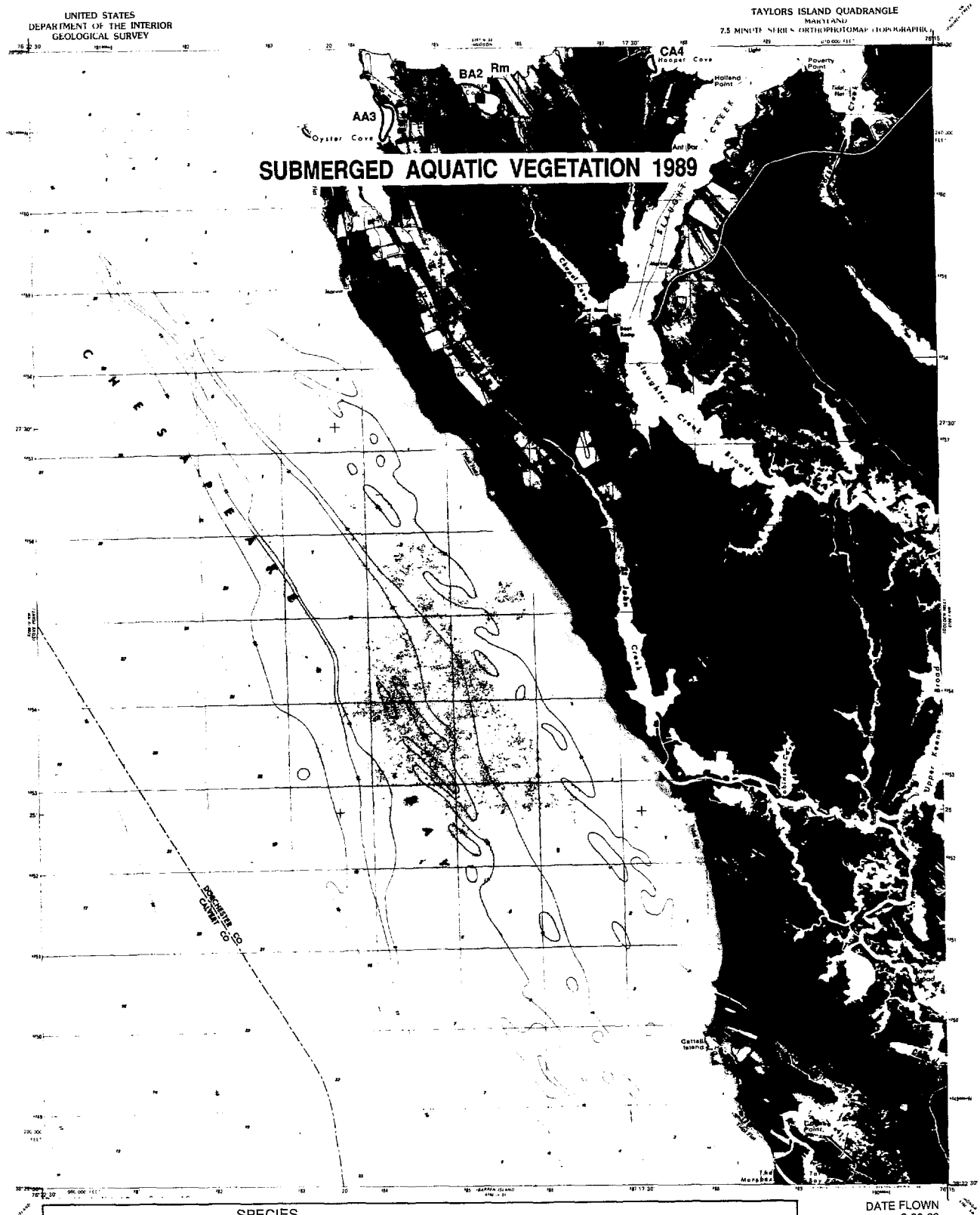
1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
9-3-89

COVE POINT, MD
061

COVE POINT, MD.



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)	Nm	*Najas minor* (slender naiad)		
Tn	*Trapa natans* (water chestnut)				
U	Unknown species composition				

N

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-30-89

TAYLORS ISLAND, MD
062

DMA 3760 IV NE SERIES V833

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

GOLDEN HILL QUADRANGLE

SUBMERGED AQUATIC VEGETATION 1989

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)	Nm	*Najas minor* (slender naiad)		
Tn	*Trapa natans* (water chestnut)				
U	Unknown species composition				

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

N

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-30-89

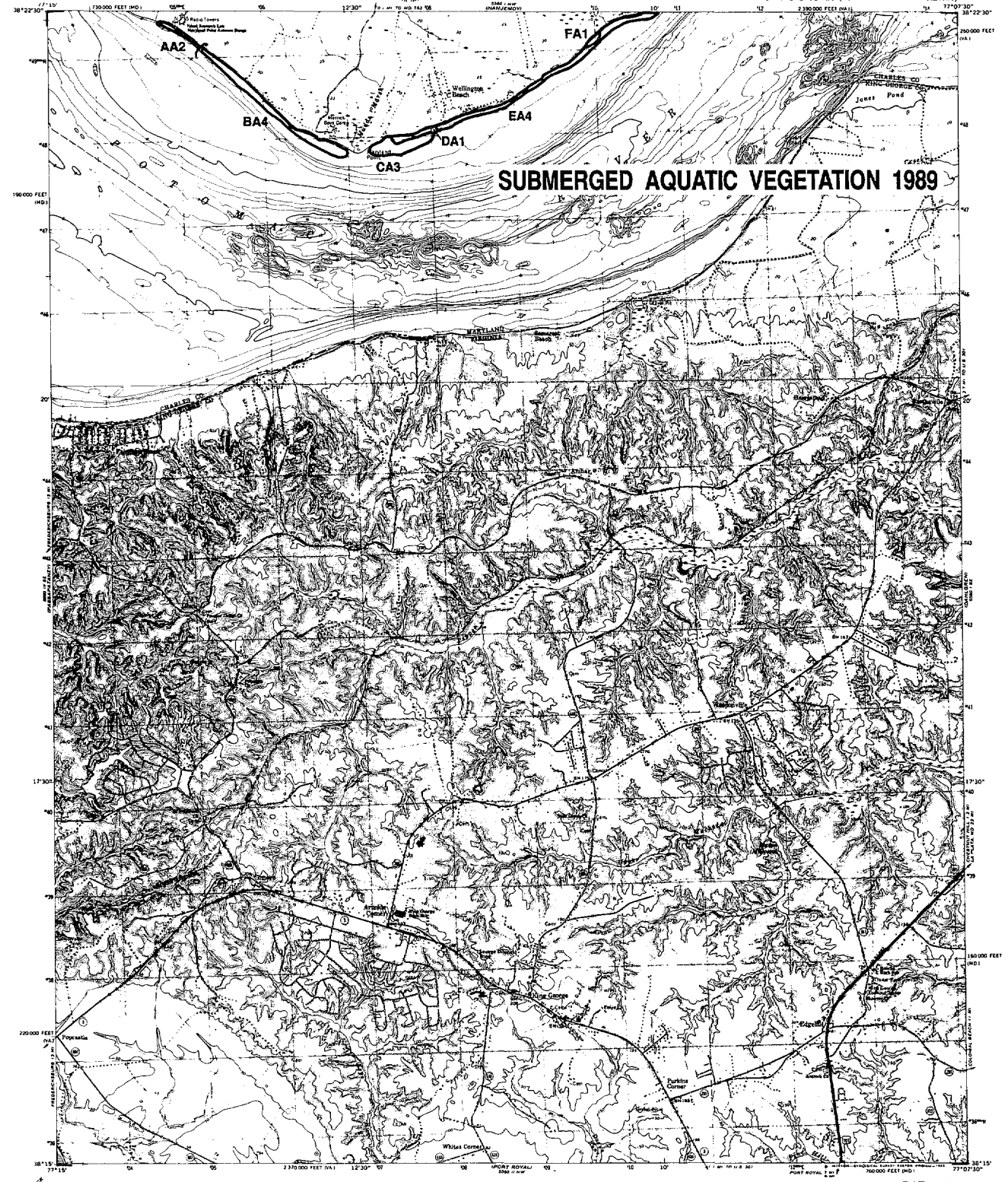
GOLDEN HILL, MD
063

1981

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES

KING GEORGE QUADRANGLE
VIRGINIA MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC BATHYMETRIC)



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)	Nm	*Najas minor* (slender naiad)		
Tn	*Trapa natans* (water chestnut)				
U	Unknown species composition				

N

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATES FLOWN
8-31-89
9-28-89

KING GEORGE, VA-MD 065

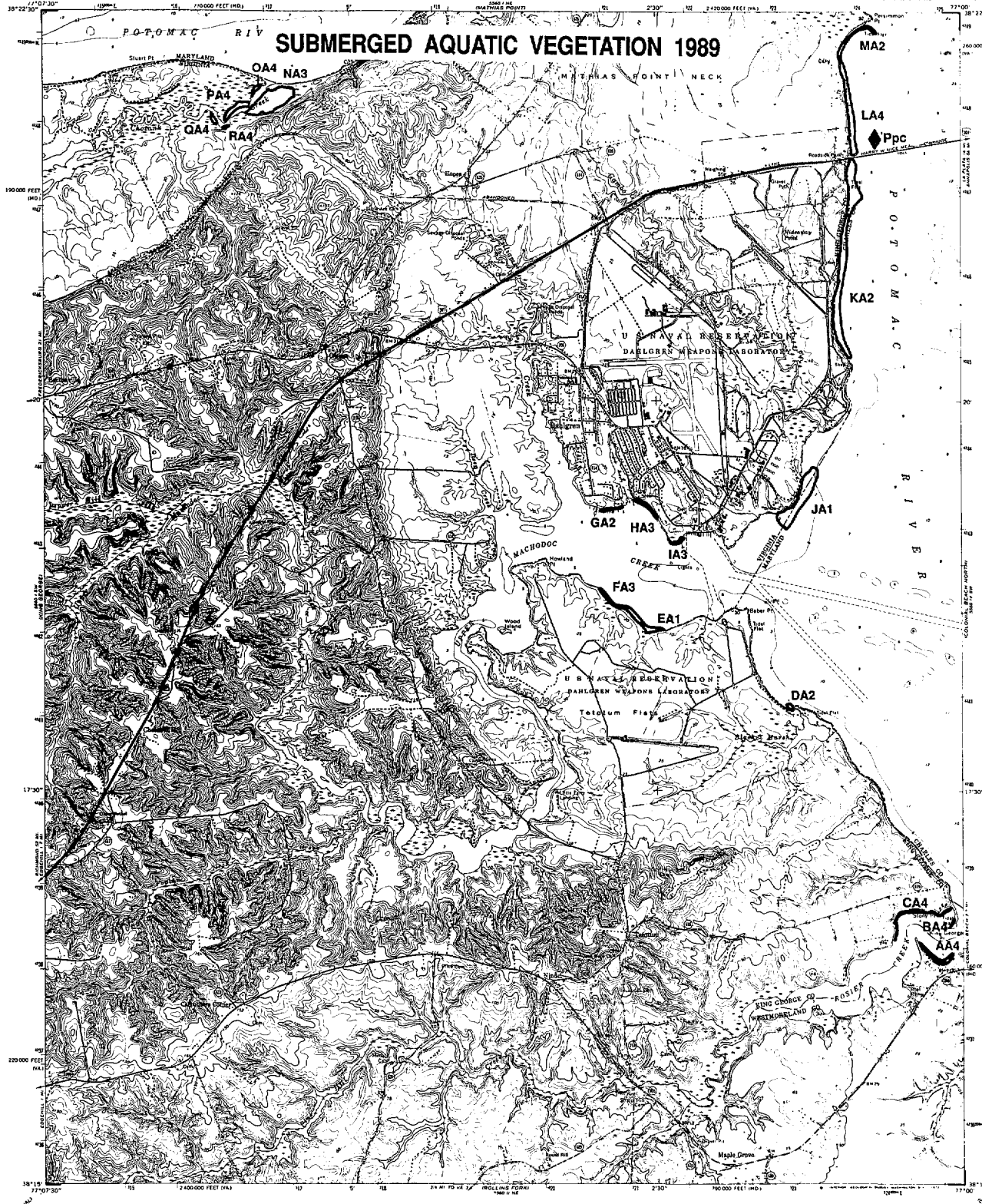
DMA 5560 I SW - SERIES V834

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES
JAMES L. CALVER, STATE GEOLOGIST

DAHLGREN QUADRANGLE
VIRGINIA – MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

N

SCALE 1:24,000

1 MILE

1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
8-31-89

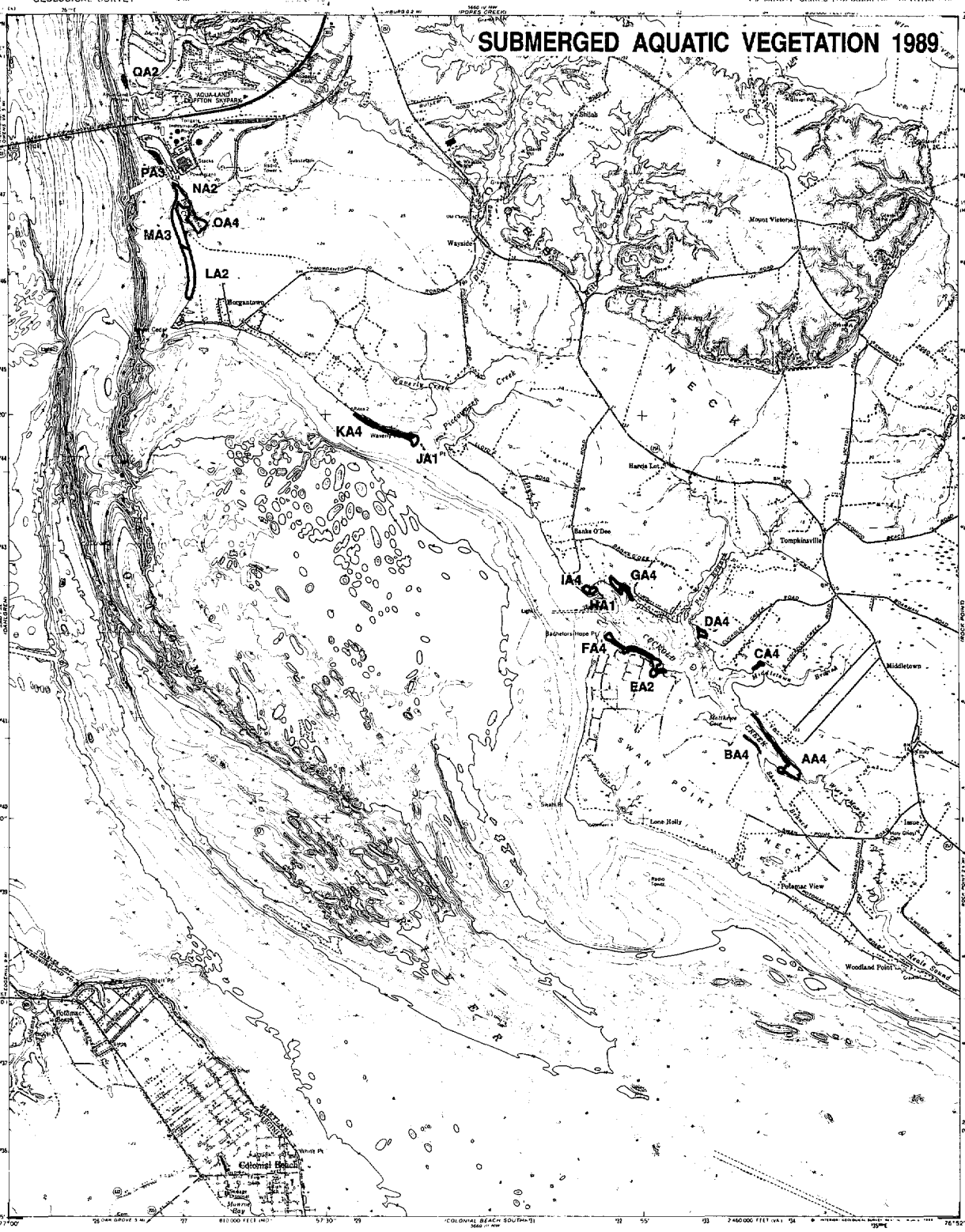
DAHLGREN
VA-MD
066

AMS 5580 I SE-SERIES V834

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COLONIAL BEACH NORTH QUADRANGLE
VIRGINIA - MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 5 0 1 MILE

1 5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
8-31-89

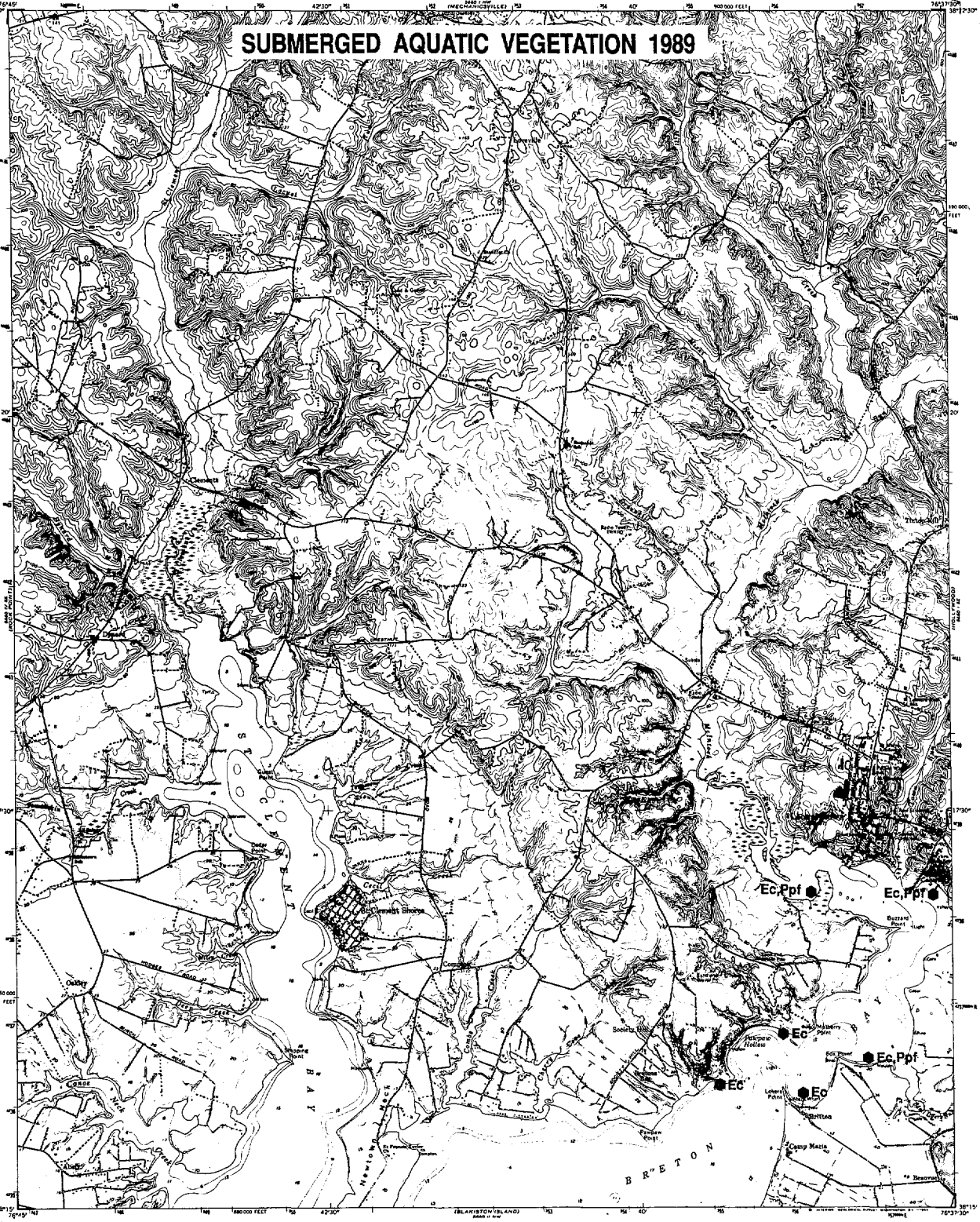
COLONIAL BEACH
NORTH, VA-MD
067

PHOTOREVISED 1983
BATHYMETRY ADDED 1982
DNA 5680 IV SW - SERIES V833

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

LEONARDTOWN QUADRANGLE
MARYLAND-ST. MARYS CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
8-31-89

LEONARDTOWN, MD
069

1963
AMS 5860 I SW—SERIES V833

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

HOLLYWOOD QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)

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)
Tn	*Trapa natans* (water chestnut)
U	Unknown species composition
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)
Nm	*Najas minor* (slender naiad)

SCALE 1:24,000

1 MILE

1 KILOMETER

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
9-3-89

HOLLYWOOD, MD 070

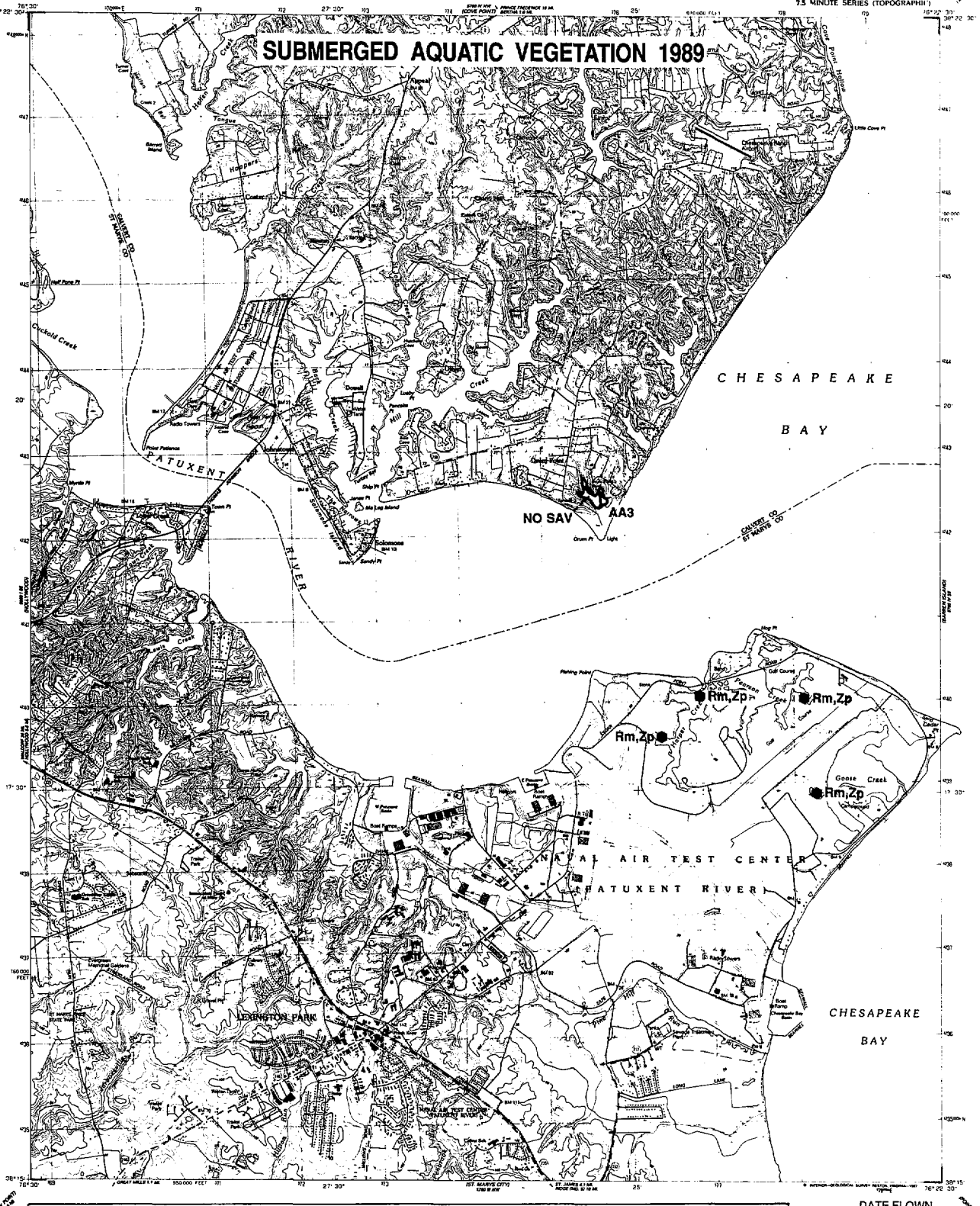
1963

AMS 5860 I SE—SERIES V833

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SOLOMONS ISLAND QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIRGINIA INSTITUTE
OF MARINE SCIENCE

DATE FLOWN
9-3-89

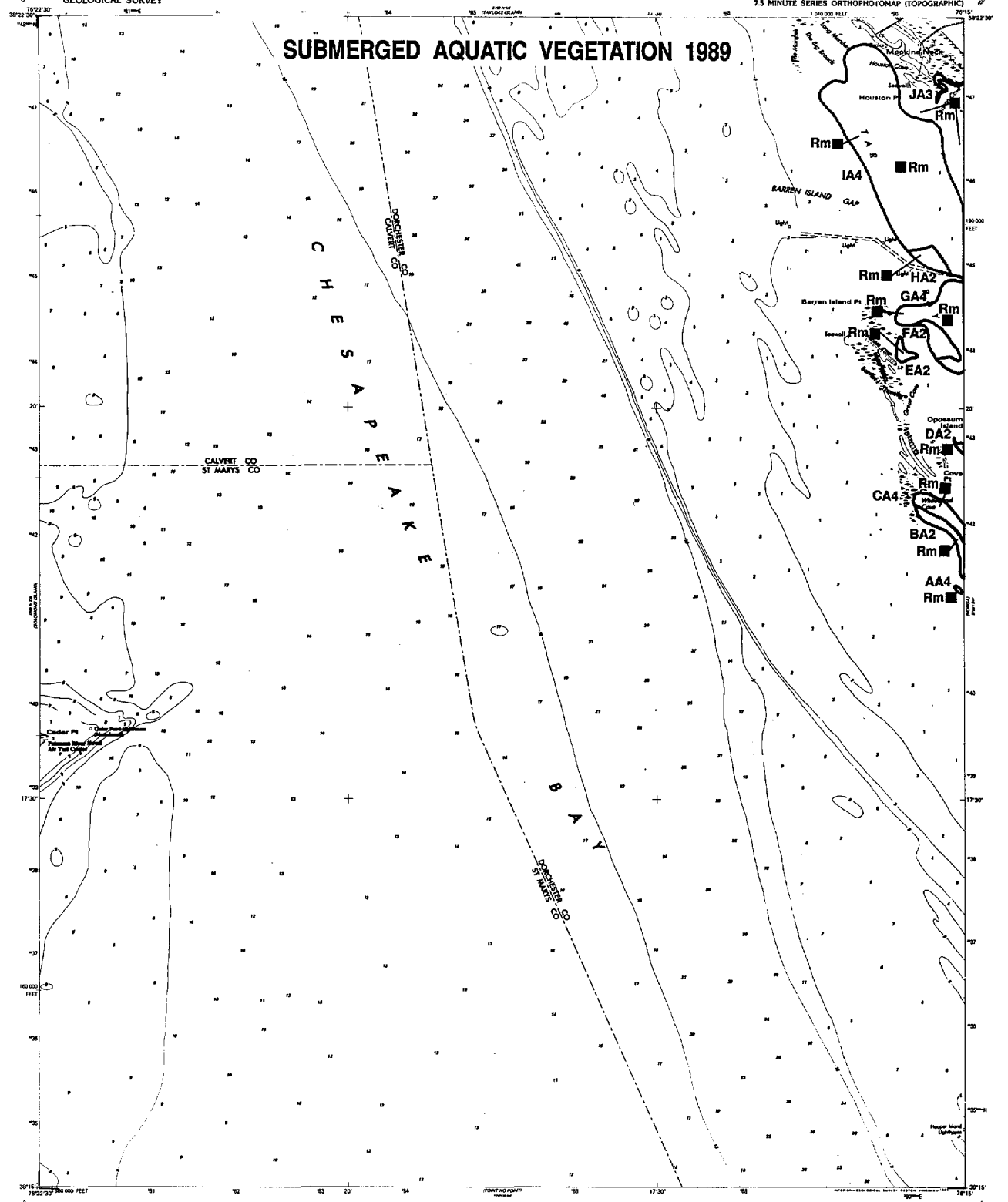
SOLOMONS
ISLAND, MD
071

SOLOMONS ISLAND, MD.

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

BARREN ISLAND QUADRANGLE
MARYLAND
7.5 MINUTE SERIES ORTHOPHOTOMAP (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 5 0 1 MILE

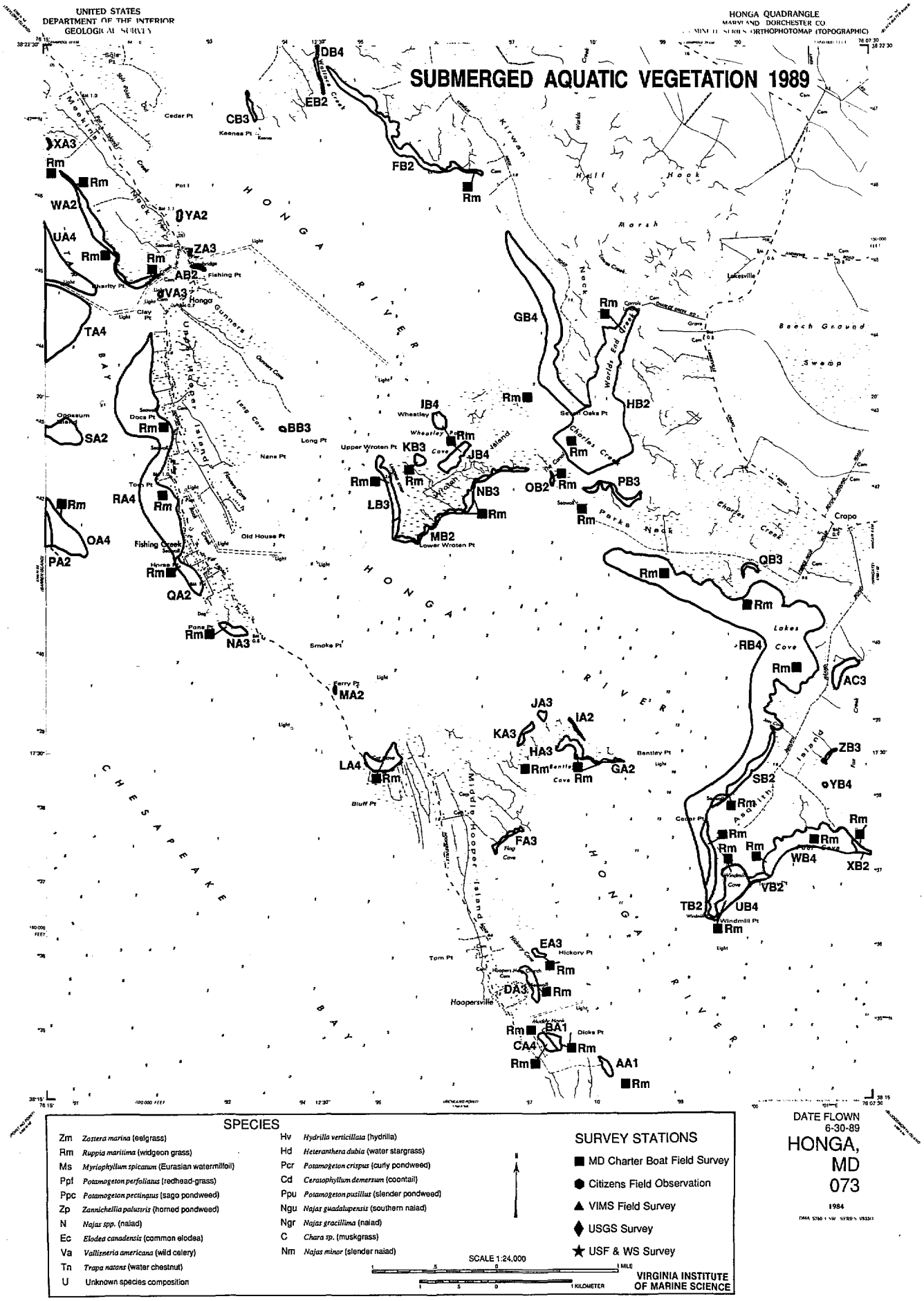
1 5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-30-89

BARREN ISLAND, MD
072

1984



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 MILE

1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-30-89

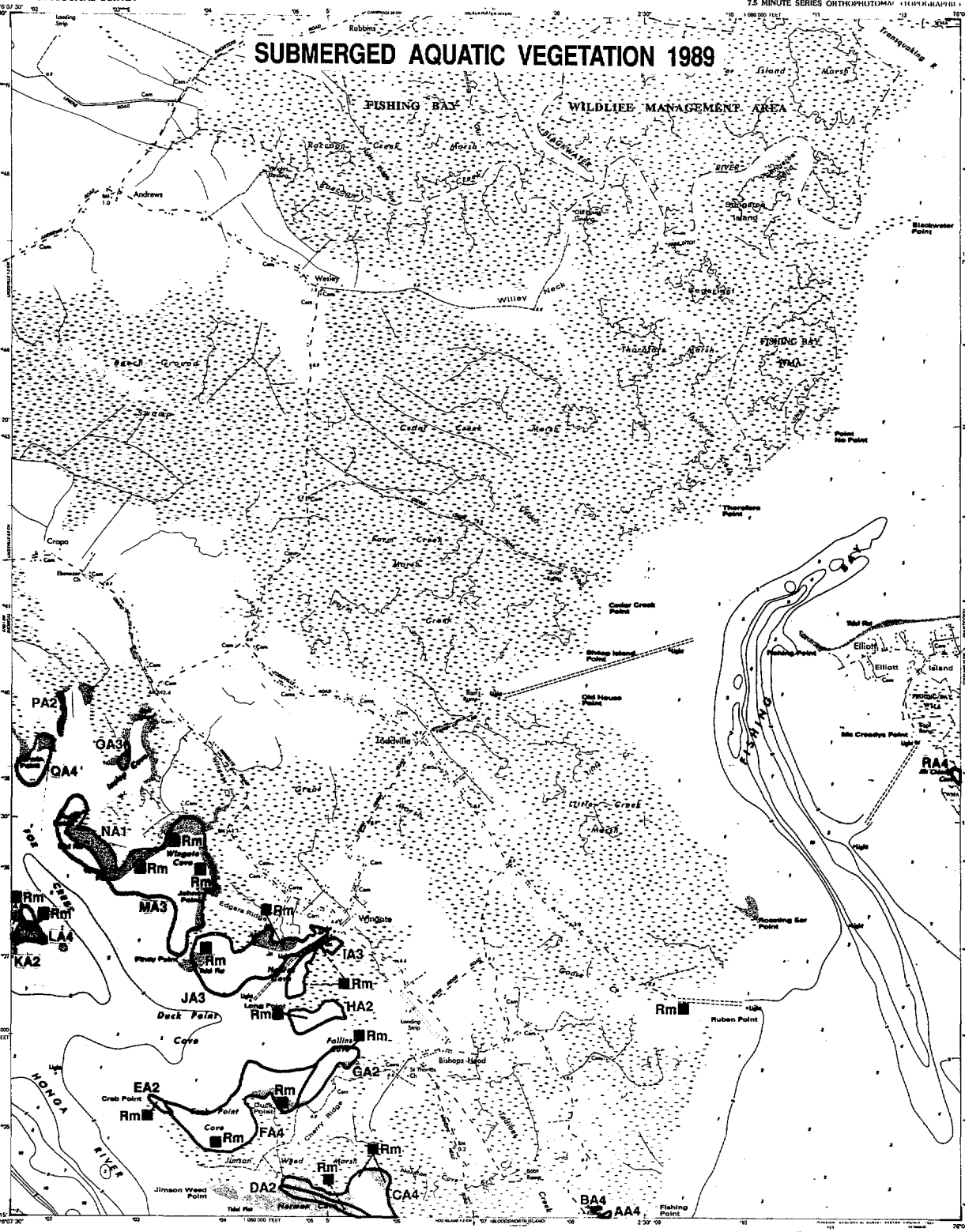
HONGA, MD 073

1984

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

WINGATE QUADRANGLE
MARYLAND [illegible]
7.5 MINUTE SERIES ORTHOPHOTOMAP [illegible]

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 5 0 1 MILE

1 5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-30-89

WINGATE, MD
074

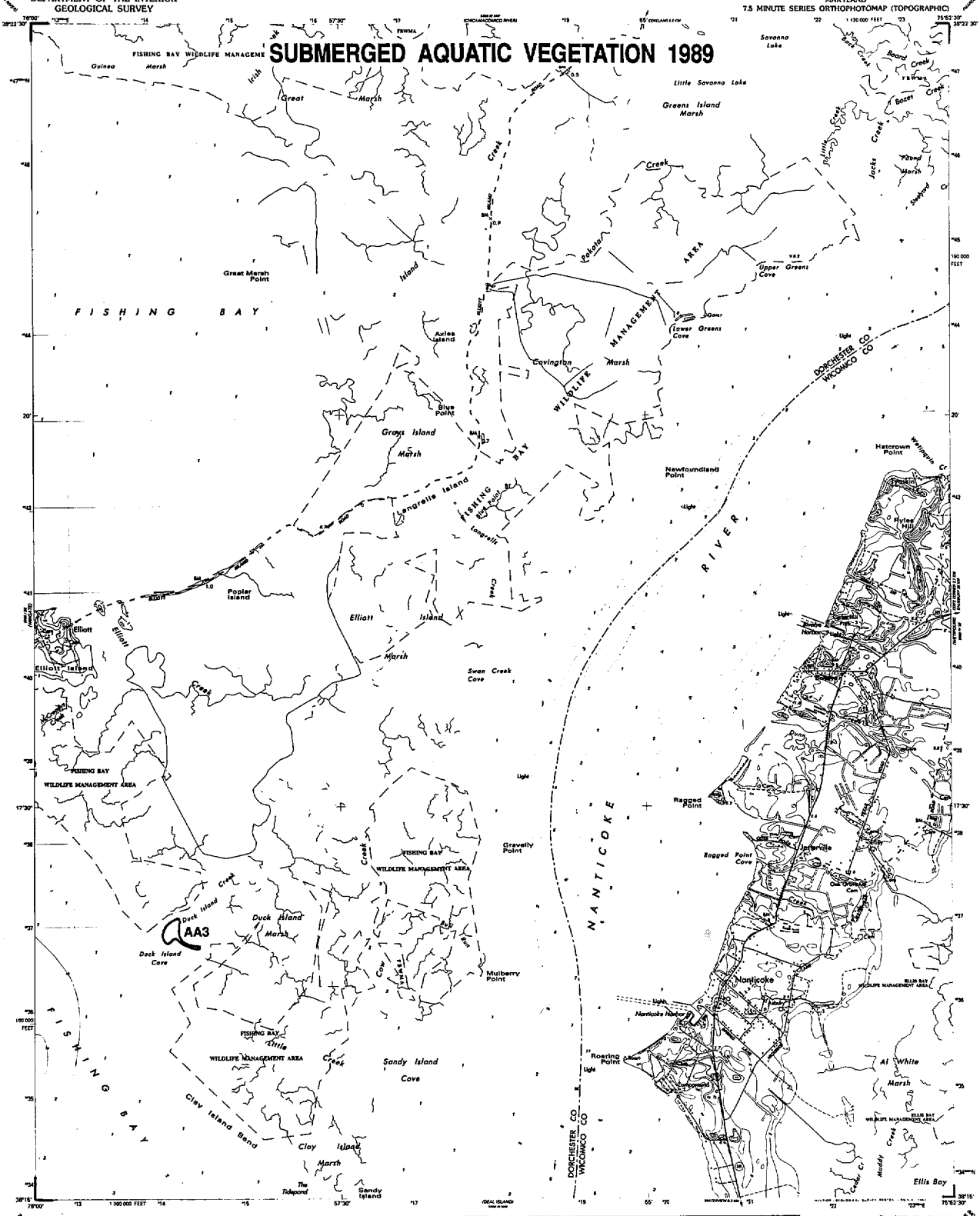
1982

DNA 3760 I SE SERIES V833O

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

NANTICOKE QUADRANGLE
MARYLAND
7.5 MINUTE SERIES ORTHOPHOTOMAP (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-30-89

NANTICOKE, MD
075

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

PINEY POINT QUADRANGLE
MARYLAND - VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989

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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
8-31-89

PINEY POINT,
MD-VA
079

PHOTOREVISED 1980
BATHYMETRY ADDED 1982
DMA 5660 II NE SERIES V833

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ST. MARYS CITY QUADRANGLE
MARYLAND–ST. MARYS CO.
7.5 MINUTE SERIES (TOPOGRAPHIC–BATHYMETRIC)

SUBMERGED AQUATIC VEGETATION 1989

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)	Nm	*Najas minor* (slender naiad)		
Tn	*Trapa natans* (water chestnut)				
U	Unknown species composition				

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 MILE

1 KILOMETER

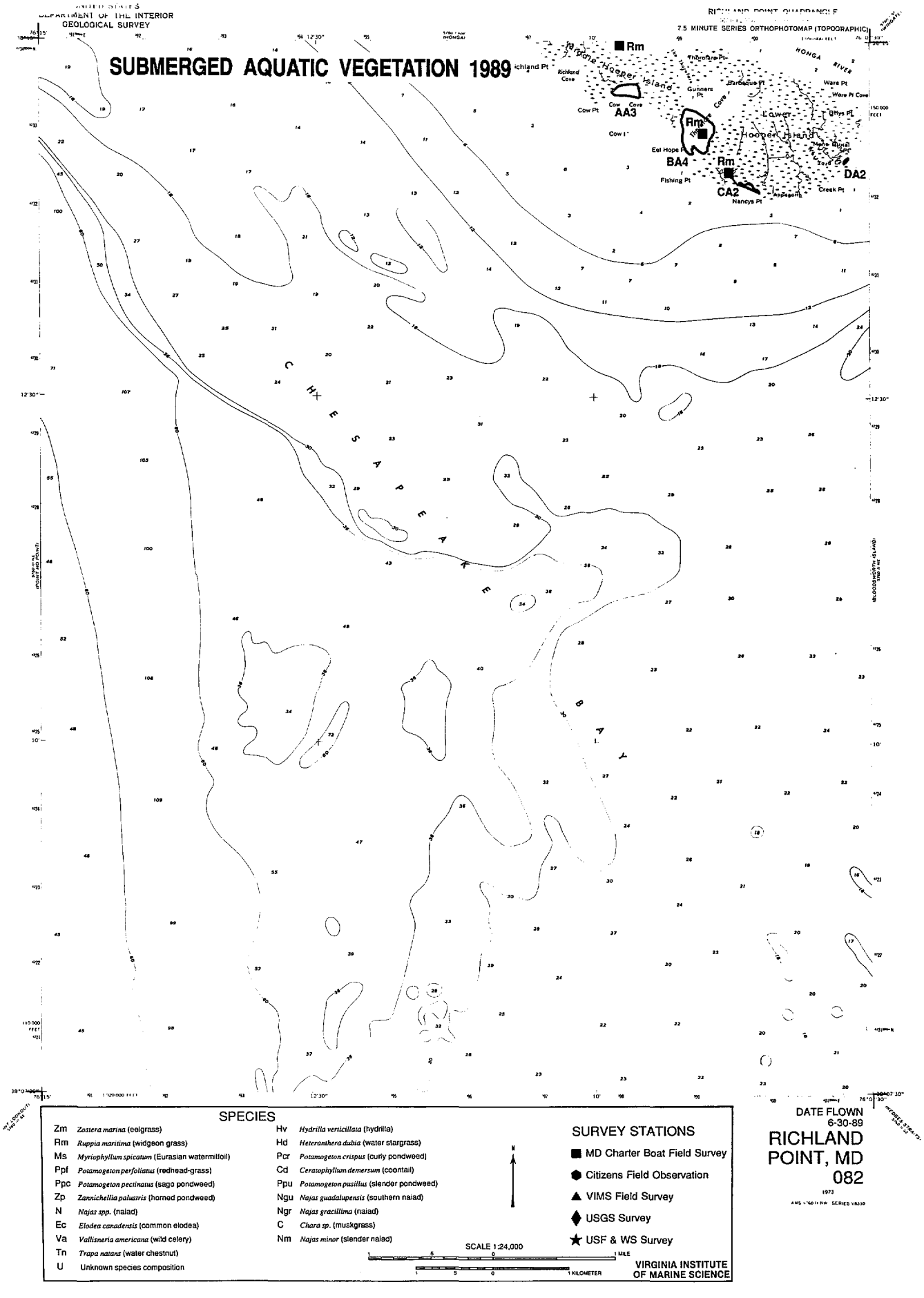
VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
8-31-89

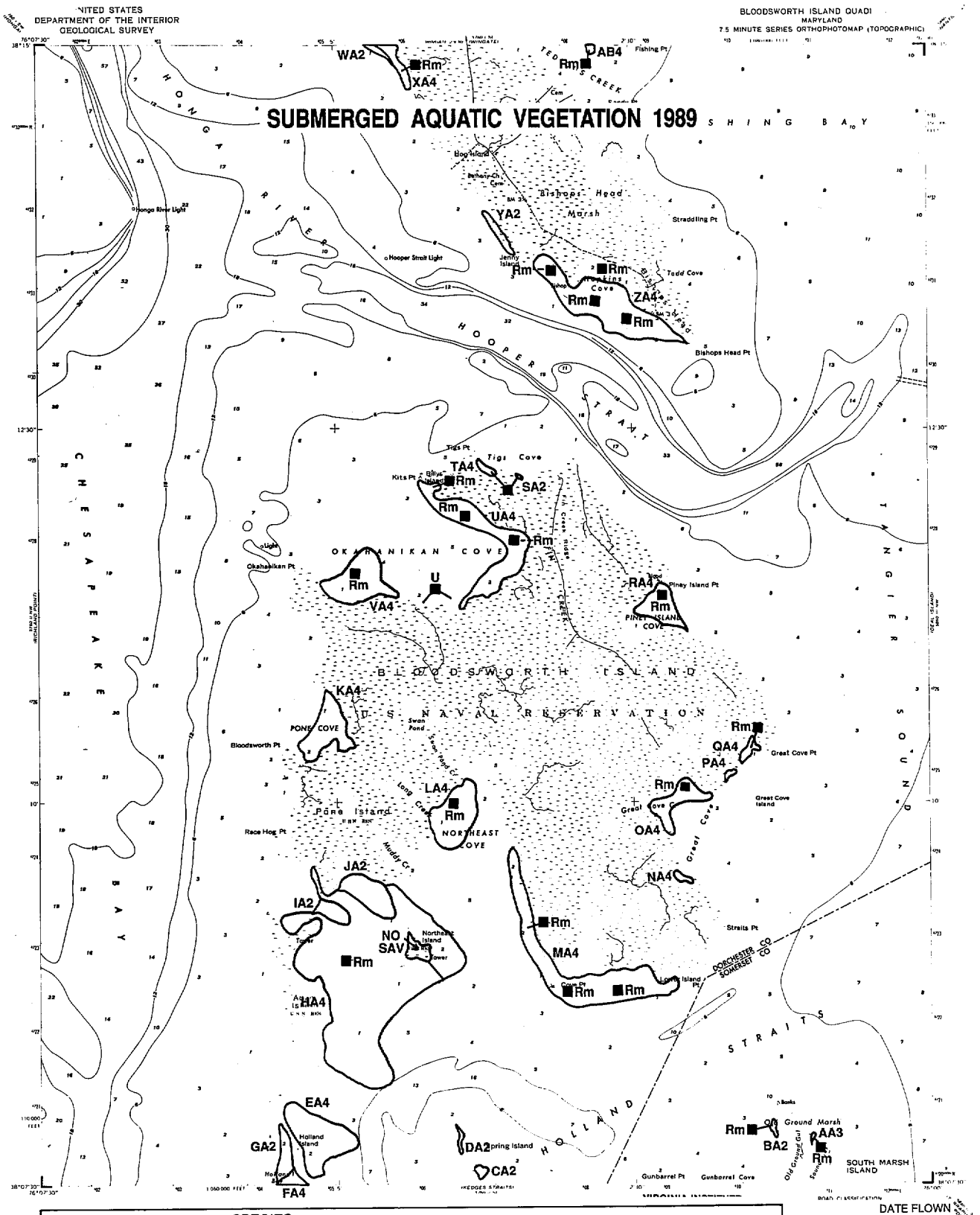
ST. MARYS CITY, MD
080
1987

DMA 5760 III NW–SERIES V833

ST. MARYS CITY, MD.



UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
RICHLAND POINT QUADRANGLE
7.5 MINUTE SERIES ORTHOPHOTOMAP (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION 1989
Rm
AA3
BA4
CA2
DA2
Richland Pt
Richland Cove
Cow Pt
Cow Cove
Cow I
Middle Hooper Island
Lower Hooper Island
Thorofare Pt
Gunners Pt
Barbeque Pt
Ware Pt
Ware Pt Cove
Billys Pt
Eel Hope Pt
Fishing Pt
Nancys Pt
Creek Pt
HONGA RIVER
CHESAPEAKE BAY
12'30"
10'
38°07'30"
76°15'
76°07'30"
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)
Tn Trapa natans (water chestnut)
U Unknown species composition
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)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
USGS Survey
USF & WS Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
VIRGINIA INSTITUTE OF MARINE SCIENCE
DATE FLOWN
6-30-89
RICHLAND POINT, MD
082
1973



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-30-89

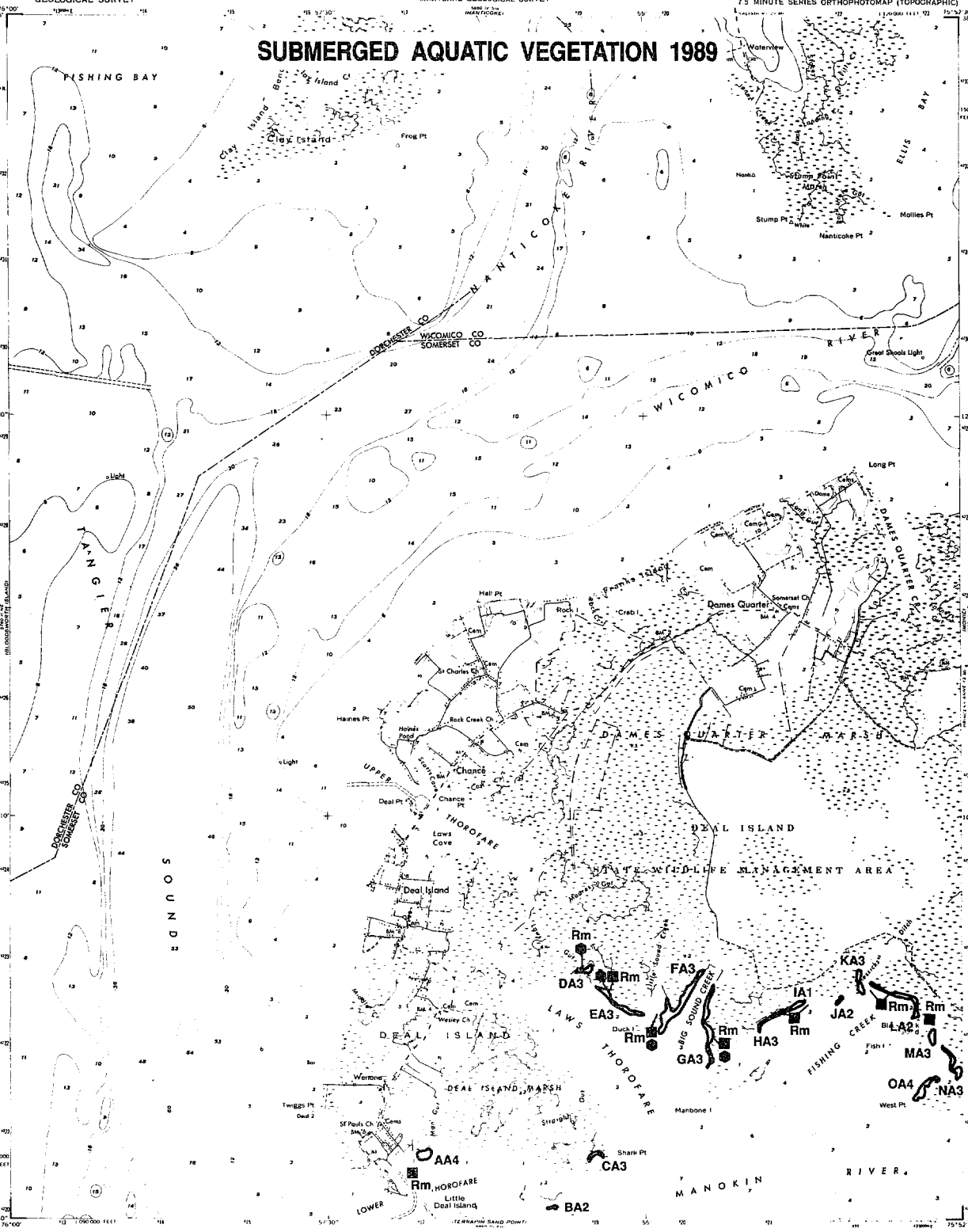
BLOODSWORTH ISLAND, MD 083

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

MARYLAND
MARYLAND GEOLOGICAL SURVEY

DEAL ISLAND QUADRANGLE
MARYLAND
7.5 MINUTE SERIES ORTHOPHOTOMAP (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- USGS Survey
- USF & WS Survey

SCALE 1:24,000

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-30-89

DEAL ISLAND, MD
084

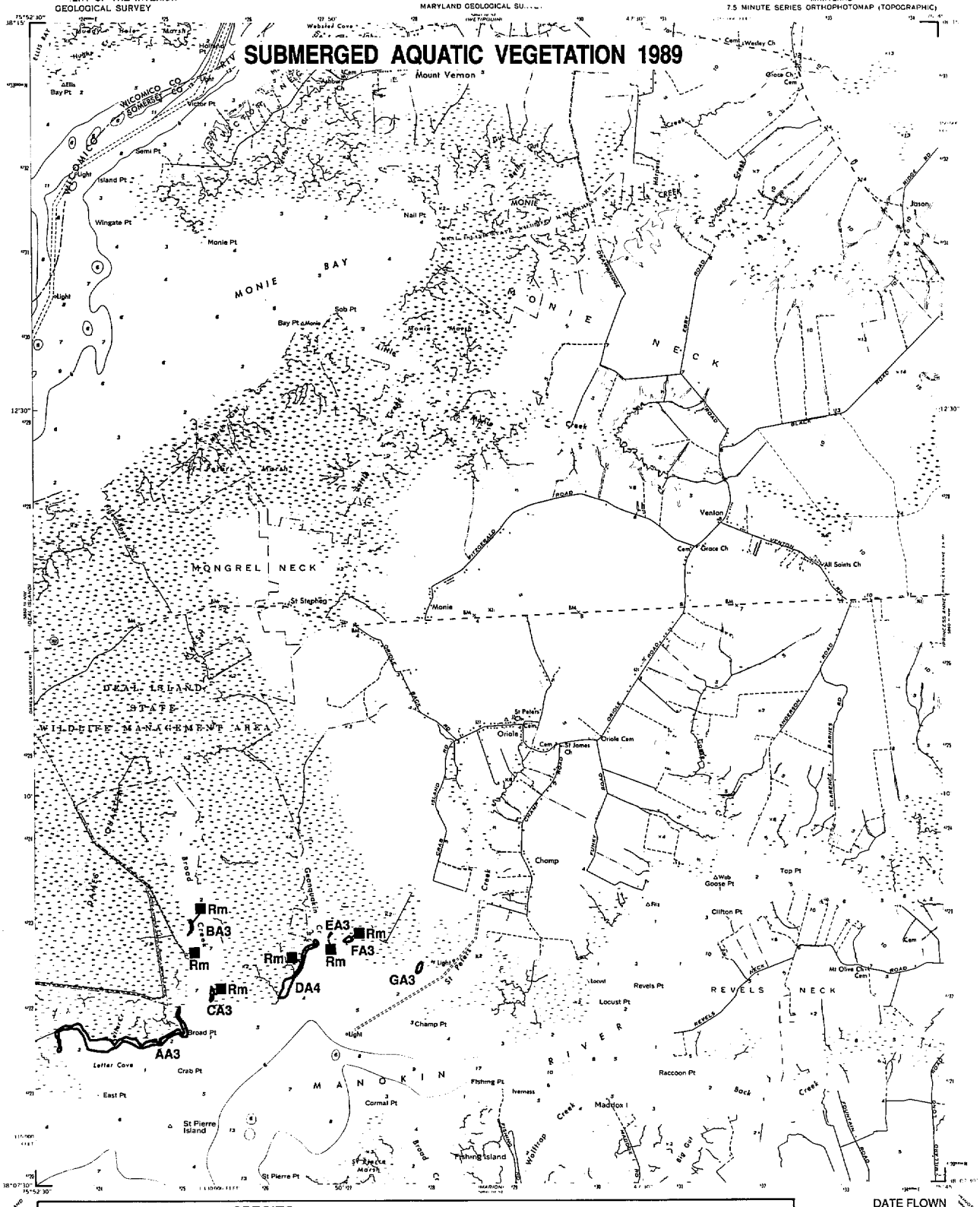
1972

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

STATE OF MARYLAND
MARYLAND GEOLOGICAL SURVEY

MONIE QUADRANGLE
MARYLAND
7.5 MINUTE SERIES ORTHOPHOTOMAP (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 MILE

1 KILOMETER

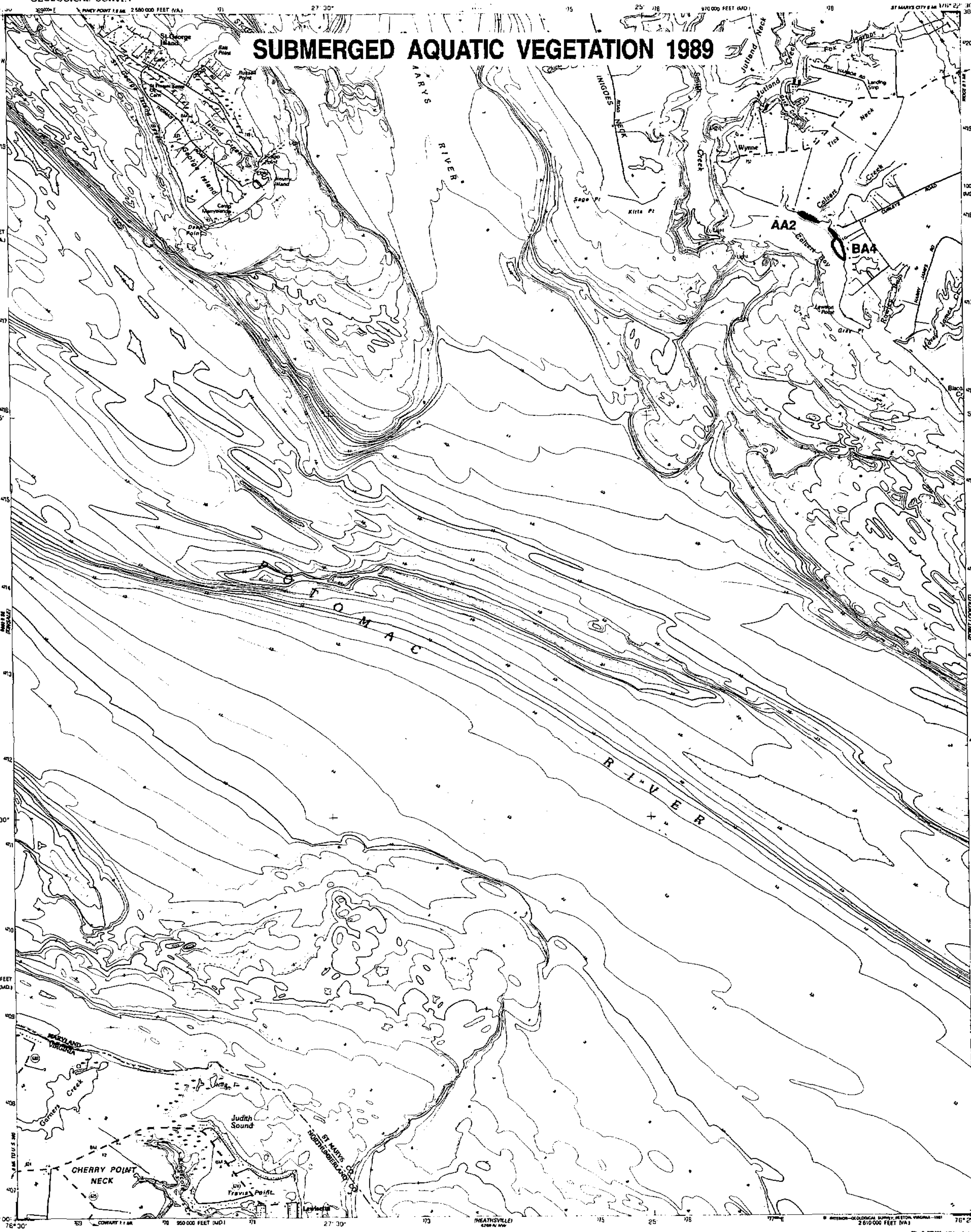
VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-30-89

MONIE,
MD
085

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ST. GEORGE ISLAND QUADRANGLE
MARYLAND–VIRGINIA



DATE FLOWN
8-31-89

ST. GEORGE ISLAND, MD-VA
089

1987
ST. GEORGE ISLAND, MD.–VA.

SPECIES

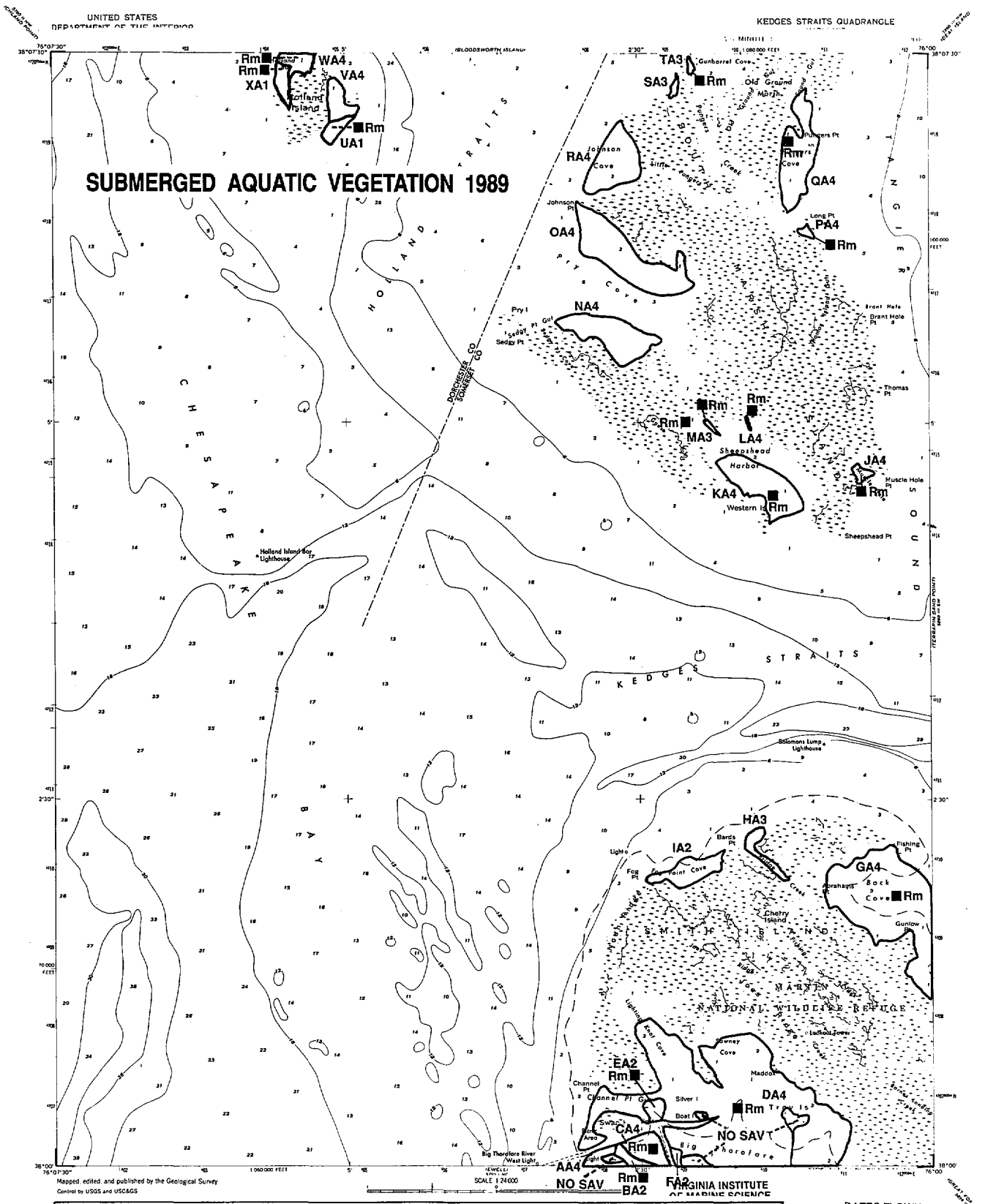
Zm	*Zostera marina* (eelgrass)
Rm	*Ruppia maritima* (widgeon grass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)
Ppf	*Potamogeton perfoliatus* (redhead-grass)
Ppc	*Potamogeton pectinatus* (sago pondweed)
Zp	*Zannichellia palustris* (horned pondweed)
N	*Najas spp.* (naiad)
Ec	*Elodea canadensis* (common elodea)
Va	*Vallisneria americana* (wild celery)
Tn	*Trapa natans* (water chestnut)
U	Unknown species composition
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)
Nm	*Najas minor* (slender naiad)

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000
1 MILE
1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 MILE

1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATES FLOWN
6-19-89 Smith Is.
6-30-89 S. Marsh Is.

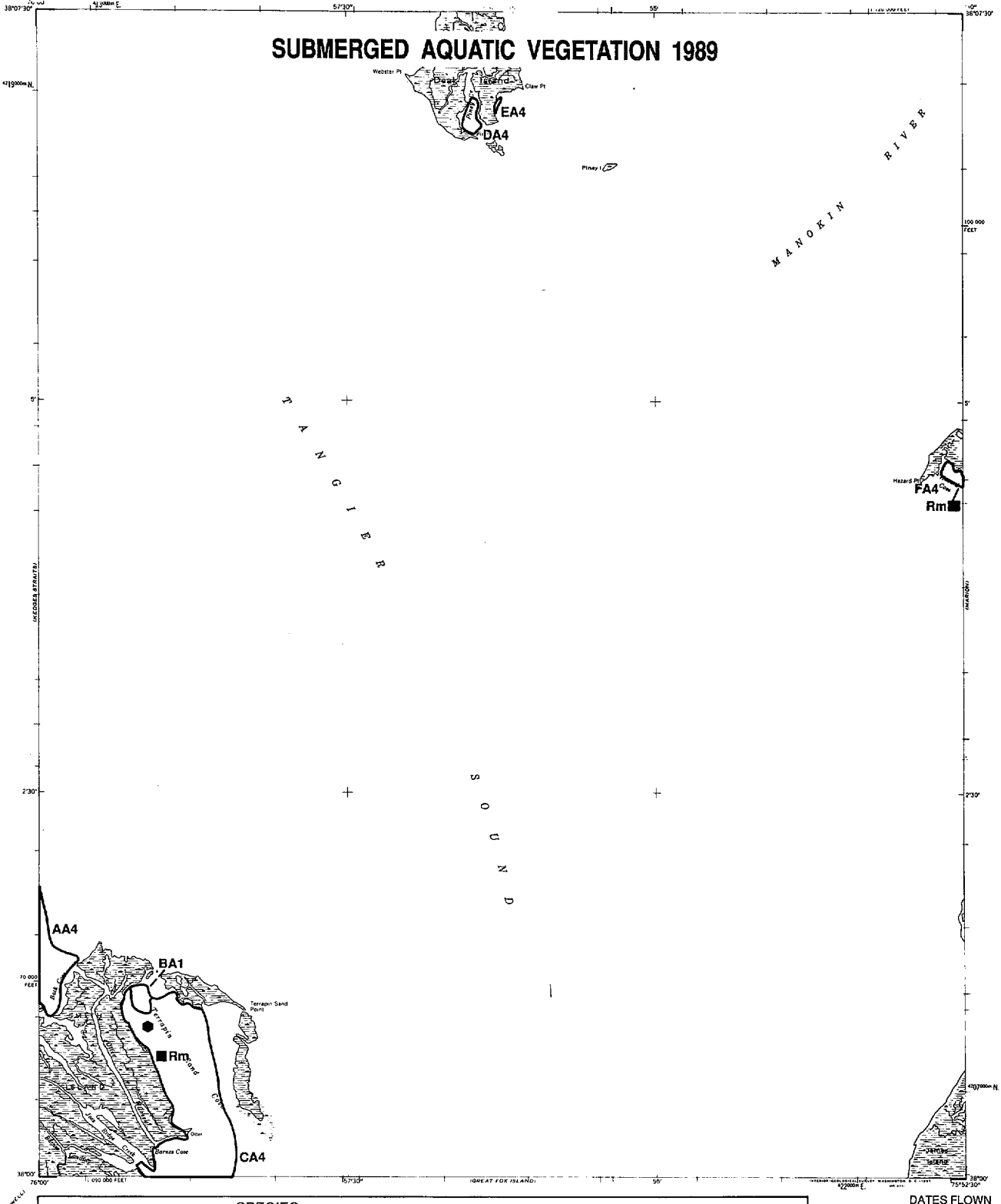
KEDGES STRAITS, MD
091

UNITED STATES
DEPARTMENT OF THE INTERIOR

UNITED STATES
DEPARTMENT OF THE ARMY

TERRAPIN SAND POINT QUADRANGLE
MARYLAND-SOMERSET CO.

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

VIRGINIA INSTITUTE OF MARINE SCIENCE

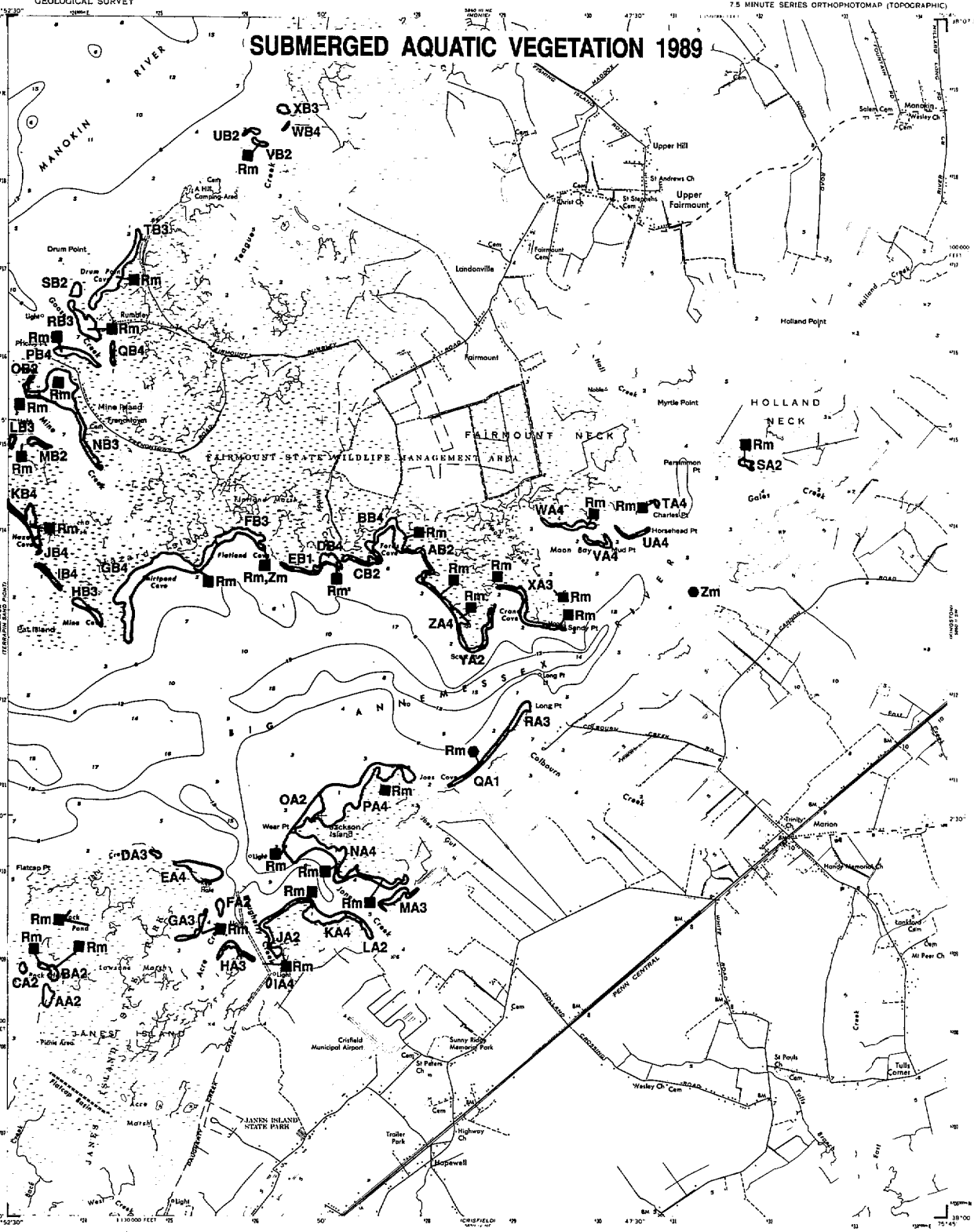
DATES FLOWN
6-19-89 Smith Is.
6-30-89 Deal Is.

TERRAPIN SAND POINT, MD
092

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

MARION QUADRANGLE
MARYLAND–SOMERSET CO
7.5 MINUTE SERIES ORTHOPHOTOMAP (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

DATES FLOWN
6-30-89 Big Annemessex R.
6-30-89 Manokin R.

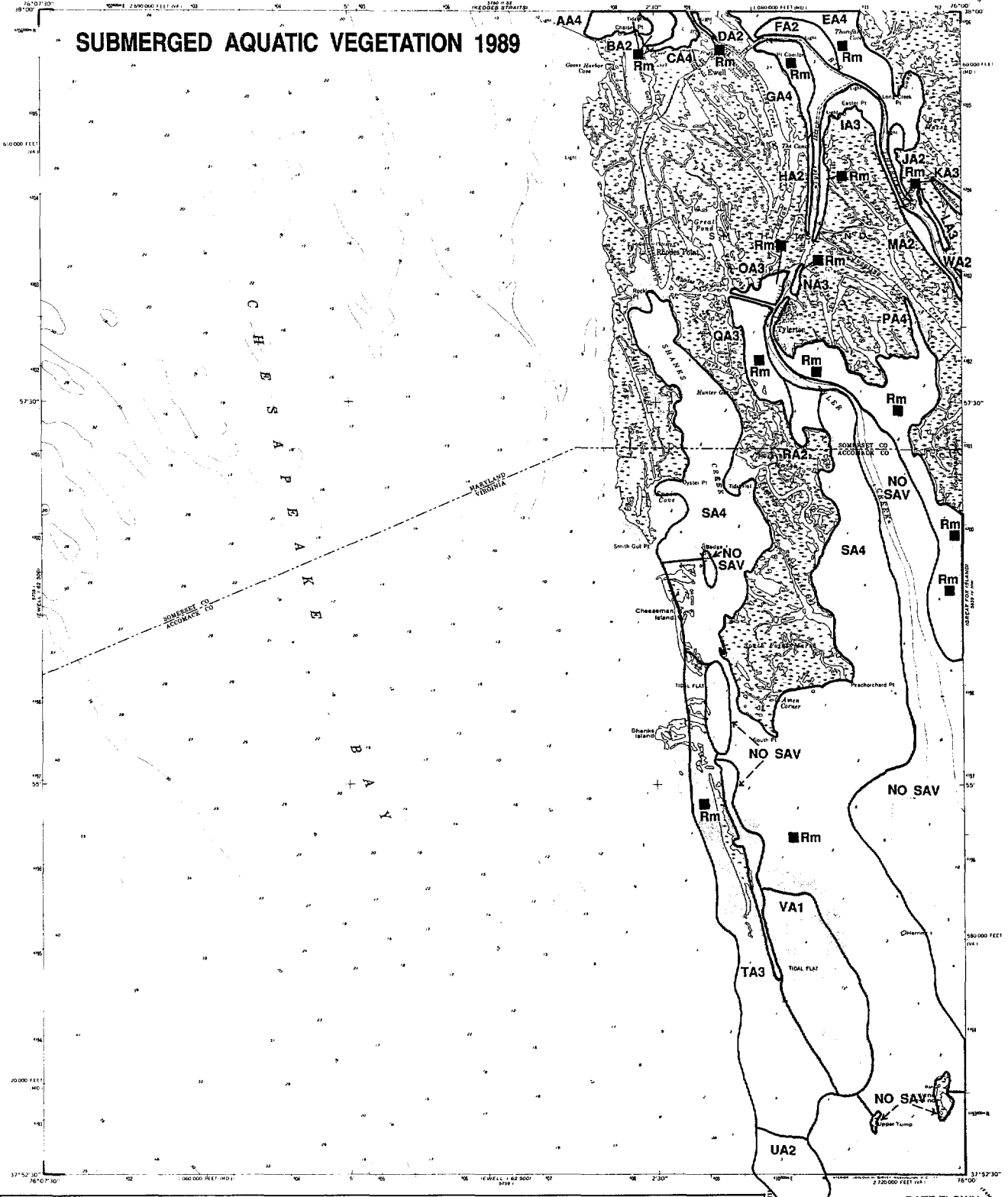
MARION, MD
093

VIRGINIA INSTITUTE OF MARINE SCIENCE

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EWELL QUADRANGLE
MARYLAND - VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)		
Tn	*Trapa natans* (water chestnut)				
U	Unknown species composition				

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

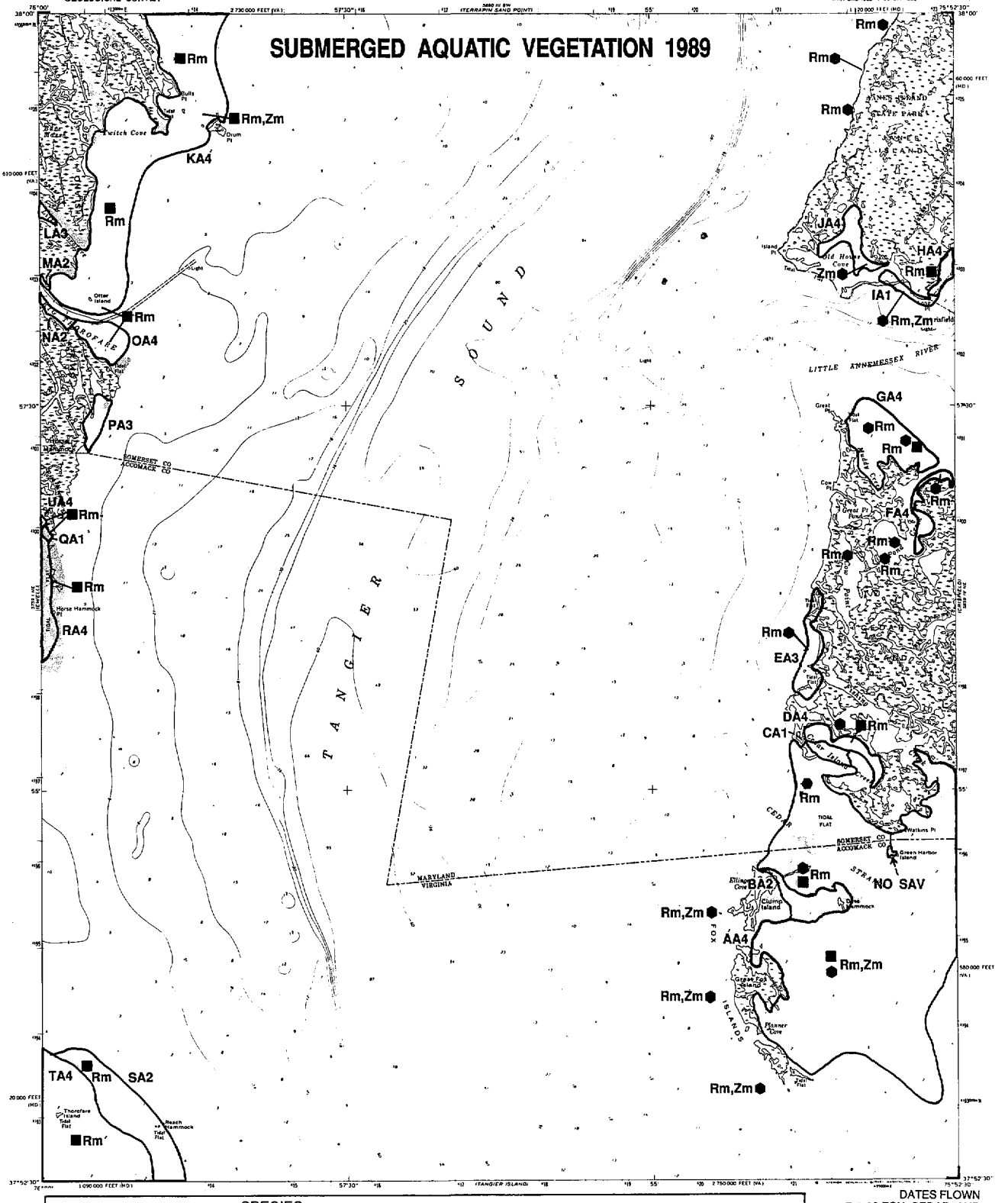
DATE FLOWN
6-19-89

EWELL,
MD-VA
099

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

GREAT FOX ISLAND QUADRANGLE
MARYLAND–VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989



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	*Elpdea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

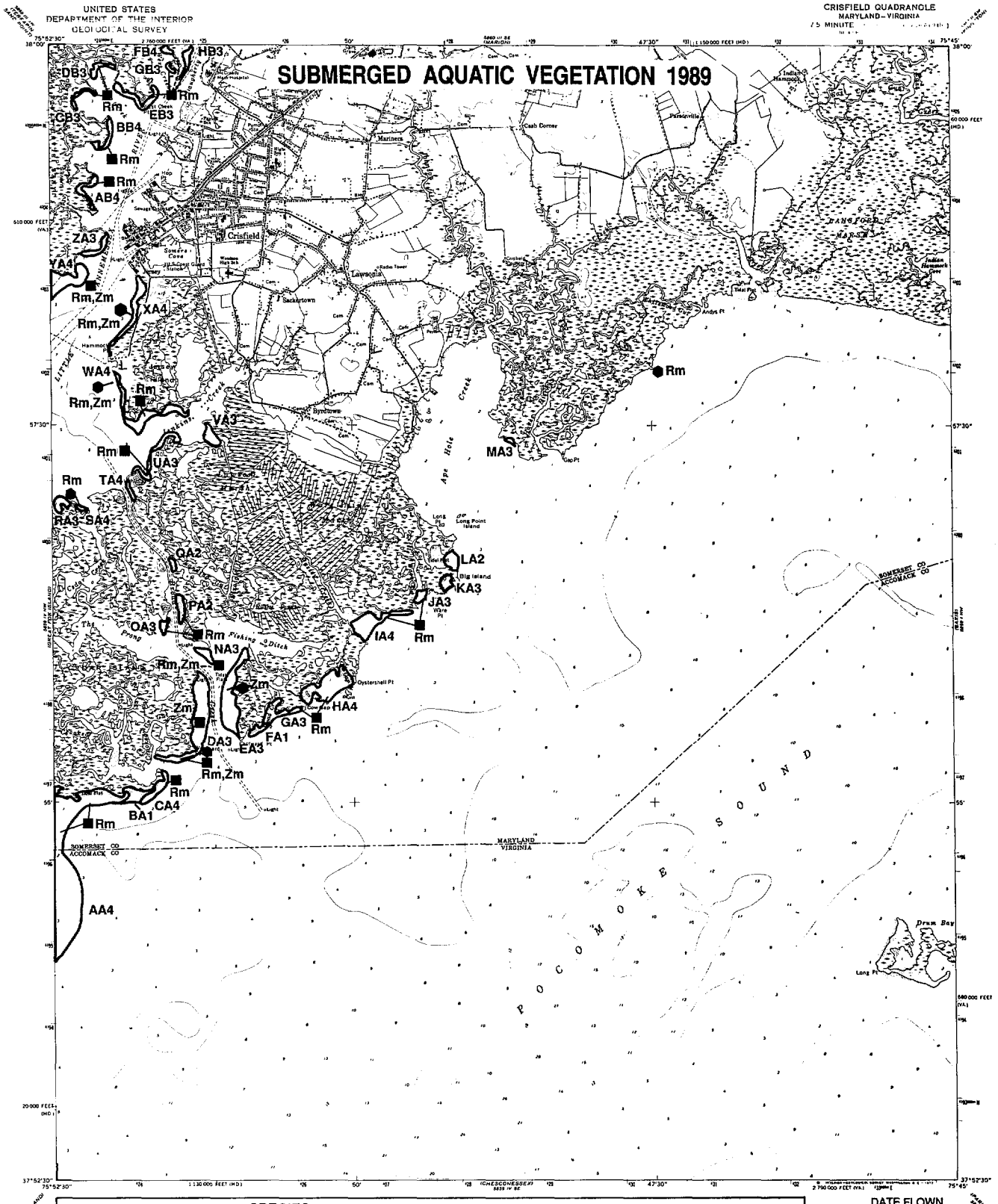
1 MILE

1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATES FLOWN
7-1-89 FOX, CEDAR, AND JANES ISLANDS
6-19-89 SMITH ISLAND

GREAT FOX ISLAND, MD-VA
100

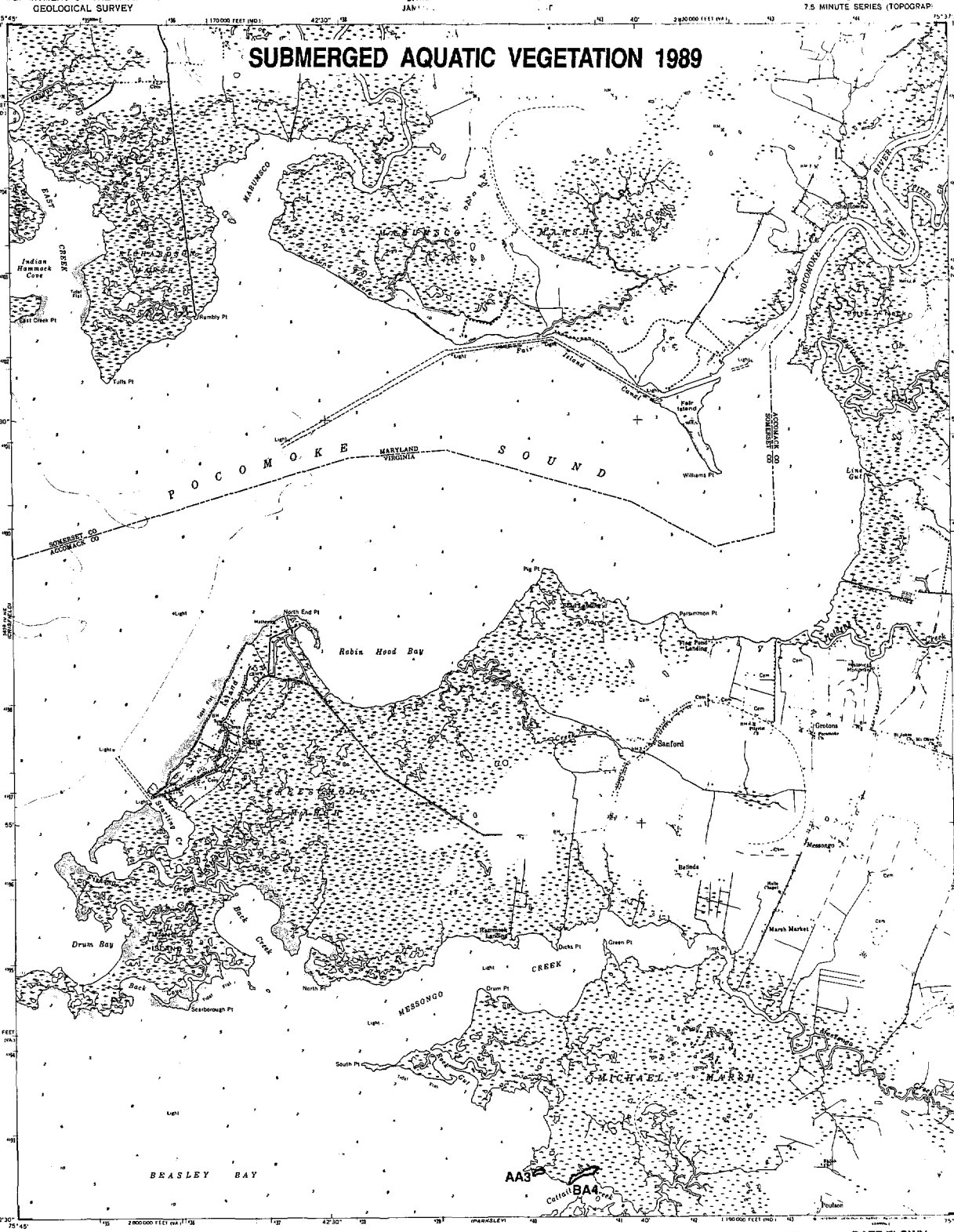

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
CRISFIELD QUADRANGLE
MARYLAND–VIRGINIA
7.5 MINUTE
SUBMERGED AQUATIC VEGETATION 1989
FB4
HB3
DB3
GB3
Rm
EB3
CB3
BB4
AB4
ZA3
YA4
Rm,Zm
XA4
WA4
Rm,Zm'
VA3
UA3
TA4
RA3
SA4
QA2
PA2
OA3
NA3
Zm
HA4
GA3
FA1
EA3
DA3
CA4
BA1
AA4
MA3
LA2
KA3
JA3
IA4
Crisfield
Mariners
Cash Corner
Pasonville
Lawsonia
Sackertown
Byrdtown
Long Point Island
Big Island
Oystershell Pt
Drum Bay
Long Pt
Andre Pt
Tilal Pt
Geo Pt
Apes Hole Creek
Little Annemessex River
Kitching Creek
Fishing Ditch
The Pond
SOMERSET CO
ACCOMACK CO
MARYLAND
VIRGINIA
POCOMOKE SOUND
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)
Tn Trapa natans (water chestnut)
U Unknown species composition
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)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
USGS Survey
USF & WS Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATE FLOWN
7-1-89
CRISFIELD,
MD-VA
101

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COMMONWEALTH OF VIRGINIA

SAXIS QUADRANGLE
VIRGINIA - MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 MILE

1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
7-24-89

SAXIS, VA-MD
102

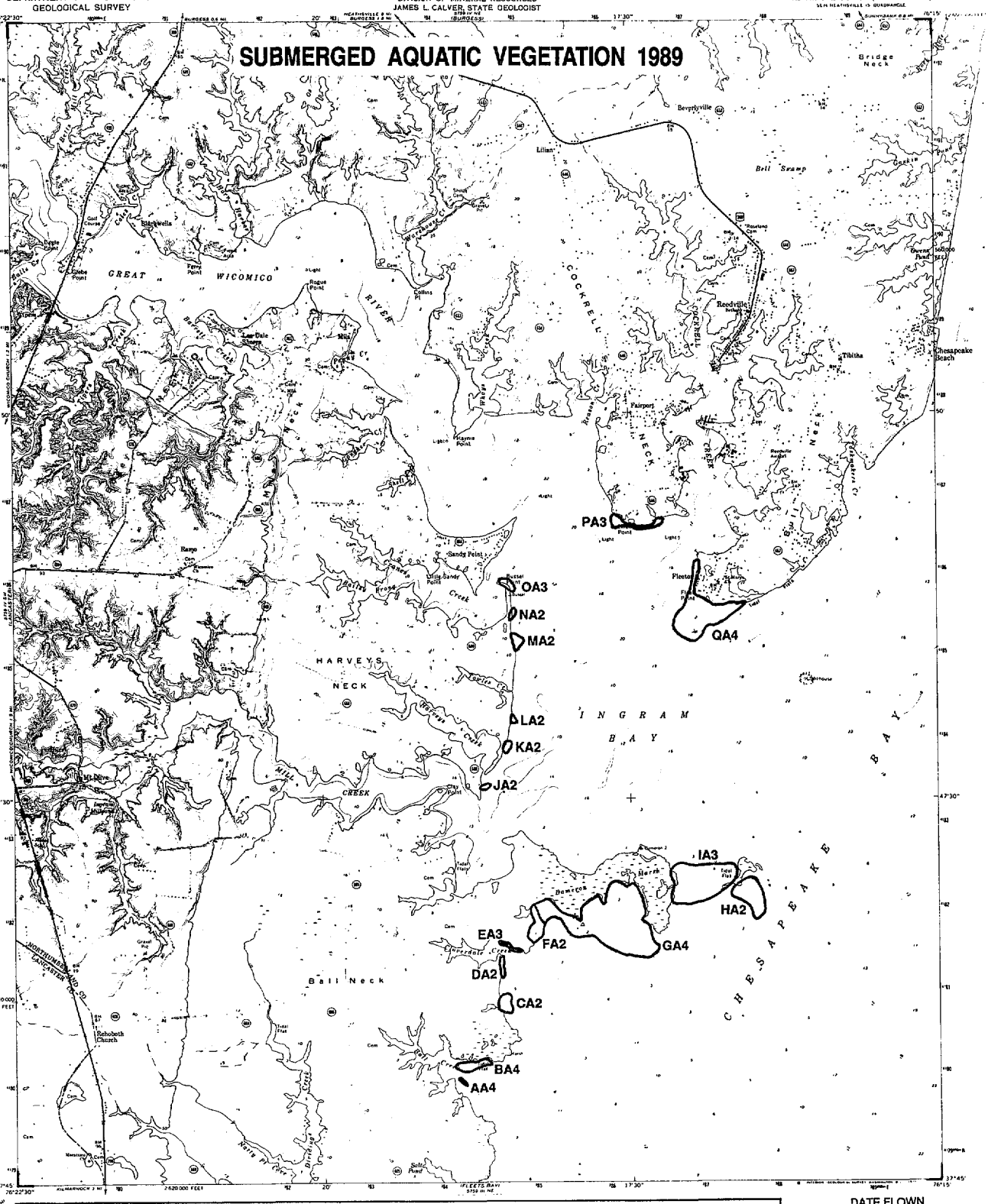
1968

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES
JAMES L. CALVER, STATE GEOLOGIST

REEDVILLE QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)		
Tn	*Trapa natans* (water chestnut)				
U	Unknown species composition				

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 MILE

1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-30-89

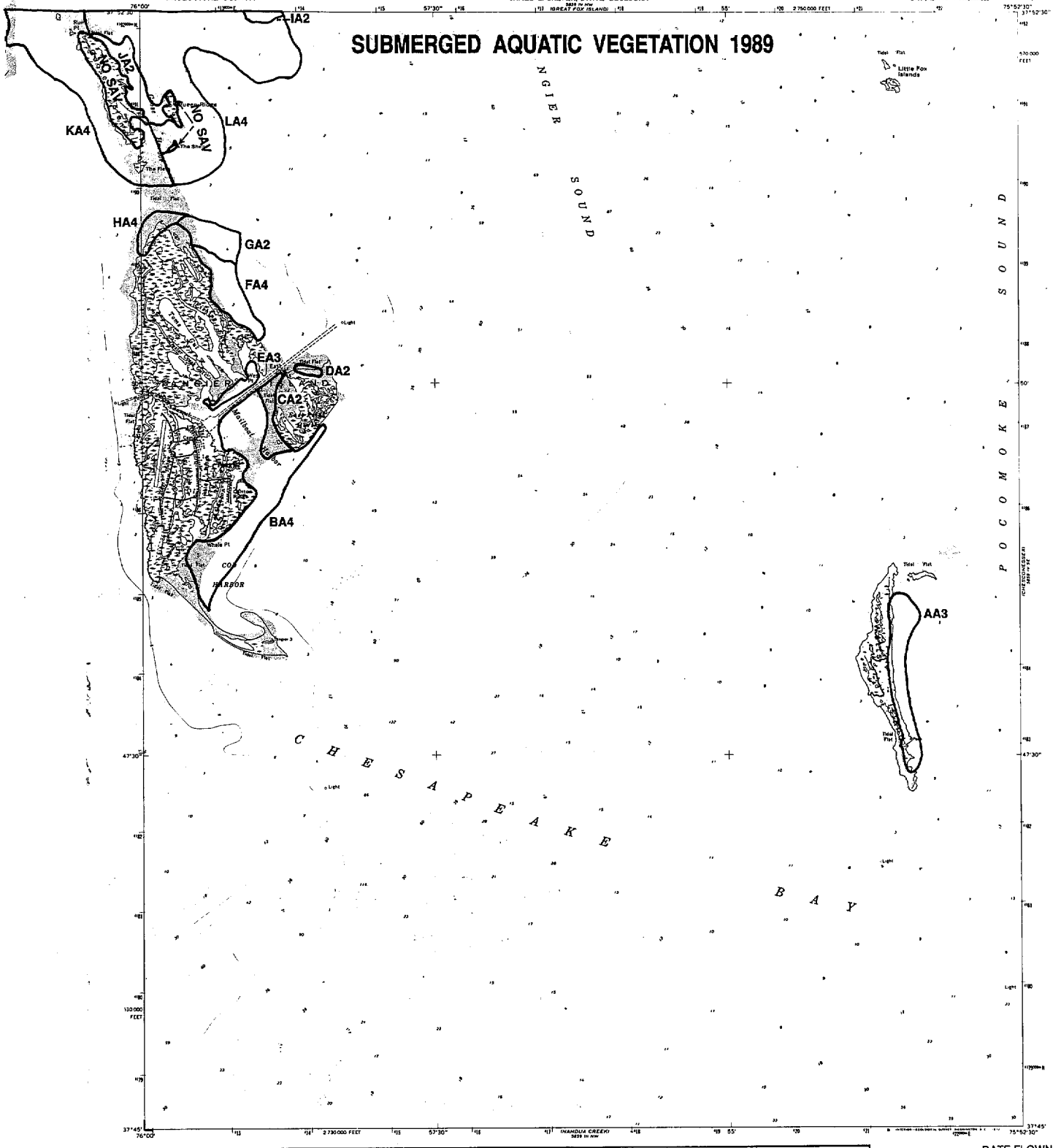
REEDVILLE, VA
106

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES
JAMES L. CALVER, STATE GEOLOGIST

TANGIER ISLAND QUADRANGLE

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)		
Tn	*Trapa natans* (water chestnut)				
U	Unknown species composition				

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 MILE

1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-19-89

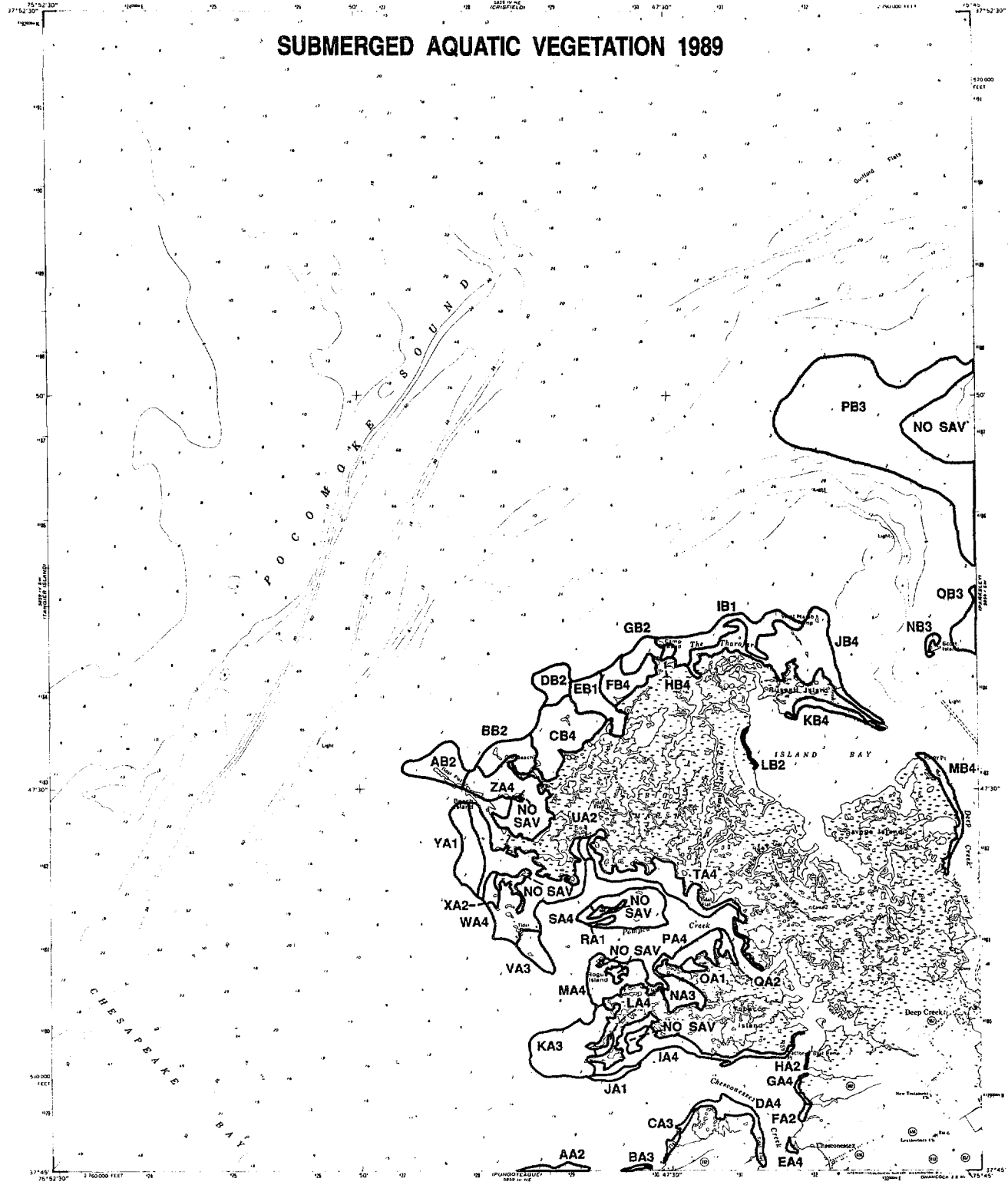
TANGIER ISLAND, VA
107

UNITED STATES
DEPARTMENT OF THE INTERIOR

COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES
JAMES L. CALVER, STATE GEOLOGIST

CHESCONESSEX QUADRANGLE
VIRGINIA ACCOMACK CO.

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

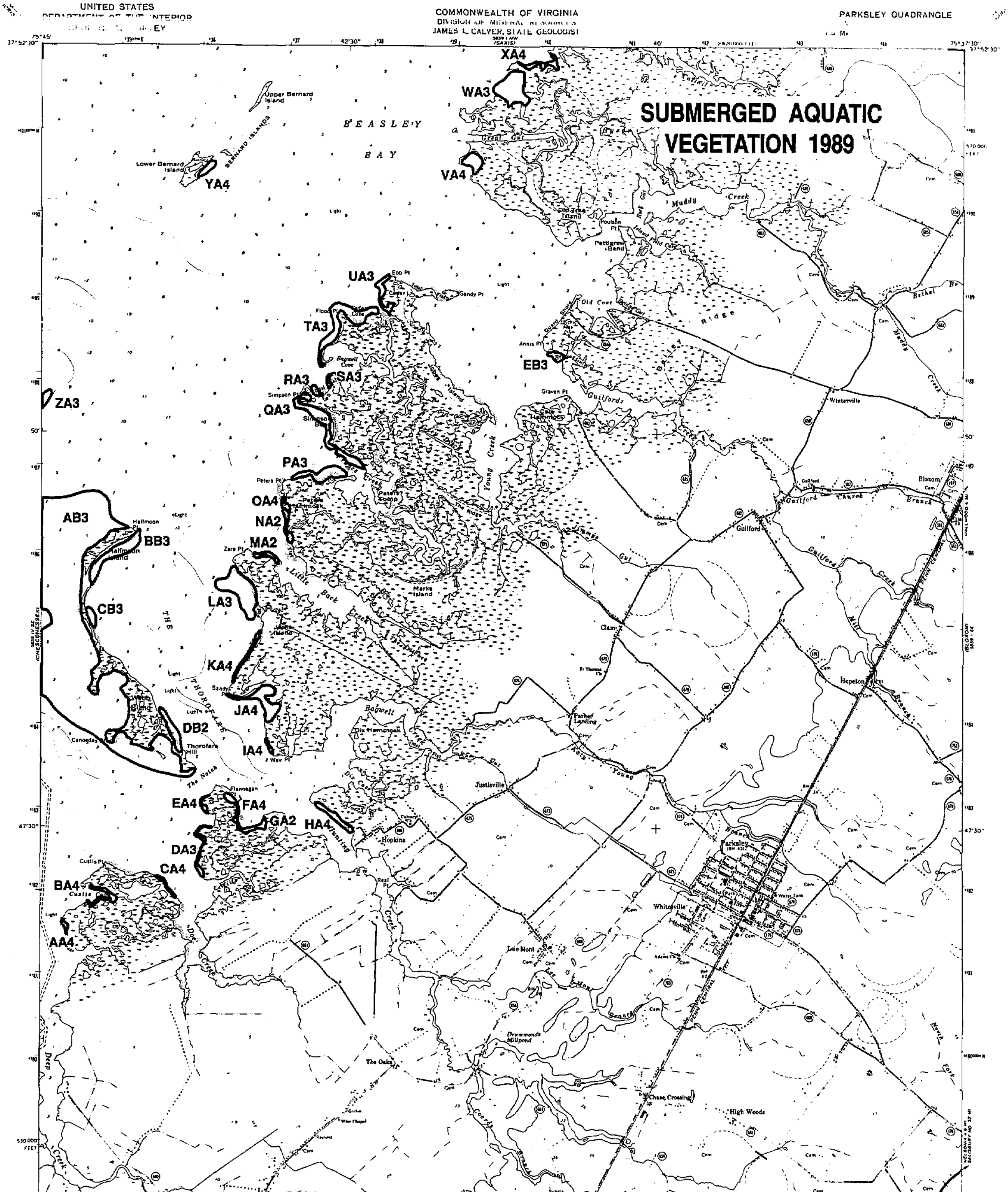
1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATES FLOWN
7-1-89
7-24-89

CHESCONESSEX, VA
108



	SPECIES		
Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
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Va	*Vallisneria americana* (wild celery)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 MILE

1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN 7-24-89

PARKSLEY, VA

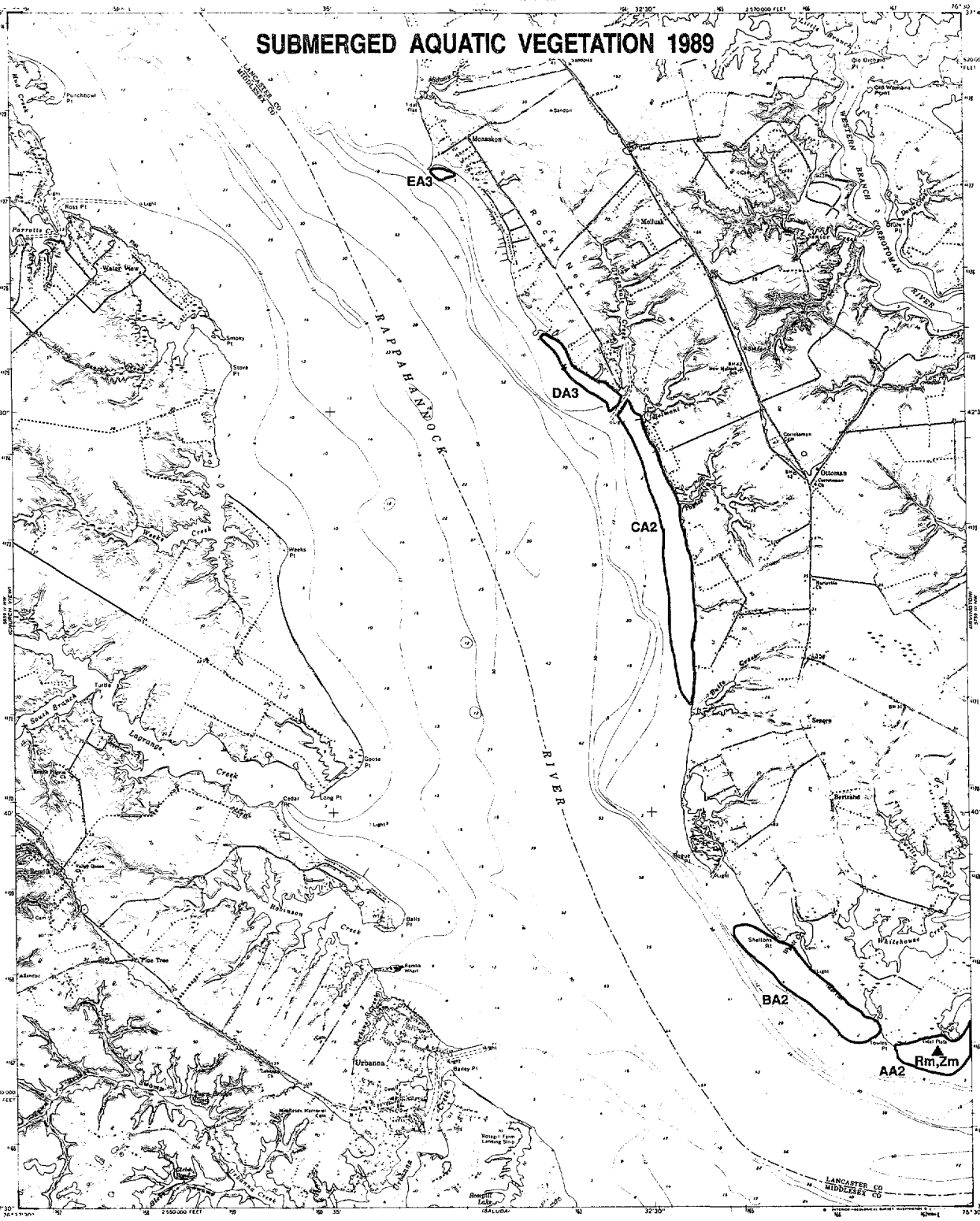
109

UNITED STATES
DEPARTMENT OF THE INTERIOR

COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES

URBANNA QUADRANGLE
VIRGINIA

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)		
Tn	*Trapa natans* (water chestnut)				
U	Unknown species composition				

N

SCALE 1:24,000

1 5 0 1 MILE

1 5 0 1 KILOMETER

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

DATE FLOWN
6-30-89

URBANNA,
VA
110

1968

AMS 5658 II NE-SERIES V834

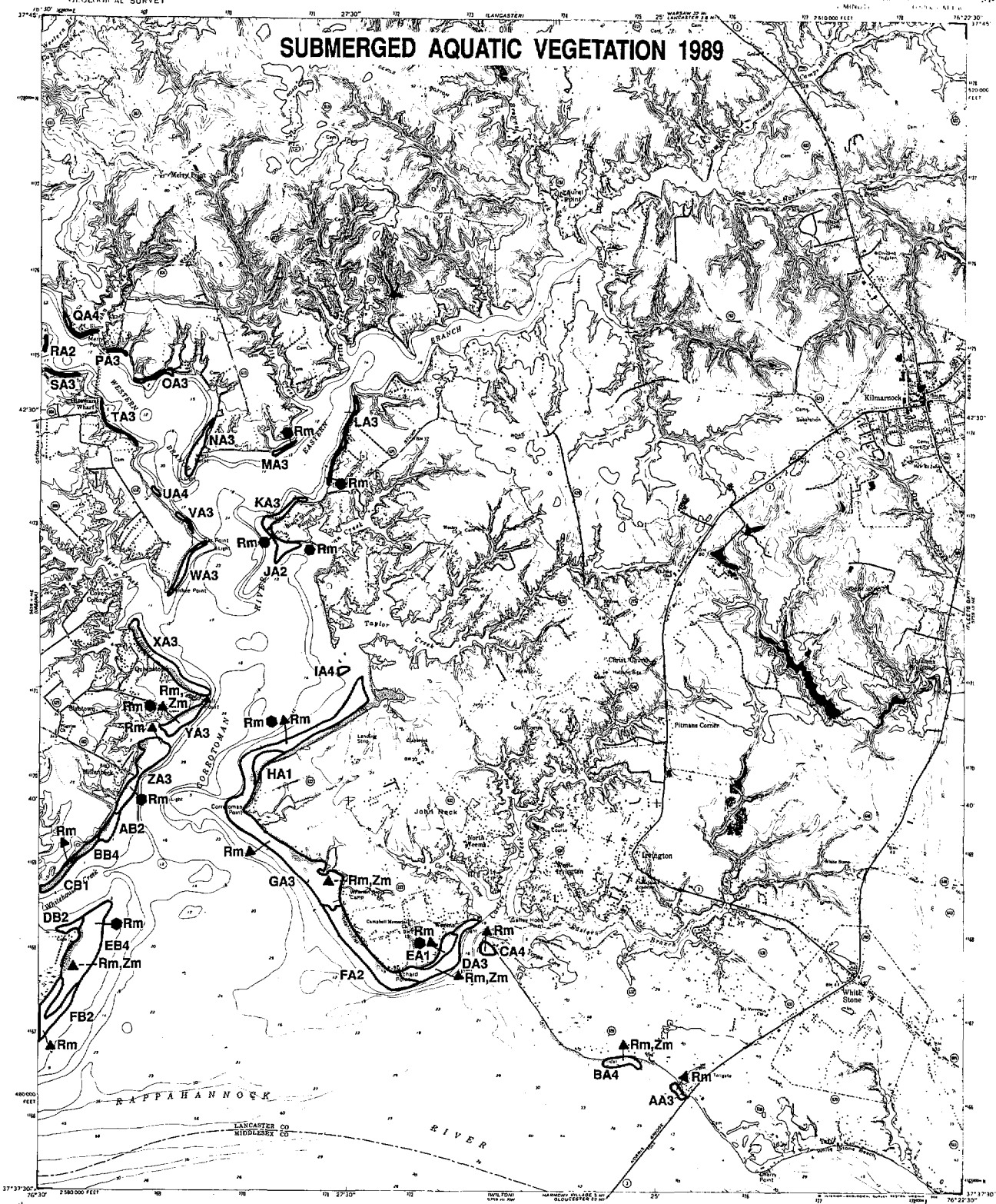
VIRGINIA INSTITUTE
OF MARINE SCIENCE

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES

IRVINGTON QUADRANGLE
VIRGINIA

SUBMERGED AQUATIC VEGETATION 1989



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
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Ppl	*Potamogeton perfoliatus* (redhead-grass)	Cd	*Ceratophyllum demersum* (coontail)
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Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

N

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

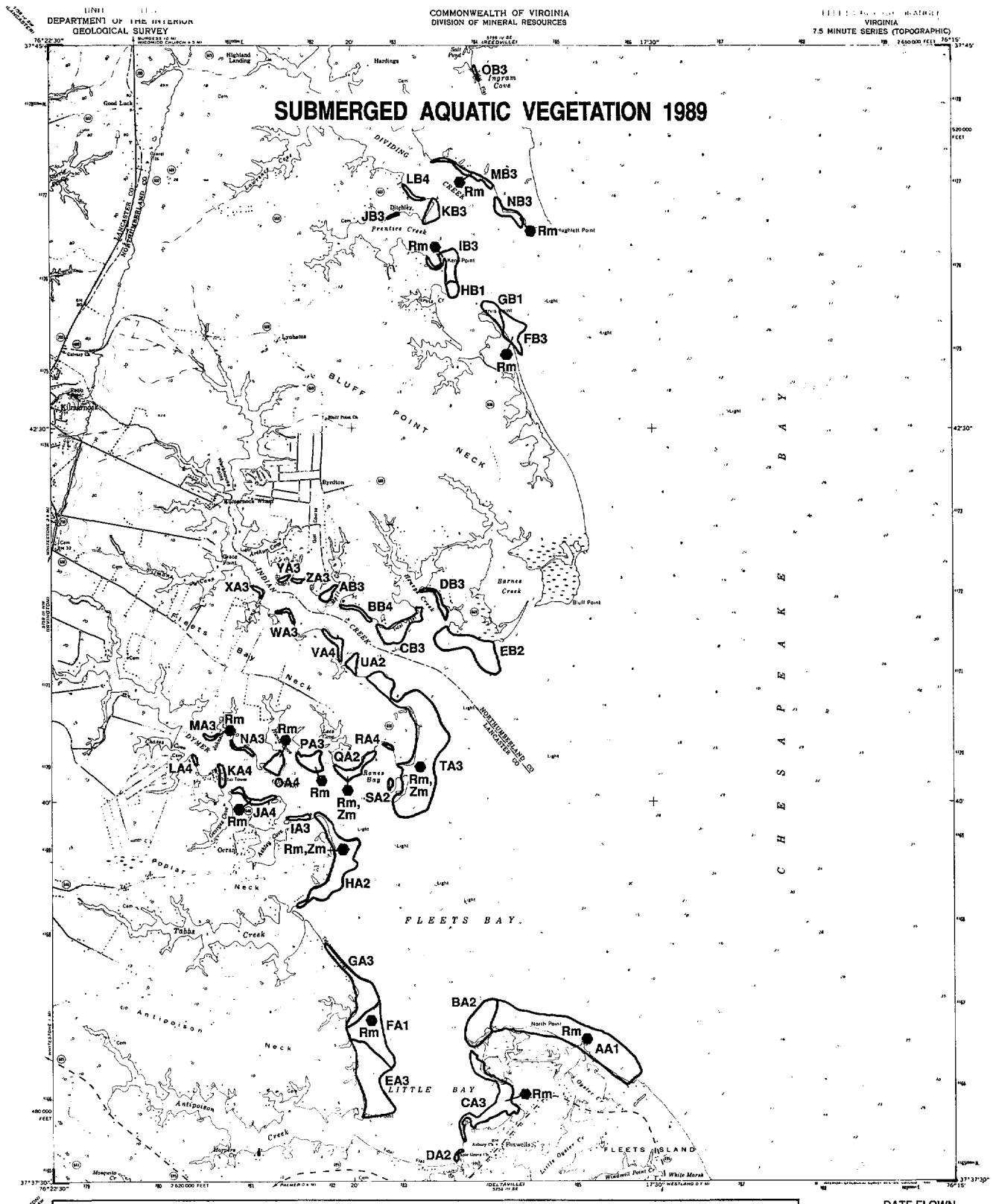
VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-30-89

IRVINGTON, VA

111

PHOTOREVISED 1979
DMA 5759 III NW-SERIES V834



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)
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Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 MILE

1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-30-89

FLEETS BAY, VA

112

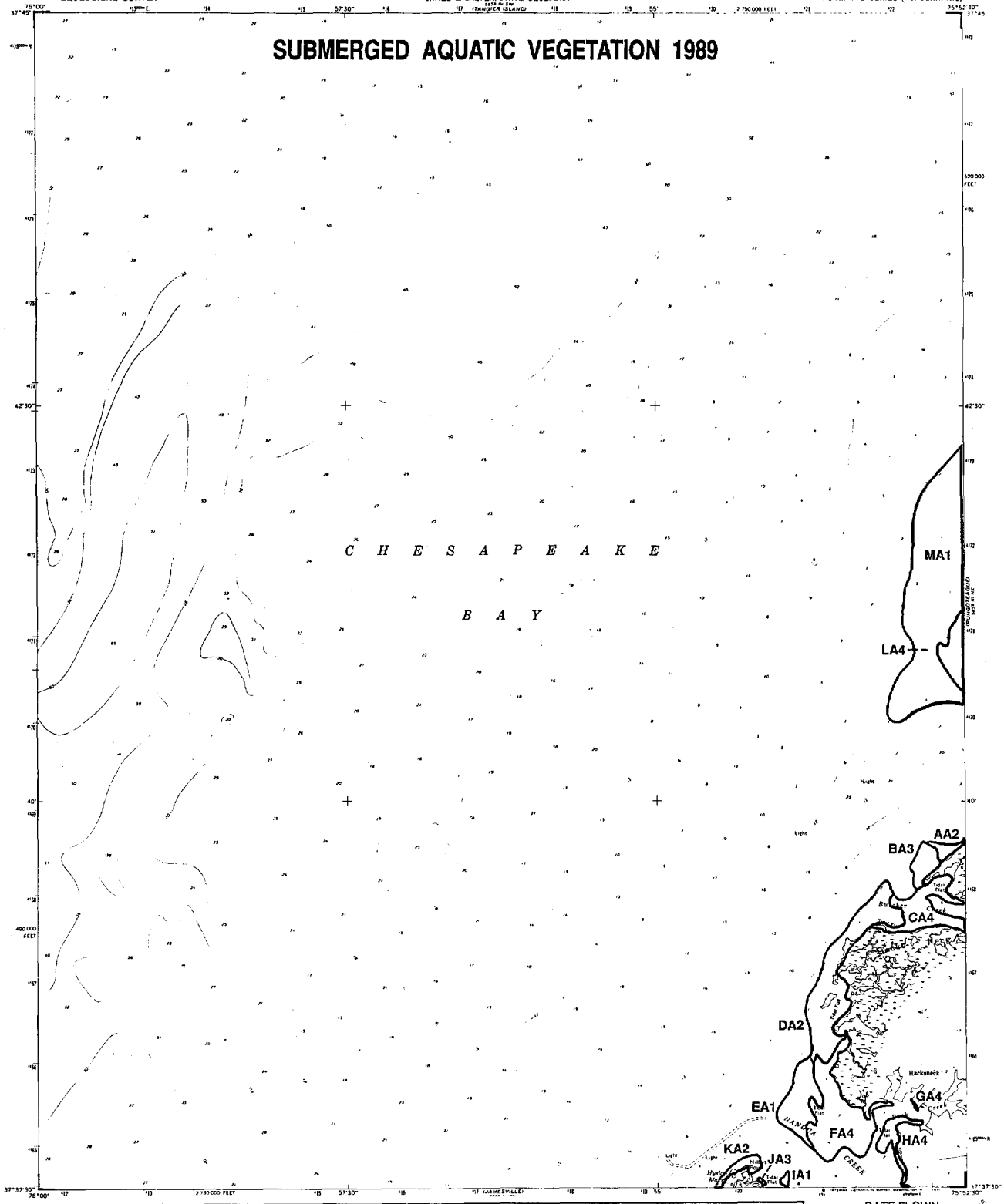
PHOTOINSPECTED 1978
DMA 5739 III NE-SERIES V834

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES
JAMES L. CALVER, STATE GEOLOGIST

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

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)		
Tn	*Trapa natans* (water chestnut)				
U	Unknown species composition				

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 MILE

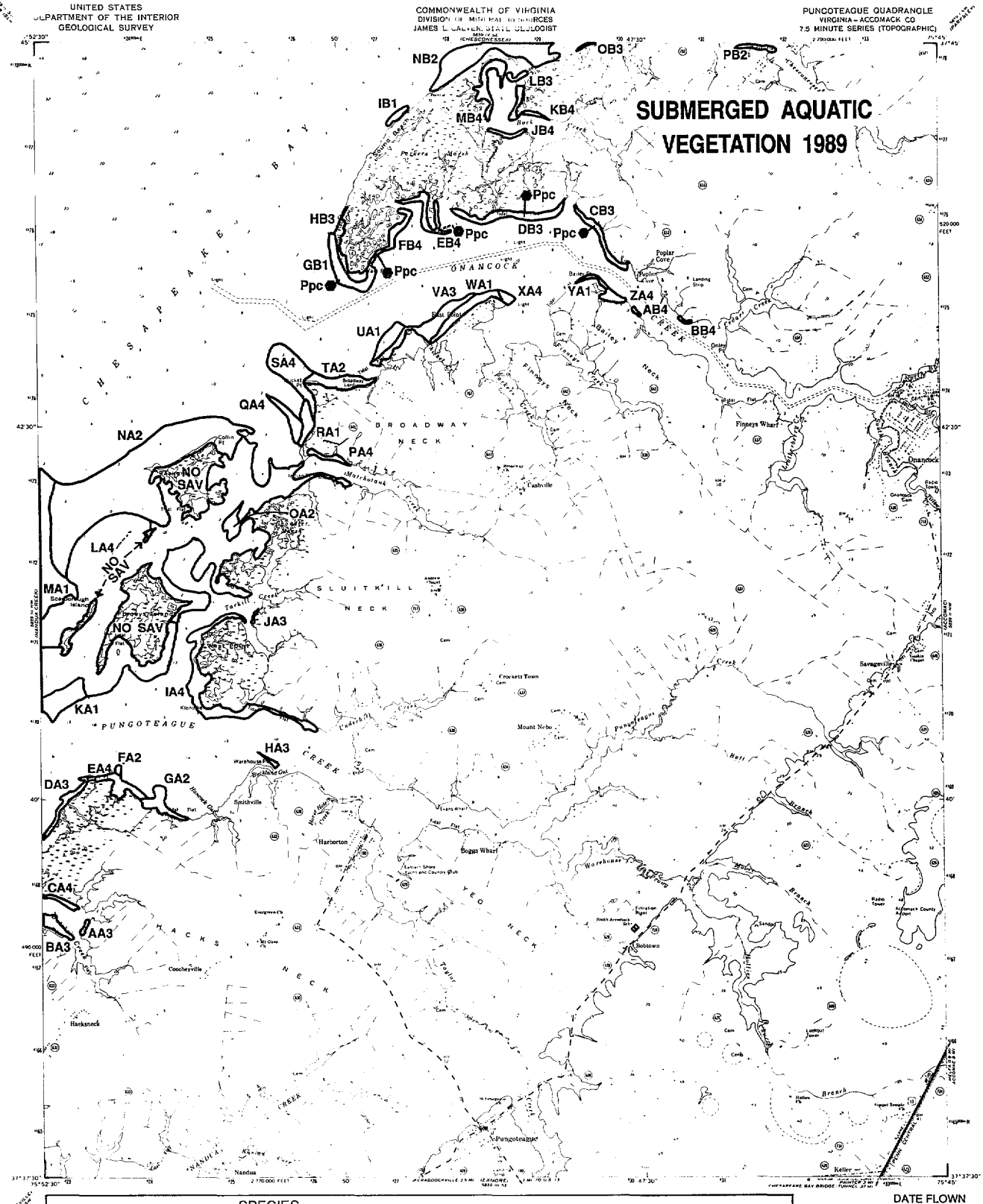
1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
7-24-89

NANDUA CREEK, VA
113

1968


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES
JAMES L. CALVER, STATE GEOLOGIST
PUNGOTEAGUE QUADRANGLE
VIRGINIA - ACCOMACK CO
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION 1989
CHESAPEAKE BAY
ONANCOCK
BROADWAY NECK
SLUITKILL NECK
PUNGOTEAGUE
YEO NECK
HACKS NECK
NB2
OB3
PB2
LB3
IB1
MB4
KB4
JB4
Ppc
HB3
CB3
DB3
FB4
EB4
GB1
VA3
WA1
XA4
YA1
ZA4
AB4
BB4
UA1
SA4
TA2
QA4
RA1
PA4
NA2
NO SAV
OA2
LA4
MA1
JA3
IA4
KA1
HA3
FA2
EA4
DA3
GA2
CA4
AA3
BA3
Onancock
Finneys Wharf
Cashville
Savageville
Mount Nebo
Smithville
Harborton
Bobtown
Pungoteague
Keller
Nandua
Hacksneck
Coocheyville
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppl 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)
Tn Trapa natans (water chestnut)
U Unknown species composition
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)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
USGS Survey
USF & WS Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
VIRGINIA INSTITUTE OF MARINE SCIENCE
DATE FLOWN
7-24-89
PUNGOTEAGUE, VA
114

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

VIRGINIA

SUBMERGED AQUATIC VEGETATION 1989

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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

N

SCALE 1:24,000

1 5 0 1 MILE

1 5 0 1 KILOMETER

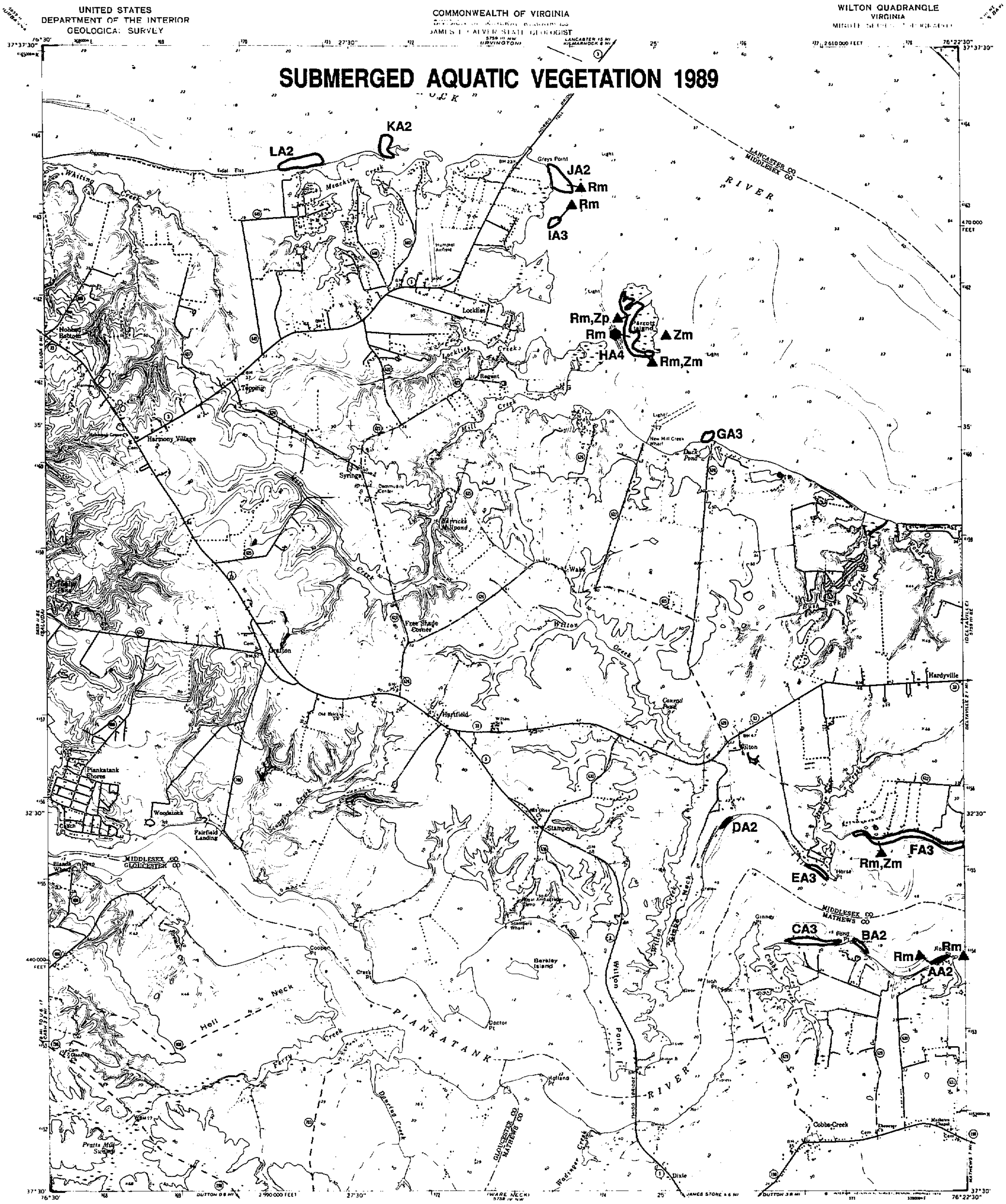
SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-30-89

SALUDA, VA
116



DATE FLOWN
6-30-89

WILTON,
VA
117

1964
PHOTOREVISED 1973
AMS 5759 III SW—SERIES V834

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)
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Va	*Vallisneria americana* (wild celery)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

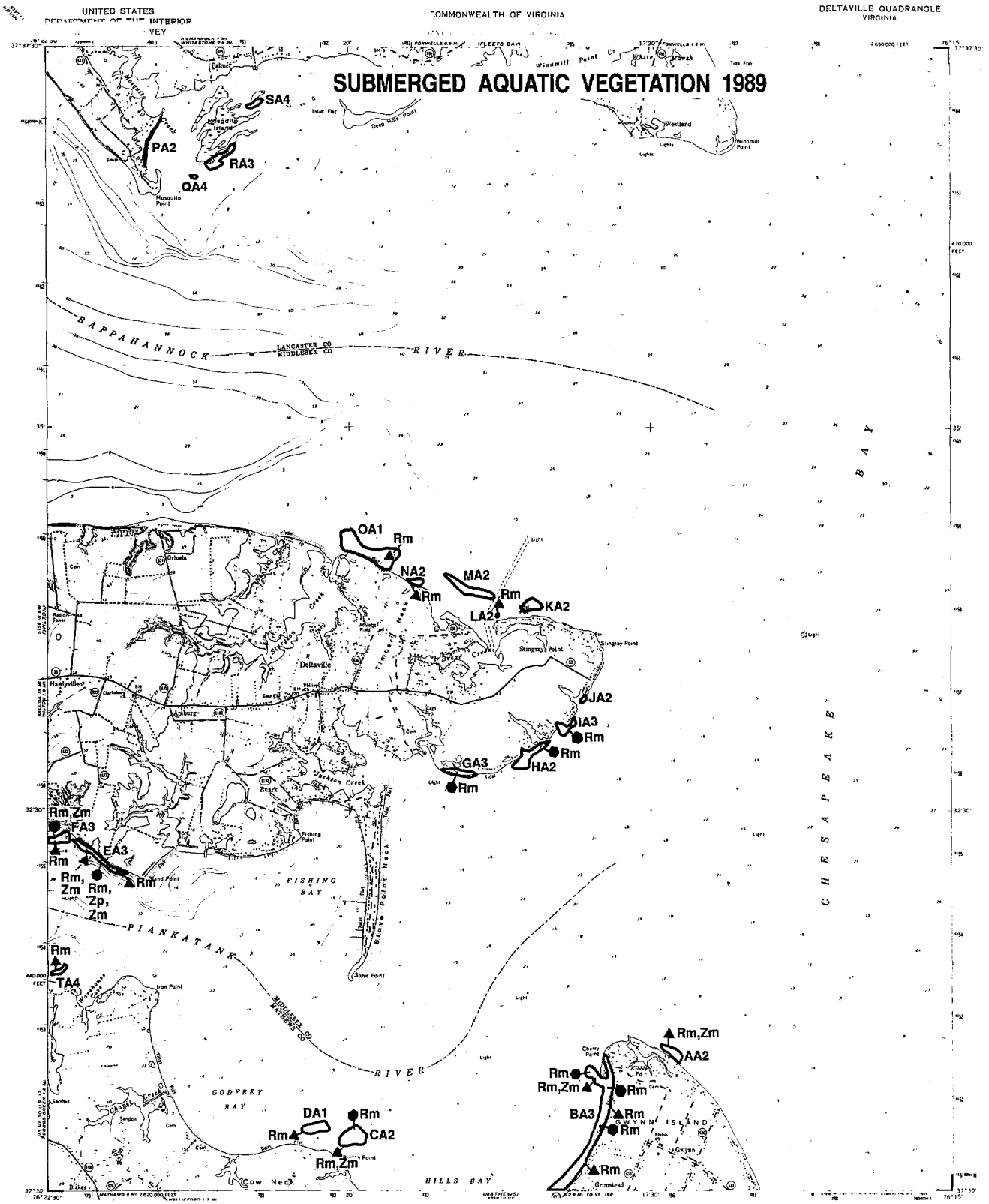
SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 MILE
1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 .5 0 1 MILE

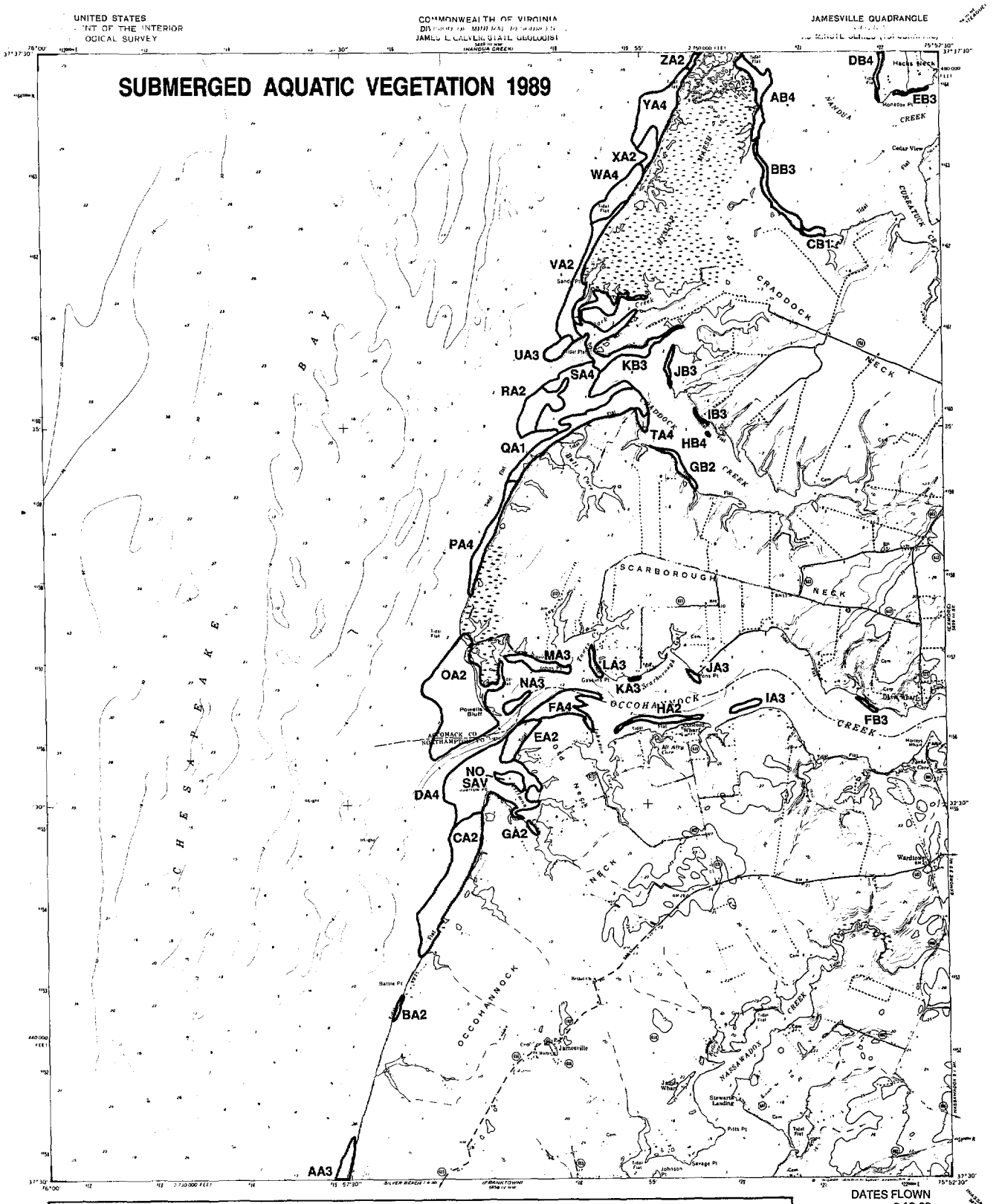
1 .5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-30-89

DELTAVILLE, VA
118

1964

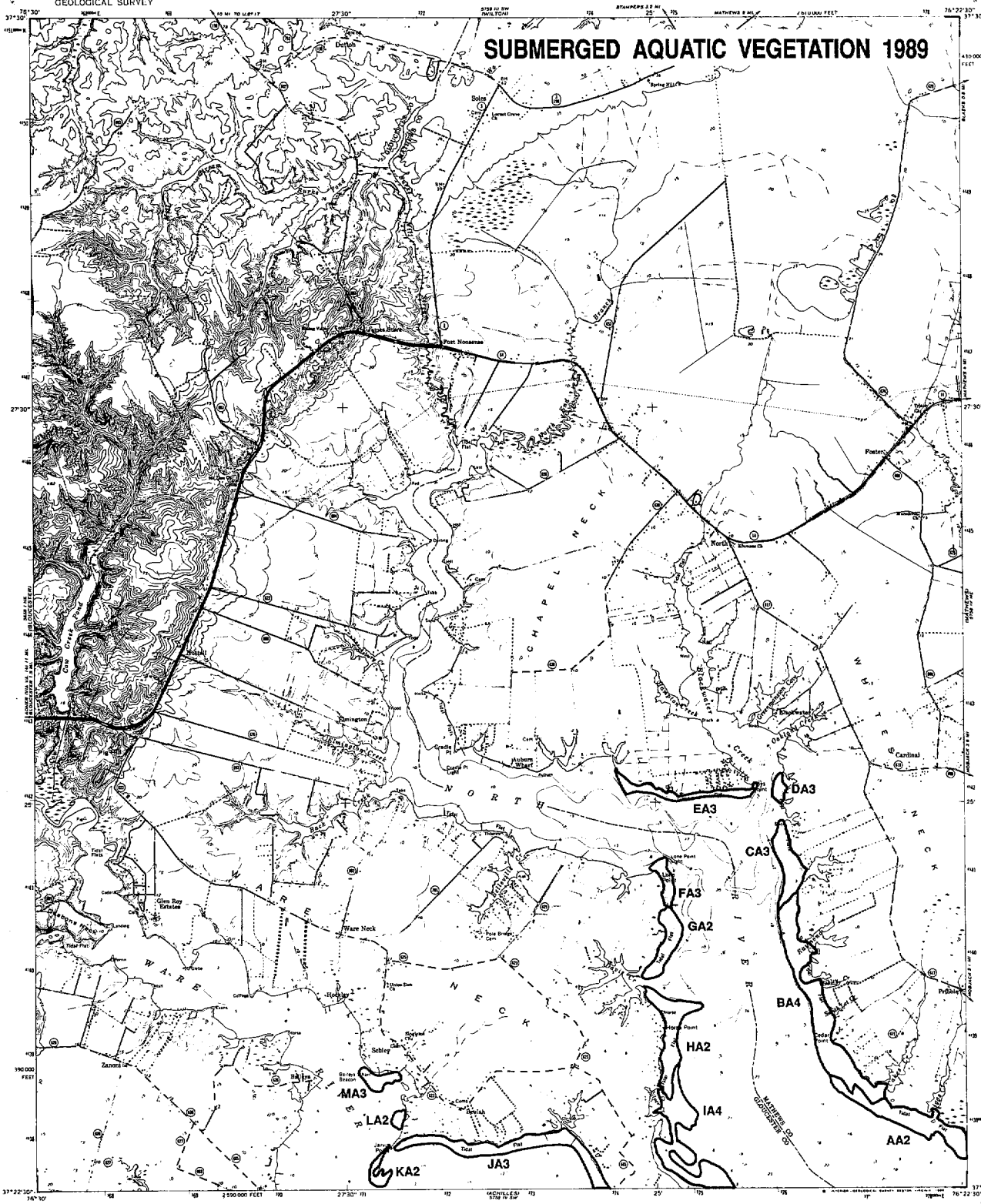

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
COMMONWEALTH OF VIRGINIA
JAMES L. CALVERT, STATE GEOLOGIST
JAMESVILLE QUADRANGLE
SUBMERGED AQUATIC VEGETATION 1989
ZA2
DB4
YA4
AB4
EB3
XA2
WA4
BB3
CB1
VA2
UA3
KB3
JB3
SA4
RA2
IB3
TA4
HB4
QA1
GB2
PA4
MA3
LA3
JA3
OA2
NA3
KA3
IA3
FA4
HA2
FB3
EA2
NO SAV
DA4
CA2
GA2
BA2
AA3
CHESAPEAKE BAY
CRADDOCK NECK
SCARBOROUGH NECK
OCCOHANNOCK CREEK
OCCOHANNOCK NECK
NASSAWADOX CREEK
CURRATUCK CREEK
HANDUA CREEK
Jamesville
Wardtown
Cedar View
Hacks Neck
Powells Bluff
Battle Pt
Savage Pt
Pitts Pt
Johnson Pt
Starwarts Landing
Old Neck
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)
Tn Trapa natans (water chestnut)
U Unknown species composition
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)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
USGS Survey
USF & WS Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
VIRGINIA INSTITUTE OF MARINE SCIENCE
DATES FLOWN
6-12-89
7-24-89
JAMESVILLE, VA
119

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES

WARE NECK QUADRANGLE
VIRGINIA

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

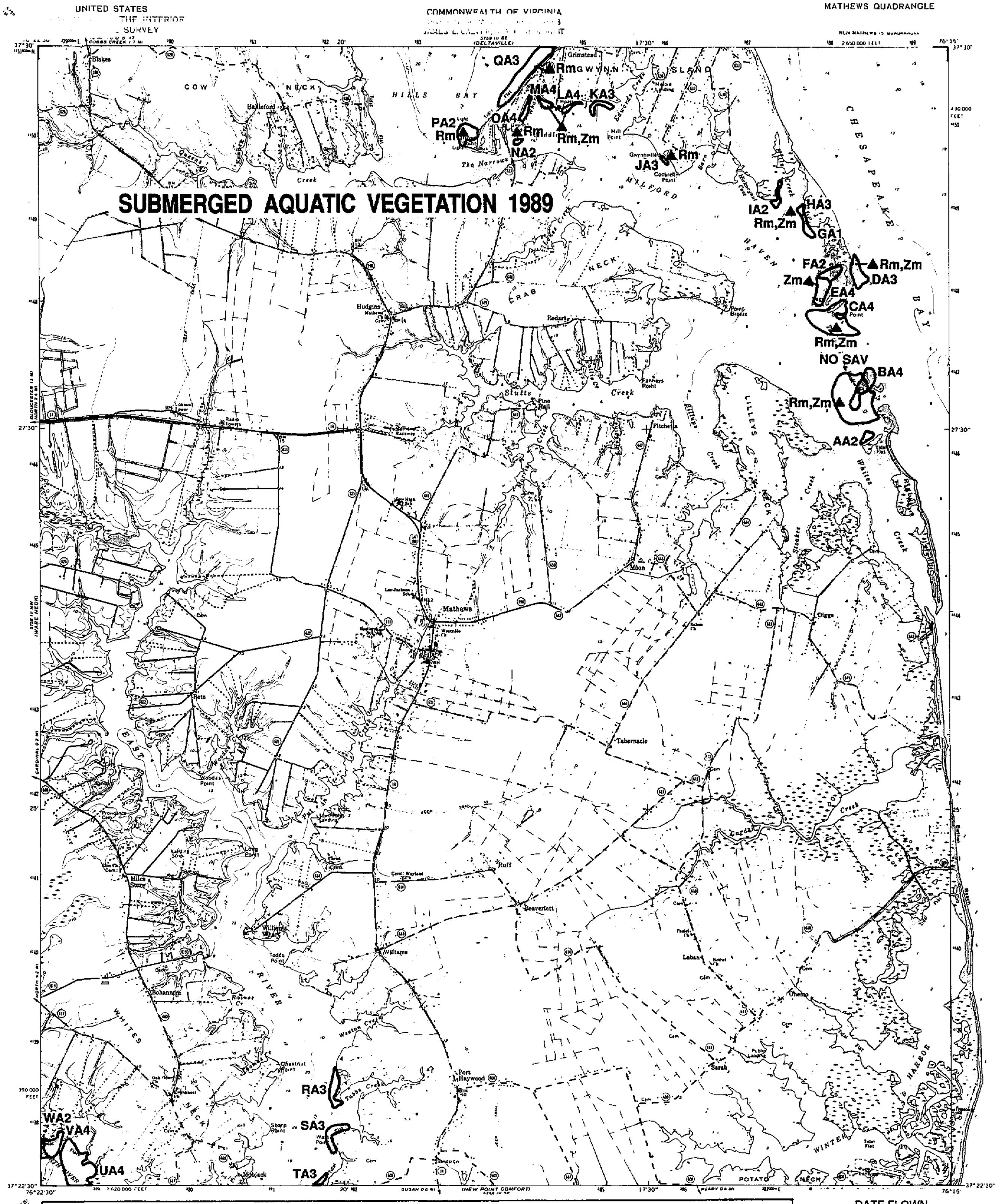
SCALE 1:24,000

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
7-1-89

WARE NECK, VA
122

1965
PHOTOREVISED 1980
DMA 5758 IV NW - SERIES V834



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
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Zp	*Zannichellia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)
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Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 MILE

1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

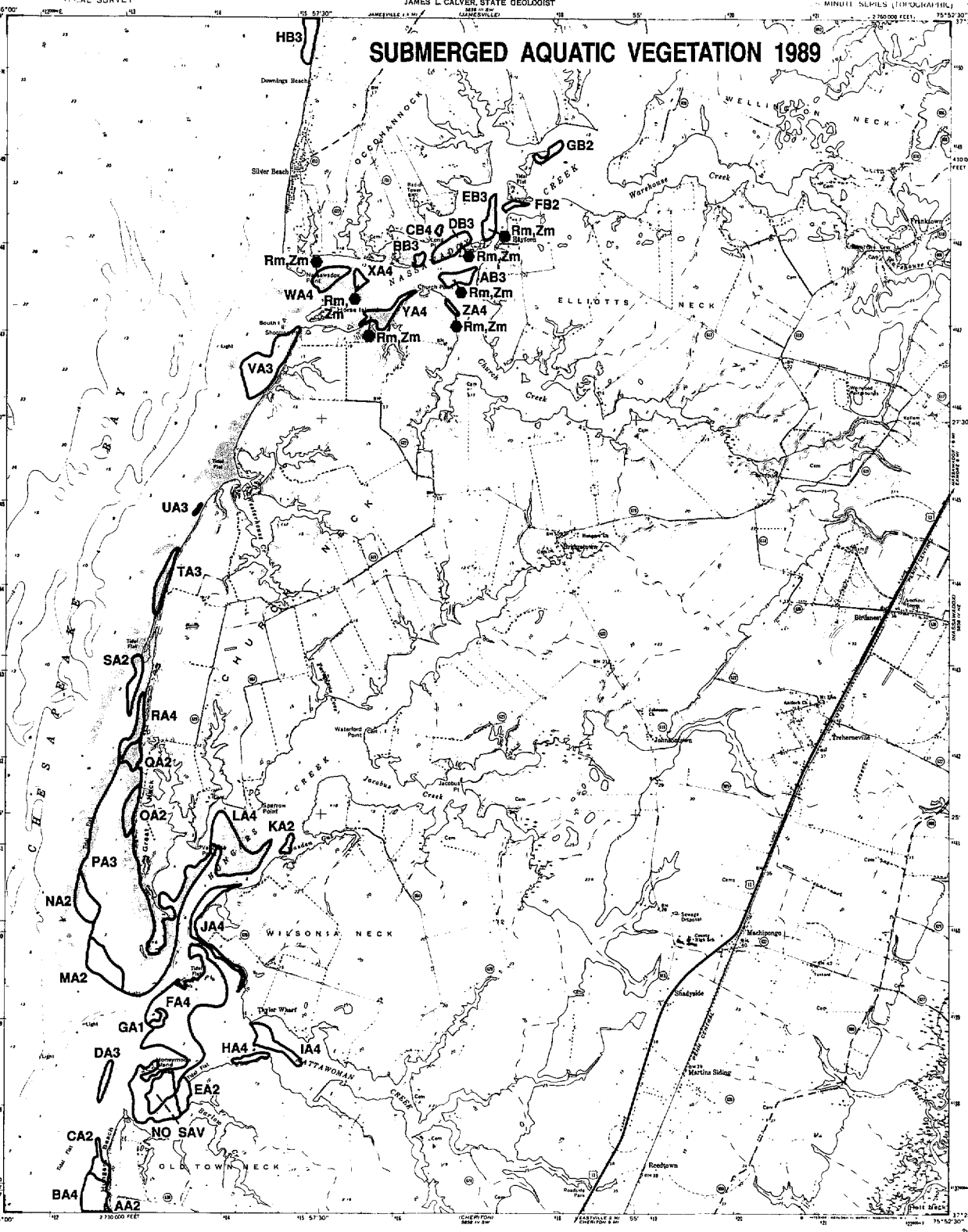
DATE FLOWN
6-11-89

MATHEWS, VA
123

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES
JAMES L. CALVER, STATE GEOLOGIST

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)		
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Ppc	*Potamogeton pectinatus* (sago pondweed)	Ppu	*Potamogeton pusillus* (slender pondweed)		
Zp	*Zannichellia palustris* (horned pondweed)	Ngu	*Najas guadalupensis* (southern naiad)		
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Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)		
Va	*Vallisneria americana* (wild celery)	Nm	*Najas minor* (slender naiad)		
Tn	*Trapa natans* (water chestnut)				
U	Unknown species composition				

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 MILE

1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-12-89

FRANKTOWN, VA
124

1968

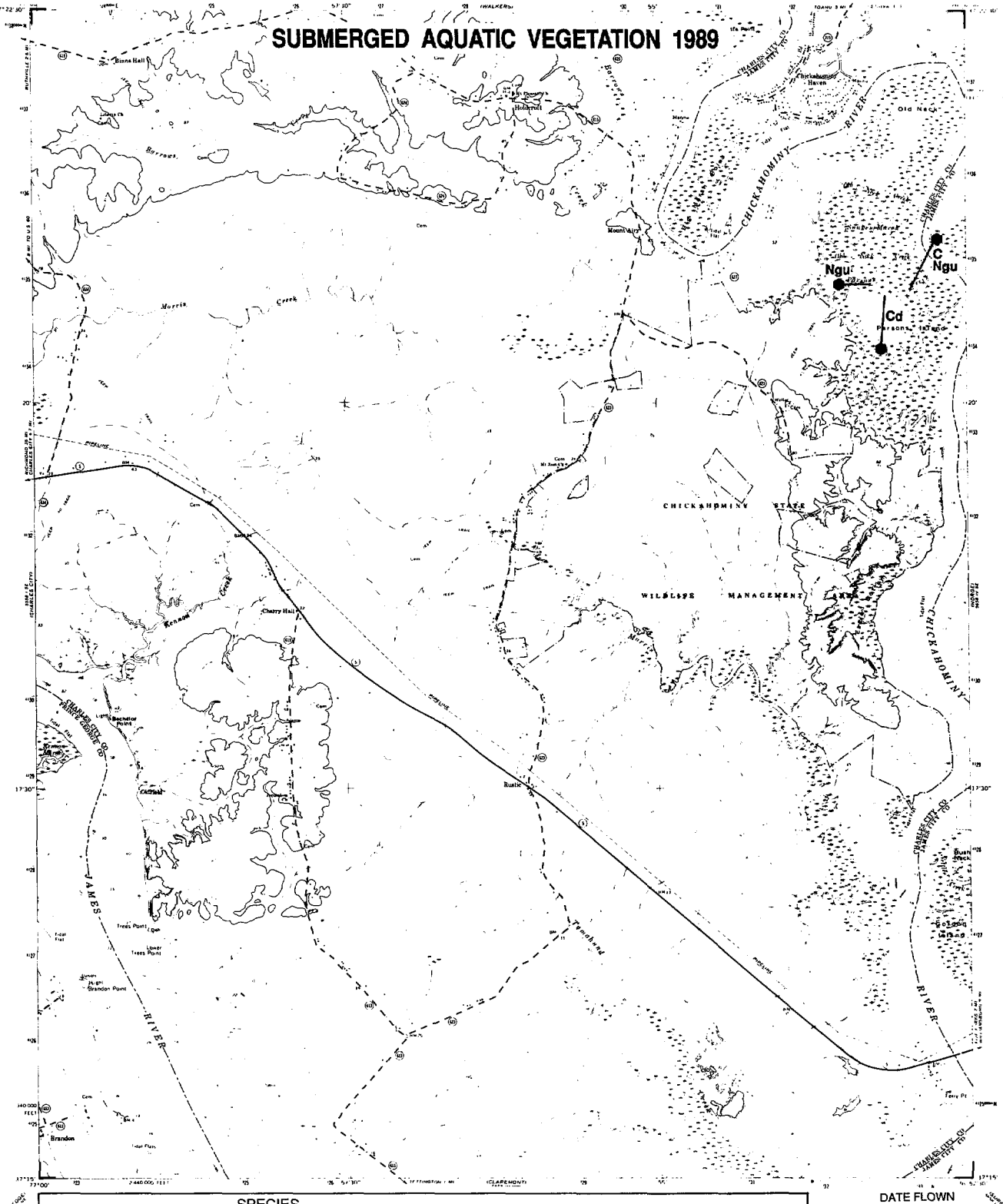
AMS 5859 IV NW—SERIES V834

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES

BRANDON QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989



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)
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Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
7-1-89

BRANDON, VA
127

1965
PHOTOREVISED 1980

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES
JAMES L. CARVER, STATE GEOLOGIST

CLAY BANK QUADRANGLE
VIRGINIA

SUBMERGED AQUATIC VEGETATION 1989

SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
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U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 5 0 1 MILE

1 5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
7-1-89

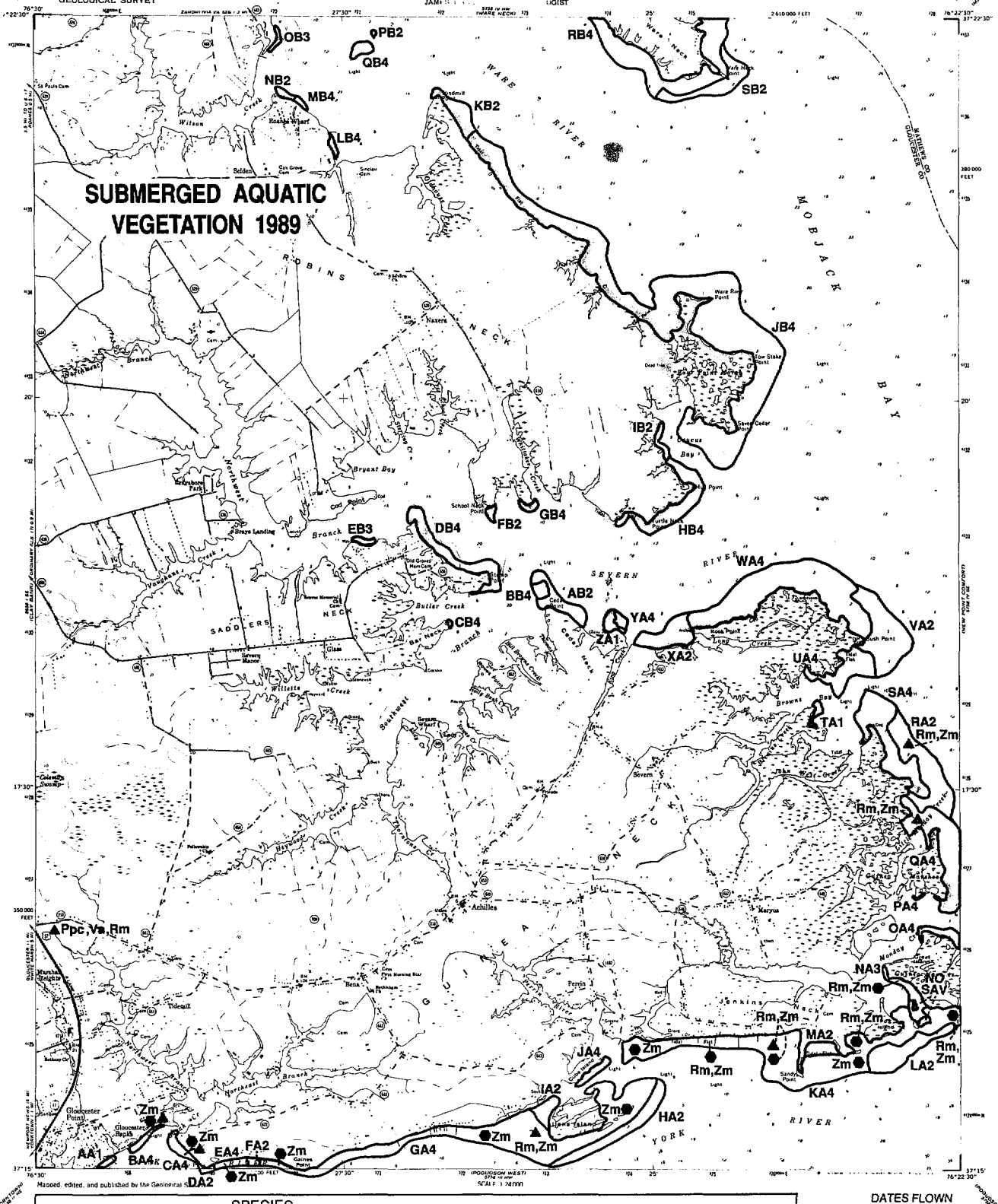
CLAY BANK
VA
130

1965
PHOTOREVISED 1972
AMS 5658 I SE—SERIES V834

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COMMONWEALTH OF VIRGINIA

ACHILLES QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)



Mapped, edited, and published by the Geological Survey

SCALE 1:24 000

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)
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U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

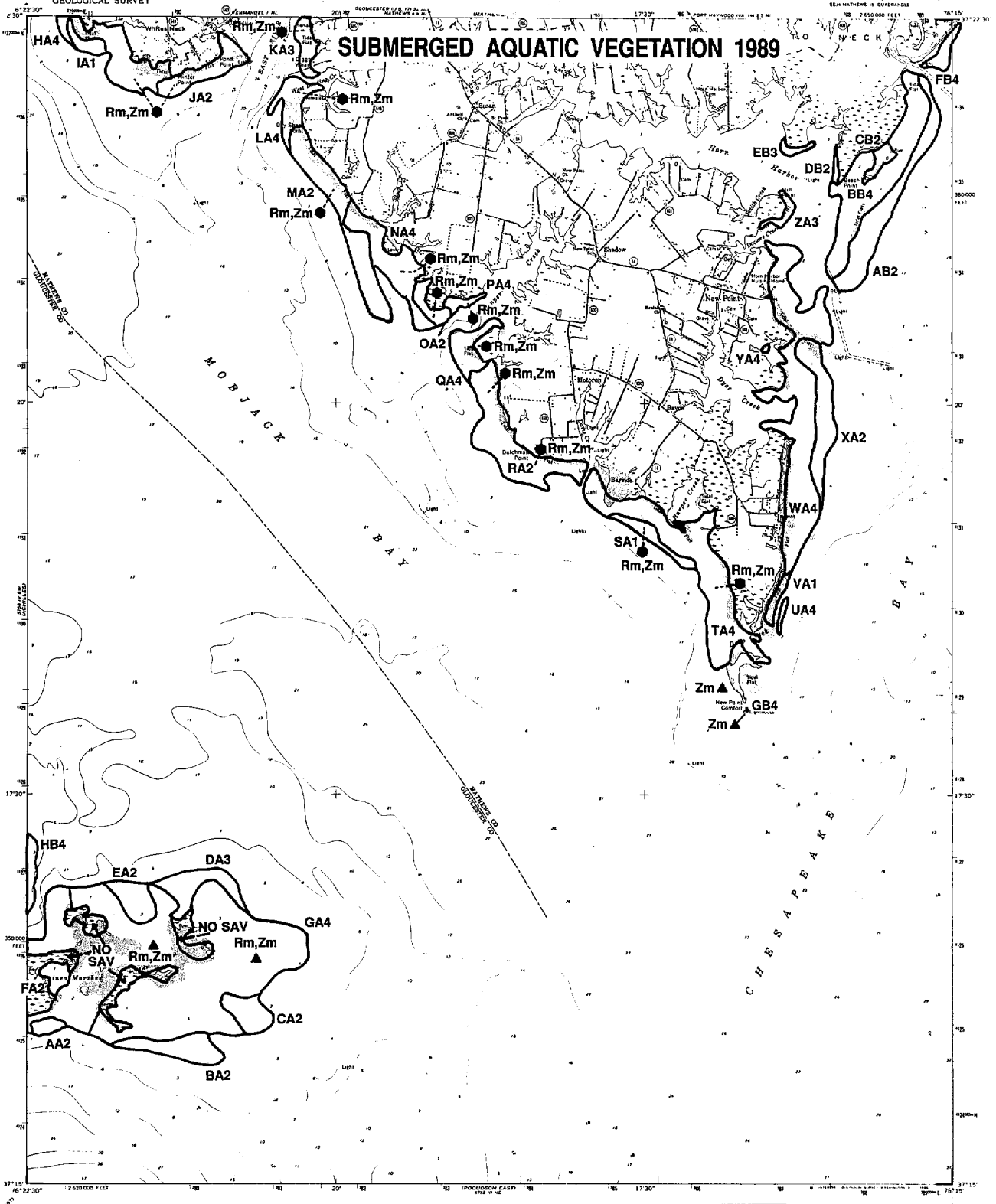
DATES FLOWN
6-11-89
7-1-89

ACHILLES, VA
131

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COMMONWEALTH OF VIRGINIA

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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
7-1-89

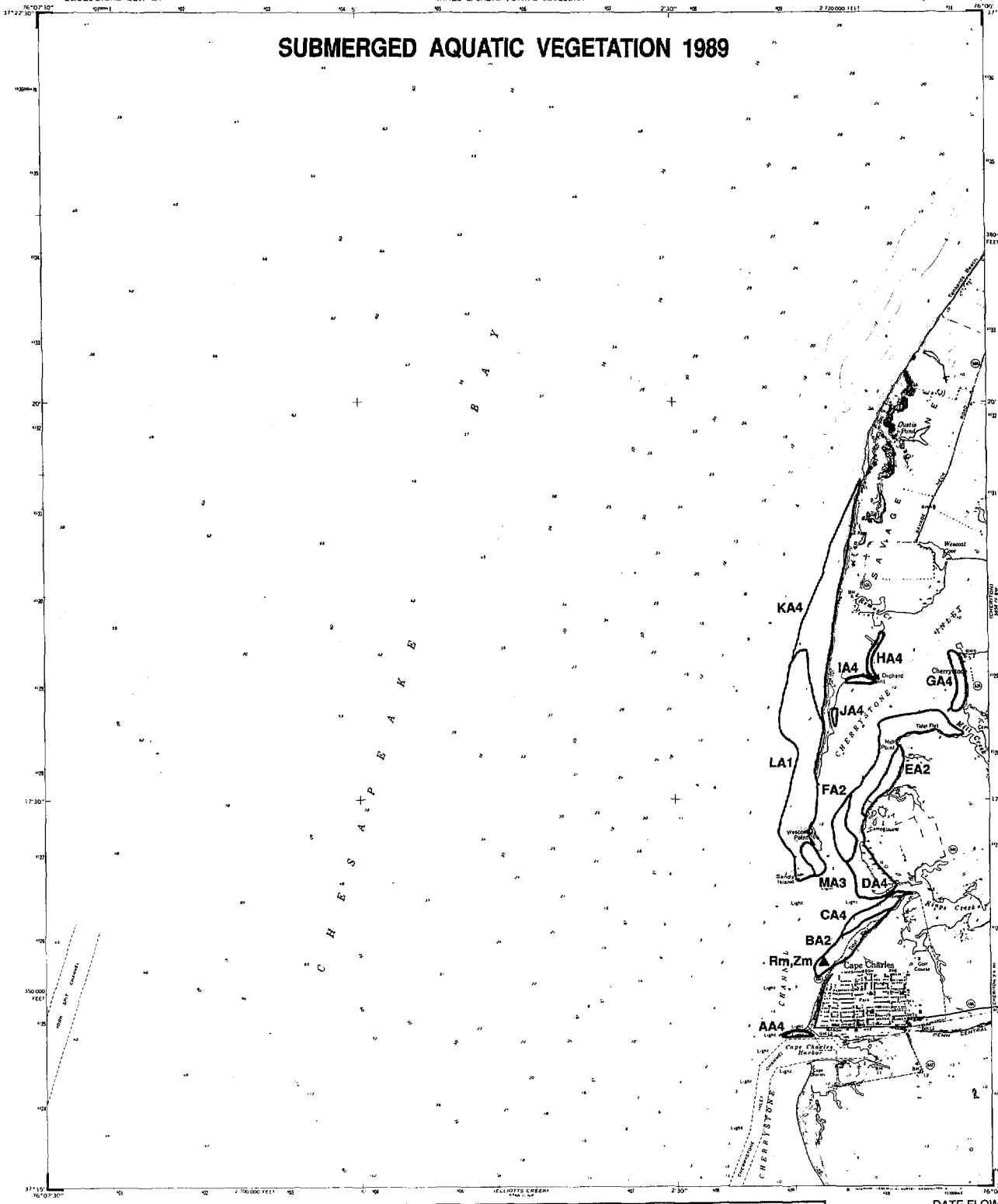
NEW POINT COMFORT, VA
132

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

DIVISION OF MINERAL RESOURCES
JAMES L. CALVER, STATE GEOLOGIST

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

SUBMERGED AQUATIC VEGETATION 1989



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verticillata* (hydrilla)
Rm	*Ruppia maritima* (widgeon grass)	Hd	*Heteranthera dubia* (water stargrass)
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Va	*Vallisneria americana* (wild celery)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 5 0 1 MILE

1 5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-12-89

CAPE CHARLES, VA
133

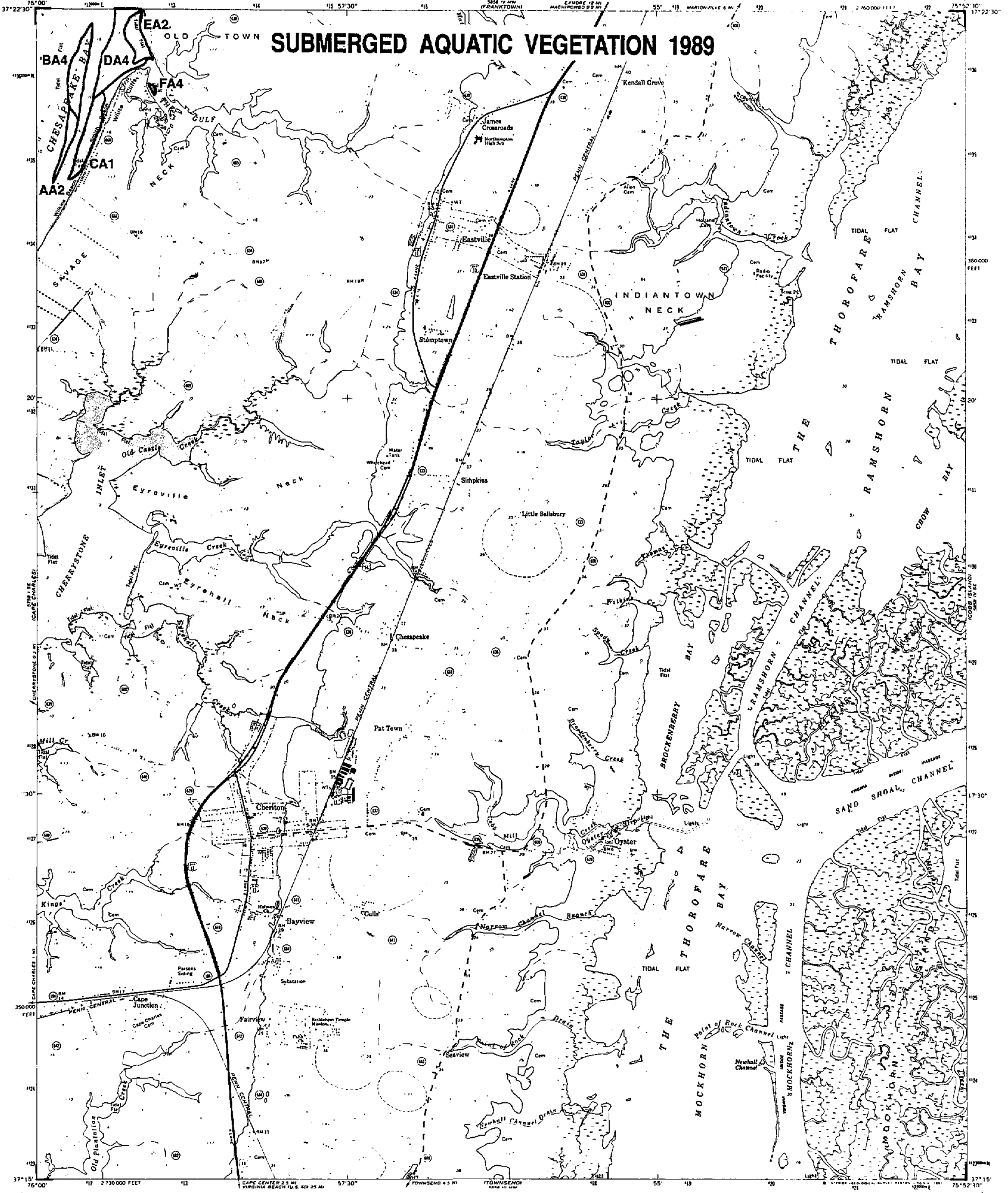
1969

AMS 5759 I SE–SERIES V834

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES

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



DATE FLOWN
6-12-89

CHERITON, VA
134

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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Tn	*Trapa natans* (water chestnut)		
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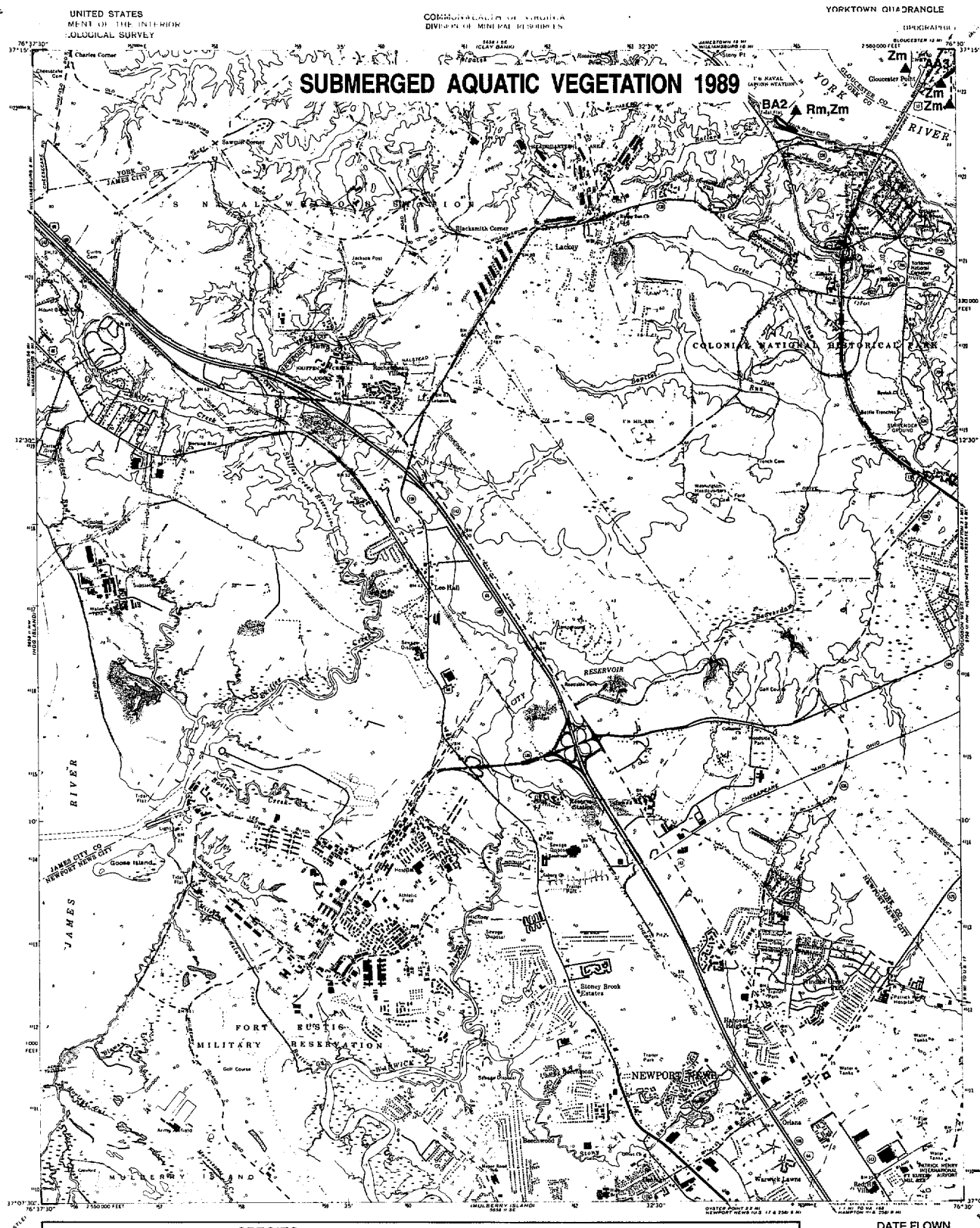
SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

VIRGINIA INSTITUTE OF MARINE SCIENCE



SPECIES

Zm	*Zostera marina* (eelgrass)	Hv	*Hydrilla verucillata* (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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- ⬢ Citizens Field Observation
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- ◆ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN 7-1-89

YORKTOWN, VA

139

PHOTOREVISED 1960

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES

POQUOSON WEST QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989

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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 5 0 1 MILE

1 5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
7-1-89

POQUOSON
WEST, VA
140

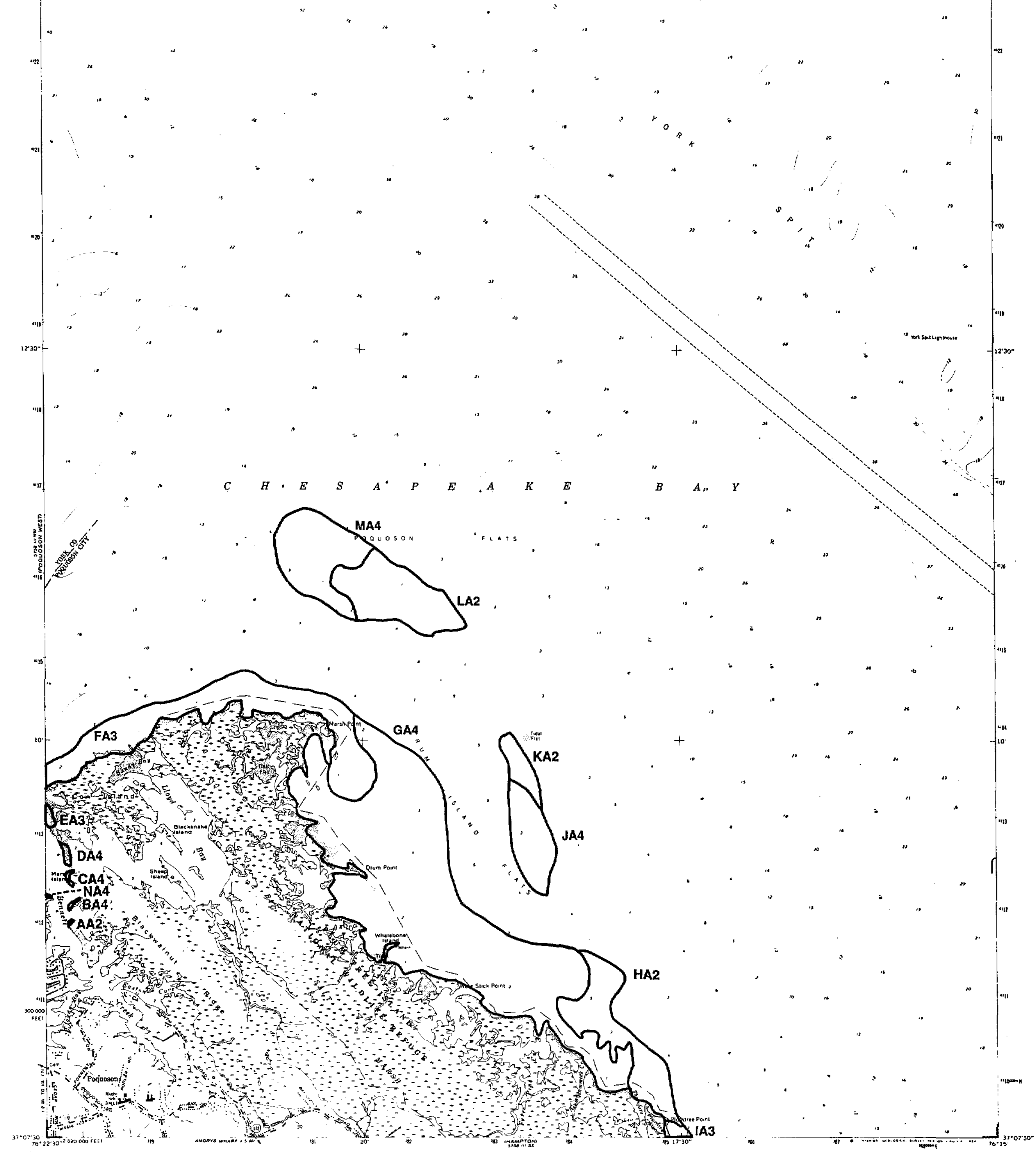
1965
PHOTOREVISED 1978
DMA 5758 III NW-SERIES V834

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COMMONWEALTH OF VIRGINIA

POQUOSON EAST QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
7-1-89

POQUOSON EAST, VA
141

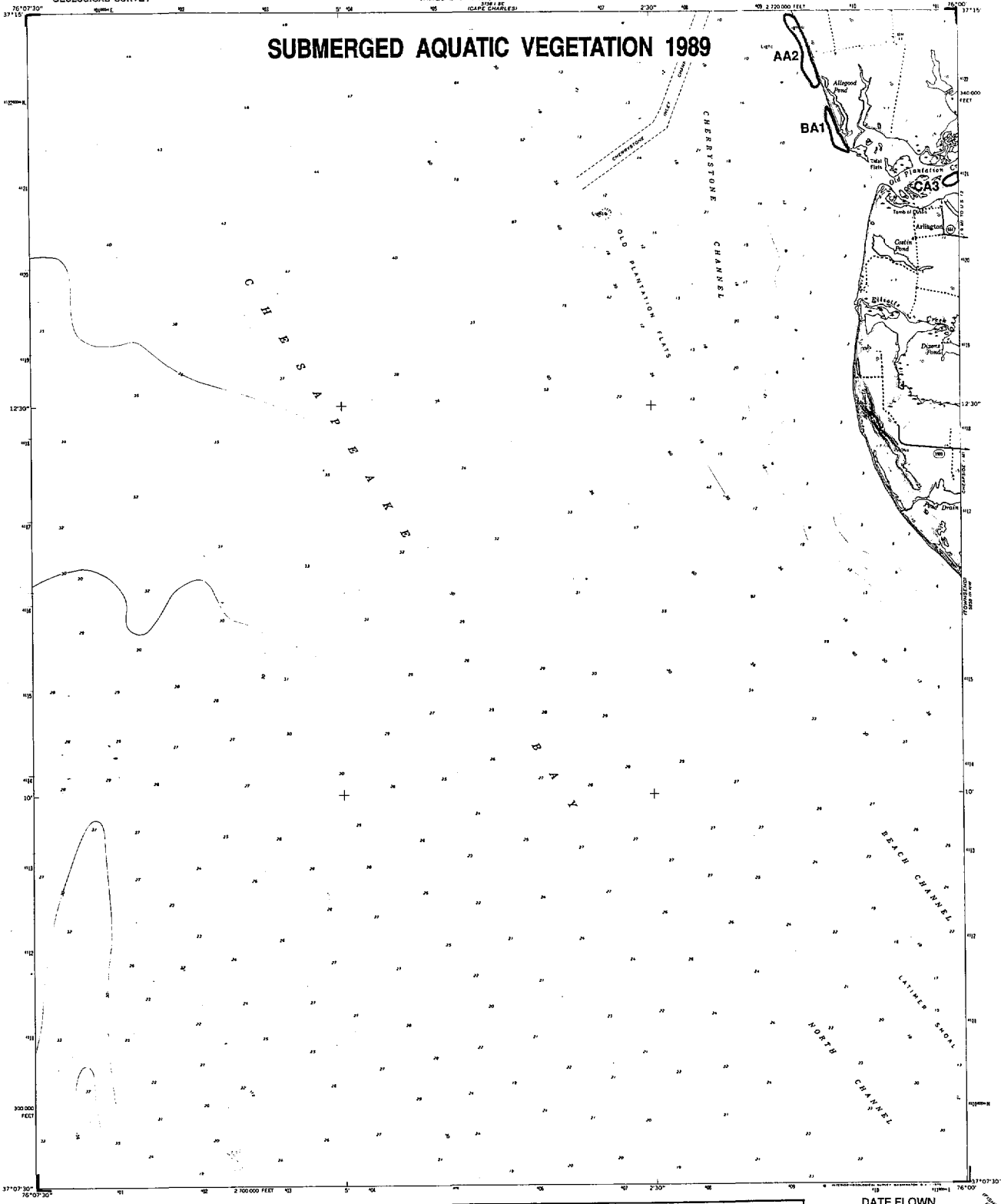
PHOTOREVISED 1970

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES
JAMES L. CALVER, STATE GEOLOGIST

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

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

N

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-12-89

ELLIOTTS CREEK, VA
142

1968

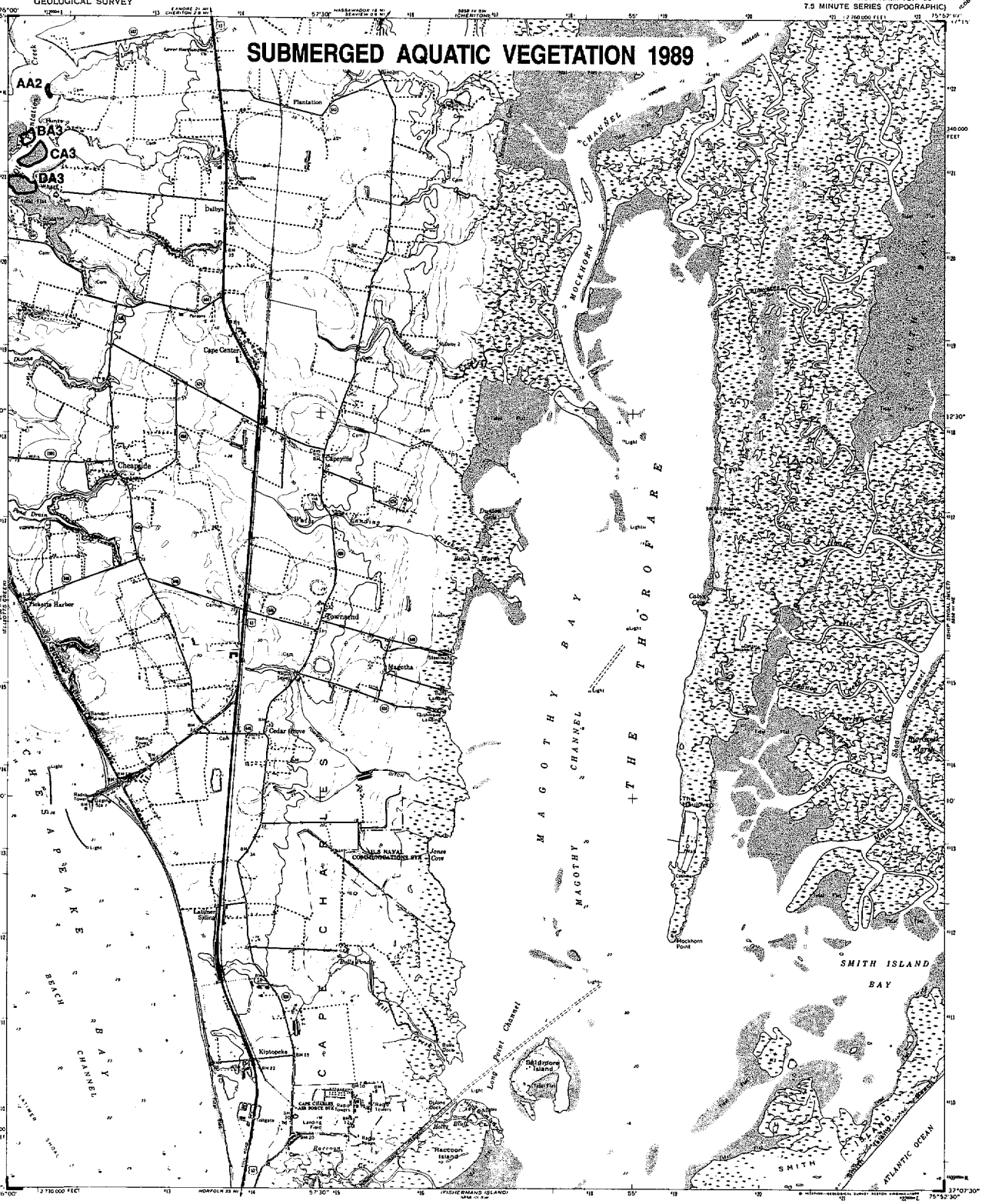
AMS 5758 II NE-SERIES V834

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES

TOWNSEND QUADRANGLE
VIRGINIA - NORTHAMPTON CO
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

N

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-12-89

TOWNSEND, VA
143

1968
PHOTOREVISED 1980
DMA 5854 III NW-SERIES V834

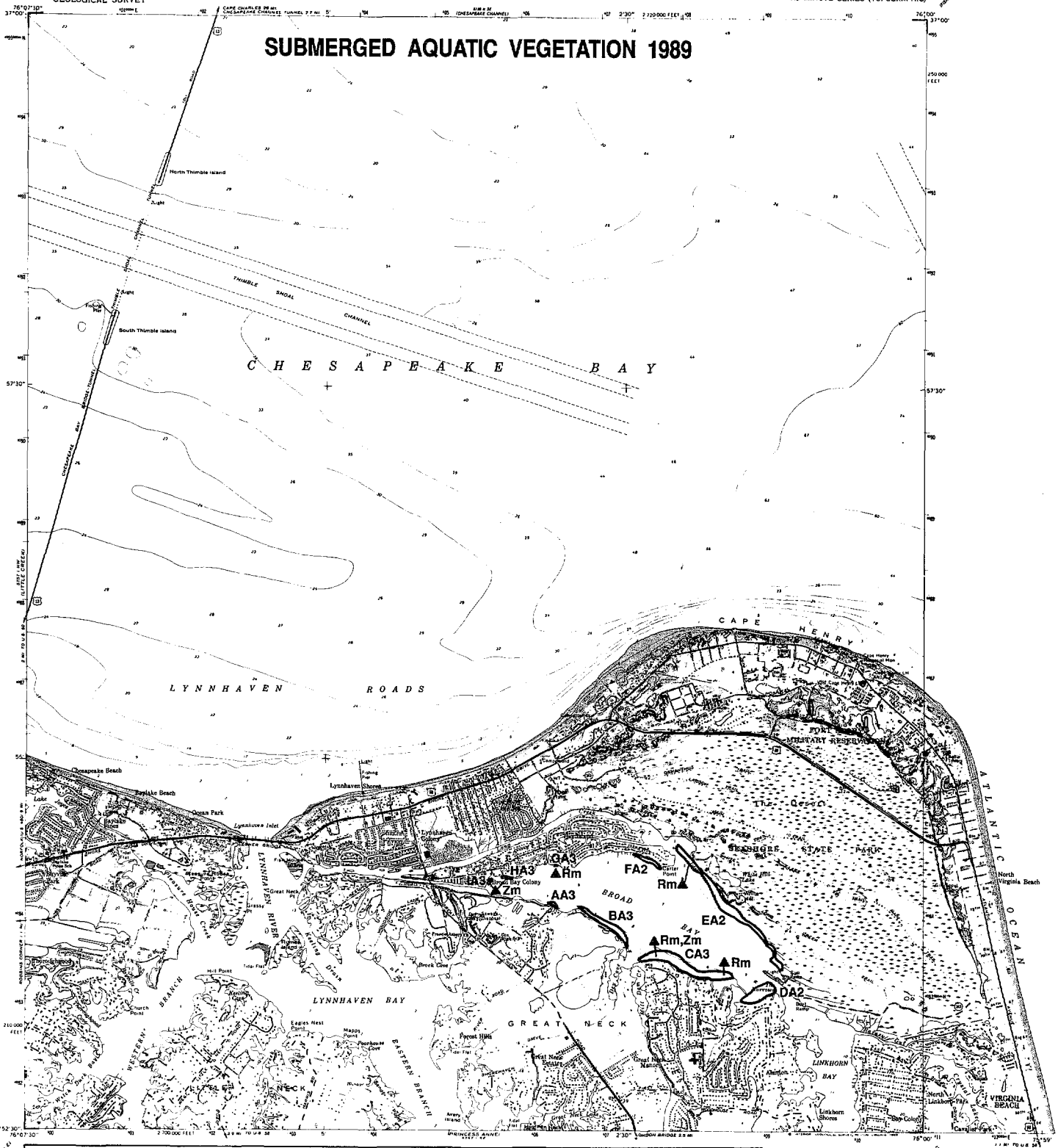
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES
HAMPTON QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION 1989
DA3
EA2
CA4
BA4
AA4
Zm
GA4
HA4
FA2
IA4
LA4
JA4
Rm,Zp,Zm,Ppf,Ppc
MA4
KA2
NA4
Zm
LANGLEY AIR FORCE BASE
HAMPTON
HAMPTON ROADS
FORT MONROE MILITARY RESERVATION
CHESAPEAKE BAY
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)
Tn Trapa natans (water chestnut)
U Unknown species composition
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)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
USGS Survey
USF & WS Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
VIRGINIA INSTITUTE OF MARINE SCIENCE
DATES FLOWN
6-11-89
7-1-89
HAMPTON, VA
147

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES

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

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-12-89

CAPE HENRY, VA

152

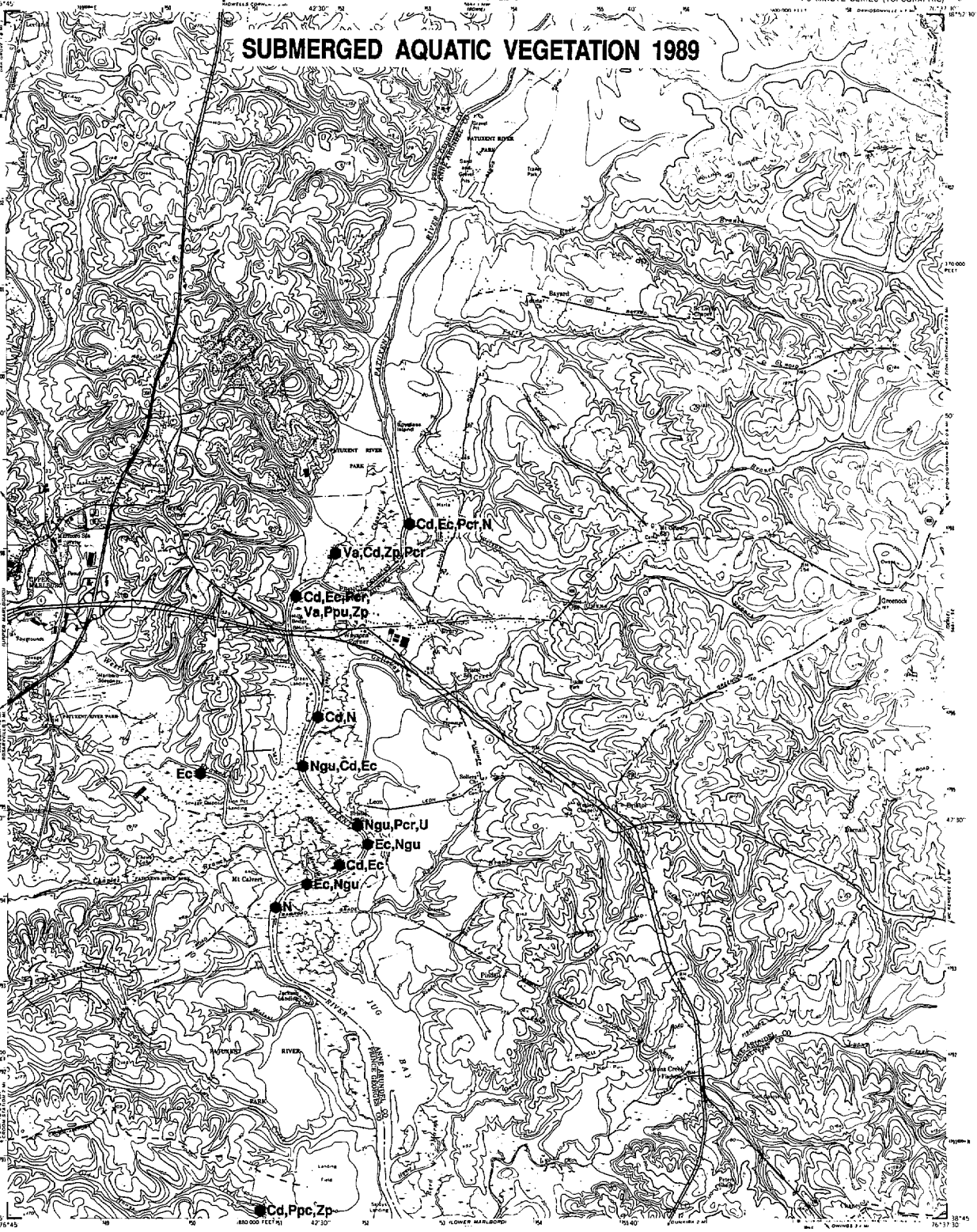
1964
PHOTOREVISED 1979
DMA 5757 I NE-SERIES V834

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

BRISTOL QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
9-3-89

BRISTOL, MD
159

1957
PHOTOREVISED 1979
AMS 5861 I SW SERIES V833

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

PORT TOBACCO QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989

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)	Nm	*Najas minor* (slender naiad)		
Tn	*Trapa natans* (water chestnut)				
U	Unknown species composition				

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

N

SCALE 1:24,000

5 0 1 MILE

1 .5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATES FLOWN
10-5-89 Upper Potomac R.
8-31-89 Port Tobacco Cr.

PORT TOBACCO, MD
161

BATHYMETRY ADDED 1982
DMA 5561 II SE SERIES V833

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

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

SUBMERGED AQUATIC VEGETATION 1989

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)
Tn	*Trapa natans* (water chestnut)
U	Unknown species composition
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)
Nm	*Najas minor* (slender naiad)

N

SCALE 1:24,000

1 MILE

1 KILOMETER

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-12-89

BERLIN, MD
167

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

OCEAN CITY QUADRANGLE
MARYLAND-WORCESTER CO
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989

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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

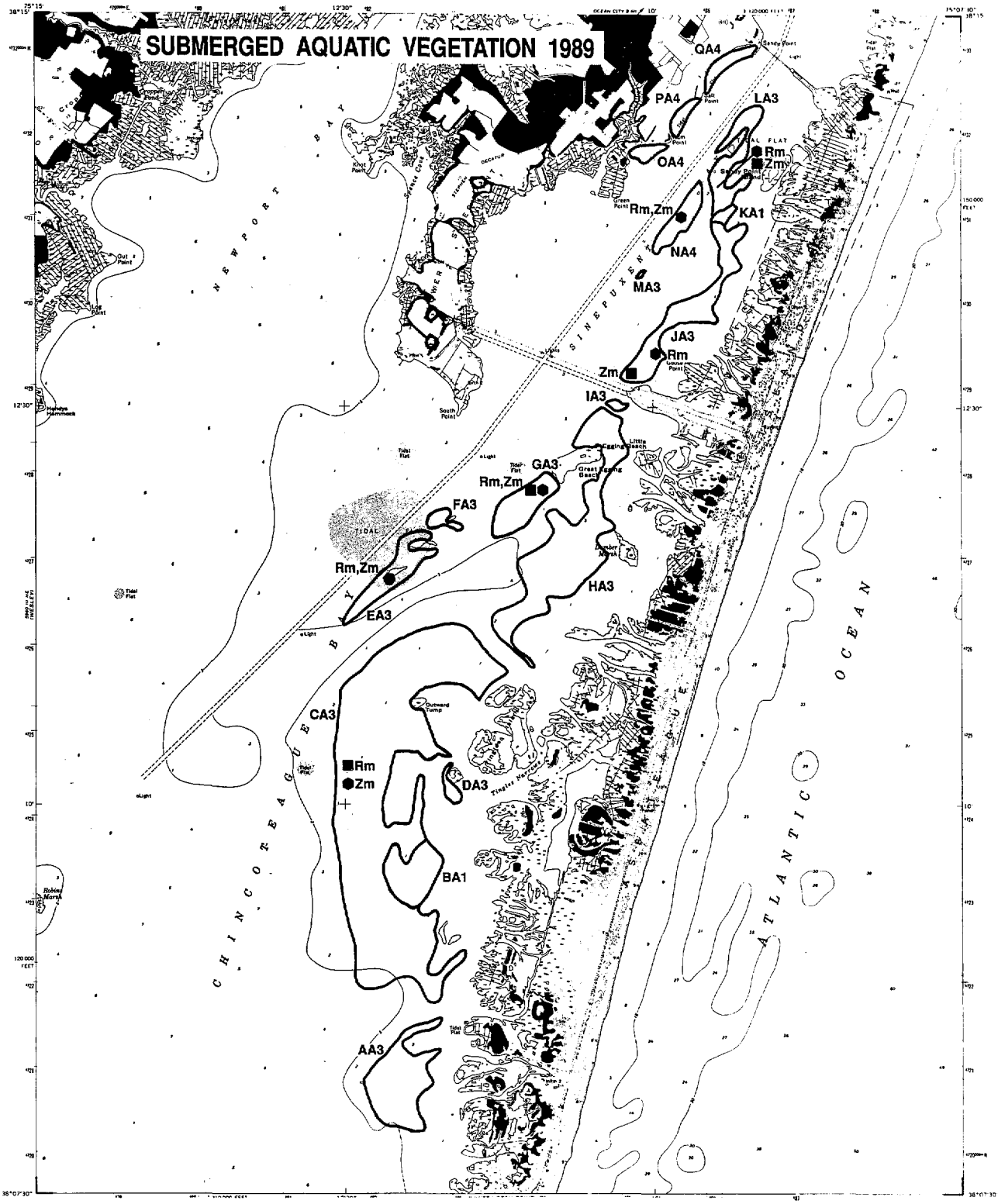
- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

DATE FLOWN
6-12-89

OCEAN CITY, MD
168

VIRGINIA INSTITUTE OF MARINE SCIENCE



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)
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Ec	*Elodea canadensis* (common elodea)	C	*Chara sp.* (muskgrass)
Va	*Vallisneria americana* (wild celery)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 MILE

1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-12-89

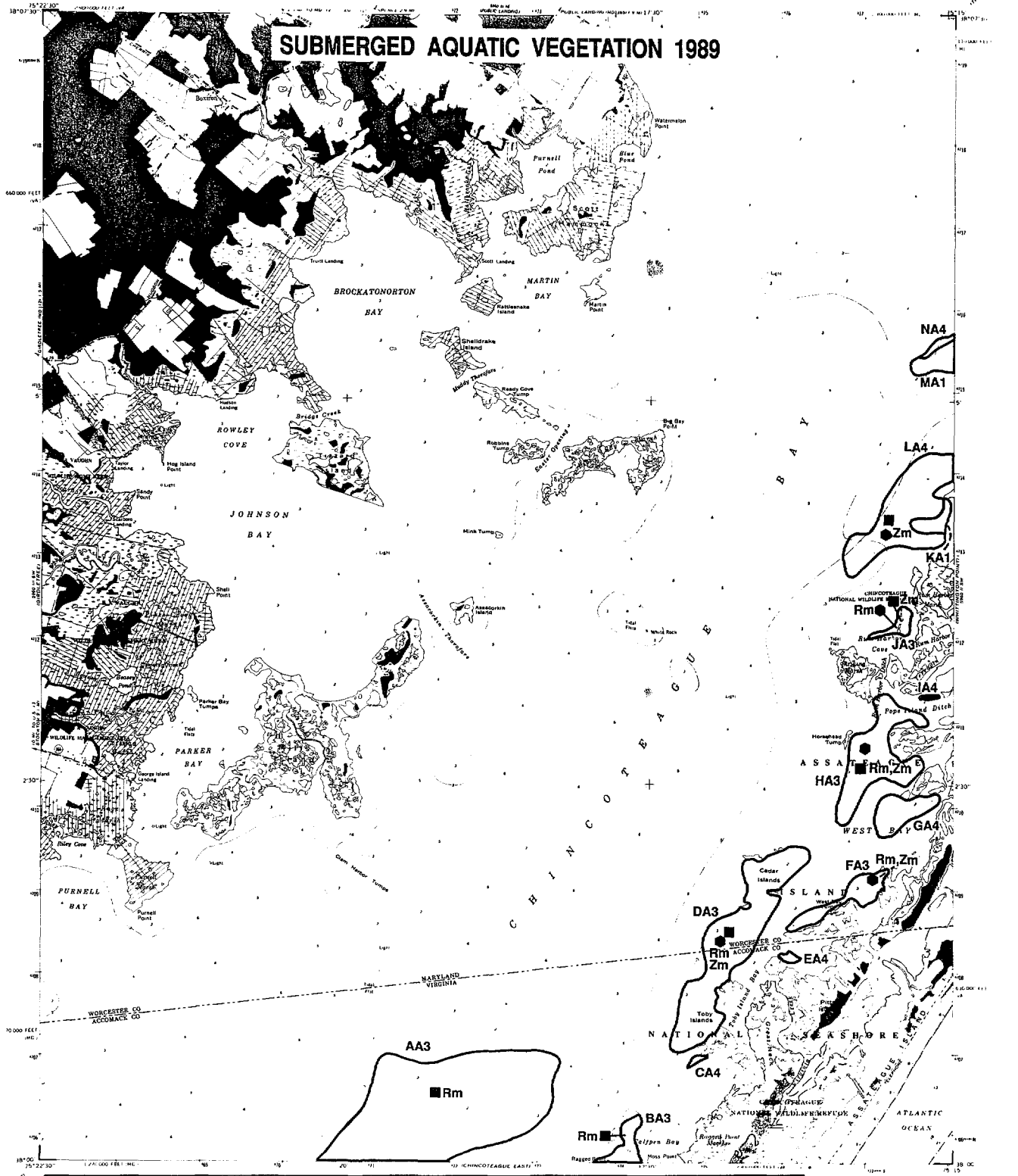
TINGLES ISLAND, MD
170

1964
PHOTOREVISED 1972
AMS 5960 II NW SERIES V833

UNITED STATES
DEPARTMENT OF THE INT
GEOLOGICAL SURVE

BOXIRON QUADRANGLE
MARYLAND-VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION 1989



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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 MILE

1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-12-89

BOXIRON, MD-VA
172 VA.

1964
PHOTOREVISED 1980

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

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

SUBMERGED AQUATIC VEGETATION 1989

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)	Nm	*Najas minor* (slender naiad)		
Tn	*Trapa natans* (water chestnut)				
U	Unknown species composition				

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

N

SCALE 1:24,000

5 0 1 MILE

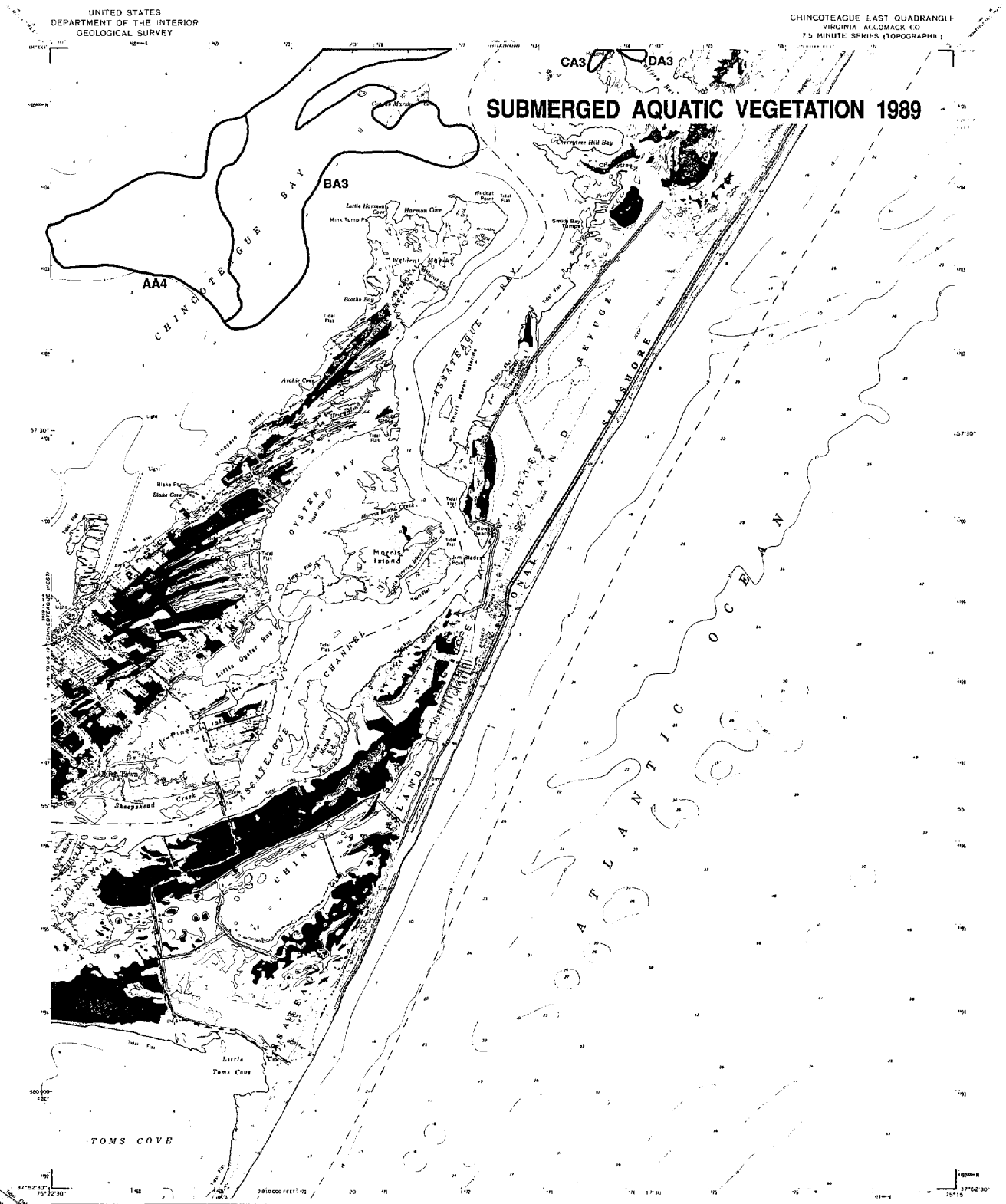
1 .5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-12-89

WHITTINGTON POINT, MD-VA
173

1964
PHOTOREVISED 1980
DMA 1960 II SW 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	*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)	Nm	*Najas minor* (slender naiad)
Tn	*Trapa natans* (water chestnut)		
U	Unknown species composition		

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-12-89

CHINCOTEAGUE
EAST, VA
175

1965
PHOTOREVISED 1986

APPENDIX D

1989 SAV Bed Areas And Density Totals For Each Topographic Quadrangle.

APPENDIX D

Number Of Square Meters Of SAV For Individual Beds And Totals For Density Categories By Topographic Quadrangle. (See Maps In Appendix C For Location Of Each Bed. Quadrangles Are Listed Numerically By VIMS Chart Number. Slight Differences In Quad Totals From Table 4 Are Due To Rounding.)

ABERDEEN MD.
VIMS CHART # 002

AA3	2834
BA2	3769
TOTAL AREA	
DENSITY 1 =	0
DENSITY 2 =	3769
DENSITY 3 =	2834
DENSITY 4 =	0
TOTAL =	6603

HAVRE DE GRACE MD.
VIMS CHART # 003

AA1	16380000
BA1	75140
CA1	16840
DA1	6120
EA1	583000
FA1	46910
GA2	12630
HA1	230200
IA2	99260
JA2	39590
KA2	32940
LA2	2753
MA2	10770
NA2	6982
OA2	3361
PA2	3221
QA2	822
RA2	3111
SA3	22530
TA2	10270
UA2	7775
VA2	3622
WA2	91290
XA3	14650
YA3	2550
ZA2	2343
AB3	144000
BB3	2645
CB3	1139
DB3	904
EB3	20650
FB3	2011
GB2	34810
HB3	14480
IB3	138700
JB2	26410
KB2	249700
LB2	6374
MB2	1046
NB2	3135
OB3	4610
TOTAL AREA	
DENSITY 1 =	17338207
DENSITY 2 =	652215
DENSITY 3 =	368869
DENSITY 4 =	0
TOTAL =	18359236

NORTH EAST MD.
VIMS CHART # 004

AA1	241300
BA1	49040
CA1	46440
DA1	72010
EA2	123000
FA2	171500
GA2	351800

TOTAL AREA

DENSITY 1 =	408790
DENSITY 2 =	646300
DENSITY 3 =	0
DENSITY 4 =	0
TOTAL =	1055090

ELKTON MD.-DEL.
VIMS CHART # 005

AA2	5932
BA2	51070

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	57002
DENSITY 3 =	0
DENSITY 4 =	0
TOTAL =	57002

SPESUTIE MD.
VIMS CHART # 009

AA2	747900
BA2	3285
CA2	39380
DA1	254600
EA1	659800
FA2	1736
GA2	4273
HA1	167600

TOTAL AREA

DENSITY 1 =	1082000
DENSITY 2 =	796574
DENSITY 3 =	0
DENSITY 4 =	0
TOTAL =	1878574

EARLEVILLE MD.
VIMS CHART # 010

AA2	13740
BA2	101100
CA2	50940
DA2	16630
EA1	64370
FA2	53980
GA1	68830
HA2	100900
IA1	43610
JA1	318900
KA1	21020
LA2	25390
MA1	87710
NA4	11550

TOTAL AREA

DENSITY 1 =	604440
DENSITY 2 =	362680
DENSITY 3 =	0
DENSITY 4 =	11550
TOTAL =	978670

MIDDLE RIVER MD.
VIMS CHART # 013

AA1	5460
BA1	14480
CA2	2666
DA2	1498
EA1	12020

TOTAL AREA

DENSITY 1 =	31960
DENSITY 2 =	4164
DENSITY 3 =	0
DENSITY 4 =	0
TOTAL =	36124

GUNPOWDER NECK MD.
VIMS CHART # 014

AA2	29370
BA3	3370
CA2	8611
DA4	12420
EA3	10290
FA3	3062
GA3	62400
HA4	5743
IA2	36970
JA3	7014
KA3	36760
LA3	24000
MA3	33370
NA3	11990
OA3	2468
PA2	5325
QA2	21510
RA2	12130
SA3	14930
TA1	3817

TOTAL AREA

DENSITY 1 =	3817
DENSITY 2 =	113916
DENSITY 3 =	209654
DENSITY 4 =	18163
TOTAL =	345550

HANESVILLE MD.
VIMS CHART # 015

AA2	11150
BA3	23750
CA2	36320
DA1	55390

TOTAL AREA

DENSITY 1 =	55390
DENSITY 2 =	47470
DENSITY 3 =	23750
DENSITY 4 =	0
TOTAL =	126610

BETTERTON MD.
VIMS CHART # 016

AA2	1639
BA2	9221

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	10860
DENSITY 3 =	0
DENSITY 4 =	0
TOTAL =	10860

GALENA MD.
VIMS CHART # 017

AA3	26430
BA2	1459

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	1459
DENSITY 3 =	26430
DENSITY 4 =	0
TOTAL =	27889

SWAN POINT MD.
VIMS CHART # 020

AA2	15030
BA3	31660
CA2	3348
DA4	2373

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	18378
DENSITY 3 =	31660
DENSITY 4 =	2373
TOTAL =	52411

ROCK HALL MD.
VIMS CHART # 021

AA2	53650
BA3	37960
CA3	11260
DA4	43670
EA4	1542
FA4	12880
GA2	5522
HA2	25100

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	84272
DENSITY 3 =	49220
DENSITY 4 =	58092
TOTAL =	191584

LANGFORD CREEK MD.
VIMS CHART # 026

AA3	18030
BA3	55090
CA2	7769
DA4	8177
EA3	1396
FA3	8758
GA3	16910
HA3	2251
IA2	15210
JA3	141700
KA4	11930
LA4	9780
MA3	118800
NA1	73160
OA1	21920
PA2	5356
QA1	155200

RA2	18280
SA1	52910
TA4	52730
UA3	4363
VA3	4023
WA1	274800
XA2	20740
YA3	123500
ZA2	5858
AB2	14490
BB1	39480
CB2	88690
DB2	17750

TOTAL AREA

DENSITY 1 =	617470
DENSITY 2 =	194143
DENSITY 3 =	494821
DENSITY 4 =	82617
TOTAL =	1389051

KENT ISLAND MD.
VIMS CHART # 032

AA3	176300
BA1	116000
CA3	6815
DA1	29350
EA4	25620
FA2	406000
GA3	2447
HA3	2762
IA2	20070
JA3	11250
KA3	4737
LA3	9274
MA3	3411
NA2	98930
OA2	56580
PA2	167500
QA3	241200
RA2	154500
SA3	109400
TA2	456600
UA2	101200
VA2	52970
WA2	155400
XA2	10200
YA2	589900
ZA1	39760
AB4	55890
BB1	166500

TOTAL AREA

DENSITY 1 =	351610
DENSITY 2 =	2269850
DENSITY 3 =	567596
DENSITY 4 =	81510
TOTAL =	3270566

QUEENSTOWN MD.
VIMS CHART # 033

AA2	46770
BA2	20850
CA1	50300
DA2	67020
EA4	238200
FA2	45190
GA4	54470
HA2	571200
IA2	56020
JA2	35750
KA2	18360
LA2	10080
MA3	15820
NA3	40380
OA3	12840

TOTAL AREA

DENSITY 1 =	50300
DENSITY 2 =	871240
DENSITY 3 =	69040
DENSITY 4 =	292670
TOTAL =	1283250

ALEXANDRIA VA.-D.C.-MD.
VIMS CHART # 034

AA2	37690
BA4	6155
CA2	7750
DA4	13340
EA4	14040
FA3	4738
GA4	314900
HA2	551600
IA4	130200
JA1	199300
KA4	173200
LA4	3810
MA2	3687
NA3	9069
OA2	5635
PA2	46800
QA2	53000
RA4	38630
SA2	3079
TA4	7512
UA1	12190
VA4	23100
WA4	32650
XA4	3289
YA4	34550
ZA4	4920
AB4	911500
BB4	5276
CB4	12070
DB2	288700
EB4	402800
FB3	3860
GB4	181700
HB2	143600

TOTAL AREA

DENSITY 1 =	211490
DENSITY 2 =	1141541
DENSITY 3 =	17667
DENSITY 4 =	2313642
TOTAL =	3684340

CLAIBORNE MD.
VIMS CHART # 036

AA2	73550
BA2	97560
CA3	305900
DA2	34630
EA3	29520
FA4	40970
GA2	7159
HA3	21410
IA4	5744
JA3	24040
KA3	23960
LA4	4871
MA4	3977
NA3	12650
OA3	33980
PA4	5116
QA4	4017
RA4	57340
SA4	46310
TA4	7150
UA4	4108
VA4	246600
WA3	14030
XA3	2049
YA3	30290
ZA3	35020
AB1	7438
BB3	45620
CB3	112800
DB2	105900
EB1	537100
FB2	122300
GB4	101700
HB4	79750
IB2	16970
JB3	32220
KB3	17890
LB4	3127
MB4	1433
NB4	3000
OB3	4924
PB4	21880
QB3	14510

RB3	14780
SB3	7658
TB2	9008
UB2	390800
VB3	10520
WB3	20190
XB4	140200
YB2	233700
ZB2	276200
AC2	49600
BC2	54870
CC1	208700

TOTAL AREA

DENSITY 1 =	753238
DENSITY 2 =	1472247
DENSITY 3 =	813961
DENSITY 4 =	777293
TOTAL =	3816739

ST. MICHAELS MD.
VIMS CHART # 037

AA4	4760
BA4	63370
CA4	4753
DA4	5479
EA2	379900
FA2	312600
GA2	258300
HA2	650300
IA2	32860
JA3	12160

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	1633960
DENSITY 3 =	12160
DENSITY 4 =	78362
TOTAL =	1724482

EASTON MD.
VIMS CHART # 038

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	0
DENSITY 3 =	0
DENSITY 4 =	0
TOTAL =	0

FORT BELVOIR VA.-MD.
VIMS CHART # 039

AA2	8053
BA4	66140
CA4	50430
DA3	32230
EA3	16840
FA1	3750
GA1	280800
HA2	40650
IA4	54260
JA3	81660

TOTAL AREA

DENSITY 1 =	284550
DENSITY 2 =	48703
DENSITY 3 =	130730
DENSITY 4 =	170830
TOTAL =	634813

MT. VERNON VA.-MD.
VIMS CHART # 040

AA3	225600
BA4	1385000
CA2	50430
DA3	96330
EA4	4984
FA4	18050
GA3	60320

HA4	29970
IA2	56910
JA4	41900
KA4	40310
LA2	37960
MA3	72580
NA2	107100
OA2	3323
PA4	33500
QA4	261100
RA2	246900
SA4	157000
TA2	201200
UA2	152500
VA4	36140
WA2	27390

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	883713
DENSITY 3 =	454830
DENSITY 4 =	2007954
TOTAL =	3346497

TILGHMAN MD.
VIMS CHART # 043

AA2	96370
BA2	13960
CA2	84450
DA2	53120
EA2	18030
FA2	74550
GA2	12700
HA2	7207
IA2	13020
JA2	79120
KA2	33330
LA2	47190
MA3	146400
NA2	325700
OA1	175200
PA3	144900
QA3	598600
RA2	277400
SA3	25790
TA3	29150
UA3	54770

TOTAL AREA

DENSITY 1 =	175200
DENSITY 2 =	1136147
DENSITY 3 =	999610
DENSITY 4 =	0
TOTAL =	2310957

OXFORD MD.
VIMS CHART # 044

AA3	203600
BA2	39110
CA2	59100
DA2	169800
EA2	66570
FA2	85370
GA3	112900
HA2	62840
IA2	55770
JA3	48930
KA2	55400

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	593960
DENSITY 3 =	365430
DENSITY 4 =	0
TOTAL =	959390

QUANTICO VA.-MD.
VIMS CHART # 047

AA4	271500
BA2	11220
CA4	49190
DA2	14420
EA4	2817
FA2	102700

GA1	11610
HA4	623000
IA2	49120
JA4	836500
KA4	73860
LA2	16390
MA4	12380
NA4	95800
OA2	49300
PA4	57380
QA1	190500
RA2	79090
SA4	37230
TA4	103500
WA4	1631000
XA1	445300
YA4	76740
ZA2	98760
AB4	186400
BB2	79280
UA4	119700
VA1	6923

TOTAL AREA

DENSITY 1 =	654333
DENSITY 2 =	500280
DENSITY 3 =	0
DENSITY 4 =	4176997
TOTAL =	5331610

INDIAN HEAD MD.-VA.
VIMS CHART # 048

AA2	116800
BA4	375900
CA1	320800
DA4	35870
EA4	33450
FA1	24180
GA3	64120
HA4	19740
IA4	12120
JA4	21370
KA4	8083
LA3	19120
MA3	87900
NA4	262000
OA1	123600
PA4	90130
QA3	44070
RA4	78050
SA2	24410
TA4	78510

TOTAL AREA

DENSITY 1 =	468580
DENSITY 2 =	141210
DENSITY 3 =	215210
DENSITY 4 =	1015223
TOTAL =	1840223

HUDSON MD.
VIMS CHART # 051

AA3	4073
BA4	13830
CA3	28860
DA3	17290
EA3	41190
FA3	2588000
GA3	388000
HA3	232600

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	0
DENSITY 3 =	3300013
DENSITY 4 =	13830
TOTAL =	3313843

CHURCH CREEK MD.
VIMS CHART # 052

AA3	5943
BA3	1674
CA2	16490
DA3	5879
EA4	144300
FA3	15630

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	16490
DENSITY 3 =	29126
DENSITY 4 =	144300
TOTAL =	189916

WIDEWATER VA.-MD.
VIMS CHART # 055

AA1	119600
BA2	17420
CA4	46340
DA1	162400
EA2	91020
FA4	85390
GA1	69370
HA4	2370000
IA3	172700
JA4	43890
KA4	164700
LA1	15340
MA4	397500
NA1	30320
OA4	642600
PA1	98470
QA2	36470
RA2	102400

TOTAL AREA

DENSITY 1 =	495500
DENSITY 2 =	247310
DENSITY 3 =	172700
DENSITY 4 =	3750420
TOTAL =	4665930

NANJEMOY MD.
VIMS CHART # 056

AA4	319800
BA3	79240
CA4	26340
DA4	12800
EA4	28750
FA1	2868
GA4	37690
HA4	30310
IA4	517900
JA2	40740
KA3	53480
LA2	60940
NA4	2279
OA2	35370
PA4	7927
RA4	39190
SA4	22590
TA2	23680
MA4	51170
QA4	48110
UA4	54880

TOTAL AREA

DENSITY 1 =	2868
DENSITY 2 =	160730
DENSITY 3 =	132720
DENSITY 4 =	1199736
TOTAL =	1496054

MATHIAS POINT MD.-VA.
VIMS CHART # 057

AA1	38530
BA4	325000
CA2	32010
DA3	53820
EA4	29570
FA2	1406
GA4	12590
HA2	10300
IA3	3965
JA4	9787
KA4	22610
LA1	19920
MA4	45830
NA4	2297
OA2	23160
PA4	29170
QA3	73980
RA4	61290
SA2	16710
TA4	20420
UA4	73940
VA2	19300
WA1	7433
XA4	6517
YA4	2620
ZA4	1663
AB4	2594
BB3	10820
CB4	3167
DB2	5575
EB4	13970
FB3	57200
GB2	103800
HB4	918800
IB2	152100
JB4	106200
KB2	10390
LB4	151100
MB4	55270
NB1	12290
OB4	148800
PB4	4146
QB2	8171
RB4	275800
SB1	11020
TB4	18980
UB3	25990
VB4	382200
WB2	22120
XB1	12260
ZB2	8052
YB2	2355

TOTAL AREA

DENSITY 1 =	101453
DENSITY 2 =	415449
DENSITY 3 =	225775
DENSITY 4 =	2724331
TOTAL =	3467008

POPES CREEK MD.
VIMS CHART # 058

AA1	35770
BA3	16260
CA1	5282
DA1	4668

TOTAL AREA

DENSITY 1 =	45720
DENSITY 2 =	0
DENSITY 3 =	16260
DENSITY 4 =	0
TOTAL =	61980

COVE POINT MD.
VIMS CHART # 061

AA2	4774

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	4774
DENSITY 3 =	0
DENSITY 4 =	0
TOTAL =	4774

TAYLORS ISLAND MD.
VIMS CHART # 062

AA3	53850
BA2	92690
CA4	15120

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	92690
DENSITY 3 =	53850
DENSITY 4 =	15120
TOTAL =	161660

GOLDEN HILL MD.
VIMS CHART # 063

AA1	3220
BA4	3624
CA2	8081
DA3	8098
EA4	1892

TOTAL AREA

DENSITY 1 =	3220
DENSITY 2 =	8081
DENSITY 3 =	8098
DENSITY 4 =	5516
TOTAL =	24915

KING GEORGE VA.-MD.
VIMS CHART # 065

AA2	16380
BA4	182800
CA3	109300
DA1	32870
EA4	167400
FA1	13720

TOTAL AREA

DENSITY 1 =	46590
DENSITY 2 =	16380
DENSITY 3 =	109300
DENSITY 4 =	350200
TOTAL =	522470

DAHLGREN VA.-MD.
VIMS CHART # 066

AA4	17420
BA4	2085
CA4	23880
DA2	3980
EA1	13270
FA3	33590
GA2	5090
HA3	8709
IA3	6657
JA1	101300
KA2	200800
LA4	77270
MA2	20080
NA3	105900
OA4	4869
PA4	20670
QA4	5946
RA4	1737

TOTAL AREA

DENSITY 1 =	114570
DENSITY 2 =	229950
DENSITY 3 =	154856
DENSITY 4 =	153877
TOTAL =	653253

COLONIAL BEACH NORTH, VA.-MD.
VIMS CHART # 067

AA4	41720
BA4	4236
CA4	3206
DA4	6505
EA2	31340
FA4	4524
GA4	12440
HA1	3306
IA4	4469
JA1	5695
KA4	23600
LA2	37660
MA3	39220
NA2	25900
OA4	31810
PA3	5573
QA2	3365

TOTAL AREA

DENSITY 1 =	9001
DENSITY 2 =	98265
DENSITY 3 =	44793
DENSITY 4 =	132510
TOTAL =	284569

SOLOMONS ISLAND MD.
VIMS CHART # 071

AA3	29600

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	0
DENSITY 3 =	29600
DENSITY 4 =	0
TOTAL =	29600

BARREN ISLAND MD.
VIMS CHART # 072

AA4	5432
BA2	92880
CA4	109500
DA2	10660
EA2	35210
FA2	109700
GA4	360000
HA2	81490
IA4	2188000
JA3	21380

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	329940
DENSITY 3 =	21380
DENSITY 4 =	2662932
TOTAL =	3014252

HONGA MD.
VIMS CHART # 073

AA1	21280
BA1	24030
CA4	31640
DA3	48440
EA3	10260
FA3	19810
GA2	13400
HA3	42320
JA3	9783
KA3	22420
LA4	88690
MA2	3104
NA3	35820
OA4	180300
PA2	30210
QA2	73200
RA4	982800
SA2	108100
TA4	405400
UA4	234100
VA3	2754
WA2	160900
XA3	3324
YA2	5834
ZA3	2422
AB2	7066
BB3	3488
CB3	17200
DB4	3449
EB2	16840
FB2	230900
GB4	518800
HB2	1018000
IB4	28980
JB4	65490
KB3	16720
LB3	66550
MB2	41490
NB3	69820
OB2	5852
PB3	51640
QB3	14380
RB4	2213000
SB2	95690
TB2	108000
UB4	161400
VB2	20920
WB4	307700
XB2	20090
YB4	2540
ZB3	8118
AC3	52680
IA2	7906

TOTAL AREA

DENSITY 1 =	45310
DENSITY 2 =	1967502
DENSITY 3 =	497949
DENSITY 4 =	5224289
TOTAL =	7735050

WINGATE MD.
VIMS CHART # 074

AA4	7365
BA4	4138
CA4	306500
DA2	97020
EA2	23270
FA4	712800
GA2	175600
HA2	132700
IA3	123400
JA3	604900
KA2	4722
LA4	86570
MA3	1072000
NA1	134000
OA3	21120
PA2	19440
QA4	152400
RA4	15100

TOTAL AREA

DENSITY 1 =	134000
DENSITY 2 =	452752
DENSITY 3 =	1821420
DENSITY 4 =	1284873
TOTAL =	3693045

NANTICOKE MD.
VIMS CHART # 075

AA3	50160

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	0
DENSITY 3 =	50160
DENSITY 4 =	0
TOTAL =	50160

RICHLAND POINT MD.
VIMS CHART # 082

AA3	44960
BA4	181800
CA2	11100
DA2	2398

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	13498
DENSITY 3 =	44960
DENSITY 4 =	181800
TOTAL =	240258

BLOODSWORTH ISLAND MD.
VIMS CHART # 083

AA3	4515
BA2	11020
CA2	19330
DA2	10850
EA4	410300
FA4	33410
GA2	91640
HA4	2599000
IA2	81040
JA2	212200
KA4	280900
LA4	325600
MA4	730100
NA4	18230
OA4	170400
PA4	8964
QA4	30070
RA4	182300
SA2	3699
TA4	22070
UA4	492900
VA4	346100
WA2	20610
XA4	68680
YA2	46340
ZA4	635900
AB4	11420

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	496729
DENSITY 3 =	4515
DENSITY 4 =	6366344
TOTAL =	6867588

DEAL ISLAND MD.
VIMS CHART # 084

AA4	17050
BA2	2473
CA3	8916
DA3	8246
EA3	23400
FA3	58760
GA3	37960
HA3	9443
IA1	13850
JA2	3203
KA3	13000
LA2	26580
MA3	10140
NA3	19530
OA4	21280

TOTAL AREA

DENSITY 1 =	13850
DENSITY 2 =	32256
DENSITY 3 =	189395
DENSITY 4 =	38330
TOTAL =	273831

MONIE MD.
VIMS CHART # 085

AA3	119900
BA3	3758
CA3	5515
DA4	36250
EA3	1363
FA3	4492
GA3	7098

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	0
DENSITY 3 =	142126
DENSITY 4 =	36250
TOTAL =	178376

ST. GEORGE ISLAND MD.-VA.
VIMS CHART # 089

AA2	7580
BA4	20830

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	7580
DENSITY 3 =	0
DENSITY 4 =	20830
TOTAL =	28410

KEDGES STRAITS MD.
VIMS CHART # 091

AA4	64140
BA2	51480
CA4	158400
DA4	3088000
EA2	58690
FA2	21090
GA4	1315000
HA3	92050
IA2	206900
JA4	38010
KA4	426500
LA4	4905
MA3	10140
NA4	414200
OA4	675300
PA4	21200
QA4	382600
RA4	383900
SA3	17560
TA3	12350
UA1	68600
VA4	128700
WA4	97870
XA1	75360

TOTAL AREA

DENSITY 1 =	143960
DENSITY 2 =	338160
DENSITY 3 =	132100
DENSITY 4 =	7198725
TOTAL =	7812945

TERRAPIN SAND POINT MD.
VIMS CHART # 092

AA4	309000
BA1	71770
CA4	1683000
DA4	62300
EA4	7104
FA4	49070

TOTAL AREA

DENSITY 1 =	71770
DENSITY 2 =	0
DENSITY 3 =	0
DENSITY 4 =	2110474
TOTAL =	2182244

MARION MD.
VIMS CHART # 093

AA2	23220
BA2	22050
CA2	7401
DA3	6181
EA4	75060
FA2	10480
GA3	21630
HA3	18780
IA4	4659
JA2	47280
KA4	56970
LA2	18050
MA3	27540
NA4	173200
OA2	47760
PA4	233300
QA1	28270
RA3	31250
SA2	10850
TA4	4804
UA4	11110
VA4	12500
WA4	26660
XA3	48670
YA2	33700
ZA4	21490
AB2	43880
BB4	67540
CB2	15370
DB4	28640
EB1	12430
FB3	47200
GB4	233700
HB3	27700
JB4	1312
KB4	55910
LB3	7328
MB2	14470
NB3	162100
OB2	17140
PB4	37480
QB4	5862
RB3	58140
SB2	17120
TB3	76370
UB2	8565
VB2	8796
WB4	2085
XB3	10810
IB4	15230

TOTAL AREA

DENSITY 1 =	40700
DENSITY 2 =	346132
DENSITY 3 =	543699
DENSITY 4 =	1067512
TOTAL =	1998043

EWELL MD.-VA.
VIMS CHART # 099

AA4	199400
BA2	127500
CA4	128100
DA2	21000
EA4	857500
FA2	226000
GA4	276600
HA2	53370
IA3	361800
JA2	91250
KA3	50270
LA3	45580
MA2	113600
NA3	24350
OA3	126400
PA4	1905000
QA3	440800
RA2	207600
TA3	2803000
VA1	1775000
WA2	4551
SA4	13540000
UA2	860600

TOTAL AREA

DENSITY 1 =	1775000
DENSITY 2 =	1705471
DENSITY 3 =	3852200
DENSITY 4 =	16906599
TOTAL =	24239267

GREAT FOX ISLAND MD.-VA.
VIMS CHART # 100

AA4	6694000
BA2	254900
CA1	89640
DA4	173200
EA3	234200
FA4	118900
GA4	609400
HA4	67440
IA1	74330
JA4	187200
KA4	2664000
LA3	23700
MA2	7925
NA2	45240
OA4	222400
PA3	118000
QA1	15160
RA4	190500
SA2	726900
TA4	1294000
UA4	7003

TOTAL AREA

DENSITY 1 =	179130
DENSITY 2 =	1034965
DENSITY 3 =	375900
DENSITY 4 =	12228041
TOTAL =	13818035

CRISFIELD MD.-VA.
VIMS CHART # 101

AA4	558700
BA1	42720
CA4	36630
DA3	194600
EA3	150200
FA1	17310
GA3	55340
HA4	144600
IA4	94570
JA3	15300
KA3	21870
LA2	31900
MA3	6044
NA3	22620
OA3	11210
PA2	30550
QA2	8145

RA3	13460
SA3	7024
TA4	10650
UA3	50370
VA3	27120
WA4	95440
XA4	66350
YA4	90700
ZA3	22480
AB4	27760
BB4	29600
CB3	17630
DB3	24140
EB3	52320
FB4	9576
GB3	8902
HB3	24540

TOTAL AREA

DENSITY 1 =	60030
DENSITY 2 =	70595
DENSITY 3 =	725170
DENSITY 4 =	1164576
TOTAL =	2020371

SAXIS VA.-MD.
VIMS CHART # 102

AA3	4360
BA4	16420

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	0
DENSITY 3 =	4360
DENSITY 4 =	16420
TOTAL =	20780

REEDVILLE VA.
VIMS CHART # 106

AA4	2460
BA4	39000
CA2	32900
DA2	9794
EA3	8486
FA2	50330
GA4	646900
HA2	112700
IA3	309300
JA2	6411
KA2	11160
LA2	5044
MA2	20270
NA2	6466
OA3	19580
PA3	37670
QA4	260300

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	255075
DENSITY 3 =	375036
DENSITY 4 =	948660
TOTAL =	1578771

TANGIER ISLAND VA.
VIMS CHART # 107

AA3	518900
BA4	1221000
CA2	175600
EA3	97470
FA4	345900
GA2	259000
HA4	147800
IA2	58630
JA2	298700
KA4	1379000
LA4	2458000

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	791930
DENSITY 3 =	616370
DENSITY 4 =	5551700
TOTAL =	6960000

CHESCONESSEX VA.
VIMS CHART # 108

AA2	50740
BA3	13530
CA3	36190
DA4	151800
EA4	11770
FA2	14400
GA4	18310
HA2	4456
IA4	344800
JA1	42560
KA3	498500
LA4	22070
MA4	274200
NA3	143500
OA1	28050
PA4	141000
QA2	42950
RA1	17950
SA4	351000
TA4	365900
UA2	27300
VA3	123900
WA4	769000
XA2	53720
YA1	255400
ZA4	495000
AB2	228000
BB2	210600
CB4	464500
DB2	154000
EB1	220200
FB4	207800
GB2	115000
HB4	24300
IB1	337200
JB4	710600
KB4	86690
LB2	15450
MB4	126300
NB3	22100
OB3	125400
PB3	2375000

TOTAL AREA

DENSITY 1 =	901360
DENSITY 2 =	916616
DENSITY 3 =	3338120
DENSITY 4 =	4565040
TOTAL =	9721136

PARKSLEY VA.
VIMS CHART # 109

AA4	6016
BA4	26080
CA4	10850
DA3	23210
EA4	6943
FA4	10480
GA2	31010
HA4	29400
IA4	5338
JA4	75930
KA4	19500
LA3	138200
MA2	12380
NA2	16220
OA4	9009
PA3	61930
QA3	104100
RA3	8405
SA3	6580
TA3	116300
UA3	30680
VA4	35800

WA3	110800
XA4	23450
YA4	18390
ZA3	13970
AB3	2091000
BB3	88910
CB3	17900
DB2	40210
EB3	12940

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	99820
DENSITY 3 =	2824925
DENSITY 4 =	277186
TOTAL =	3201931

URBANNA VA.
VIMS CHART # 110

AA2	314700
BA2	664500
CA2	845100
DA3	157800
EA3	24490

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	1824300
DENSITY 3 =	182290
DENSITY 4 =	0
TOTAL =	2006590

IRVINGTON VA.
VIMS CHART # 111

AA3	17630
BA4	46220
CA4	21840
DA3	145100
EA1	45910
FA2	233400
GA3	652800
HA1	51490
IA4	10980
JA2	44240
KA3	41670
LA3	32150
MA3	12100
NA3	58600
OA3	17650
PA3	7165
QA4	20110
RA2	3845
SA3	9636
TA3	17000
UA4	4420
VA3	11150
WA3	37640
XA3	124700
YA3	68460
ZA3	149900
AB2	42030
BB4	23550
CB1	33150
DB2	26880
EB4	328000
FB2	114900

TOTAL AREA

DENSITY 1 =	130550
DENSITY 2 =	465295
DENSITY 3 =	1403351
DENSITY 4 =	455120
TOTAL =	2454316

FLEETS BAY VA.
VIMS CHART # 112

AA1	566500
BA2	140200
CA3	166400
DA2	5851
EA3	277500
FA1	186000
GA3	151900

HA2	236500
IA3	12490
JA4	25650
KA4	15650
LA4	3872
MA3	6048
NA3	10540
OA4	40770
PA3	54840
QA2	52250
RA4	3355
SA2	5777
TA3	630400
UA2	18900
VA4	29560
WA3	10740
XA3	7708
YA3	4774
ZA3	4005
AB3	18650
BB4	13640
CB3	94040
DB3	21970
EB2	194000
FB3	75770
GB1	40060
HB1	23130
IB3	63420
JB3	3529
KB3	35000
LB4	9785
MB3	38240
NB3	41490
OB3	4993

TOTAL AREA

DENSITY 1 =	815690
DENSITY 2 =	653478
DENSITY 3 =	1734447
DENSITY 4 =	142282
TOTAL =	3345897

NANDUA CREEK VA.
VIMS CHART # 113

AA2	41270
BA3	114900
CA4	313900
DA2	698100
EA1	298500
FA4	591800
GA4	3000
HA4	110900
IA1	14770
JA3	5564
KA2	74810
LA4	147900
MA1	1647000

TOTAL AREA

DENSITY 1 =	1960270
DENSITY 2 =	814180
DENSITY 3 =	120464
DENSITY 4 =	1167500
TOTAL =	4062414

PUNGOTEAGUE VA.
VIMS CHART # 114

AA3	8515
BA3	47600
CA4	22880
DA3	51420
EA4	78350
FA2	8481
GA2	73980
HA3	9935
IA4	280700
JA3	5078
KA1	141600
LA4	3431000
MA1	347900
NA2	1503000
OA2	55440
PA4	24070

QA4	58060
RA1	58620
SA4	210600
TA2	98840
UA1	63240
VA3	150400
WA1	93650
XA4	20260
YA1	16800
ZA4	33440
AB4	5468
BB4	7024
CB3	66830
DB3	115300
EB4	66500
FB4	55070
GB1	110500
HB3	73770
IB1	25550
JB4	20330
KB4	46840
LB3	14920
MB4	94650
NB2	322500
OB3	6605
PB2	24930

TOTAL AREA

DENSITY 1 =	857860
DENSITY 2 =	2087171
DENSITY 3 =	550373
DENSITY 4 =	4455242
TOTAL =	7950646

SALUDA VA.
VIMS CHART # 116

AA2	38690
BA1	40600
CA1	97630
DA1	13870

TOTAL AREA

DENSITY 1 =	152100
DENSITY 2 =	38690
DENSITY 3 =	0
DENSITY 4 =	0
TOTAL =	190790

WILTON VA.
VIMS CHART # 117

AA2	7081
BA2	8705
CA3	39600
DA2	4737
EA3	11440
FA3	89210
GA3	12220
HA4	92140
IA3	12020
JA2	62910
KA2	30830
LA2	59780

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	174043
DENSITY 3 =	164490
DENSITY 4 =	92140
TOTAL =	430673

DELTAVILLE VA.
VIMS CHART # 118

AA2	25650
BA3	214900
CA2	58490
DA1	35930
EA3	38710
FA3	25700
GA3	22860

HA2	49570
IA3	26760
JA2	5014
KA2	30670
LA2	1730
MA2	48890
NA2	11550
OA1	145900
PA2	12810
QA4	2240
RA3	34330
SA4	9957
TA4	8942

TOTAL AREA

DENSITY 1 =	181830
DENSITY 2 =	244374
DENSITY 3 =	363260
DENSITY 4 =	21139
TOTAL =	810603

JAMESVILLE VA.
VIMS CHART # 119

AA3	58160
BA2	13120
CA2	489400
DA4	613700
EA2	111400
FA4	167300
GA2	9428
HA2	66600
IA3	22760
JA3	10940
KA3	3663
LA3	27670
MA3	79230
NA3	31340
OA2	797600
PA4	125200
QA1	278500
RA2	172300
SA4	401300
TA4	23940
UA3	52100
VA2	215100
WA4	169700
XA2	72790
YA4	270100
ZA2	12990
AB4	128200
BB3	92030
CB1	21480
DB4	23470
EB3	12310
FB3	10010
GB2	39210
HB4	1492
IB3	6619
JB3	21950
KB3	311000

TOTAL AREA

DENSITY 1 =	299980
DENSITY 2 =	1999938
DENSITY 3 =	739782
DENSITY 4 =	1924402
TOTAL =	4964102

WARE NECK VA.
VIMS CHART # 122

AA2	334700
BA4	631800
CA3	195800
DA3	39550
EA3	146400
FA3	81620
GA2	160000
HA2	267100
IA4	410000
JA3	365300
KA2	53620
LA2	25720
MA3	69150

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	841140
DENSITY 3 =	897820
DENSITY 4 =	1041800
TOTAL =	2780760

MATHEWS VA.
VIMS CHART # 123

AA2	13290
BA4	237400
CA4	145500
DA3	46710
EA4	47840
FA2	29460
GA1	22170
HA3	8706
IA2	13140
JA3	5203
KA3	19690
LA4	12680
MA4	12700
NA2	6404
OA4	15440
PA2	42850
QA3	118700
RA3	36840
SA3	37510
TA3	9316
UA4	166100
VA4	45110
WA2	9052

TOTAL AREA

DENSITY 1 =	22170
DENSITY 2 =	114196
DENSITY 3 =	282675
DENSITY 4 =	682770
TOTAL =	1101811

FRANKTOWN VA.
VIMS CHART # 124

AA2	5040
BA4	109200
CA2	59590
DA3	30220
EA2	50850
FA4	805600
GA1	20000
HA4	26690
IA4	88450
JA4	96650
KA2	18600
LA4	255900
MA2	132800
NA2	92840
OA2	63280
PA3	1511000
QA2	45560
RA4	65310
SA2	60570
TA3	76640
UA3	5137
VA3	232700
WA4	72760
XA4	24360
YA4	72710
ZA4	11410
AB3	53250
BB3	15650
CB4	6548
DB3	88610
EB3	49850
FB2	16430
GB2	27050
HB3	67280

TOTAL AREA

DENSITY 1 =	20000
DENSITY 2 =	572610
DENSITY 3 =	2130337
DENSITY 4 =	1635588
TOTAL =	4358535

ACHILLES VA.
VIMS CHART # 131

AA1	13960
BA4	29120
CA4	45910
DA2	13340
EA4	38660
FA2	16460
GA4	1055000
HA2	196700
IA2	65780
JA4	38250
LA2	209200
MA2	57460
OA4	60550
PA4	5308
QA4	403300
RA2	368200
SA4	373400
TA1	22550
UA4	201600
VA2	391600
WA4	825500
XA2	168200
YA4	22940
ZA1	39270
AB2	134900
BB4	33730
CB4	4800
DB4	212300
EB3	18220
FB2	15400
GB4	21290
HB4	234300
IB2	32790
JB4	2102000
KB2	110800
LB4	17670
MB4	12210
NB2	17880
OB3	15770
PB2	3589
QB4	38400
RB4	556200
SB2	185400
KA4	1062000
NA3	87160

TOTAL AREA

DENSITY 1 =	75780
DENSITY 2 =	1987699
DENSITY 3 =	121150
DENSITY 4 =	7394438
TOTAL =	9579066

NEW POINT COMFORT VA.
VIMS CHART # 132

AA2	63860
BA2	272700
CA2	184800
DA3	267900
EA2	188500
FA2	87100
GA4	3875000
HA4	445500
IA1	73870
JA2	255100
KA3	127300
LA4	210200
MA2	557600
NA4	433000
OA2	98650
PA4	53660
QA4	193200
RA2	660100
SA1	120500
TA4	1022000
UA4	25310
VA1	61620
WA4	1357000
XA2	368600
YA4	6583
ZA3	59260
AB2	505100
BB4	852700
CB2	72750

DB2	22850
EB3	37250
FB4	88580
GB4	1165
HB4	88590

TOTAL AREA

DENSITY 1 =	255990
DENSITY 2 =	3337710
DENSITY 3 =	491710
DENSITY 4 =	8652486
TOTAL =	12737896

CAPE CHARLES VA.
VIMS CHART # 133

AA4	17240
BA2	175600
CA4	86760
DA4	637300
EA2	101500
FA2	115400
GA4	84660
HA4	24910
IA4	22580
JA4	8764
KA4	572900
LA1	810600
MA3	58420

TOTAL AREA

DENSITY 1 =	810600
DENSITY 2 =	392500
DENSITY 3 =	58420
DENSITY 4 =	1455114
TOTAL =	2716634

CHERITON VA.
VIMS CHART # 134

AA2	60870
BA4	159700
CA1	140100
DA4	261100
EA2	104000
FA4	6321

TOTAL AREA

DENSITY 1 =	140100
DENSITY 2 =	164870
DENSITY 3 =	0
DENSITY 4 =	427121
TOTAL =	732091

YORKTOWN VA.
VIMS CHART # 139

AA3	3292
BA2	12530

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	12530
DENSITY 3 =	3292
DENSITY 4 =	0
TOTAL =	15822

POQUOSON WEST VA.
VIMS CHART # 140

AA4	4441
BA4	19470
CA4	18750
DA4	105400
EA2	412200
FA4	500700
GA3	88830

HA2	24500
IA4	113200
JA2	22100
KA2	18120
LA4	31700
MA1	30840
NA4	127500
OA2	345600
PA3	478500
QA4	82000
RA4	469800
SA3	107100
TA2	158700
UA3	226400
VA4	659400
WA3	38120
XA3	6719
YA1	29900

TOTAL AREA

DENSITY 1 =	60740
DENSITY 2 =	981220
DENSITY 3 =	945669
DENSITY 4 =	2132361
TOTAL =	4119990

POQUOSON EAST VA.
VIMS CHART # 141

AA2	2443
BA4	6511
CA4	8614
DA4	17730
EA3	21540
FA3	1560000
GA4	5084000
HA2	850700
IA3	44830
JA4	465800
KA2	178500
LA2	853700
MA4	852300
NA4	2226

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	1885343
DENSITY 3 =	1626370
DENSITY 4 =	6437181
TOTAL =	9948894

ELLIOTTS CREEK VA.
VIMS CHART # 142

AA2	93040
BA1	47130
CA3	18810

TOTAL AREA

DENSITY 1 =	47130
DENSITY 2 =	93040
DENSITY 3 =	18810
DENSITY 4 =	0
TOTAL =	158980

TOWNSEND VA.
VIMS CHART # 143

AA2	3655
BA3	16520
CA3	50430
DA3	54930

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	3655
DENSITY 3 =	121880
DENSITY 4 =	0
TOTAL =	125535

HAMPTON VA.
VIMS CHART # 147

AA4	371000
BA4	9173
CA4	559900
DA3	358400
EA2	222700
FA2	294100
GA4	55540
HA4	385800
IA4	82250
JA4	379400
KA2	50800
LA4	124400
MA4	108400
NA4	38600

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	567600
DENSITY 3 =	358400
DENSITY 4 =	2114463
TOTAL =	3040463

CAPE HENRY VA.
VIMS CHART # 152

AA3	4099
BA3	39920
CA3	116900
DA2	57840
EA2	125000
FA2	13410
GA3	719
HA3	3860
IA3	2877

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	196250
DENSITY 3 =	168375
DENSITY 4 =	0
TOTAL =	364625

PORT TOBACCO MD.
VIMS CHART # 161

AA1	32250
BA4	71490
CA2	3318
DA4	6735
EA2	2848
FA4	2469
GA2	1795

TOTAL AREA

DENSITY 1 =	32250
DENSITY 2 =	7961
DENSITY 3 =	0
DENSITY 4 =	80694
TOTAL =	120905

BERLIN MD.
VIMS CHART # 167

AA4	8575
BA3	30960
CA3	10240

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	0
DENSITY 3 =	41200
DENSITY 4 =	8575
TOTAL =	49775

OCEAN CITY MD.
VIMS CHART # 168

AA3	34490

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	0
DENSITY 3 =	34490
DENSITY 4 =	0
TOTAL =	34490

TINGLES ISLAND MD.
VIMS CHART # 170

AA3	630700
BA1	365500
CA3	3973000
DA3	53060
EA3	304100
FA3	58650
GA3	294900
HA3	1246000
IA3	20750
JA3	522800
KA1	36380
LA3	300600
MA3	4506
NA4	173800
OA4	54720
PA4	65050
QA4	104300

TOTAL AREA

DENSITY 1 =	401880
DENSITY 2 =	0
DENSITY 3 =	7409066
DENSITY 4 =	397870
TOTAL =	8208816

BOXIRON MD.-VA.
VIMS CHART # 172

AA3	2800000
BA3	136500
CA4	15750
DA3	1213000
EA4	20560
FA3	226200
GA4	235600
HA3	672600
IA4	8352
JA3	81580
KA1	98950
LA4	860500
MA1	131400
NA4	38020

TOTAL AREA

DENSITY 1 =	230350
DENSITY 2 =	0
DENSITY 3 =	5129880
DENSITY 4 =	1178782
TOTAL =	6539012

WHITTINGTON POINT MD.-VA.
VIMS CHART # 173

AA4	275000
BA4	12940
CA4	17640
DA3	12130
EA3	121900
FA3	112400
GA3	82370
HA3	104200
IA2	134500
JA3	19120
KA2	114000
LA4	170900
MA1	169000
NA4	265300
OA1	6332

TOTAL AREA

DENSITY 1 =	175332
DENSITY 2 =	248500
DENSITY 3 =	452120
DENSITY 4 =	741780
TOTAL =	1617732

CHINCOTEAGUE EAST VA.
VIMS CHART # 175

AA4	2577000
BA3	4005000
CA3	39000
DA3	35620

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	0
DENSITY 3 =	4079620
DENSITY 4 =	2577000
TOTAL =	6656620

APPENDIX E

1989 Submerged Aquatic Vegetation Ground Truth Surveys.

1989 SUBMERGED AQUATIC VEGETATION GROUND TRUTH SURVEYS

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
2	AA3	AA3	Cd,Hv,Ms	CAPT./CIT.	8-14/NO DATE
2	-	BA4	Cd,Ms	CAPT./CIT.	8-14/NO DATE
2	BA2	CA3	Cd,Ms	CAPT./CIT.	8-14/NO DATE
2	-	DA3	Cd	CAPT.	8-14
2	-	EA3	Cd	CAPT.	8-14
2	-	FA3	Cd	CAPT.	8-14
3	CA1	AA3	Ms/Ms	SK/CIT.	NO DATE/NO DATE
3	DA1	BA3	Ms/Ms	SK/CIT.	NO DATE/NO DATE
3	-	CA3	Cd	CAPT.	8-14
3	-	DA3	Cd,Ms	CAPT./CIT.	8-14/NO DATE
3	-	EA3	Cd	CAPT.	8-14
3	GA2	HA4	Cd,Hv	CAPT.	8-14
3	JA2	IA4	Hv,Ms,Cd/Hv	SK/CAPT.	NO DATE/8-14
3	HA1,IA2	JA4	Hv,Ms,Cd/Cd	SK/CAPT.	NO DATE/8-14
3	HA1	KA2	Ms/Cd	SK/CAPT.	NO DATE/8-14
3	KA2	LA4	Va,Ms/Hv,Va	SK/CAPT.	NO DATE/8-14
3	MA2	NA4	Ms,Va,Hv/Cd,Ms	SK/CAPT./CIT.	NO DATE/8-14/9-29
3	NA2	OA4	Ms,Va,Hv/Cd,Ms	SK/CAPT./CIT.	NO DATE/8-14/9-29
3	NA2	PA4	Cd,Ms	CAPT./CIT.	8-14/9-29
3	OA2	QA4	Ms,Va,Hv/Ms	SK/CIT.	NO DATE/9-29
3	PA2	RA4	Ms,Va,Hv/Hv	SK/CIT.	NO DATE/9-29
3	PA2	SA4	Ms	CIT.	9-29
3	QA2	TA4	Ms,Va,Hv/Ms	SK/CIT.	NO DATE/9-29
3	RA2	UA4	Ms,Va,Hv/Ms	SK/CIT.	NO DATE/9-29
3	OB3	VA4	Hv,Ms	CAPT./CIT.	8-14/9-29
3	SA3	WA4	Ms/Cd,Ms	SK/CAPT./CIT.	NO DATE/8-14/9-29
3	TA2	XA4	Ms,Hv/Cd,Ms	SK/CAPT./CIT.	NO DATE/8-14/9-29

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
3	UA2	YA4	Ms,Hv/Cd	SK/CAPT.	NO DATE/8-14
3	VA2	ZA4	Ms,Hv/Cd,Ms	SK/CAPT./CIT.	NO DATE/8-14/9-29
3	-	AB4	Cd,Ms	CAPT./CIT.	8-14/9-29
3	WA2	BB3	Ms/Cd	SK/CAPT.	NO DATE/8-14
3	XA3	CB4	Ms/Cd,Ms	SK/CAPT./CIT.	NO DATE/9-29
3	YA3	DB4	Ms/Cd,Ms	SK/CAPT./CIT.	NO DATE/8-14/9-29
3	ZA2	GB3	Hd,Ms,N,U	CAPT./CIT.	8-14/9-29
3	-	HB3	Cd,Hd,Ms	CAPT./CIT.	8-14/9-4
3	-	IB3	Cd,Hd,Va	CAPT./CIT.	8-14/9-4
3	AB3	JB4	Cd,Ms,N,Va	CAPT./CIT.	8-14/9-4
3	AB3	JB4	Ms,Hv,Va,Cd,N	STAN KOLLAR	NO DATE
3	AB3	KB4	Cd,Ms,N,Va,U	CAPT./CIT.	8-14/9-4
3	FB3	QB4	Cd,Ms	CAPT./CIT.	8-14/9-29
3	GB2	RB4	Ms,Hv/Cd	SK/CAPT./CIT.	NO DATE/8-14/NO DATE
3	GB2	SB2	Ms,Hv/Ms	SK/CIT.	NO DATE/NO DATE
3	HB3	TB4	Hv/Cd,Ms	SK/CAPT./CIT.	NO DATE/8-14/9-29
3	JB2,IB3	UB4	Cd	CAPT.	8-14
3	JB2	VB3	Cd,Hv	CAPT.	8-14
3	KB2	WB2	Ms,Cd/Cd,Ms	SK/CAPT./CIT.	NO DATE/8-14/NO DATE
3	AA1	YB1	Cd,Ms,Ngu,Ppc,Va	CIT.	NO DATE
3	AA1	YB1	Ms,Hv	STAN KOLLAR	NO DATE
3	-	FB3	Ms	CIT.	NO DATE
3	BA1	ZB3	Ms,Va,Hd/Cd	SK/CAPT.	NO DATE/8-14
3	-	EB3	Cd,Ms	CAPT./CIT.	9-29
3	LB2	XB2	Ms,Cd	CAPT./CIT.	8-14/8-10
3	Quarry #		Ms	CIT.	NO DATE
3	EA1		Ms,Hv	STAN KOLLAR	NO DATE
3	FA1	FA2	Ms,Hv	STAN KOLLAR	NO DATE
3	FA1	GA2	Ms,Hv	STAN KOLLAR	NO DATE
3	GA2	HA4	Hv,Ms,Cd,Va	STAN KOLLAR	NO DATE
3	LA2	MA4	Va,Ms	STAN KOLLAR	NO DATE
3	BB3	LB4	Ms,Hd,Hv,Cd	STAN KOLLAR	NO DATE

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
3	CB3	MB4	Ms,Hd,Hv,Cd	STAN KOLLAR	NO DATE
3	DB3	NB4	Ms,Hd,Hv,Cd	STAN KOLLAR	NO DATE
3	EB3	OB4	Ms,Hd,Hv,Cd	STAN KOLLAR	NO DATE
3	EB3	PB4	Ms,Hd,Hv,Cd	STAN KOLLAR	NO DATE
3	IB3	UB4	Hv,Ms,Va,Cd,N	STAN KOLLAR	NO DATE
3	JB2	VB3	Ms,Hv,Hd,Cd,N	STAN KOLLAR	NO DATE
3	Copper Rd. #		Ms,Cd,Ppc	CIT.	NO DATE
3	Susquehanna Flats #		Ms	CIT.	NO DATE
4	GA2	AA2	Ms	CIT.	7-23
4	FA2,GA2		Ms	CIT.	NO DATE
4	Old Field Point #		Ms	CIT.	NO DATE
4	EA2		Ms	CIT.	NO DATE
4		BA2	Ms	CIT.	NO DATE
4	DA1	CA3	Ms	CIT.	7-23
4	-	DA3	Cd	CAPT.	NO DATE
4	-	EA2	Cd	CAPT.	NO DATE
4	AA1		Ms	STAN KOLLAR	NO DATE
4	CA1		Ms	STAN KOLLAR	NO DATE
4	DA1		Ms	STAN KOLLAR	NO DATE
4	EA2		Ms,Va	STAN KOLLAR	NO DATE
4	FA2		Ms,Va	STAN KOLLAR	NO DATE
4	GA2		Ms,Va	STAN KOLLAR	NO DATE
4	BA1		Ms	CIT.	NO DATE
4	Old Field Point #		Ms	CIT.	NO DATE
5	BA2		Ms,Va/Ms	SK/CIT.	NO DATE/NO DATE
5	AA2		Ms	CIT.	NO DATE

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
7	-	BA3	Cd	CAPT.	8-14
9	Elk River #		Ms	CIT.	NO DATE
9	AA2	AA3	Cd	CAPT.	NO DATE
9	AA2	BA3	Cd	CAPT.	NO DATE
9	-	DA3	Ms	CAPT.	NO DATE
9	BA2	EA2	Ms	CAPT.	NO DATE
9	-	FA3	Ms	CAPT.	NO DATE
9	FA2,DA1,EA1,GA2	JA1	Cd	CAPT.	NO DATE
9	GA2	HA3	Cd	CAPT.	NO DATE
9	FA2	IA3	Cd	CAPT.	NO DATE
9	AA2		Ms,Va	STAN KOLLAR	NO DATE
9	CA2		Va	STAN KOLLAR	NO DATE
9	EA1	JA1	Ms	STAN KOLLAR	NO DATE
9	FA2	IA3	Hv,Ms,Cd	STAN KOLLAR	NO DATE
9	GA2	HA3	Va,Ms,Cd	STAN KOLLAR	NO DATE
9	HA1		Ms	STAN KOLLAR	NO DATE
10	-	AA3	Ms	CIT.	9-6
10	BA2	BA3	Ms,Va	SK/CIT.	NO DATE/9-6
10	JA1	FA3	Cd,Va	CAPT./CIT.	NO DATE
10	HA2	GA3	Cd	CAPT.	NO DATE
10	JA1	EA3	Cd,Va	CAPT./CIT.	NO DATE
10	FA2	DA2	Cd	CAPT.	NO DATE
10	CA2,DA2		Ms,Va	CIT.	9-6
10	Bohemia R.-Stoney Point #		Va,Ec,N,Ppc	CIT.	NO DATE

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
10	AA2		Ms	STAN KOLLAR	NO DATE
10	EA1		Ms	STAN KOLLAR	NO DATE
10	FA2		Ms,Va	STAN KOLLAR	NO DATE
10	HA2		Ms,Ppc	STAN KOLLAR	NO DATE
10	IA1		Ms	STAN KOLLAR	NO DATE
10	JA1		Ms,Va,Ppc	STAN KOLLAR	NO DATE
10	KA1		Ms,Va	STAN KOLLAR	NO DATE
10	LA2		Va	STAN KOLLAR	NO DATE
10	MA1		Ms	STAN KOLLAR	NO DATE
10	NA4		Va,Ms	STAN KOLLAR	NO DATE
10	Bohemia R.-Old Hack Point #		Ec	CIT.	NO DATE
13	-	AA4	Cd	CAPT.	8-14
14	-	AB2	Cd	CAPT.	8-14
14	SA3	ZA4	Cd	CAPT.	8-14
14	-	DB3	Cd	CAPT.	8-14
14	-	FB2	Cd	CAPT.	8-14
14	FA3	JB3	Cd,Ec	CAPT.	8-14
14	GA3	MA4	Cd,Ec	CAPT.	8-14
14	CA2	HA3	Cd	CAPT.	8-14
14	NA3	VA3	Ms,Cd	CAPT.	NO DATE
14	MA3	WA2	Ms,Cd	CAPT.	NO DATE
15	-	AA3	Ms,Va	CIT.	NO DATE
15	Worton Creek #		Hv,Rm	CIT.	NO DATE
15	Worton Creek #		Va,Ms	CIT.	NO DATE
15	Worton Creek #		Rm	CIT.	NO DATE
15	Worton Creek #		Zp	CIT.	NO DATE

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
15	Mill Creek #		Va,Ms	CIT.	NO DATE
15	Mill Creek #		Va,Ms	CIT.	NO DATE
15	Mill Creek #		Va,Ms,Hv	CIT.	NO DATE
15	BA3	FA3	Ms	STAN KOLLAR	NO DATE
15	CA2		Ms	STAN KOLLAR	NO DATE
15	DA1		Ms	STAN KOLLAR	NO DATE
16	AA2		Va	STAN KOLLAR	NO DATE
16	BA2		Va	STAN KOLLAR	NO DATE
17	AA3		Ms,Va,Pcr	STAN KOLLAR	NO DATE
17	BA2		Va,Cd,Pcr	STAN KOLLAR	NO DATE
18	Rock Creek #		Zp	CIT.	6-29
18	Rock Creek #		Zp	CIT.	6-29
19	Main Creek #		Zp,Ppc	CIT.	NO DATE
21	DA4	BA4	Ppf	CAPT.	8-27
21	AA2	AA1	Ppf	CAPT.	8-27

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
23	Mayneider Creek #		Ppc,Zp	CIT.	10-8
23	Valentine Creek #		Ppc	CIT.	MAY
23	Cattail Creek #		Zp	CIT.	9-9
23	Cattail Creek #		Zp	CIT.	9-9
24	Forked Creek #		Zp	CIT.	NO DATE
26	GA3	TB3	Rm	FWS	9-6
26	-	SB4	Zp	FWS	9-6
26	MA3	QB3	Ppf	CIT./FWS	10-13/9-6
26	LA4,KA4	RB4	Ec,Ppf	FWS	9-6
26	-	OB3	Zp	FWS	9-6
26	QA1,MA3	PB2	Ec,Ppf	FWS	9-6
26	QA1	MB3	Ppf,Rm	FWS	9-6
26	TA4,VA3,UA3	LB2	Ec,Ms,Ppf,Va,Rm	CIT./FWS	10-13/8-30
26	SA1	KB2	Rm	FWS	9-6
26	-	JB4	Ec,Ppf,Rm	FWS	8-30
26	-	FB3	Rm	FWS	8-30
26	-	XA2	Ec,Ms	FWS	7-25
26	-	VA4	Ec,Rm	FWS	7-25
26	-	UA2	Ppc,Rm	FWS	7-25
26	DB2	GA3	Ppf,Rm	CIT.	9-10
26	BB1	HA1	Ms,Ppf	CIT.	9-30
26	CB2	IA3	Ms,Ppf	CIT.	NO DATE
26	AA3		Rm	FWS	NO DATE
26	HA3		Ppf	FWS	NO DATE

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
30	Beards Creek #		Rm	CIT.	NO DATE
30	Harness Creek #		Zp	CIT.	NO DATE
32	Warehouse Creek #		Rm	CIT.	NO DATE
32	Warehouse Creek #		Rm,Ppc,Zp	CIT.	NO DATE
32	Warehouse Creek #		Rm,Ppc,Zp	CIT.	NO DATE
32	Warehouse Creek #		Rm,Ppc,Zp	CIT.	NO DATE
32	Cox Creek #		Rm,Ppc,Zp	CIT.	NO DATE
32	-	AB3	Rm,Ppc,Zp	CIT.	NO DATE
33	JA2	LA1	Ppc	CIT.	8-13
33	-	ZA4	Rm	CIT.	NO DATE
33	JA2		Ppc	CIT.	8-13
33	-	AB2	Rm	CIT.	7-4
33	-	BB2	Rm	CIT.	7-4
33	-	EB3	Rm	CIT.	7-4
33	-	FB3	Rm	CIT.	7-4
33	-	GB2	Rm	CIT.	7-7
34	-	WA4	Hv	USGS	7-28
34	HB2	WA4	Ms,Hv	USGS	7-28
34	HB2	WA4	Ms,Hv	USGS	7-28
34	MA2	JA3	Hv,Va	USGS	7-28
34	NA3		Hv	USGS	7-28
34	OA2	KA2	Hv,Va	USGS	7-28
34	QA2		Hv,Zp,Ngu	USGS	10-30

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
34	Hunter Point #		Va	USGS	10-30
35	South Creek #		Rm	CIT.	NO DATE
36	SA4		Ppc	CIT.	7-29
36	Broad Creek #		Ppc	CIT.	7-29
36	QA4		Ppc	CIT.	7-29
36	PA4		Ppc	CIT.	7-29
36	Broad Creek #		Ppc	CIT.	NO DATE
36	NA3		Ppc	CIT.	7-29
36	TA4,UA4		Ppc	CIT.	7-29
36	JB3		Rm	CIT.	NO DATE
36	JB3		Rm	CIT.	NO DATE
36	Broad Creek #		Ppc	CIT.	NO DATE
36	Broad Creek #		Ppc	CIT.	NO DATE
37	Miles River #		U	CIT.	8-7
37	Miles River #		Rm	CIT.	8-7
39	AA2	AA2	Ms	CIT.	8-13
39	BA4	BA2	Ms	CIT.	8-13
39	CA4	CA2	Va	CIT.	8-13
39	Gunston Manor #		Va	CIT.	8-13
39	DA3	DA2	Va	CIT.	8-13
39	Gunston Manor #		Ms,Va	CIT.	8-13
39	EA3	EA3	Ms	CIT.	8-13
39	Gunston Hall #		Hd,Ms,Va	CIT.	8-13
39	Accotink Bay #		Cd	CIT.	8-13
39	IA4	FA2	Ms	CIT.	8-13

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
39	IA4	GA4	Cd,Hv	CIT.	8-13
39	HA2	HA4	Hd,Hv,Ms,Va,Nm	CIT.	8-13
39	HA2	IA1	Hd,Ms,Va	CAPT.	NO DATE
39	HA2	JA4	Ms,Va	CAPT.	NO DATE
39	JA3		Cd	USGS	7-28
39	Accotink Bay #		Cd	CIT.	NO DATE
40	UA2	CB3	Cd	CIT.	8-29
40	TA2	BB4	Cd	CIT.	8-29
40	TA2	AB2	Cd	CIT.	8-29
40	SA4	ZA4	Hv	CIT.	8-29
40	RA2	VA1	Hv	CIT.	8-29
40	QA4	SA3	Ms/Hv	USGS/CIT.	7-28/8-29
40	NA2	NA2	Hv	CIT.	8-29
40	KA4	MA4	Hv,Ms,Ppu,Va	CIT.	8-29
40	IA2,JA4	KA4	Cd,Hv,Ms,Va	CIT.	8-29
40	BA4	IA4	Cd,Hv,Ms,Ppu,Va	CIT.	8-29
40	CA2	IA4	Hv,Va,Ms	CIT.	8-29
40	CA2	IA4	Hv,Va,Ms	CIT.	8-29
40	-	IA4	Hv	CIT.	8-29
40	DA3	IA4	Va,Ms	CIT.	8-29
40	-	IA4	Hv	CIT.	8-29
40	-	IA4	Hv	CIT.	8-29
40	-	IA4	Hv,Va	CIT.	8-29
40	FA4	IA4	Hv,Ms	CIT.	8-29
40	HA4	IA4	Hv,Ms,Cd	CIT.	8-29
40	IA2	IA4	Hv,Ms,Va,Cd	CIT.	8-29
40	JA4	KA4	Hv,Ms,Va,Cd	CIT.	8-29
40	JA4	MA4	Ms,Va,Hv,Ppu	CIT.	8-29
40	BA4	CA4	Hv	USGS	7-28

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
40	BA4		Ms,Hv,Cd	USGS	7-28
40	BA4	CA4	Hv,Ms,Va	USGS	7-28
40	BA4	DA4	Hv,Ms,Va	USGS	7-28
40	BA4		Ms,Hv,Hd,Cd	USGS	7-28
40	-	DA4	Hv,Hd,Cd	USGS	7-28
40	BA4	EA4	Hv,Ms,Va,Nm	USGS	7-28
40	BA4	FA1	Ms,Hv,Va	USGS	7-28
40	BA4	FA1	Hv,Va,Ms	USGS	7-28
40	BA4	FA1	Hv,Ms,Cd,Hd	USGS	7-28
40	BA4	GA4	Hv,Ms,Va,Hd	USGS	7-28
40	BA4	GA4	Ms	USGS	7-28
40	BA4	IA4	Ms,Hv,Cd,Va	USGS	7-28
43	-	YA2	Rm	CAPT.	8-22
43	CA2	XA3	Rm	CAPT.	8-22
43	CA2	WA3	Rm	CAPT.	8-23
43	-	UA2	Rm	CAPT.	8-23
43	-	RA2	Rm	CAPT.	9-21
43	-	PA4	Rm	CAPT.	9-20
43	GA2	MA2	Rm	CAPT.	9-20
43	LA2	LA2	Rm	CAPT.	9-20
43	OA1	GA3	Rm	CAPT.	9-21
43	PA3	FA4	Rm	CAPT.	9-21
43	-	EA2	Rm	CAPT.	9-21
43	QA3	DA4	Rm	CAPT.	9-20
43	QA3	CA3	Rm	CAPT.	9-20
43	AA2		Rm	COURT STEVENSON	NO DATE
43	CA2		Rm	COURT STEVENSON	NO DATE

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
44	-	DA3	Rm	CAPT.	10-12
44	-	CA3	Rm	CAPT.	10-12
44	AA3	DA3	Rm	COURT STEVENSON	NO DATE
47	Neabsco Creek #		Cd,Hv	CIT.	11-14
47	Quantico Creek #		Cd,Va	CIT.	11-14
48	Mattawoman Creek #		Cd,Hv	CIT.	JULY-OCT.
48	NA4	CA3	Cd,Hv	CIT.	JULY-OCT.
48	NA4	DA2	Cd,Hv	CIT.	JULY-OCT.
48	Tidal Flats #		Cd,Ms	CIT.	JULY-OCT.
48	Foul Area Piling #		Cd,Ms	CIT.	JULY-OCT.
48	AA2		Ms,Cd,Va,Hv	USGS	7-28
48	AA2		Ngu,Ms,Hv,Va,Cd	USGS	10-12
48	BA4	AA2	Hv,Cd,Ms,Va,Ngu	USGS	10-12
48	AA2	BA4	Hd,Va,Cd,Hv	USGS	7-28
48	CA1		Nm,Va,Hd,Hv,Ms,Cd	USGS	7-28
48	CA1		Hd,Cd,Hv,Va	USGS	7-28
48	CA1		Ms	USGS	10-12
48	EA4		Ppu,Hd,Ms,Va,Cd,Hv	USGS	7-28
48	EA4		Va,Hv,Nm	USGS	7-28
48	GA3		Hv,Va,Nm,Ms	USGS	7-28
48	NA4	CA3	Ms,Hd,Cd,Hv	USGS	7-28
48	NA4	DA2	Ms,Hd,Cd,Hv	USGS	7-28
48	OA1		Ms,Hv	USGS	7-28
48	OA1		Ms,Hv	USGS	7-28
48	OA1		Hv	USGS	7-28
48	PA4	EA3	Hv,Ms,Va	USGS	7-28

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
48	PA4		Va,Hd,Hv,Cd,Ms	USGS	7-28
48	PA4		Hv,Ms,Hd,Cd	USGS	7-28
48	PA4		Hv,Ms,Hd,Cd	USGS	7-28
48	FA4		Hv	USGS	7-28
48	Indian Head #		Hd,Hv,Va,Ms,Cd	USGS	7-28
48	QA3	FA3	Hv	USGS	7-28
48	QA3	GA2	Hv	USGS	7-28
48	QA3		Va,Ms,Hv,Hd,Cd	USGS	7-28
48	RA4	HA2	Va,Ms,Hv,Cd	USGS	7-28
48	RA4	IA1	Cd,Va,Hd,Hv,Ms	USGS	7-28
48	SA2		Va,Cd,Ms,Hv	USGS	7-28
48	TA4	LA4	Hv,Ms	USGS	7-28
48	TA4	MA3	Hd,Hv,Ms,Va	USGS	7-28
48	TA4	MA3	Cd,Va,Hv,Ms	USGS	7-28
48	Chapman Point #		Hv,Ms,Va,Cd	USGS	7-28
49	Kennedy Run #		Zp	CIT.	8-29
49	Deep Landing #		Ec,Zp	CIT.	8-29
51	-	AA3	Rm	CAPT.	9-1
51	-	KA4	Rm	CAPT.	9-17
51	-	IA3	Rm	CAPT.	9-1
51	-	HA3	Rm	CAPT.	9-1
51	-	GA3	Rm	CAPT.	9-1
51	-	FA3	Rm	CAPT.	9-1
51	-	DA3	Rm	CAPT.	9-1
51	-	EA3	Rm	CAPT.	9-1
51	EA3	NA2	Rm	CAPT./CIT.	8-29/8-12

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
51	FA3	PA4	Rm	CAPT.	8-29
51	FA3	QA2	Rm	CAPT.	8-29
51	FA3	RA4	Rm	CIT.	8-12
51	FA3	SA2	Rm	CAPT.	8-29
51	FA3	TA4	Rm	CAPT.	8-29
51	FA3	UA3	Rm	CAPT.	8-29
51	FA3	VA3	Rm	CAPT.	8-29
51	-	YA3	Rm	CAPT.	8-22
51	-	XA3	Rm	CAPT.	8-22
51	GA3	AB3	Rm	CAPT.	8-22
51	GA3	BB4	Rm	CAPT.	8-22
51	HA3	CB2	Rm	CAPT.	8-22
51	-	DB4	Rm	CAPT.	8-22
51	FA3		Rm	COURT STEVENSON	NO DATE
51	FA3		Rm	COURT STEVENSON	NO DATE
51	GA3		Zp,Rm	COURT STEVENSON	NO DATE
52	-	AA4	Rm	CAPT.	9-17
52	-	BA4	Rm	CAPT.	9-17
52	-	EA2	Rm	CAPT.	9-17
52	-	LA3	Rm	CAPT.	8-22
52	-	JA4	Rm	CAPT.	8-22
52	-	IA4	Ppc,Rm	CAPT.	8-22
52	FA3	HA3	Rm	CAPT.	8-22
52	EA4	KA3	Rm,Zp/Rm	CS/CIT.	NO DATE/8-22
52	Todds Point #		Rm	CIT.	NO DATE
52	Ross Neck #		Ppc	CIT.	NO DATE
52	Ross Neck #		Ppc	CIT.	NO DATE
52	Back Creek #		Rm,Ppc	CIT.	NO DATE
52	Casson Point #		Ppc	CIT.	NO DATE

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
52	Casson Point #		Ppc	CIT.	NO DATE
55	CA4		Ms,Ngu,Hv,Cd	USGS	10-12
55	GA1		Hv	USGS	10-12
55	Potomac-Brent Pt. #		Cd,Ms	USGS	10-12
55	HA4	AA4	Cd,Ngu,Ms	USGS	10-12
55	HA4	BA2	Cd,Ngu,Ms	USGS	10-12
55	HA4		Cd,Ngu,Ms	USGS	10-12
55	HA4		Ms,Cd	USGS	10-12
55	MA4	FA2	Hv	USGS	10-12
56	IA4	FA4	Ms,Cd	USGS	8-15
57	HB4	DB4	Cd,Ms,Rm,Va	FWS	9-20
57	HB4	DB4	Va,Ppf	USGS	8-15
57	AB4	LB4	Ms,Ppf,Va	FWS	9-20
57	TB4		Ppf,Va	FWS	9-20
57	UB3,VB4	QB3	Ms,Ppf,Va	FWS	9-20
57	UB3	QB3	Va	USGS	8-15
57	VB4	QB3	Va,Ppf	USGS	8-15
57	OB4	IB4	Va,Ms/Va	USGS/FWS	8-15/9-20
57	NB1	HB3	Va,Rm	FWS	9-20
57	MB4	GB4	Va,Rm,N,Ppc/Va	USGS/FWS	8-15/9-20
57	LB4	FB4	Va,Ms/Ms	USGS/FWS	8-15/9-20
57	LB4	FB4	Ms,Cd	USGS	8-15
57	JB4	FB4	Ms	FWS	9-20

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
57	KB4,JB4	FB4	Va,Cd	FWS	9-20
57	HB4	DB4	Rm,Ms,Ppf,Va	FWS	9-20
57	EA4	HA3	Va,Ms,Cd,Zp	USGS	8-15
57	EA4	GA3	Va,Ms,Cd,Zp	USGS	8-15
57	EA4	FA1	Va,Ms,Cd,Zp	USGS	8-15
57	RB4	LB4	Va,Ms,Ppu,Pcr	USGS	8-15
57	RB4	LB4	Va,Ms,Ppc	USGS	8-15
60	-	BA3	Ppc,Rm	CAPT.	9-17
60	-	FA2	Rm	CAPT.	9-17
60	-	JA3	Rm	CAPT.	7-29
62	BA2	HA3	Rm	CAPT.	10-3
63	-	DA3	Rm	CAPT.	NO DATE
63	BA4	CA2	Rm	CAPT.	NO DATE
63	CA2	BA3	Rm	CAPT.	NO DATE
66	LA4	DA4	Ppc	USGS	8-15
69	Brenton Bay #		Ec	CIT.	7-21
69	Brenton Bay #		Ec	CIT.	7-21
69	Brenton Bay #		Ec,Ppf	CIT.	7-21
69	Brenton Bay #		Ec,Ppf	CIT.	7-21
69	Brenton Bay #		Ec,Ppf	CIT.	7-21
69	Brenton Bay #		Ec	CIT.	7-21

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
70	-	AA3	Rm	CAPT.	7-29
70	-	BA2	Rm	CAPT.	7-29
70	-	CA4	Rm	CAPT.	7-29
70	-	DA2	Rm	CAPT.	7-29
70	Forrest Landing #		Zp,Rm	CIT.	NO DATE
70	Patuxent River #		Rm	CAPT.	NO DATE
71	Goose Creek #		Rm,Zp	CIT.	6-26
71	Pearson Creek #		Rm,Zp	CIT.	6-26
71	Harper Creek #		Rm,Zp	CIT.	6-26
71	Harper Creek #		Rm,Zp	CIT.	6-26
72	AA4	AA3	Rm	CAPT.	NO DATE
72	BA2,CA4	BA1	Rm	CAPT.	NO DATE
72	CA4	CA4	Rm	CAPT.	NO DATE
72	EA2	FA4	Rm	CAPT.	NO DATE
72	GA4,FA2	HA4	Rm	CAPT.	NO DATE
72	GA4	JA4	Rm	CAPT.	NO DATE
72	HA2,IA4	KA1	Rm	CAPT.	NO DATE
72	-	OA3	Rm	CAPT.	NO DATE
72	IA4	MA2	Rm	CAPT.	NO DATE
72	DA2	DA3	Rm	CAPT.	NO DATE
72	IA4	NA1	Rm	CAPT.	NO DATE
72	IA4	LA4	Rm	CAPT.	NO DATE
73	XB2	AA1	Rm	CAPT.	NO DATE
73	-	QC4	Rm	CAPT.	NO DATE
73	WB4	BA4	Rm	CAPT.	NO DATE

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
73	WB4	CA1	Rm	CAPT.	NO DATE
73	UB4	DA4	Rm	CAPT.	NO DATE
73	UB4	EA4	Rm	CAPT.	NO DATE
73	WB4	FA4	Rm	CAPT.	NO DATE
73	RB4	GA1	Rm	CAPT.	NO DATE
73	SB2	HA3	Rm	CAPT.	NO DATE
73	RB4	IA1	Rm	CAPT.	NO DATE
73	RB4	JA4	Rm	CAPT.	NO DATE
73	RB4	KA2	Rm	CAPT.	NO DATE
73	-	LA2	Rm	CAPT.	NO DATE
73	OB2	MA4	Rm	CAPT.	NO DATE
73	NB3	NA4	Rm	CAPT.	NO DATE
73	NB3	OA1	Rm	CAPT.	NO DATE
73	LB3	RA3	Rm	CAPT.	NO DATE
73	KB3	SA3	Rm	CAPT.	NO DATE
73	JB4	TA3	Rm	CAPT.	NO DATE
73	IB4	UA4	Rm	CAPT.	NO DATE
73	-	VA2	Rm	CAPT.	NO DATE
73	HB2	WA1	Rm	CAPT.	NO DATE
73	HB2	YA3	Rm	CAPT.	NO DATE
73	FB2	ZA2	Rm	CAPT.	NO DATE
73	-	SB3	Rm	CAPT.	NO DATE
73	WA2	RB1	Rm	CAPT.	NO DATE
73	WA2	QB3	Rm	CAPT.	NO DATE
73	WA2	PB2	Rm	CAPT.	NO DATE
73	RA4	MB4	Rm	CAPT.	NO DATE
73	RA4	KB4	Rm	CAPT.	NO DATE
73	OA4	WB1	Rm	CAPT.	NO DATE
73	QA2	JB2	Rm	CAPT.	NO DATE
73	NA3	IB2	Rm	CAPT.	NO DATE
73	LA4	ZB3	Rm	CAPT.	NO DATE
73	-	OC4	Rm	CAPT.	NO DATE

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
73	-	NC2	Rm	CAPT.	NO DATE
73	BA1	MC4	Rm	CAPT.	NO DATE
73	BA1	LC1	Rm	CAPT.	NO DATE
73	CA4	KC3	Rm	CAPT.	NO DATE
73	DA3	JC3	Rm	CAPT.	NO DATE
73	-	FC2	Rm	CAPT.	NO DATE
73	EA3	HC4	Rm	CAPT.	NO DATE
73	-	IC2	Rm	CAPT.	NO DATE
73	GA2	EC2	Rm	CAPT.	NO DATE
73	GA2	DC2	Rm	CAPT.	NO DATE
74	-	UA2	Rm	CAPT.	NO DATE
74	KA2	OA1	Rm	CAPT.	NO DATE
74	LA4	PA3	Rm	CAPT.	NO DATE
74	MA3	TA3	Rm	CAPT.	NO DATE
74	MA3	SA1	Rm	CAPT.	NO DATE
74	MA3	RA4	Rm	CAPT.	NO DATE
74	MA3	QA2	Rm	CAPT.	NO DATE
74	JA3	MA2	Rm	CAPT.	NO DATE
74	JA3	NA4	Rm	CAPT.	NO DATE
74	IA3	LA3	Rm	CAPT.	NO DATE
74	IA3	KA3	Rm	CAPT.	NO DATE
74	HA2	IA3	Rm	CAPT.	NO DATE
74	HA2	JA3	Rm	CAPT.	NO DATE
74	GA2	HA3	Rm	CAPT.	NO DATE
74	GA2,FA4	GA4	Rm	CAPT.	NO DATE
74	FA4	FA2	Rm	CAPT.	NO DATE
74	EA2,FA4	EA2	Rm	CAPT.	NO DATE
74	FA4	DA4	Rm	CAPT.	NO DATE
74	CA4	CA3	Rm	CAPT.	NO DATE

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
74	CA4	BA3	Rm	CAPT.	NO DATE
74	CA4	AA4	Rm	CAPT.	NO DATE
74	-	VA4	Rm	CAPT.	NO DATE
79	Herring Creek #		Rm,Zm	CIT.	JUNE
80	-	DA3	Rm	CIT.	9-7
80	-	CA2	Rm	CIT.	9-7
80	-	EA1	Rm	CIT.	NO DATE
80	-	FA4	Rm	CIT.	NO DATE
80	-	GA3	Rm	CIT.	NO DATE
80	-	HA3	Rm	CIT.	NO DATE
82	BA4	BA3	Rm	CAPT.	NO DATE
82	CA2	AA1	Rm	CAPT.	NO DATE
82	-	DA2	Rm	CAPT.	NO DATE
82	-	EA4	Rm	CAPT.	NO DATE
83	-	CB3	Rm	CAPT.	NO DATE
83	AB4	BB4	Rm	CAPT.	NO DATE
83	WA2,XA4	AB4	Rm	CAPT.	NO DATE
83	AA3	AA2	Rm	CAPT.	NO DATE
83	BA2	BA3	Rm	CAPT.	NO DATE
83	HA4,IA2,JA2	JA4	Rm	CAPT.	NO DATE
83	MA4	JB3	Rm	CAPT.	NO DATE

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
83	MA4	IB1	Rm	CAPT.	NO DATE
83	MA4	HB4	Rm	CAPT.	NO DATE
83	LA4	LB3	Rm	CAPT.	NO DATE
83	OA4	FB4	Rm	CAPT.	NO DATE
83	QA4	EB4	Rm	CAPT.	NO DATE
83	RA4	DB3	Rm	CAPT.	NO DATE
83	VA4	QA4	Rm	CAPT.	NO DATE
83	-	RA2	U	CAPT.	NO DATE
83	UA4	SA4	Rm	CAPT.	NO DATE
83	-	SA4	U	CAPT.	NO DATE
83	UA4	TA4	Rm	CAPT.	NO DATE
83	UA4	UA4	Rm	CAPT.	NO DATE
83	TA4	VA4	Rm	CAPT.	NO DATE
83	SA2	WA4	Rm	CAPT.	NO DATE
83	ZA4	XA4	Rm	CAPT.	NO DATE
83	ZA4	YA1	Rm	CAPT.	NO DATE
83	ZA4	ZA4	Rm	CAPT.	NO DATE
83	-	CB3	Rm	CAPT.	NO DATE
83	AB4	BB4	Rm	CAPT.	NO DATE
83	WA2,XA4	AB4	Rm	CAPT.	NO DATE
84	AA4	MA3	Rm	CAPT.	NO DATE
84	DA3		Rm	CIT.	9-20
84	EA3	JA2	Rm	CAPT./CIT.	NO DATE/9-15
84	FA3	IA3	Rm	CAPT./CIT.	NO DATE/9-15
84	GA3	GA3	Rm	CAPT./CIT.	NO DATE/9-20
84	HA3	FA1	Rm	CAPT.	NO DATE
84	IA1	EA1	Rm	CAPT.	NO DATE
84	KA3	DA3	Rm	CAPT.	NO DATE
84	LA2	CA4	Rm	CAPT.	NO DATE
84	MA3	BA2	Rm	CAPT.	NO DATE

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
85	FA3	BA2	Rm	CAPT.	NO DATE
85	EA3	CA3	Rm	CAPT.	NO DATE
85	DA4	DA3	Rm	CAPT.	NO DATE
85	DA4	EA3	Rm	CAPT.	NO DATE
85	CA3	HA2	Rm	CAPT.	NO DATE
85	-	GA2	Rm	CAPT.	NO DATE
85	BA3	FA2	Rm	CAPT.	NO DATE
91	DA4,EA2	AA1	Rm	CAPT.	NO DATE
91	DA4	DA4	Rm	CAPT.	NO DATE
91	BA2	EA2	Rm	CAPT.	NO DATE
91	CA4	FA4	Rm	CAPT.	NO DATE
91	GA4	GA3	Rm	CAPT.	NO DATE
91	KA4	HA4	Rm	CAPT.	NO DATE
91	LA4	IA4	Rm	CAPT.	NO DATE
91	MA3	JA4	Rm	CAPT.	NO DATE
91	-	KA4	Rm	CAPT.	NO DATE
91	TA3	QA4	Rm	CAPT.	NO DATE
91	QA4	RA4	Rm	CAPT.	NO DATE
91	PA4	SA4	Rm	CAPT.	NO DATE
91	JA4	TA4	Rm	CAPT.	NO DATE
91	UA1	UA4	Rm	CAPT.	NO DATE
91	WA4	VA4	Rm	CAPT.	NO DATE
91	XA1	WA1	Rm	CAPT.	NO DATE
91	DA4	BA3	Rm	CAPT.	NO DATE
92	CA4	AA4	Rm	CAPT./CIT.	NO DATE/10-9
92	FA4	BA4	Rm	CAPT.	NO DATE

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
93	BA2	AA4	Rm	CAPT.	NO DATE
93	BA2	BA3	Rm	CAPT.	NO DATE
93	-	CA3	Rm	CAPT.	NO DATE
93	GA3	FA3	Rm	CAPT.	NO DATE
93	HA3	EA3	Rm	CAPT.	NO DATE
93	JA2	GA4	Rm	CAPT.	NO DATE
93	NA4	DA2	Rm	CAPT.	NO DATE
93	NA4	HA3	Rm	CAPT.	NO DATE
93	JA2,KA4	IA2	Rm	CAPT.	NO DATE
93	NA4	JA3	Rm	CAPT.	NO DATE
93	-	LA4	Rm	CAPT.	NO DATE
93	RA3		Rm	CIT.	SEPT.
93	Big Annemessex River #		Zm	CIT.	SEPT.
93	SA2	PA3	Rm	CIT.	SEPT.
93	TA4	QA3	Rm	CAPT.	NO DATE
93	WA4	RA3	Rm	CAPT.	NO DATE
93	-	SA3	Rm	CAPT.	NO DATE
93	XA3	TA3	Rm	CAPT.	NO DATE
93	XA3	UA3	Rm	CAPT.	NO DATE
93	YA2,ZA4	WA2	Rm	CAPT.	NO DATE
93	AB2	XA2	Rm	CAPT.	NO DATE
93	XA2,BB4	AA3	Rm	CAPT.	NO DATE
93	DB4	AB3	Rm	CAPT.	NO DATE
93	FB3	BB3	Rm	CAPT.	NO DATE
93	GB4,FB3	CB3	Rm	CAPT.	NO DATE
93	KB4,JB4	EB4	Rm	CAPT.	NO DATE
93	MB2,LB3	FB2	Rm	CAPT.	NO DATE
93	NB3	GB2	Rm	CAPT.	NO DATE
93	OB2	HB3	Rm	CAPT.	NO DATE
93	PB4	IB3	Rm	CAPT.	NO DATE
93	RB3	JB4	Rm	CAPT.	NO DATE
93	TB3	MB3	Rm	CAPT.	NO DATE

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
93	UB2	OB3	Rm	CAPT.	NO DATE
99	SA4	AA4	Rm	CAPT.	NO DATE
99	TA3	CA2	Rm	CAPT.	NO DATE
99	QA3	BA3	Rm	CAPT.	NO DATE
99	OA3	DA3	Rm	CAPT.	NO DATE
99	-	GA3	Rm	CAPT.	NO DATE
99	PA4	PA4	Rm	CAPT.	NO DATE
99	PA4	QA3	Rm	CAPT.	NO DATE
99	PA4	RA1	Rm	CAPT.	NO DATE
99	PA4	SA4	Rm	CAPT.	NO DATE
99	AA4,BA2,CA4	HA4	Rm	CAPT.	NO DATE
99	BA2,CA4	GA2	Rm	CAPT.	NO DATE
99	DA2	IA4	Rm	CAPT.	NO DATE
99	GA4	FA3	Rm	CAPT.	NO DATE
99	IA3	KA4	Rm	CAPT.	NO DATE
99	EA4,FA2	JA4	Rm	CAPT.	NO DATE
99	IA3,JA2,MA2	LA3	Rm	CAPT.	NO DATE
99	KA3	MA2	Rm	CAPT.	NO DATE
99	LA3	NA3	Rm	CAPT.	NO DATE
99	NA3	OA3	Rm	CAPT.	NO DATE
100	AA4	AA4	Rm,Zm	CAPT./CIT.	NO DATE
100	AA4,BA2	BA2	Rm	CAPT./CIT.	NO DATE
100	Fox Island #		Rm,Zm	CIT.	7-15
100	AA4		Rm	CIT.	7-15
100	DA4	CA2	Rm	CAPT./CIT.	NO DATE
100	EA3		Rm	CIT.	7-15

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
100	Cow Point Creek #		Rm	CIT.	AUG.
100	Pond Creek #		Rm	CIT.	AUG.
100	Pond Creek #		Rm	CIT.	AUG.
100	FA4		Rm	CIT.	AUG.
100	GA4	DA4	Rm	CAPT./CIT.	NO DATE
100	GA4		Rm	CIT.	8-5
100	IA1		Rm,Zm	CIT.	8-5
100	Janes Island #		Rm	CIT.	8-5
100	HA4	EA4	Rm	CAPT.	NO DATE
100	JA4	FA3	Zm	CIT.	NO DATE
100	KA4	LA4	Rm	CAPT.	NO DATE
100	KA4	KA1	Rm,Zm	CAPT.	NO DATE
100	KA4	JA4	Rm	CAPT.	NO DATE
100	KA4	IA2	Rm	CAPT.	NO DATE
100	KA4	HA4	Rm	CAPT.	NO DATE
100	QA1,UA4	MA4	Rm	CAPT.	NO DATE
100	QA1,UA4,RA4	NA1	Rm	CAPT.	NO DATE
100	RA4	OA4	Rm	CAPT.	NO DATE
100	SA2	QA2	Rm	CAPT.	NO DATE
100	TA4,SA2	PA4	Rm	CAPT.	NO DATE
100	OA4	GA4	Rm	CAPT.	NO DATE
101	AA4	AA4	Rm	CAPT.	NO DATE
101	AA4,BA1,CA4	BA2	Rm	CAPT.	NO DATE
101	DA3	CA3	Rm	CAPT.	NO DATE
101	DA3		Zm	CIT.	NO DATE
101	DA3	DA3	Zm	CAPT.	NO DATE
101	NA3	EA2	Rm,Zm	CAPT.	NO DATE
101	PA2	GA2	Rm	CAPT.	NO DATE
101	OA3	FA4	Rm	CAPT.	NO DATE

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
101	EA3		Zm	CIT.	7-15
101	FA1	VA3	Rm	CAPT.	NO DATE
101	HA4	UA3	Rm	CAPT.	NO DATE
101	IA4	TA3	Rm	CAPT.	NO DATE
101	JA3	SA3	Rm	CAPT.	NO DATE
101	Gap Point #		Rm	CIT.	NO DATE
101	RA3,SA4		Rm	CIT.	NO DATE
101	UA3	HA3	Rm	CAPT.	NO DATE
101	WA4	IA4	Rm	CAPT.	NO DATE
101	WA4		Rm,Zm	CIT.	NO DATE
101	XA4		Rm,Zm	CIT.	NO DATE
101	YA4	KA4	Rm,Zm	CAPT.	NO DATE
101	AB4	LA3	Rm	CAPT.	NO DATE
101	BB4	MA4	Rm	CAPT.	NO DATE
101	CB3	NA4	Rm	CAPT.	NO DATE
101	DB3	OA4	Rm	CAPT.	NO DATE
101	EB3	PA4	Rm	CAPT.	NO DATE
101	FB4,GB3,HB3	QA4	Rm	CAPT.	NO DATE
110	AA2	AA1	Zm,Rm	VIMS	6-21
111	YA3	PA4	Rm	CIT.	10-12
111	EB4,FB2,DB2	VA3	Rm	CIT.	10-12
111	GA3,HA1	GA3	Rm	CIT.	10-12
111	DA3,EA1	DA4	Rm	CIT.	10-12
111	YA3	QA3	Rm	CIT.	10-12
111	ZA3	SA4	Rm	CIT.	10-12
111	MA3		Rm	CIT.	10-26

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
111	LA3		Rm	CIT.	10-26
111	JA2		Rm	CIT.	10-26
111	Moran Creek #		Rm	CIT.	10-26
111	GA3	FA1	Rm	VIMS	6-21
111	GA3	EA4	Rm,Zm	VIMS	6-5
111	DA3	CA2	Rm,Zm	VIMS	6-21
111	CA4	BA2	Rm	VIMS	6-21
111	BA4	AA3	Rm,Zm	VIMS	6-5/6-21
111	AA3		Rm	VIMS	6-5/6-21
111	EA1	DA4	Rm	VIMS	6-21
111	GA3	GA3	Rm	VIMS	6-21
111	YA3	PA4	Zm,Rm	VIMS	6-21
111	YA3	QA3	Zm,Rm	VIMS	6-21
111	ZA3	RA2	Rm	VIMS	6-21
111	CB1		Rm	VIMS	6-21
111	EB4	VA3	Rm,Zm	VIMS	6-21
111	FB2	VA3	Rm	VIMS	6-21
112	MB3	BB2	Rm	CIT.	10-15
112	NB3	AB2	Rm	CIT.	10-15
112	FB3	YA2	Rm	CIT.	10-15
112	IB3	ZA2	Rm	CIT.	10-15
112	TA3	QA2	Rm,Zm	CIT.	9-2
112	QA2	OA2	Rm,Zm	CIT.	9-2
112	JA4	JA2	Rm	CIT.	8-20
112	HA2	HA2	Rm,Zm	CIT.	8-20
112	EA3,FA1,GA3	FA1	Rm	CIT.	8-20
112	AA1	AA1	Rm	CIT.	8-20
112	MA3	LA3	Rm	CIT.	9-2
112	OA4	MA3	Rm	CIT.	9-2

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
112	PA3	NA2	Rm	CIT.	9-2
112	CA3	CA3	Rm	CIT.	9-2
112	TA3	QA2	Rm	CIT.	9-2
114	CB3	WA3	Ppc	CIT.	7-3
114	DB3	XA3	Ppc	CIT.	7-3
114	EB4	YA4	Ppc	CIT.	7-3
114	HB3,GB1	AB2	Ppc	CIT.	7-3
114	FB4	ZA4	Ppc	CIT.	7-3
117	HA4	JA2	Rm,Zp/Rm	VIMS/CIT.	6-22/10-28
117	Roand Point #		Rm	VIMS	8-9
117	AA2		Rm	VIMS	8-9
117	FA3	BA2	Rm,Zm	VIMS	6-14/6-20/6-23
117	FA3	CA2	Rm,Zm	VIMS	6-14/6-20/6-23
117	FA3	DA3	Rm,Zm	VIMS	6-14/6-20/6-23
117	FA3	EA3	Rm,Zm	VIMS	6-14/6-20/6-23
117	FA3	FA2	Rm,Zm	VIMS	6-14/6-20/6-23
117	Parrot Island #		Zm	VIMS	6-22
117	HA4	IA2	Zm,Rm	VIMS	6-5/6-22
117	HA4	HA2	Zm,Rm	VIMS	6-5/6-22
117	IA3	KA1	Rm	VIMS	6-22
117	JA2	LA1	Rm/Rm	VIMS/CIT.	6-22/10-28
118	GA3	HA2	Rm	CIT.	8-9
118	HA2	IA2	Rm	CIT.	8-9
118	IA3	JA1	Rm	CIT.	8-9

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
118	BA3	CA2	Rm,Zm/Rm	VIMS/CIT.	8-16/8-9
118	BA3	BA4	Rm/Rm	VIMS/CIT.	8-16/8-9
118	BA3	AA2	Rm	CIT.	8-9
118	EA3	GA4	Zm,Rm/Rm,Zm,Zp	VIMS/CIT.	6-20/10-14
118	FA3	FA2	Rm/Rm,Zm	VIMS/CIT.	6-20/10-14
118	CA2	DA1	Zm,Rm/Rm	VIMS/CIT.	6-23/8-30
118	AA2		Zm,Rm	VIMS	6-14/6-20
118	LA2		Rm	VIMS	8-16
118	NA2		Rm	VIMS	8-16
118	OA1		Rm	VIMS	8-16
118	TA4		Rm	VIMS	8-9
118	DA1	EA1	Zm,Rm	VIMS	6-23
123	BA4	HA4	Zm,Rm	VIMS	6-20
123	CA4	FA4	Zm,Rm	VIMS	6-20
123	DA3	GA1	Zm,Rm	VIMS	6-20
123	EA4	EA1	Zm	VIMS	6-20
123	HA3		Rm,Zm	VIMS	6-20
123	JA3		Rm	VIMS	8-9
123	LA4	CA4	Rm,Zm	VIMS	6-20
123	MA4	BA4	Rm,Zm	VIMS	6-20
123	-	NA2	Rm	VIMS	6-20
123	PA2		Rm	VIMS	6-20
123	QA3		Rm	VIMS	6-20
124	EB3	XA3	Rm,Zm	CIT.	10-17
124	XA4	BB4	Rm,Zm	CIT.	10-17
124	AB3	WA3	Rm,Zm	CIT.	10-17

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
124	DB3	ZA3	Rm,Zm	CIT.	10-17
124	YA4	UA3	Rm,Zm	CIT.	10-17
124	ZA4	VA3	Rm,Zm	CIT.	10-17
124	WA4	CB4	Rm,Zm	CIT.	10-17
127	Parson's Cr. #		Ngu	CIT.	8-15
127	Parson's Is. #		Cd	CIT.	8-15
127	Parson's Cr. #		C,Ngu	CIT.	8-15
130	Big Mumford Is. #		Zm,Rm	VIMS	4-7
130	Big Mumford Is. #		Zm,Rm	VIMS	4-27/7-13/10-26
130	Little Mumford Is. #		Zm,Rm	VIMS	4-27
131	BA4	AA3	Zm/Zm	VIMS/CIT.	3-20/JULY-SEPT.
131	CA4	BA4	Zm/Zm	VIMS/CIT.	3-20/JULY-SEPT.
131	DA2,EA4	CA4	Zm	CIT.	JULY-SEPT.
131	FA2,GA4	DA2	Zm	CIT.	JULY-SEPT.
131	GA4,IA2,HA2	EA4	Zm	CIT.	JULY-SEPT.
131	GA4	EA4	Rm,Zm	VIMS	5-18
131	GA4,HA2	FA2	Zm	CIT.	JULY-SEPT.
131	GA4,HA2	GA4	Zm	CIT.	JULY-SEPT.
131	KA4	IA4	Zm	CIT.	JULY-SEPT.
131	KA4	JA2	Rm,Zm	CIT.	JULY-SEPT.
131	KA4	KA4	Zm,Rm/Rm,Zm	VIMS/CIT.	5-18/6-1/JULY-SEPT.
131	MA2,LA2,KA4	LA2	Zm	CIT.	JULY-SEPT.
131	KA4	MA4	Rm,Zm	CIT.	JULY-SEPT.
131	NA3	OA2	Rm,Zm	CIT.	JULY-SEPT.
131	KA4	NA4	Rm,Zm	CIT.	JULY-SEPT.

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
131	QA4	TA4	Rm,Zm	VIMS	5-18/5-26
131	QA4	RA2	Rm,Zm	VIMS	5-18/5-26
131	RA2	RA2	Rm,Zm	VIMS	5-18/5-26
131	Sarahs Creek #		Ppc,Va,Rm	VIMS	8-7/8-20
132	IA2,JA2	HA2	Rm,Zm	CIT.	8-31
132	KA3	KA3	Rm,Zm	CIT.	8-31
132	LA4	LA4	Rm,Zm	CIT.	8-31
132	LA4,MA2,NA4	MA2	Rm,Zm	CIT.	8-31
132	NA3	NA3	Rm,Zm	CIT.	8-31
132	OA2	OA1	Rm,Zm	CIT.	8-31
132	PA4	PA3	Rm,Zm	CIT.	8-31
132	RA2,QA4	QA3	Rm,Zm	CIT.	7-31
132	RA2	RA2	Rm,Zm	CIT.	7-31
132	TA4	SA4	Rm,Zm	CIT.	8-31
132	SA1,TA4	TA2	Rm,Zm	CIT.	8-31
132	New Point Comfort #		Zm	VIMS	NO DATE
132	-	GB4	Zm	VIMS	8-17
132	-	GA4	Rm,Zm	VIMS	5-18/5-29
133	BA2	BA2	Zm,Rm	VIMS	4-10
139	AA3		Zm	VIMS	5-30
139	BA2		Rm,Zm	VIMS	7-19/9-8/11-14
139	Gloucester Point #		Zm	VIMS	5-30

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
140	VA4		Rm/Zm	VIMS/CIT.	MAR.-NOV./JULY-SEPT.
140	QA4		Rm/Rm	VIMS/CIT.	MAR.-NOV./JULY-SEPT.
140	Tue Point #		Zm	CIT.	JULY-SEPT.
140	OA2	NA1	Zm	CIT.	JULY-SEPT.
140	PA3	OA2	Zm	CIT.	JULY-SEPT.
140	PA3	PA4	Zm	CIT.	JULY-SEPT.
140	QA4	QA3	Rm,Zm	CIT.	JULY-SEPT.
140	SA3	RA3	Rm,Zm	CIT.	JULY-SEPT.
140	RA4	TA4	Rm,Zm	VIMS/CIT.	MAR.-NOV./JULY-SEPT.
140	VA4	UA3	Rm,Zm	VIMS/CIT.	MAR.-NOV./JULY-SEPT.
140	Lyons Creek #		Rm,Zm	CIT.	NO DATE
140	Goodwin Island #		Rm	VIMS	MAR.-NOV.
147	JA4,KA2	FA4	Ppc,Ppf,Rm,Zm,Zp	CIT.	AUG.-SEPT.
147	AA4	MA4	Zm	CIT.	JUNE
147	NA4		Zm	VIMS	8-8
152	CA3	DA3	Rm,Zm	VIMS	8-23
152	CA3	DA3	Rm	VIMS	8-23
152	EA2	BA2	Rm	VIMS	8-23
152	GA3		Rm	VIMS	8-23
152	HA3		Zm	VIMS	8-23
152	IA3		Zm	VIMS	8-23
159	Patuxent River #		Cd,Ec,Pcr,N	CIT.	NO DATE
159	Patuxent River #		Va,Cd,Zp,Pcr	CIT.	NO DATE

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
159	Patuxent River #		Cd,Ec,Pcr,Va,Ppu,Zp	CIT.	NO DATE
159	Patuxent River #		Cd,N	CIT.	NO DATE
159	Patuxent River #		Ngu,Cd,Ec	CIT.	NO DATE
159	Patuxent River #		Ngu,Pcr,U	CIT.	NO DATE
159	Patuxent River #		Ec,Ngu	CIT.	NO DATE
159	Patuxent River #		Cd,Ec	CIT.	NO DATE
159	Patuxent River #		Ec,Ngu	CIT.	NO DATE
159	Patuxent River #		N	CIT.	NO DATE
167	-	AA3	Zm	CIT.	NO DATE
168	-	AA3	Zm	CIT.	NO DATE
168	-	BA4	Zm	CIT.	NO DATE
170	CA3	AA3	Rm,Zm	CAPT./CIT.	NO DATE/9-11
170	EA3	BA4	Rm,Zm	CIT.	9-11
170	GA3	DA3	Rm,Zm	CAPT./CIT.	NO DATE/NO DATE
170	JA3	EA3	Rm,Zm	CAPT./CIT.	NO DATE/9-11
170	NA4	FA4	Rm,Zm	CIT.	9-11
170	LA3	GA4	Rm,Zm	CAPT./CIT.	NO DATE/9-11
170	LA3	HA4	Rm,Zm	CAPT./CIT.	NO DATE/9-11
172	AA3	AA3	Rm	CAPT.	NO DATE
172	BA3	BA4	Rm	CAPT.	NO DATE
172	DA3	CA3	Rm,Zm	CAPT./CIT.	NO DATE/9-17
172	FA3	DA4	Rm,Zm	CIT.	9-17

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
172	HA3	EA3	Rm,Zm	CAPT./CIT.	NO DATE/9-17
172	JA3	FA3	Rm,Zm	CAPT./CIT.	NO DATE/9-17
172	LA4	GA4	Zm	CAPT./CIT.	NO DATE/9-17
173	AA4	AA4	Rm,Zm	CIT.	9-17
173	-	BA4	Zm	CIT.	9-5
173	GA3,NA4	CA4	Rm,Zm	CAPT./CIT.	NO DATE/9-13
173	FA3	DA3	Rm,Zm	CIT.	9-13
173	EA3	EA4	Rm,Zm	CIT.	9-13
173	DA3	FA4	Rm,Zm	CIT.	9-17
173	Fox Hill Point #		Rm,Zm	CIT.	9-17

** Abbreviations under column "Species" are as follows:

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)
Tn = *Trapa natans* (water chestnut)
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)
Nm = *Najas minor* (slender naiad)
U = Unknown species composition

/ = Slash mark separates species data of independent surveys sources and independent survey dates.

*** = Abbreviations under column "Source" are as follows:

CAPT. = Charterboat Captain's Survey
CIT. = Citizen's Survey
FWS = U.S. Fish and Wildlife Service Surveys
USGS = U.S. Geological Survey Potomac River Surveys
VIMS = Virginia Institute Of Marine Science Surveys
SK = Stan Kollar Of Harford Community College
Court Stevenson = J. Court Stevenson Of University Of Maryland Horn Point Environmental Laboratory

- = No SAV bed mapped from 1989 aerial photography but SAV bed presence was verified in 1987 bed location by ground truth survey

= No SAV bed mapped from 1987 or 1989 aerial photography. SAV bed presence verified by 1989 ground truth survey.