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# Distribution of Submerged Aquatic Vegetation in the Chesapeake Bay and Tributaries and Chincoteague Bay - 1989

by

Robert J. Orth and Judith F. Nowak

Virginia Institute of Marine Science  
School of Marine Science  
College of William and Mary  
Gloucester Point, VA 23062



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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 Salt peter 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.

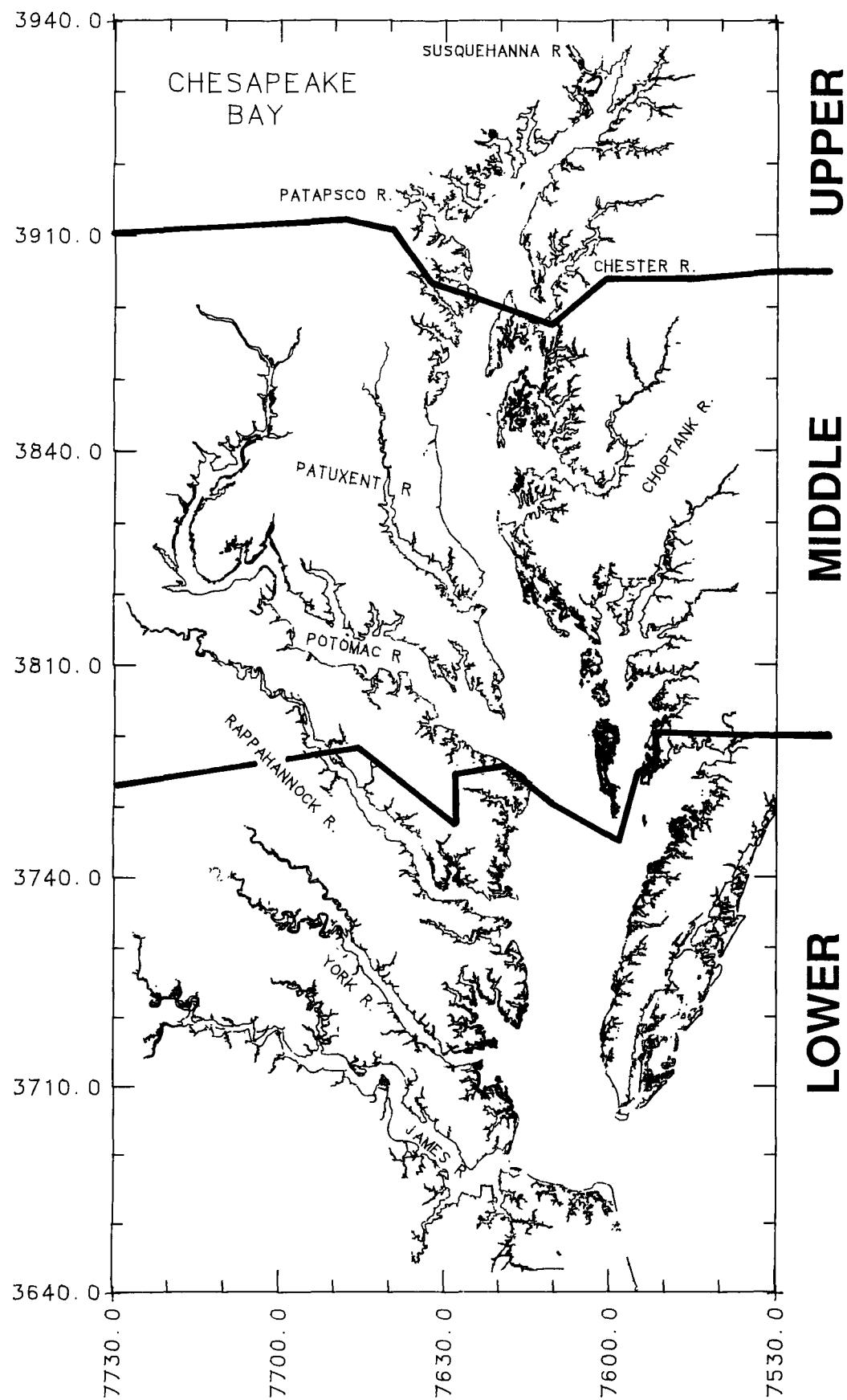


Figure 1. Map of the Chesapeake Bay and tributaries with Upper, Middle and Lower zones and locations of all SAV beds in 1989. (SAV is shown in red. Latitude and longitude are in decimal degrees along the vertical and horizontal axes, respectively.)

## HECTARES OF SAV IN EACH ZONE OF THE CHESAPEAKE BAY

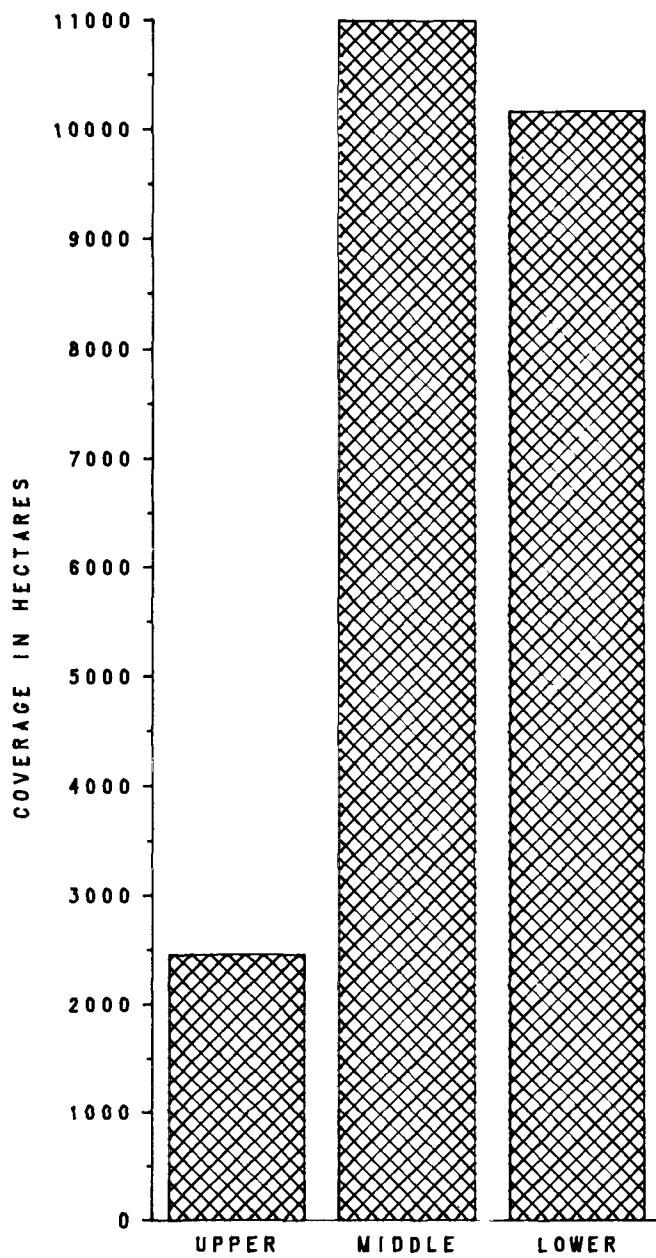


Figure 2. Total hectares of SAV for the Upper, Middle and Lower zones of the Chesapeake Bay in 1989. (Refer to Figures 1 and 7 for zone locations.)

Hectares of SAV in 1989  
by Section

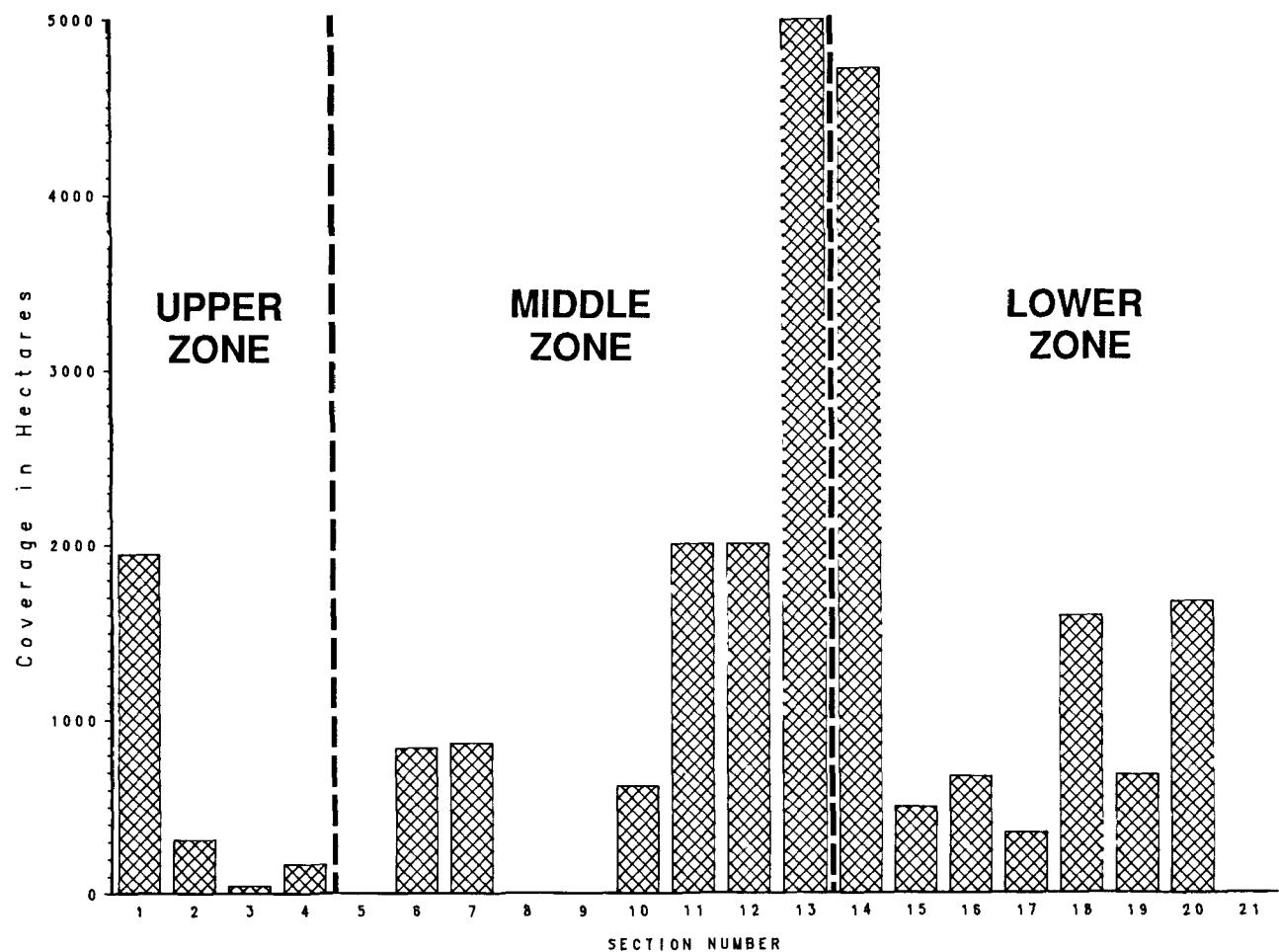


Figure 3. Total hectares of SAV in 1989 by section of the Chesapeake Bay. (Refer to Figure 7, Table 3 and Appendix B for section locations and boundaries.)

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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.

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## 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.).

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## 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

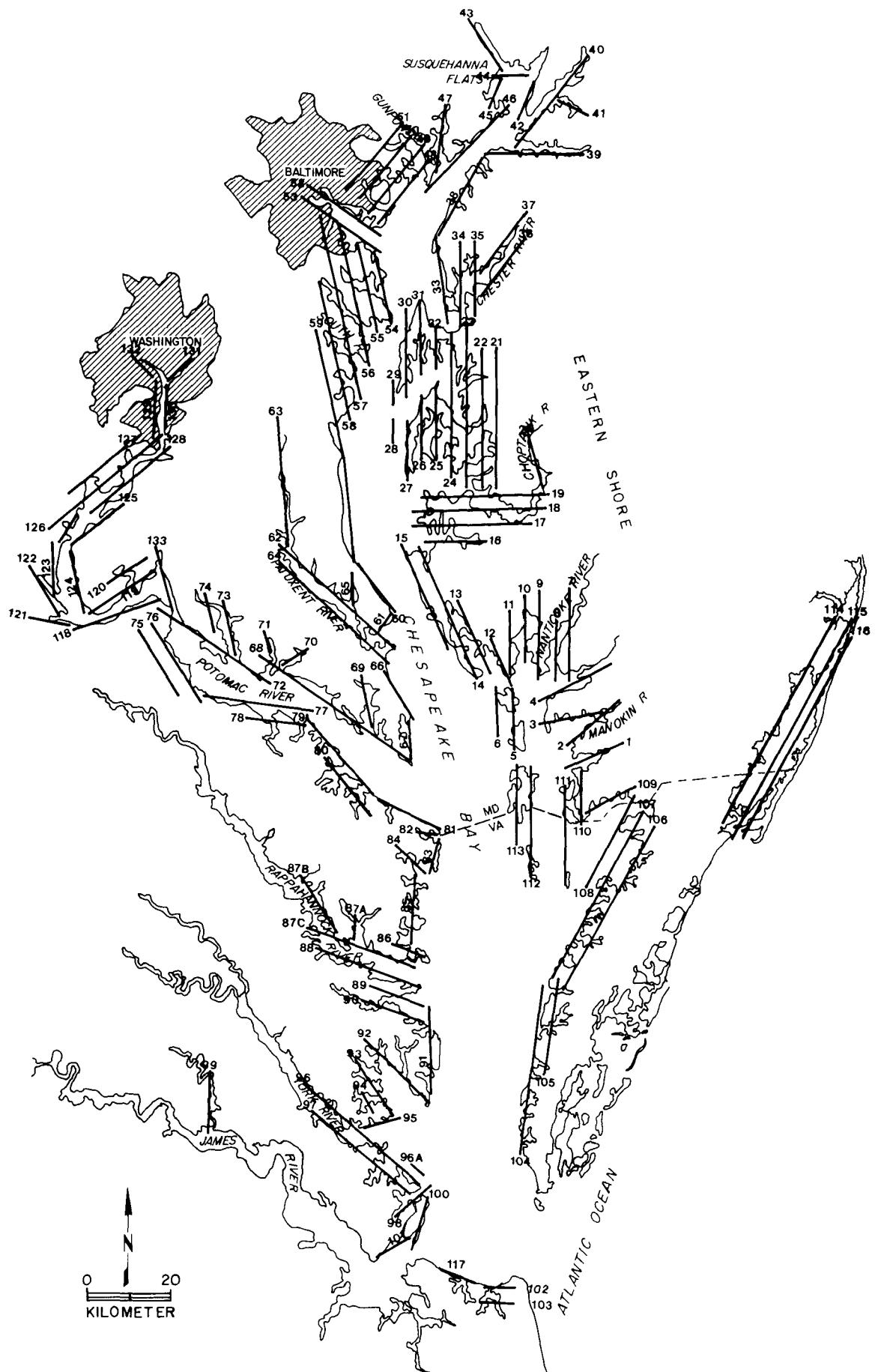


Figure 4. Map of the Chesapeake Bay, its tributaries and Chincoteague Bay with approximate locations of flight lines for 1989 SAV photography.

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## **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.

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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

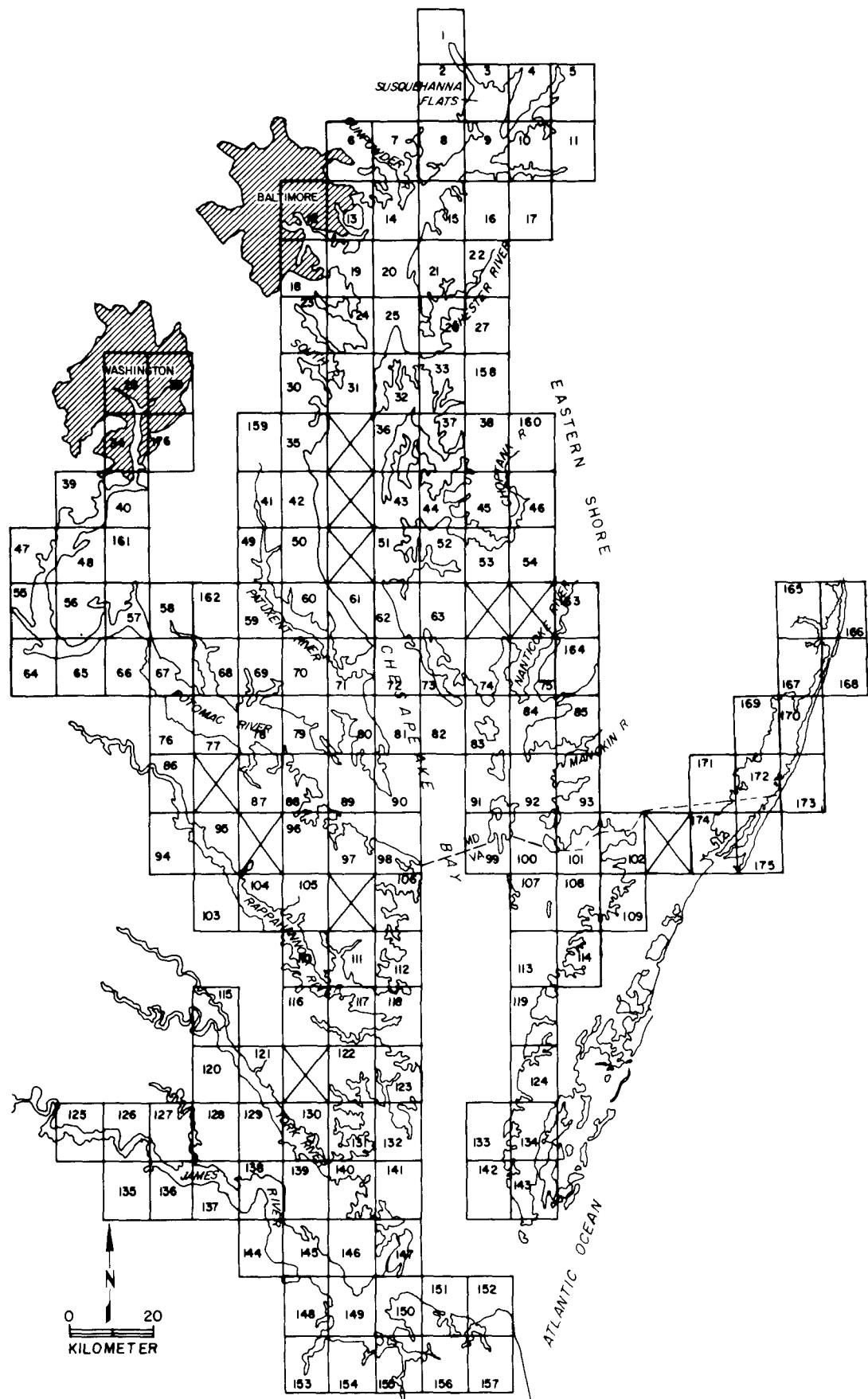


Figure 5. Location of USGS 7.5 minute topographic quadrangles for the Chesapeake Bay, its tributaries and Chincoteague Bay with corresponding code numbers. (See Table 2 for quad names.)

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## 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.

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**Table 2 (continued)**

- |                                |                                 |
|--------------------------------|---------------------------------|
| 91. Kedges Straits, Md.        | 134. Cheriton, Va.              |
| 92. Terrapin Sand Point, Md.   | 135. Savedge, Va.               |
| 93. Marion, Md.                | 136. Claremont, Va.             |
| 94. Mount Landing, Va.         | 137. Surry, Va.                 |
| 95. Tappahannock, Va.          | 138. Hog Island, Va.            |
| 96. Lottsburg, Va.             | 139. Yorktown, Va.              |
| 97. Heathsville, Va.-Md.       | 140. Poquoson West, Va.         |
| 98. Burgess, Va.-Md.           | 141. Poquoson East, Va.         |
| 99. Ewell, Md.-Va.             | 142. Elliotts Creek, Va.        |
| 100. Great Fox Island, Va.-Md. | 143. Townsend, Va.              |
| 101. Crisfield, Md.-Va.        | 144. Bacons Castle, Va.         |
| 102. Saxis, Va.-Md.            | 145. Mulberry Island, Va.       |
| 103. Dunnsville, Va.           | 146. Newport News North, Va.    |
| 104. Morattico, Va.            | 147. Hampton, Va.               |
| 105. Lively, Va.               | 148. Benns Church, Va.          |
| 106. Reedville, Va.            | 149. Newport News South, Va.    |
| 107. Tangier Island, Va.       | 150. Norfolk North, Va.         |
| 108. Chesconessex, Va.         | 151. Little Creek, Va.          |
| 109. Parksley, Va.             | 152. Cape Henry, Va.            |
| 110. Urbanna, Va.              | 153. Chuckatuck, Va.            |
| 111. Irvington, Va.            | 154. Bowers Hill, Va.           |
| 112. Fleets Bay, Va.           | 155. Norfolk South, Va.         |
| 113. Nandua Creek              | 156. Kempsville, Va.            |
| 114. Pungoteague, Va.          | 157. Princess Anne, Va.         |
| 115. West Point, Va.           | 158. Wye Mills, Md.             |
| 116. Saluda, Va.               | 159. Bristol, Md.               |
| 117. Wilton, Va.               | 160. Fowling Creek, Md.         |
| 118. Deltaville, Va.           | 161. Port Tobacco, Md.          |
| 119. Jamesville, Va.           | 162. Charlotte Hall, Md.        |
| 120. Toano, Va.                | 163. Mardela Springs, Md.       |
| 121. Gressitt, Va.             | 164. Wetipquin, Md.             |
| 122. Ware Neck, Va.            | 165. Selbyville, Md.            |
| 123. Mathews, Va.              | 166. Assawoman Bay, Md.         |
| 124. Franktown, Va.            | 167. Berlin, Md                 |
| 125. Westover, Va.             | 168. Ocean City, Md.            |
| 126. Charles City, Va.         | 169. Public Landing, Md.        |
| 127. Brandon, Va.              | 170. Tingles Island, Md.        |
| 128. Norge, Va.                | 171. Girdle Tree, Md.-Va.       |
| 129. Williamsburg, Va.         | 172. Boxiron, Md.-Va.           |
| 130. Clay Bank, Va.            | 173. Whittington Point, Md.-Va. |
| 131. Achilles, Va.             | 174. Chincoteague West, Va.     |
| 132. New Point Comfort, Va.    | 175. Chincoteague East, Va.     |
| 133. Cape Charles, Va.         | 176. Anacostia, D.C.-Md.        |

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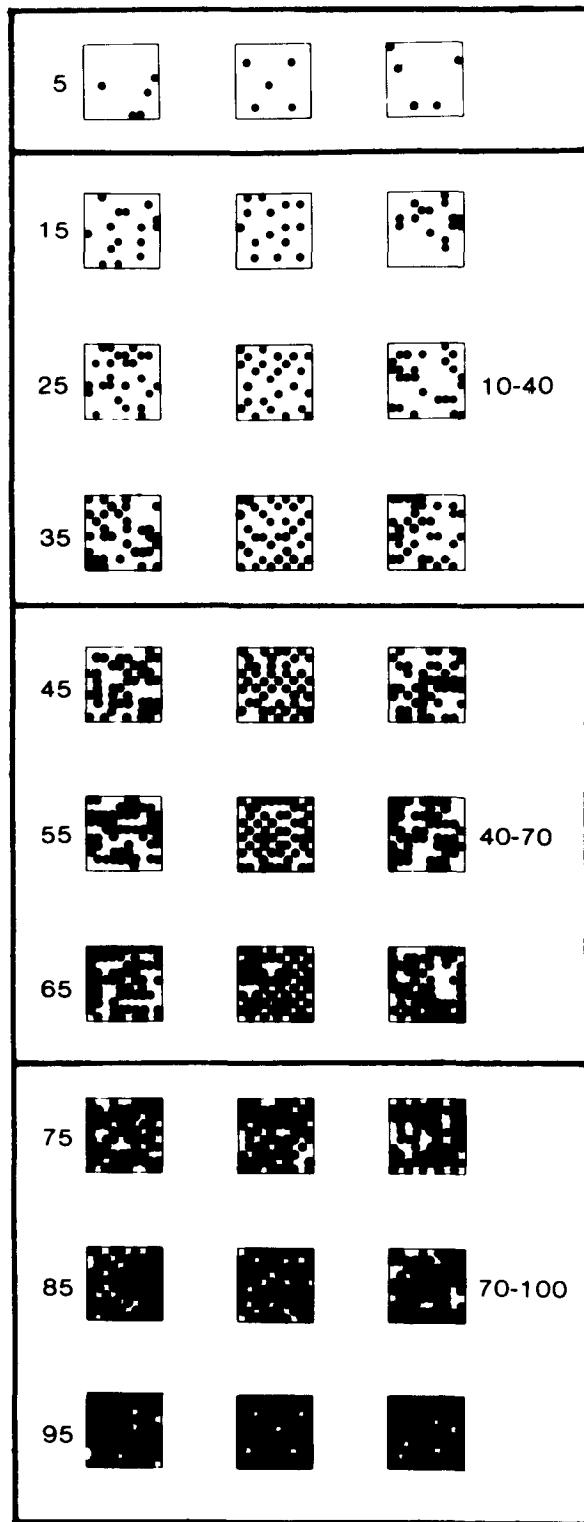
was mapped onto these diazo copies of USGS topographic quadrangles. Delineation of SAV bed boundaries onto the topographic quadrangle maps was facilitated by superimposing the photographic print with the appropriate mylar quadrangle on a light table. SAV boundaries were then traced directly onto the 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.



### PERCENT CROWN COVER

**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%.

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

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

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 than 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

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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 assessment. 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.

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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:

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

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.  
              XCOPNERPOINT(# is the X value in centimeters of the numbered chart corner point.  
              YCOPNERPOINT(# 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.

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### **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‰), Lower zone; mesohaline (5-18‰), Middle zone; oligohaline (0.5-5‰), 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.

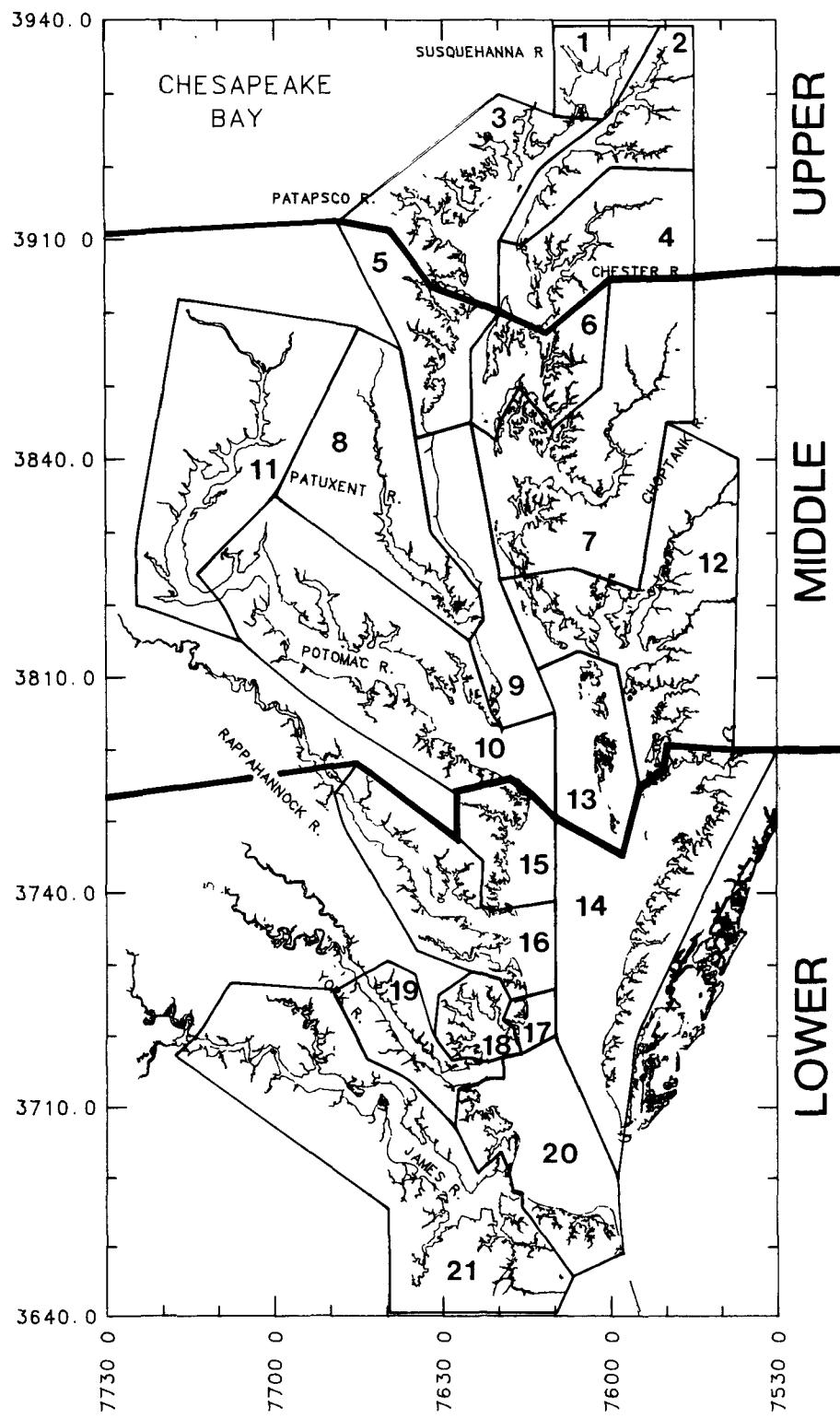


Figure 7. Location of Upper, Middle and Lower zones of the Chesapeake Bay and the 21 major sections used for delineation of SAV distribution patterns. (Latitude and longitude are in decimal degrees along the vertical and horizontal axes, respectively. See Table 3 and Appendix B for exact boundary positions.)

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### **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.

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**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).

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## **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

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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.

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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 sighting by 1987 bed location. VIMS staff mapped these data on maps reproduced in Appendix C, and data were tabulated in Appendix E.

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## 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 Salt peter 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

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**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

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**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

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**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

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**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

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**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.	-	-

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**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.

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**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

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

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**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)		<u>0</u>
		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)		<u>69.033</u>
		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)		<u>0</u>
		0 sq.m
		0 hectares
		0 acres
Eastern Bay - 6		
Annapolis (31)		0
Kent Island (32)		3,270,646
Queenstown (33)		1,214,290

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**Table 6 (Continued)**

SECTION	QUADRANGLE	AREA
<b>Eastern Bay - 6 (continued)</b>		
	Claiborne (36)	2,196,050
	St. Michaels (37)	1,633,851
	Easton (38)	0
	Tilghman (43)	0
	Oxford (44)	<u>0</u>
		8,314,837 sq.m
		831.48 hectares
		2,054.56 acres
<b>Choptank River - 7</b>		
	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)	<u>0</u>
		8,646,996 sq.m
		864.70 hectares
		2,136.64 acres
<b>Patuxent River - 8</b>		
	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

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**Table 6 (Continued)**

SECTION	QUADRANGLE	AREA
Patuxent River - 8 (continued)		
	Hollywood (70)	0
	Solomons Island (71)	29,595
	Bristol (159)	<u>0</u>
		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)	<u>0</u>
		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

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**Table 6 (Continued)**

SECTION	QUADRANGLE	AREA
<b>Lower Potomac River - 10 (continued)</b>		
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)		<u>0</u>
		6,156,173 sq.m
		615.62 hectares
		1,521.18 acres
<b>Upper Potomac River - 11</b>		
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)		<u>103,741</u>
		19,981,637 sq.m
		1,998.16 hectares
		4,937.39 acres
<b>Middle Eastern Shore - 12</b>		
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

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**Table 6 (Continued)**

SECTION	QUADRANGLE	AREA
<b>Middle Eastern Shore - 12 (continued)</b>		
	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
<b>Mid-Bay Island Complex - 13</b>		
	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
<b>Lower Eastern Shore - 14</b>		
	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

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**Table 6 (Continued)**

SECTION	QUADRANGLE	AREA
Lower Eastern Shore - 14 (continued)		
Elliotts Creek (142)	158,983	
Townsend (143)	<u>125,531</u>	
47,184,115 sq.m 4,718.41 hectares 11,659.03 acres		
Reedville Region - 15		
Heathsille (97)	0	
Burgess (98)	0	
Reedville (106)	1,578,740	
Irvington (111)	0	
Fleets Bay (112)	<u>3,344,656</u>	
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)	<u>797,841</u>	
6,692,221 sq.m 669.22 hectares 1,653.62 acres		
New Point Comfort Region - 17		
Mathews (123)	0	
New Point Comfort (132)	<u>3,457,814</u>	
3,457,814 sq.m 345.78 hectares 854.41 acres		

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**Table 6 (Continued)**

SECTION	QUADRANGLE	AREA
Mobjack Bay Complex - 18	Ware Neck (122) Mathews (123) Achilles (131) New Point Comfort (132)	2,780,630 303,970 6,650,301 <u>6,190,963</u>
		15,925,864 sq.m 1,592.59 hectares 3,935.24 acres
York River - 19	Toano (120) Gressitt (121) Williamsburg (129) Clay Bank (130) Achilles (131) New Point Comfort (132) Hog Island (138) Yorktown (139) Poquoson West (140) Poquoson East (141)	0 0 0 0 2,929,149 3,089,733 0 15,826 734,147 <u>0</u>
		6,768,855 sq.m 676.89 hectares 1,672.57 acres
Lower Western Shore - 20	Poquoson West (140) Poquoson East (141) Elliotts Creek (142) Newport News North (146) Hampton (147) Norfolk North (150) Little Creek (151) Cape Henry (152) Kempsville (156) Princess Anne (157)	3,385,727 9,948,414 0 0 3,001,969 0 0 364,695 0 <u>0</u>
		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)	<u>          </u>
		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)	<u>       </u> 6,655,790
		23,104,941 sq.m
		2,310.49 hectares
		5,709.14 acres

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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.

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## 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.

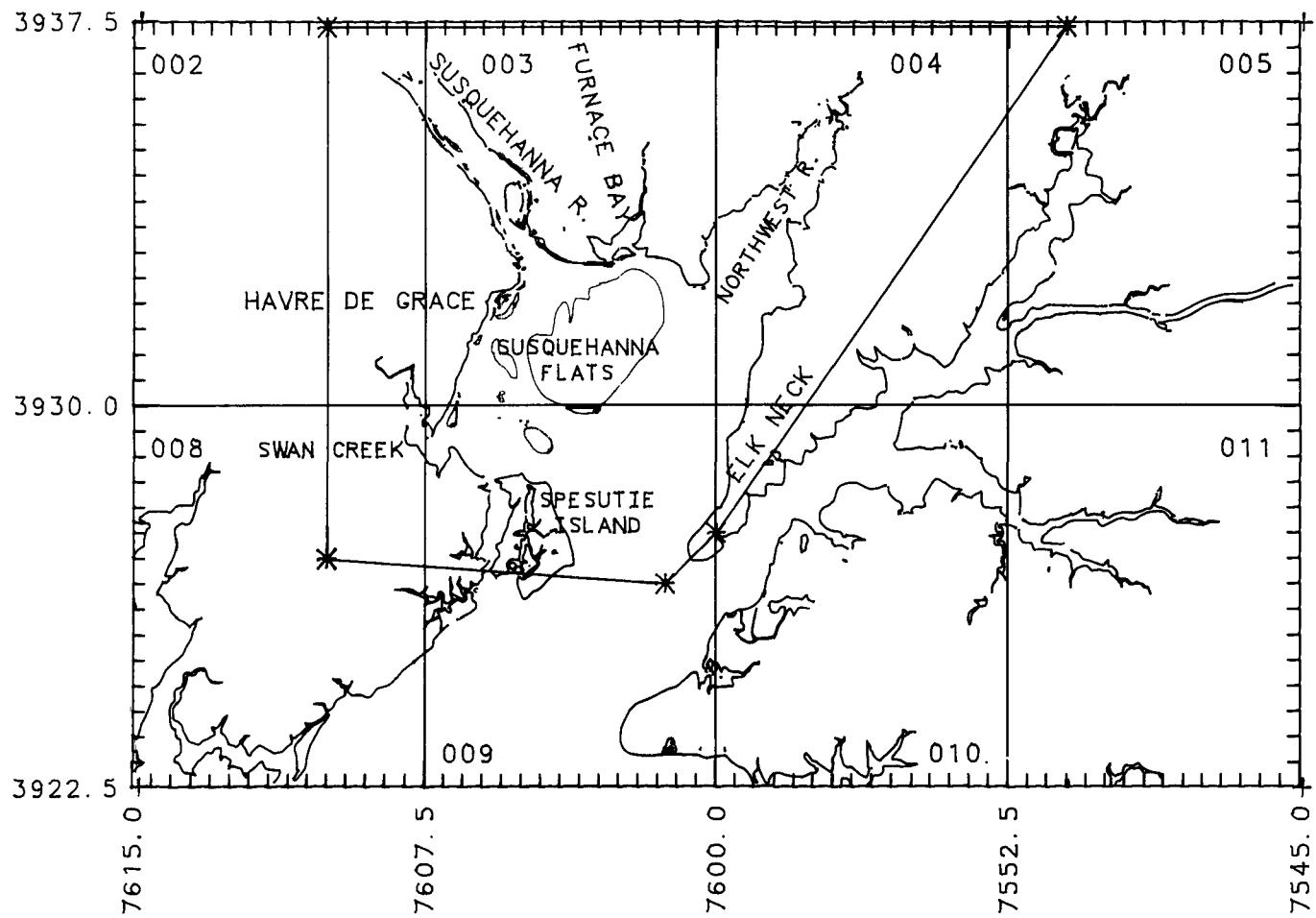
## 2. UPPER EASTERN SHORE

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 Salt peter 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).**

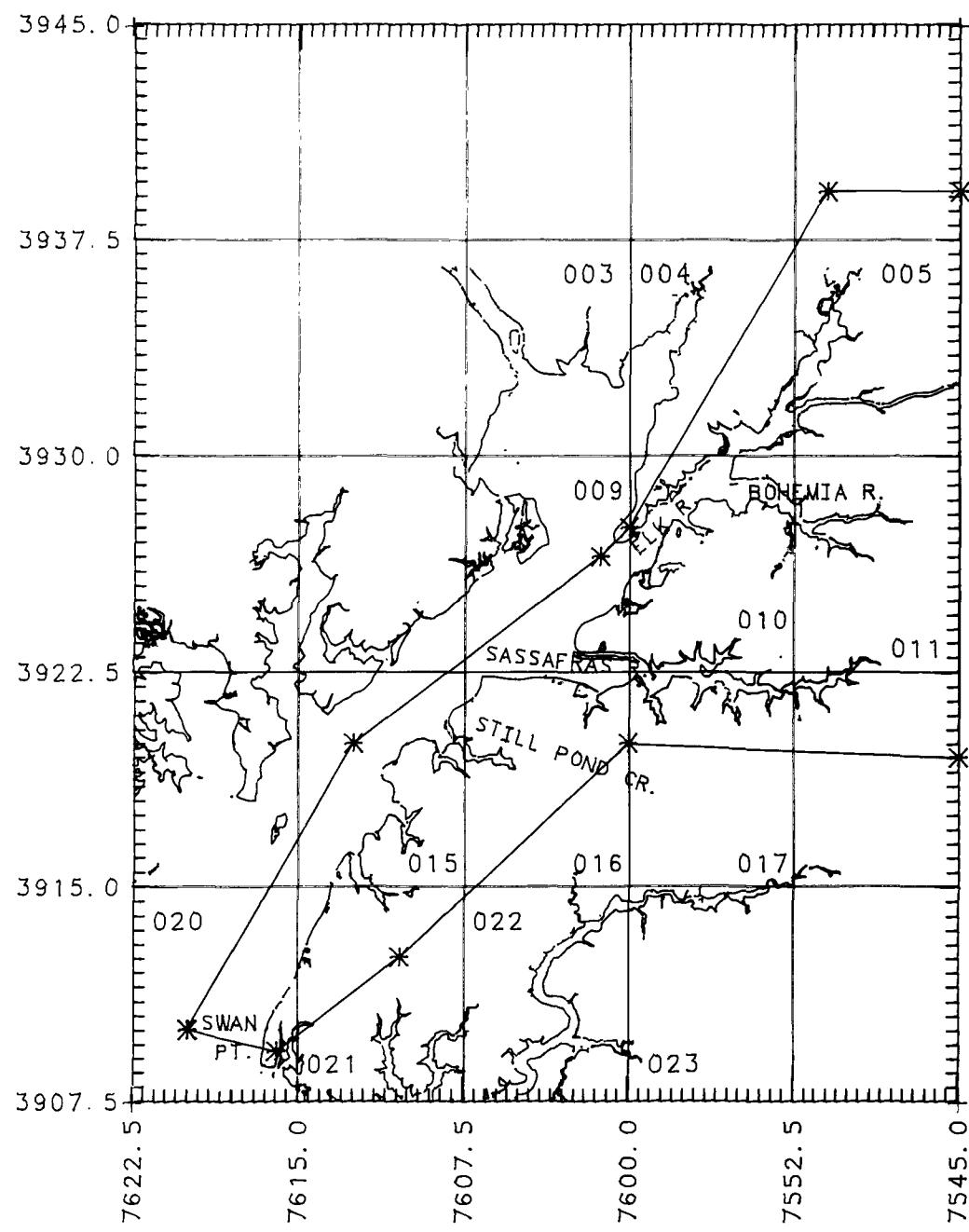


Figure 9. Distribution of SAV in the Upper Eastern Shore (Section 2).

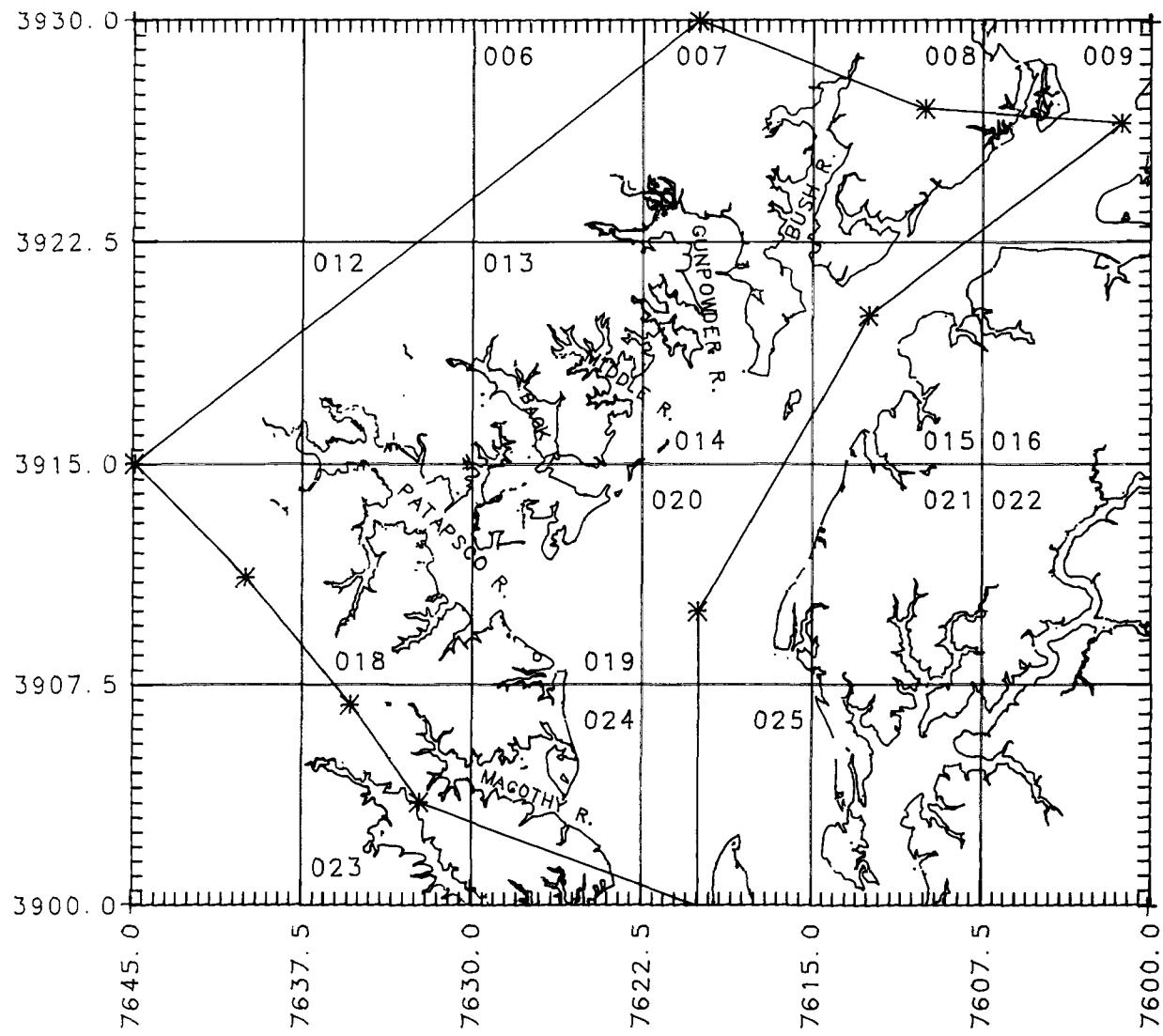


Figure 10. Distribution of SAV in the Upper Western Shore (Section 3).

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*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,

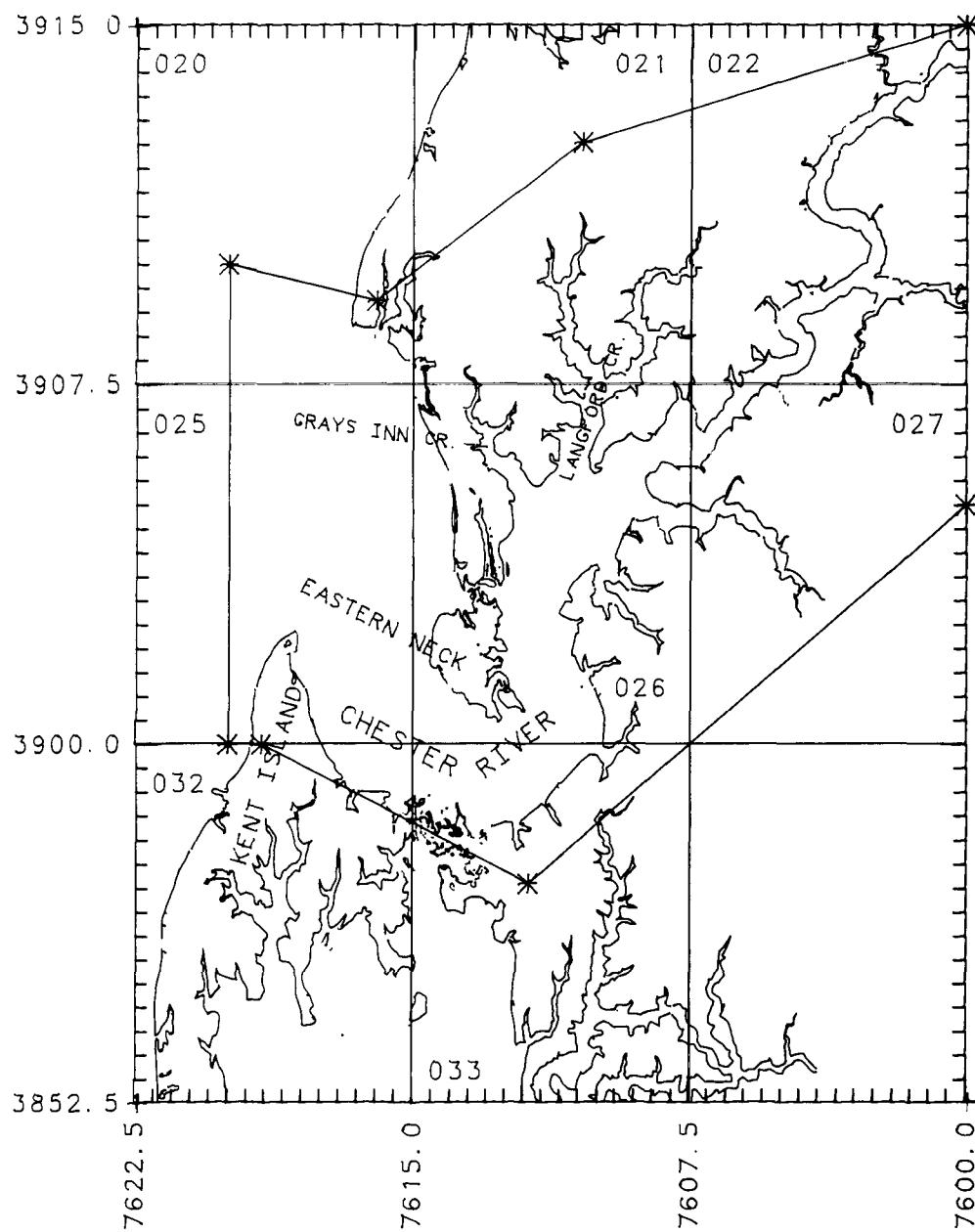


Figure 11. Distribution of SAV in the Chester River (Section 4).

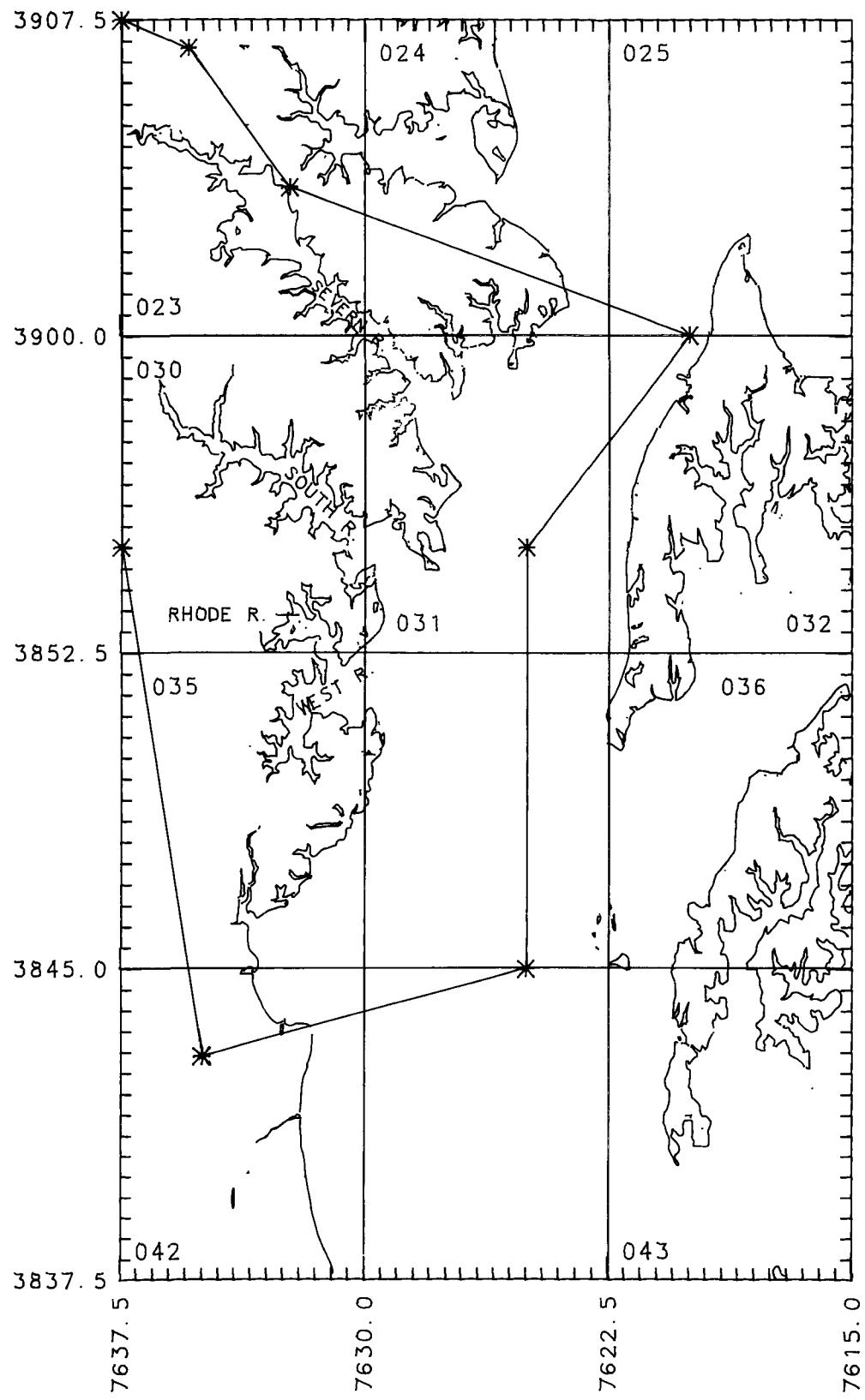


Figure 12. Distribution of SAV in the Central Western Shore (Section 5).

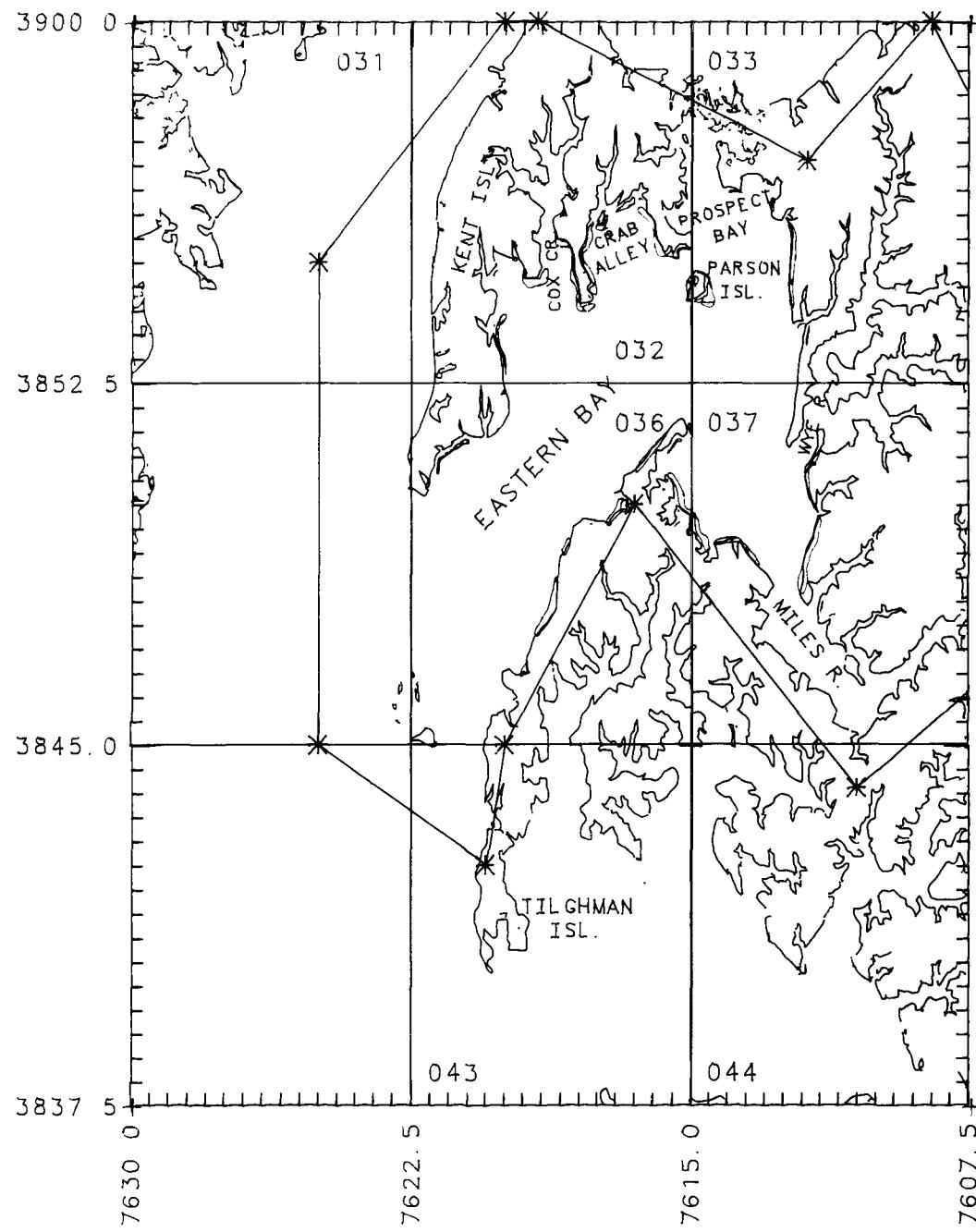


Figure 13. Distribution of SAV in the Eastern Bay (Section 6).

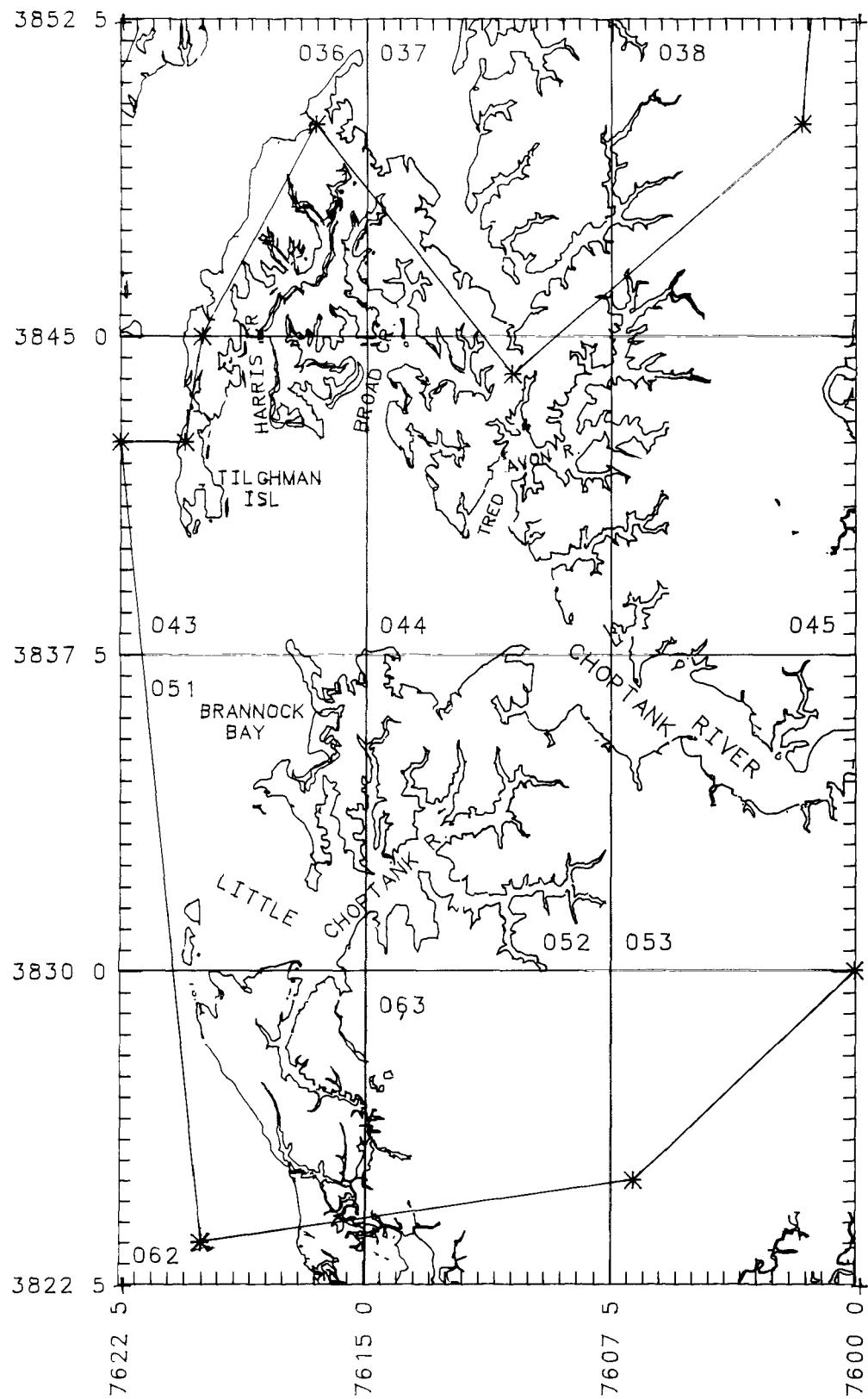


Figure 14. Distribution of SAV in the Choptank River (Section 7).

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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

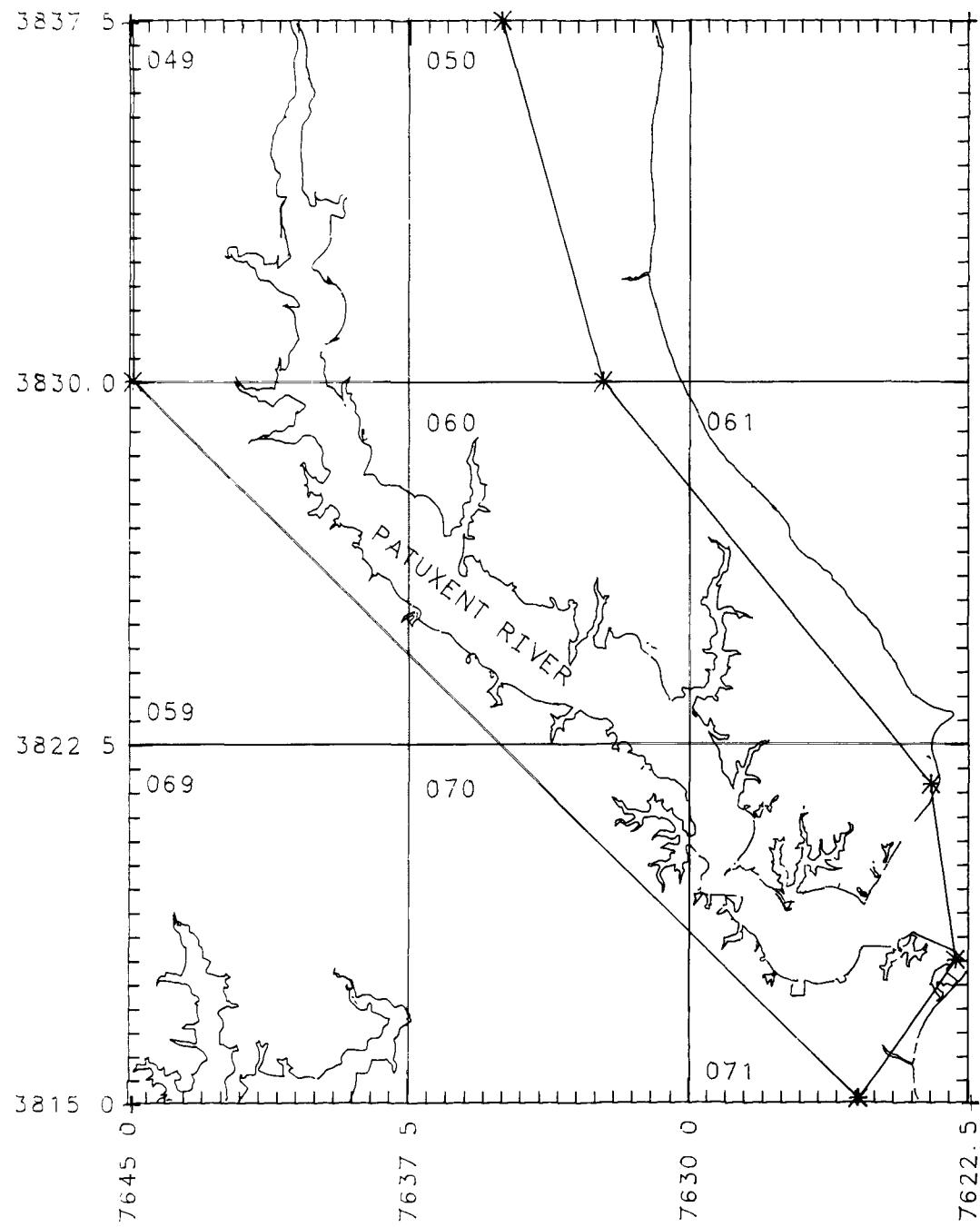


Figure 15. Distribution of SAV in the Patuxent River (Section 8).

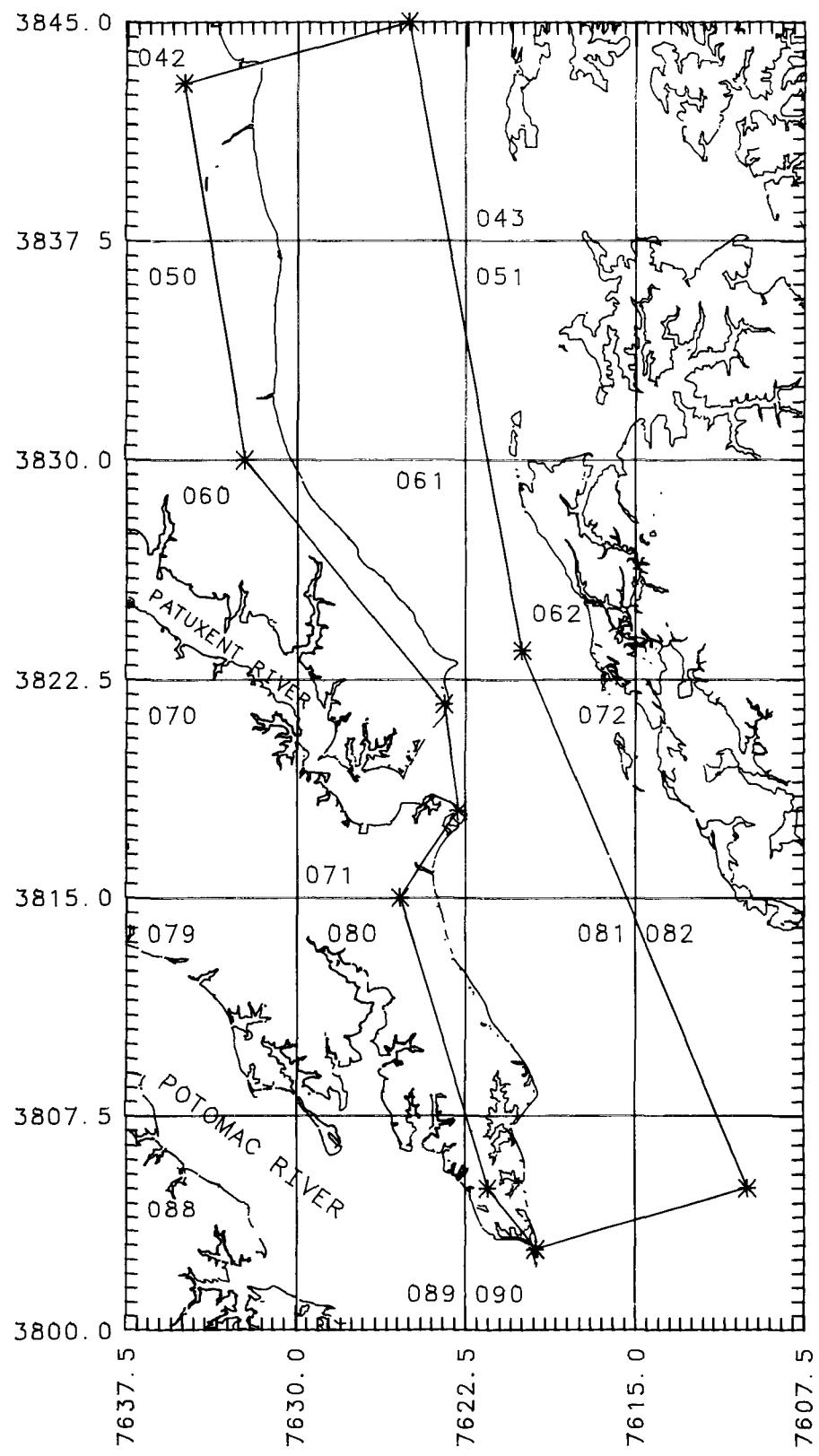


Figure 16. Distribution of SAV in the Middle Western Shore (Section 9).

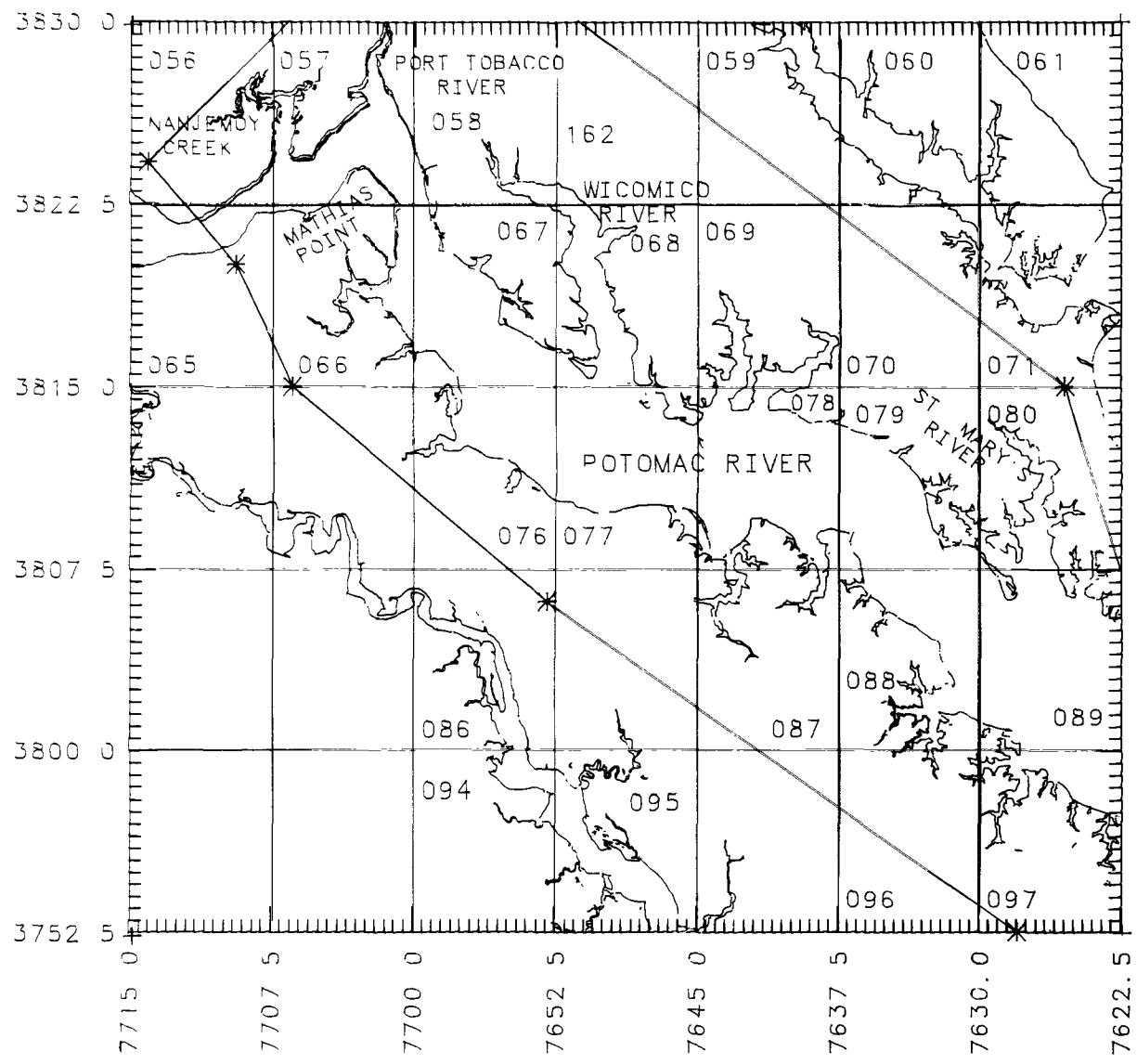


Figure 17. Distribution of SAV in the Lower Potomac River (Section 10).

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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, Wrotten 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*,

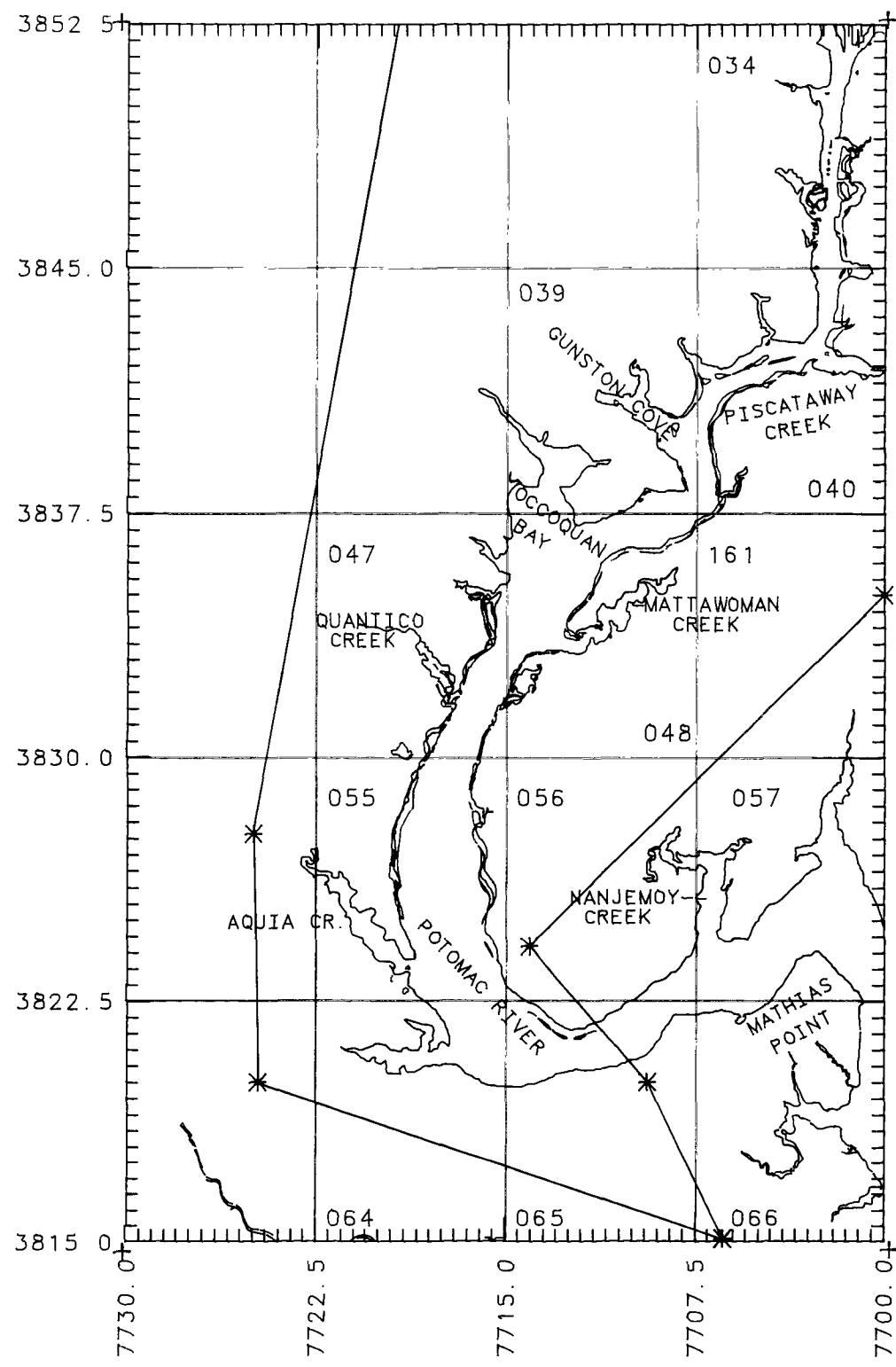


Figure 18. Distribution of SAV in the Upper Potomac River (Section 11).

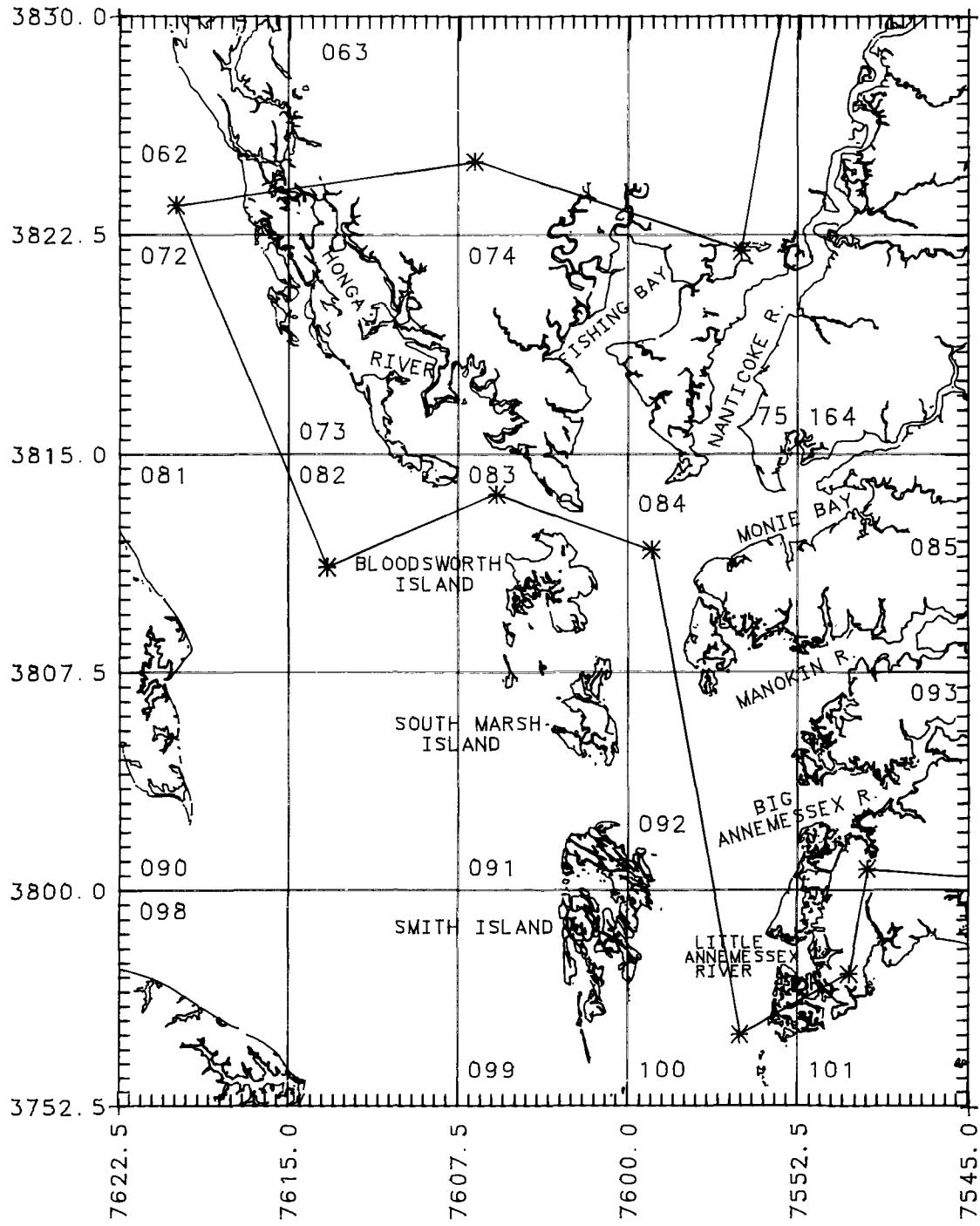


Figure 19. Distribution of SAV in the Middle Eastern Shore (Section 12).

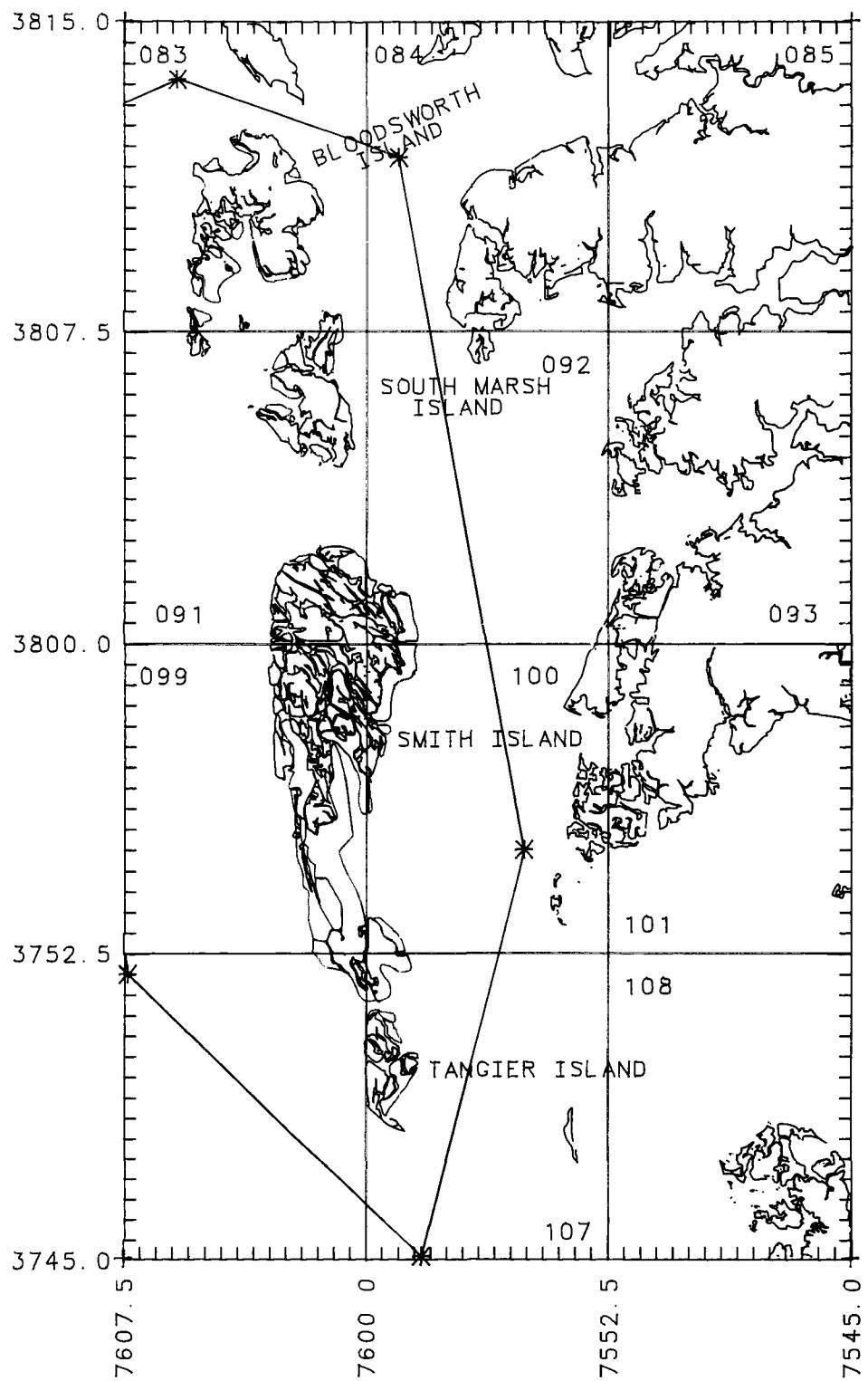


Figure 20. Distribution of SAV in the Mid-Bay Island Complex (Section 13).

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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 observations 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

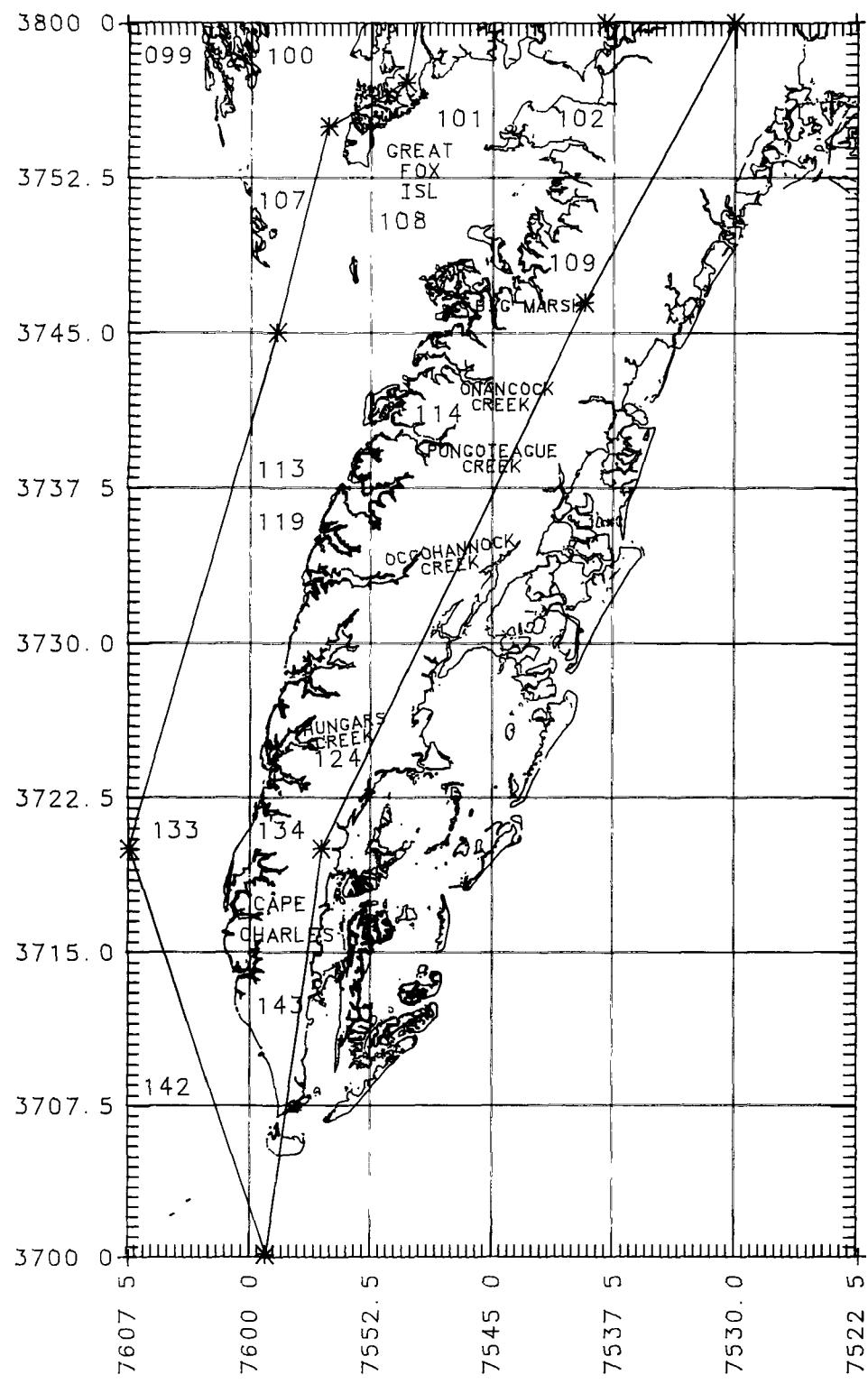


Figure 21. Distribution of SAV in the Lower Eastern Shore (Section 14).

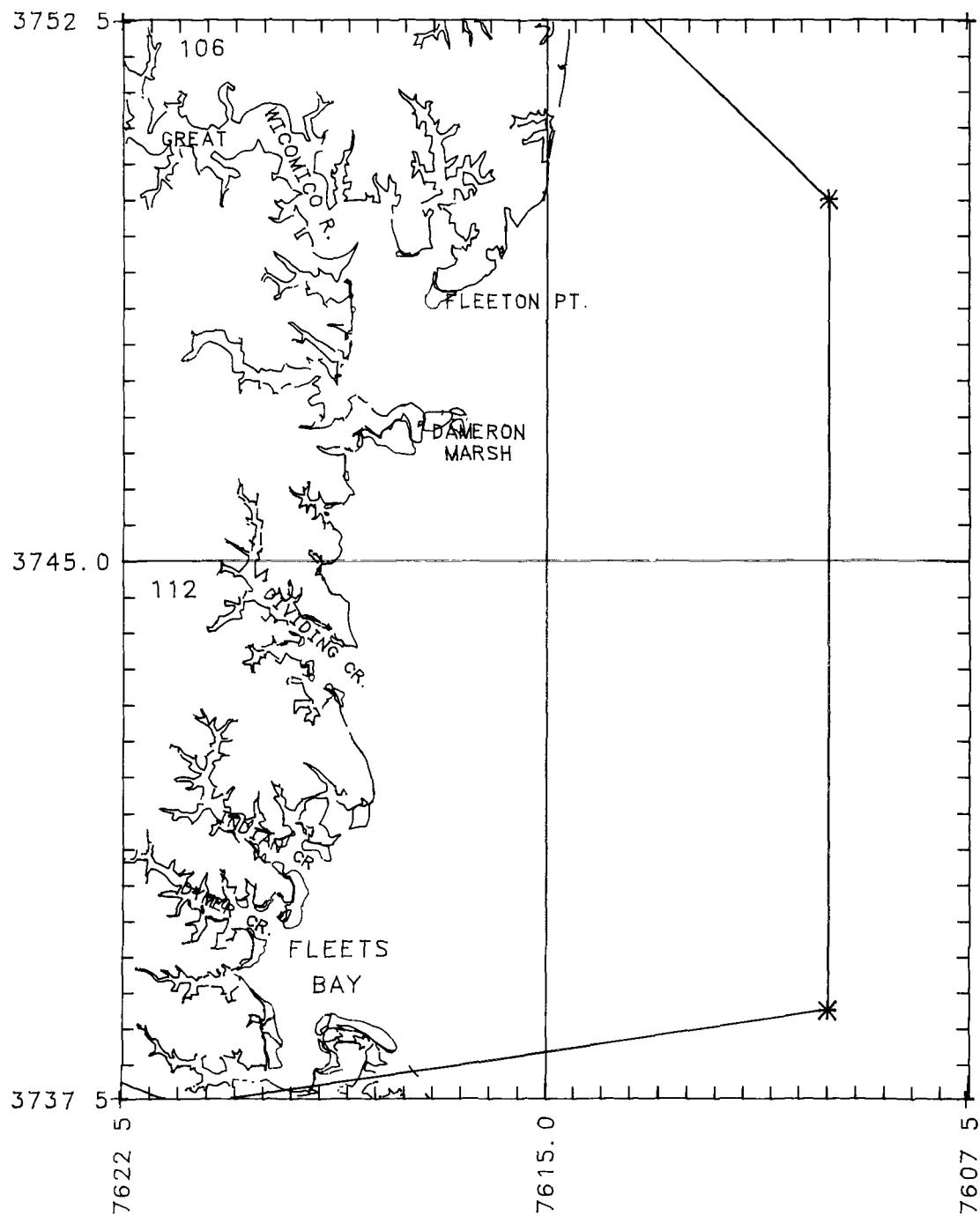


Figure 22. Distribution of SAV in the Reedville Region (Section 15).

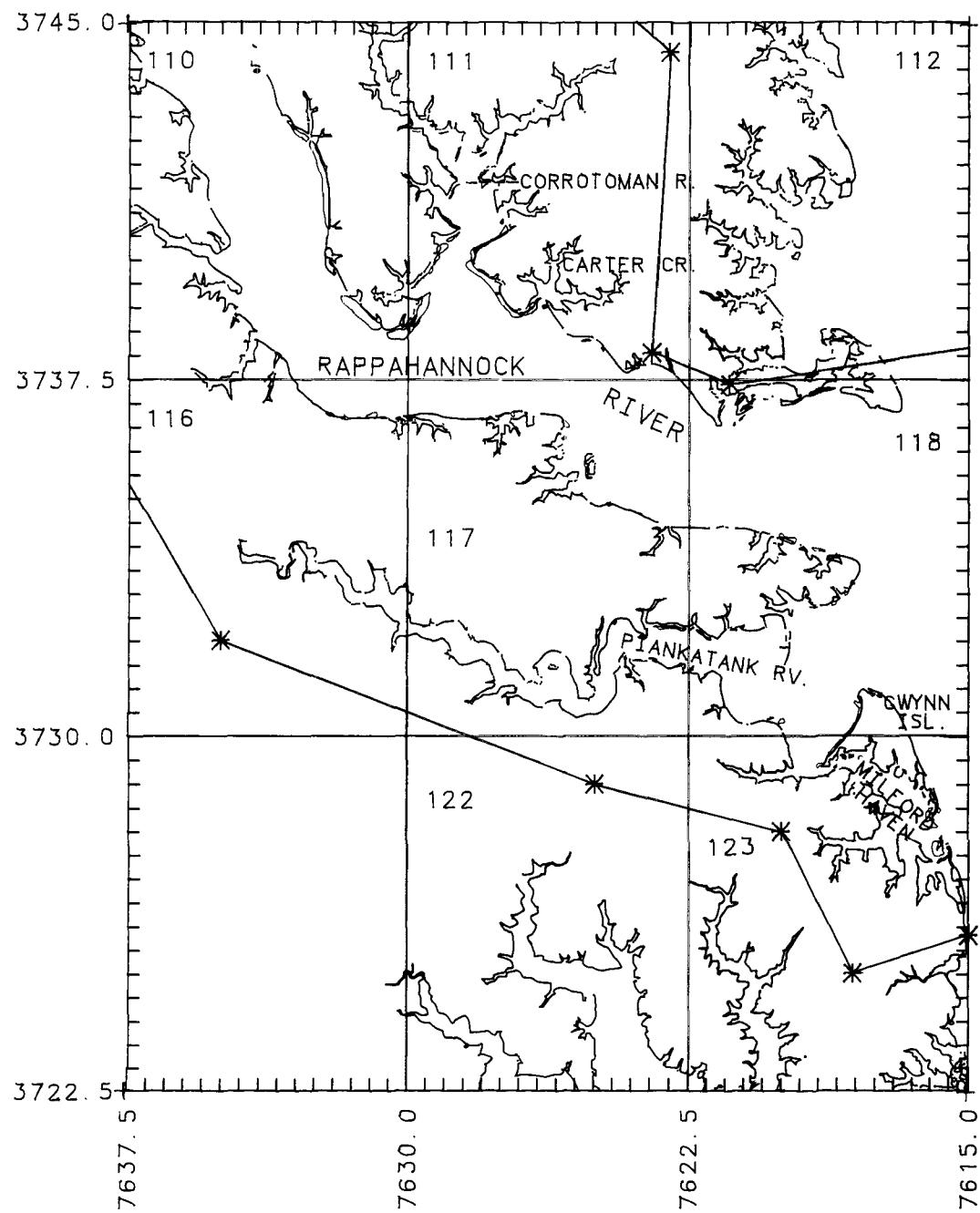


Figure 23. Distribution of SAV in the Rappahannock River Complex (Section 16).

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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<sup>2</sup>) 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

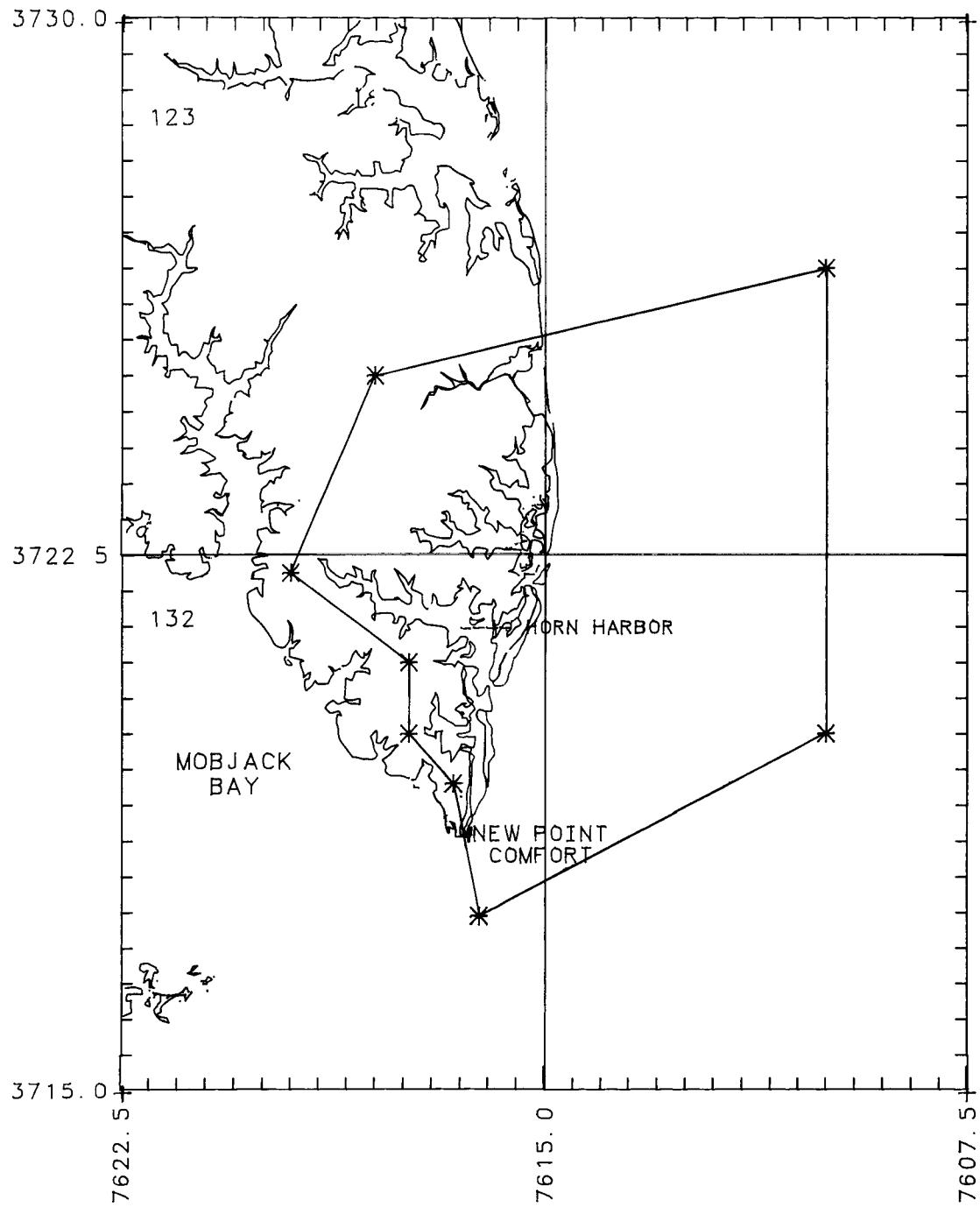


Figure 24. Distribution of SAV in the New Point Comfort Region (Section 17).

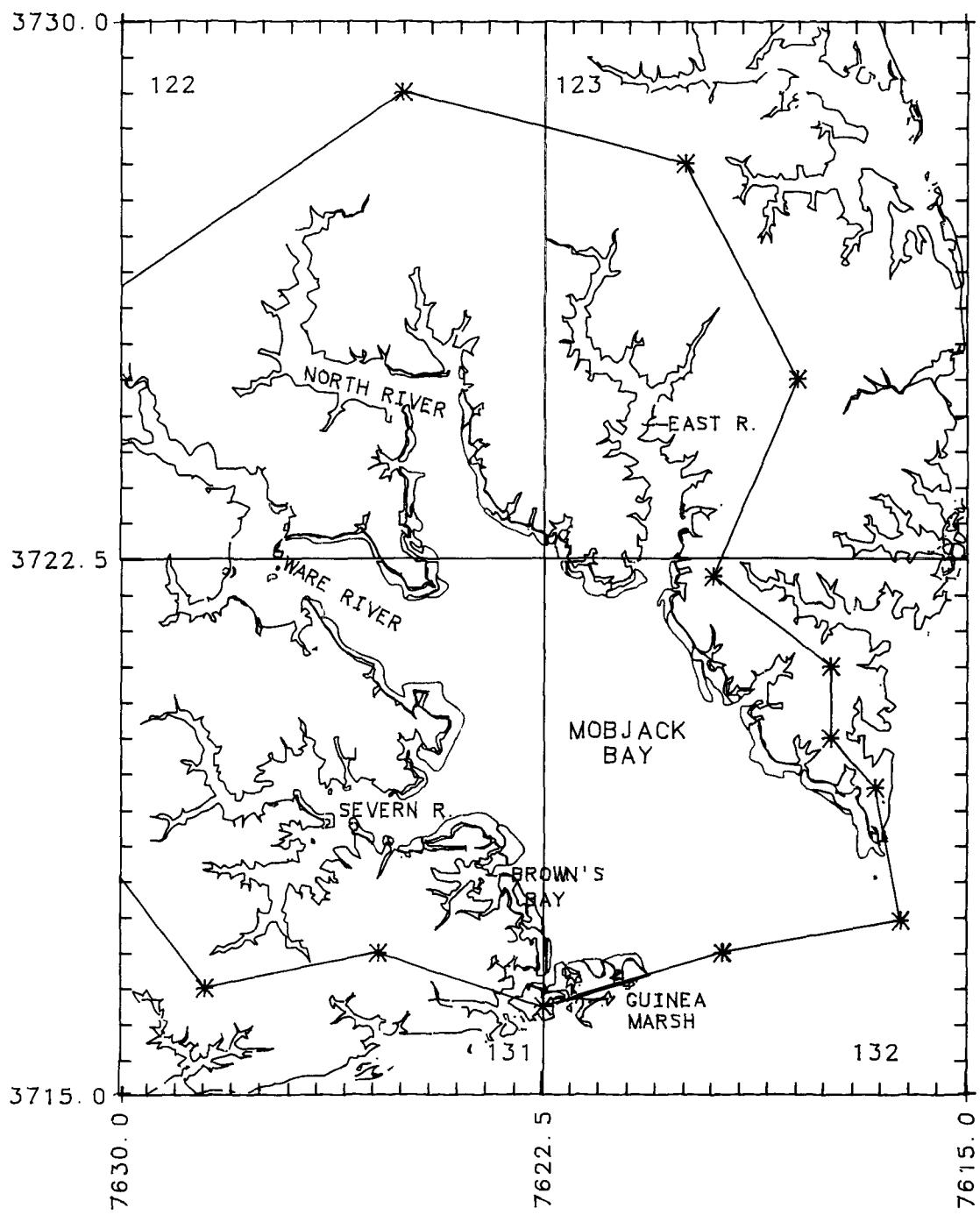


Figure 25. Distribution of SAV in the Mobjack Bay Complex (Section 18).

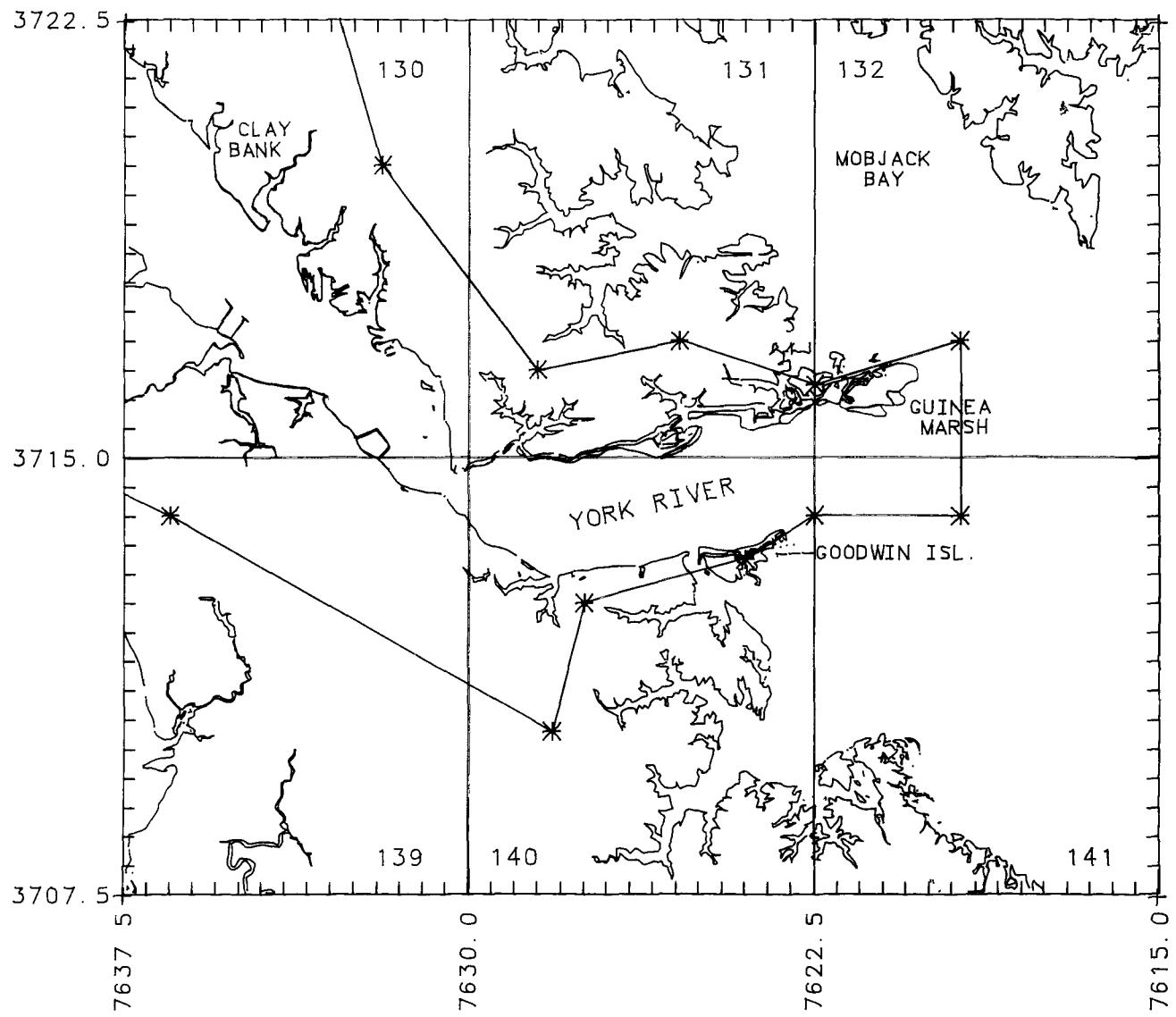


Figure 26. Distribution of SAV in the York River (Section 19).

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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. quadrangulensis*, *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.

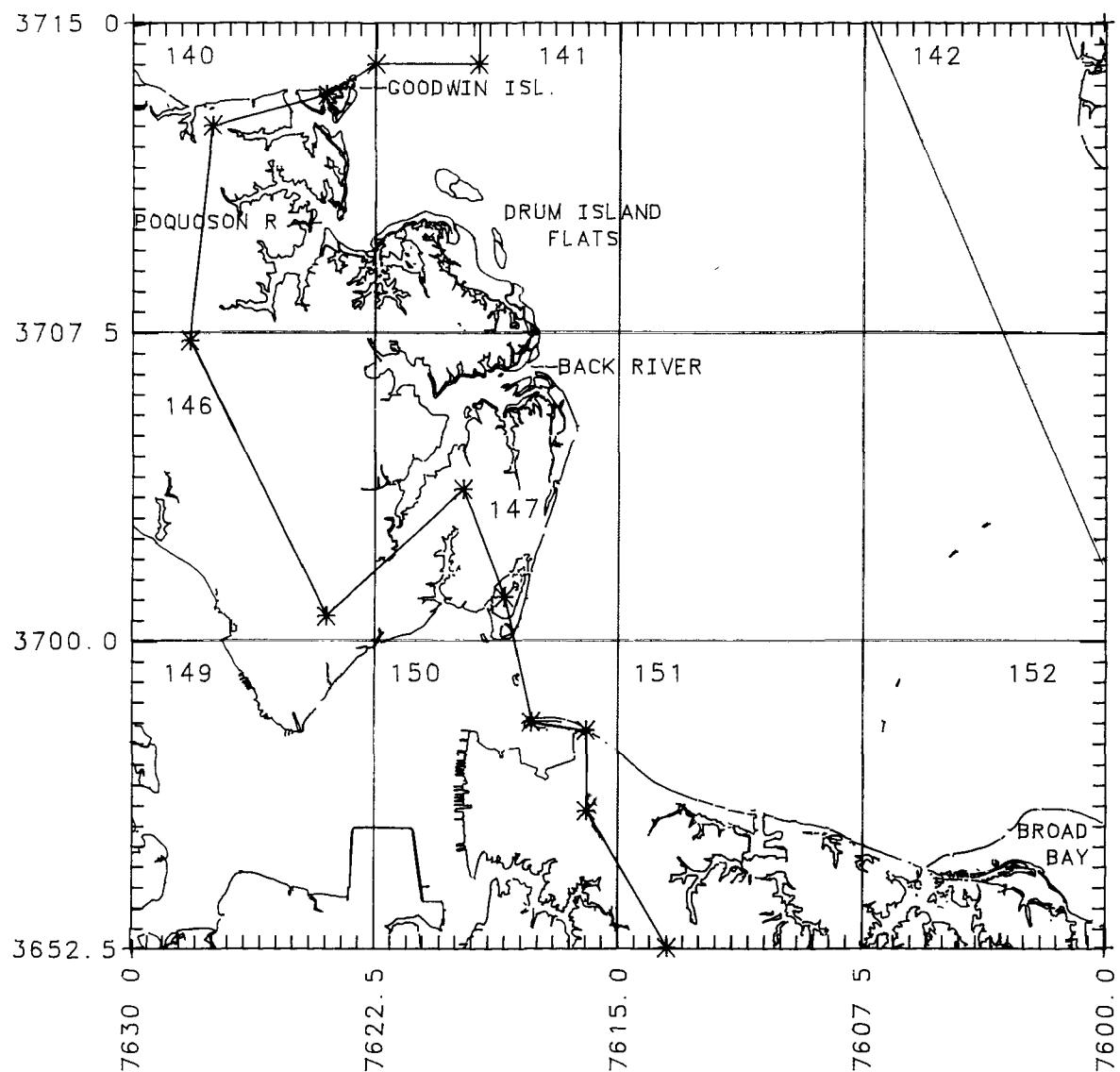


Figure 27. Distribution of SAV in the Lower Western Shore (Section 20).

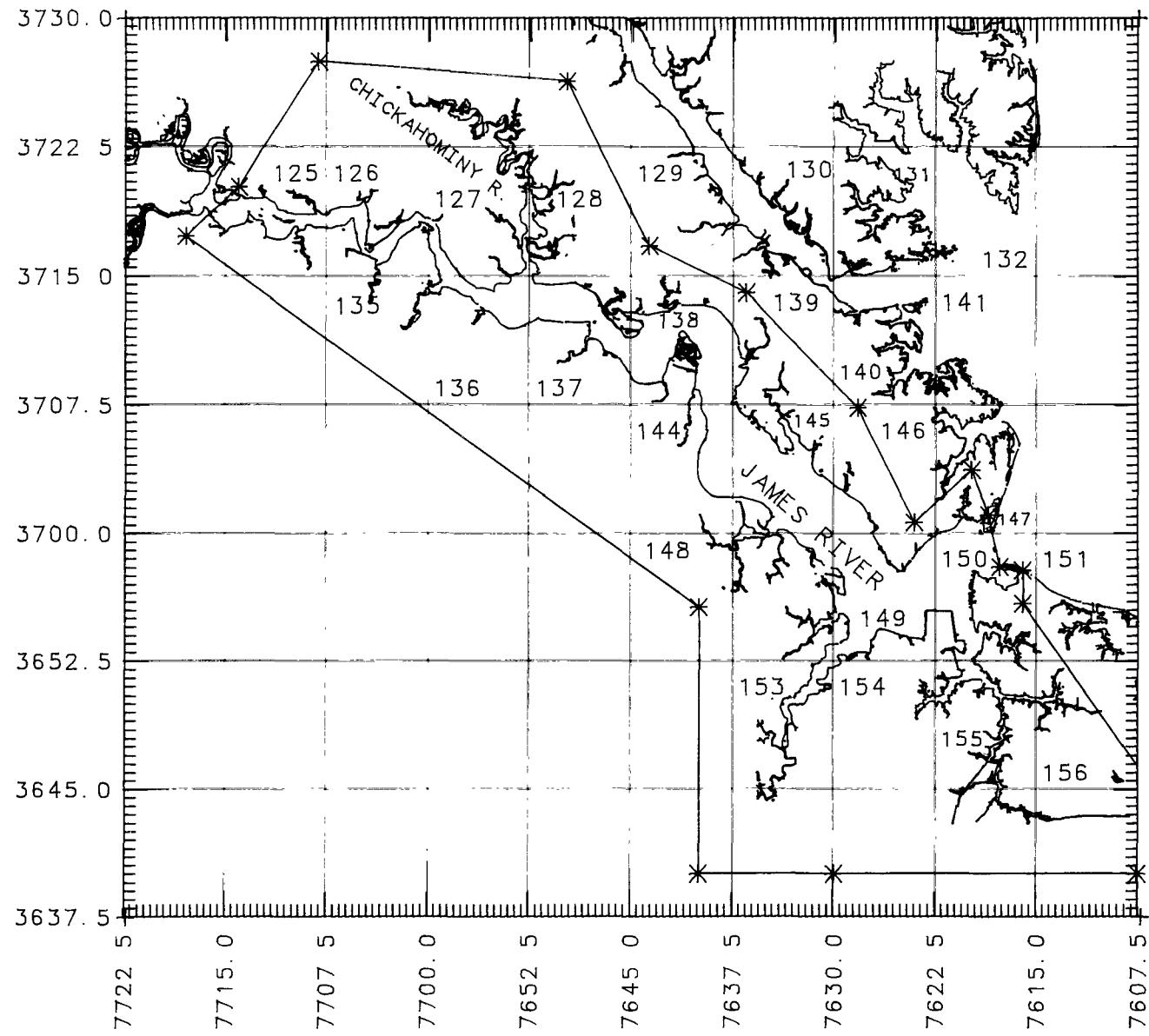
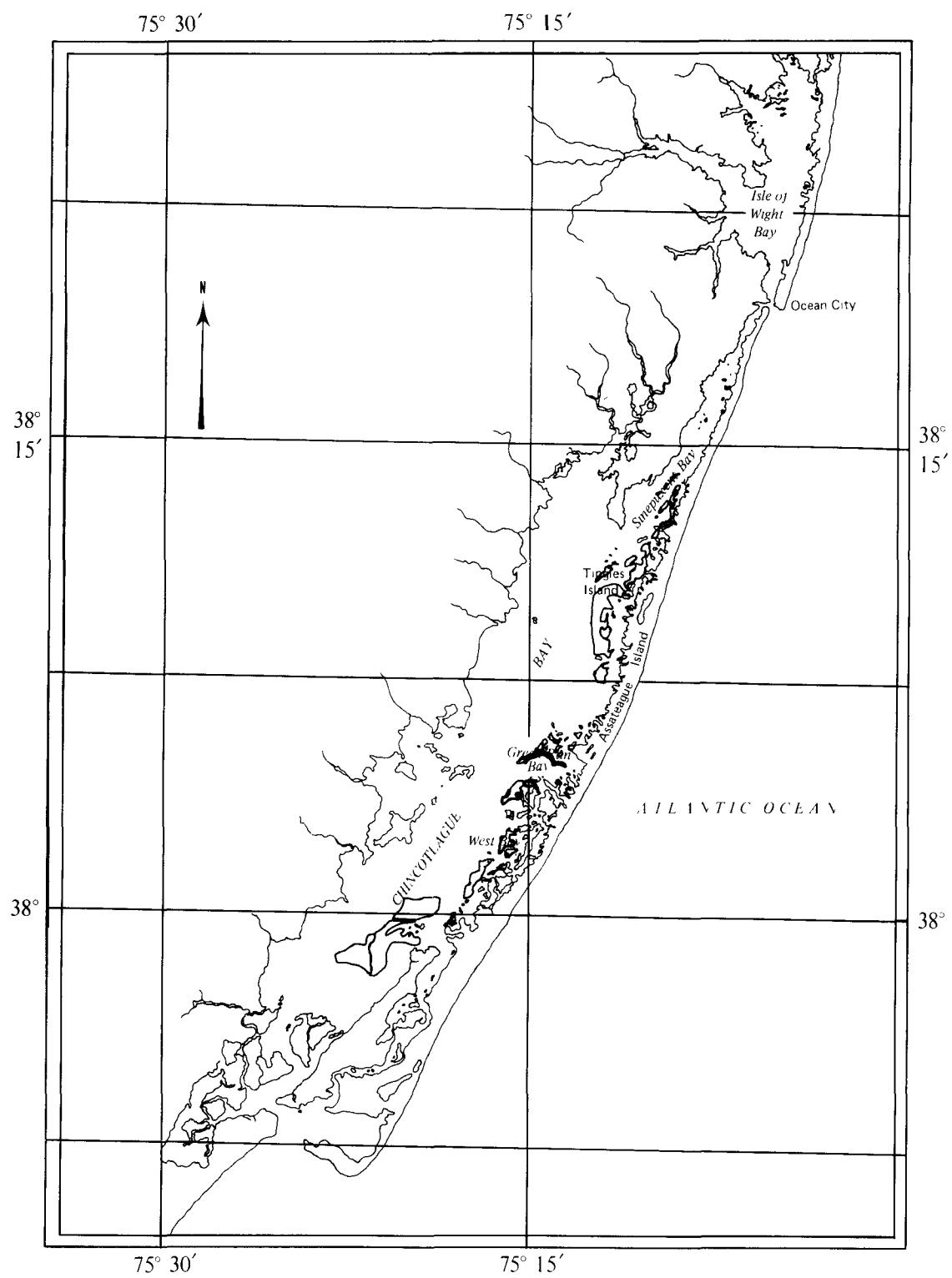


Figure 28. Distribution of SAV in the James River (Section 21).



**Figure 29. Distribution of SAV in Chincoteague Bay.**

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## APPENDICES

## APPENDIX A

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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)

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

## APPENDIX B

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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.)

	Latitude Deg Min	Longitude Deg Min		Latitude Deg Min	Longitude Deg Min
SEC. 1. Susquehanna Flats			SEC. 5. Central Western Shore		
	39 27.00	76 10.00		38 42.90	76 35.00
	39 39.15	76 10.00		38 55.00	76 37.50
	39 39.15	75 51.00		39 12.40	76 49.00
	39 27.50	76 00.00		39 11.15	76 40.00
	39 26.50	76 01.31		39 06.82	76 35.40
				39 03.50	76 32.30
SEC. 2. Upper Eastern Shore				39 00.00	76 20.00
	39 10.00	76 20.00		38 55.00	76 25.00
	39 20.00	76 12.50		38 45.00	76 25.00
	39 26.50	76 01.31	SEC. 6. Eastern Bay		
	39 27.50	76 00.00		38 45.00	76 25.00
	39 39.15	75 51.00		38 55.00	76 25.00
	39 39.15	75 45.00		39 00.00	76 20.00
	39 19.50	75 45.00		39 00.00	76 19.10
	39 20.00	76 00.00		39 12.55	76 10.40
	39 12.55	76 10.40		39 09.25	76 16.00
	39 09.25	76 16.00			
SEC. 3. Upper Western Shore				38 44.10	76 10.50
	39 12.40	76 49.00		38 50.00	76 16.50
	39 30.00	76 20.00		38 45.00	76 20.00
	39 27.00	76 10.00		38 42.50	76 20.50
	39 26.50	76 01.31	SEC. 7. Choptank River		
	39 20.00	76 12.50		38 23.50	76 20.00
	39 10.00	76 20.00		38 45.00	76 25.00
	39 00.00	76 20.00		38 42.50	76 20.50
	39 03.50	76 32.30		38 45.00	76 20.00
	39 06.82	76 35.40		38 50.00	76 16.50
	39 11.15	76 40.00		38 44.10	76 10.50
SEC. 4. Chester River				38 50.00	76 01.65
	39 00.00	76 20.00		39 05.00	76 00.00
	39 10.00	76 20.00		38 45.00	75 45.00
	39 09.25	76 16.00		38 45.00	75 50.00
	39 12.55	76 10.40		38 21.93	75 55.00
	39 20.00	76 00.00		38 25.00	76 06.80
	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			

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	Latitude Deg	Longitude Min		Latitude Deg	Longitude Min	
SEC. 8. Patuxent River			SEC. 11. Upper Potomac River			
38 15.00	76 25.45		38 15.00	77 06.40		
38 35.00	77 00.00		38 20.00	77 24.80		
38 58.00	76 45.00		38 27.65	77 25.00		
38 55.00	76 37.50		39 01.80	77 17.10		
38 42.90	76 35.00		38 58.00	76 45.00		
38 30.00	76 32.30		38 35.00	77 00.00		
38 21.66	76 23.50		38 24.20	77 14.08		
38 18.00	76 22.83		38 20.00	77 09.40		
SEC. 9. Middle Western Shore			SEC. 12. Middle Eastern Shore			
38 02.85	76 19.40		38 11.10	76 13.30		
38 05.00	76 21.54		38 23.50	76 20.00		
38 15.00	76 25.45		38 25.00	76 06.80		
38 18.00	76 22.83		38 21.93	75 55.00		
38 21.66	76 23.50		38 45.00	75 50.00		
38 30.00	76 32.30		38 40.00	75 37.00		
38 42.90	76 35.00		38 00.00	75 38.00		
38 45.00	76 25.00		38 00.73	75 49.50		
38 23.50	76 20.00		37 57.10	75 50.30		
38 05.00	76 10.00		37 55.00	75 55.10		
SEC. 10. Lower Potomac River				38 11.70	75 59.00	
				38 13.60	76 05.83	
37 53.40	76 14.45		SEC. 13. Mid-Bay Island Complex			
37 55.50	76 18.15		37 45.00	75 58.30		
37 53.85	76 28.00		37 50.00	76 10.00		
38 06.15	76 53.00		38 05.00	76 10.00		
38 15.00	77 06.40		38 11.10	76 13.30		
38 20.00	77 09.40		38 13.60	76 05.83		
38 24.20	77 14.08		38 11.70	75 59.00		
38 35.00	77 00.00		37 55.00	75 55.10		
38 15.00	76 25.45		SEC. 14. Lower Eastern Shore			
38 05.00	76 21.54		37 00.00	75 58.95		
38 02.85	76 19.40		37 20.00	76 10.00		
38 05.00	76 10.00		37 38.75	76 10.00		
37 50.00	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		

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Latitude Deg Min	Longitude Deg Min
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## 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
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## 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

## SEC. 19. York River

37 21.00	76 17.40
37 20.00	76 17.40
37 19.30	76 16.62
37 17.45	76 16.16
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

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Latitude Deg Min	Longitude Deg Min
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## SEC. 20. Lower Western Shore

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

Latitude Deg Min	Longitude Deg Min
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## Chincoteague Bay

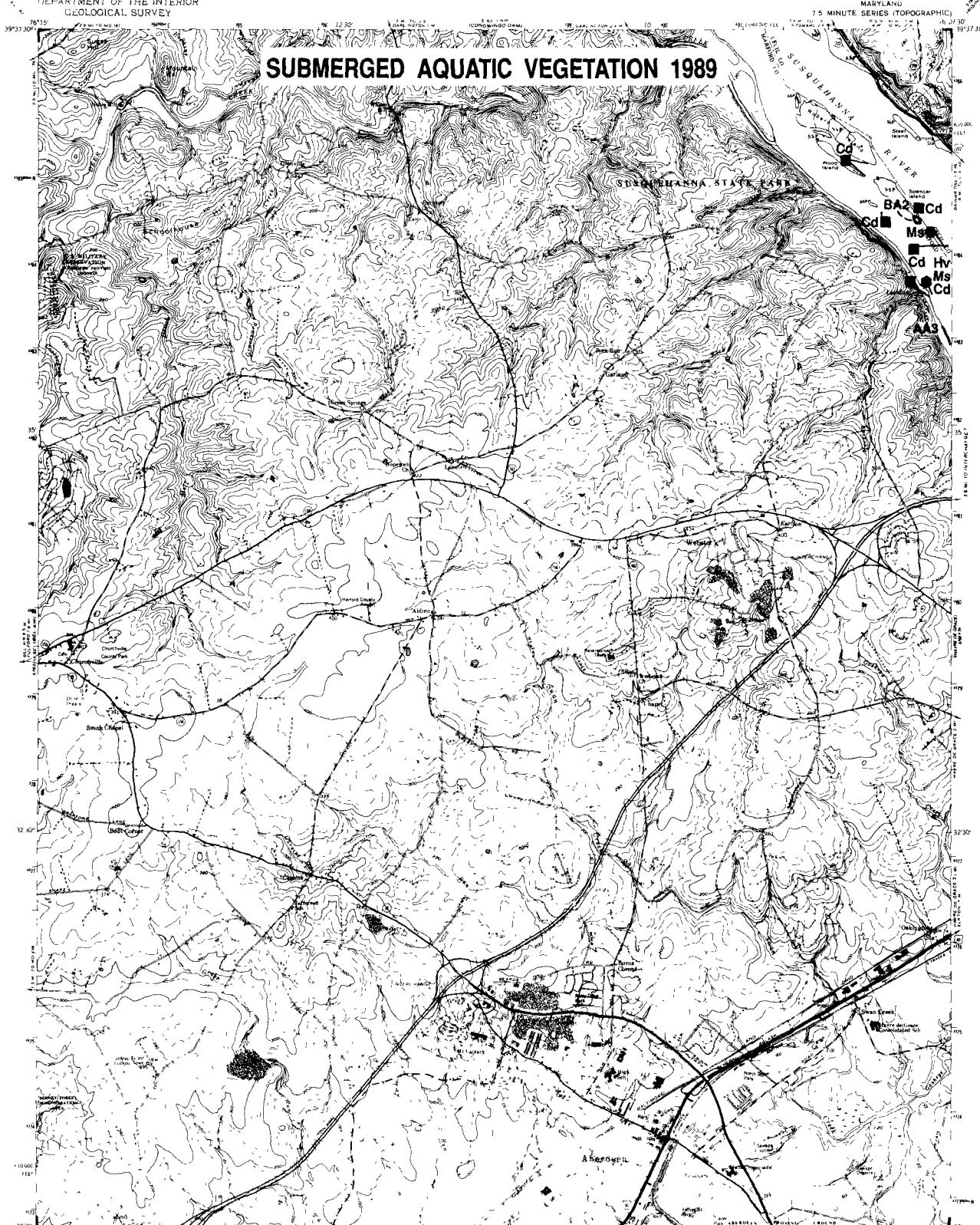
37 52.50	75 30.00
38 00.00	75 30.00
38 07.50	75 22.50
38 15.00	75 17.50
38 15.00	75 15.00
38 22.50	75 15.00
38 30.00	75 10.00
38 30.00	75 02.50
38 22.50	75 02.50
38 15.00	75 07.50
38 07.50	75 10.00
38 00.00	75 15.00
37 52.50	75 20.00
37 51.00	75 22.30
37 51.00	75 30.00

## SEC. 21. James River

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

## 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.)



**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.* (naiaid)  
Ec *Floella 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 naiaid)  
Ngr *Najas gracillima* (naiaid)  
C *Chara sp.* (muskglass)  
Nm *Najas minor* (slender naiaid)

**SURVEY STATIONS**

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

DATE FLOWN

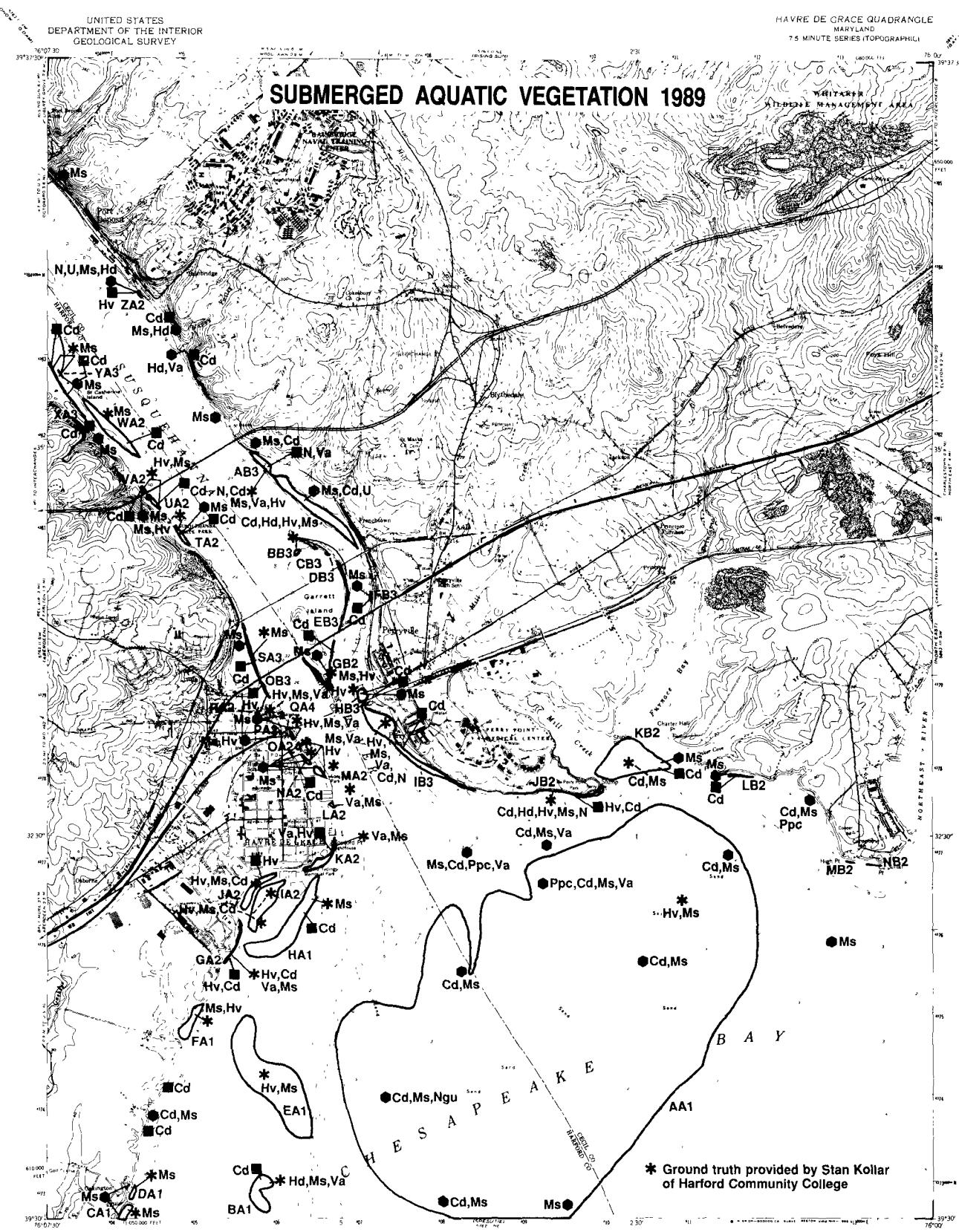
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002

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DMA 2500 J 54 SERIES 483

SCALE 1:24,000  
1 MILE  
5 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



SPECIES		SURVEY STATIONS		DATES FLOWN
Zm	<i>Zostera marina</i> (eelgrass)	Hv	<i>Hydrilla verticillata</i> (hydrilla)	8-8-89
Rm	<i>Ruppia maritima</i> (widgeon grass)	Hd	<i>Heteranthera dubia</i> (water stargrass)	8-31-89
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pct	<i>Potamogeton crispus</i> (curly pondweed)	
Ppf	<i>Potamogeton perfoliatus</i> (redhead pondweed)	Cd	<i>Ceratophyllum demersum</i> (coontail)	
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	Ppu	<i>Potamogeton pusillus</i> (slender pondweed)	
Zp	<i>Zannichellia palustris</i> (horned pondweed)	Ngu	<i>Najas guadalupensis</i> (southern naiad)	
N	<i>Najas</i> spp. (naiad)	Ngr	<i>Najas gracilissima</i> (naiad)	
Ec	<i>Elodea canadensis</i> (common elodea)	C	<i>Chara</i> sp. (muskglass)	
Va	<i>Vallisneria americana</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)	
Tn	<i>Trapa natans</i> (water chestnut)			
U	Unknown species composition			

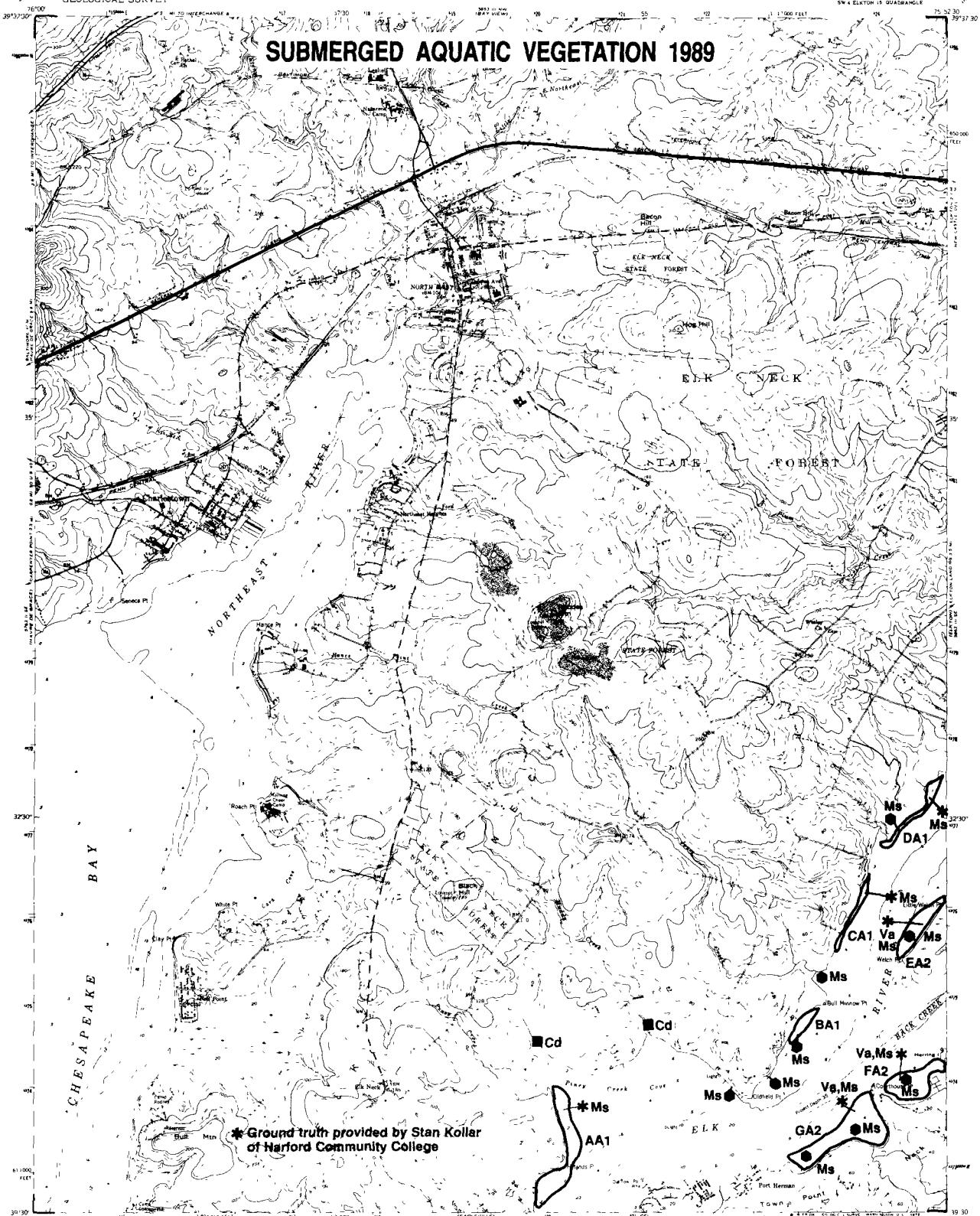
SCALE 1:24,000

1 MILE

1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

**HAVRE DE  
GRACE, MD  
003**



**SPECIES**

Zm	<i>Zostera marina</i> (eelgrass)	Hv	<i>Hydrilla verticillata</i> (hydrilla)
Rm	<i>Ruppia maritima</i> (widgeon grass)	Hd	<i>Heisanthera dubia</i> (water stargrass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)	Ngu	<i>Najas guadalupensis</i> (southern naiad)
N	<i>Najas spp.</i> (naiad)	Ngr	<i>Najas gracillima</i> (naiad)
Ec	<i>Eldaea canadenensis</i> (common elodea)	C	<i>Chara sp.</i> (muskglass)
Va	<i>Vallisneria americana</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapa natans</i> (water chestnut)		
U	Unknown species composition		

**SURVEY STATIONS**

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

DATE FLOWN

8-8-89

**NORTH EAST,  
MD  
004**

PHOTOGRAPHED 1970

AMS 28610 1:250,000 SERIES VERS

SCALE 1:24,000

1 MILE  
1 KILOMETER

VIRGINIA INSTITUTE  
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#### SPECIES

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

Hv	<i>Hydrilla verticillata</i> (hydrilla)
Hd	<i>Heteranthera dubia</i> (water stargrass)
Pct	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (southern naiad)
Ngr	<i>Najas gracillima</i> (naiad)
C	<i>Chara sp.</i> (muskgrass)
Nm	<i>Najas minor</i> (slender naiad)

#### SURVEY STATIONS

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

DATE FLOWN

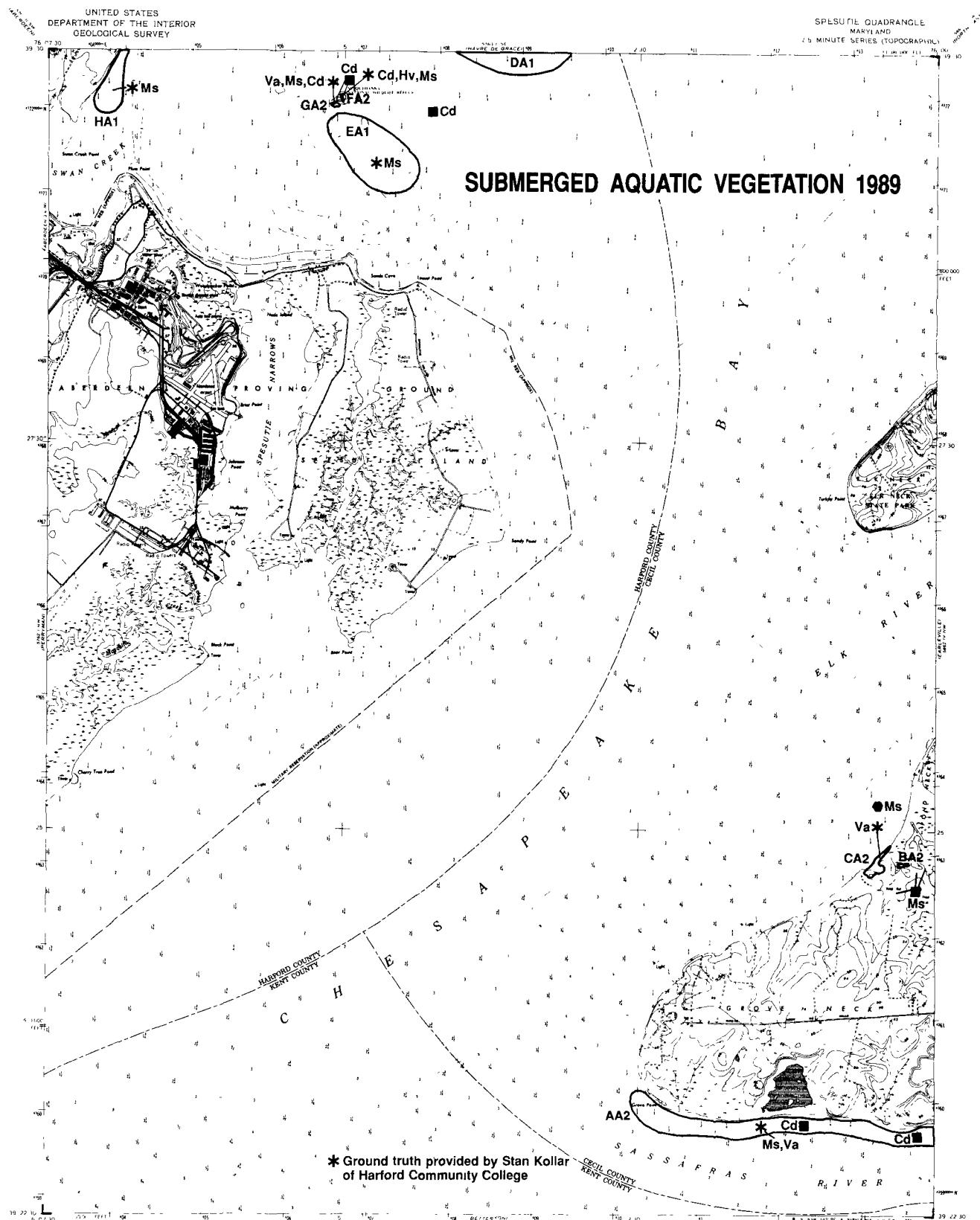
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ELKTON,  
MD  
005

1983  
PHOTOREVISED 1970  
AMS 5653 III SE SERIES V33

VIRGINIA INSTITUTE  
OF MARINE SCIENCE





#### SPECIES

Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppl	<i>Potamogeton perfoliatus</i> (redhead grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas</i> spp. (naiaid)
Ec	<i>Elodea canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
U	Unknown species composition
Hv	<i>Hydrilla verticillata</i> (hydrilla)
Hd	<i>Heteranthera dubia</i> (water stargrass)
Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Cc	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (southern naiaid)
Ngr	<i>Najas gracillima</i> (naiaid)
C	<i>Chara</i> sp. (muskgrazz)
Nm	<i>Najas minor</i> (slender naiaid)

#### 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

SPESUTIE,

MD

009

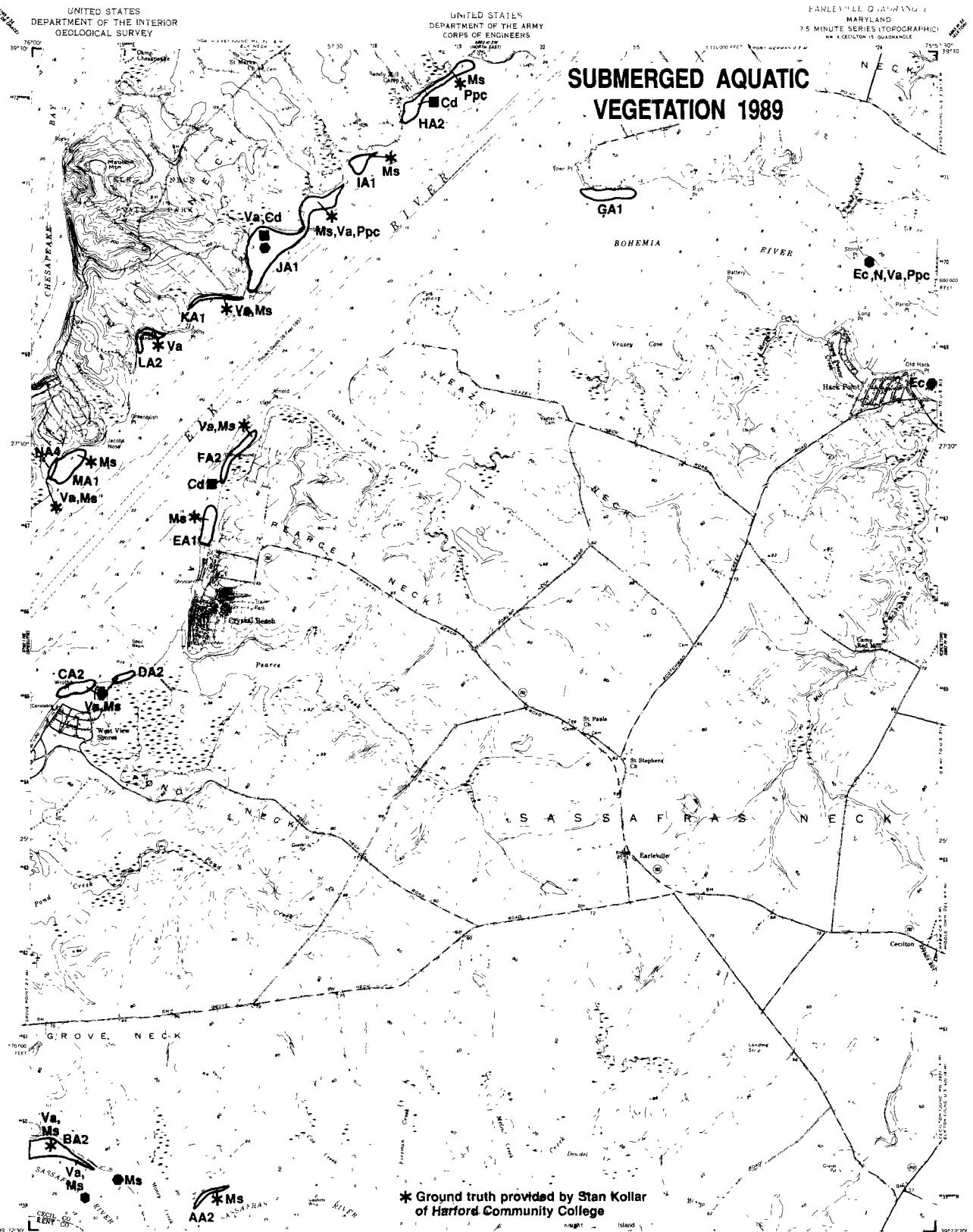
VIRGINIA INSTITUTE  
OF MARINE SCIENCE

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

UNITED STATES  
DEPARTMENT OF THE ARMY  
CORPS OF ENGINEERS

EARLEVILLE, MARYLAND  
7.5 MINUTE SERIES TOPOGRAPHIC  
MAP SECTION 15 (WADDELL)

## SUBMERGED AQUATIC VEGETATION 1989



### SPECIES

Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (wedge grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ptk	<i>Potamogeton perfoliatus</i> (redhead grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas</i> spp. (naiad)
Ec	<i>Eleocharis canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
U	Unknown species composition

### SURVEY STATIONS

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

DATE FLOWN

8-8-89

EARLEVILLE,

MD

010

1958  
PHOTOCOPIES 1975  
AMS 1402 14 14-BERIES V222

SCALE 1:24,000  
1 5 0 1 MILE  
1 5 0 1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



SPECIES

Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas</i> spp. (naiad)
Ec	<i>Ectoedemia canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
U	Unknown species composition
Hv	<i>Hydrilla verticillata</i> (hydrilla)
Hd	<i>Heteranthera dubia</i> (water stargrass)
Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (southern naiad)
Ngr	<i>Najas gracillima</i> (naiad)
C	<i>Chara</i> sp. (muskglass)
Ntm	<i>Najas minor</i> (slender naiad)

DATE FLOWN

8-31-89

MIDDLE RIVER,  
MD  
013

SURVEY STATIONS

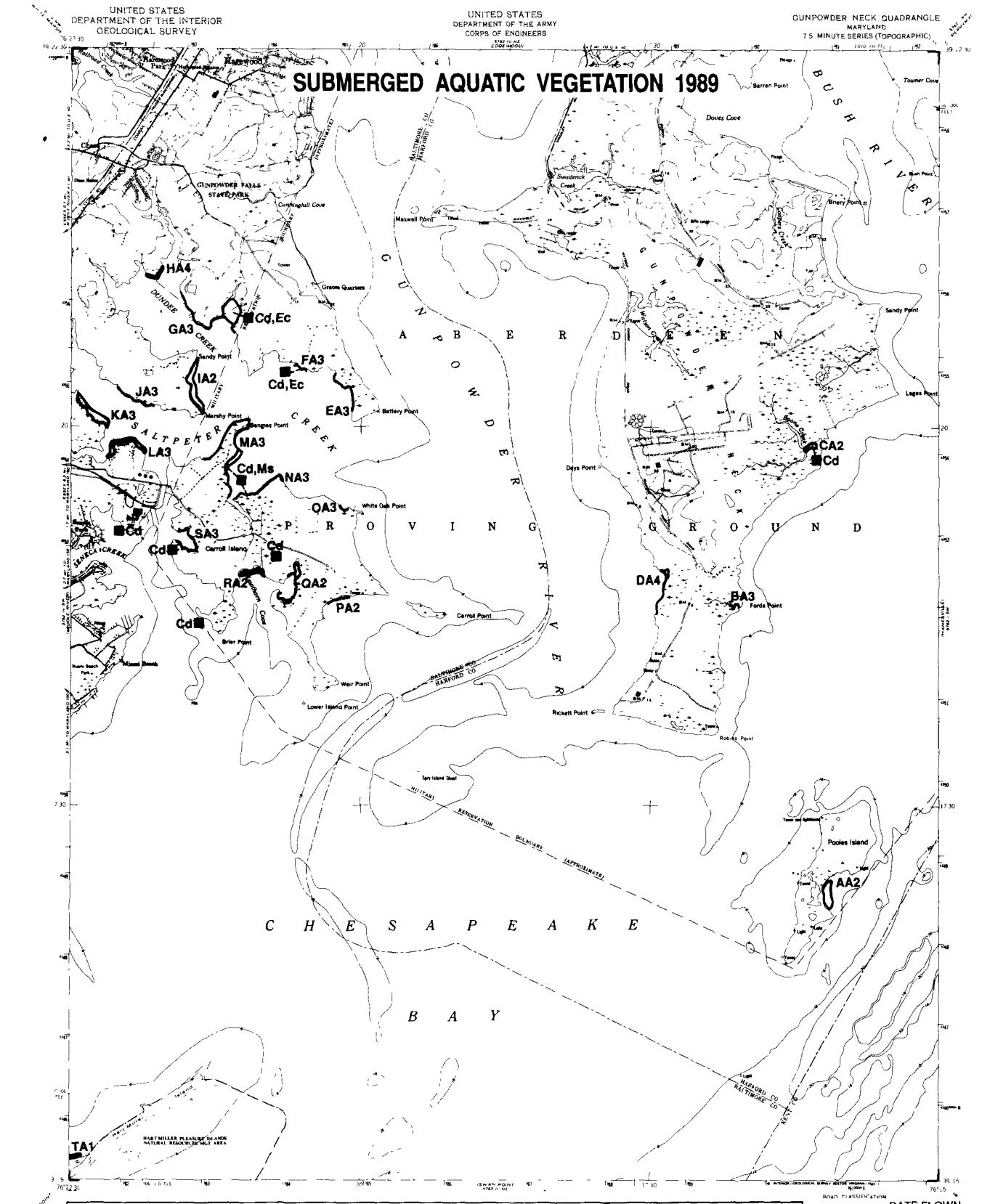
- MD Charter Boat Field Survey
- Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

1989  
PHOTOCHEVISED 1985  
DMA 5187 IV SW SERIES V33

SCALE 1:24,000

1 MILE  
1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



	SPECIES
Zm	<i>Zostera marina</i> (eel-grass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppl	<i>Pozamogezion perfoliatum</i> (redthead-grass)
Ppc	<i>Pozamogezion pectinatum</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas spp.</i> (naaid)
Ec	<i>Elodea canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild caltrop)
Tn	<i>Trapa natans</i> (water chestnut)
U	Unknown species composition

Hv	<i>Hydrilla verticillata</i> (hydrilla)
Hd	<i>Heteranthera dubia</i> (water stargrass)
Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (southern naiad)
Ngr	<i>Najas gracilissima</i> (naiad)
C	<i>Chara</i> sp. (muskgrazz)
Nm	<i>Najas minor</i> (slender naiad)

## SURVEY STATIONS

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

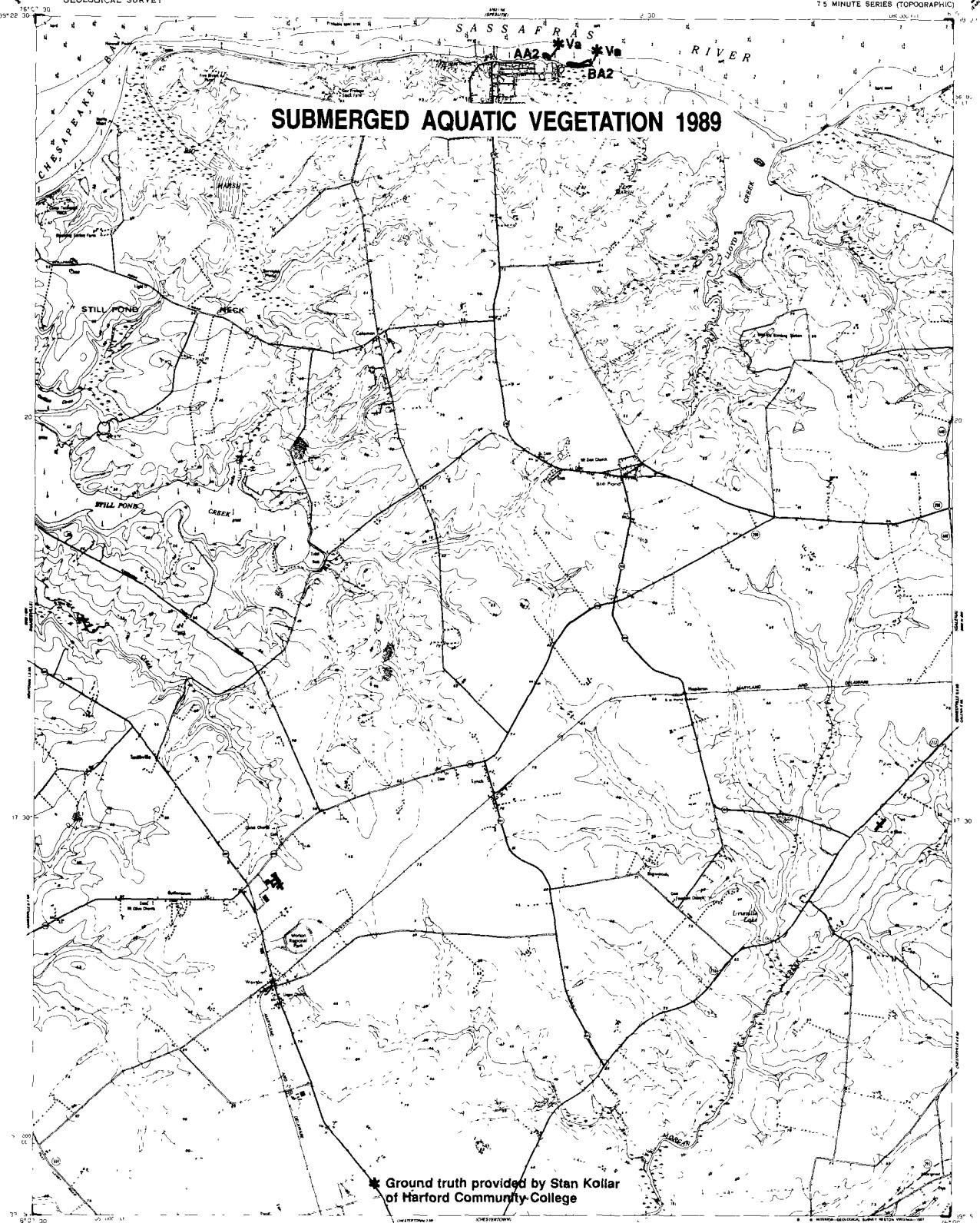
DATE FLOWN  
8-31-89  
**GUNPOWDER  
NECK, MD**  
**014**

PHOTOREVISED 1986  
DMA 5752 19 SF SERIES 4832

1 5 9  
SCALE 1 24 000

VIRGINIA INSTITUTE  
OF MARINE SCIENCE





**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.* (naid)  
Ec *Eloidea canadensis* (common elodea)  
Va *Vallisneria americana* (wild celery)  
Tn *Trapa natans* (water chestnut)  
U Unknown species composition

Hv *Hydrilla verticillata* (hydrilla)  
Hd *Peteranthera 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* (naid)  
C *Chura sp.* (muskgrass)  
Nm *Najas minor* (slender naiad)

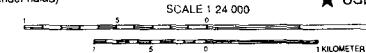
**SURVEY STATIONS**

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

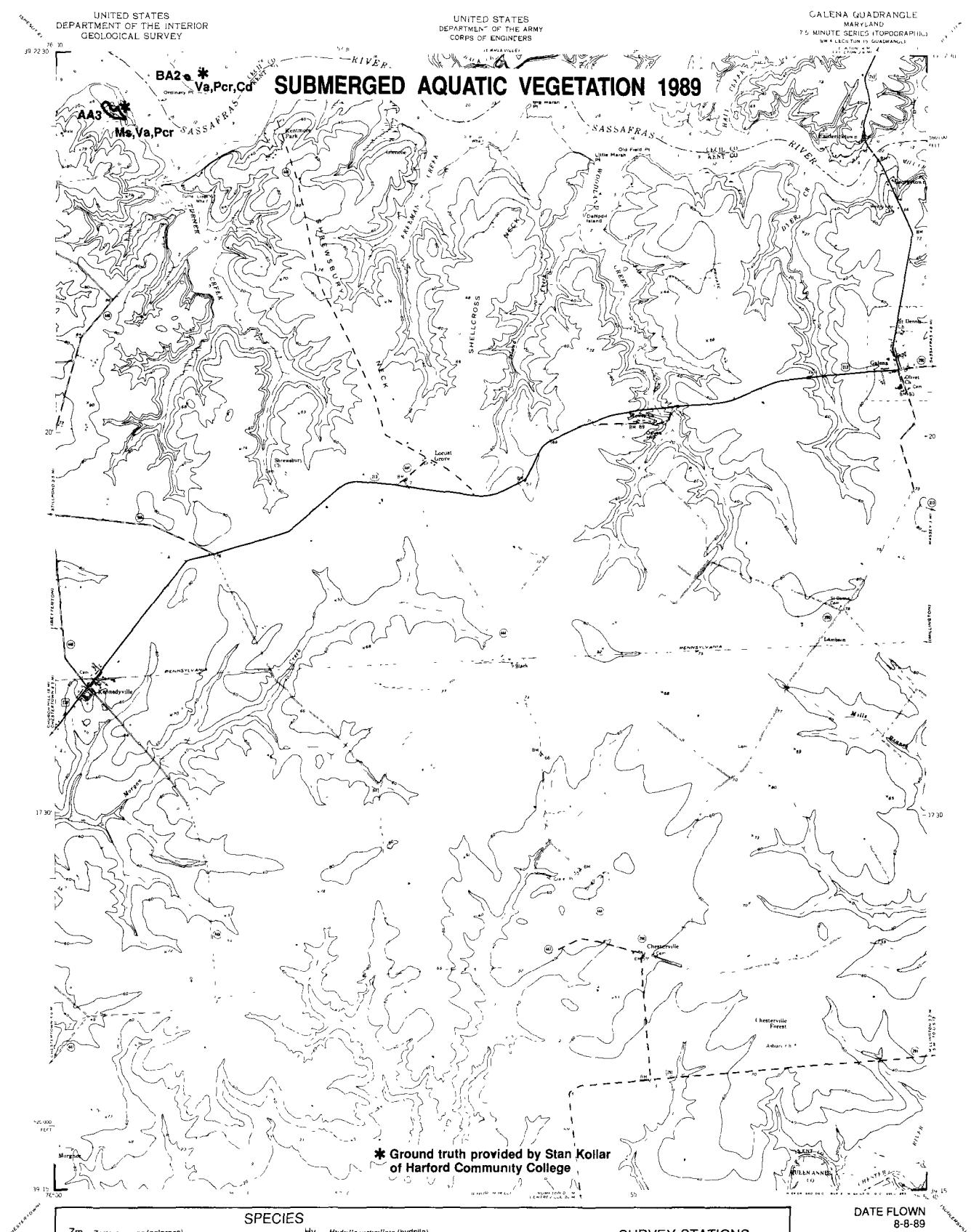
DATE FLOWN  
8-8-89

BETTERTON,  
MD  
016

1948  
PHOTOREVISED 1986  
DMA 5707 1:250,000 SERIES 7823



VIRGINIA INSTITUTE  
OF MARINE SCIENCE



	SPECIES
Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgion grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppf	<i>Phragmites australis</i> (redthead-grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas spp.</i> (naiad)
Ec	<i>Eloëda canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
U	Unknown species composition

\* Ground truth provided by Stan Kollar  
of Harford Community College

## SURVEY STATIONS

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

DATE FLOWN

B-89

8-8-89  
**GALENA,**  
**MD**

**VIRGINIA INSTITUTE  
OF MARINE SCIENCE**

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  
NEA RELIEF 1:250,000 QUADRANGLE



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

CURTIS BAY,  
MD  
018

SPECIES

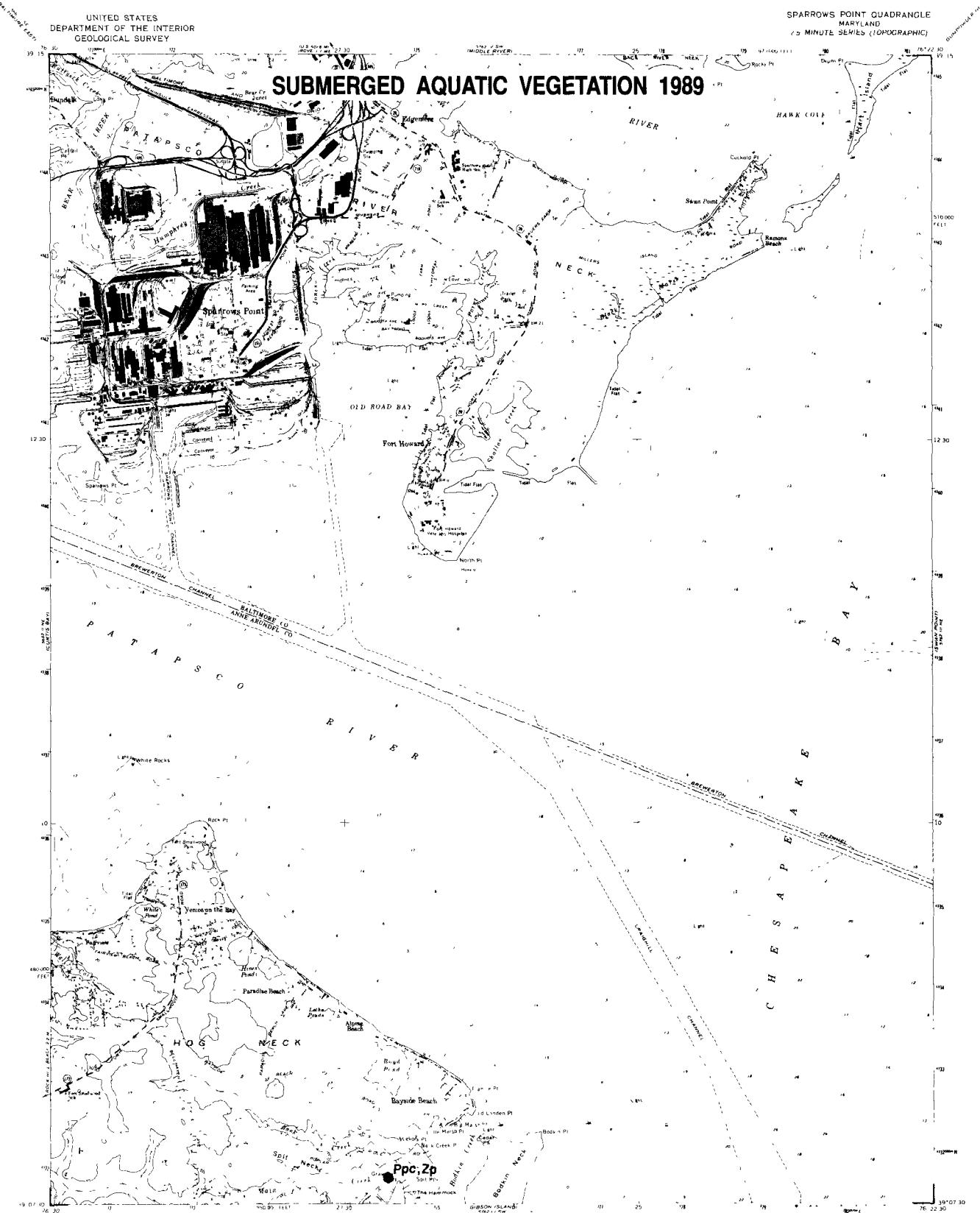
Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas</i> spp. (naads)
Ec	<i>Elderia canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild caltrop)
Tn	<i>Trapa natans</i> (water chestnut)
U	Unknown species composition
Hv	<i>Hydrilla verticillata</i> (hydrilla)
Hd	<i>Heptapterus dubius</i> (water stargrass)
Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (Southern naad)
Ngr	<i>Najas gracillima</i> (naad)
C	<i>Charrula</i> sp. (muskglass)
Nm	<i>Najas minor</i> (slender naad)

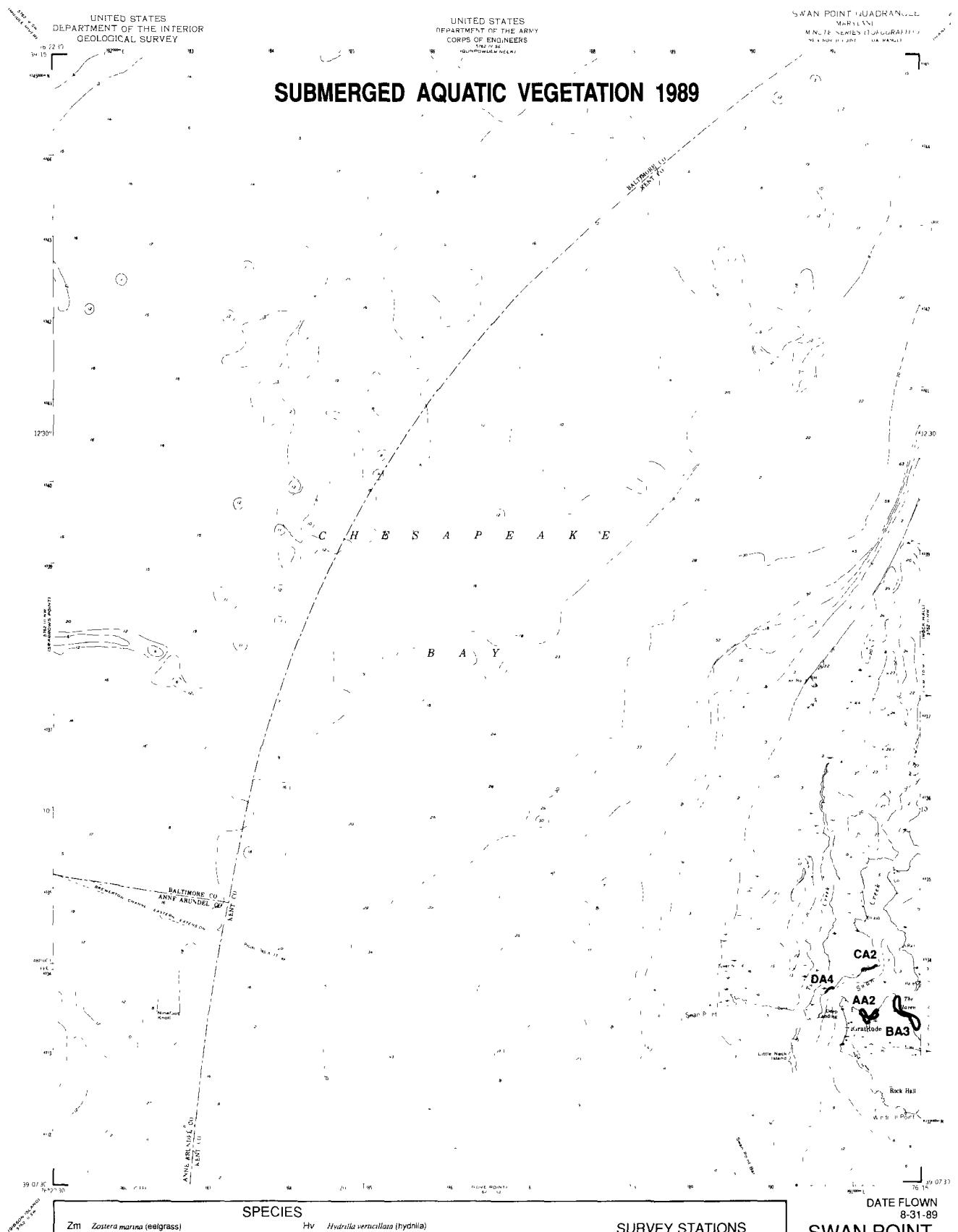
SURVEY STATIONS

- 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

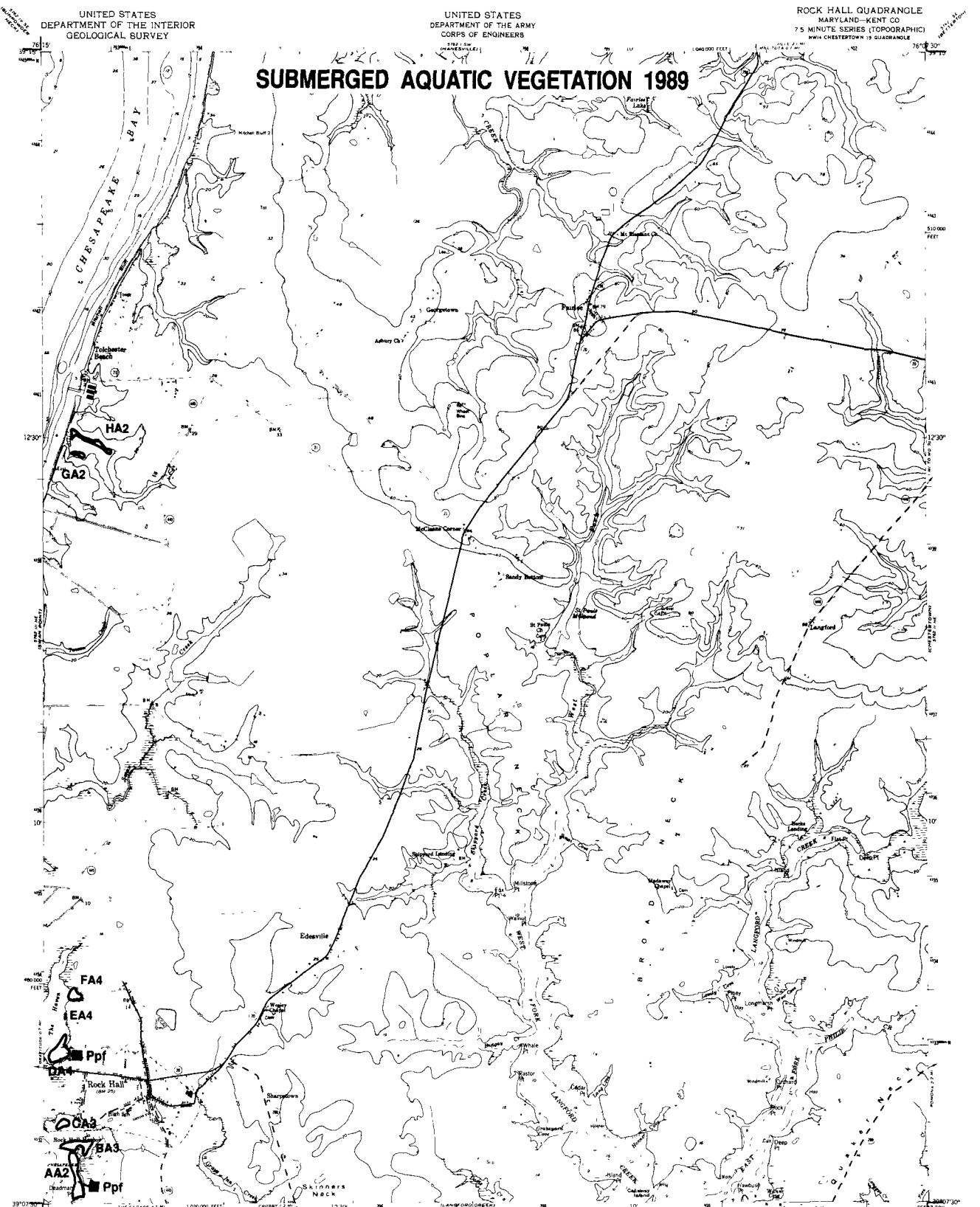
Zm	<i>Zostera marina</i> (eelgrass)	Hv	<i>Hydrilla verticillata</i> (hydrilla)
Rm	<i>Ruppia maritima</i> (widgeon grass)	Hd	<i>Heteranthera dubia</i> (water stargrass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	Psu	<i>Potamogeton pusillus</i> (slender pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)	Ngu	<i>Najas guadalupensis</i> (southern naiad)
N	<i>Najas spp</i> (naiad)	Ngr	<i>Najas gracillima</i> (maid)
Ec	<i>Eloëda canadensis</i> (common elodea)	C	<i>Chara sp</i> (muskglass)
Va	<i>Vallisneria americana</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapa natans</i> (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	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas spp.</i> (naiad)
Ec	<i>Ectoda canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
U	Unknown species composition

Hv	<i>Hydrilla verticillata</i> (hydrilla)
Hd	<i>Heteranthera dubia</i> (water stargrass)
Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngd	<i>Najas guadalupensis</i> (southern naiad)
Ngr	<i>Najas gracillima</i> (naiad)
C	<i>Chara sp.</i> (muskratgrass)
Nm	<i>Najas minor</i> (slender naiad)

#### SURVEY STATIONS

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

DATE FLOWN  
8-31-89

**ROCK HALL,  
MD  
021**

PHOTOREVISED 1973  
AMS 5142 1:250,000 SERIES V833

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)  
SE 1/4 RELAT 18 QUADRANGLE



SPECIES

Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppf	<i>Potamogeton perfoliatus</i> (redhead grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas</i> spp. (naad)
Ec	<i>Elderia canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
U	Unknown species composition

Hv	<i>Hydrilla verticillata</i> (hydrilla)
Hd	<i>Heteranthera dubia</i> (water stargrass)
Per	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (Southern naad)
Ngr	<i>Najas gracilima</i> (naad)
C	<i>Chara</i> sp. (muskglass)
Nm	<i>Naias minor</i> (slender naad)

SURVEY STATIONS

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

DATES FLOWN

8-25-89  
10-5-89

ROUND BAY,  
MD  
023

SCALE 1:24 000  
1 MILE  
1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



**SPECIES**

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

Hv	<i>Hydrochaete verticillata</i> (hydnilla)
Hd	<i>Heleocharis dubia</i> (water stargrass)
PCR	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (southern naiad)
Ngr	<i>Najas gracillima</i> (naiad)
C	<i>Chara sp.</i> (muskglass)
Nm	<i>Najas minor</i> (slender naiad)

**SURVEY STATIONS**

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

DATE FLOWN  
8-25-89

**GIBSON ISLAND,  
MD  
024**

1954  
PHOTOGRAPHED 1979  
AMS 5102 1/2 M. SERIES 7412

SCALE 1:24,000

1 5 9  
MILE  
KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE





#### SPECIES

Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian water-milfoil)
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas spp.</i> (naiaid)
Ec	<i>Elatine canadensis</i> (common elatine)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
U	Unknown species composition

Hv	<i>Hydrilla verticillata</i> (hydrilla)
Hd	<i>Heteranthera dubia</i> (water stargrass)
Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (southern naiaid)
Ngr	<i>Najas gracillima</i> (naiaid)
C	<i>Chara sp.</i> (muskgrass)
Nm	<i>Najas minor</i> (slender naiaid)

#### SURVEY STATIONS

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

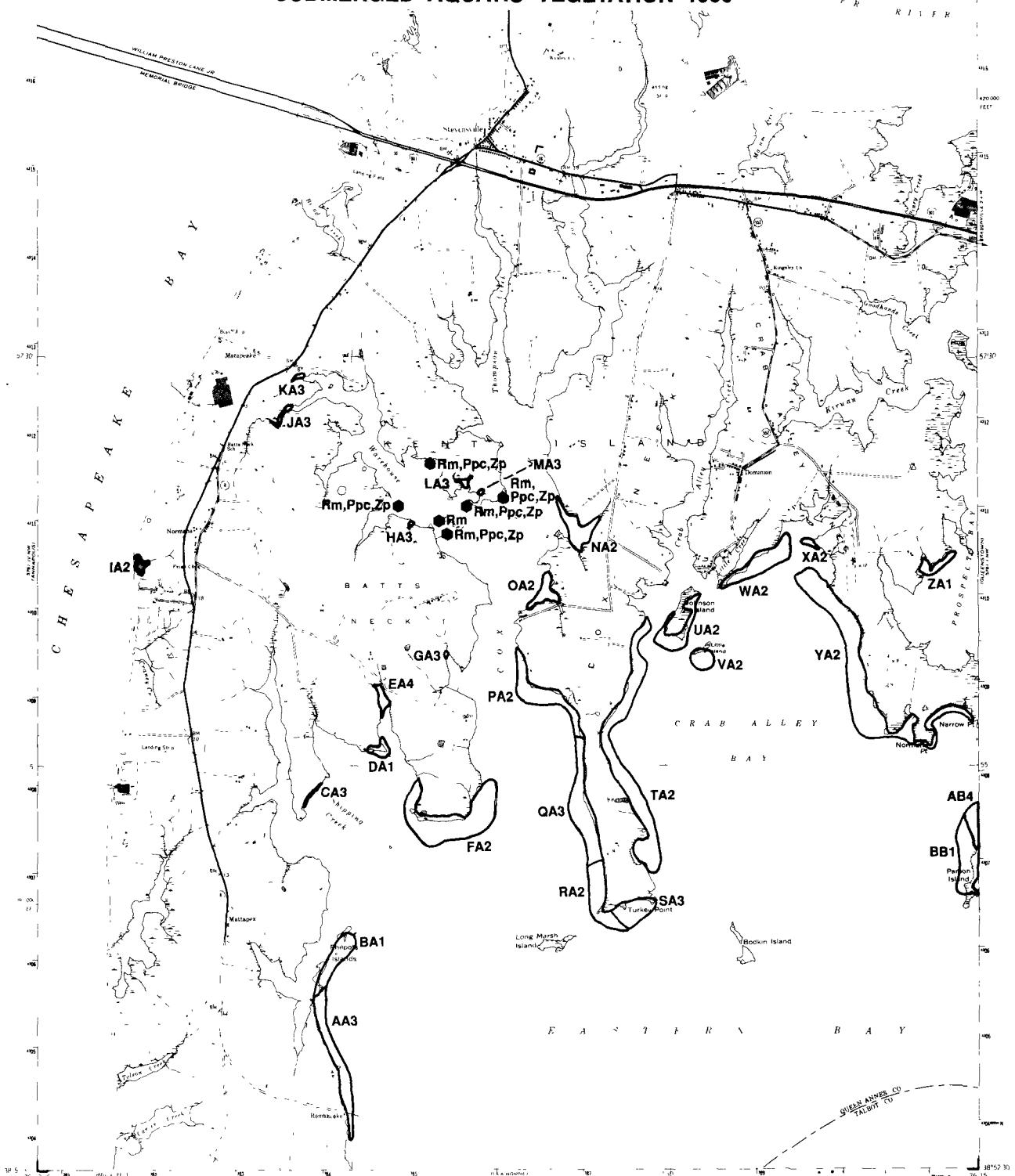
DATES FLOWN  
8-25-89  
10-5-89

**SOUTH RIVER,  
MD  
030**

SCALE 1:24,000  
1 MILE  
1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE

## SUBMERGED AQUATIC VEGETATION 1989



### SPECIES

Zm	<i>Zostera marina</i> (eelgrass)	Hv	<i>Hydrilla verticillata</i> (hydrilla)
Rm	<i>Ruppia maritima</i> (widgeon grass)	Hd	<i>Heteranthera dubia</i> (water stargrass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)	Ngu	<i>Najas guadalupensis</i> (southern naiad)
N	<i>Najas spp.</i> (naiad)	Ngr	<i>Najas gracilissima</i> (naiad)
Ec	<i>Elodea canadensis</i> (common elodea)	C	<i>Chara sp.</i> (muskglass)
Va	<i>Vallisneria americana</i> (wid celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapa natans</i> (water chestnut)		
U	Unknown species composition		

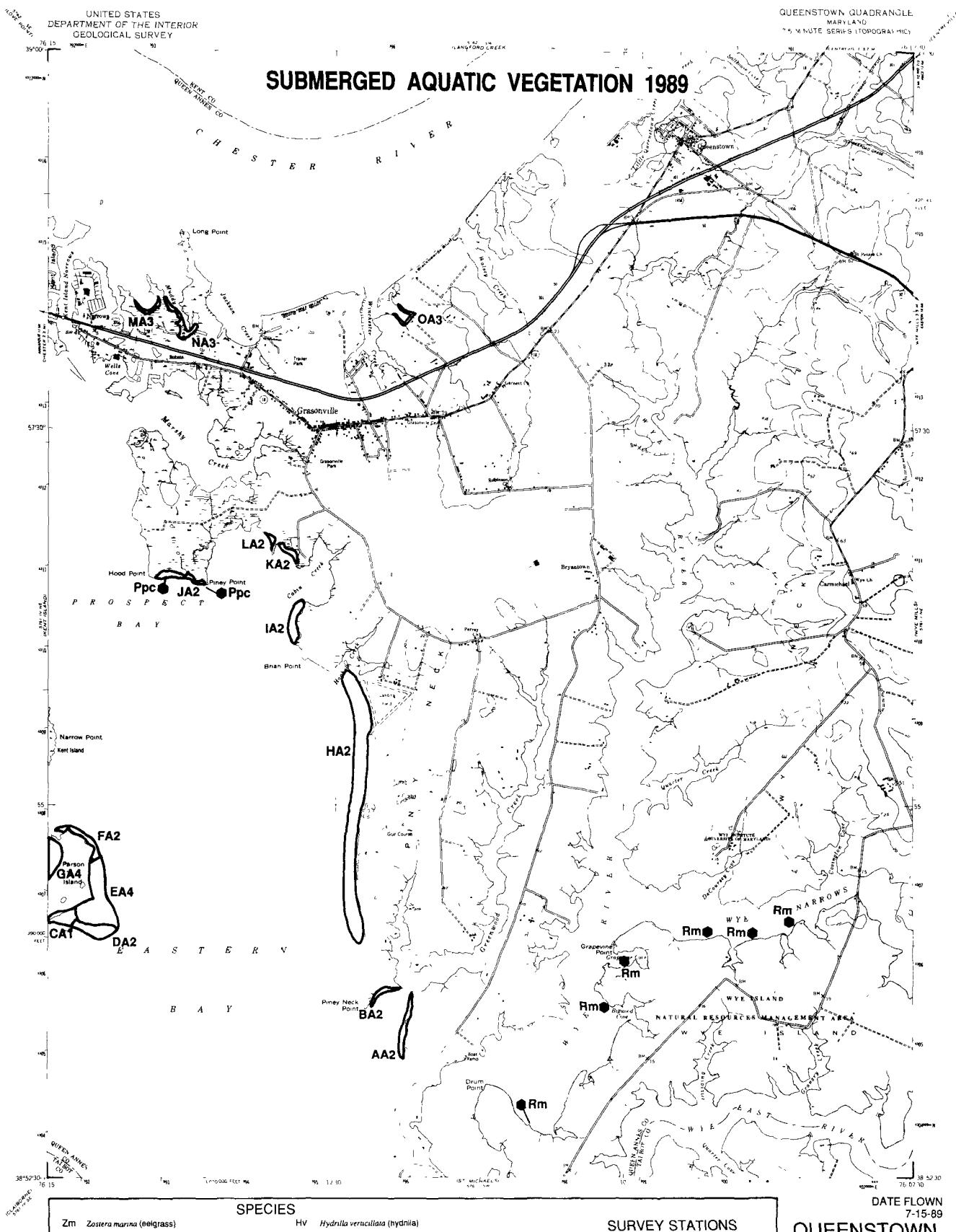
### SURVEY STATIONS

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

DATE FLOWN  
7-15-89  
**KENT ISLAND,  
MD  
032**

SCALE 1:24,000  
1 MILE  
1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



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

Hv	<i>Hydnella vermiculata</i> (hydnilla)
Hd	<i>Heteranthera dubia</i> (water stargrass)
Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (southern naquad)
Ngr	<i>Najas gracilissima</i> (naaqad)
C	<i>Chara</i> sp. (muskgrass)
Nnt	<i>Najas minor</i> (slender naquad)

**SPECIES**

## SURVEY STATIONS

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

DATE FLOWN  
7-15-89

## QUEENSTOWN,

MD

1942  
PHOTOREVISED 1966  
OMA 5261 I NW SERIES V833

PROTOS REVISED 1988  
DMA 5261 I NW SERIES V833

SCALE 1 24,000

19



**SPECIES**

Zm	<i>Zostera marina</i> (eelgrass)	Hv	<i>Hydrilla verticillata</i> (Hydrilla)
Rm	<i>Ruppia maritima</i> (widgeon grass)	Fd	<i>Heteranthera dubia</i> (water stargrass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Ppf	<i>Potamogeton perfoliatus</i> (redhead grass)	Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	Fpu	<i>Potamogeton pusillus</i> (slender pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)	Ngu	<i>Najas guadalupensis</i> (southern naiad)
N	<i>Najas spp.</i> (naiad)	Ngr	<i>Najas gracilima</i> (naiad)
Ec	<i>Eleocharis canadensis</i> (common elodea)	G	<i>Chardia sp.</i> (muskgrass)
Va	<i>Vallisneria americana</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapa natans</i> (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

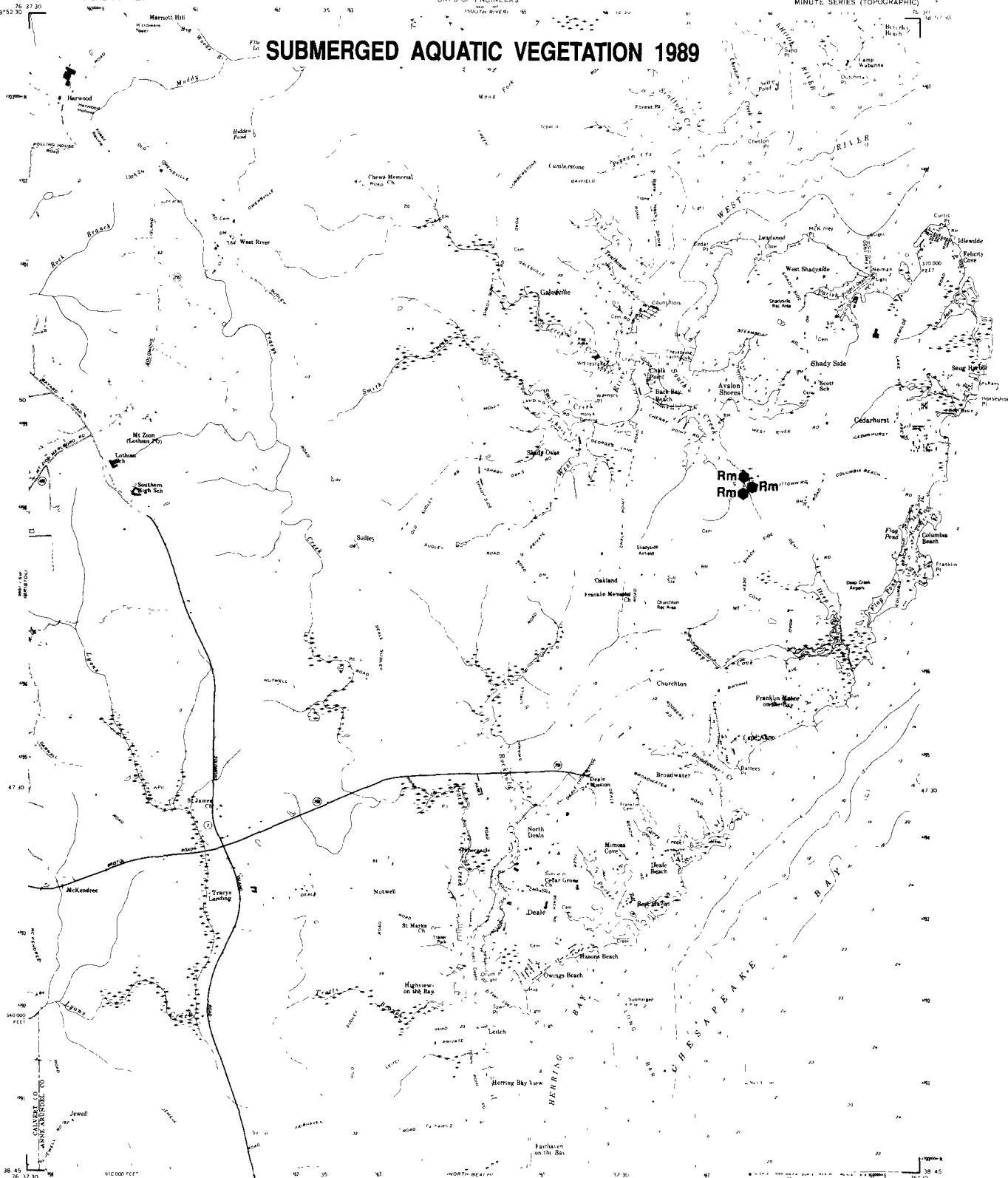
VIRGINIA INSTITUTE  
OF MARINE SCIENCE

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

UNITED STATES  
ARMED FORCES  
ORCH OF ENGINEERS  
MILITARY RIVER

DEALE QUADRANGLE  
MARYLAND  
MINUTE SERIES (TOPOGRAPHIC)

## SUBMERGED AQUATIC VEGETATION 1989



### SPECIES

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

Hv	<i>Hydrilla verticillata</i> (hydrilla)
Hd	<i>Heisanthera dubia</i> (water stargrass)
Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (southern naiad)
Ngr	<i>Najas gracilissima</i> (naiad)
C	<i>Chara sp.</i> (muskglass)
Nm	<i>Najas minor</i> (slender naiad)

### SURVEY STATIONS

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

DATE FLOWN  
9-28-89

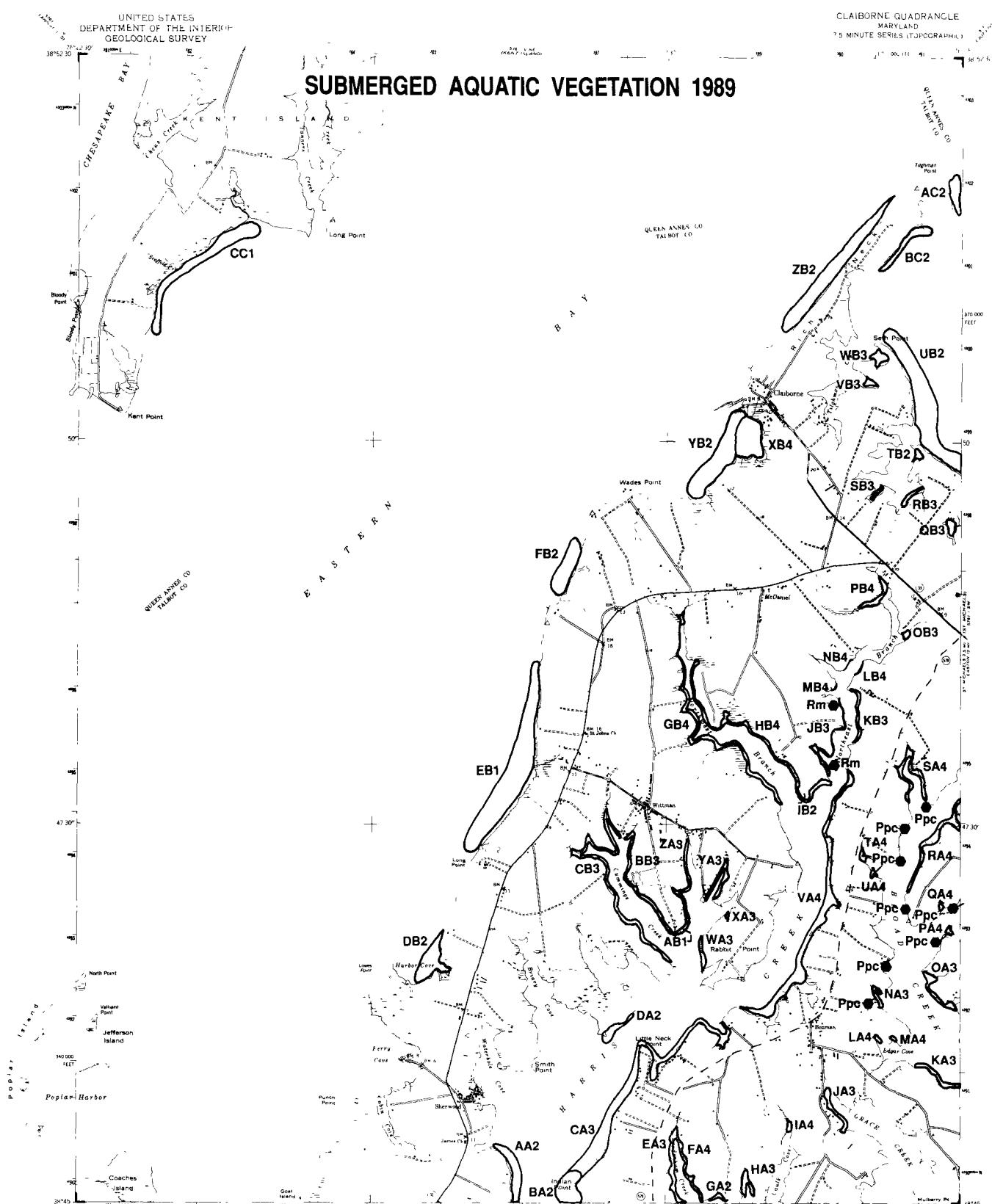
DEALE,  
MD  
035

PHOTOGRAPHED 1979  
AMS 546 - S. SERIES 4833

SCALE 1:24,000  
1 MILE  
1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE

# SUBMERGED AQUATIC VEGETATION 1989



## SPECIES

Zm	<i>Zostera marina</i> (eelgrass)	Hv	<i>Hydrilla verticillata</i> (hydrilla)
Rm	<i>Ruppia maritima</i> (widgeon grass)	Hd	<i>Heranthera dubia</i> (water stargrass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)	Ngu	<i>Najas guadalupensis</i> (southern naiad)
N	<i>Najas spp.</i> (naiad)	Ngr	<i>Najas gracilissima</i> (naiad)
Ec	<i>Eldotea canadensis</i> (common elodea)	C	<i>Chara sp.</i> (muskglass)
Va	<i>Vallisneria americana</i> (wild celery)	Nm	<i>Najas minor</i> (siender naiad)
Tn	<i>Troapa natans</i> (water chestnut)		
U	Unknown species composition		

## SURVEY STATIONS

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

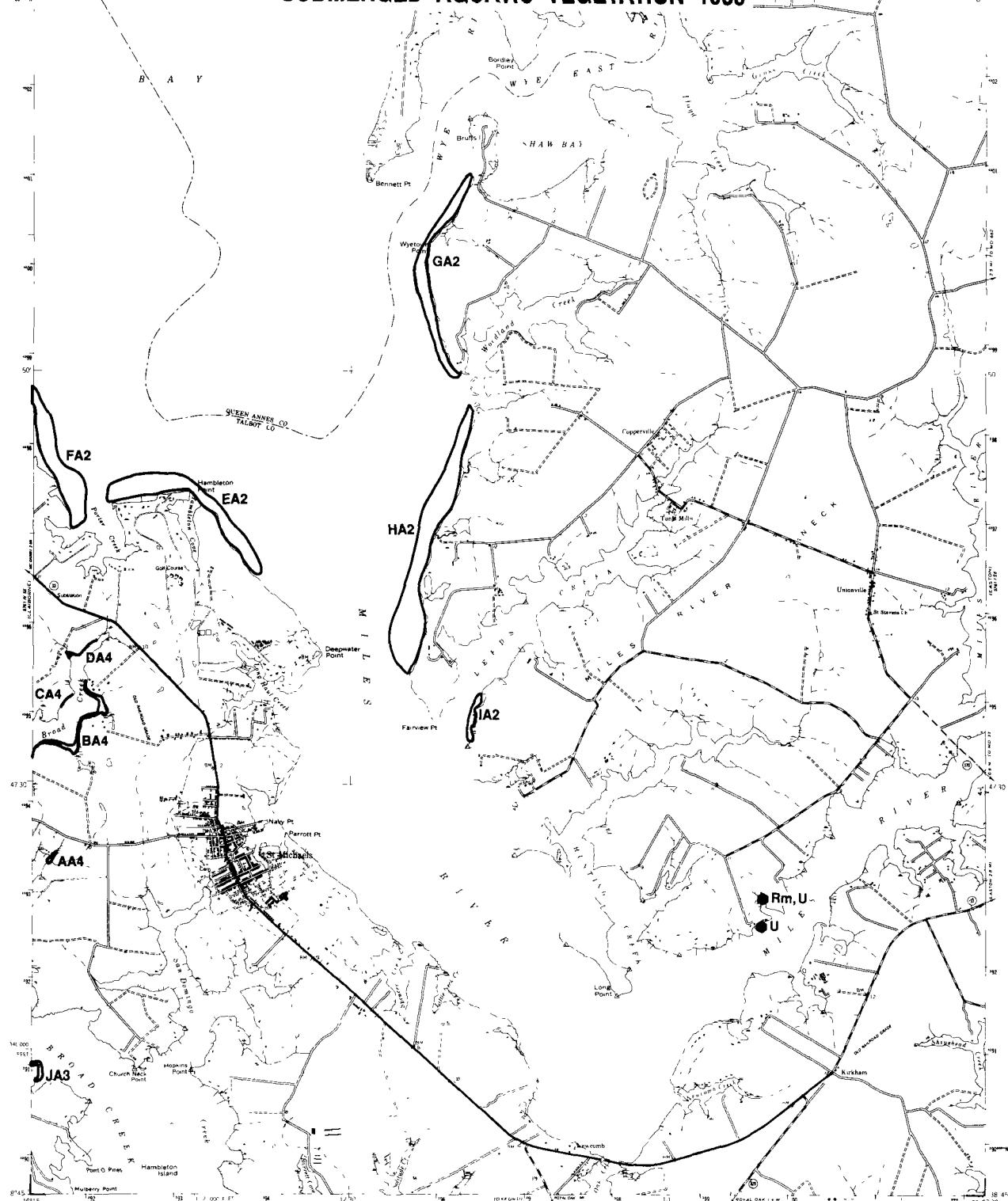
DATES FLOWN  
7-15-89  
KENT ISLAND  
8-25-89

CLAIBORNE,  
MD  
036

SCALE 1:24 000  
1 MILE  
1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE

## SUBMERGED AQUATIC VEGETATION 1989



### SPECIES

Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppl	<i>Potamogeton perfoliatus</i> (redhead-grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas spp.</i> (naiad)
Ec	<i>Eelaea canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
U	Unknown species composition
Hv	<i>Hydrilla verticillata</i> (hydrilla)
Hd	<i>Heatherantha dubia</i> (water stargrass)
Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (southern naiad)
Ngr	<i>Najas gracillima</i> (naiad)
C	<i>Chara sp.</i> (muskglass)
Nm	<i>Najas minor</i> (slender naiad)

### SURVEY STATIONS

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

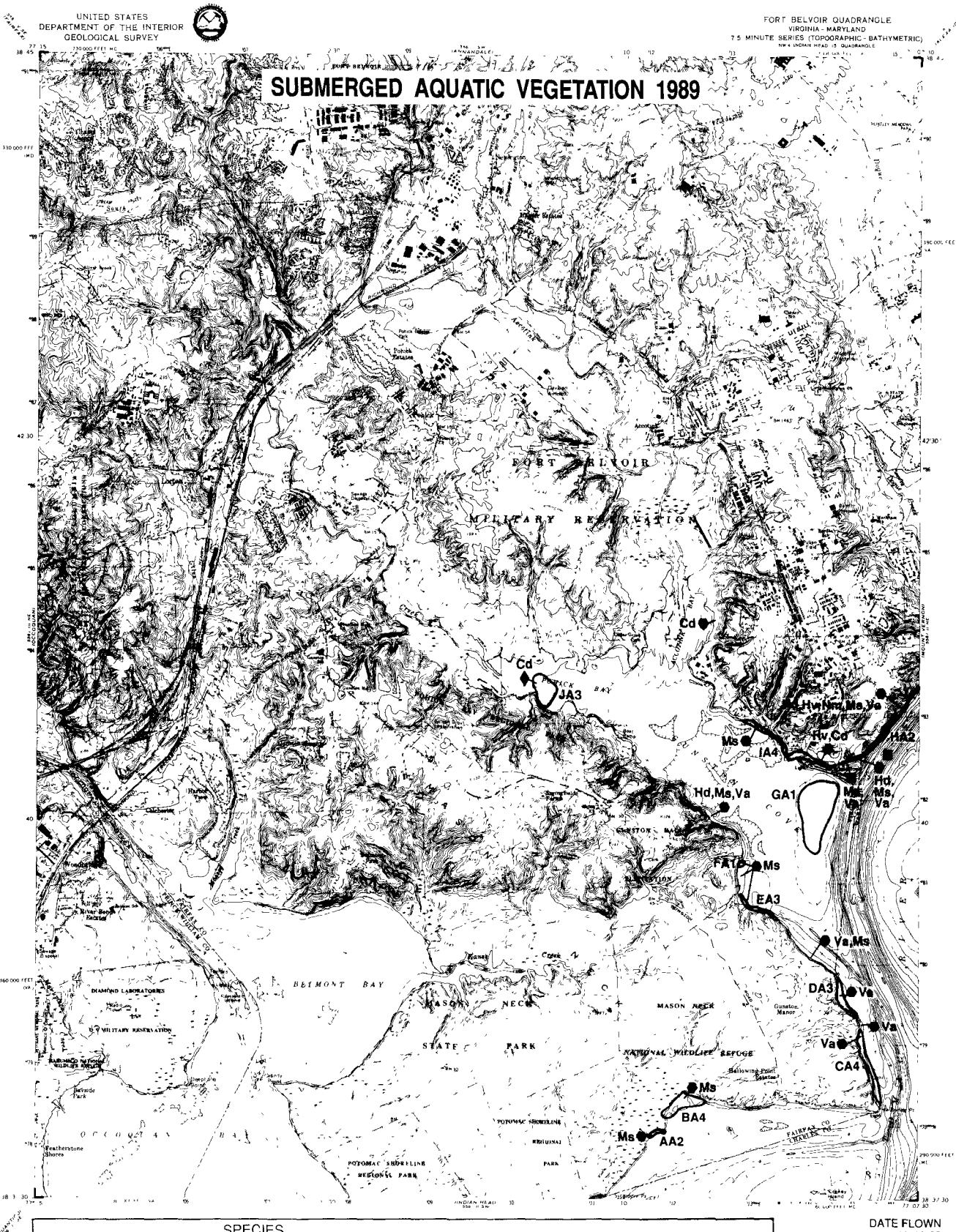
DATE FLOWN  
7-15-89

ST. MICHAELS,  
MD  
037

PHOTOGRAPHED 1986  
04-7181 1-24 8143-1023

SCALE 1:24,000  
1 MILE  
1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



**SPECIES**

Zm	<i>Zostera marina</i> (eelgrass)	Hv	<i>Hydrilla verticillata</i> (hydrilla)
Rm	<i>Ruppia maritima</i> (widgeon grass)	Hd	<i>Herminiera dubia</i> (water stargrass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Ppf	<i>Potamogeton perfoliatus</i> (redhead grass)	Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppo	<i>Potamogeton pectinatus</i> (sago pondweed)	Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)	Ngu	<i>Najas guadalupensis</i> (southern naiad)
N	<i>Najas spp.</i> (naiad)	Ngr	<i>Najas gracilissima</i> (naiad)
Ec	<i>Eloetea canadensis</i> (common elodea)	C	<i>Chard sp.</i> (muskgrass)
Va	<i>Vallisneria americana</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapa natans</i> (water chestnut)		
U	Unknown species composition		

**SURVEY STATIONS**

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

DATE FLOWN  
10-10-89

**FORT BELVOIR,  
VA-MD**

039

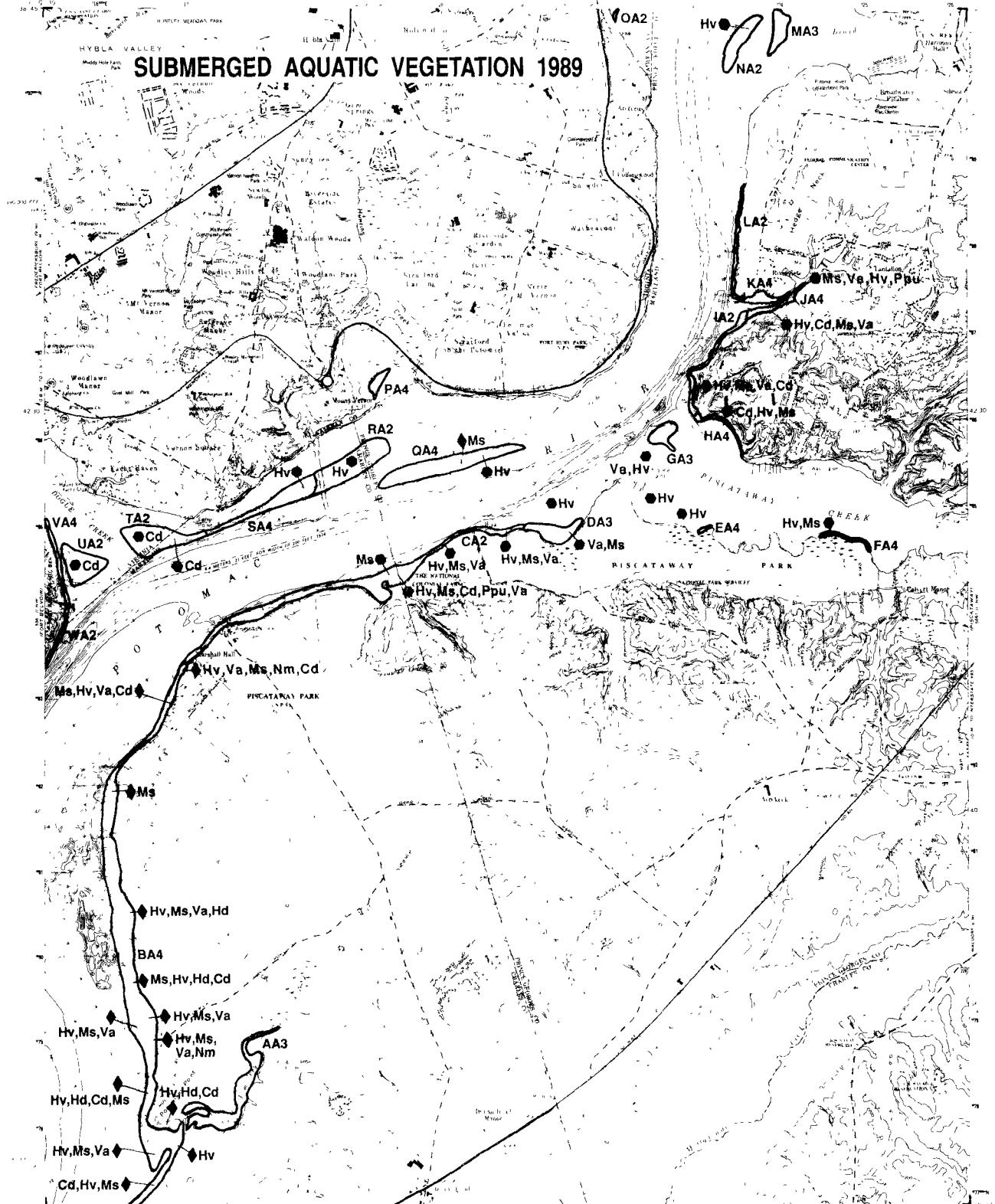
PHOTOREVISED 1983  
BATHYMETRY ADDED 1982  
DATA 300' T. SP. SERIES 1024

SCALE 1:24,000

1 MILE  
1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE

## SUBMERGED AQUATIC VEGETATION 1989



### SPECIES

ZM	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppf	<i>Potamogeton perfoliatus</i> (redhead grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas</i> spp. (naiad)
Ec	<i>Eloete canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
U	Unknown species composition

### SURVEY STATIONS

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

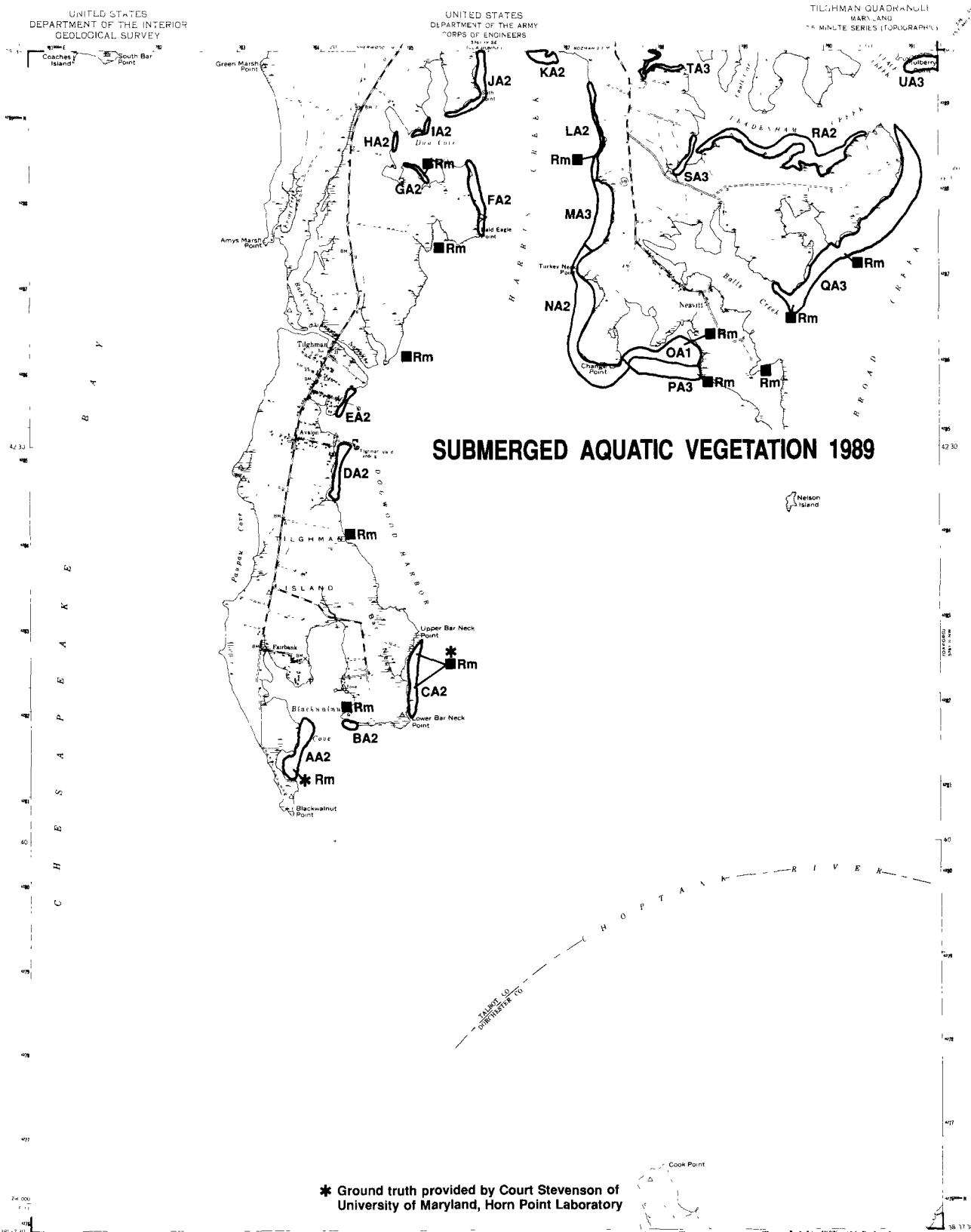
DATE FLOWN  
10-10-89

MT. VERNON,  
VA-MD  
040

1966  
PHOTOREVISED 1983  
BATHYMETRY ADDED 1982  
DM4 1:40,000 SERIES 1950

SCALE 1:24,000

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



20000  
10000  
0  
100' 200' 300' 400' 500' 600' 700' 800' 900' 1000' 1100' 1200' 1300' 1400' 1500' 1600' 1700' 1800' 1900' 2000'

DATE FLOWN  
7-15-89  
**TILGHMAN,  
MD  
043**

PHOTOGRAPH BY  
AMER. PHOTOGRAPHIC CORP.

**SPECIES**

Zm	<i>Zostera marina</i> (eelgrass)	Hv	<i>Hydrilla verticillata</i> (hydrilla)
Rm	<i>Ruppia maritima</i> (widgen grass)	Hd	<i>Heteranthera dubia</i> (water stargrass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)	Ngu	<i>Najas guadalupensis</i> (southern naiad)
N	<i>Najas spp.</i> (naiad)	Ngr	<i>Najas gracillima</i> (naiad)
Ec	<i>Ectoda canadensis</i> (common elodea)	C	<i>Chara sp.</i> (muskglass)
Va	<i>Vallisneria americana</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapa natans</i> (water chestnut)		
U	Unknown species composition		

**SURVEY STATIONS**

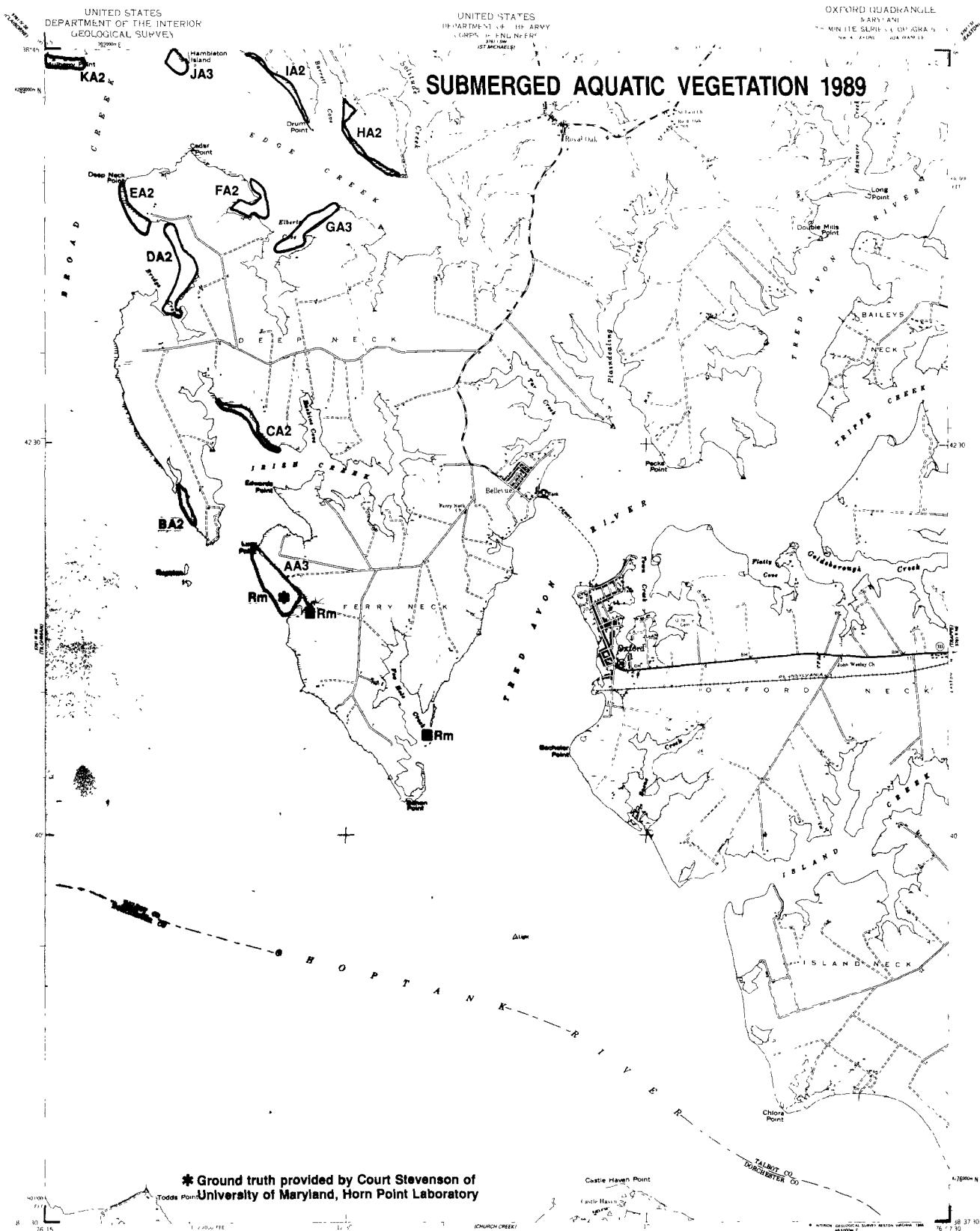
- MD Charter Boat Field Survey
- Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

SCALE 1:24,000

1 MILE

1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	Hv	Hydrilla verticillata (hydrilla)
Rm	<i>Ruppia maritima</i> (widgeon grass)	Hd	<i>Heteranthera dubia</i> (water stargrass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Ppf	<i>Potamogeton perfoliatus</i> (redhead grass)	Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)	Ngu	<i>Najas guadalupensis</i> (southern naiad)
N	<i>Najas</i> spp. (naiads)	Ngr	<i>Najas gracillima</i> (naiad)
Ec	<i>Eloida canadensis</i> (common elodea)	C	<i>Chara</i> sp. (muskglass)
Va	<i>Vallisneria americana</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapa natans</i> (water chestnut)		
U	Unknown species composition		

SCALE 1:24,000      DATE FLOWN 7-15-89

OXFORD,  
MD  
044

1942  
DMA 5000 HNW-SERIES VADS

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



		SPECIES
Zm	<i>Zostera marina</i> (eelgrass)	H
Rm	<i>Ruppia maritima</i> (widgeon grass)	H
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	H
Ppf	<i>Potamogeton perfoliatus</i> (redthead grass)	C
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	A
Zp	<i>Zannichellia palustris</i> (horned pondweed)	A
N	<i>Najas spp.</i> (naiad)	H
Ec	<i>Eloea canadensis</i> (common elodea)	C
Va	<i>Vallisneria americana</i> (wild celery)	C
Tn	<i>Trapa natans</i> (water chestnut)	C
U1	Unknown species composition	
U2	Unknown species composition	

Hv	<i>Hydrilla verticillata</i> (hydrilla)
Dd	<i>Heteranthera dubia</i> (water stargrass)
Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Cdc	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Nja	<i>Najas guadalupensis</i> (southern naad)
Ngr	<i>Najas gracilissima</i> (naad)
C	<i>Carex sp.</i> (muskgrass)
Ntm	<i>Najas minor</i> (slender naad)

## SURVEY STATIONS

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

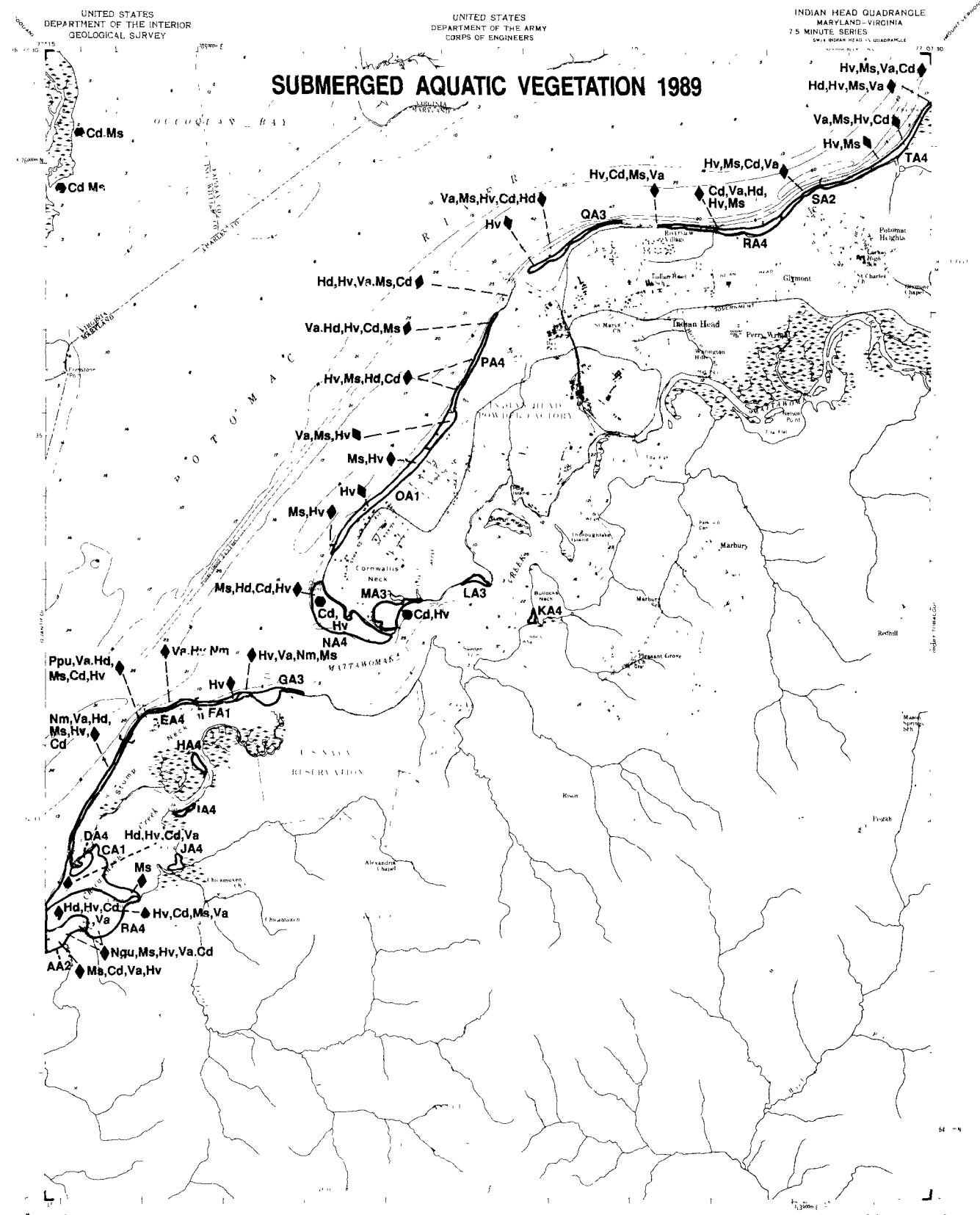
RIVERSIDE 14 MI P 7715  
DATES FLOWN  
9-28-89  
10-5-89  
**QUANTICO,  
VA-MD  
047**

1966  
PHOTOREVISED 1963  
BATHYMETRY ADDED 1982  
OMA 5561 III SE SERIES V834

1966  
PHOTOREVISED 1983  
BATHYMETRY ADDED 1982  
OMA 5561 III SE SERIES 4834

(ender naiad) SCALE 1:24 000

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	Hv	Hydrilla verticillata (hydrilla)
Rm	<i>Ruppia maritima</i> (widgeon grass)	Hd	<i>Heteranthera dubia</i> (water stargrass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian water-milfoil)	Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	Ppu	<i>Potamogeton pectinatus</i> (slender pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)	Ngu	<i>Najas guadalupensis</i> (southern naiad)
N	<i>Najas</i> sp. (naiad)	Ngr	<i>Najas gracillima</i> (naiad)
Ec	<i>Eleocharis canadensis</i> (common el-e-ee-a)	C	<i>Chara</i> sp. (muskglass)
Va	<i>Vallisneria americana</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapa natans</i> (water chestnut)		
U	Unknown species composition		

SCALE 1:24 000

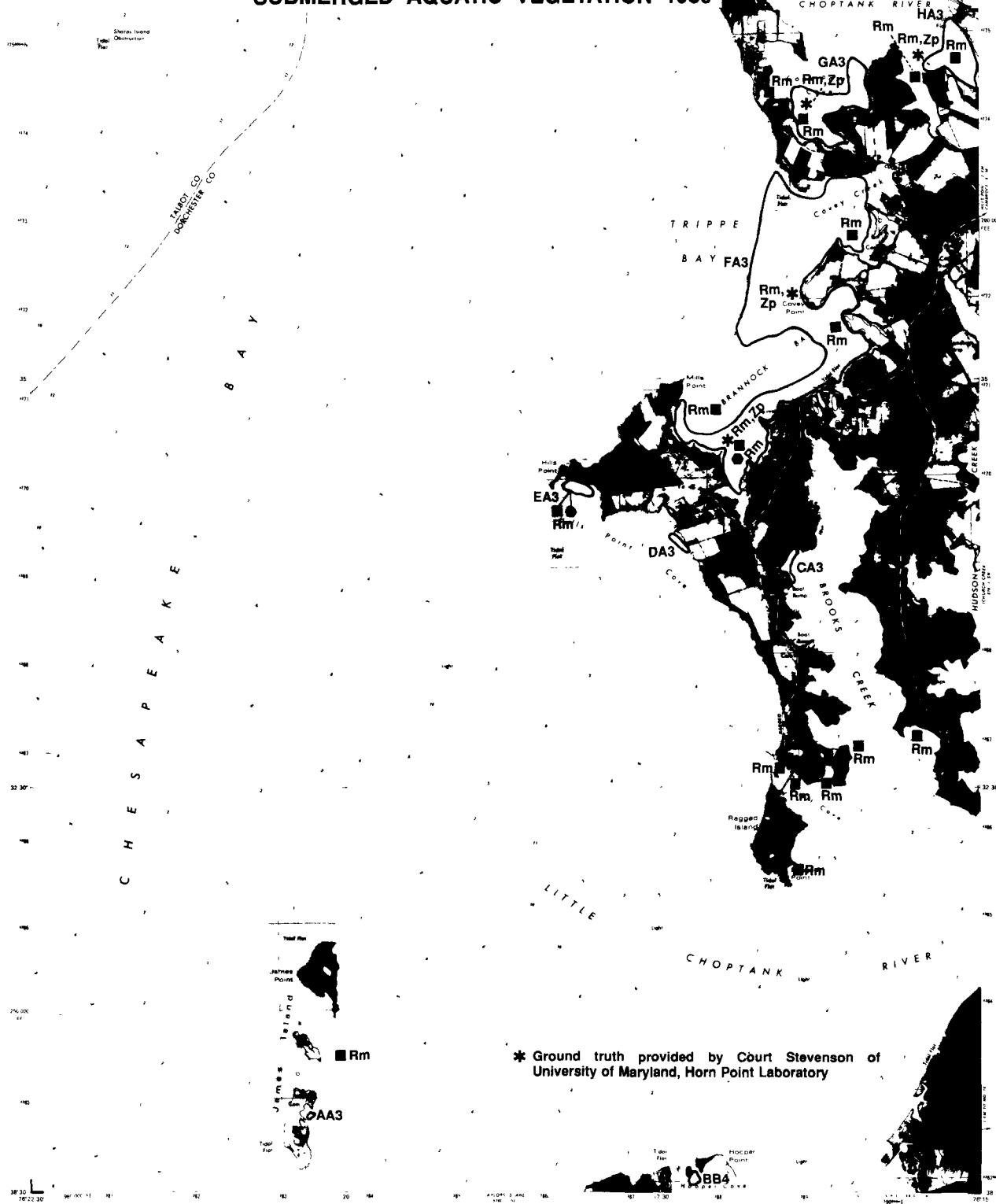
1 MILE

1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



## SUBMERGED AQUATIC VEGETATION 1989



### SPECIES

Zm	<i>Zostera marina</i> (eelgrass)	Hv	<i>Hydrilla verticillata</i> (hydrilla)
Rm	<i>Ruppia maritima</i> (widgeon grass)	Hd	<i>Heteranthera dubia</i> (water stargrass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Ppl	<i>Potamogeton perfoliatus</i> (redhead-grass)	Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)	Ngu	<i>Najas guadalupensis</i> (southern naiad)
N	<i>Najas spp.</i> (naiad)	Ngr	<i>Najas gracillima</i> (naiad)
Ec	<i>Elderia canadensis</i> (common elodea)	C	<i>Chloris sp.</i> (muskglass)
Va	<i>Vallisneria americana</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Tropea natans</i> (water chestnut)		
U	Unknown species composition		

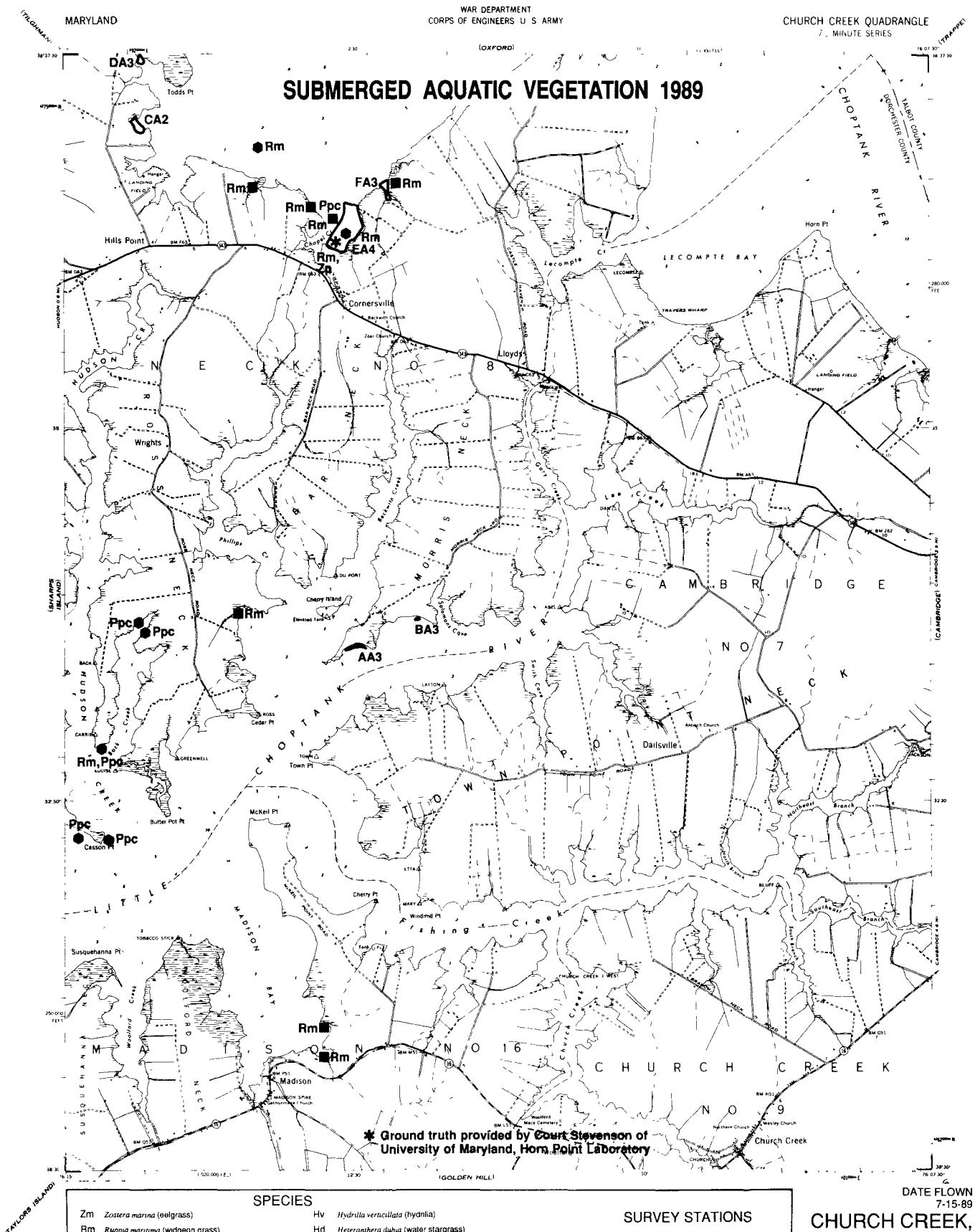
### SURVEY STATIONS

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

DATE FLOWN  
7-15-89  
**HUDSON,**  
MD  
051  
1989

DMA 50' RES. SERIES 1983

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	Hv	<i>Hydrilla verticillata</i> (hydrilla)
Rm	<i>Ruppia maritima</i> (widgeon grass)	Hd	<i>Heisanthera dubia</i> (water stargrass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)	Ngu	<i>Najas guadalupensis</i> (southern naiad)
N	<i>Najas</i> spp. (naiad)	Ngr	<i>Najas gracilima</i> (naiad)
Ec	<i>Elderia canadenis</i> (common elodea)	C	<i>Chara</i> sp. (muskgrass)
Va	<i>Vallisneria americana</i> (wild celery)	Nrm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapa natans</i> (water chestnut)		
U	Unknown species composition		

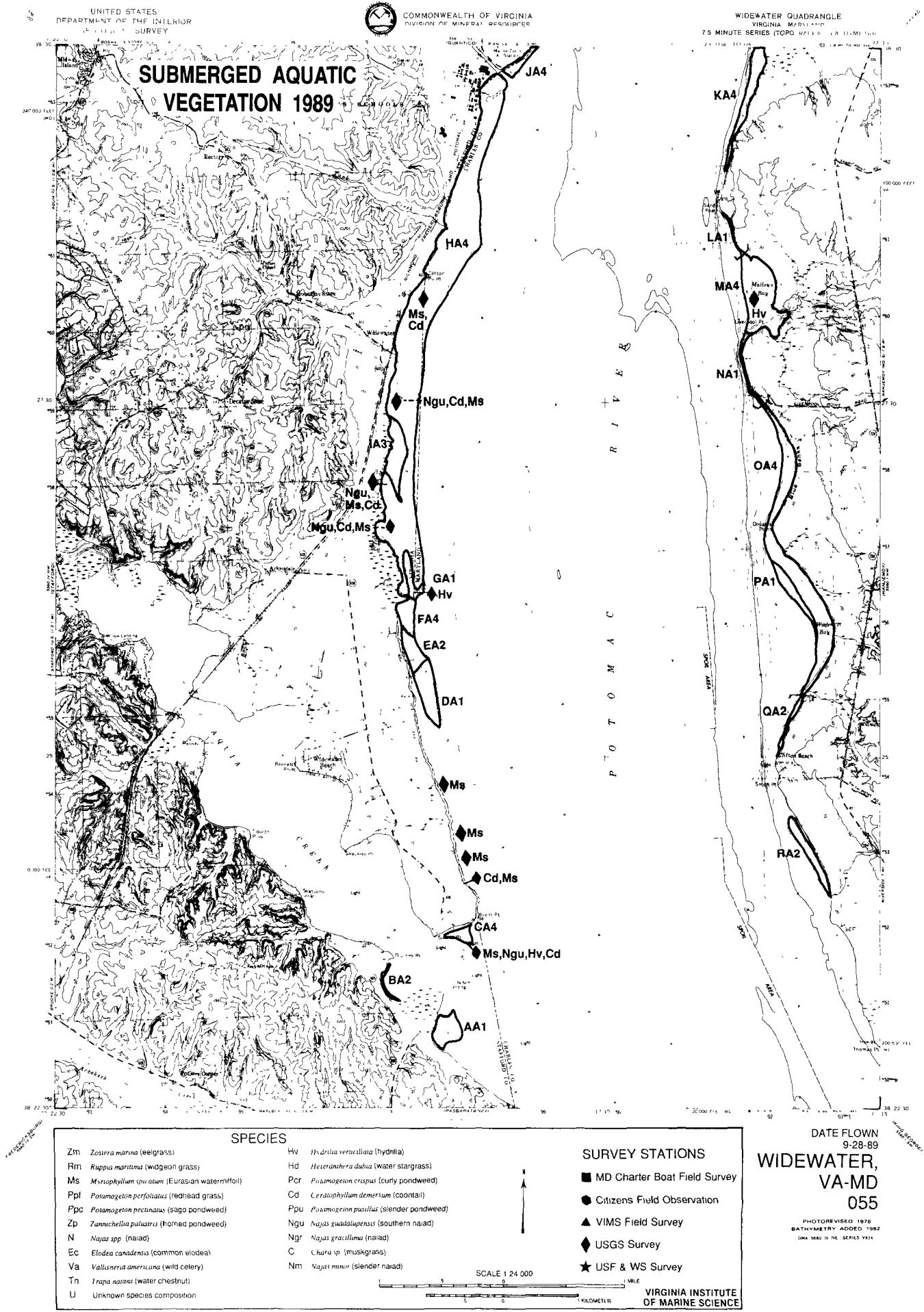
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7-15-89  
CHURCH CREEK,  
MD 052

N3830 W7607.5/7.5  
1942

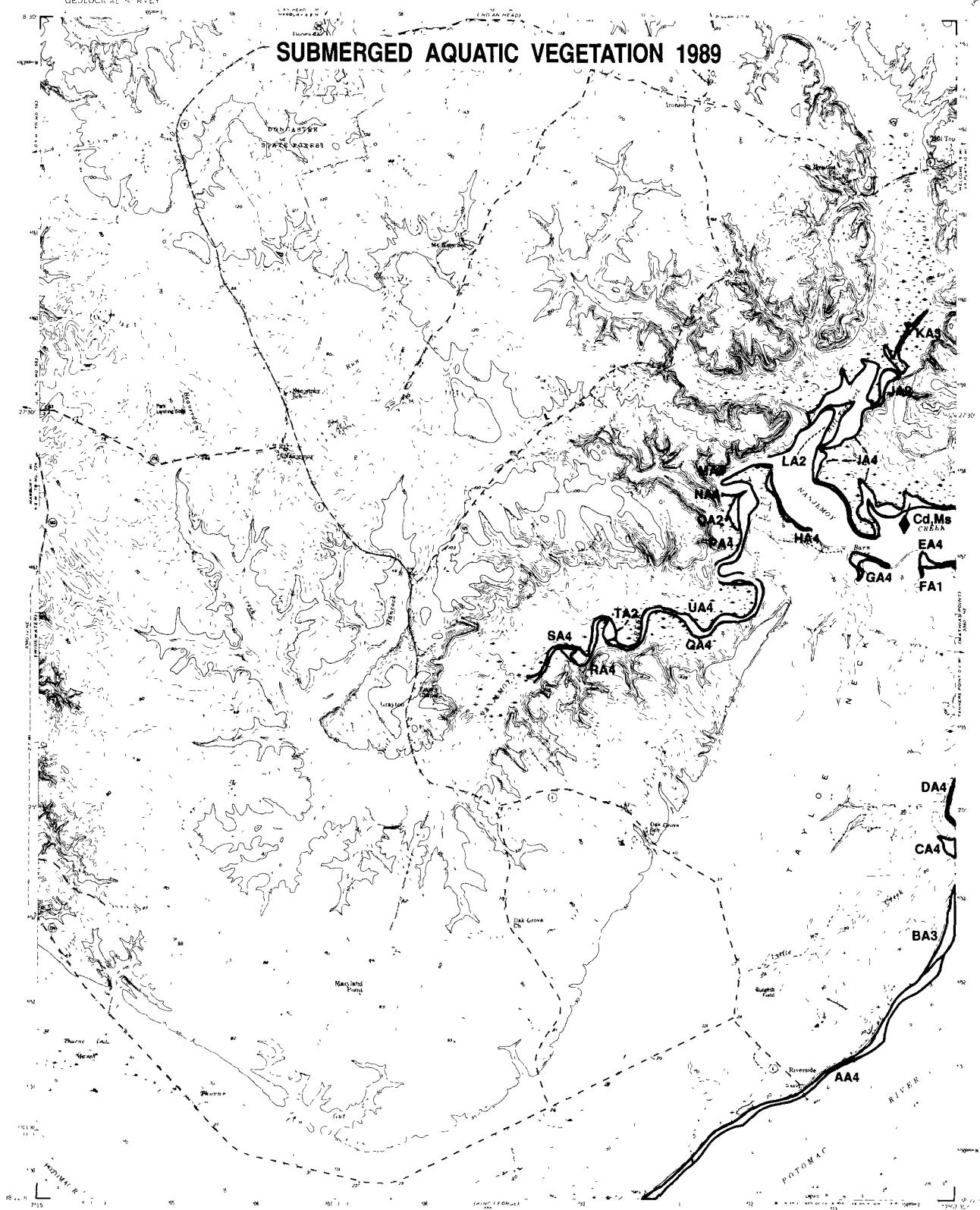
SCALE 1:24 000

1 MILE  
1 5 0 1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



## SUBMERGED AQUATIC VEGETATION 1989



### SPECIES

Zm	<i>Zostera marina</i> (eelgrass)	Hv	<i>Hydrilla verticillata</i> (hydrilla)
Rm	<i>Ruppia maritima</i> (widgeon grass)	Hd	<i>Heteranthera dubia</i> (water stargrass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Ppl	<i>Potamogeton perfoliatus</i> (redhead grass)	Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)	Ngu	<i>Najas guadalupensis</i> (southern naiad)
N	<i>Najas spp.</i> (naiad)	Ngr	<i>Najas gracilima</i> (naiad)
Ec	<i>Eloea canadensis</i> (common elodea)	C	<i>Chara sp.</i> (muskglass)
Va	<i>Vallisneria americana</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapa natans</i> (water chestnut)		
U	Unknown species composition		

### SURVEY STATIONS

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

DATE FLOWN  
9-28-89

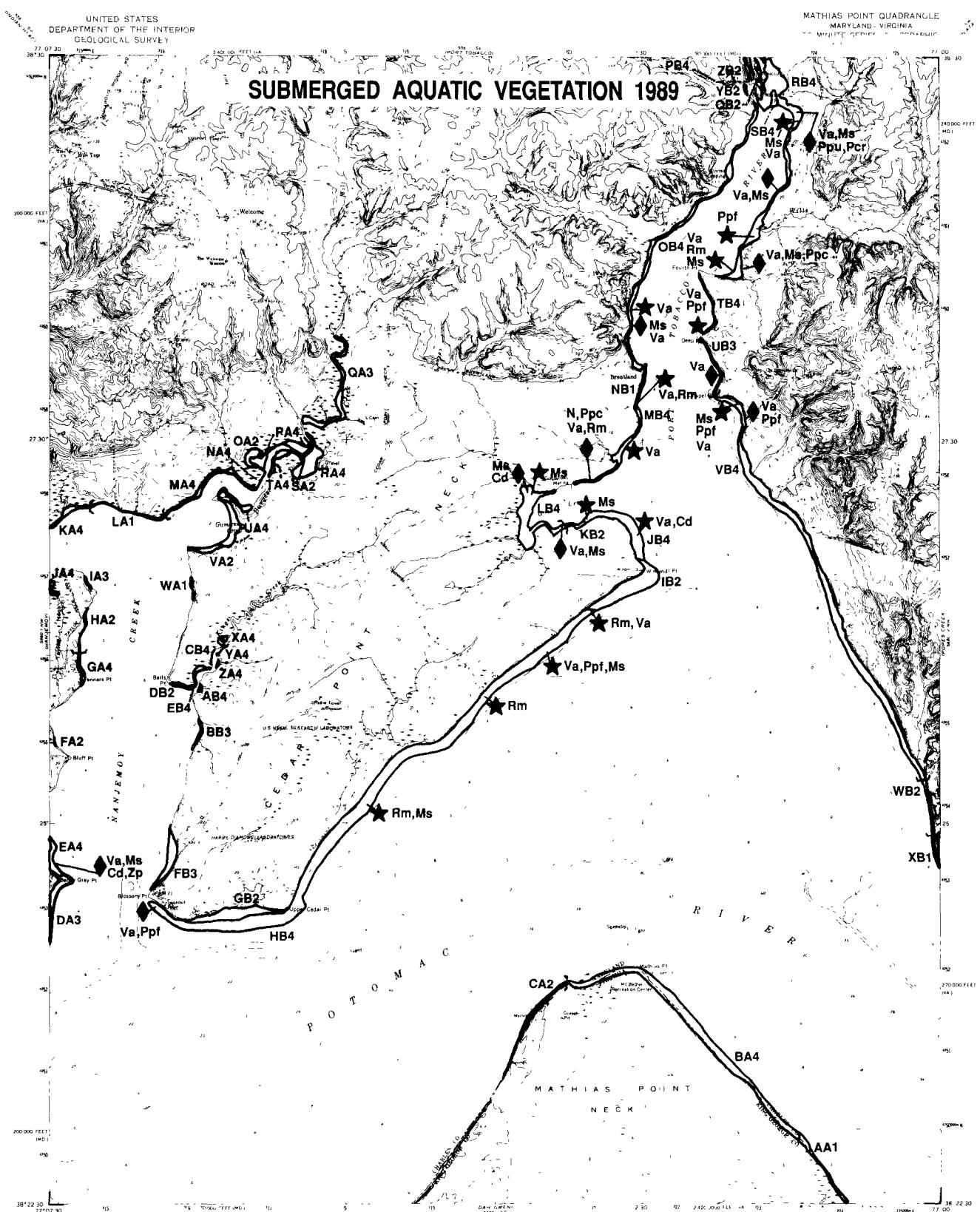
NANJEMOY,  
MD  
056

PHOTOGRAPHED 1978  
AS OF 1989

SCALE 1:24,000

1 MILE  
1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (wedgeon grass)
Mm	<i>Myriophyllum spicatum</i> (Eurasian water milfoil)
Ppl	<i>Potamogeton perfoliatus</i> (redthead grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas spp.</i> (naiad)
Ec	<i>Elodea canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
U	Unknown species composition

S	
Hv	<i>Hydrilla verticillata</i> (hydrilla)
Hd	<i>Heteranthera dubia</i> (water stargrass)
Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (southern naad)
Ngr	<i>Najas gracilis</i> (narad)
Ch	<i>Chara sp.</i> (muskgrass)
Nm	<i>Najas minor</i> (slender naad)

## SURVEY STATIONS

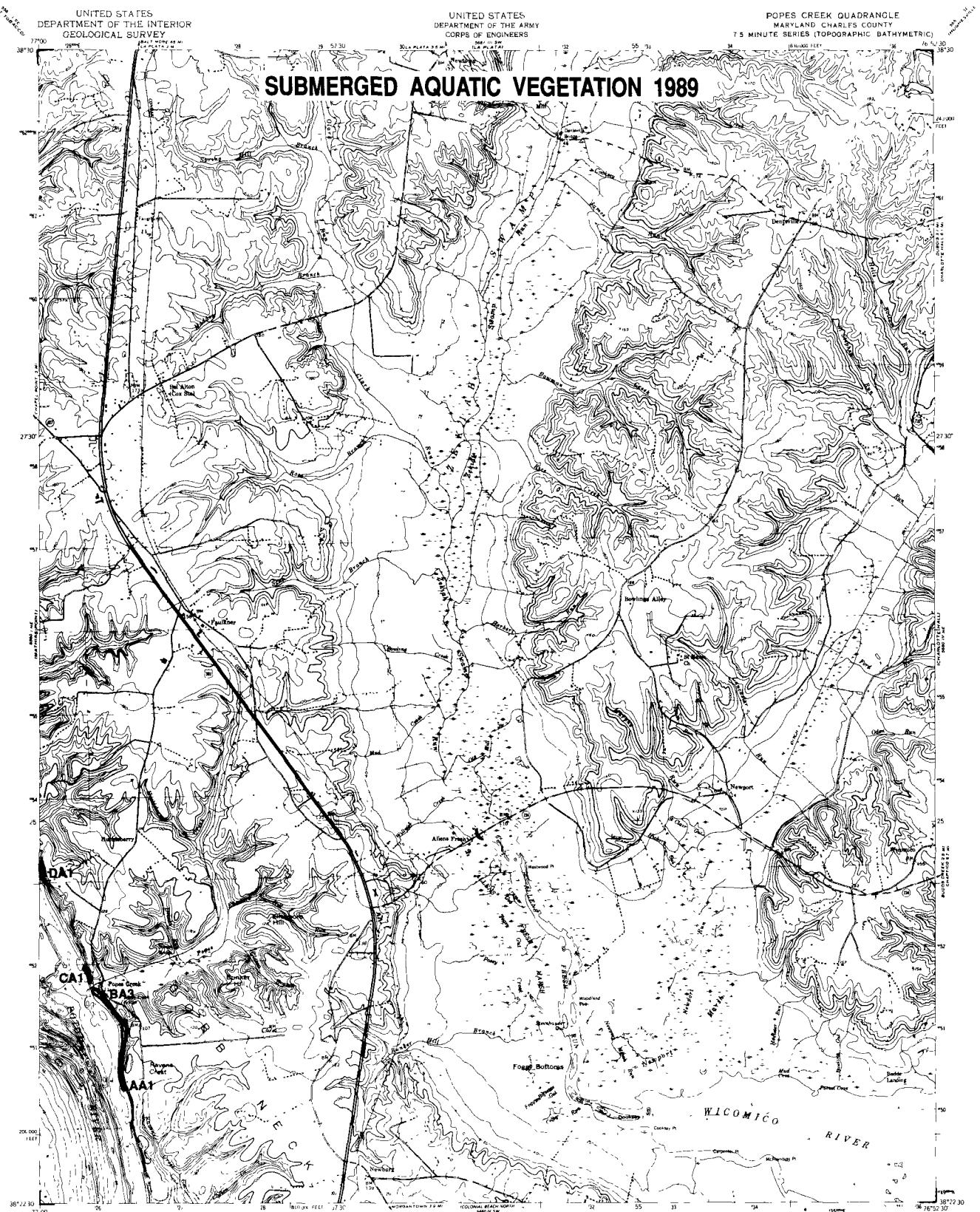
- MD Charter Boat Field Survey
  - ◆ Citizens Field Observation
  - ▲ VIMS Field Survey
  - ◆ USGS Survey
  - ★ USF & WS Survey

DATE 9-28-89  
MATHIAS POINT,  
MD-VA  
057

1968

ANS 3360-1142-0001 / 4000

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	Hv	<i>Hydrilla verticillata</i> (hydrilla)
Rm	<i>Ruppia marina</i> (widgeon grass)	Hd	<i>Heteranthera dubia</i> (water stargrass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Ppl	<i>Potamogeton perfoliatus</i> (redhead-grass)	Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)	Ngu	<i>Najas guadalupensis</i> (southern naiad)
N	<i>Najas spp.</i> (naiad)	Ngr	<i>Najas gracillima</i> (naiad)
Ec	<i>Eloetea canadensis</i> (common elodea)	C	<i>Chara sp.</i> (muskglass)
Va	<i>Vallisneria americana</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapa natans</i> (water chestnut)		
U	Unknown species composition		

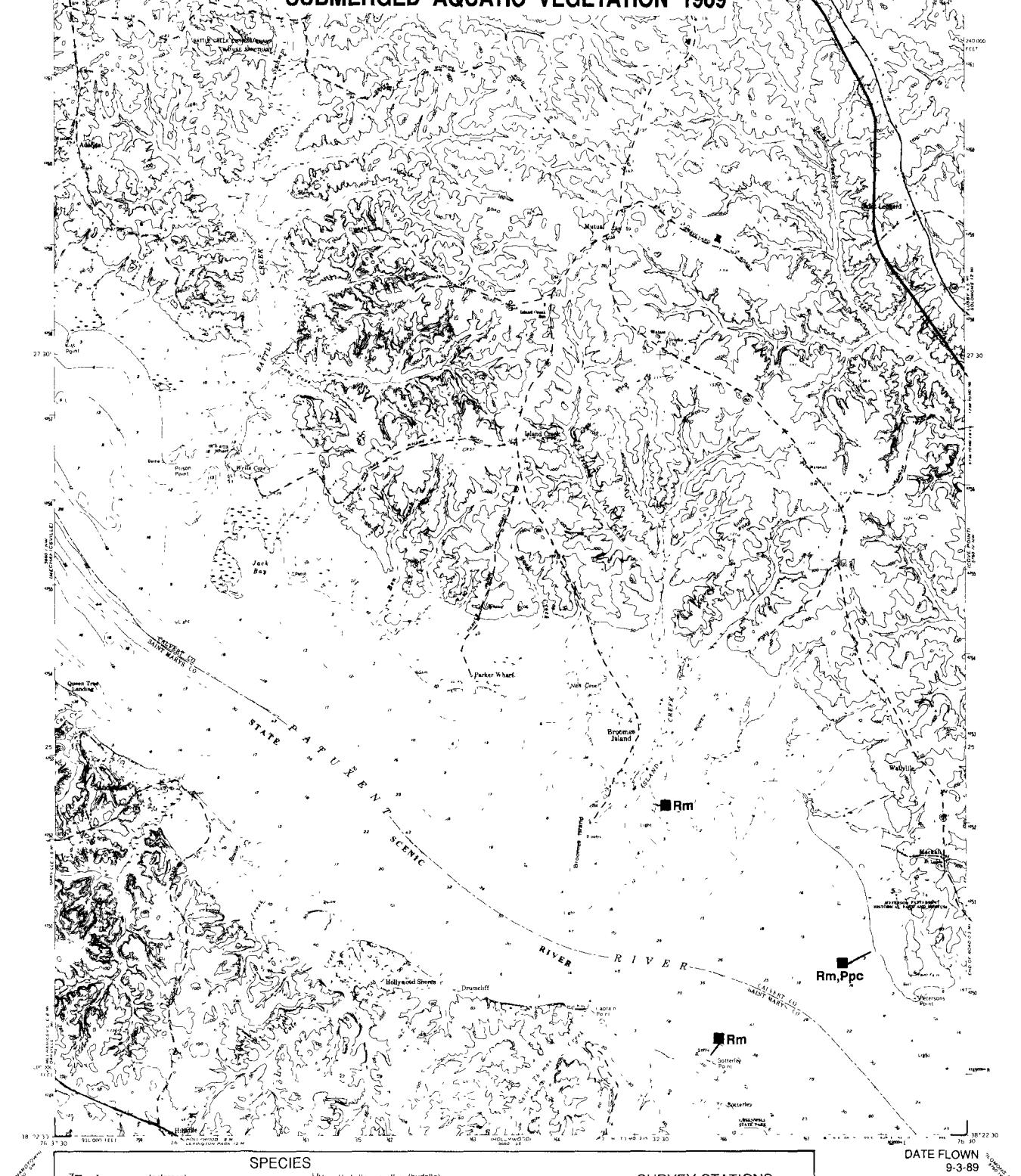
SCALE 1:24 000

1 MILE

1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

SUBMERGED AQUATIC VEGETATION 1989



SPECIES	
Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (wedgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppl	<i>Potamogeton perfoliatus</i> (redhead grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas spp.</i> (naad)
Ec	<i>Elodea canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
U	Unknown species composition
Hv	<i>Hydrilla verticillata</i> (hydrilla)
Hd	<i>Heteranthera dubia</i> (water stargrass)
Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (southern naad)
Ngr	<i>Najas graciliformis</i> (naad)
C	<i>Chara sp.</i> (muskratgrass)
Nm	<i>Najas minor</i> (slender naad)

#### SURVEY STATIONS

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

DATE FLOWN  
8-8-02

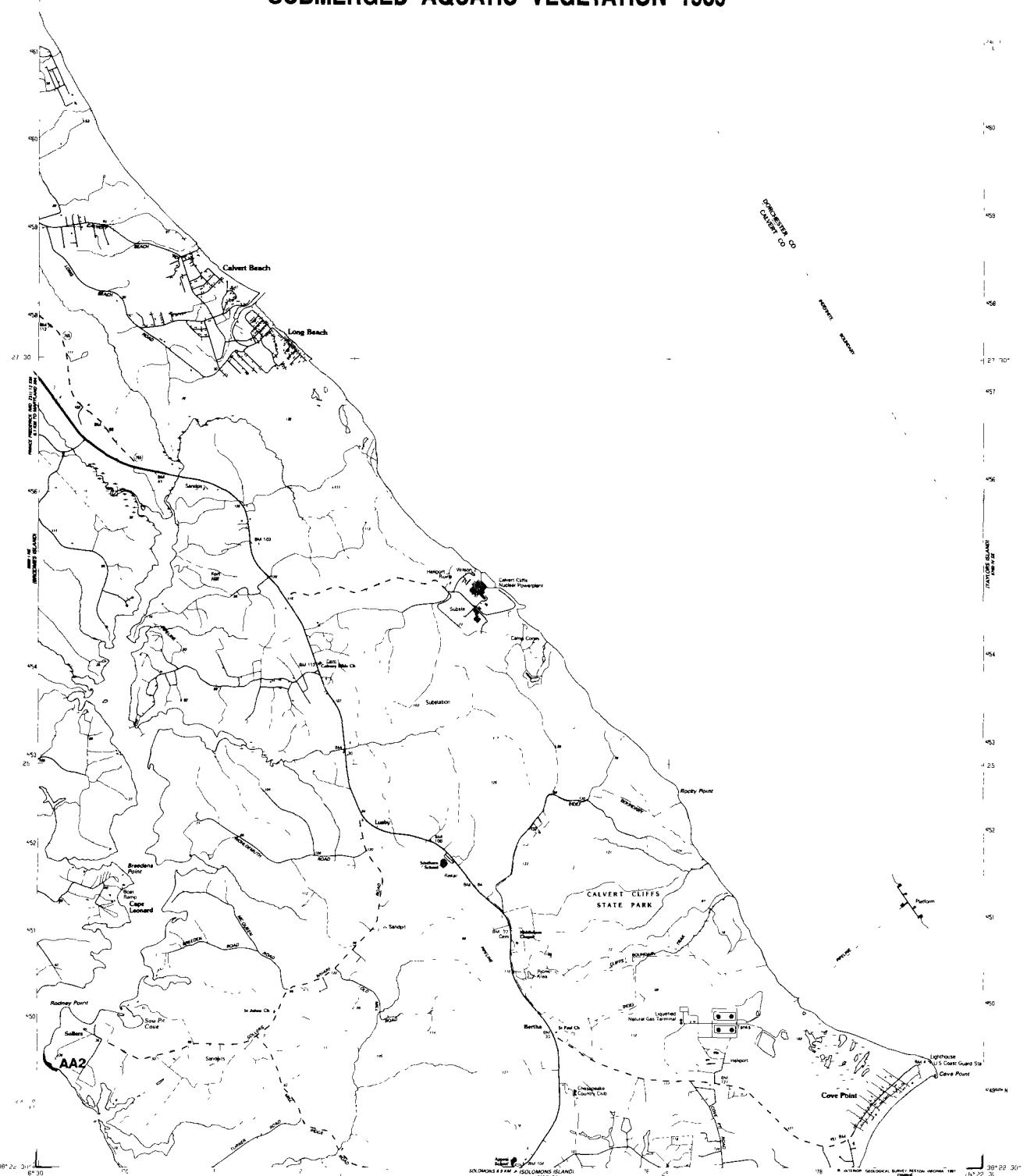
9-3-89  
BROOMES  
ISLAND, MD  
060

190/6 US 17 024  
1983  
PHOTORÉVISED 1986

A scale bar and north arrow are located at the bottom of the map. The scale bar is labeled "SCALE 1:24,000" and features markings for 1, 5, and 0 miles, as well as 1 KILOMETER. A north arrow points upwards.

VIRGINIA INSTITUTE  
OF MARINE SCIENCE

## SUBMERGED AQUATIC VEGETATION 1989



### SPECIES

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

### SURVEY STATIONS

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

DATE FLOWN  
9-3-89

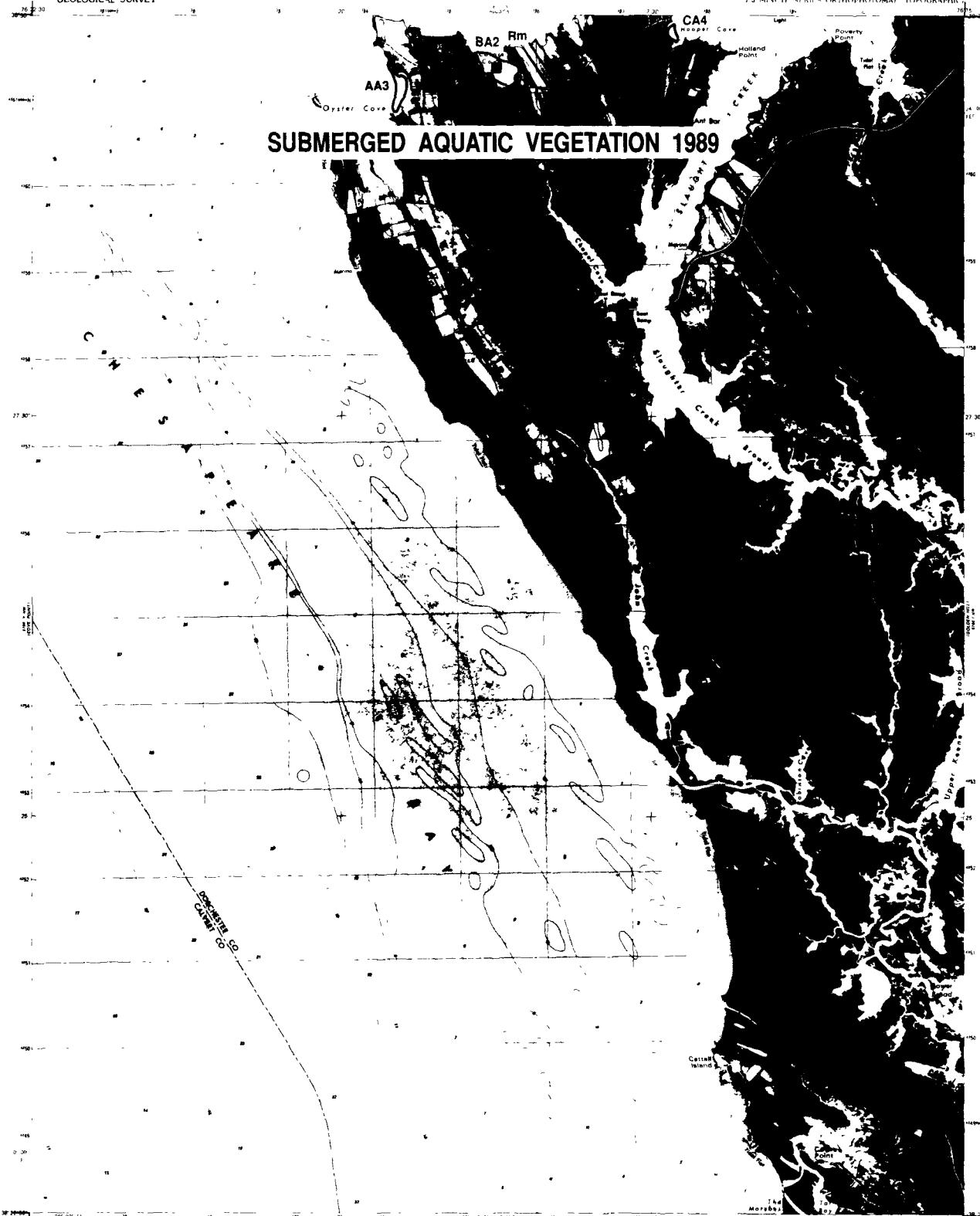
COVE POINT,  
MD  
061

DMA 5760 IV NW-SERIES V333

COVE POINT, MD  
ST MARY'S CITY REV COMPLEX

SCALE 1:24,000  
1 MILE  
1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	Hv	<i>Hippuris vulgaris</i> (hydnilla)
Rm	<i>Ruppia maritima</i> (widgeon grass)	Hd	<i>Heteranthera dubia</i> (water stargrass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Ppl	<i>Potamogeton perfoliatus</i> (redhead-grass)	Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)	Ngu	<i>Najas guadalupensis</i> (southern naiad)
N	<i>Najas</i> spp. (naiad)	Ngr	<i>Najas gracillima</i> (naiad)
Ec	<i>Elodea canadensis</i> (common elodea)	C	<i>Chara</i> sp. (muskglass)
Va	<i>Vallisneria americana</i> (wild celery)	Ntm	<i>Najas minor</i> (sister naiad)
Tn	<i>Trapa natans</i> (water chestnut)		
U	Unknown species composition		

DATE FLOWN  
6-30-89

**TAYLORS  
ISLAND, MD  
062**

DNA 5700 R. M. SERIES V1330

SCALE 1:24,000  
1 MILE  
0 5 1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE

# SUBMERGED AQUATIC VEGETATION 1989



DATE FLOWN  
6-30-89

GOLDEN HILL,

MD

063

1981

## SPECIES

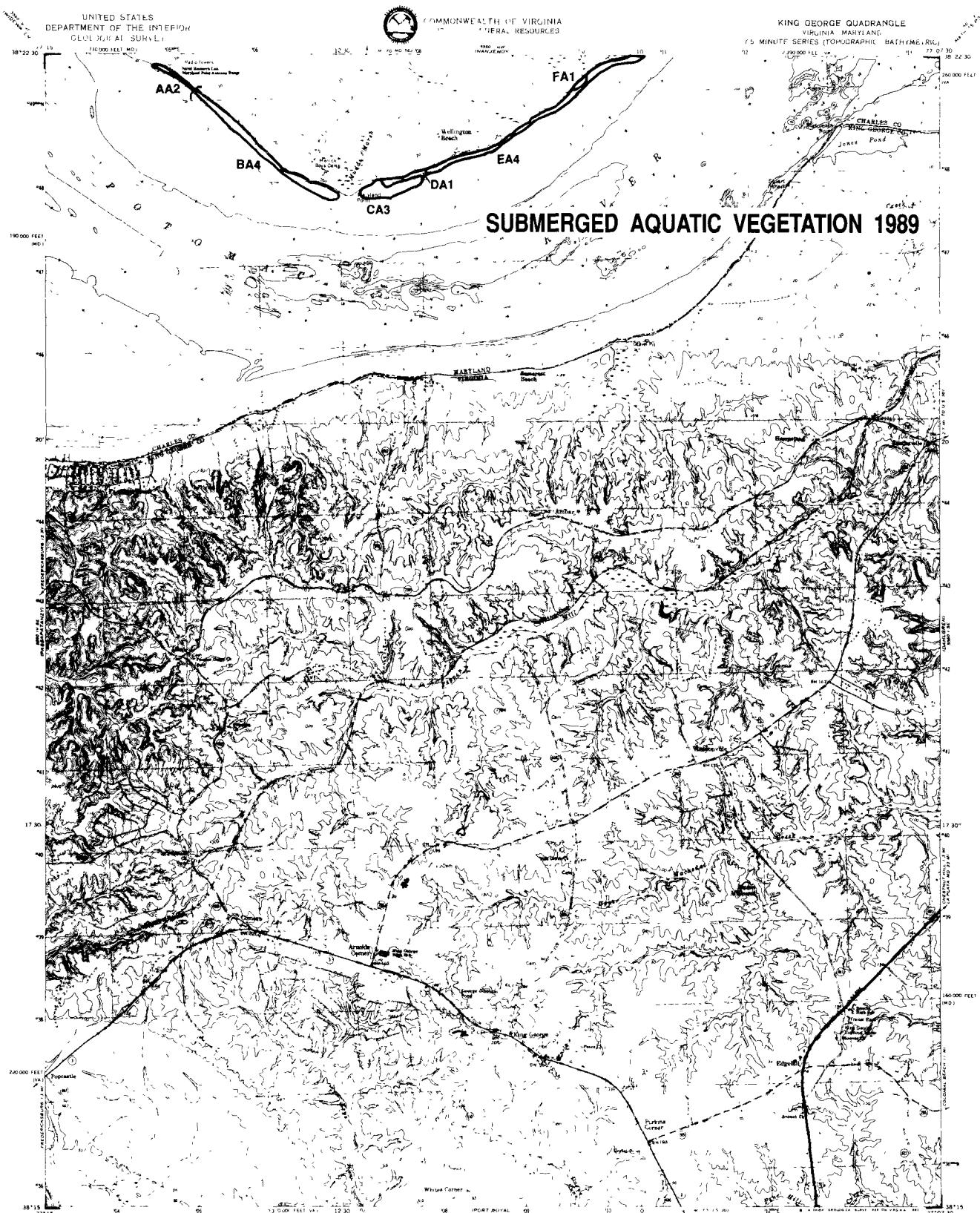
Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Misriphis spicatum</i> (Eurasian watermilfoil)
Ppf	<i>Potamogeton pectinatus</i> (redhead grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas spp.</i> (naiads)
Ec	<i>Elatospuria leiorhiza</i> (common elatospuria)
Va	<i>Vallisneria americana</i> (water caltrop)
Tn	<i>Trapa natans</i> (water chestnut)
U	Unknown species (non-composite)

## SURVEY STATIONS

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

SCALE 1:24,000  
1 MILE  
0 5 10 KILOMETERS

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



**SPECIES**

Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppl	<i>Potamogeton perfoliatus</i> v (redhead-grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas</i> sp. (naiad)
Ec	<i>Elodea canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
U	Unknown species composition

Hv	<i>Hydrilla verticillata</i> (hydrilla)
Ha	<i>Heteranthera dubia</i> (water stargrass)
Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngl	<i>Najas guadalupensis</i> (southern naiad)
Ngr	<i>Najas gr. acutiflora</i> (naiad)
C	<i>Chara</i> sp. (muskglass)
Nm	<i>Najas minor</i> (slender naiad)

**SURVEY STATIONS**

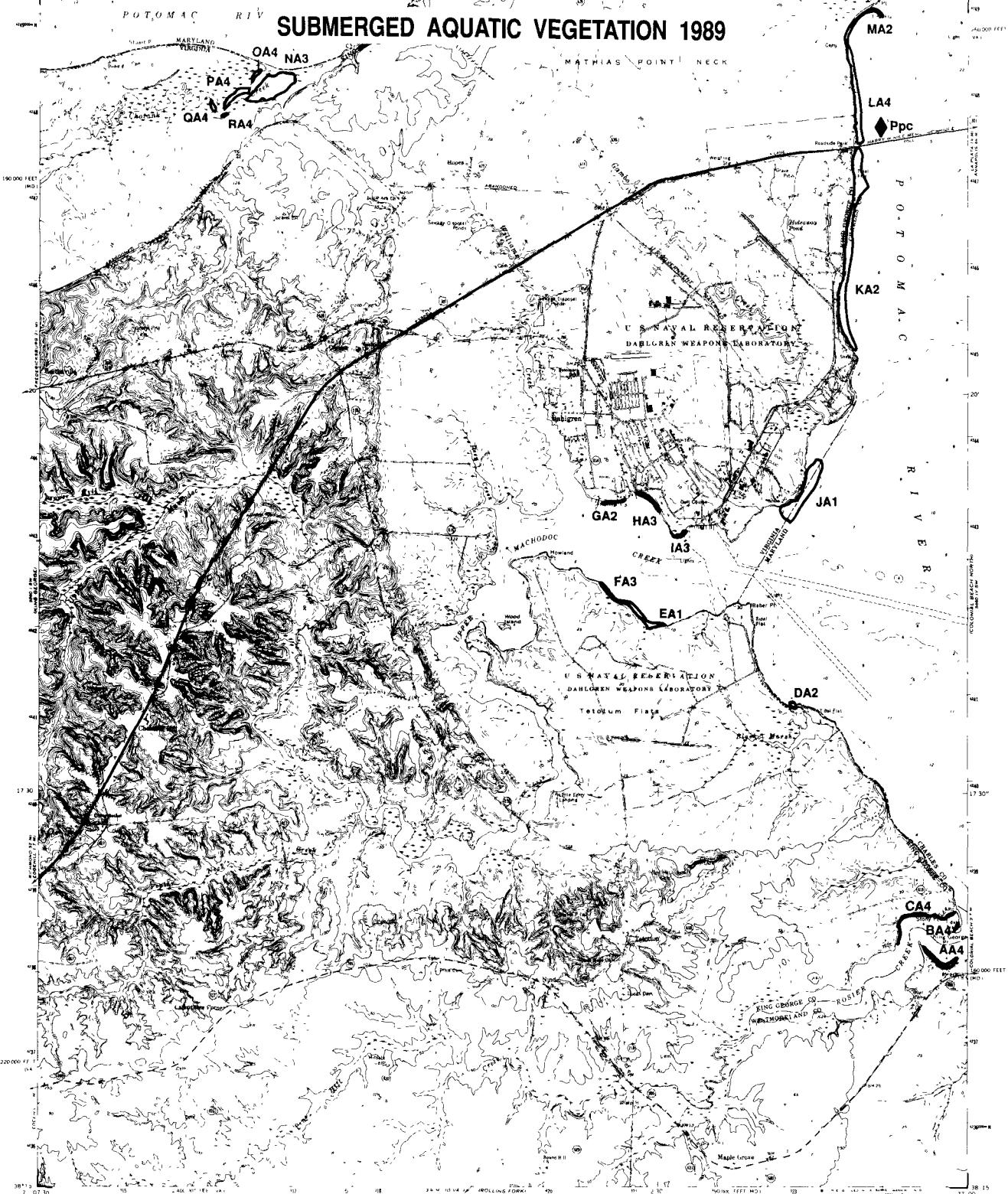
- MD Charter Boat Field Survey
- Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

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

**KING GEORGE,  
VA-MD  
065**

DAIA 9900 | SW SERIES 1834

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



**SPECIES**

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

Hv	<i>Hydrocharis verticillata</i> (hydnilla)
Hd	<i>Herminium dubium</i> (water stargrass)
Pc	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pectinatus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (southern naiad)
Ngr	<i>Najas gracillima</i> (naiad)
C	<i>Carex</i> sp. (muskgrass)
Nm	<i>Najas minor</i> (slender naiad)

**SURVEY STATIONS**

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

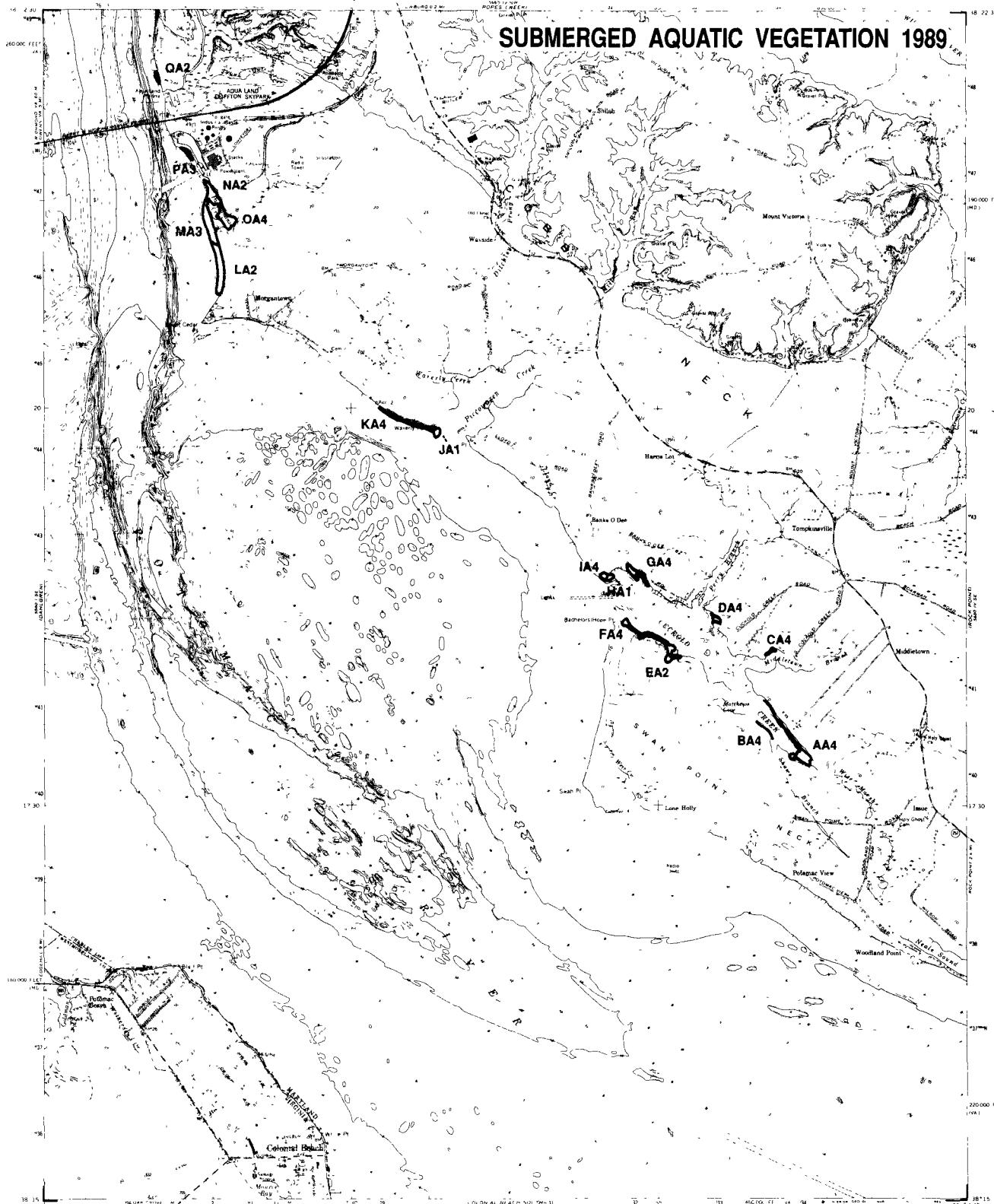
DATE FLOWN  
8-31-89  
**DAHLGREN**  
VA-MD  
066

AMERICAN SERIES 1984

SCALE 1:24,000  
1 MILE  
1 5 0 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE

# SUBMERGED AQUATIC VEGETATION 1989



DATE FLOWN  
8-31-89

COLONIAL BEACH  
NORTH, VA-MD

067

PHOTOGRAPHED 1989  
BATHYMETRY ADDED 1982  
DMA 5060 IV SW SERIES V83

## SPECIES

Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (wedgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Pp1	<i>Potamogeton perfoliatus</i> (redhead grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (thorned pondweed)
N	<i>Najas</i> spp. (naiad)
Ec	<i>Eloea canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
U	Unknown species composition

Hv	<i>Hydrilla verticillata</i> (hydrilla)
Hd	<i>Heisanthera dubia</i> (water stargrass)
Pcr	<i>Potamogeton crispus</i> (cutleaf pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (Southern naiad)
Ngr	<i>Najas gracilissima</i> (naiad)
C	<i>Chara</i> sp. (muskglass)
Nrm	<i>Najas minor</i> (slender naiad)

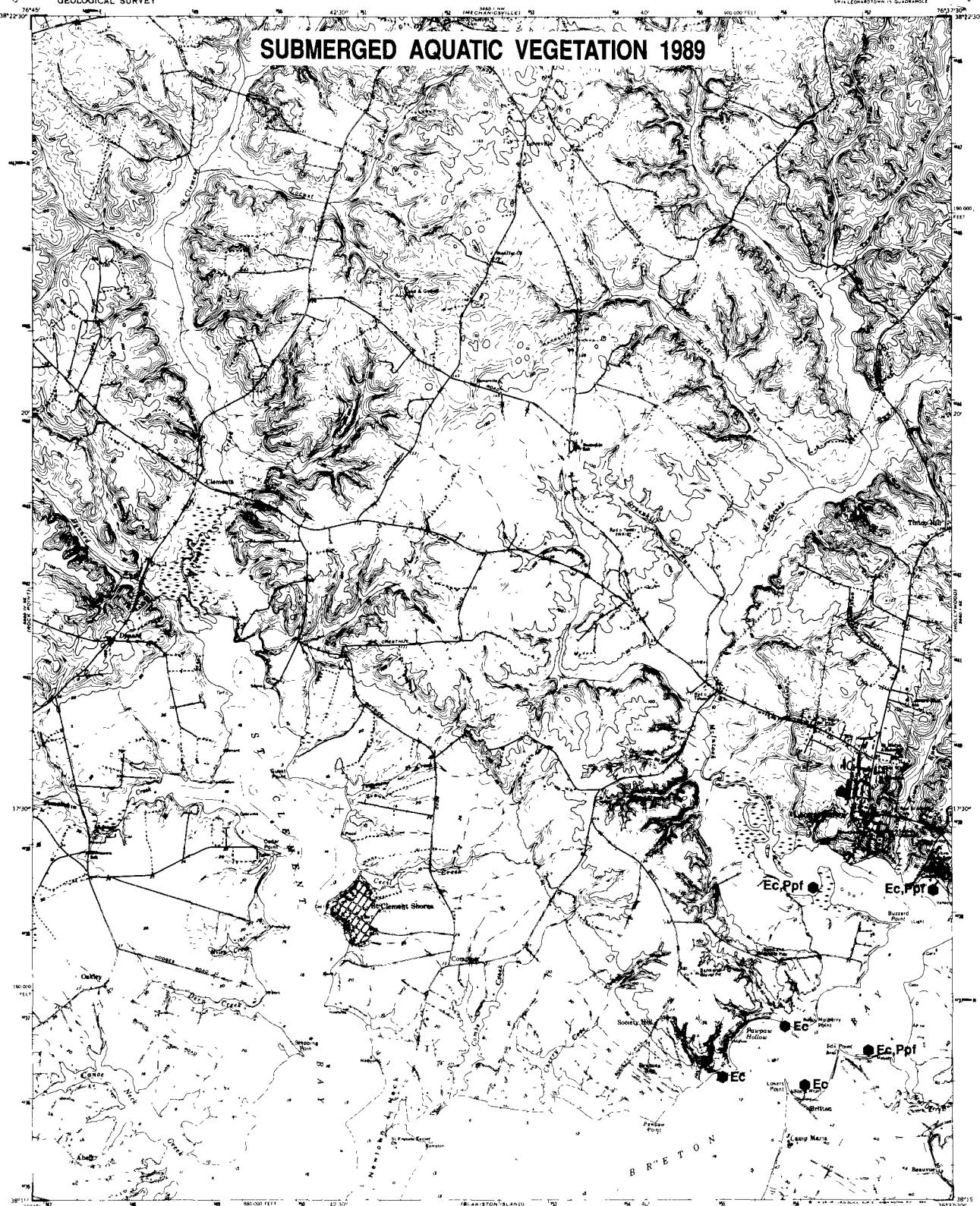
## SURVEY STATIONS

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

SCALE 1:24 000

1 MILE  
5 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



**SPECIES**

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

**Hv** *Hydrocharis verticillata* (hydnilla)

Hd	<i>Heatherantha dubia</i> (water stargrass)
Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (southern naiaid)
Ngr	<i>Najas gracillima</i> (naiaid)
C	<i>Chara</i> sp. (muskglass)
Nm	<i>Najas minor</i> (slender naiaid)

**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

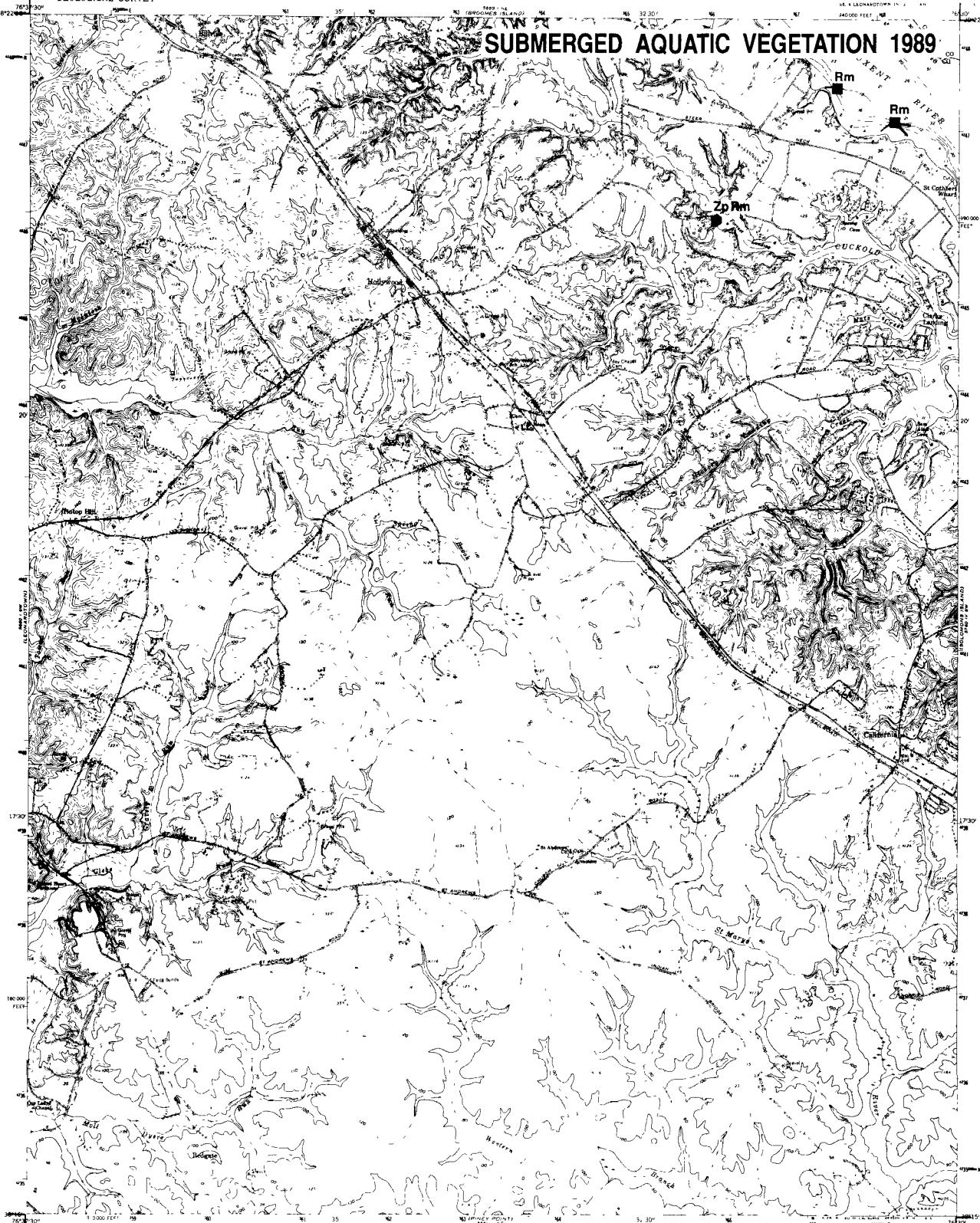
DATE FLOWN  
8-31-89

LEONARDTOWN,

MD

069

1983  
AMS 54401 SW-SERIES VASS



**SPECIES**

Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppl	<i>Potamogeton perfoliatus</i> (redhead grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas</i> spp. (naiad)
Ec	<i>Eleocharis canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
U	Unknown species composition

Hv	<i>Hydrobaenaceae</i> (hydrilla)
Hd	<i>Heteranthera dubia</i> (water stargrass)
Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (southern naiad)
Ngr	<i>Najas gracillima</i> (naiad)
C	<i>Chara</i> sp. (muskgrass)
Nm	<i>Najas minor</i> (slender naiad)

**SURVEY STATIONS**

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

DATE FLOWN  
9-3-89

**HOLLYWOOD,  
MD  
070**

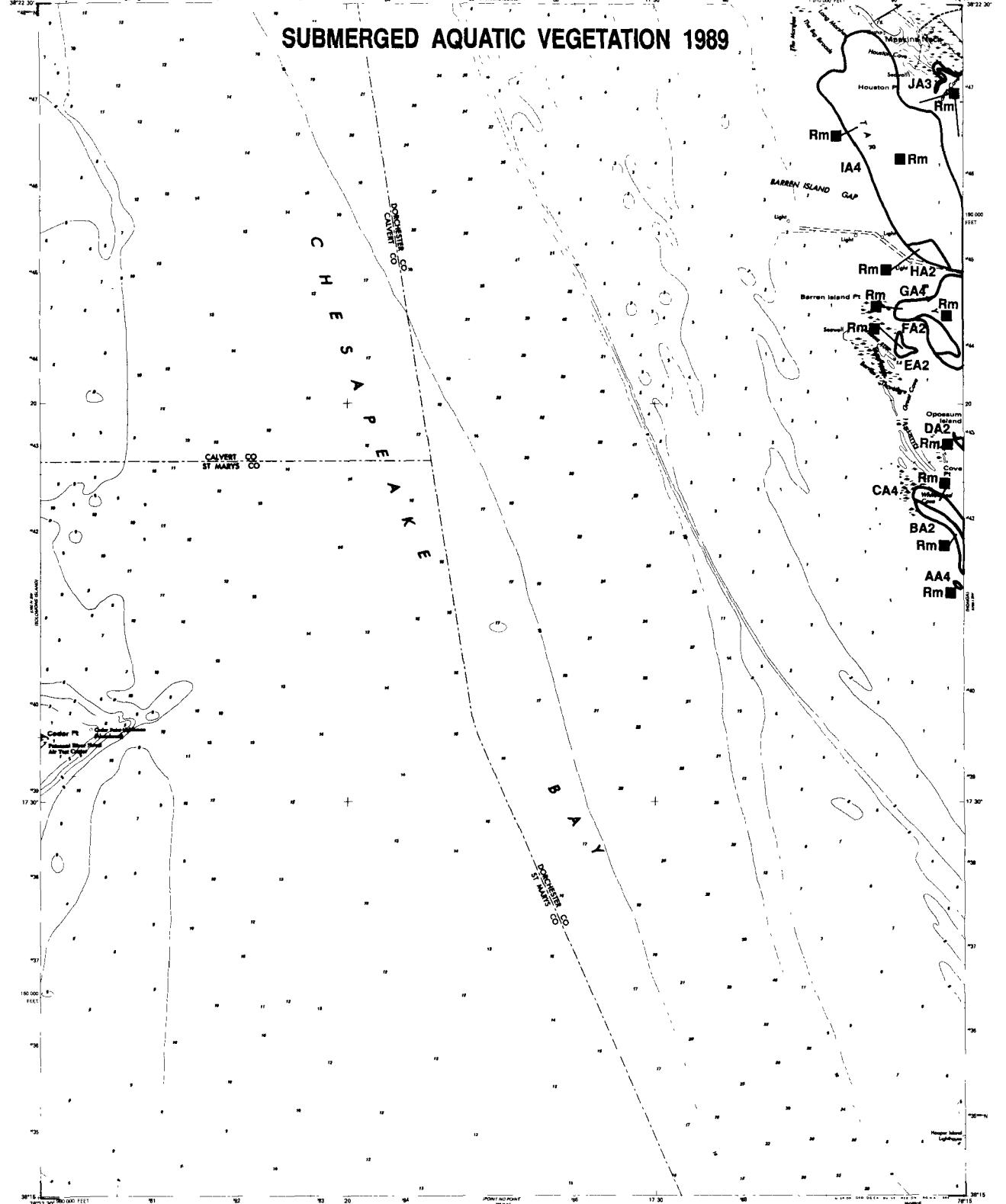
1983  
AMS 2460 I SE-SERIES VB33

VIRGINIA INSTITUTE  
OF MARINE SCIENCE

SCALE 1:24,000

1 MILE  
1 KILOMETER





SPECIES

Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia marina</i> (wedgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppl	<i>Potamogeton perfoliatus</i> (redhead-grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas</i> spp. (naiad)
Ec	<i>Elodea canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Typha natans</i> (water chestnut)
U	Unknown species composition

SURVEY STATIONS

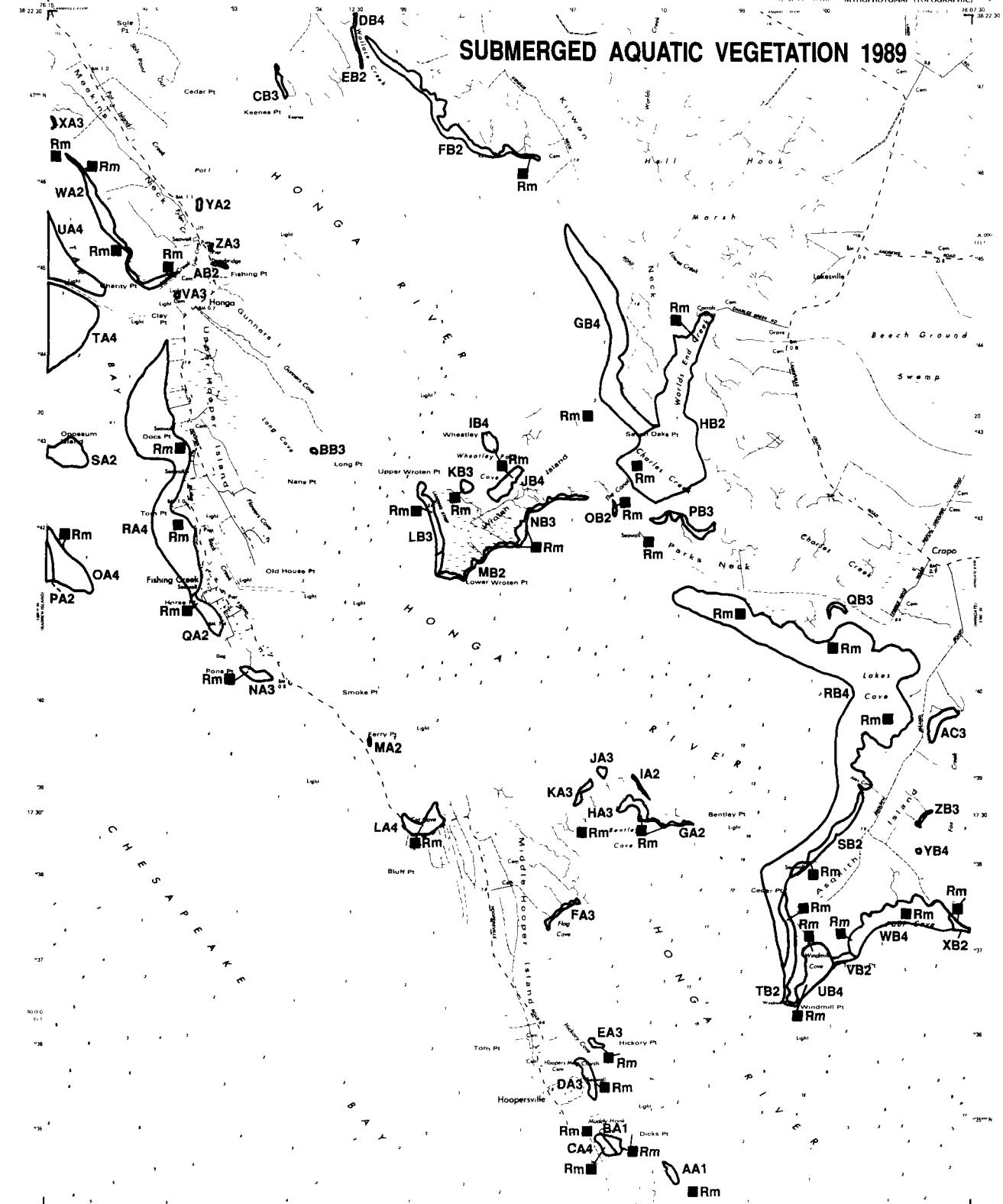
- MD Charter Boat Field Survey
- Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

DATE FLOWN  
6-30-89  
**BARREN  
ISLAND, MD  
072**  
1984

DMA 3760 TV SE - SERIES VERSO

VIRGINIA INSTITUTE  
OF MARINE SCIENCE

## **SUBMERGED AQUATIC VEGETATION 1989**



	SPECIES
Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (wedgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppt	<i>Potamogeton perfoliatus</i> (redhead-grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas spp.</i> (naiad)
Ec	<i>Elosha canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Trapra natans</i> (water chestnut)
U	Unknown species composition

Hv	<i>Hydrilla verticillata</i> (hydrilla)
Hd	<i>Heteranthera dubia</i> (water stargrass)
Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (southern naiaid)
Ngr	<i>Najas gracilis</i> (naiaid)
C	<i>Chara sp.</i> (muskgrass)
Nnr	<i>Najas minor</i> (slender naiaid)

## SURVEY STATIONS

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

DATE FLOWN  
6-30-89  
**HONGA,**  
**MD**  
**073**

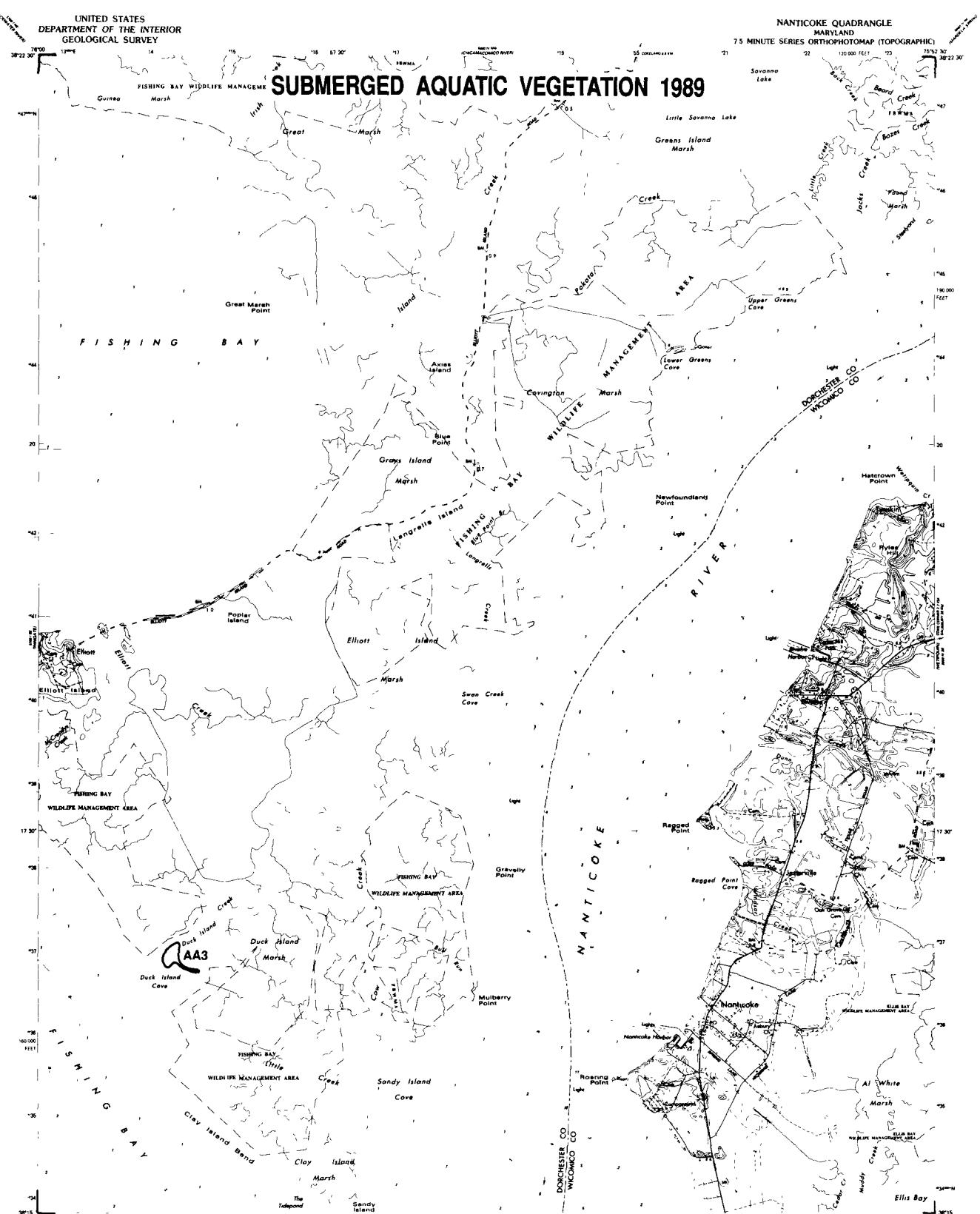
1984

IMA 3780 1 NW SERIES VHS

VIRGINIA INSTITUTE  
OF MARINE SCIENCE

128





	SPECIES
Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Pfl	<i>Poaceumagoton perfoliatum</i> (redhead-grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas spp.</i> (naiad)
Ec	<i>Elatoda canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
U	Unknown species composition

- |     |  |
|-----|--|
| Hv  | <i>Hydrilla verticillata</i> (hydrilla)        |
| Hd  | <i>Heteranthera dubia</i> (water stargrass)    |
| Pcr | <i>Potamogeton crispus</i> (curly pondweed)    |
| Cd  | <i>Ceratophyllum demersum</i> (coontail)       |
| Ppu | <i>Potamogeton pusillus</i> (slender pondweed) |
| Ngu | <i>Najas guadalupensis</i> (southern naquad)   |
| Ngi | <i>Najas gracilissima</i> (naaqd)              |
| C   | <i>Chara sp.</i> (muskglass)                   |
| Nm  | <i>Najas minor</i> (slender naaqd)             |

#### SURVEY STATIONS

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

73-1 7563

NANTICOKE,

MD  
075

DNA 5060 IV SW SERIES V8330

VIRGINIA INSTITUTE  
OF MARINE SCIENCE

130



SPECIES

Zm	<i>Zostera marina</i> (eelgrass)	Hv	<i>Hydrilla verticillata</i> (hydrilla)
Rm	<i>Ruppia maritima</i> (widgeon grass)	Hd	<i>Heteranthera dubia</i> (water stargrass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr	<i>Potamogeton crispus</i> (cutleaf pondweed)
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)	Ngu	<i>Najas guadalupensis</i> (southern naiad)
N	<i>Najas spp.</i> (naiad)	Ngr	<i>Najas gracilissima</i> (naiad)
Ec	<i>Elodea canadensis</i> (common elodea)	C	<i>Chara sp.</i> (muskglass)
Va	<i>Vallisneria americana</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapa natans</i> (water chestnut)		
U	Unknown species composition		

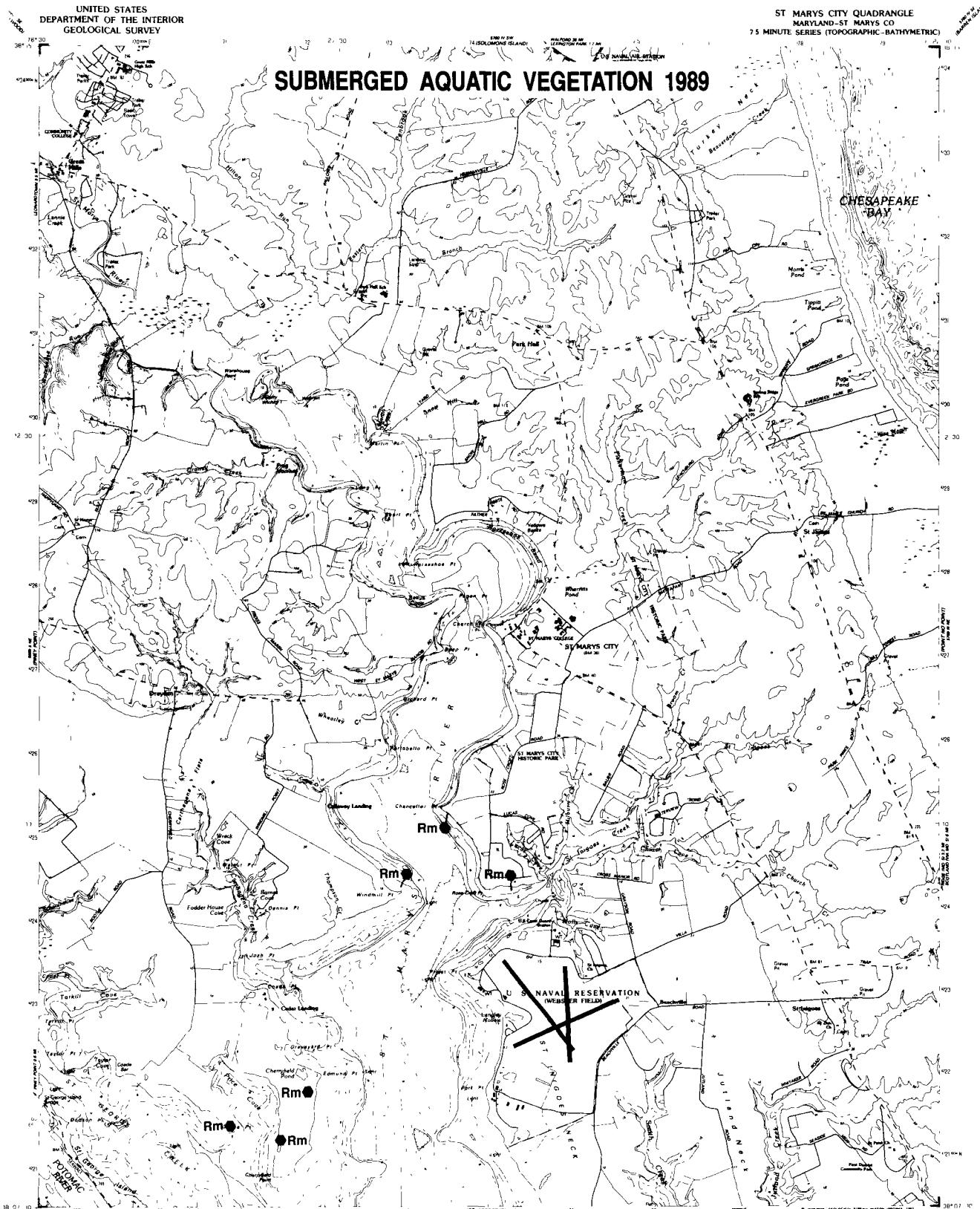
SURVEY STATIONS

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

SCALE 1:24,000

1 3 0 1 KILOMETER

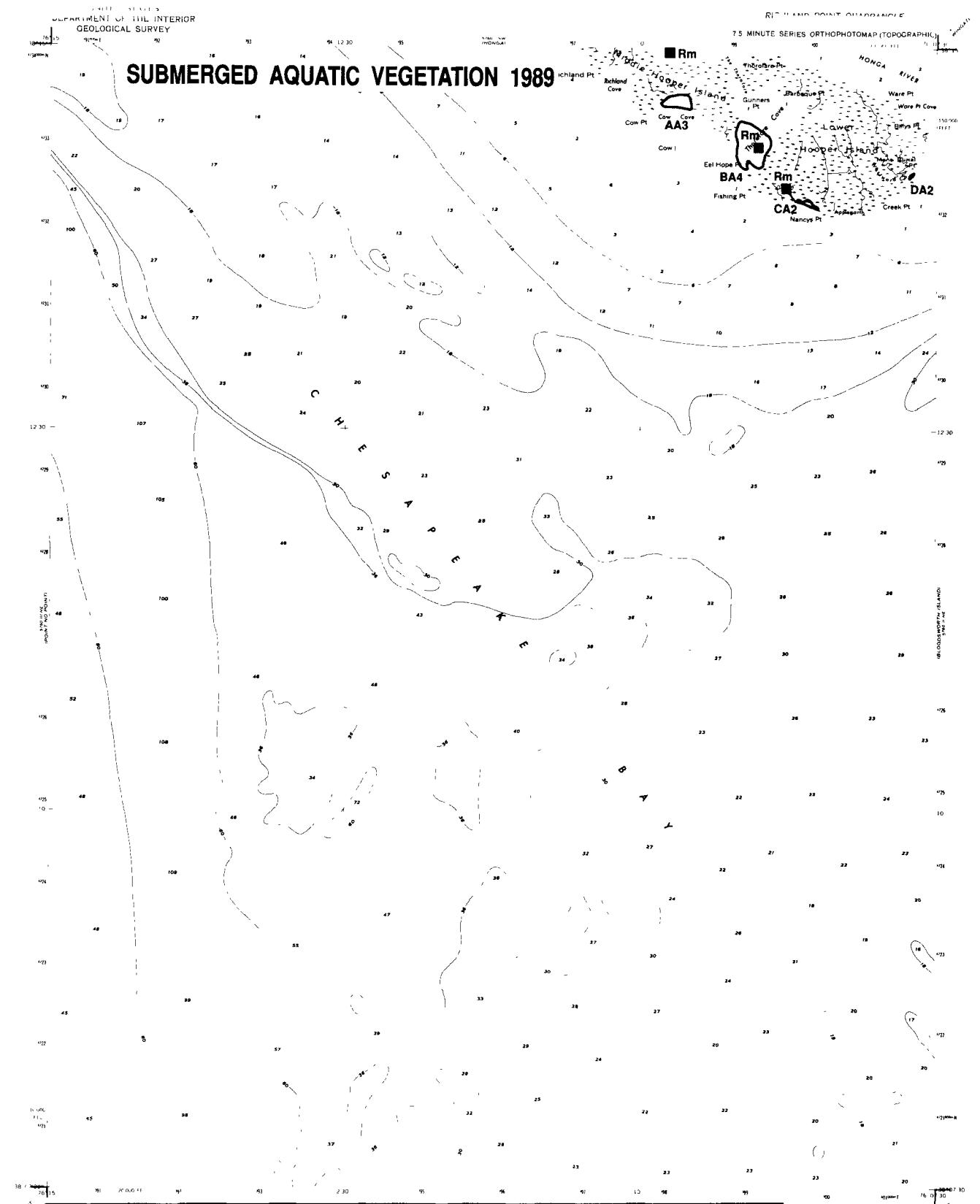
VIRGINIA INSTITUTE  
OF MARINE SCIENCE



SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	■	MD Charter Boat Field Survey
Rm	<i>Ruppia maritima</i> (wedge grass)	●	Citizens Field Observation
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	▲	VIMS Field Survey
Ppl	<i>Potamogeton perfoliatus</i> (redhead-grass)	◆	USGS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	★	USF & WS Survey
Zp	<i>Zannichellia palustris</i> (horned pondweed)		
N	<i>Najas spp</i> (naad)		
Ec	<i>Eloëda canadensis</i> (common elodea)		
Va	<i>Vallisneria americana</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
U	Unknown species composition		

SCALE 1:24,000  
1 MILE  
1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



#### SPECIES

Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)
Pps	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas</i> spp. (naad)
Ec	<i>Eldotea canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
U	Unknown species composition

#### SURVEY STATIONS

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

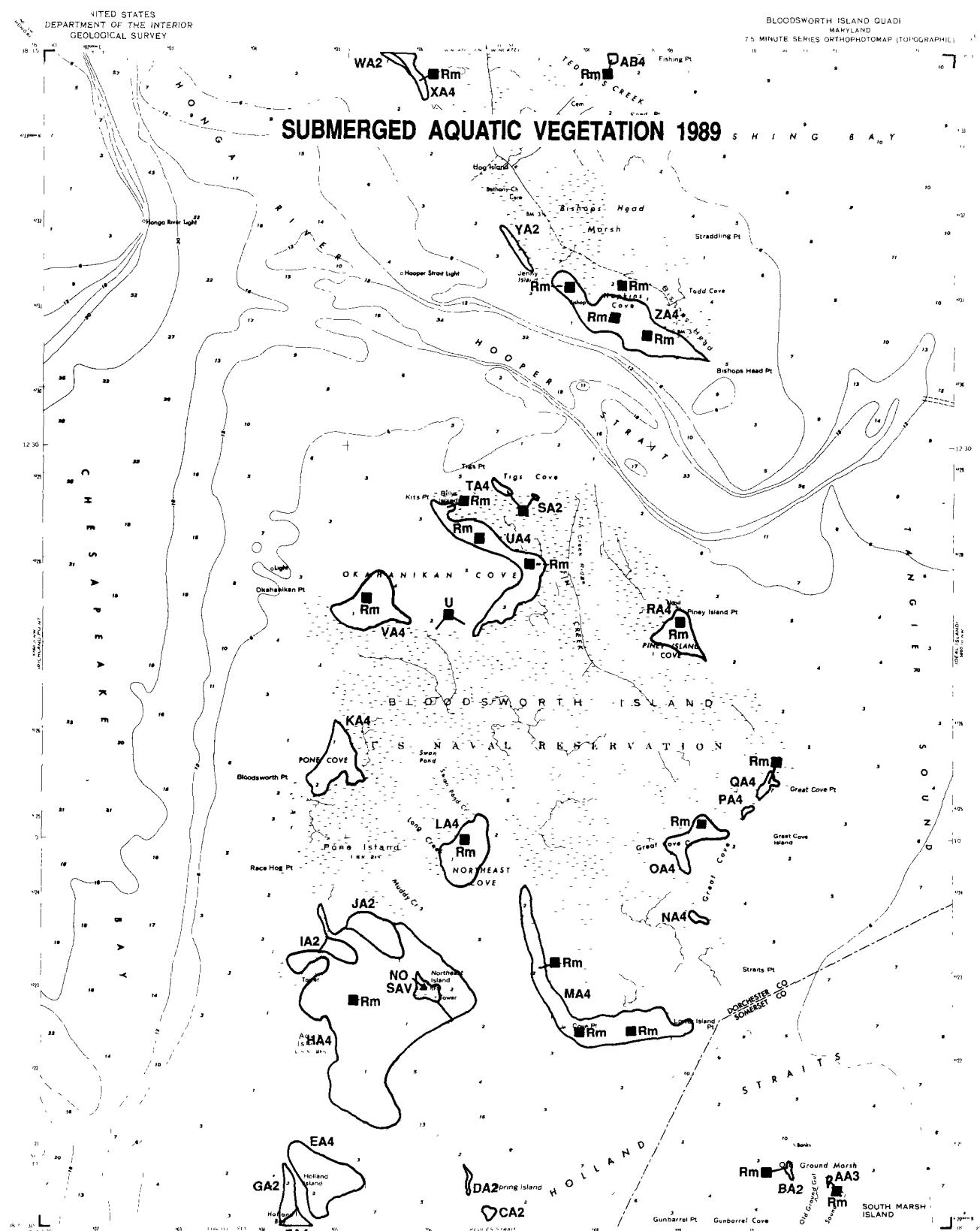
DATE FLOWN  
6-30-89

RICHLAND  
POINT, MD  
082

1973  
1974  
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1980  
1981  
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1984  
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1986  
1987  
1988  
1989

SCALE 1:24,000  
1 MILE  
1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



**SPECIES**

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

Hv	<i>Hydrilla verticillata</i> (hydrilla)
Hd	<i>Heteranthera dubia</i> (water stargrass)
Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (southern naiad)
Ngr	<i>Najas gracillima</i> (naiad)
C	<i>Chara</i> sp. (muskglass)
Nm	<i>Najas m. nor</i> (slender naiad)

**SURVEY STATIONS**

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

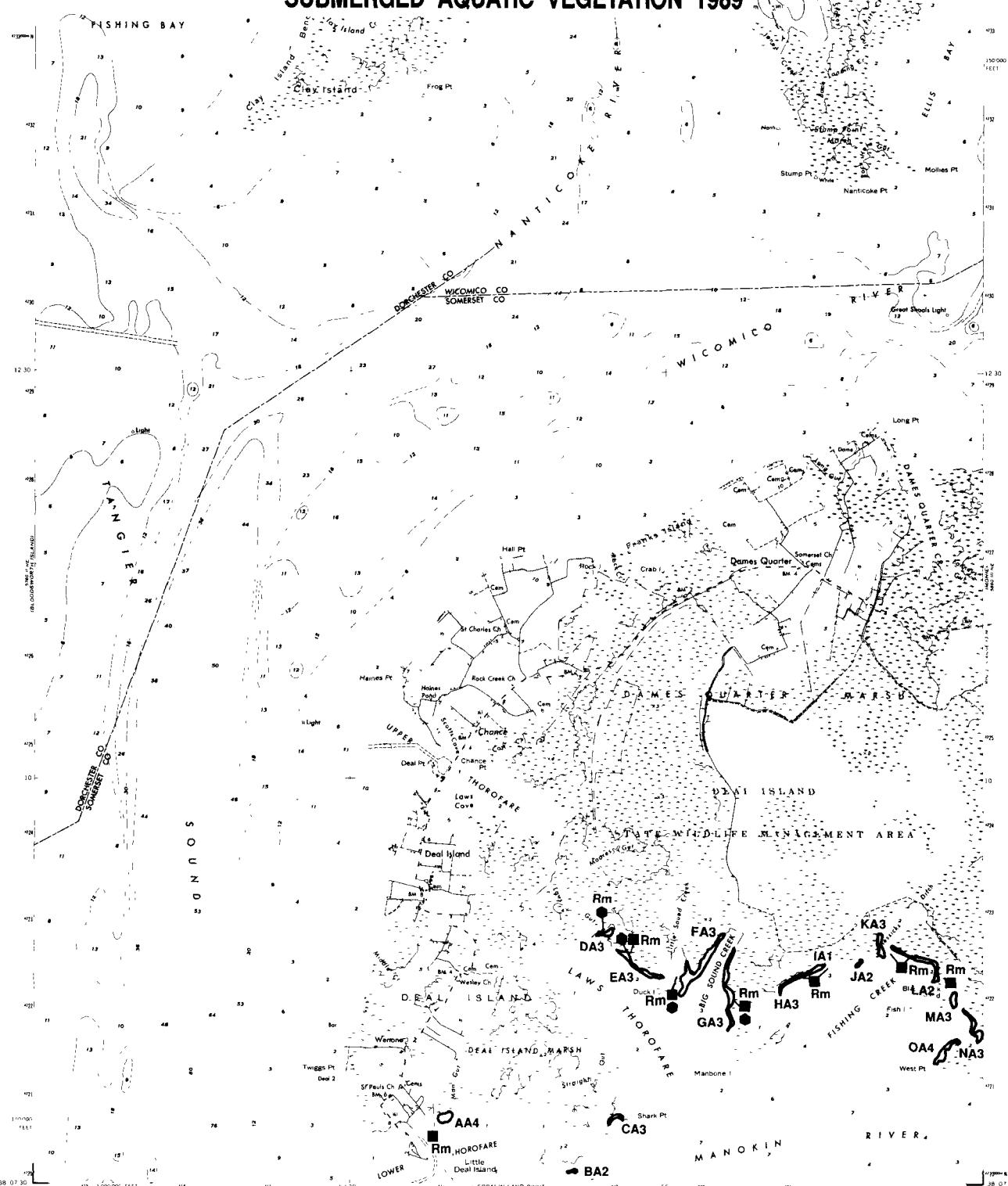
**BLOODSWORTH  
ISLAND, MD  
083**

MAP CLASSIFICATION

DATE FLOWN  
6-30-89

VIRGINIA INSTITUTE  
OF MARINE SCIENCE

# SUBMERGED AQUATIC VEGETATION 1989



## SPECIES

Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppl	<i>Potamogeton perfoliatus</i> (redhead-grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas spp.</i> (naid)
Ec	<i>Ectoda canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
U	Unknown species composition

## SURVEY STATIONS

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

DATE FLOWN  
6-30-89  
**DEAL ISLAND,  
MD  
084**

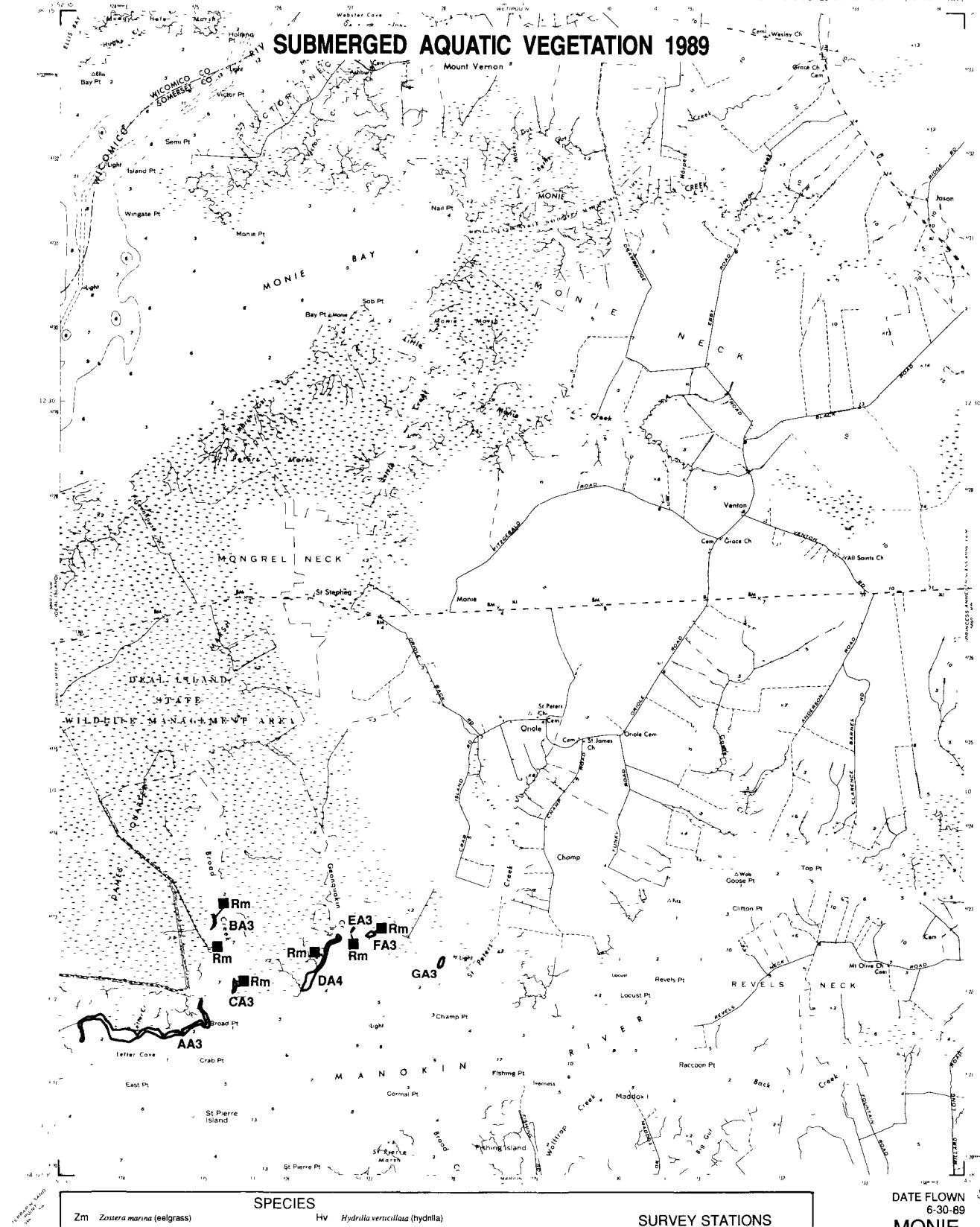
AMS 3880 11 NW SERIES V110

SCALE 1:24,000

1 MILE  
1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE

# SUBMERGED AQUATIC VEGETATION 1989



## SPECIES

Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas spp.</i> (naid)
Ec	<i>Eloea canadensis</i> (common elodea)
Va	<i>Valisneria americana</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
U	Unknown species composition
Hv	<i>Hydrilla verticillata</i> (hydrilla)
Hd	<i>Heteranthera dubia</i> (water stargrass)
Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (southern naiad)
Ngr	<i>Najas gracillima</i> (naid)
C	<i>Chara sp.</i> (muskglass)
Nm	<i>Najas minor</i> (slender naiad)

## SURVEY STATIONS

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

DATE FLOWN

6-30-89

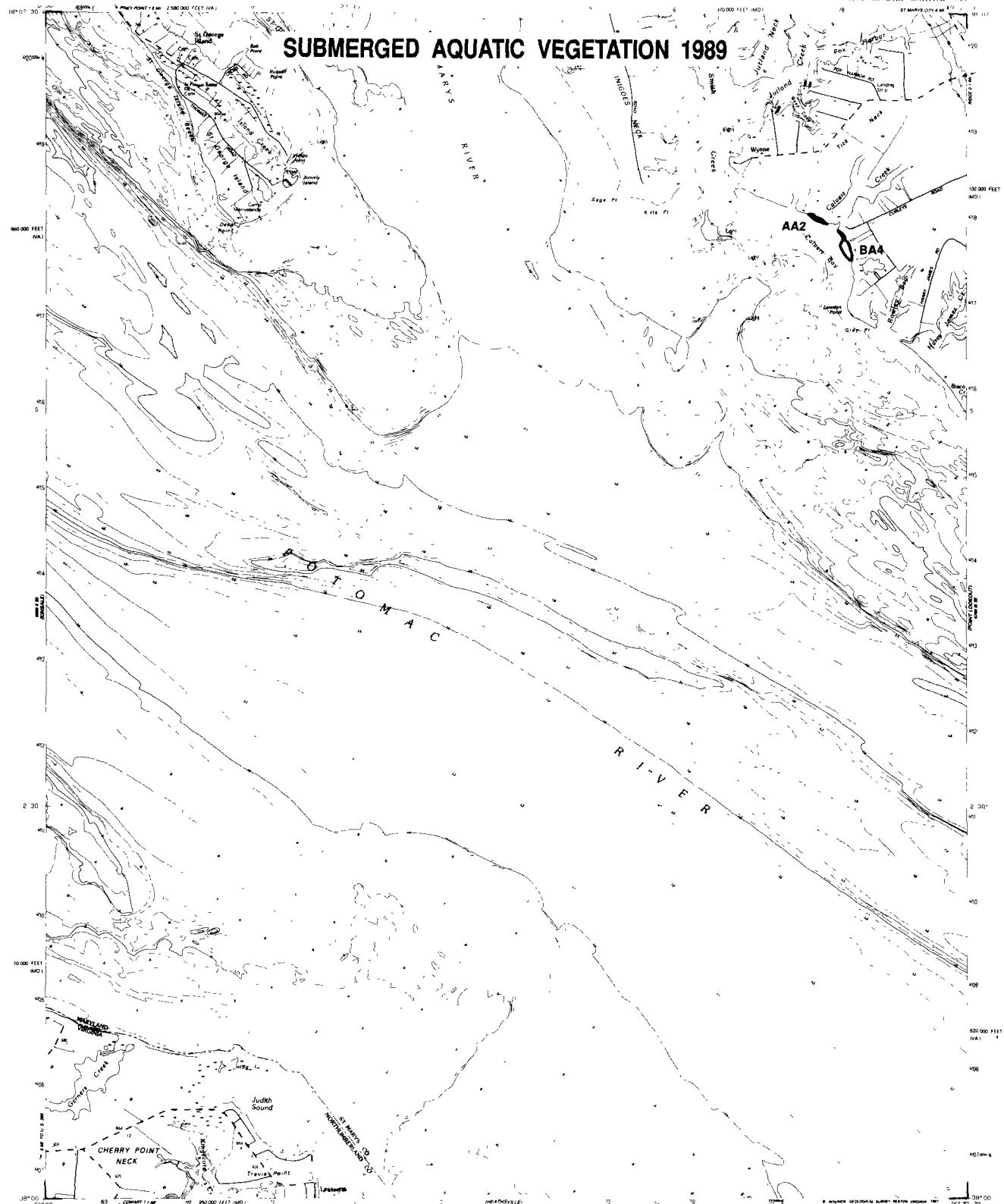
MONIE,

MD

085

SCALE 1:24 000  
1 MILE  
1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



SPECIES

Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (wedgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian water-milfoil)
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas spp.</i> (naiad)
Ec	<i>Ectoda canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
U	Unknown species composition

SURVEY STATIONS

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

DATE FLOWN

8-31-89

ST. GEORGE  
ISLAND, MD-VA  
089

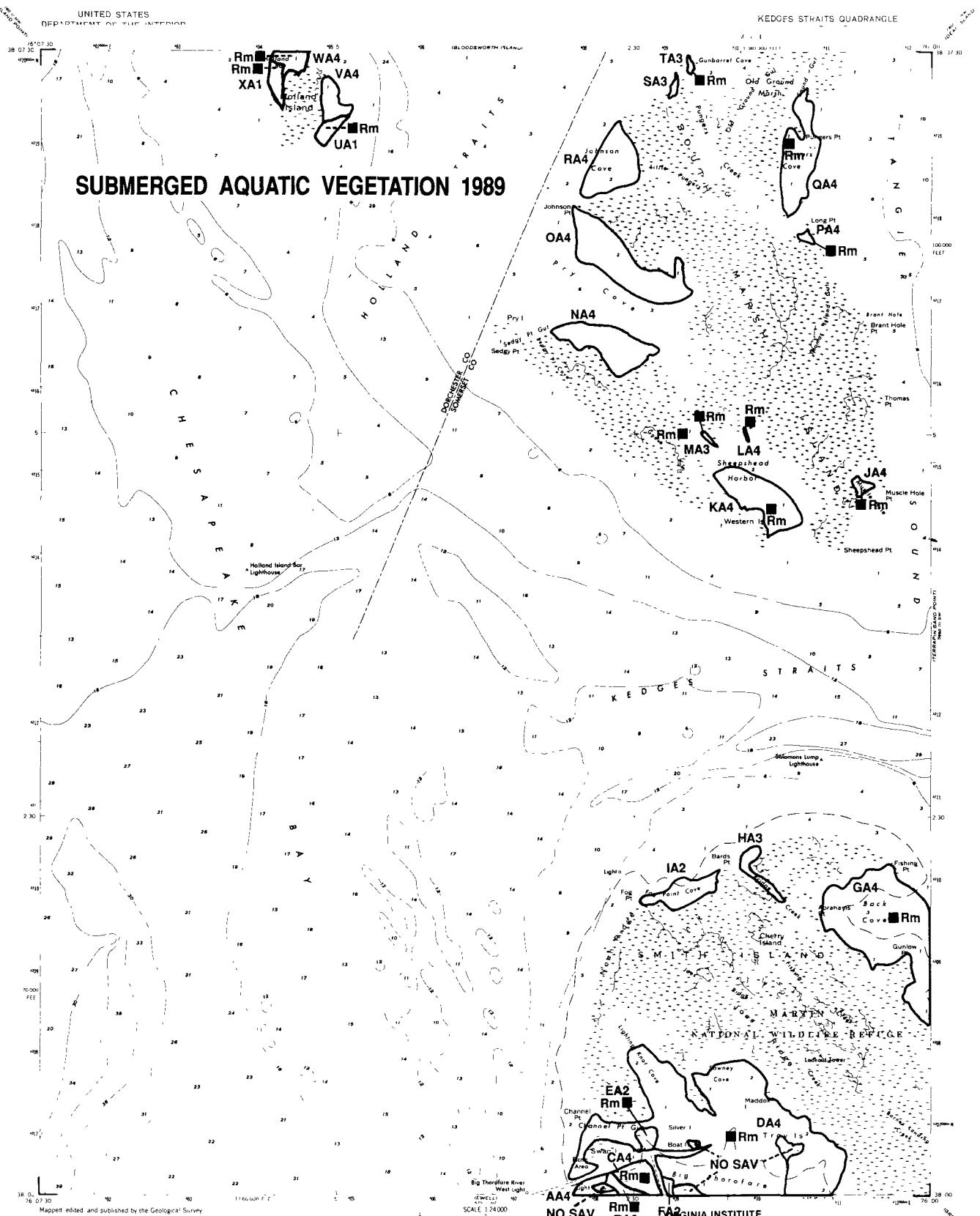
1987

DMA 1:250,000 SW-SERIES V33  
ST. GEORGE ISLAND, MD-VA  
ST. MARY'S 1777 PROJ. LAM

SCALE 1:24,000

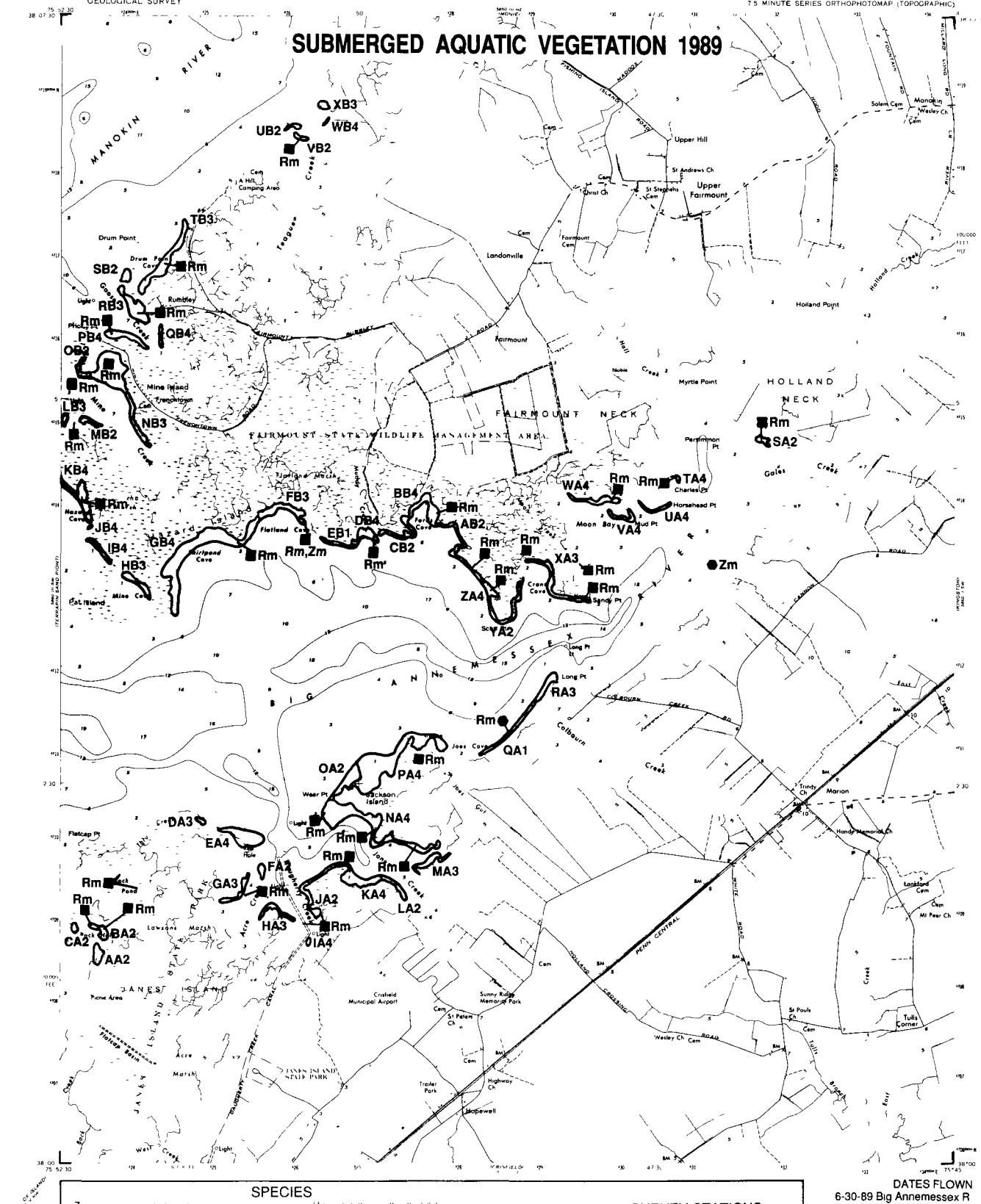
1 MILE  
1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE





## **SUBMERGED AQUATIC VEGETATION 1989**



**SPECIES**

- |     |  |
|-----|--|
| Zm  | <i>Zostera marina</i> (eelgrass)                     |
| Rm  | <i>Ruppia maritima</i> (widgeon grass)               |
| Ms  | <i>Myriophyllum spicatum</i> (Eurasian watermilfoil) |
| Ppl | <i>Potamogeton perfoliatus</i> (redchain-grass)      |
| Ppc | <i>Potamogeton pectinatus</i> (sago pondweed)        |
| Zp  | <i>Zannichellia palustris</i> (horned pondweed)      |
| Np  | <i>Najas</i> spp. (naiaid)                           |
| Ec  | <i>Eloëda canadensis</i> (common elodea)             |
| Va  | <i>Vallisneria americana</i> (wild celery)           |
| Tn  | <i>Trapa natans</i> (water chestnut)                 |
| U   | Unknown species composition                          |

- |     |  |
|-----|--|
| Hv  | <i>Rhytidella verticillata</i> (hydrilla)      |
| Hd  | <i>Heteranthera dubia</i> (water stargrass)    |
| Pcr | <i>Potamogeton crispus</i> (curly pondweed)    |
| Cd  | <i>Ceratophyllum demersum</i> (coontail)       |
| Ppu | <i>Potamogeton pusillus</i> (slender pondweed) |
| Ngu | <i>Najas guadalupensis</i> (southern naad)     |
| Ngr | <i>Najas gracilissima</i> (naad)               |
| C   | <i>Chara sp.</i> (muskglass)                   |
| Nnt | <i>Najas minor</i> (slender naad)              |

## 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

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6-30-89 Manokin R

MARION,  
MD

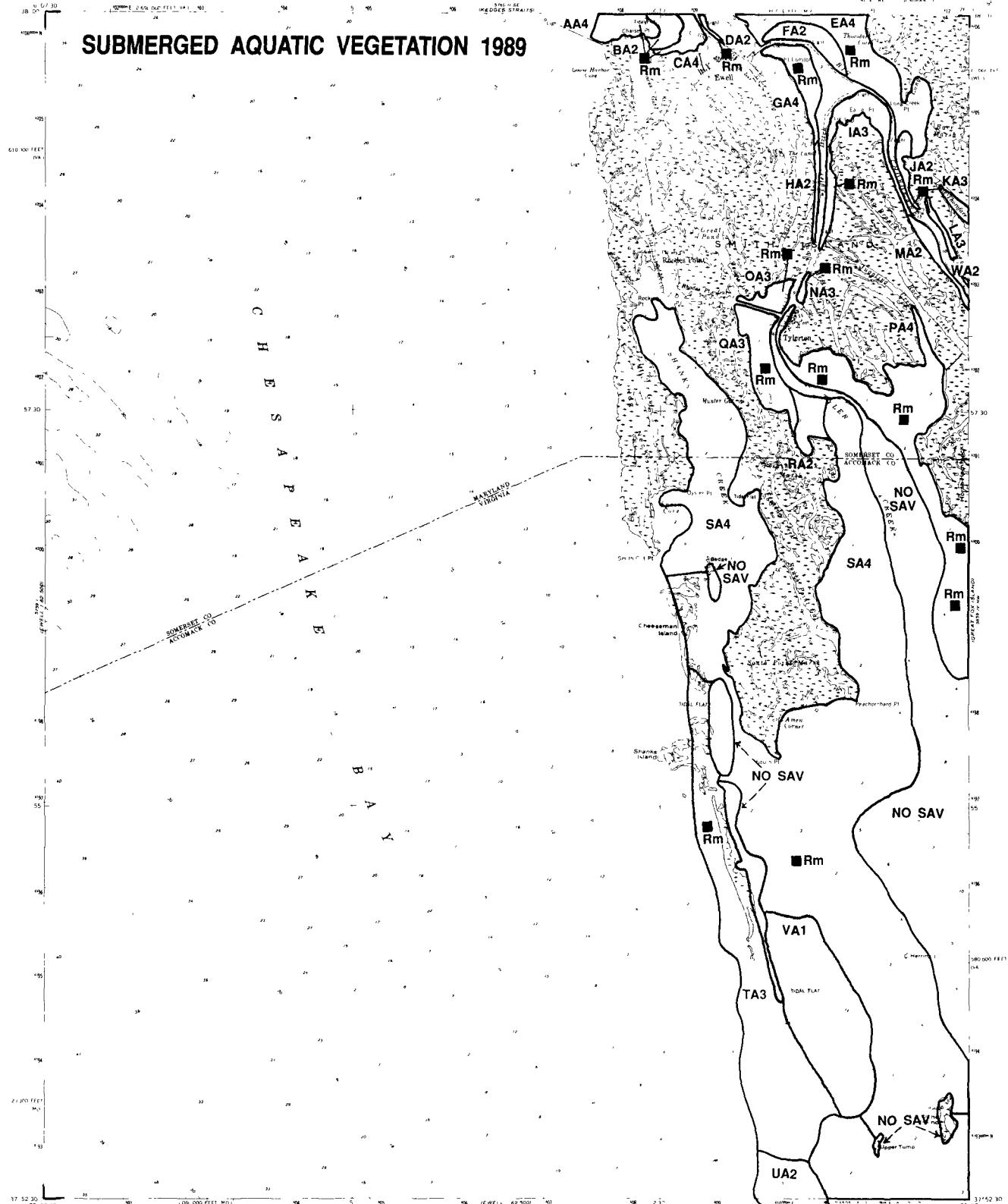
09

SCALE 1:240

**EXERCISES** **SKETCHED**

1 MILE  
VIRGINIA INSTITUTE  
OF MARINE SCIENCE

# SUBMERGED AQUATIC VEGETATION 1989



## SPECIES

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

## SURVEY STATIONS

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

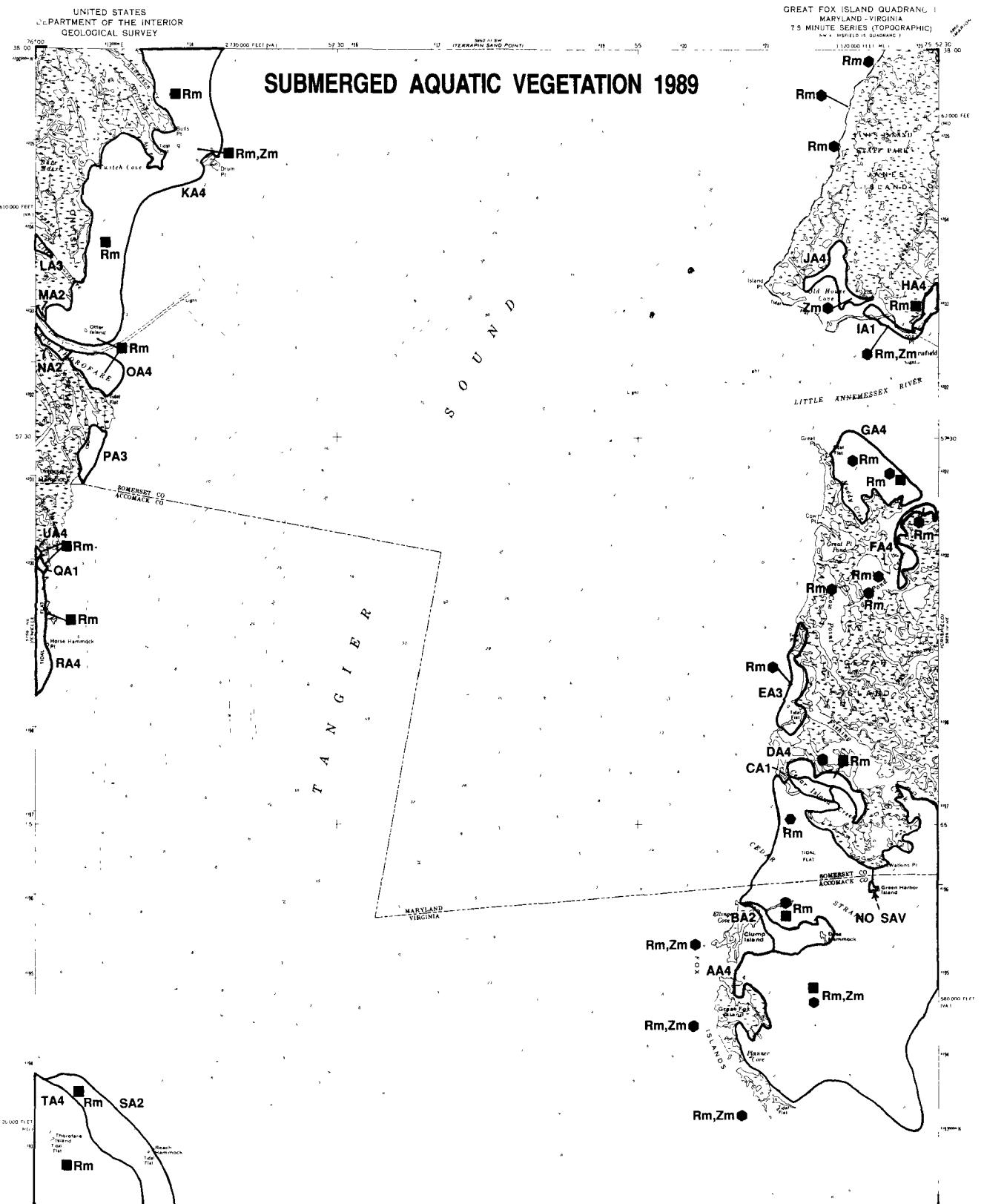
DATE FLOWN  
6-19-89  
**EWELL,  
MD-VA  
099**

AMERICAN MAP SERIES 1984

SCALE 1:24,000

1 MILE  
1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



#### SPECIES

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

Hv	<i>Hydrilla verticillata</i> (hydrilla)
Hd	<i>Heteranthera dubia</i> (water stargrass)
Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (southern naad)
Ngr	<i>Najas gracilima</i> (naad)
C	<i>Chara</i> sp. (muskglass)
Nm	<i>Najas minor</i> (slender naad)

#### SURVEY STATIONS

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

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

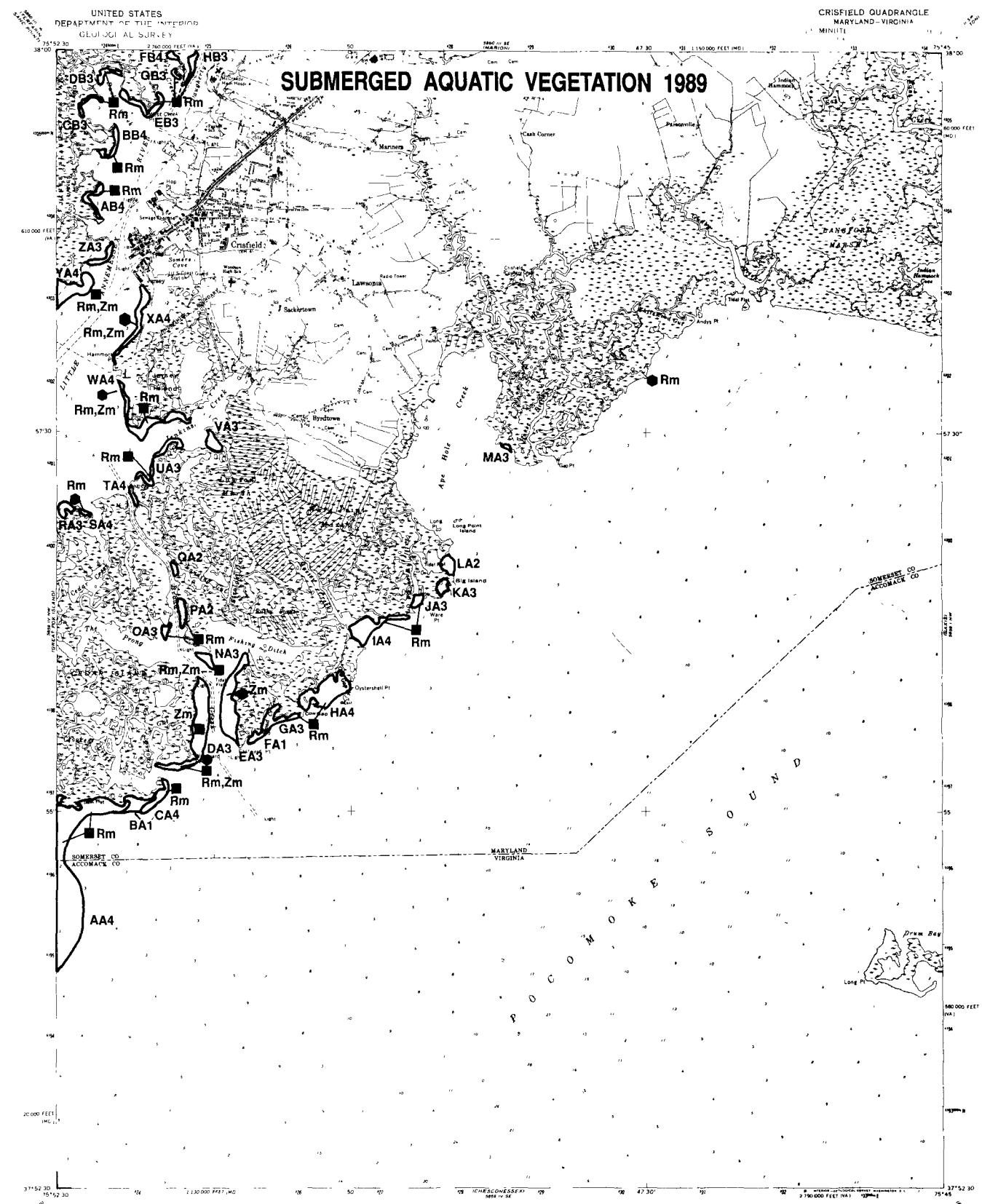
**GREAT FOX  
ISLAND, MD-VA**  
100

SCALE 1:24,000

1 MILE

1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



#### SPECIES

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

Hv	<i>Hydrilla verticillata</i> (hydrilla)
Hd	<i>Heironaeris dubia</i> (water stargrass)
Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (southern naiad)
Ngr	<i>Najas gracilima</i> (naiad)
C	<i>Chara sp.</i> (muskgrass)
Nm	<i>Najas minor</i> (slender naiad)

#### SURVEY STATIONS

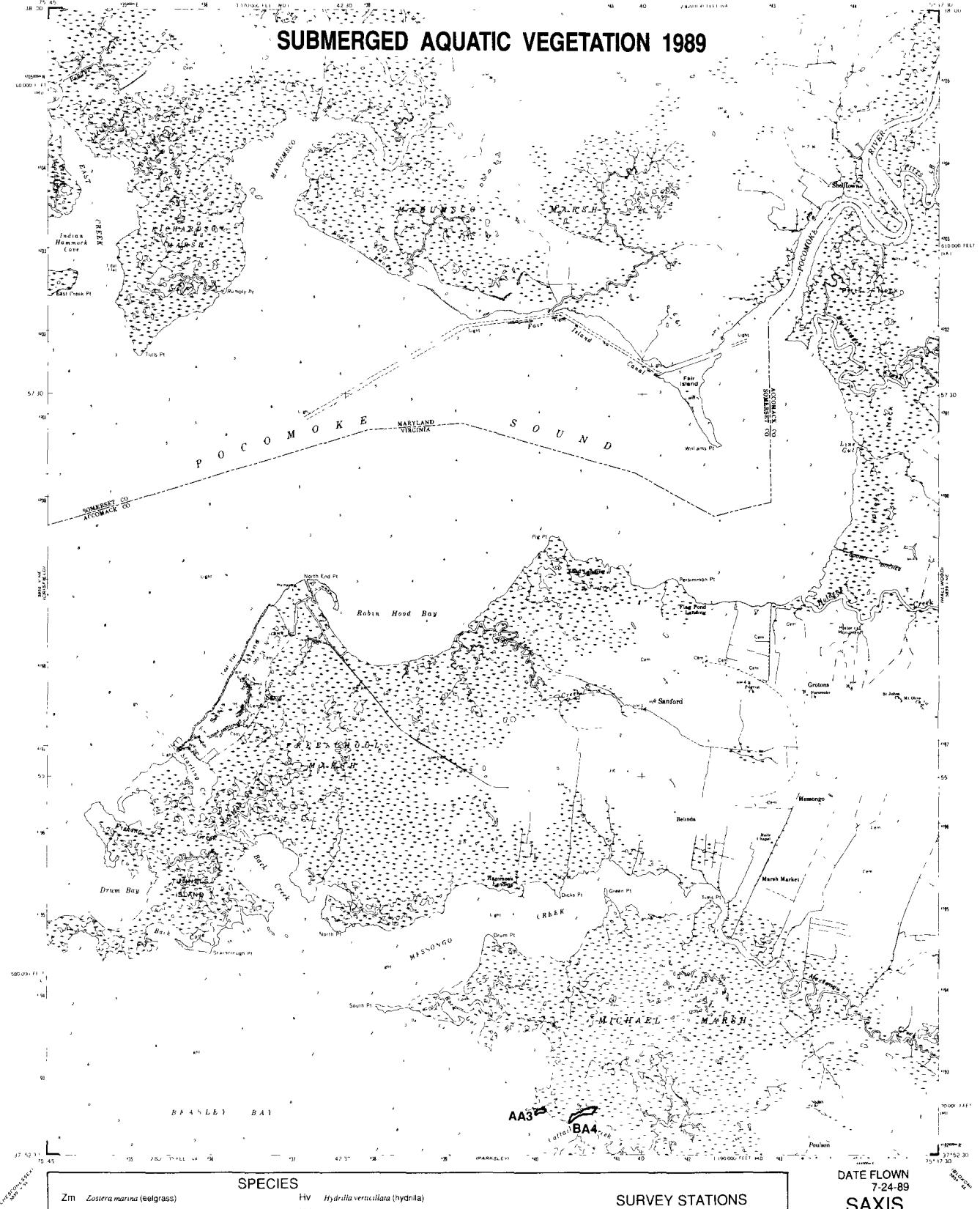
- MD Charter Boat Field Survey
- Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

CRISFIELD,  
MD-VA  
101

AMS 3504 IV NE-SERIES 1933

SCALE 1:24 000

5 0 1 MILE  
1 5 0 1 KILOMETER

**SPECIES**

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

Hv	<i>Hydrilla verticillata</i> (hydrilla)
Hd	<i>Herionthemus dubius</i> (water stargrass)
Pct	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (southern naiad)
Ngr	<i>Najas gracillima</i> (naiad)
C	<i>Chara sp.</i> (muskglass)
Nm	<i>Najas minor</i> (slender naiad)

**SURVEY STATIONS**

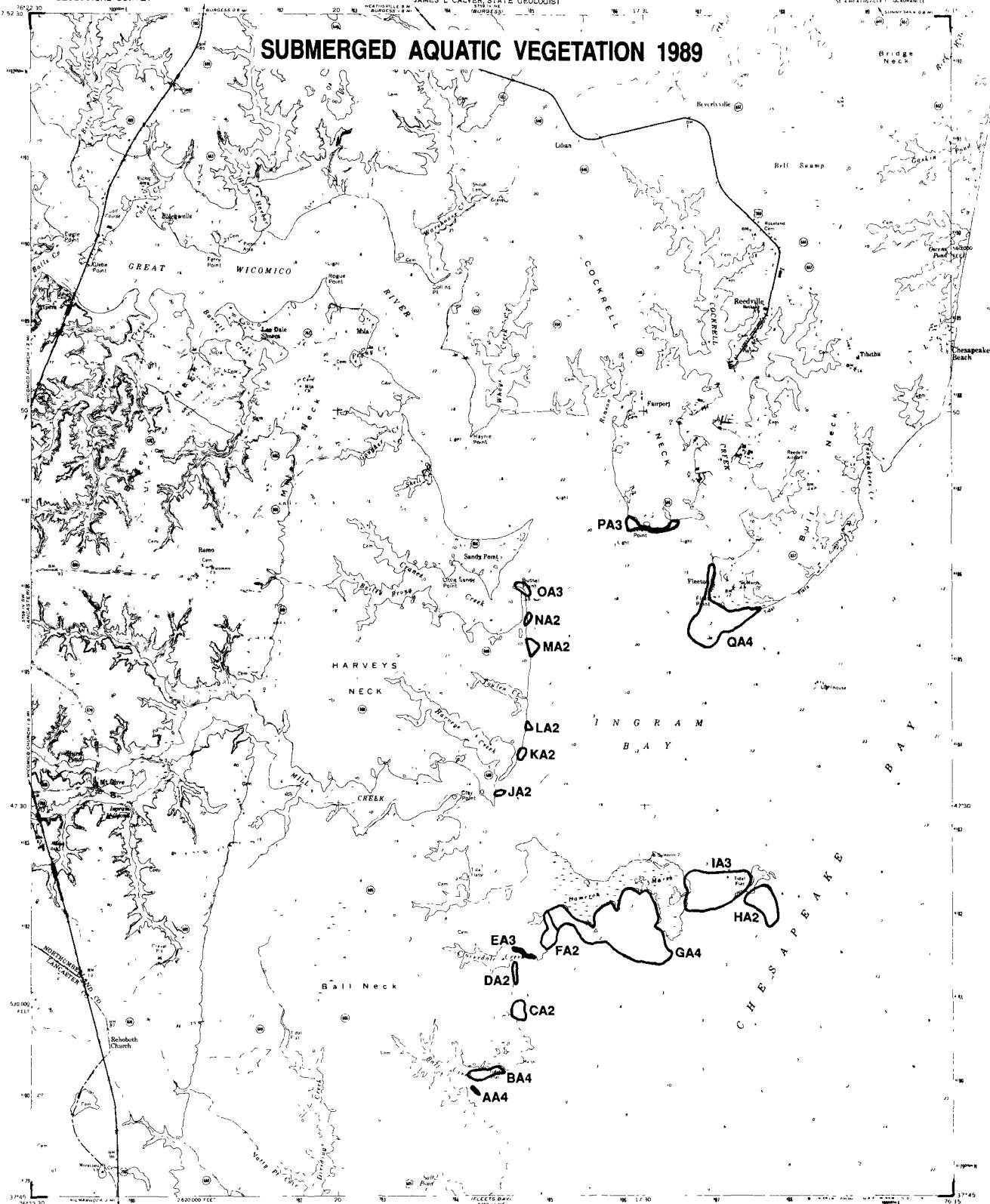
- MD Charter Boat Field Survey
- Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

DATE FLOWN  
7-24-89SAXIS,  
VA-MD  
102

1968

AMS 5841 1:250,000

SCALE 1:24,000  
1 MILE  
5 KILOMETERVIRGINIA INSTITUTE  
OF MARINE SCIENCE



SPECIES

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

SURVEY STATIONS

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

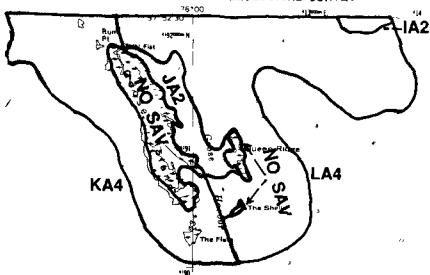
DATE FLOWN  
6-30-89  
**REEDVILLE,  
VA  
106**

AMS 5748 IV SE-SERIES V834

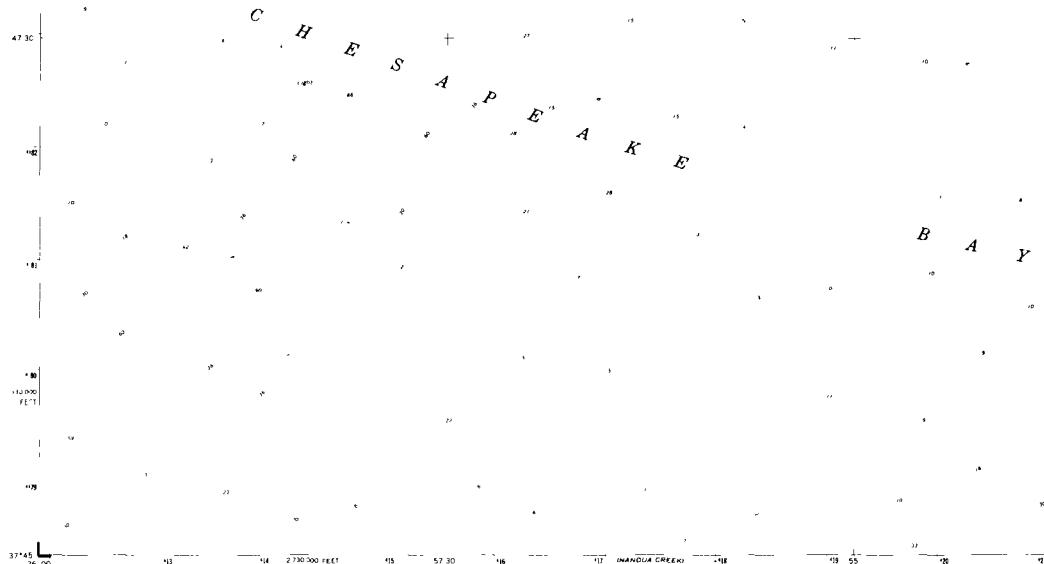
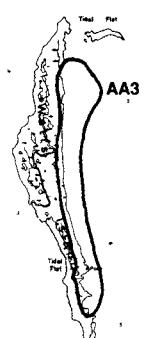
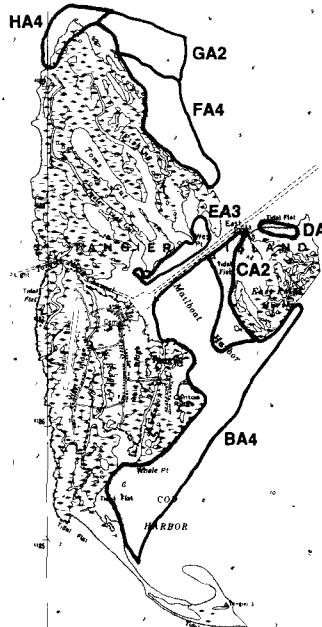
SCALE 1:24 000

1 MILE  
1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



## SUBMERGED AQUATIC VEGETATION 1989



SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	Hv	Hydrilla verticillata (hydrilla)
Rm	<i>Ruppia maritima</i> (widgeon grass)	Hd	<i>Heteranthera dubia</i> (water stargrass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)	Ngu	<i>Najas guadalupensis</i> (southern naiad)
N	<i>Najas</i> spp. (naiad)	Ngr	<i>Najas gracilima</i> (naad)
Ec	<i>Eelodea canadensis</i> (common elodea)	C	<i>Chara</i> sp. (muskgrass)
Va	<i>Vallisneria americana</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapa natans</i> (water chestnut)		
U	Unknown species composition		

DATE FLOWN

6-19-89

TANGIER ISLAND,

VA

107

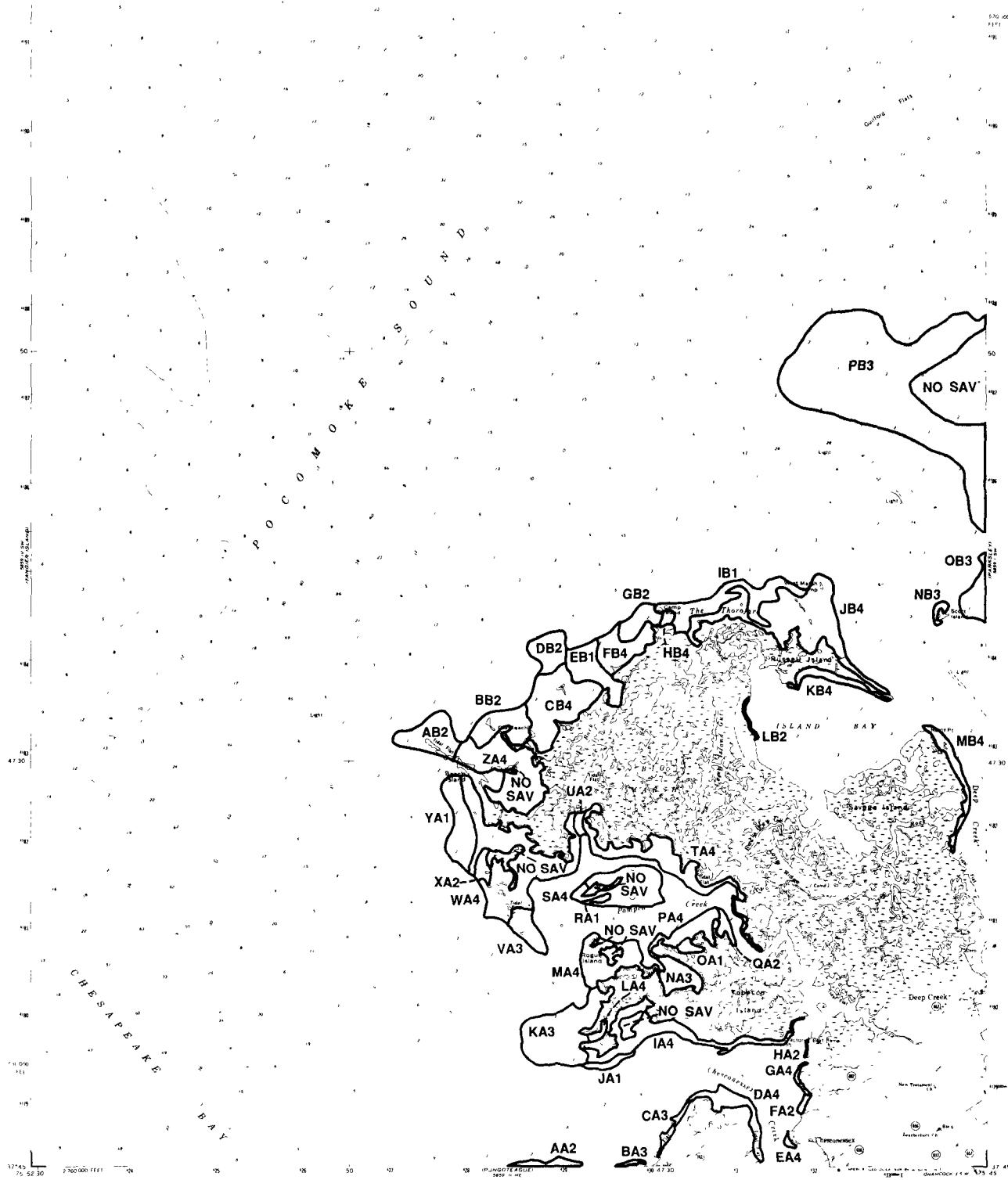
AMS 3859 IV SW - SERIES V84A

SCALE 1:24,000

1 MILE  
1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE

## SUBMERGED AQUATIC VEGETATION 1989



SPECIES	
Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppl	<i>Potamogeton perfoliatus</i> (redhead-grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas</i> spp. (naiad)
Ec	<i>Eelodea canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Tropea natans</i> (water chestnut)
U	Unknown species composition

SPECIES	
Hv	<i>Hydrilla verticillata</i> (hydrilla)
Hd	<i>Heteranthera dubia</i> (water stargrass)
Pcr	<i>Potamogeton crispus</i> (cutleaf pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (southern naiad)
Ngr	<i>Najas gracillima</i> (naiad)
C	<i>Chara</i> sp. (muskglass)
Nm	<i>Najas minor</i> (slender naiad)

### SURVEY STATIONS

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

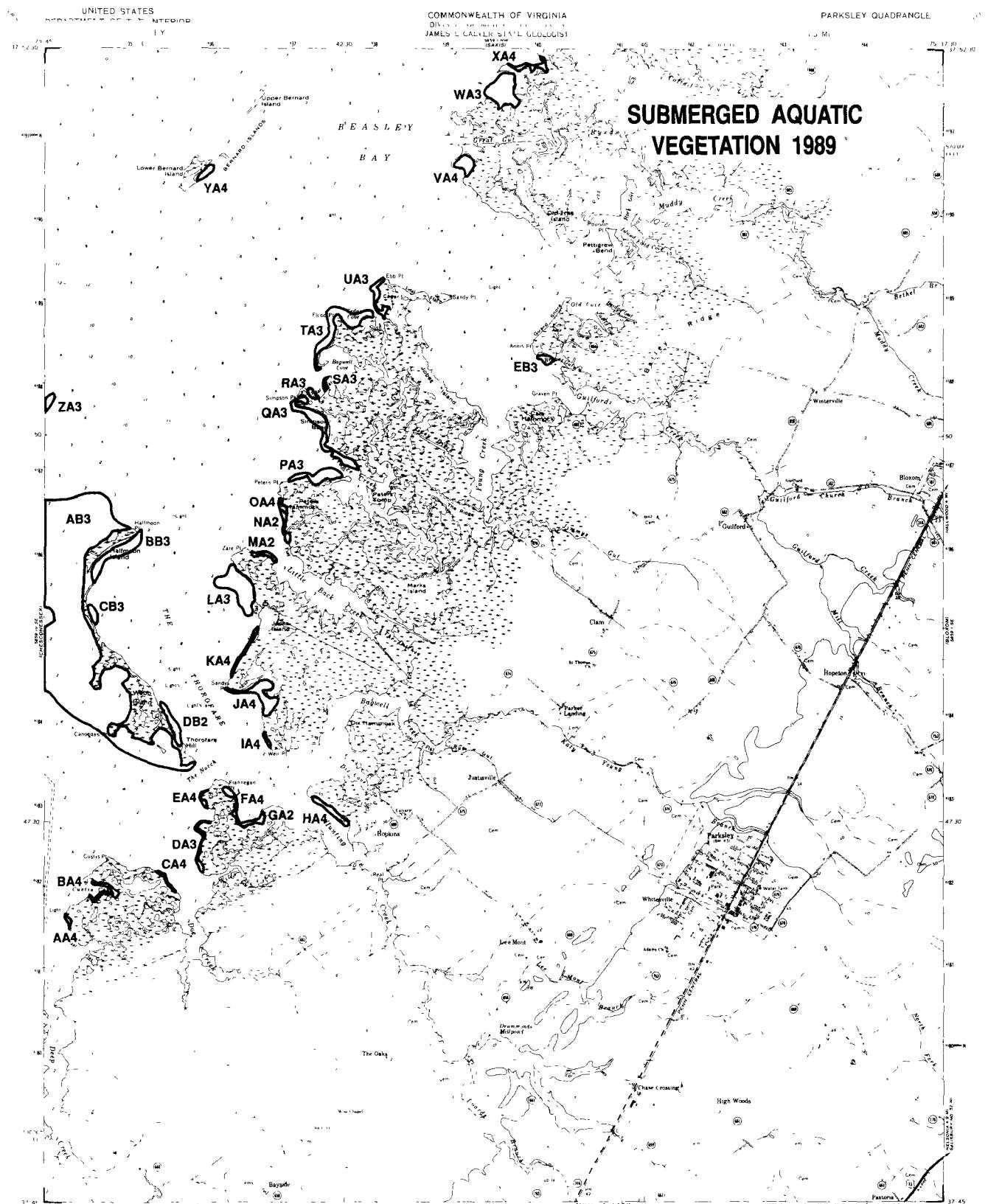
DATES FLOWN  
7-1-89  
7-24-89

CHESCONESSEX,  
VA  
108

SCALE 1:24,000

1 MILE  
1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	Hv	Hydrilla verticillata (hydrilla)
Rm	<i>Ruppia maritima</i> (widgeon grass)	Hd	<i>Heranthera dubia</i> (water stargrass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Ppl	<i>Potamogeton perfoliatus</i> (redhead grass)	Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)	Ngu	<i>Najas guadalupensis</i> (southern naiad)
N	<i>Najas spp.</i> (naiad)	Ngr	<i>Najas gracilima</i> (naiad)
Ec	<i>Elodea canadensis</i> (common elodea)	C	<i>Chara sp.</i> (muskglass)
Va	<i>Vallisneria americana</i> (widg celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapa natans</i> (water chestnut)		
U	Unknown species composition		

DATE FLOWN

7-24-89

PARKSLEY,

VA

109

AM-S8501 SW SERIES V34

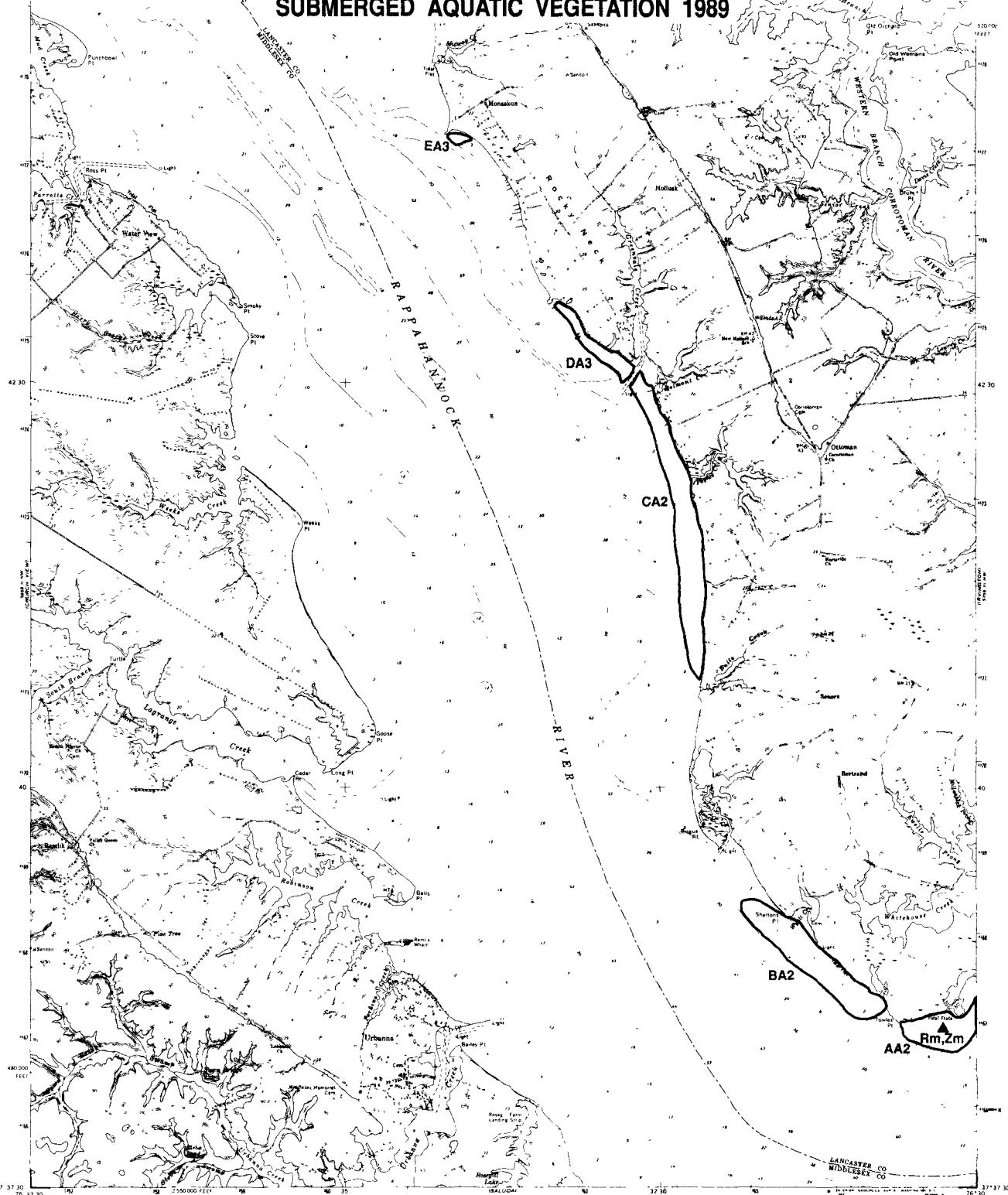
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1 MILE

1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE

# **SUBMERGED AQUATIC VEGETATION 1989**



		SPECIES
Zm	<i>Zostera marina</i> (eelgrass)	Hv <i>Hydrilla verticillata</i> (hydrilla)
Rm	<i>Ruppia maritima</i> (wedge grass)	Hd <i>Heisanthera dubia</i> (water stargrass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr <i>Potamogeton crispus</i> (curly pondweed)
Ppl	<i>Potamogeton perfoliatus</i> (redhead-grass)	Cd <i>Ceratophyllum demersum</i> (coontail)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	Ppu <i>Potamogeton pusillus</i> (slender pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)	Ngu <i>Najas guadalupensis</i> (southern naiad)
N	<i>Najas</i> spp. (naiad)	Ngr <i>Najas gracilissima</i> (naiad)
Ec	<i>Ectoedemia canadensis</i> (common elodea)	C <i>Chara</i> sp. (muskglass)
Va	<i>Vallisneria americana</i> (widder's eye)	Nm <i>Najas minor</i> (slender naiad)
Tn	<i>Trochus natalensis</i> (water chestnut)	
U	Unknown species composition	

## SURVEY STATIONS

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

DATE FLOWN

6-30-89

VA

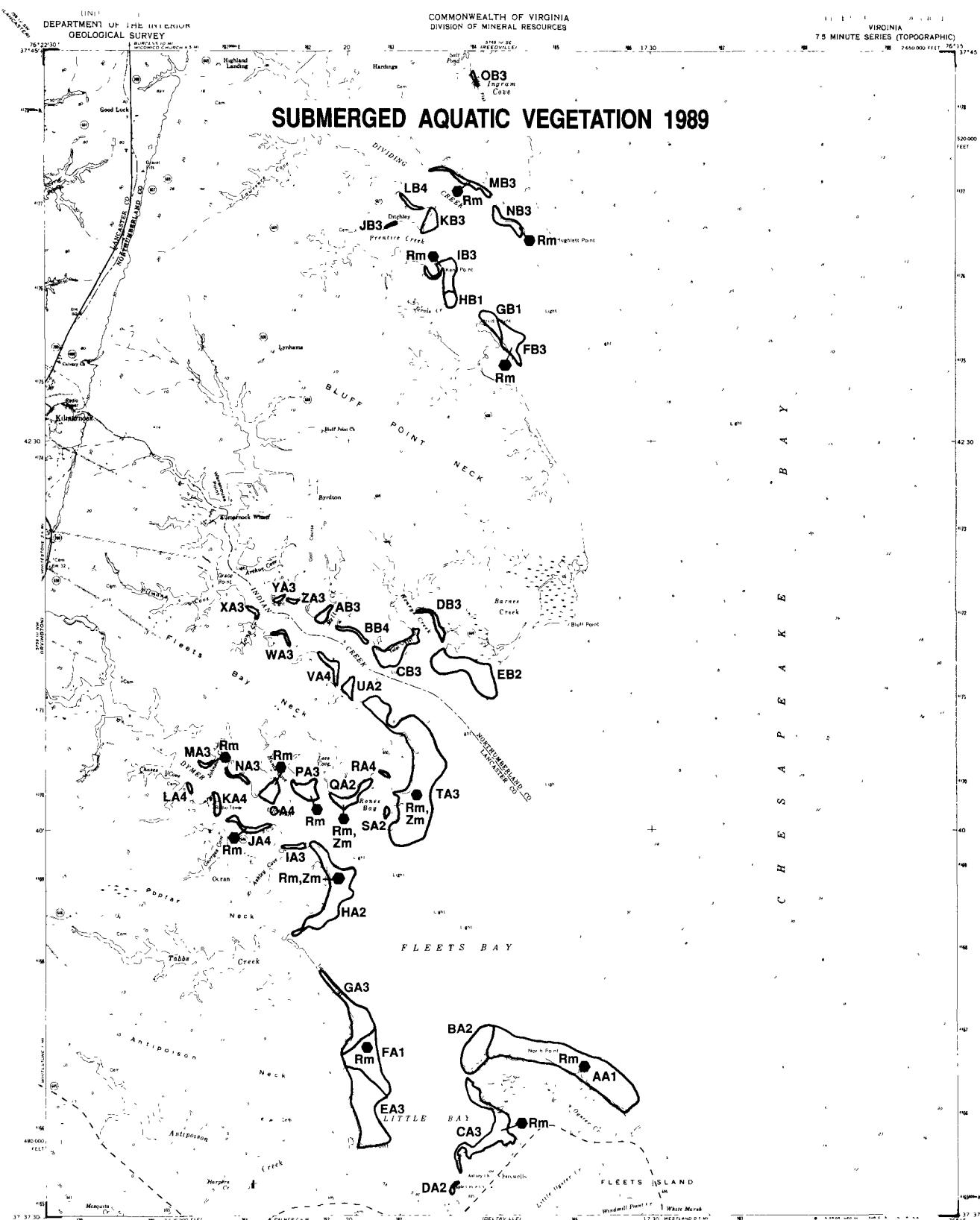
110

1968

AMS 3459 LINE SERIES V834

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OF MARINE SCIENCE





#### 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	Eloetea canadensis (common elodea)
Va	Vallisneria americana (wild celery)
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

DATE FLOWN  
6-30-89

FLEETS BAY,  
VA

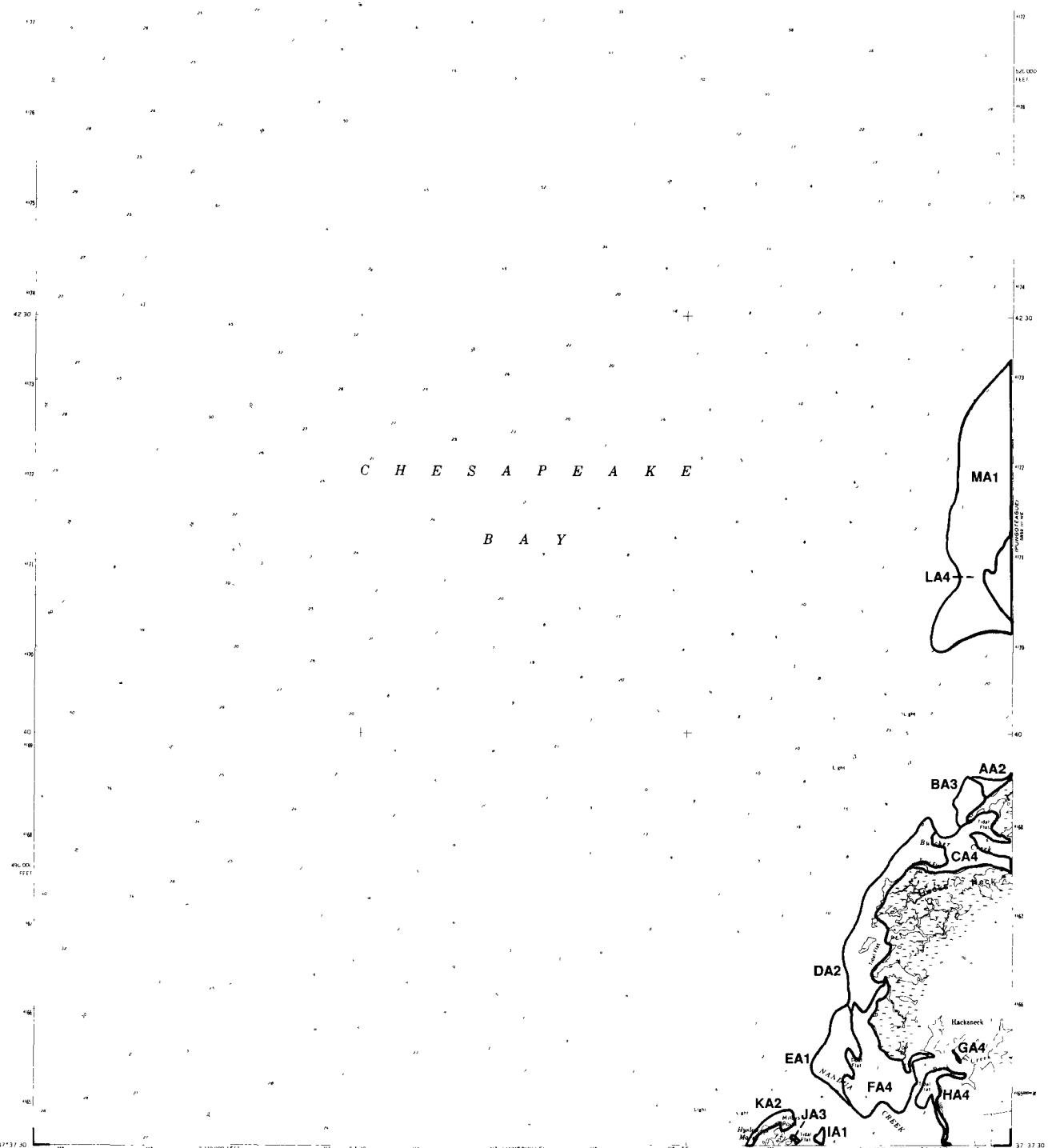
112

PHOTOGRAPHED 1989  
DN-5298 III RE-SERIES 984

SCALE 1:24,000  
1 MILE  
1 KILOMETER

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OF MARINE SCIENCE

## SUBMERGED AQUATIC VEGETATION 1989



### SPECIES

Zm	<i>Zostera marina</i> (eelgrass)	Hv	<i>Hydrilla verticillata</i> (hydrilla)
Rm	<i>Ruppia maritima</i> (widgeon grass)	Hd	<i>Heteranthera dubia</i> (water stargrass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Ppf	<i>Potamogeton perfoliatus</i> (redhead grass)	Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)	Ngu	<i>Najas guadalupensis</i> (southern naiad)
N	<i>Najas spp.</i> (naiad)	Ngr	<i>Najas gracillima</i> (naiad)
Ec	<i>Elderia canadensis</i> (common elodea)	C	<i>Chara sp.</i> (muskglass)
Va	<i>Valisneria americana</i> (wild celery)	Nm	<i>Najas m. nor</i> (slender naiad)
Tn	<i>Trapa natans</i> (water chestnut)		
U	Unknown species composition		

### SURVEY STATIONS

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

DATE FLOWN  
7-24-89

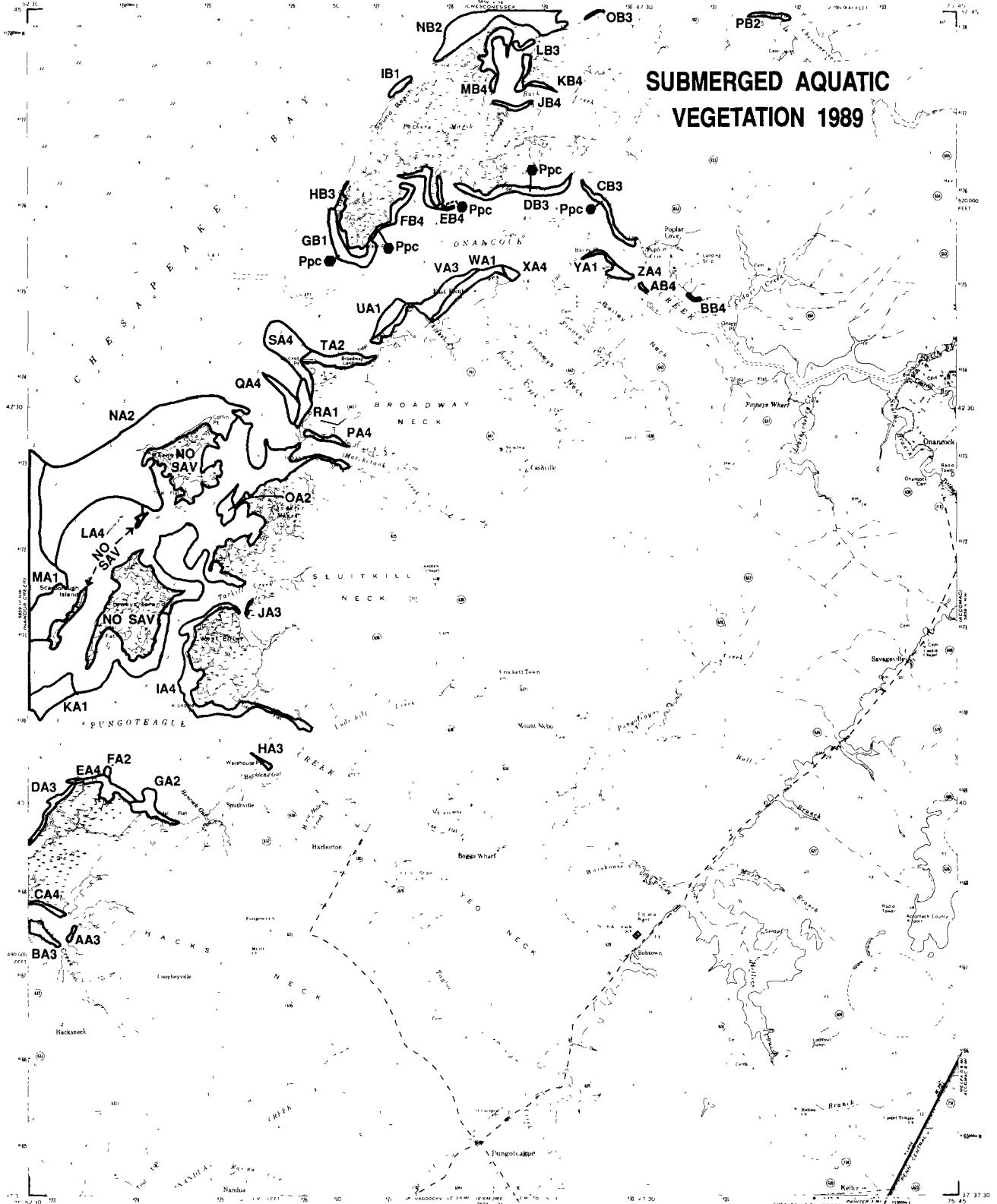
NANDUA  
CREEK, VA  
113

1968

AMS 529 U NW SERIES VB34

SCALE 1:24 000  
1 MILE  
1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



SPECIES

Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppf	<i>Potamogeton perfoliatus</i> (redhead grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas spp.</i> (naiad)
Ec	<i>Ectoda canadensis</i> (common eelgrass)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
U	Unknown species composition
Hv	<i>Hydrilla verticillata</i> (hydrilla)
Hd	<i>Heteranthera dubia</i> (water stargrass)
Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (southern naiad)
Ngr	<i>Najas gracilima</i> (naiad)
C	<i>Chara sp.</i> (muskglass)
Nm	<i>Najas minor</i> (slender naiad)

SURVEY STATIONS

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

DATE FLOWN  
7-24-89

PUNGOTEAGUE,

VA

114

AMG 5859 1:250,000 SER. 8324

SCALE 1:24,000

1 MILE  
1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE

## SUBMERGED AQUATIC VEGETATION 1989



### SPECIES

Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Micropeltis spirata</i> (Eurasian watermilfoil)
Ppf	<i>Potamogeton perfoliatus</i> (redhead grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas</i> spp. (naid)
Ec	<i>Elodea canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
U	Unknown species composition
Hv	<i>Hydrilla verticillata</i> (hydrilla)
Hd	<i>Heisanthera dubia</i> (water stargrass)
Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (southern naiad)
Ngr	<i>Najas gracillima</i> (naid)
C	<i>Chara</i> sp. (muskgrass)
Nm	<i>Najas minor</i> (slender naiad)

### SURVEY STATIONS

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

DATE FLOWN

6-30-89

SALUDA,

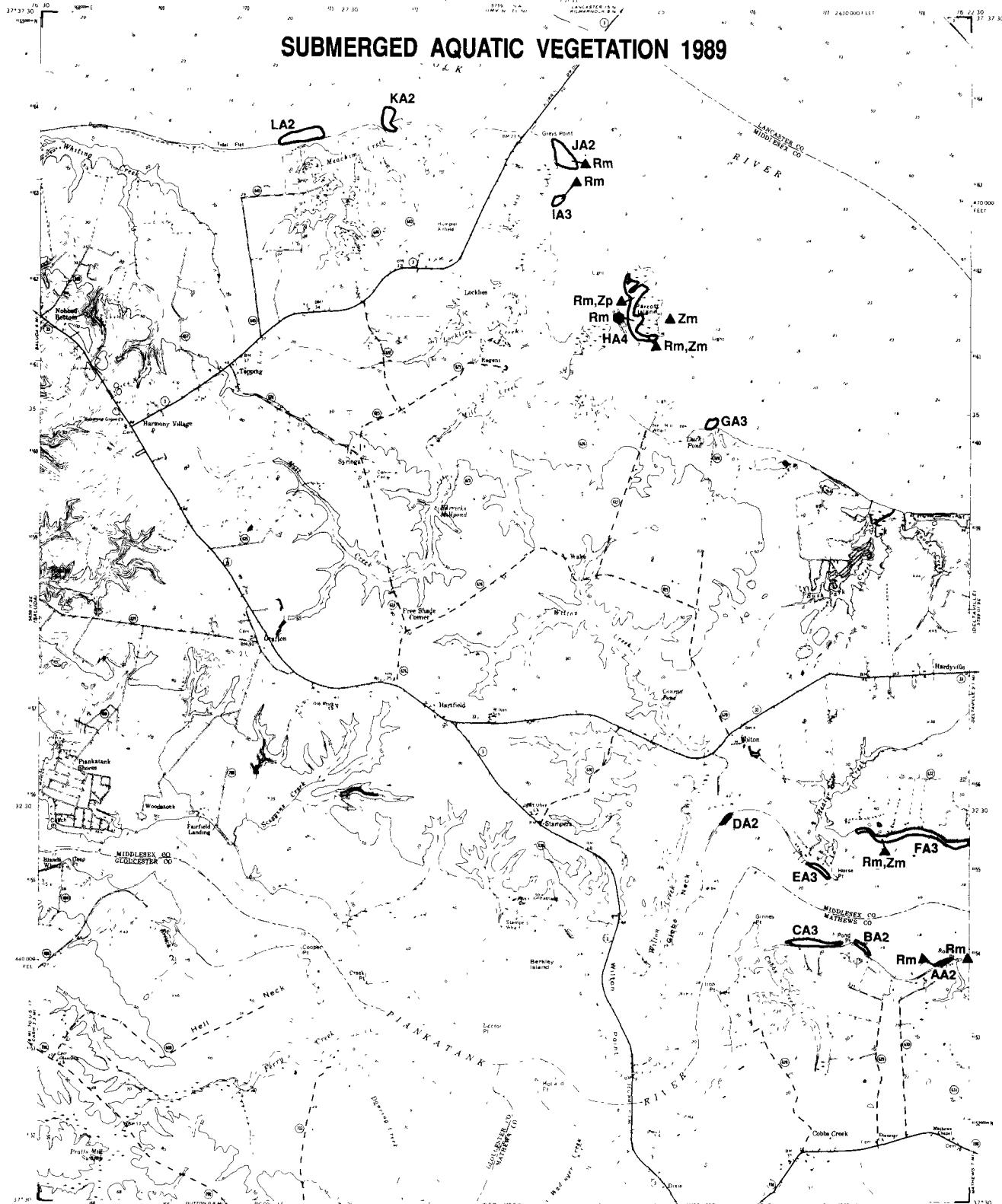
VA

116

NO. 116

SCALE 1:24,000

1 MILE  
1 KILOMETER



SPECIES

- Zm *Zostera marina* (eelgrass)
- Rm *Ruppia maritima* (wedgeon grass)
- Ms *Mystrophyllum speciatum* (Eurasian watermilfoil)
- Ppl *Potamogeton perfoliatus* (redhead grass)
- Ppc *Potamogeton pectinatus* (sago pondweed)
- Zp *Zannichellia palustris* (horned pondweed)
- Zp *Zannichellia palustris* (horned pondweed)
- N *Najas spp.* (naiaid)
- Ec *Ectoda canadensis* (common elodea)
- Va *Vallisneria americana* (wild celery)
- Tn *Trapa natans* (water chestnut)
- U Unknown species composition

- Hv *Hydroila verticillata* (hydnilla)
- Hd *Heteranthera dubia* (water stargrass)
- Pcr *Potamogeton crispus* (curly pondweed)
- Cd *Ceratophyllum demersum* (coontail)
- Ppu *Potamogeton pusillus* (slender pondweed)
- Ngu *Najas guadalupensis* (southern naiaid)
- Ngr *Najas gracilima* (naiaid)
- C *Chara sp.* (muskglass)
- Nm *Najas minor* (slender naiaid)

SURVEY STATIONS

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

DATE FLOWN

6-30-89

WILTON,

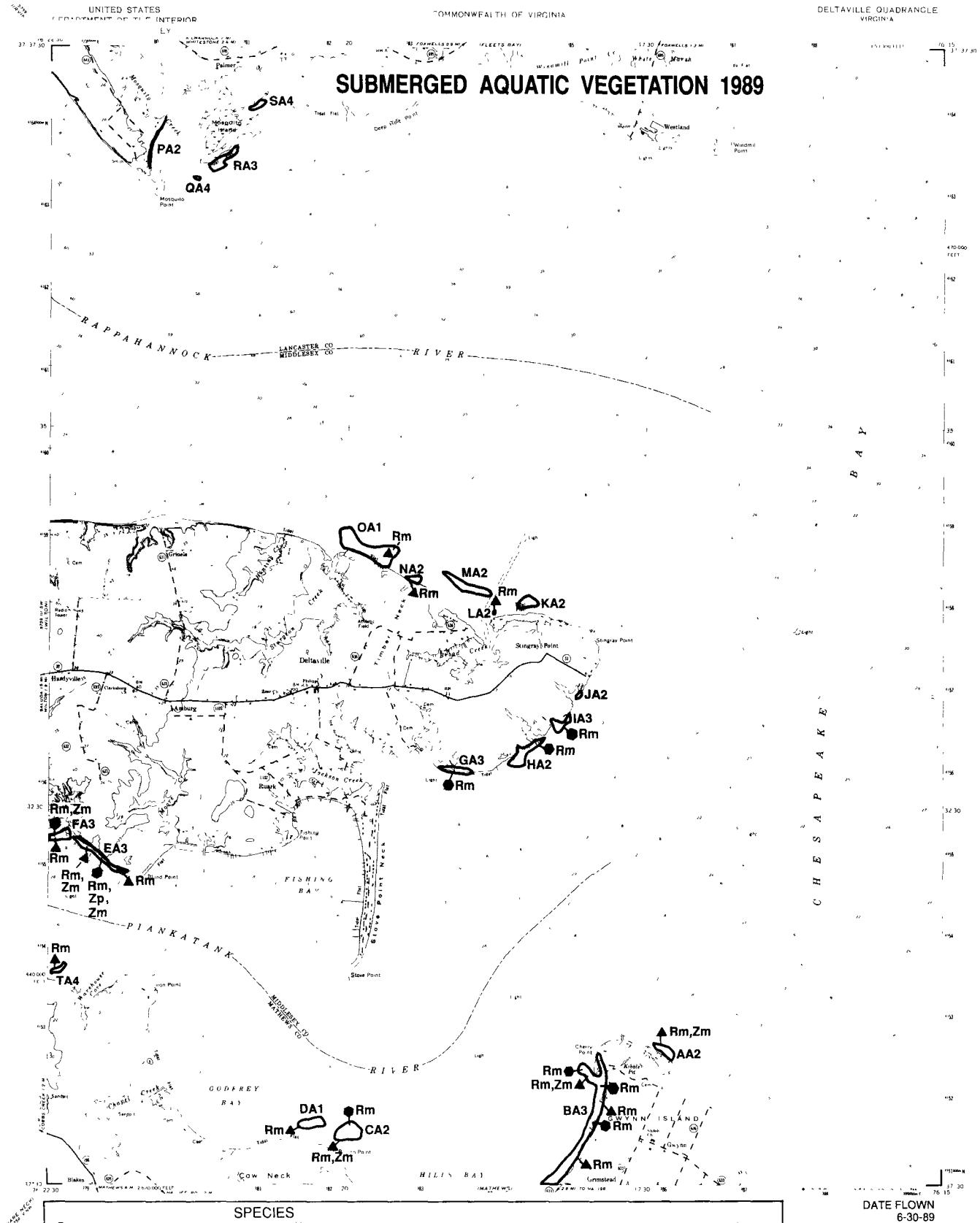
VA

117

1964  
PHOTOREVISED 1973  
AMS 5759 III SW SERIES V834

SCALE 1:24 000  
1 5 0  
KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



SPECIES

Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia marina</i> (widgen grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas</i> spp. (naad)
Ec	<i>Elderia canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Troapa natans</i> (water chestnut)
U	Unknown species composition

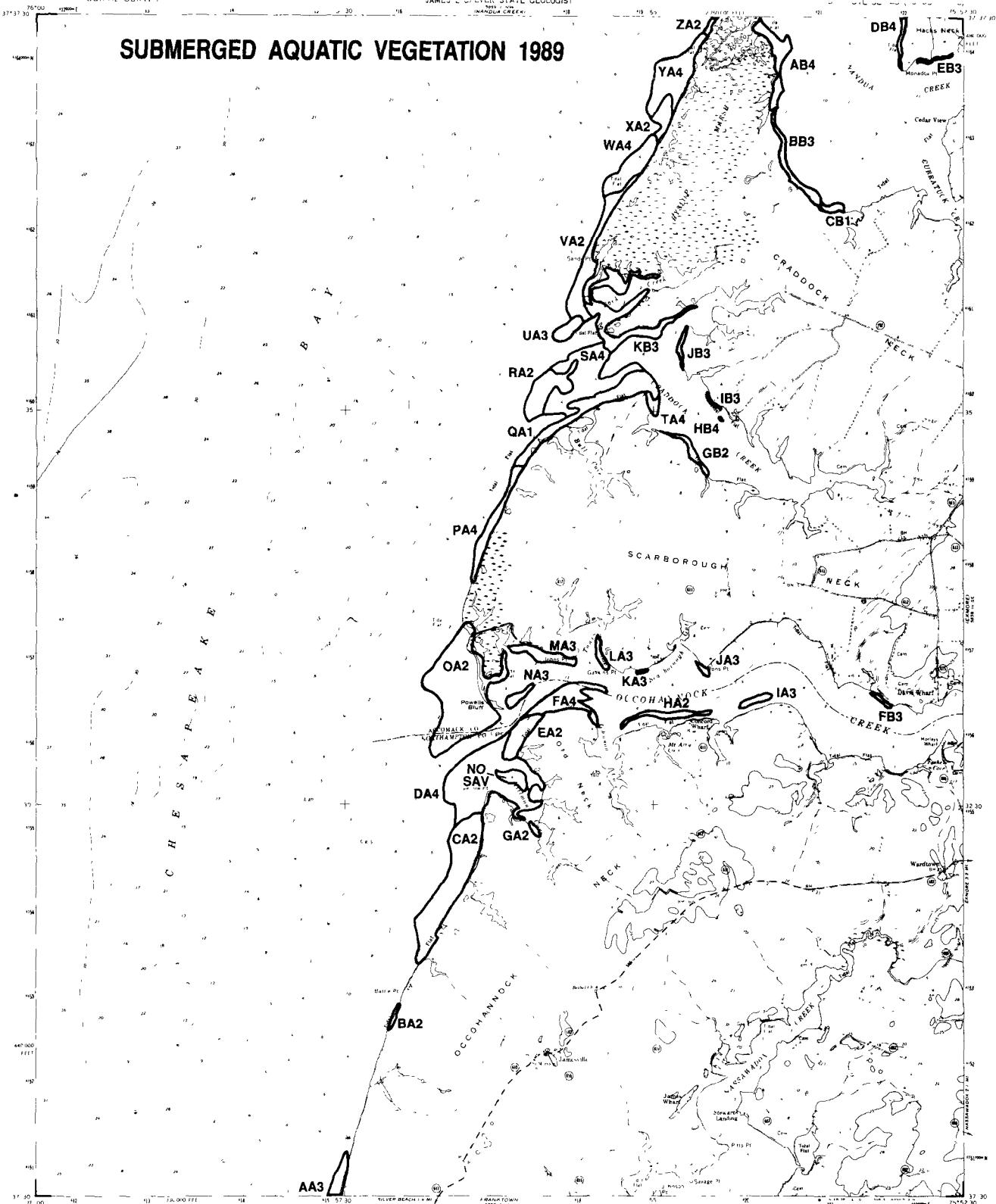
SURVEY STATIONS

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

SCALE 1:24,000

1 MILE  
1 KILOMETER

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OF MARINE SCIENCE



SPECIES

Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppl	<i>Potamogeton perfoliatus</i> (redhead-grass)
Poc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas</i> spp. (naiad)
Ec	<i>Elatia canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
U	Unknown species composition

SURVEY STATIONS

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

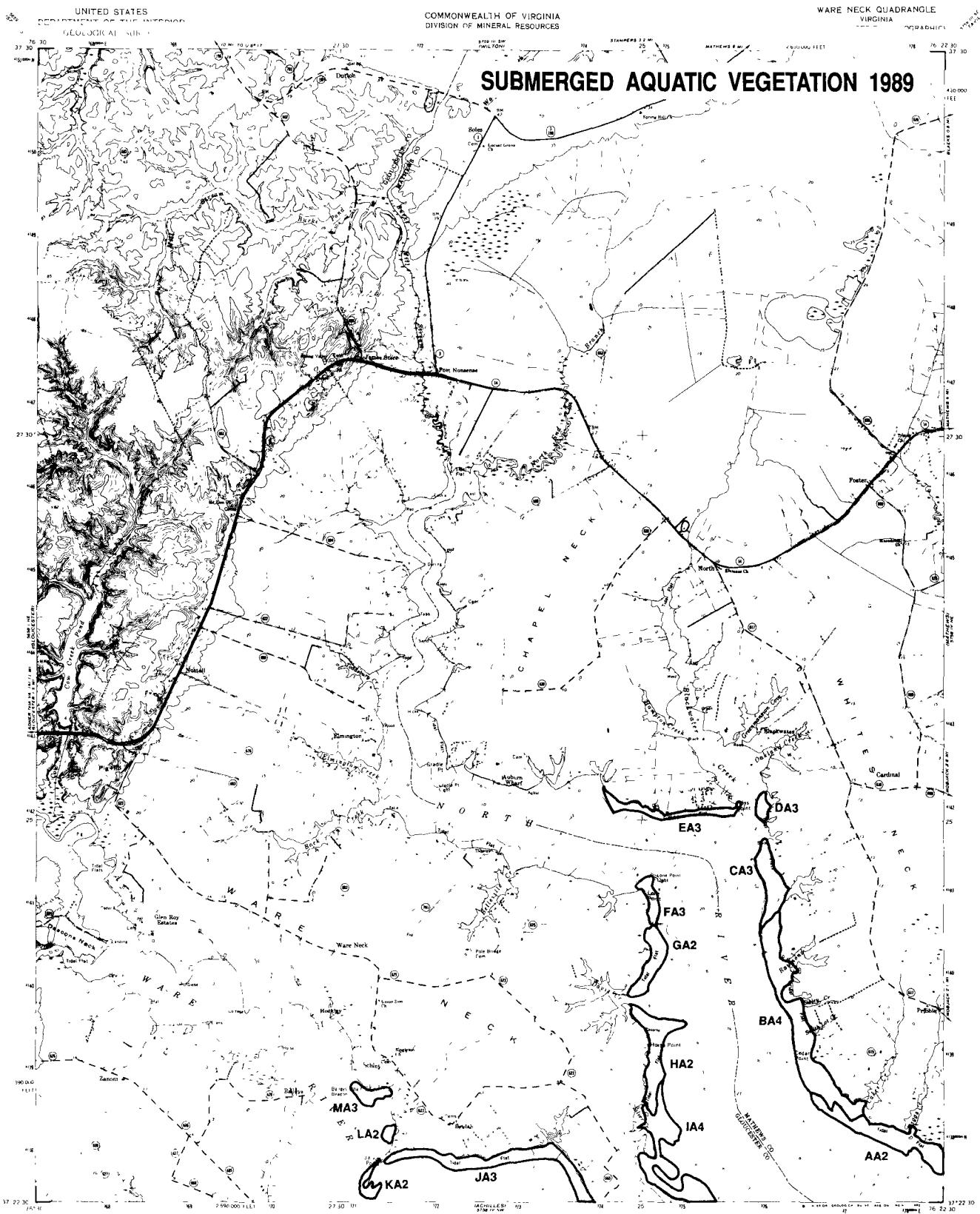
DATES FLOWN  
6-12-89  
7-24-89

JAMESVILLE,  
VA  
119

SCALE 1:24,000

1 5 0 MILE  
1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



**SPECIES**

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

7-1-89

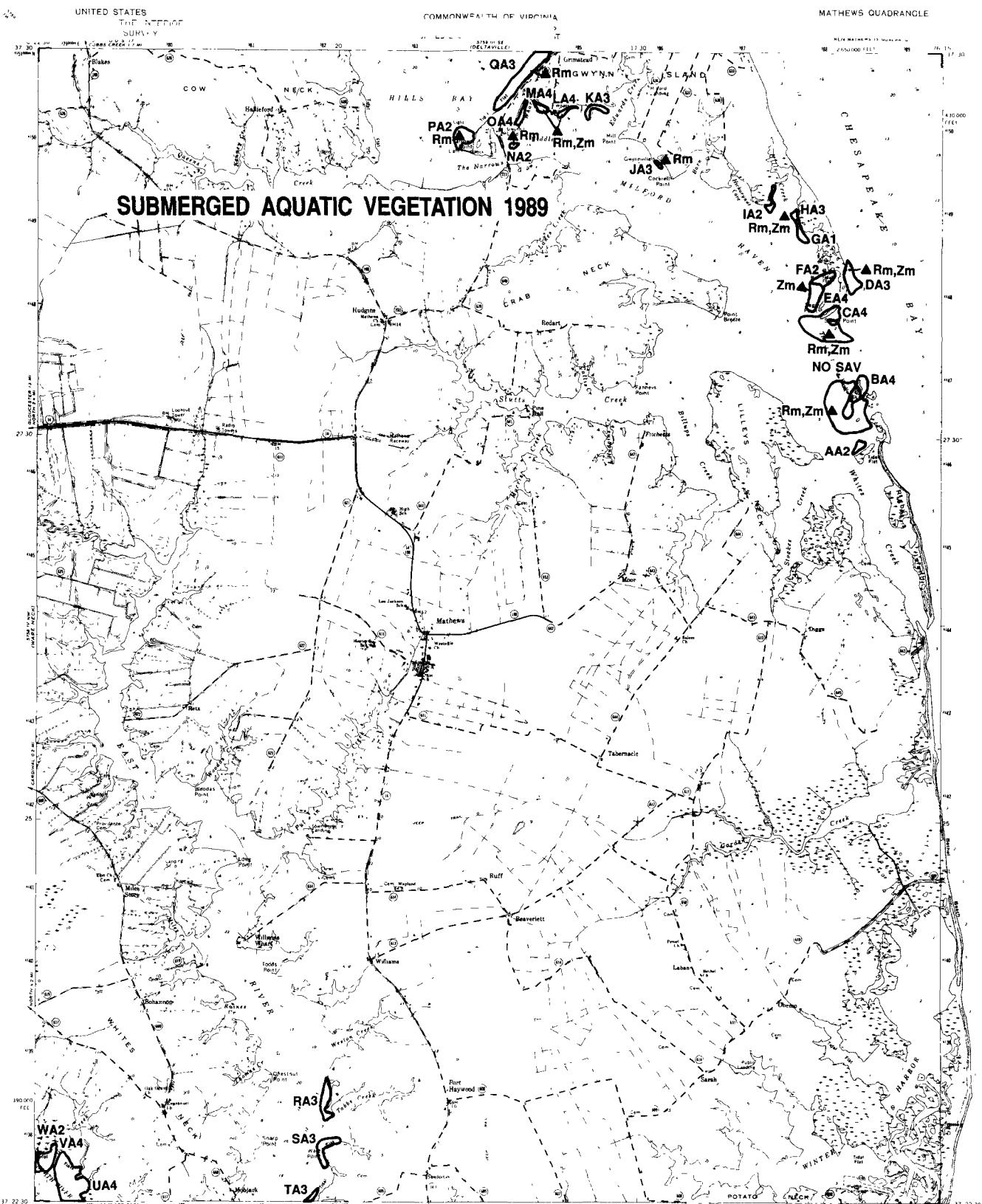
WARE NECK,

VA

122

PHOTOREVISED 1980

DMA 575 IV NW-SERIES V83



#### SPECIES

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

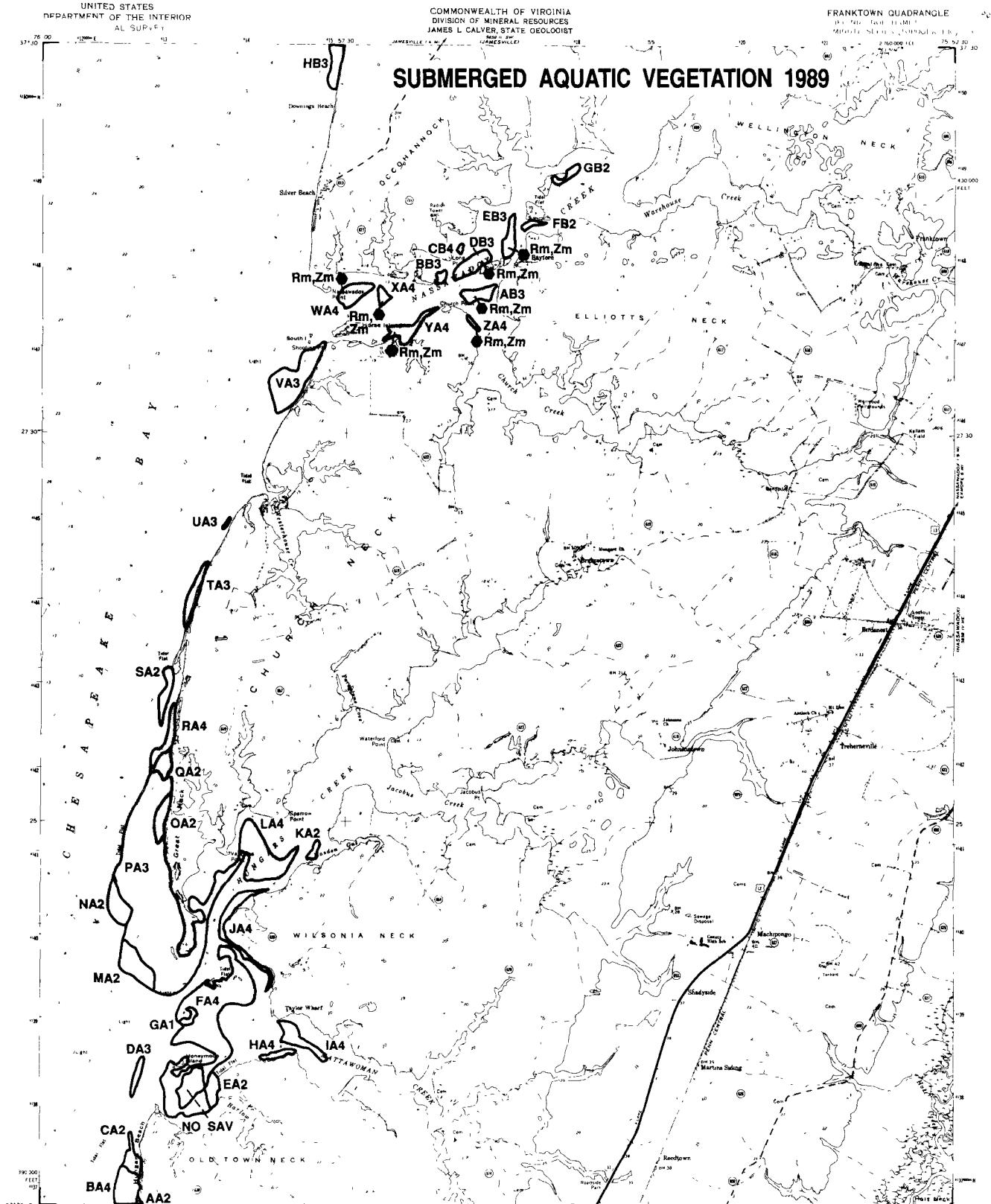
#### SURVEY STATIONS

- 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		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	Hv	Hydrilla verticillata (hydrilla)
Rm	<i>Ruppia maritima</i> (widgeon grass)	Hd	<i>Heteranthera dubia</i> (water stargrass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)	Ngu	<i>Najas guadalupensis</i> (southern naiad)
N	<i>Najas spp.</i> (naiad)	Ngr	<i>Najas gracilima</i> (naiad)
Ec	<i>Ectoda canadensis</i> (common elodea)	C	<i>Chara sp.</i> (muskglass)
Va	<i>Vallisneria americana</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapa natans</i> (water chestnut)		
U	Unknown species composition		

DATE FLOWN  
6-12-89

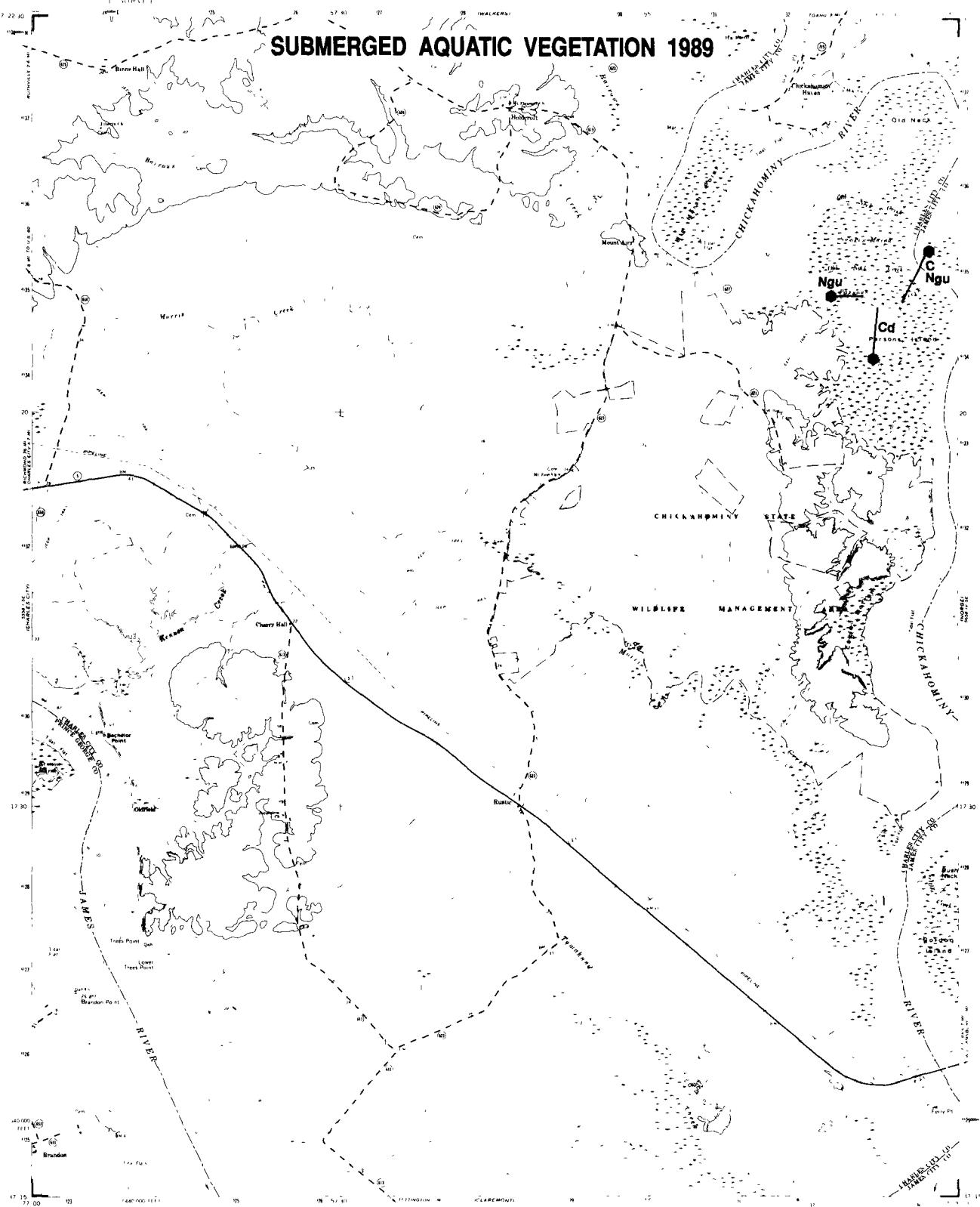
FRANKTOWN,  
VA

124

AMS 5858 IV NW SERIES V33

SCALE 1:24,000

## 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	Elderia canadensis (common elodes)
Va	Vallisneria americana (widg 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. (muskglass)
Nm	Najas minor (slender naiad)

## SURVEY STATIONS

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

DATE FLOWN  
7-1-89BRANDON,  
VA  
127

PHOTOREVISED 1980



SPECIES

Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppl	<i>Potamogeton perfoliatus</i> (redhead-grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas</i> spp. (naid)
Ec	<i>Elatoda canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Troapa natans</i> (water chestnut)
U	Unknown species composition

Hv	<i>Hydrilla verticillata</i> (hydrilla)
Hd	<i>Heteranthera dubia</i> (water stargrass)
Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (southern naiad)
Ngr	<i>Najas gracilima</i> (naid)
C	<i>Chara</i> sp. (muskglass)
Nm	<i>Najas minor</i> (slender naiad)

SURVEY STATIONS

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

DATE FLOWN  
7-1-89

CLAY BANK

VA

130

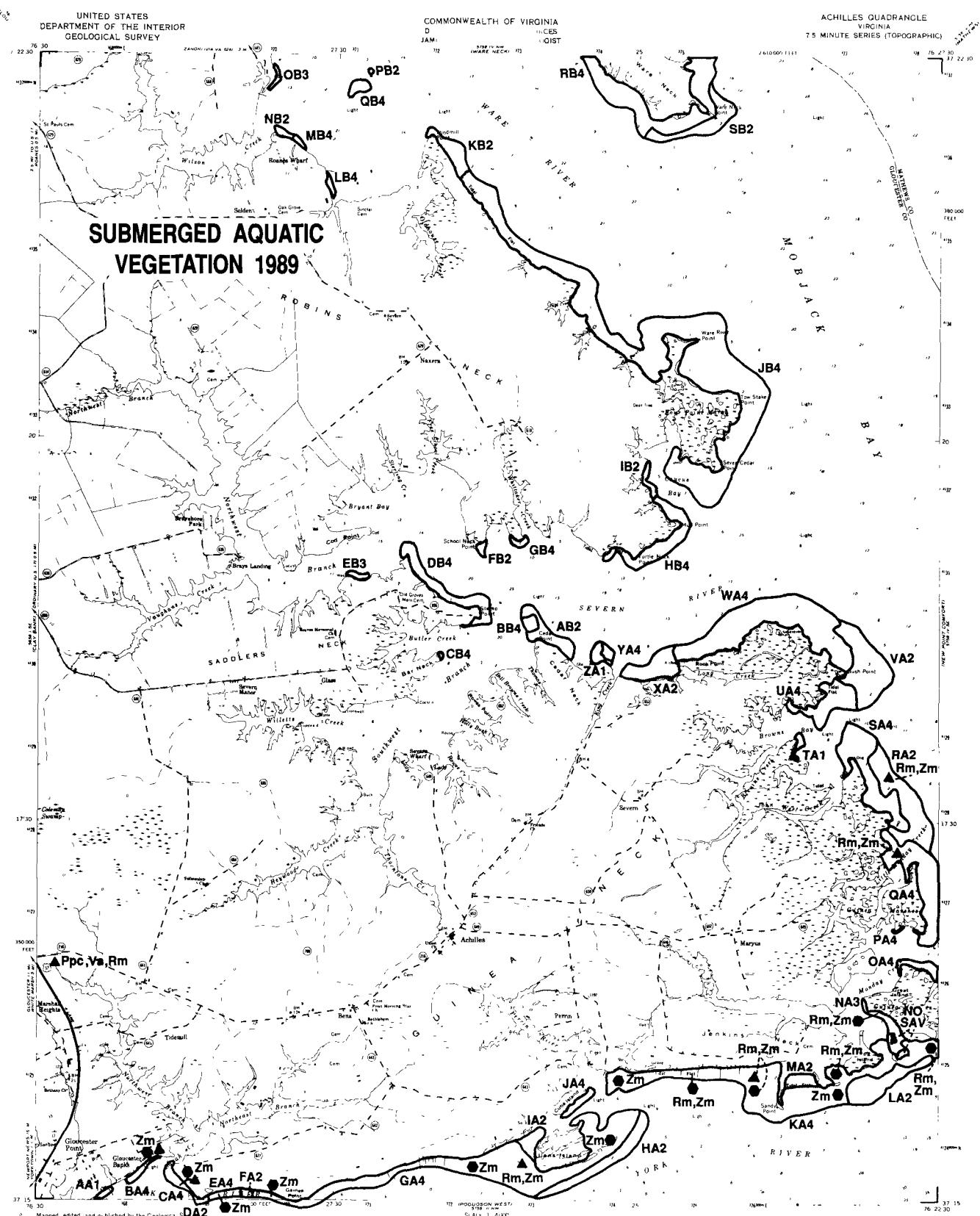
1985

PHOTOREVISED 1972

AMS 5054 - SE-SERIES 1334

SCALE 1:24 000  
1 MILE  
1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



Map edited and published by the Geodinamica

**SPECIES**

Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppl	<i>Potamogeton perfoliatus</i> (redhead-grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas spp.</i> (naiad)
Ec	<i>Elatia canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wid celery)
Tn	<i>Tropaeolum</i> (water chestnut)
U	Unknown species composition

Hv	<i>Hydrilla verticillata</i> (hydrilla)
Hd	<i>Heteranthera dubia</i> (water stargrass)
Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (southern naiad)
Ngr	<i>Najas gracillima</i> (naiad)
C	<i>Chara sp.</i> (muskglass)
Nm	<i>Najas minor</i> (slender naiad)

**SURVEY STATIONS**

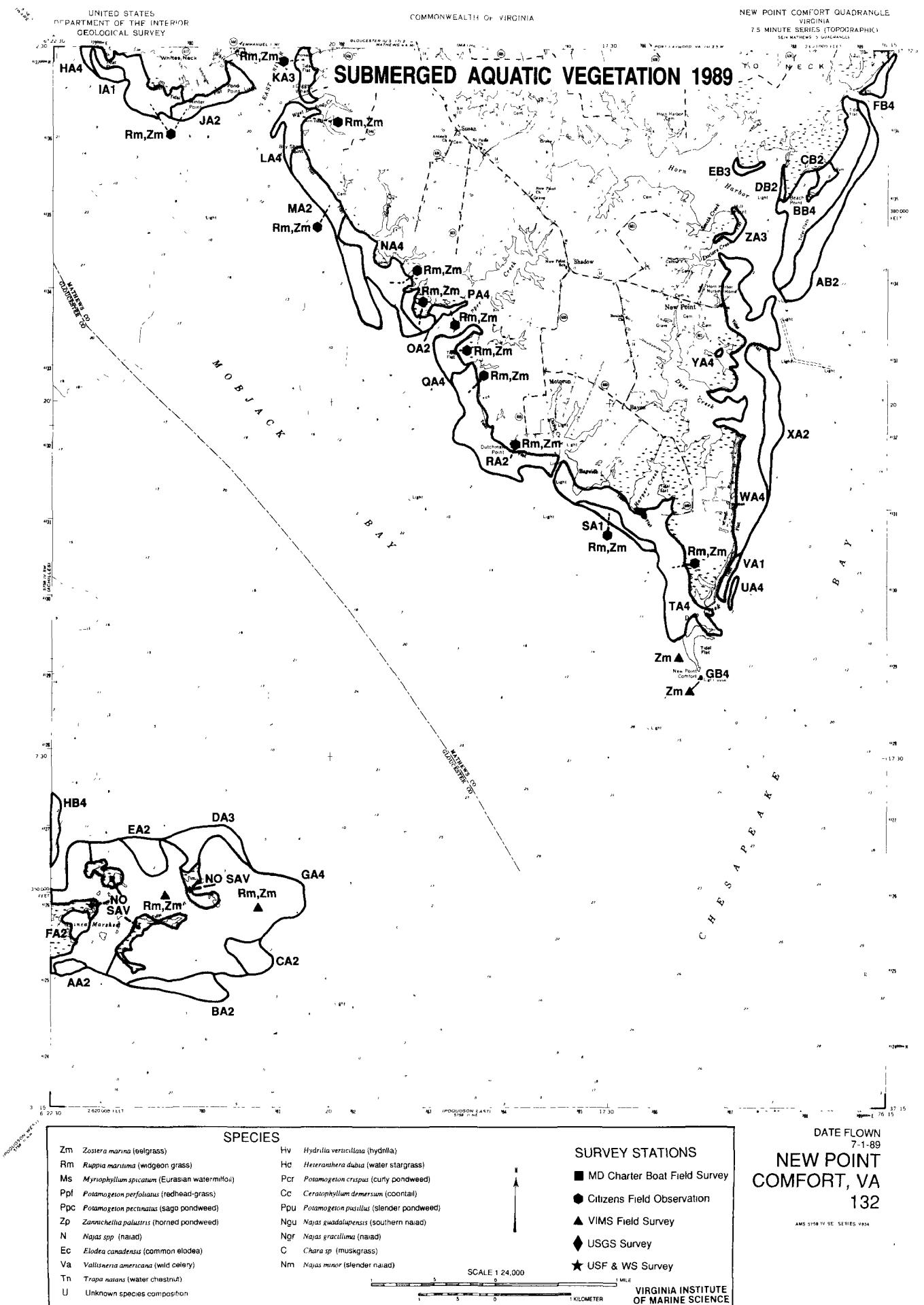
- MD Charter Boat Field Survey
- Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

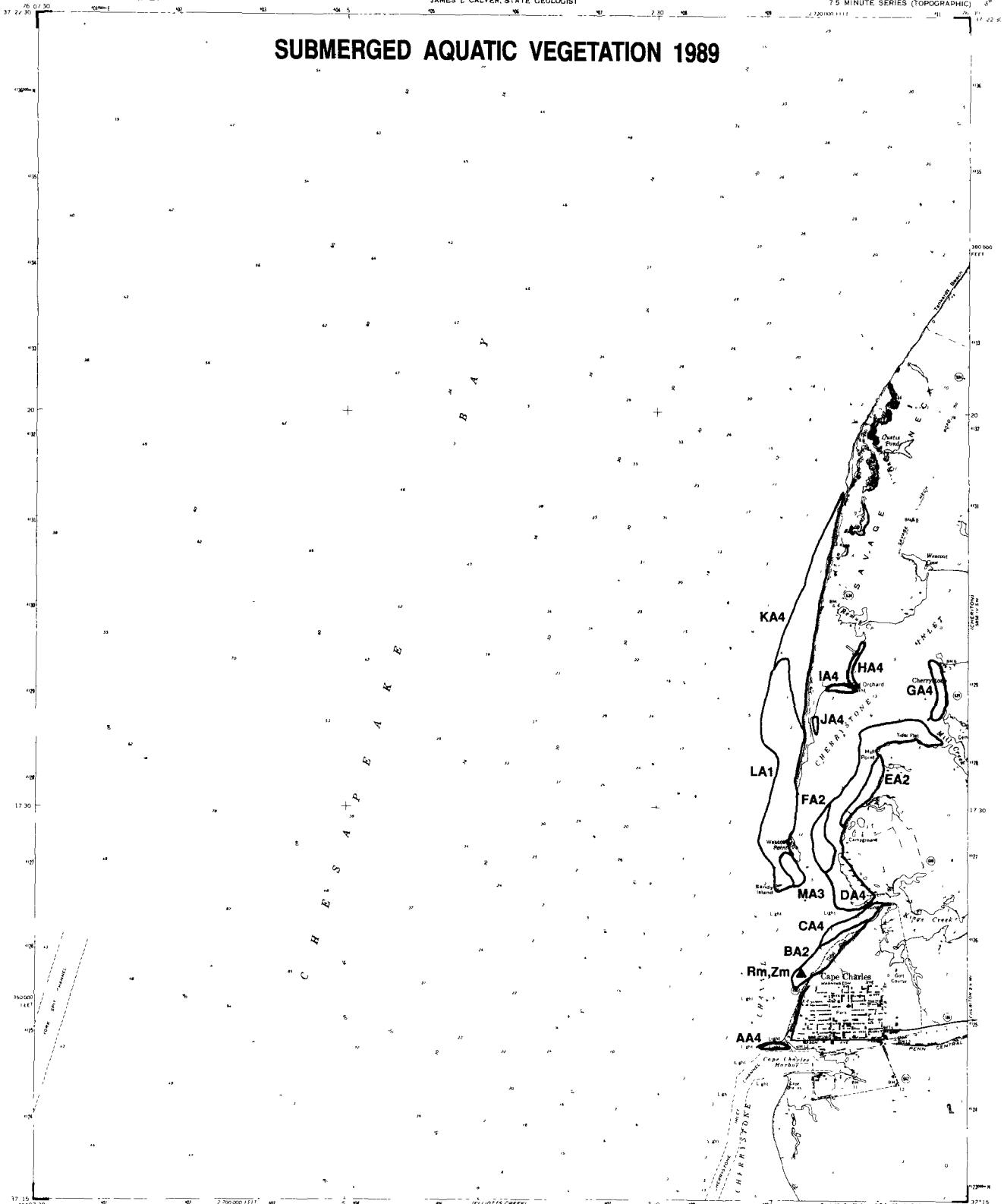
DATES FLOWN  
6-11-89  
7-1-89

ACHILLES,  
VA  
131

SCALE 1:24,000  
1 MILE  
1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE





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 pectinatus* (slender pondweed)
- Ngu *Najas guadalupensis* (southern naiad)
- Ngr *Najas gracillima* (naiad)
- C *Chara spp.* (muskglass)
- Nm *Najas minor* (slender naiad)

SURVEY STATIONS

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

DATE FLOWN  
6-12-89

CAPE CHARLES,

VA

133

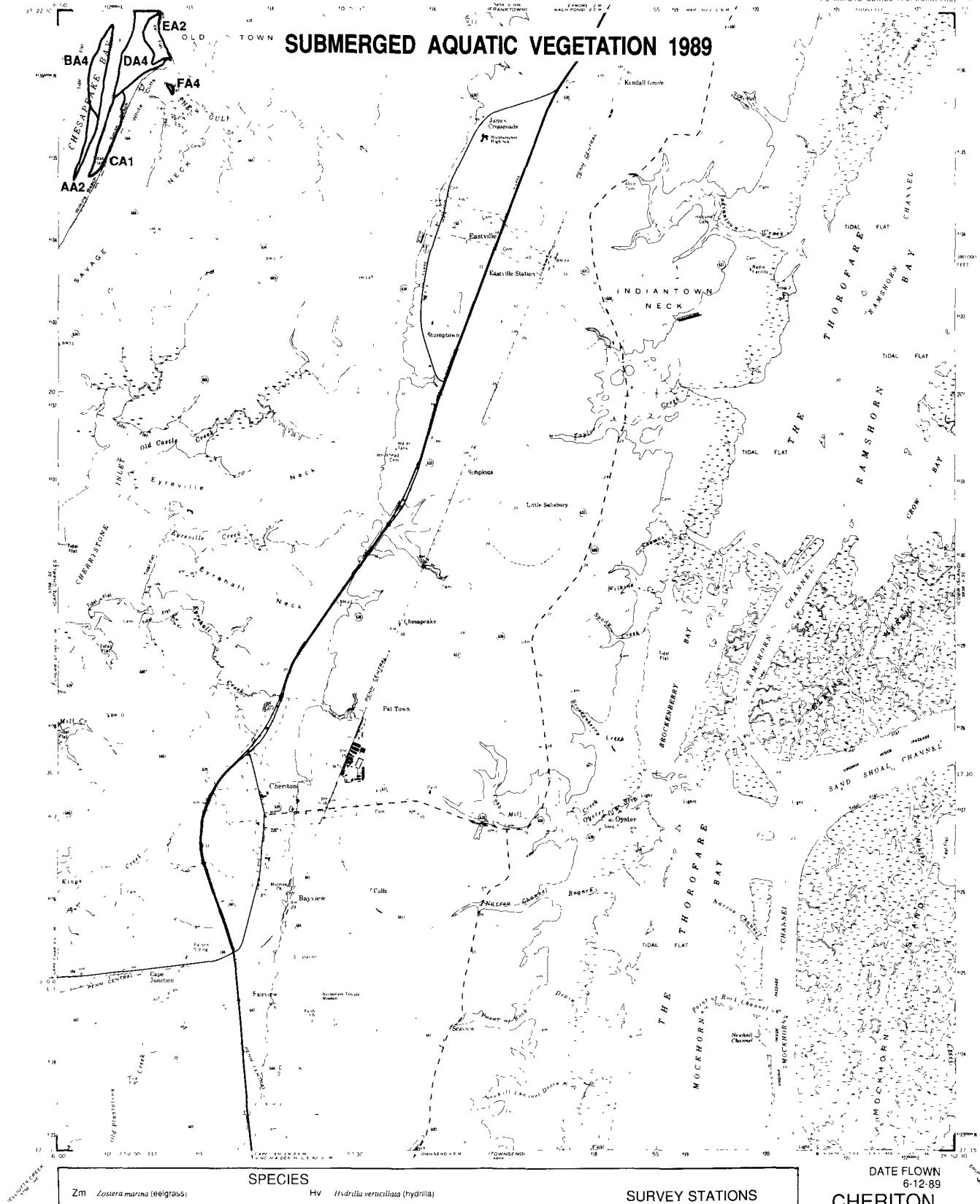
1989  
AMS 5781 SF SERIES 934

SCALE 1:24 000

1 MILE

1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



SPECIES

Zm	Zostera marina (eelgrass)
Rm	Ruppia maritima (widgen 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 gracilima (naiad)
C	Chara sp. (muskgrass)
Nrm	Najas minor (slender naiad)

SURVEY STATIONS

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

DATE FLOWN

6-12-89

CHERITON,

VA

134

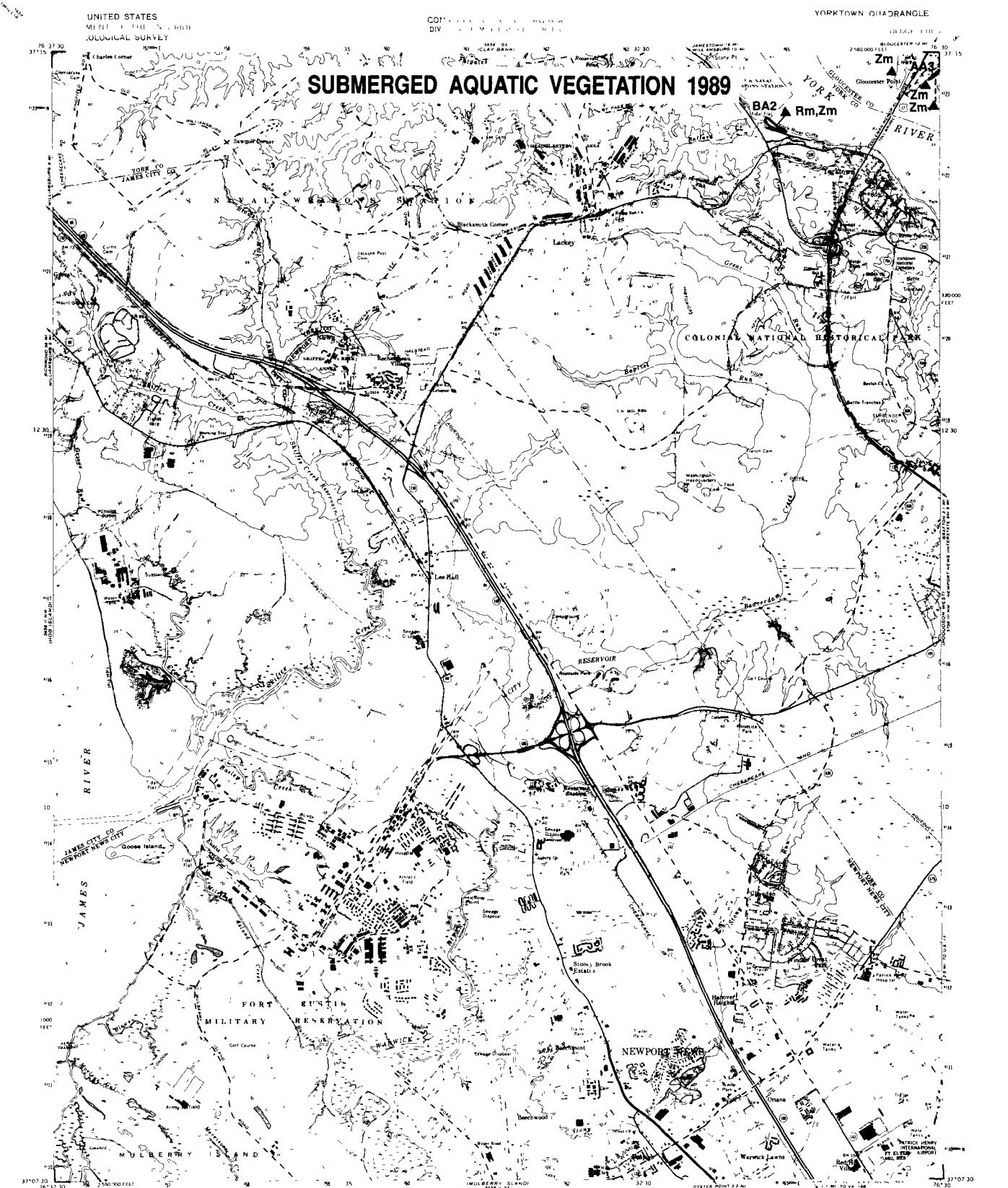
1989

AKY 5058 1:250,000 SERIES 1984

SCALE 1:24,000

5 5 5 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppf	<i>Poumagezon perfoliatus</i> (redhead grass)
Pcp	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas spp.</i> (naiaid)
Ec	<i>Eloea canadensis</i> (common eloeida)
Va	<i>Valeriana americana</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
U	Unknown species composition

---

**SPECIES**

- |     |  |
|-----|--|
| Hv  | <i>Hydrilla verticillata</i> (hydrilla)        |
| Hd  | <i>Heteranthera dubia</i> (water stargrass)    |
| Pcr | <i>Potamogeton crispus</i> (curly pondweed)    |
| Cd  | <i>Ceratophyllum demersum</i> (coontail)       |
| Pp  | <i>Potamogeton pusillus</i> (slender pondweed) |
| Ngu | <i>Najas guadalupensis</i> (southern naquad)   |
| Nna | <i>Najas gracilissima</i> (naad)               |
| C   | <i>Chara sp.</i> (muskgrass)                   |
| Nm  | <i>Najas minor</i> (slender naquad)            |

#### SURVEY STATIONS

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

DATE FLOWN  
7-1-89  
**YORKTOWN,  
VA  
139**

PHOTOREVISED 1980  
DMA 3655 II NE -SERIES V834

SCALE 1 24 000

VIRGINIA INSTITUTE  
OF MARINE SCIENCE

## SUBMERGED AQUATIC VEGETATION 1989



### SPECIES

Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppt	<i>Potamogeton perfoliatus</i> (redhead grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas</i> spp. (naiad)
Ec	<i>Elosta canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tr	<i>Trapa natans</i> (water chestnut)
U	Unknown species composition
Hv	<i>Hydrilla verticillata</i> (hydrilla)
Hd	<i>Heteranthera dubia</i> (water stargrass)
Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (southern naiad)
Ngr	<i>Najas gracillima</i> (naiad)
C	<i>Chara</i> sp. (muskgrass)
Nm	<i>Najas minor</i> (slender naiad)

### SURVEY STATIONS

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

DATE FLOWN  
7-1-89  
**POQUOSON  
WEST, VA**  
140

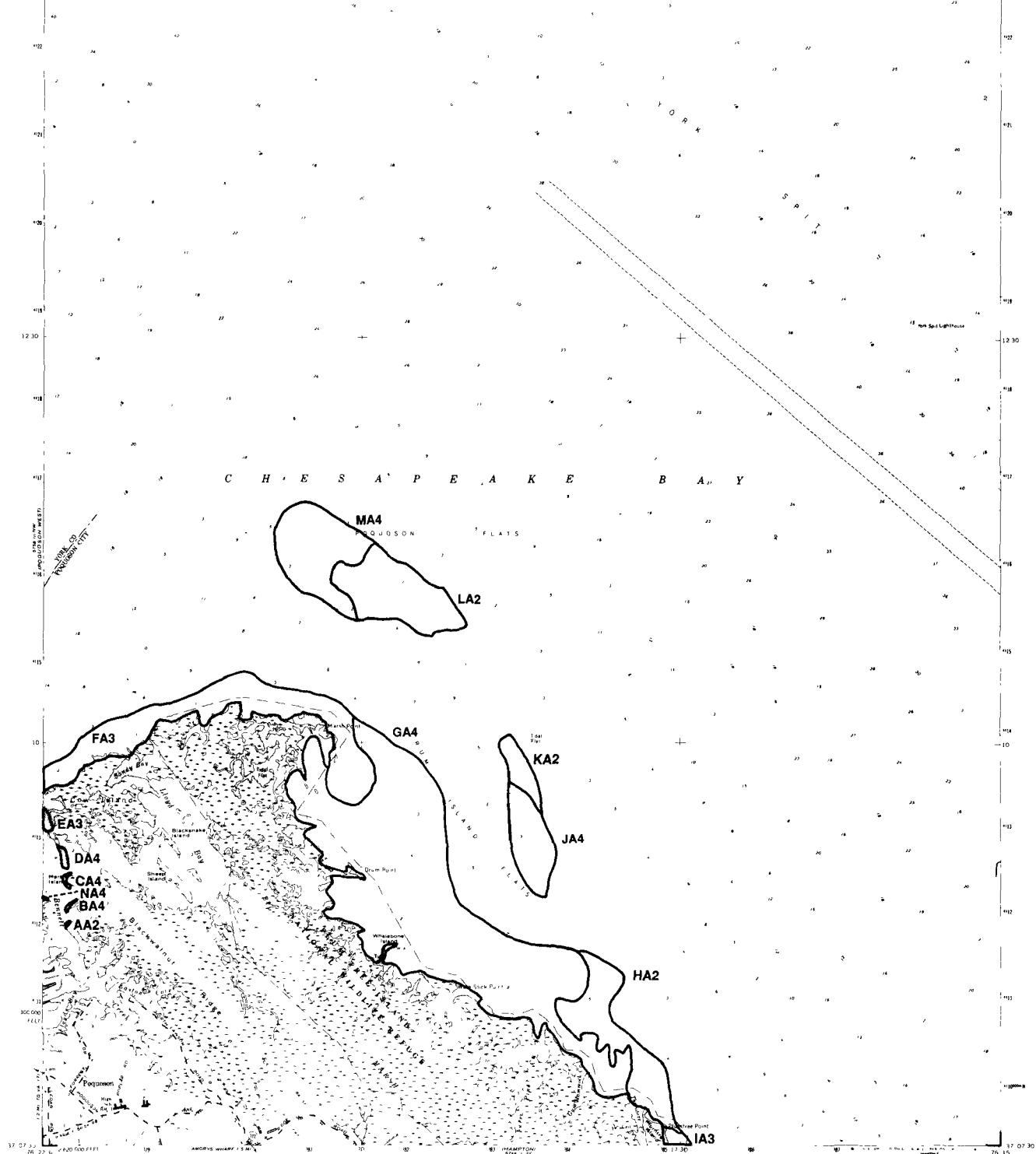
1985  
PHOTOGRAPHED 1979  
DMA 1:250,000 SERIALIZED

SCALE 1:24,000

1 MILE  
1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE

## SUBMERGED AQUATIC VEGETATION 1989



### SPECIES

Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas</i> spp. (naiad)
Ec	<i>Elodea canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Trapa natans</i> (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

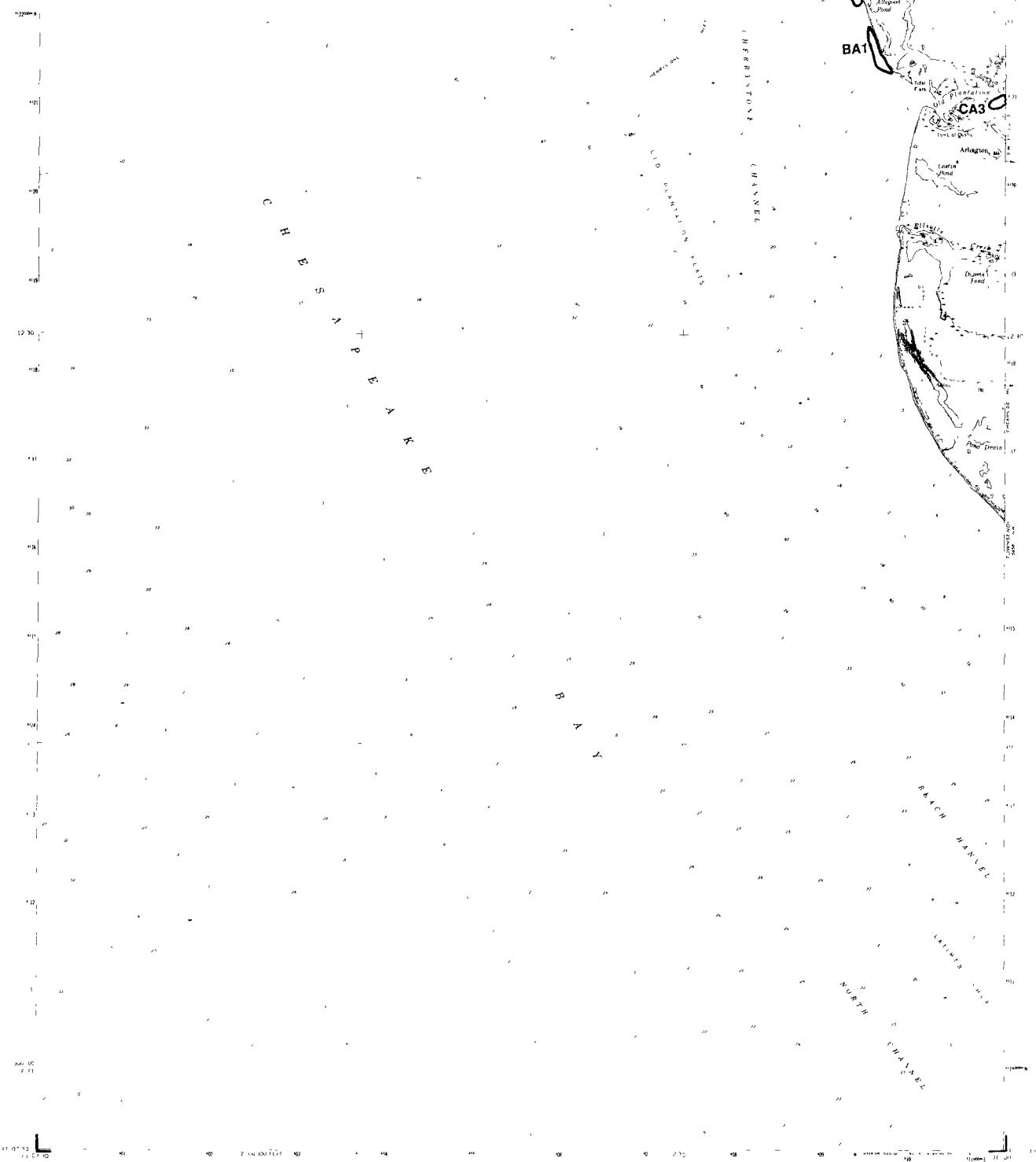
1 MILE  
1 KILOMETER

DATE FLOWN  
7-1-89  
**POQUOSON  
EAST, VA**  
141

PHOTOREVISED 1979  
DMA 3158 III NE-SERIES VB34

VIRGINIA INSTITUTE  
OF MARINE SCIENCE

## SUBMERGED AQUATIC VEGETATION 1989



### SPECIES

Zm	<i>Zostera marina</i> (eelgrass)	Hv	<i>Hydrilla verticillata</i> (hydrilla)
Rm	<i>Ruppia maritima</i> (widgton grass)	Hd	<i>Heteranthera dubia</i> (water stargrass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	Cd	<i>Ceratophyllum demersum</i> (water-milfoil)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)	Ngu	<i>Najas guadalupensis</i> (southern naiad)
N	<i>Najas</i> spp. (naiads)	Ngr	<i>Najas gracillima</i> (gracile naiad)
Ec	<i>Elatine canadensis</i> (common elatine)	C	<i>Chara</i> sp. (muskrat-cake)
Va	<i>Vallisneria americana</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapa natans</i> (water chestnut)		
U	Unknown species (common reed)		

### SURVEY STATIONS

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

DATE FLOWN  
6-12-89  
ELLIOTTS  
CREEK, VA  
142

AM 5748 HN N 888 N 888

VIRGINIA INSTITUTE  
OF MARINE SCIENCE

SCALE 1:24 000

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1 KILOMETER

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**SPECIES**

Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Mysrophyllum spicatum</i> (Eurasian watermilfoil)
Ppf	<i>Potamogeton perfoliatus</i> (redhead grass)
Ppc	<i>Potamogeton pectinatus</i> (Sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas spp</i> (naiad)
Ec	<i>Ectoda canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Trapa natans</i> (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

# SUBMERGED AQUATIC VEGETATION 1989



## SPECIES

Zm	Zizaniopsis miliacea
Rm	Ruppia maritima (Walter)
Ms	Myriophyllum spicatum (Burm)
Pof	Potamogeton pectinatus (Medik)
Poc	Potamogeton pectinatus (Sago)
Zp	Zannichellia palustris (Hornem)
Tp	Trapa natans
Ec	Egeria canadensis (Nels)
Va	Vallisneria americana (Walt)
Td	Trapa natans (std)
U	Unknown

## SURVEY STATIONS

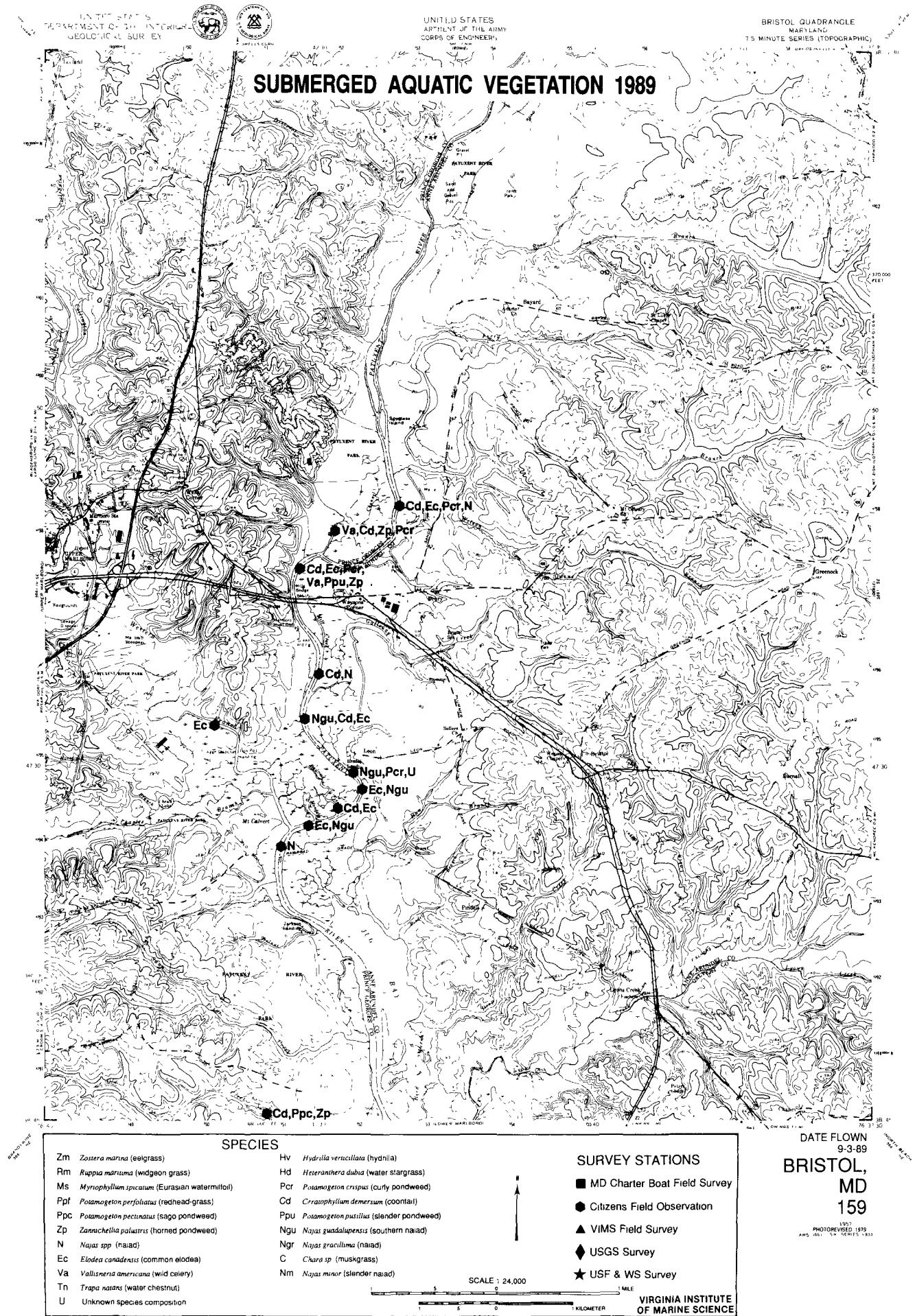
- MD Charter Boat Field Survey
- Citizens Field Observations
- ▲ VIMS Field Survey
- ◆ USGS Survey
- ★ USF & WS Survey

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

HAMPTON,  
VA  
147

VIRGINIA INSTITUTE  
OF MARINE SCIENCE





AA1  
Chesapeake Bay  
BA4

## SUBMERGED AQUATIC VEGETATION 1989



### SPECIES

Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas sp.</i> (naiaid)
Ec	<i>Eelodea canadensis</i> (common eelodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
U	Unknown species composition
Hv	<i>Hydrilla verticillata</i> (hydrilla)
Hd	<i>Heteranthera dubia</i> (water stargrass)
Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (southern naiaid)
Ngr	<i>Najas gracilima</i> (naiaid)
C	<i>Chara sp.</i> (muskglass)
Nm	<i>Najas minor</i> (slender naiaid)

### SURVEY STATIONS

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

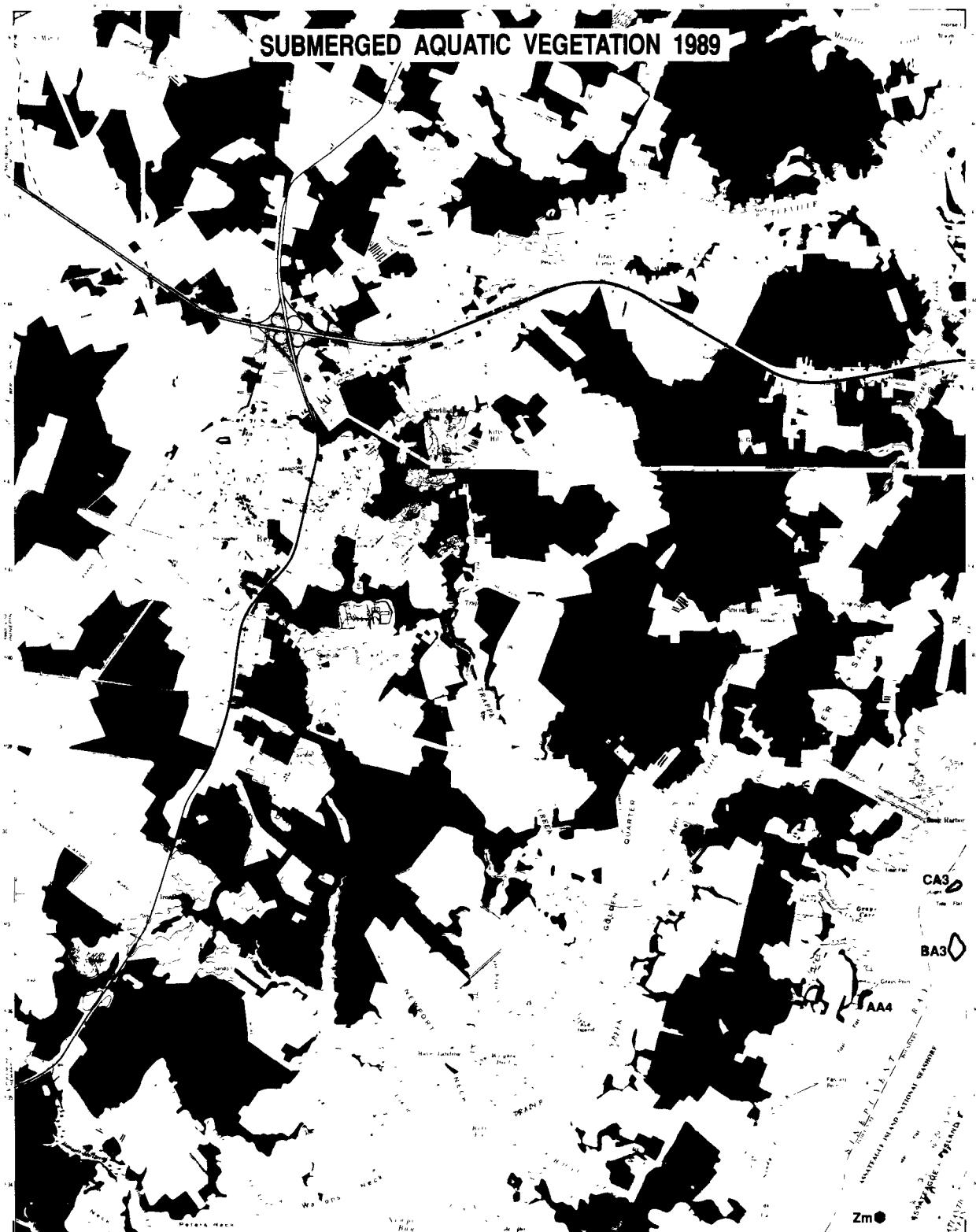
DATES FLOWN  
10-5-89 Upper Potomac R  
8-31-89 Port Tobacco Cr

PORT

TOBACCO, MD

161

GRAPHOMETRY ADDED 1982  
DMA 1561 E SE 2083 1983



SPECIES

Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppl	<i>Potamogeton perfoliatus</i> (redhead-grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas</i> spp. (naiad)
Ec	<i>Elderia canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Tropea natans</i> (water chestnut)
U	Unknown species composition
Hv	<i>Hydrilla verticillata</i> (hydrilla)
Hd	<i>Heteranthera dubia</i> (water stargrass)
Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (southern naiad)
Ngr	<i>Najas gracilima</i> (naiad)
C	<i>Chara</i> sp. (muskglass)
Nm	<i>Najas minor</i> (slender naiad)

SURVEY STATIONS

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

DATE FLOWN  
6-12-89

BERLIN,  
MD  
167

PHOTOGRAPH BY  
WILLIAM H. MCGOWAN

SCALE 1:24,000

1 MILE  
1 KILOMETER

VIRGINIA INSTITUTE  
OF MARINE SCIENCE



SPECIES

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

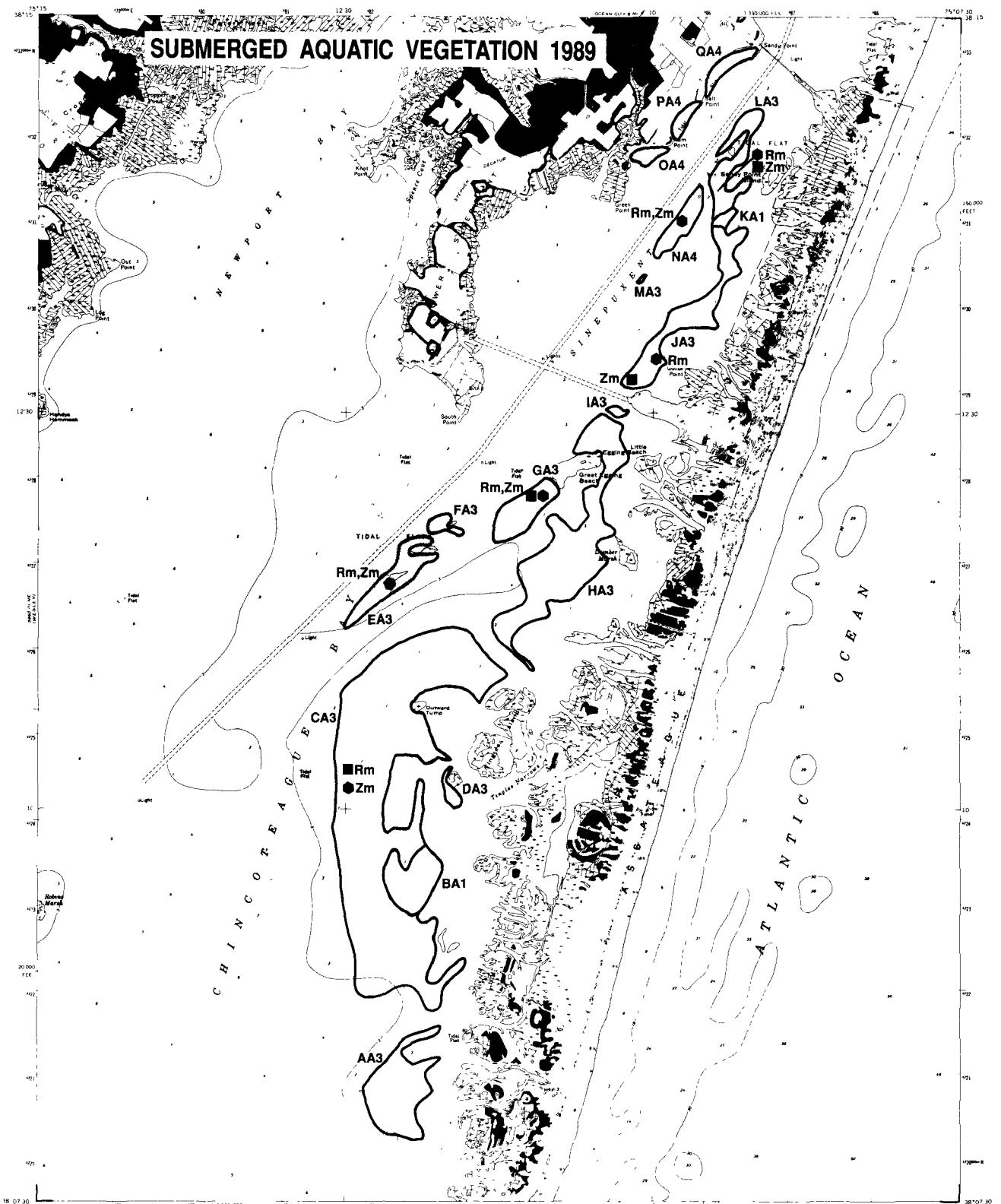
SURVEY STATIONS

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

DATE FLOWN  
6-12-89  
OCEAN CITY,  
MD  
168

1984  
AMSI 59601 SE SERIES V83

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OF MARINE SCIENCE

DATE FLOWN  
6-12-89TINGLES ISLAND,  
MD  
1701984  
PHOTOGRAPHED 1972  
AMS 1:625,000 - NW-SERIES 1933

SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	■	MD Charter Boat Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	●	Citizens Field Observation
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	▲	VIMS Field Survey
Ppl	<i>Potamogeton perfoliatus</i> (redhead-grass)	◆	USGS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	★	USF & WS Survey
Zp	<i>Zannichellia palustris</i> (horned pondweed)		
N	<i>Najas</i> spp. (naiad)		
Ec	<i>Elodea canadensis</i> (common elodea)		
Va	<i>Vallisneria americana</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
U	Unknown species composition		
Hv	<i>Hydrilla verticillata</i> (hydrilla)		
Hd	<i>Heteranthera dubia</i> (water stargrass)		
Pcr	<i>Potamogeton crispus</i> (curly pondweed)		
Cd	<i>Ceratophyllum demersum</i> (coontail)		
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)		
Ngu	<i>Naja guadalupensis</i> (southern naiad)		
Ngr	<i>Naja gracillima</i> (naiad)		
C	<i>Chara</i> sp. (muskglass)		
Nm	<i>Naja minor</i> (slender naiad)		

SCALE 1:24,000

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SPECIES

Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Micropylus spicatum</i> (Eurasian watermilfoil)
Ppl	<i>Potamogeton perfoliatus</i> (redhead-grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas spp.</i> (naiad)
Ec	<i>Elodea canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Tropea natans</i> (water chestnut)
U	Unknown species composition

SURVEY STATIONS

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

DATE FLOWN

6-12-89

BOXIRON,

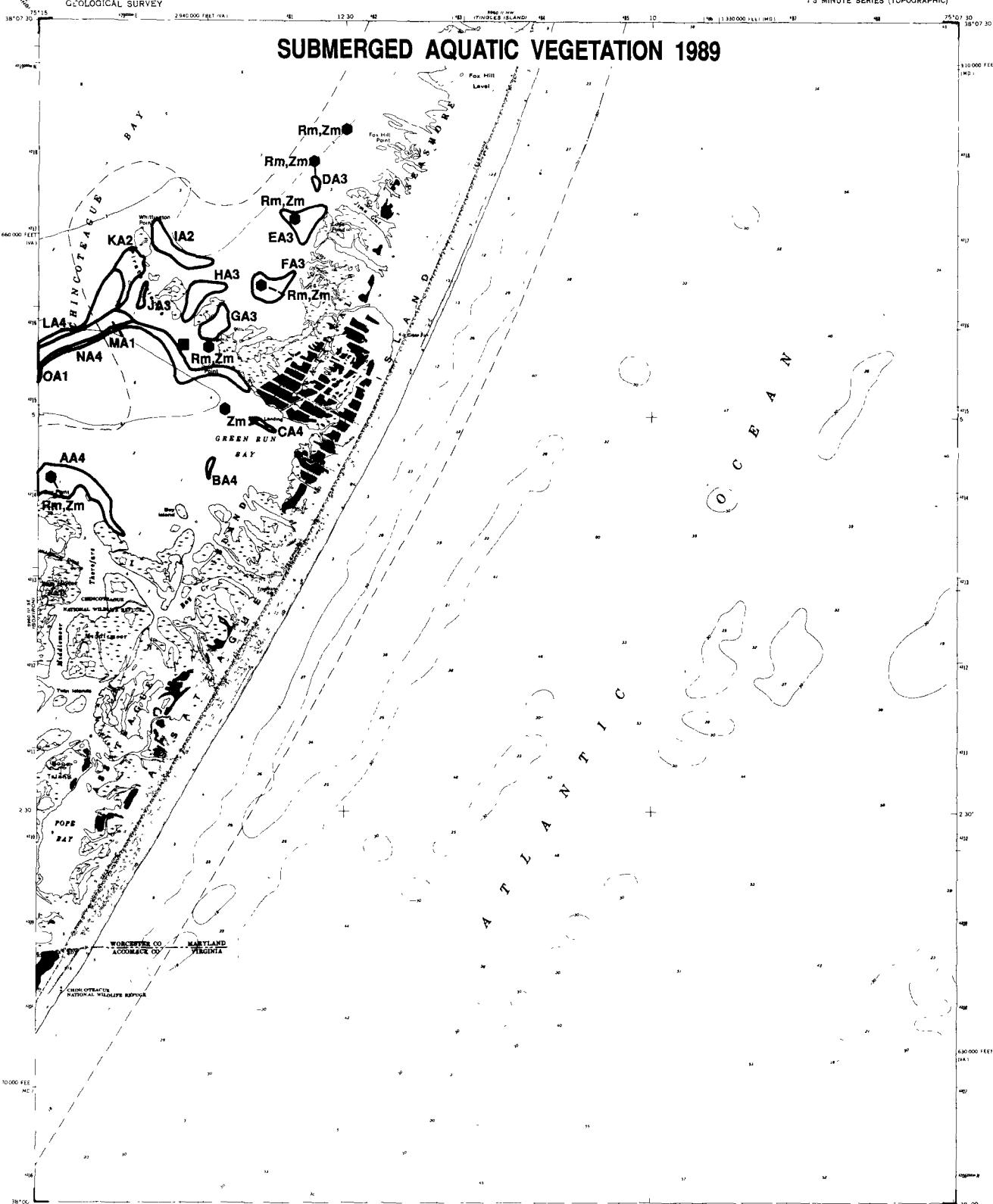
MD-VA

172

PHOTOREVISED 1980

SCALE 1:24,000  
1 MILE  
1 KILOMETER

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WHITTINGTON  
POINT, MD-VA  
173

PHOTOREVISED 1980  
DMA 5860 II SW-SERIES V83

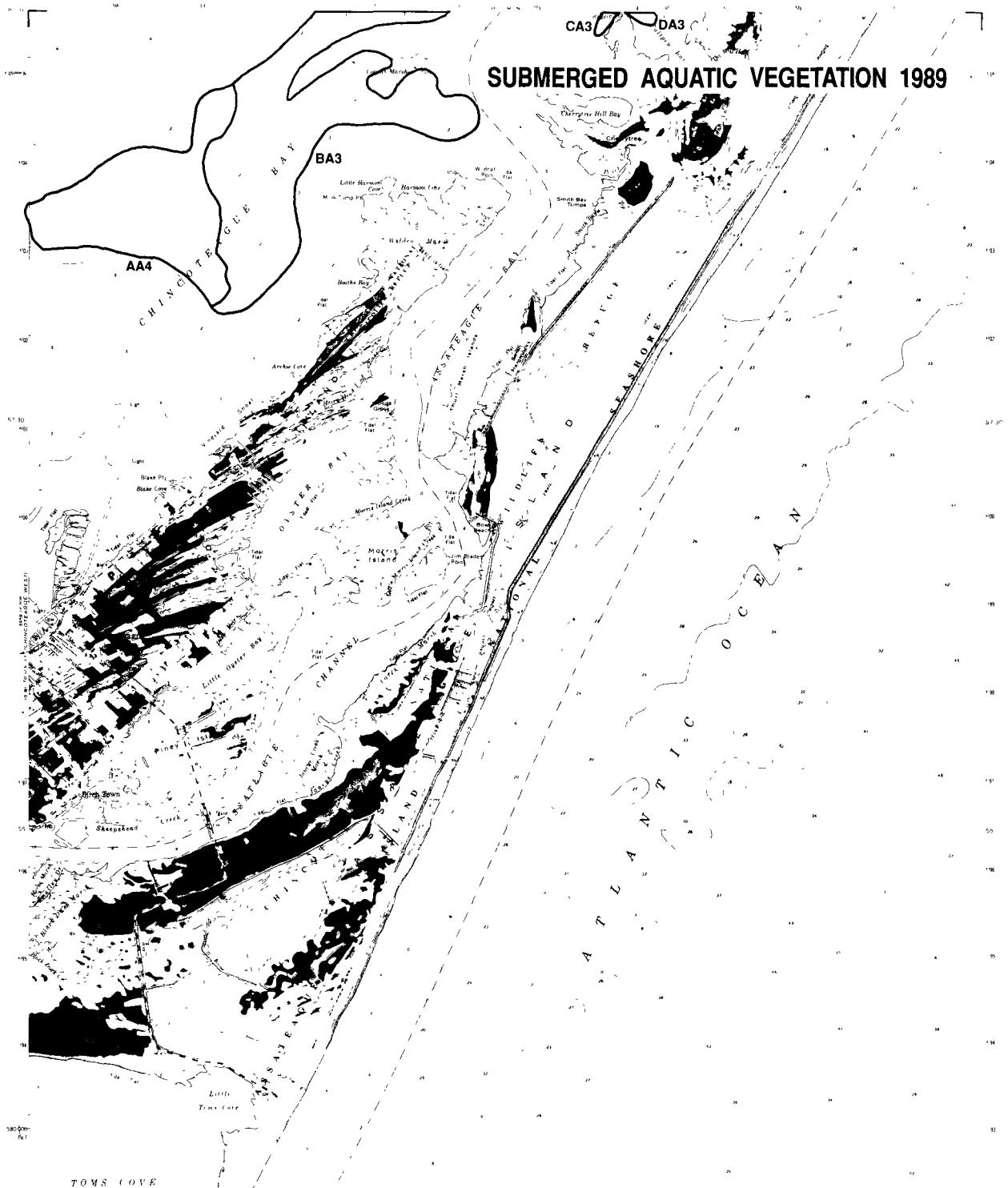
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## SUBMERGED AQUATIC VEGETATION 1989



### SPECIES

Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (thorned pondweed)
N	<i>Najas spp.</i> (naiaid)
Ec	<i>Ectoda canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Tropaeolum subulatum</i> (water chestnut)
U	Unknown species composition
Hv	<i>Hydrilla verticillata</i> (hydrilla)
Hd	<i>Heteranthera dubia</i> (water stargrass)
Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (southern naiaid)
Ngr	<i>Najas gracilissima</i> (naiaid)
C	<i>Chara sp.</i> (muskglass)
Nm	<i>Najas minor</i> (slender naiaid)

### SURVEY STATIONS

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

DATE FLOWN  
6-12-89

CHINCOTEAGUE  
EAST, VA

175

1989  
PHOTOREVISED 1988

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0 1 KILOMETER

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## APPENDIX D

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

## APPENDIX D

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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.		QA2	822
VIMS CHART # 002		RA2	3111
		SA3	22530
AA3	2834	TA2	10270
BA2	3769	UA2	7775
		VA2	3622
TOTAL AREA		WA2	91290
		XA3	14650
DENSITY 1 =	0	YA3	2550
DENSITY 2 =	3769	ZA2	2343
DENSITY 3 =	2834	AB3	144000
DENSITY 4 =	0	BB3	2645
		CB3	1139
TOTAL =	6603	DB3	904
		EB3	20650
HAVRE DE GRACE MD.		FB3	2011
VIMS CHART # 003		GB2	34810
		HB3	14480
AA1	16380000	IB3	138700
BA1	75140	JB2	26410
CA1	16840	KB2	249700
DA1	6120	LB2	6374
EA1	583000	MB2	1046
FA1	46910	NB2	3135
GA2	12630	OB3	4610
HA1	230200		
IA2	99260	TOTAL AREA	
JA2	39590		
KA2	32940	DENSITY 1 =	17338207
LA2	2753	DENSITY 2 =	652215
MA2	10770	DENSITY 3 =	368869
NA2	6982	DENSITY 4 =	0
OA2	3361		
PA2	3221	TOTAL =	18359236

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NORTH EAST MD.		EA1	659800
VIMS CHART # 004		FA2	1736
		GA2	4273
AA1	241300	HA1	167600
BA1	49040		
CA1	46440	TOTAL AREA	
DA1	72010		
EA2	123000	DENSITY 1 =	1082000
FA2	171500	DENSITY 2 =	796574
GA2	351800	DENSITY 3 =	0
		DENSITY 4 =	0
TOTAL AREA		TOTAL =	1878574
DENSITY 1 =	408790		
DENSITY 2 =	646300	EARLEVILLE MD.	
DENSITY 3 =	0	VIMS CHART # 010	
DENSITY 4 =	0		
TOTAL =	1055090	AA2	13740
		BA2	101100
		CA2	50940
		DA2	16630
ELKTON MD.-DEL.		EA1	64370
VIMS CHART # 005		FA2	53980
		GA1	68830
AA2	5932	HA2	100900
BA2	51070	IA1	43610
		JA1	318900
TOTAL AREA		KA1	21020
		LA2	25390
DENSITY 1 =	0	MA1	87710
DENSITY 2 =	57002	NA4	11550
DENSITY 3 =	0	TOTAL AREA	
DENSITY 4 =	0		
TOTAL =	57002	DENSITY 1 =	604440
		DENSITY 2 =	362680
SPESUTIE MD.		DENSITY 3 =	0
VIMS CHART # 009		DENSITY 4 =	11550
AA2	747900	TOTAL =	978670
BA2	3285		
CA2	39380		
DA1	254600		

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MIDDLE RIVER MD. VIMS CHART # 013		TOTAL AREA
AA1	5460	DENSITY 1 = 3817
BA1	14480	DENSITY 2 = 113916
CA2	2666	DENSITY 3 = 209654
DA2	1498	DENSITY 4 = 18163
EA1	12020	TOTAL = 345550
TOTAL AREA		HANESVILLE MD. VIMS CHART # 015
DENSITY 1 =	31960	
DENSITY 2 =	4164	AA2 11150
DENSITY 3 =	0	BA3 23750
DENSITY 4 =	0	CA2 36320
		DA1 55390
TOTAL =	36124	
GUNPOWDER NECK MD. VIMS CHART # 014		TOTAL AREA
AA2	29370	DENSITY 1 = 55390
BA3	3370	DENSITY 2 = 47470
CA2	8611	DENSITY 3 = 23750
DA4	12420	DENSITY 4 = 0
EA3	10290	TOTAL = 126610
FA3	3062	
GA3	62400	BETTERTON MD. VIMS CHART # 016
HA4	5743	
IA2	36970	AA2 1639
JA3	7014	BA2 9221
KA3	36760	
LA3	24000	
MA3	33370	TOTAL AREA
NA3	11990	
OA3	2468	DENSITY 1 = 0
PA2	5325	DENSITY 2 = 10860
QA2	21510	DENSITY 3 = 0
RA2	12130	DENSITY 4 = 0
SA3	14930	
TA1	3817	TOTAL = 10860

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<b>GALENA MD.</b>		<b>ROCK HALL MD.</b>	
<b>VIMS CHART # 017</b>		<b>VIMS CHART # 021</b>	
AA3	26430	AA2	53650
BA2	1459	BA3	37960
		CA3	11260
<b>TOTAL AREA</b>		DA4	43670
		EA4	1542
<b>DENSITY 1 =</b>	0	FA4	12880
<b>DENSITY 2 =</b>	1459	GA2	5522
<b>DENSITY 3 =</b>	26430	HA2	25100
<b>DENSITY 4 =</b>	0		
<b>TOTAL</b>	<b>=</b>	<b>27889</b>	<b>TOTAL AREA</b>
<b>SWAN POINT MD.</b>		<b>DENSITY 1 =</b>	
<b>VIMS CHART # 020</b>		0	
AA2	15030	DENSITY 2 =	84272
BA3	31660	DENSITY 3 =	49220
CA2	3348	DENSITY 4 =	58092
DA4	2373	<b>TOTAL</b>	<b>=</b>
			191584
<b>TOTAL AREA</b>		<b>LANGFORD CREEK MD.</b>	
		<b>VIMS CHART # 026</b>	
		AA3	18030
<b>DENSITY 1 =</b>	0	BA3	55090
<b>DENSITY 2 =</b>	18378	CA2	7769
<b>DENSITY 3 =</b>	31660	DA4	8177
<b>DENSITY 4 =</b>	2373	EA3	1396
<b>TOTAL</b>	<b>=</b>	FA3	8758
		GA3	16910
		HA3	2251
		IA2	15210
		JA3	141700
		KA4	11930
		LA4	9780
		MA3	118800
		NA1	73160
		OA1	21920
		PA2	5356
		QA1	155200

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RA2	18280	VA2	52970
SA1	52910	WA2	155400
TA4	52730	XA2	10200
UA3	4363	YA2	589900
VA3	4023	ZA1	39760
WA1	274800	AB4	55890
XA2	20740	BB1	166500
YA3	123500		
ZA2	5858	TOTAL AREA	
AB2	14490		
BB1	39480	DENSITY 1 =	351610
CB2	88690	DENSITY 2 =	2269850
DB2	17750	DENSITY 3 =	567596
		DENSITY 4 =	81510
TOTAL AREA			
		TOTAL =	3270566
DENSITY 1 =	617470		
DENSITY 2 =	194143	QUEENSTOWN MD.	
DENSITY 3 =	494821	VIMS CHART # 033	
DENSITY 4 =	82617		
		AA2	46770
TOTAL =	1389051	BA2	20850
		CA1	50300
KENT ISLAND MD.		DA2	67020
VIMS CHART # 032		EA4	238200
		FA2	45190
AA3	176300	GA4	54470
BA1	116000	HA2	571200
CA3	6815	IA2	56020
DA1	29350	J2A	35750
EA4	25620	KA2	18360
FA2	406000	LA2	10080
GA3	2447	MA3	15820
HA3	2762	NA3	40380
IA2	20070	OA3	12840
JA3	11250		
KA3	4737	TOTAL AREA	
LA3	9274		
MA3	3411	DENSITY 1 =	50300
NA2	98930	DENSITY 2 =	871240
OA2	56580	DENSITY 3 =	69040
PA2	167500	DENSITY 4 =	292670
QA3	241200		
RA2	154500	TOTAL =	1283250
SA3	109400		
TA2	456600		
UA2	101200		

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

AA2	37690	AA2	73550
BA4	6155	BA2	97560
CA2	7750	CA3	305900
DA4	13340	DA2	34630
EA4	14040	EA3	29520
FA3	4738	FA4	40970
GA4	314900	GA2	7159
HA2	551600	HA3	21410
IA4	130200	IA4	5744
JA1	199300	JA3	24040
KA4	173200	KA3	23960
LA4	3810	LA4	4871
MA2	3687	MA4	3977
NA3	9069	NA3	12650
OA2	5635	OA3	33980
PA2	46800	PA4	5116
QA2	53000	QA4	4017
RA4	38630	RA4	57340
SA2	3079	SA4	46310
TA4	7512	TA4	7150
UA1	12190	UA4	4108
VA4	23100	VA4	246600
WA4	32650	WA3	14030
XA4	3289	XA3	2049
YA4	34550	YA3	30290
ZA4	4920	ZA3	35020
AB4	911500	AB1	7438
BB4	5276	BB3	45620
CB4	12070	CB3	112800
DB2	288700	DB2	105900
EB4	402800	EB1	537100
FB3	3860	FB2	122300
GB4	181700	GB4	101700
HB2	143600	HB4	79750
		IB2	16970
<b>TOTAL AREA</b>		<b>JB3</b>	<b>32220</b>
		<b>KB3</b>	<b>17890</b>
<b>DENSITY 1 =</b>	<b>211490</b>	<b>LB4</b>	<b>3127</b>
<b>DENSITY 2 =</b>	<b>1141541</b>	<b>MB4</b>	<b>1433</b>
<b>DENSITY 3 =</b>	<b>17667</b>	<b>NB4</b>	<b>3000</b>
<b>DENSITY 4 =</b>	<b>2313642</b>	<b>OB3</b>	<b>4924</b>
<b>TOTAL =</b>	<b>3684340</b>	<b>PB4</b>	<b>21880</b>
		<b>QB3</b>	<b>14510</b>

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RB3	14780	EASTON MD.
SB3	7658	VIMS CHART # 038
TB2	9008	
UB2	390800	TOTAL AREA
VB3	10520	
WB3	20190	
XB4	140200	DENSITY 1 = 0
YB2	233700	DENSITY 2 = 0
ZB2	276200	DENSITY 3 = 0
AC2	49600	DENSITY 4 = 0
BC2	54870	
CC1	208700	TOTAL = 0
 TOTAL AREA		FORT BELVOIR VA.-MD.
		VIMS CHART # 039
DENSITY 1 =	753238	AA2 8053
DENSITY 2 =	1472247	BA4 66140
DENSITY 3 =	813961	CA4 50430
DENSITY 4 =	777293	DA3 32230
		EA3 16840
TOTAL =	3816739	FA1 3750
		GA1 280800
ST. MICHAELS MD.		HA2 40650
VIMS CHART # 037		IA4 54260
		JA3 81660
AA4	4760	
BA4	63370	TOTAL AREA
CA4	4753	
DA4	5479	
EA2	379900	DENSITY 1 = 284550
FA2	312600	DENSITY 2 = 48703
GA2	258300	DENSITY 3 = 130730
HA2	650300	DENSITY 4 = 170830
IA2	32860	
JA3	12160	TOTAL = 634813
 TOTAL AREA		MT. VERNON VA.-MD.
		VIMS CHART # 040
DENSITY 1 =	0	AA3 225600
DENSITY 2 =	1633960	BA4 1385000
DENSITY 3 =	12160	CA2 50430
DENSITY 4 =	78362	DA3 96330
		EA4 4984
TOTAL =	1724482	FA4 18050
		GA3 60320

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HA4	29970	QA3	598600
IA2	56910	RA2	277400
JA4	41900	SA3	25790
KA4	40310	TA3	29150
LA2	37960	UA3	54770
MA3	72580		
NA2	107100	TOTAL AREA	
OA2	3323		
PA4	33500	DENSITY 1 =	175200
QA4	261100	DENSITY 2 =	1136147
RA2	246900	DENSITY 3 =	999610
SA4	157000	DENSITY 4 =	0
TA2	201200		
UA2	152500	TOTAL =	2310957
VA4	36140		
WA2	27390	OXFORD MD.	
		VIMS CHART # 044	
	TOTAL AREA		
DENSITY 1 =	0	AA3	203600
DENSITY 2 =	883713	BA2	39110
DENSITY 3 =	454830	CA2	59100
DENSITY 4 =	2007954	DA2	169800
TOTAL =	3346497	EA2	66570
		FA2	85370
		GA3	112900
		HA2	62840
TILGHMAN MD.		IA2	55770
VIMS CHART # 043		JA3	48930
		KA2	55400
AA2	96370		
BA2	13960	TOTAL AREA	
CA2	84450		
DA2	53120	DENSITY 1 =	0
EA2	18030	DENSITY 2 =	593960
FA2	74550	DENSITY 3 =	365430
GA2	12700	DENSITY 4 =	0
HA2	7207		
IA2	13020	TOTAL =	959390
JA2	79120		
KA2	33330	QUANTICO VA.-MD.	
LA2	47190	VIMS CHART # 047	
MA3	146400		
NA2	325700	AA4	271500
OA1	175200	BA2	11220
PA3	144900	CA4	49190
		DA2	14420
		EA4	2817
		FA2	102700

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GA1	11610	KA4	8083
HA4	623000	LA3	19120
IA2	49120	MA3	87900
JA4	836500	NA4	262000
KA4	73860	OA1	123600
LA2	16390	PA4	90130
MA4	12380	QA3	44070
NA4	95800	RA4	78050
OA2	49300	SA2	24410
PA4	57380	TA4	78510
QA1	190500		

RA2	79090	TOTAL AREA	
SA4	37230		
TA4	103500		
WA4	1631000	DENSITY 1 =	468580
XA1	445300	DENSITY 2 =	141210
YA4	76740	DENSITY 3 =	215210
ZB2	98760	DENSITY 4 =	1015223
AB4	186400		
BB2	79280	TOTAL =	1840223
UA4	119700		
VA1	6923	HUDSON MD. VIMS CHART # 051	

TOTAL AREA		AA3	4073
		BA4	13830
DENSITY 1 =	654333	CA3	28860
DENSITY 2 =	500280	DA3	17290
DENSITY 3 =	0	EA3	41190
DENSITY 4 =	4176997	FA3	2588000
TOTAL =	5331610	GA3	388000
		HA3	232600

INDIAN HEAD MD.-VA.		TOTAL AREA	
VIMS CHART # 048			
AA2	116800	DENSITY 1 =	0
BA4	375900	DENSITY 2 =	0
CA1	320800	DENSITY 3 =	3300013
DA4	35870	DENSITY 4 =	13830
EA4	33450		
FA1	24180	TOTAL =	3313843
GA3	64120		
HA4	19740		
IA4	12120		
JA4	21370		

CHURCH CREEK MD.  
VIMS CHART # 052

TOTAL AREA

AA3	5943	<hr/>	DENSITY 1 =	495500
BA3	1674		DENSITY 2 =	247310
CA2	16490		DENSITY 3 =	172700
DA3	5879		DENSITY 4 =	3750420
EA4	144300			
FA3	15630		TOTAL =	4665930

TOTAL AREA

NANJEMOY MD.  
VIMS CHART # 056

DENSITY 1 =	0			
DENSITY 2 =	16490		AA4	319800
DENSITY 3 =	29126		BA3	79240
DENSITY 4 =	144300		CA4	26340
			DA4	12800
TOTAL =	189916		EA4	28750
			FA1	2868

WIDEWATER VA.-MD.  
VIMS CHART # 055

AA1	119600		JA2	40740
BA2	17420		KA3	53480
CA4	46340		LA2	60940
DA1	162400		NA4	2279
EA2	91020		OA2	35370
FA4	85390		PA4	7927
GA1	69370		RA4	39190
HA4	2370000		SA4	22590
IA3	172700		TA2	23680
JA4	43890		MA4	51170
KA4	164700		QA4	48110
LA1	15340		UA4	54880
MA4	397500			
NA1	30320		TOTAL AREA	
OA4	642600	<hr/>	DENSITY 1 =	2868
PA1	98470		DENSITY 2 =	160730
QA2	36470		DENSITY 3 =	132720
RA2	102400		DENSITY 4 =	1199736
			TOTAL =	1496054

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	MATHIAS POINT MD.-VA.	PB4	4146
	VIMS CHART # 057	QB2	8171
		RB4	275800
AA1	38530	SB1	11020
BA4	325000	TB4	18980
CA2	32010	UB3	25990
DA3	53820	VB4	382200
EA4	29570	WB2	22120
FA2	1406	XB1	12260
GA4	12590	ZB2	8052
HA2	10300	YB2	2355
IA3	3965		
JA4	9787	TOTAL AREA	
KA4	22610		
LA1	19920	DENSITY 1 =	101453
MA4	45830	DENSITY 2 =	415449
NA4	2297	DENSITY 3 =	225775
OA2	23160	DENSITY 4 =	2724331
PA4	29170		
QA3	73980	TOTAL =	3467008
RA4	61290		
SA2	16710	POPES CREEK MD.	
TA4	20420	VIMS CHART # 058	
UA4	73940		
VA2	19300	AA1	35770
WA1	7433	BA3	16260
XA4	6517	CA1	5282
YA4	2620	DA1	4668
ZA4	1663		
AB4	2594	TOTAL AREA	
BB3	10820		
CB4	3167	DENSITY 1 =	45720
DB2	5575	DENSITY 2 =	0
EB4	13970	DENSITY 3 =	16260
FB3	57200	DENSITY 4 =	0
GB2	103800		
HB4	918800	TOTAL =	61980
IB2	152100		
JB4	106200	COVE POINT MD.	
KB2	10390	VIMS CHART # 061	
LB4	151100		
MB4	55270	AA2	4774
NB1	12290		
OB4	148800		

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TOTAL AREA		KING GEORGE VA.-MD. VIMS CHART # 065	
DENSITY 1 =	0	AA2	16380
DENSITY 2 =	4774	BA4	182800
DENSITY 3 =	0	CA3	109300
DENSITY 4 =	0	DA1	32870
TOTAL =	4774	EA4	167400
		FA1	13720
TAYLORS ISLAND MD. VIMS CHART # 062		TOTAL AREA	
AA3	53850	DENSITY 1 =	46590
BA2	92690	DENSITY 2 =	16380
CA4	15120	DENSITY 3 =	109300
		DENSITY 4 =	350200
TOTAL AREA		TOTAL = 522470	
DENSITY 1 =	0	DAHLGREN VA.-MD.	
DENSITY 2 =	92690	VIMS CHART # 066	
DENSITY 3 =	53850		
DENSITY 4 =	15120	AA4	17420
TOTAL =	161660	BA4	2085
		CA4	23880
GOLDEN HILL MD. VIMS CHART # 063		DA2	3980
		EA1	13270
		FA3	33590
AA1	3220	GA2	5090
BA4	3624	HA3	8709
CA2	8081	IA3	6657
DA3	8098	JA1	101300
EA4	1892	KA2	200800
		LA4	77270
TOTAL AREA		MA2	20080
		NA3	105900
		OA4	4869
DENSITY 1 =	3220	PA4	20670
DENSITY 2 =	8081	QA4	5946
DENSITY 3 =	8098	RA4	1737
DENSITY 4 =	5516		
TOTAL =	24915		

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TOTAL AREA		SOLOMONS ISLAND MD. VIMS CHART # 071	
DENSITY 1 =	114570	AA3	29600
DENSITY 2 =	229950		
DENSITY 3 =	154856		
DENSITY 4 =	153877	TOTAL AREA	
 TOTAL =	653253	DENSITY 1 =	0
COLONIAL BEACH NORTH, VA.-MD.		DENSITY 2 =	0
VIMS CHART # 067		DENSITY 3 =	29600
		DENSITY 4 =	0
AA4	41720	TOTAL =	29600
BA4	4236		
CA4	3206	BARREN ISLAND MD.	
DA4	6505	VIMS CHART # 072	
EA2	31340		
FA4	4524	AA4	5432
GA4	12440	BA2	92880
HA1	3306	CA4	109500
IA4	4469	DA2	10660
JA1	5695	EA2	35210
KA4	23600	FA2	109700
LA2	37660	GA4	360000
MA3	39220	HA2	81490
NA2	25900	IA4	2188000
OA4	31810	JA3	21380
PA3	5573		
QA2	3365	TOTAL AREA	
 TOTAL AREA		DENSITY 1 =	0
DENSITY 1 =	9001	DENSITY 2 =	329940
DENSITY 2 =	98265	DENSITY 3 =	21380
DENSITY 3 =	44793	DENSITY 4 =	2662932
DENSITY 4 =	132510	TOTAL =	3014252
 TOTAL =	284569		

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HONGA MD.		RB4	2213000
VIMS CHART # 073		SB2	95690
		TB2	108000
AA1	21280	UB4	161400
BA1	24030	VB2	20920
CA4	31640	WB4	307700
DA3	48440	XB2	20090
EA3	10260	YB4	2540
FA3	19810	ZB3	8118
GA2	13400	AC3	52680
HA3	42320	IA2	7906
JA3	9783		
KA3	22420	TOTAL AREA	
LA4	88690		
MA2	3104	DENSITY 1 =	45310
NA3	35820	DENSITY 2 =	1967502
OA4	180300	DENSITY 3 =	497949
PA2	30210	DENSITY 4 =	5224289
QA2	73200		
RA4	982800	TOTAL =	7735050
SA2	108100		
TA4	405400		
UA4	234100	WINGATE MD.	
VA3	2754	VIMS CHART # 074	
WA2	160900	AA4	7365
XA3	3324	BA4	4138
YA2	5834	CA4	306500
ZA3	2422	DA2	97020
AB2	7066	EA2	23270
BB3	3488	FA4	712800
CB3	17200	GA2	175600
DB4	3449	HA2	132700
EB2	16840	IA3	123400
FB2	230900	JA3	604900
GB4	518800	KA2	4722
HB2	1018000	LA4	86570
IB4	28980	MA3	1072000
JB4	65490	NA1	134000
KB3	16720	OA3	21120
LB3	66550	PA2	19440
MB2	41490	QA4	152400
NB3	69820	RA4	15100
OB2	5852		
PB3	51640		
QB3	14380		

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<b>TOTAL AREA</b>		<b>BLOODSWORTH ISLAND MD.</b> <b>VIMS CHART # 083</b>	
DENSITY 1 =	134000	AA3	4515
DENSITY 2 =	452752	BA2	11020
DENSITY 3 =	1821420	CA2	19330
DENSITY 4 =	1284873	DA2	10850
<b>TOTAL =</b>	<b>3693045</b>	EA4	410300
		FA4	33410
<b>NANTICOKE MD.</b> <b>VIMS CHART # 075</b>		GA2	91640
AA3	50160	HA4	2599000
		IA2	81040
		JA2	212200
		KA4	280900
<b>TOTAL AREA</b>		LA4	325600
DENSITY 1 =	0	MA4	730100
DENSITY 2 =	0	NA4	18230
DENSITY 3 =	50160	OA4	170400
DENSITY 4 =	0	PA4	8964
<b>TOTAL =</b>	<b>50160</b>	QA4	30070
		RA4	182300
		SA2	3699
		TA4	22070
<b>RICHLAND POINT MD.</b> <b>VIMS CHART # 082</b>		UA4	492900
AA3	44960	VA4	346100
BA4	181800	WA2	20610
CA2	11100	XA4	68680
DA2	2398	YA2	46340
<b>TOTAL AREA</b>		ZA4	635900
DENSITY 1 =	0	AB4	11420
DENSITY 2 =	13498	<b>TOTAL AREA</b>	
DENSITY 3 =	44960	DENSITY 1 =	0
DENSITY 4 =	181800	DENSITY 2 =	496729
<b>TOTAL =</b>	<b>240258</b>	DENSITY 3 =	4515
		DENSITY 4 =	6366344
		<b>TOTAL =</b>	<b>6867588</b>

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**DEAL ISLAND MD.  
VIMS CHART # 084**

AA4	17050	AA2	7580
BA2	2473	BA4	20830
CA3	8916		
DA3	8246	<b>TOTAL AREA</b>	
EA3	23400		
FA3	58760	<b>DENSITY 1 =</b>	0
GA3	37960	<b>DENSITY 2 =</b>	7580
HA3	9443	<b>DENSITY 3 =</b>	0
IA1	13850	<b>DENSITY 4 =</b>	20830
JA2	3203		
KA3	13000	<b>TOTAL =</b>	28410
LA2	26580		
MA3	10140		
NA3	19530	<b>KEDGES STRAITS MD.</b>	
OA4	21280	<b>VIMS CHART # 091</b>	
<b>TOTAL AREA</b>		AA4	64140
		BA2	51480
		CA4	158400
<b>DENSITY 1 =</b>	13850	DA4	3088000
<b>DENSITY 2 =</b>	32256	EA2	58690
<b>DENSITY 3 =</b>	189395	FA2	21090
<b>DENSITY 4 =</b>	38330	GA4	1315000
		HA3	92050
<b>TOTAL =</b>	273831	IA2	206900
		JA4	38010
<b>MONIE MD.</b>		KA4	426500
<b>VIMS CHART # 085</b>		LA4	4905
		MA3	10140
AA3	119900	NA4	414200
BA3	3758	OA4	675300
CA3	5515	PA4	21200
DA4	36250	QA4	382600
EA3	1363	RA4	383900
FA3	4492	SA3	17560
GA3	7098	TA3	12350
		UA1	68600
<b>TOTAL AREA</b>		VA4	128700
		WA4	97870
<b>DENSITY 1 =</b>	0	XA1	75360
<b>DENSITY 2 =</b>	0		
<b>DENSITY 3 =</b>	142126		
<b>DENSITY 4 =</b>	36250		
<b>TOTAL =</b>	178376		

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TOTAL AREA		PA4	233300
		QA1	28270
DENSITY 1 =	143960	RA3	31250
DENSITY 2 =	338160	SA2	10850
DENSITY 3 =	132100	TA4	4804
DENSITY 4 =	7198725	UA4	11110
		VA4	12500
TOTAL =	7812945	WA4	26660
		XA3	48670
TERRAPIN SAND POINT MD.		YA2	33700
VIMS CHART # 092		ZA4	21490
		AB2	43880
AA4	309000	BB4	67540
BA1	71770	CB2	15370
CA4	1683000	DB4	28640
DA4	62300	EB1	12430
EA4	7104	FB3	47200
FA4	49070	GB4	233700
		HB3	27700
TOTAL AREA		JB4	1312
		KB4	55910
DENSITY 1 =	71770	LB3	7328
DENSITY 2 =	0	MB2	14470
DENSITY 3 =	0	NB3	162100
DENSITY 4 =	2110474	OB2	17140
		PB4	37480
TOTAL =	2182244	QB4	5862
		RB3	58140
MARION MD.		SB2	17120
VIMS CHART # 093		TB3	76370
		UB2	8565
AA2	23220	VB2	8796
BA2	22050	WB4	2085
CA2	7401	XB3	10810
DA3	6181	IB4	15230
EA4	75060		
FA2	10480	TOTAL AREA	
GA3	21630		
HA3	18780	DENSITY 1 =	40700
IA4	4659	DENSITY 2 =	346132
JA2	47280	DENSITY 3 =	543699
KA4	56970	DENSITY 4 =	1067512
LA2	18050		
MA3	27540	TOTAL =	1998043
NA4	173200		
OA2	47760		

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EWELL MD.-VA.		GA4	609400
VIMS CHART # 099		HA4	67440
		IA1	74330
AA4	199400	JA4	187200
BA2	127500	KA4	2664000
CA4	128100	LA3	23700
DA2	21000	MA2	7925
EA4	857500	NA2	45240
FA2	226000	OA4	222400
GA4	276600	PA3	118000
HA2	53370	QA1	15160
IA3	361800	RA4	190500
JA2	91250	SA2	726900
KA3	50270	TA4	1294000
LA3	45580	UA4	7003
MA2	113600		
NA3	24350		TOTAL AREA
OA3	126400		
PA4	1905000	DENSITY 1 =	179130
QA3	440800	DENSITY 2 =	1034965
RA2	207600	DENSITY 3 =	375900
TA3	2803000	DENSITY 4 =	12228041
VA1	1775000		
WA2	4551	TOTAL =	13818035
SA4	13540000		
UA2	860600		

CRISFIELD MD.-VA.

VIMS CHART # 101

TOTAL AREA

DENSITY 1 =	1775000	AA4	558700
DENSITY 2 =	1705471	BA1	42720
DENSITY 3 =	3852200	CA4	36630
DENSITY 4 =	16906599	DA3	194600
		EA3	150200
		FA1	17310
TOTAL =	24239267	GA3	55340
		HA4	144600
GREAT FOX ISLAND MD.-VA.		IA4	94570
VIMS CHART # 100		JA3	15300
		KA3	21870
AA4	6694000	LA2	31900
BA2	254900	MA3	6044
CA1	89640	NA3	22620
DA4	173200	OA3	11210
EA3	234200	PA2	30550
FA4	118900	QA2	8145

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RA3	13460	REEDVILLE VA.
SA3	7024	VIMS CHART # 106
TA4	10650	
UA3	50370	AA4 2460
VA3	27120	BA4 39000
WA4	95440	CA2 32900
XA4	66350	DA2 9794
YA4	90700	EA3 8486
ZA3	22480	FA2 50330
AB4	27760	GA4 646900
BB4	29600	HA2 112700
CB3	17630	IA3 309300
DB3	24140	JA2 6411
EB3	52320	KA2 11160
FB4	9576	LA2 5044
GB3	8902	MA2 20270
HB3	24540	NA2 6466
		OA3 19580
TOTAL AREA		PA3 37670
		QA4 260300
DENSITY 1 =	60030	
DENSITY 2 =	70595	TOTAL AREA
DENSITY 3 =	725170	
DENSITY 4 =	1164576	DENSITY 1 = 0
TOTAL =	2020371	DENSITY 2 = 255075
		DENSITY 3 = 375036
		DENSITY 4 = 948660
SAXIS VA.-MD. VIMS CHART # 102		TOTAL = 1578771
AA3	4360	TANGIER ISLAND VA.
BA4	16420	VIMS CHART # 107
TOTAL AREA		AA3 518900
		BA4 1221000
DENSITY 1 =	0	CA2 175600
DENSITY 2 =	0	EA3 97470
DENSITY 3 =	4360	FA4 345900
DENSITY 4 =	16420	GA2 259000
TOTAL =	20780	HA4 147800
		IA2 58630
		JA2 298700
		KA4 1379000
		LA4 2458000

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TOTAL AREA		GB2	115000
		HB4	24300
DENSITY 1 =	0	IB1	337200
DENSITY 2 =	791930	JB4	710600
DENSITY 3 =	616370	KB4	86690
DENSITY 4 =	5551700	LB2	15450
		MB4	126300
TOTAL =	6960000	NB3	22100
		OB3	125400
CHESCONESSEX VA.		PB3	2375000

VIMS CHART # 108

		TOTAL AREA	
AA2	50740	DENSITY 1 =	901360
BA3	13530	DENSITY 2 =	916616
CA3	36190	DENSITY 3 =	3338120
DA4	151800	DENSITY 4 =	4565040
EA4	11770		
FA2	14400	TOTAL =	9721136
GA4	18310		
HA2	4456		
IA4	344800	PARKSLEY VA.	
JA1	42560	VIMS CHART # 109	
KA3	498500		
LA4	22070	AA4	6016
MA4	274200	BA4	26080
NA3	143500	CA4	10850
OA1	28050	DA3	23210
PA4	141000	EA4	6943
QA2	42950	FA4	10480
RA1	17950	GA2	31010
SA4	351000	HA4	29400
TA4	365900	IA4	5338
UA2	27300	JA4	75930
VA3	123900	KA4	19500
WA4	769000	LA3	138200
XA2	53720	MA2	12380
YA1	255400	NA2	16220
ZA4	495000	OA4	9009
AB2	228000	PA3	61930
BB2	210600	QA3	104100
CB4	464500	RA3	8405
DB2	154000	SA3	6580
EB1	220200	TA3	116300
FB4	207800	UA3	30680
		VA4	35800

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WA3	110800	HA1	51490
XA4	23450	IA4	10980
YA4	18390	JA2	44240
ZA3	13970	KA3	41670
AB3	2091000	LA3	32150
BB3	88910	MA3	12100
CB3	17900	NA3	58600
DB2	40210	OA3	17650
EB3	12940	PA3	7165
		QA4	20110
TOTAL AREA		RA2	3845
		SA3	9636
DENSITY 1 =	0	TA3	17000
DENSITY 2 =	99820	UA4	4420
DENSITY 3 =	2824925	VA3	11150
DENSITY 4 =	277186	WA3	37640
		XA3	124700
TOTAL =	3201931	YA3	68460
		ZA3	149900
URBANNA VA.		AB2	42030
VIMS CHART # 110		BB4	23550
		CB1	33150
AA2	314700	DB2	26880
BA2	664500	EB4	328000
CA2	845100	FB2	114900
DA3	157800		
EA3	24490	TOTAL AREA	
TOTAL AREA		DENSITY 1 =	130550
		DENSITY 2 =	465295
DENSITY 1 =	0	DENSITY 3 =	1403351
DENSITY 2 =	1824300	DENSITY 4 =	455120
DENSITY 3 =	182290		
DENSITY 4 =	0	TOTAL =	2454316
TOTAL =	2006590	FLEETS BAY VA.	
		VIMS CHART # 112	
IRVINGTON VA.		AA1	566500
VIMS CHART # 111		BA2	140200
		CA3	166400
AA3	17630	DA2	5851
BA4	46220	EA3	277500
CA4	21840	FA1	186000
DA3	145100	GA3	151900
EA1	45910		
FA2	233400		
GA3	652800		

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HA2	236500	NANDUA CREEK VA.
IA3	12490	VIMS CHART # 113
JA4	25650	
KA4	15650	AA2 41270
LA4	3872	BA3 114900
MA3	6048	CA4 313900
NA3	10540	DA2 698100
OA4	40770	EA1 298500
PA3	54840	FA4 591800
QA2	52250	GA4 3000
RA4	3355	HA4 110900
SA2	5777	IA1 14770
TA3	630400	JA3 5564
UA2	18900	KA2 74810
VA4	29560	LA4 147900
WA3	10740	MA1 1647000
XA3	7708	
YA3	4774	TOTAL AREA
ZA3	4005	
AB3	18650	<hr/> DENSITY 1 = 1960270
BB4	13640	DENSITY 2 = 814180
CB3	94040	DENSITY 3 = 120464
DB3	21970	DENSITY 4 = 1167500
EB2	194000	
FB3	75770	
GB1	40060	TOTAL = 4062414
HB1	23130	
IB3	63420	PUNGOTEAGUE VA.
JB3	3529	VIMS CHART # 114
KB3	35000	
LB4	9785	AA3 8515
MB3	38240	BA3 47600
NB3	41490	CA4 22880
OB3	4993	DA3 51420
		EA4 78350
		FA2 8481
TOTAL AREA		GA2 73980
		HA3 9935
DENSITY 1 =	815690	IA4 280700
DENSITY 2 =	653478	JA3 5078
DENSITY 3 =	1734447	KA1 141600
DENSITY 4 =	142282	LA4 3431000
		MA1 347900
TOTAL =	3345897	NA2 1503000
		OA2 55440
		PA4 24070

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QA4	58060	TOTAL AREA
RA1	58620	
SA4	210600	
TA2	98840	DENSITY 1 = 152100
UA1	63240	DENSITY 2 = 38690
VA3	150400	DENSITY 3 = 0
WA1	93650	DENSITY 4 = 0
XA4	20260	
YA1	16800	TOTAL = 190790
ZA4	33440	
AB4	5468	
BB4	7024	
CB3	66830	
DB3	115300	AA2 7081
EB4	66500	BA2 8705
FB4	55070	CA3 39600
GB1	110500	DA2 4737
HB3	73770	EA3 11440
IB1	25550	FA3 89210
JB4	20330	GA3 12220
KB4	46840	HA4 92140
LB3	14920	IA3 12020
MB4	94650	J42 62910
NB2	322500	KA2 30830
OB3	6605	LA2 59780
PB2	24930	
TOTAL AREA		
TOTAL AREA		
DENSITY 1 =	857860	DENSITY 1 = 0
DENSITY 2 =	2087171	DENSITY 2 = 174043
DENSITY 3 =	550373	DENSITY 3 = 164490
DENSITY 4 =	4455242	DENSITY 4 = 92140
TOTAL =	7950646	TOTAL = 430673
DELTAVILLE VA.		
VIMS CHART # 118		
SALUDA VA.		
VIMS CHART # 116		
AA2	38690	AA2 25650
BA1	40600	BA3 214900
CA1	97630	CA2 58490
DA1	13870	DA1 35930
		EA3 38710
		FA3 25700
		GA3 22860

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HA2	49570	TA4	23940
IA3	26760	UA3	52100
JA2	5014	VA2	215100
KA2	30670	WA4	169700
LA2	1730	XA2	72790
MA2	48890	YA4	270100
NA2	11550	ZA2	12990
OA1	145900	AB4	128200
PA2	12810	BB3	92030
QA4	2240	CB1	21480
RA3	34330	DB4	23470
SA4	9957	EB3	12310
TA4	8942	FB3	10010
		GB2	39210
TOTAL AREA		HB4	1492
		IB3	6619
DENSITY 1 =	181830	JB3	21950
DENSITY 2 =	244374	KB3	311000
DENSITY 3 =	363260		
DENSITY 4 =	21139	TOTAL AREA	
TOTAL =	810603	DENSITY 1 =	299980
JAMESVILLE VA.		DENSITY 2 =	1999938
VIMS CHART # 119		DENSITY 3 =	739782
		DENSITY 4 =	1924402
AA3	58160	TOTAL =	4964102
BA2	13120		
CA2	489400	WARE NECK VA.	
DA4	613700	VIMS CHART # 122	
EA2	111400		
FA4	167300	AA2	334700
GA2	9428	BA4	631800
HA2	66600	CA3	195800
IA3	22760	DA3	39550
JA3	10940	EA3	146400
KA3	3663	FA3	81620
LA3	27670	GA2	160000
MA3	79230	HA2	267100
NA3	31340	IA4	410000
OA2	797600	JA3	365300
PA4	125200	KA2	53620
QA1	278500	LA2	25720
RA2	172300	MA3	69150
SA4	401300		

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TOTAL AREA		FRANKTOWN VA. VIMS CHART # 124	
DENSITY 1 =	0	AA2	5040
DENSITY 2 =	841140	BA4	109200
DENSITY 3 =	897820	CA2	59590
DENSITY 4 =	1041800	DA3	30220
TOTAL =	2780760	EA2	50850
		FA4	805600
MATHEWS VA.		GA1	20000
VIMS CHART # 123		HA4	26690
		IA4	88450
AA2	13290	JA4	96650
BA4	237400	KA2	18600
CA4	145500	LA4	255900
DA3	46710	MA2	132800
EA4	47840	NA2	92840
FA2	29460	OA2	63280
GA1	22170	PA3	1511000
HA3	8706	QA2	45560
IA2	13140	RA4	65310
JA3	5203	SA2	60570
KA3	19690	TA3	76640
LA4	12680	UA3	5137
MA4	12700	VA3	232700
NA2	6404	WA4	72760
OA4	15440	XA4	24360
PA2	42850	YA4	72710
QA3	118700	ZA4	11410
RA3	36840	AB3	53250
SA3	37510	BB3	15650
TA3	9316	CB4	6548
UA4	166100	DB3	88610
VA4	45110	EB3	49850
WA2	9052	FB2	16430
		GB2	27050
		HB3	67280
TOTAL AREA			

		TOTAL AREA	
DENSITY 1 =	22170	DENSITY 1 =	20000
DENSITY 2 =	114196	DENSITY 2 =	572610
DENSITY 3 =	282675	DENSITY 3 =	2130337
DENSITY 4 =	682770	DENSITY 4 =	1635588
TOTAL =	1101811	TOTAL =	4358535

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ACHILLES VA.		SB2	185400
VIMS CHART # 131		KA4	1062000
		NA3	87160
AA1	13960		
BA4	29120	TOTAL AREA	
CA4	45910		
DA2	13340	DENSITY 1 =	75780
EA4	38660	DENSITY 2 =	1987699
FA2	16460	DENSITY 3 =	121150
GA4	1055000	DENSITY 4 =	7394438
HA2	196700		
IA2	65780	TOTAL =	9579066
JA4	38250		
LA2	209200	NEW POINT COMFORT VA.	
MA2	57460	VIMS CHART # 132	
OA4	60550		
PA4	5308	AA2	63860
QA4	403300	BA2	272700
RA2	368200	CA2	184800
SA4	373400	DA3	267900
TA1	22550	EA2	188500
UA4	201600	FA2	87100
VA2	391600	GA4	3875000
WA4	825500	HA4	445500
XA2	168200	IA1	73870
YA4	22940	JA2	255100
ZA1	39270	KA3	127300
AB2	134900	LA4	210200
BB4	33730	MA2	557600
CB4	4800	NA4	433000
DB4	212300	OA2	98650
EB3	18220	PA4	53660
FB2	15400	QA4	193200
GB4	21290	RA2	660100
HB4	234300	SA1	120500
IB2	32790	TA4	1022000
JB4	2102000	UA4	25310
KB2	110800	VA1	61620
LB4	17670	WA4	1357000
MB4	12210	XA2	368600
NB2	17880	YA4	6583
OB3	15770	ZA3	59260
PB2	3589	AB2	505100
QB4	38400	BB4	852700
RB4	556200	CB2	72750

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DB2	22850	CHERITON VA.
EB3	37250	VIMS CHART # 134
FB4	88580	
GB4	1165	AA2 60870
HB4	88590	BA4 159700
		CA1 140100
TOTAL AREA		DA4 261100
		EA2 104000
		FA4 6321
DENSITY 1 =	255990	
DENSITY 2 =	3337710	TOTAL AREA
DENSITY 3 =	491710	
DENSITY 4 =	8652486	
TOTAL =	12737896	DENSITY 1 = 140100
CAPE CHARLES VA.		DENSITY 2 = 164870
VIMS CHART # 133		DENSITY 3 = 0
		DENSITY 4 = 427121
		TOTAL = 732091
AA4	17240	
BA2	175600	YORKTOWN VA.
CA4	86760	VIMS CHART # 139
DA4	637300	
EA2	101500	AA3 3292
FA2	115400	BA2 12530
GA4	84660	
HA4	24910	TOTAL AREA
IA4	22580	
JA4	8764	
KA4	572900	DENSITY 1 = 0
LA1	810600	DENSITY 2 = 12530
MA3	58420	DENSITY 3 = 3292
		DENSITY 4 = 0
TOTAL AREA		TOTAL = 15822
DENSITY 1 =	810600	POQUOSON WEST VA.
DENSITY 2 =	392500	VIMS CHART # 140
DENSITY 3 =	58420	
DENSITY 4 =	1455114	AA4 4441
TOTAL =	2716634	BA4 19470
		CA4 18750
		DA4 105400
		EA2 412200
		FA4 500700
		GA3 88830

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HA2	24500	TOTAL AREA
IA4	113200	
JA2	22100	DENSITY 1 = 0
KA2	18120	DENSITY 2 = 1885343
LA4	31700	DENSITY 3 = 1626370
MA1	30840	DENSITY 4 = 6437181
NA4	127500	
OA2	345600	TOTAL = 9948894
PA3	478500	
QA4	82000	ELLIOTTS CREEK VA.
RA4	469800	VIMS CHART # 142
SA3	107100	
TA2	158700	AA2 93040
UA3	226400	BA1 47130
VA4	659400	CA3 18810
WA3	38120	
XA3	6719	
YA1	29900	TOTAL AREA
<hr/>		
TOTAL AREA		DENSITY 1 = 47130
		DENSITY 2 = 93040
DENSITY 1 =	60740	DENSITY 3 = 18810
DENSITY 2 =	981220	DENSITY 4 = 0
DENSITY 3 =	945669	
DENSITY 4 =	2132361	TOTAL = 158980
<hr/>		
TOTAL =	4119990	TOWNSEND VA.
		VIMS CHART # 143
POQUOSON EAST VA.		AA2 3655
VIMS CHART # 141		BA3 16520
		CA3 50430
AA2	2443	DA3 54930
BA4	6511	
CA4	8614	
DA4	17730	TOTAL AREA
EA3	21540	
FA3	1560000	DENSITY 1 = 0
GA4	5084000	DENSITY 2 = 3655
HA2	850700	DENSITY 3 = 121880
IA3	44830	DENSITY 4 = 0
JA4	465800	
KA2	178500	TOTAL = 125535
LA2	853700	
MA4	852300	
NA4	2226	

HAMPTON VA.  
VIMS CHART # 147

TOTAL AREA

AA4	371000	DENSITY 1 =	0
BA4	9173	DENSITY 2 =	196250
CA4	559900	DENSITY 3 =	168375
DA3	358400	DENSITY 4 =	0
EA2	222700		
FA2	294100	TOTAL =	364625
GA4	55540		
HA4	385800	PORT TOBACCO MD.	
IA4	82250	VIMS CHART # 161	
JA4	379400		
KA2	50800	AA1	32250
LA4	124400	BA4	71490
MA4	108400	CA2	3318
NA4	38600	DA4	6735
		EA2	2848
		FA4	2469
		GA2	1795
<b>TOTAL AREA</b>			

DENSITY 1 =	0
DENSITY 2 =	567600
DENSITY 3 =	358400
DENSITY 4 =	2114463
<b>TOTAL =</b>	<b>3040463</b>

TOTAL AREA

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

CAPE HENRY VA.  
VIMS CHART # 152

TOTAL = 120905

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

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	AA3	2800000
		BA3	136500
TOTAL AREA		CA4	15750
		DA3	1213000
DENSITY 1 =	0	EA4	20560
DENSITY 2 =	0	FA3	226200
DENSITY 3 =	34490	GA4	235600
DENSITY 4 =	0	HA3	672600
		IA4	8352
TOTAL =	34490	JA3	81580
		KA1	98950
TINGLES ISLAND MD.		LA4	860500
VIMS CHART # 170		MA1	131400
		NA4	38020
AA3	630700	TOTAL AREA	
BA1	365500	DENSITY 1 =	230350
CA3	3973000	DENSITY 2 =	0
DA3	53060	DENSITY 3 =	5129880
EA3	304100	DENSITY 4 =	1178782
FA3	58650		
GA3	294900		
HA3	1246000		
IA3	20750	TOTAL =	6539012
JA3	522800		
KA1	36380	WHITTINGTON POINT MD.-VA.	
LA3	300600	VIMS CHART # 173	
MA3	4506		
NA4	173800	AA4	275000
OA4	54720	BA4	12940
PA4	65050	CA4	17640
QA4	104300	DA3	12130
		EA3	121900
TOTAL AREA		FA3	112400
		GA3	82370
DENSITY 1 =	401880	HA3	104200
DENSITY 2 =	0	IA2	134500
DENSITY 3 =	7409066	JA3	19120
DENSITY 4 =	397870	KA2	114000
		LA4	170900
TOTAL =	8208816	MA1	169000
		NA4	265300
		OA1	6332

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**TOTAL AREA**

DENSITY 1 =	175332
DENSITY 2 =	248500
DENSITY 3 =	452120
DENSITY 4 =	741780
<b>TOTAL =</b>	<b>1617732</b>

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
<b>TOTAL =</b>	<b>6656620</b>

## 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 BA4	Cd,Hv,Ms Cd,Ms	CAPT./CIT. CAPT./CIT.	8-14/NO DATE 8-14/NO DATE
2	-	BA2	Cd,Ms	CAPT./CIT.	8-14/NO DATE
2	-	CA3	Cd	CAPT.	8-14
2	-	DA3	Cd	CAPT.	8-14
2	-	EA3	Cd	CAPT.	8-14
2	-	FA3	Cd	CAPT.	8-14
3	CA1 DA1	AA3 BA3 CA3	Ms/Ms Ms/Ms Cd	SK/CIT. SK/CIT. CAPT.	NO DATE/NO DATE NO DATE/NO DATE 8-14
3	-	DA3	Cd,Ms	CAPT./CIT.	8-14/NO DATE
3	-	EA3	Cd	CAPT.	8-14
3	-	HA4	Cd,Hv	CAPT.	8-14
3	-	IA4	Hv,Ms,Cd/Hv	SK/CAPT.	NO DATE/8-14
3	-	JA4	Hv,Ms,Cd/Cd	SK/CAPT.	NO DATE/8-14
3	-	KA2	Ms/Cd	SK/CAPT.	NO DATE/8-14
3	-	LA4	Va,Ms/Hv,Va	SK/CAPT.	NO DATE/8-14
3	-	GA2	Hv,Ms,Cd,Ms	SK/CAPT./CIT.	NO DATE/8-14/9-29
3	-	JA2	Hv,Ms,Cd,Ms	SK/CAPT./CIT.	NO DATE/8-14/9-29
3	-	HA1,IA2	Ms/Cd	CAPT./CIT.	8-14/9-29
3	-	HA1	Va,Ms/Hv,Va	SK/CIT.	NO DATE/9-29
3	-	KA1	Ms,Va,Hv,Cd,Ms	SK/CIT.	NO DATE/9-29
3	-	KA2	Ms,Va,Hv,Cd,Ms	CIT.	9-29
3	-	LA4	Cd,Ms	SK/CIT.	NO DATE/9-29
3	-	MA2	Ms,Va,Hv/MS	SK/CIT.	NO DATE/9-29
3	-	NA2	Ms,Va,Hv/MS	CAPT./CIT.	8-14/9-29
3	-	NA2	Ms	CIT.	9-29
3	-	PA2	Ms,Va,Hv/MS	SK/CIT.	NO DATE/9-29
3	-	PA4	Ms	CIT.	9-29
3	-	QA2	Ms,Va,Hv/MS	SK/CIT.	NO DATE/9-29
3	-	RA2	Ms,Va,Hv/MS	CAPT./CIT.	NO DATE/9-29
3	-	PA2	Hv,Ms	CAPT./CIT.	8-14/9-29
3	-	QA4	Ms,Cd,Ms	SK/CAPT./CIT.	NO DATE/8-14/9-29
3	-	TA4	Ms,Hv,Cd,Ms	SK/CAPT./CIT.	NO DATE/8-14/9-29
3	-	UA4	Ms,Hv,Cd,Ms	SK/CAPT./CIT.	NO DATE/8-14/9-29
3	-	RA2	Hv,Ms	CAPT./CIT.	8-14/9-29
3	-	OB3	Ms,Cd,Ms	CAPT./CIT.	NO DATE/8-14/9-29
3	-	SA3	Ms,Hv,Cd,Ms	SK/CAPT./CIT.	NO DATE/8-14/9-29
3	-	WA4	Ms,Hv,Cd,Ms	SK/CAPT./CIT.	NO DATE/8-14/9-29
3	-	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.	8-14/9-4
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	SK/CAPT.	8-14
3	KB2	WB2	Ms,Cd/Cd,Ms	NO DATE/8-14/NO DATE	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 #	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	7-23	
4	FA2,GA2		Ms		NO DATE
4	Old Field Point #	EA2	Ms		NO DATE
4		BA2	Ms		NO DATE
4		CA3	Ms		NO DATE
4	DA1	DA3	Ms		NO DATE
4	-	CD	Cd		7-23
4		EA2	Cd		NO DATE
4	AA1		Ms		NO DATE
4	CA1		Ms		NO DATE
4	DA1		Ms		NO DATE
4	EA2		Ms,Va		NO DATE
4	FA2		Ms,Va		NO DATE
4	GA2		Ms,Va		NO DATE
4	BA1		Ms		NO DATE
4	Old Field Point #		Ms		NO DATE
5	BA2	AA2	MS,Va/MS	SK/CIT.	NO DATE/NO DATE
5			MS	CIT.	NO DATE

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
7	-	BA3	Cd	CAPT.	8-14
9	Elk River #	AA3 AA2 AA2	Ms Cd Cd	CIT. CAPT. CAPT.	NO DATE NO DATE NO DATE
9	-	DA3	Ms	CAPT.	NO DATE
9	BA2	EA2	Ms	CAPT.	NO DATE
9	-	FA3	Cd	CAPT.	NO DATE
9	FA2,DA1,EA1,GA2	JA1 HA3 IA3	Cd	CAPT.	NO DATE
9	GA2	HA3	Ms,Va	STAN KOLLAR	NO DATE
9	FA2	IA3	Cd	STAN KOLLAR	NO DATE
9	AA2	JA1	Ms,Va	STAN KOLLAR	NO DATE
9	CA2	IA3	Cd	STAN KOLLAR	NO DATE
9	EA1	HA3	Va,Ms,Cd	STAN KOLLAR	NO DATE
9	FA2	HA3	Ms	STAN KOLLAR	NO DATE
9	GA2	HA1	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	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	HA3	HA3	Cd	CAPT.	8-14
14	CA2	VA3	Ms,Cd	CAPT.	NO DATE
14	NA3	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		STAN KOLLAR	NO DATE
15	CA2		Ms	STAN KOLLAR	NO DATE
15	DA1		Ms	STAN KOLLAR	NO DATE
			Ms	STAN KOLLAR	NO DATE
16	AA2		Va	STAN KOLLAR	NO DATE
16	BA2		Va	STAN KOLLAR	NO DATE
17	AA3			STAN KOLLAR	NO DATE
17	BA2		Ms,Va,Pcr	STAN KOLLAR	NO DATE
			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		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	FWS	9-6
26		-	SB4	FWS	9-6
26		MA3	QB3	CIT./FWS	10-13/9-6
26		LA4,KA4	RB4	FWS	9-6
26		-	OB3	FWS	9-6
26		QA1,MA3	PB2	FWS	9-6
26		QA1	MB3	FWS	9-6
26		TA4,VA3,UA3	LB2	CIT./FWS	10-13/8-30
26		SA1	KB2	FWS	9-6
26		-	Rm	FWS	8-30
26		JB4	Ec,Ppf,Rm	FWS	8-30
26		-	Rm	FWS	8-30
26		FB3	Ec,Ms	FWS	7-25
26		-	Ec,Rm	FWS	7-25
26		XA2	Ppc,Rm	FWS	7-25
26		-	Ppf,Rm	CIT.	9-10
26		VA4	Ms,Ppf	CIT.	9-30
26		-	Ms,Ppf	NO DATE	NO DATE
26		UA2	Rm	FWS	NO DATE
26		GA3	Ppf	FWS	NO DATE
26		HA1			
26		IA3			

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	CIT.	8-13
33		-	ZA4	CIT.	NO DATE
33		JA2	Ppc	CIT.	
33		-	Rm	CIT.	8-13
33		AB2	Ppc	CIT.	
33		-	Rm	CIT.	7-4
33		BB2	Rm	CIT.	7-4
33		-	Rm	CIT.	7-4
33		EB3	Rm	CIT.	7-4
33		-	Rm	CIT.	7-4
33		FB3	Rm	CIT.	7-7
33		-	Rm	CIT.	
		GB2			
34			WA4	Hv	7-28
34		HB2	WA4	Ms, Hv	7-28
34		HB2	WA4	Ms, Hv	7-28
34		MA2	JA3	Hv, Va	7-28
34		NA3		Hv	7-28
34		OA2	KA2	Hv, Va	7-28
34		QA2		Hv, Zp, Ngu	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	7-29	
36	Broad Creek #			Ppc	7-29	
36	QA4			Ppc	7-29	
36	PA4			Ppc	7-29	
36	Broad Creek #			Ppc	NO DATE	
36	NA3			Ppc	7-29	
36	TA4,UA4			Ppc	7-29	
36	JB3			Rm	NO DATE	
36	JB3			Rm	NO DATE	
36	Broad Creek #			Ppc	NO DATE	
36	Broad Creek #			Ppc	NO DATE	
37	Miles River #		U	CIT.	8-7	
37	Miles River #		Rm	CIT.	8-7	
39	AA2	AA2		Ms	8-13	
39	BA4	BA2		Ms	8-13	
39	CA4	CA2		Va	8-13	
39	Gunston Manor #			Va	8-13	
39	DA3	DA2		Va	8-13	
39	Gunston Manor #			Ms,Va	8-13	
39	EA3	EA3		Ms	8-13	
39	Gunston Hall #			Hd,Ms,Va	8-13	
39	Accotink Bay #			Cd	8-13	
39	IA4	FA2		Ms	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	RA2	SA3	Hv	USGS/CIT.	7-28/8-29
40	QA4	NA2	Ms/Hv	CIT.	8-29
40	NA2	MA4	Hv	CIT.	8-29
40	KA4	KA4	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	-	IA4	Hv,Ms	CIT.	8-29
40	FA4	IA4	Hv,Ms,Cd	CIT.	8-29
40	HA4	IA4	Hv,Ms,Va,Cd	CIT.	8-29
40	IA2	IA4	Hv,Ms,Va,Cd	CIT.	8-29
40	JA4	KA4	Ms,Va,Hv,Ppu	CIT.	8-29
40	JA4	MA4	Hv	USGS	7-28
40	CA4				

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	Hv,Hv,Va	USGS	7-28
40	BA4	FA1	Ms,Ms,Va,Nm	USGS	7-28
40	BA4	FA1	Hv,Va,Ms	USGS	7-28
40	BA4	GA4	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	CA2		YA2	Rm	8-22
43	CA2		XA3	Rm	8-22
43			WA3	Rm	8-23
43			UA2	Rm	8-23
43	-		RA2	Rm	9-21
43	-		PA4	Rm	9-20
43	GA2		MA2	Rm	9-20
43	LA2		LA2	Rm	9-20
43	OA1		GA3	Rm	9-21
43	PA3		FA4	Rm	9-21
43			EA2	Rm	9-21
43	-		DA4	Rm	9-20
43	QA3		CA3	Rm	NO DATE
43	QA3		AA2	Rm	NO DATE
43	CA2		CA2	Rm	COURT STEVENSON
					COURT STEVENSON

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
44	-	DA3 CA3 DA3	Rm Rm Rm	CAPT. CAPT. COURT STEVENSON	10-12 10-12 NO DATE
44	AA3			CIT. CIT.	11-14 11-14
44					
47	Neabsco Creek # Quantico Creek #		Cd,Hv Cd,Va	CIT.	JULY-OCT.
47					JULY-OCT.
48	Mattawoman Creek #	CA3 DA2	Cd,Hv Cd,Hv Cd,Hv Cd,Ms Cd,Ms	CIT. CIT. CIT. CIT. CIT.	JULY-OCT. JULY-OCT. JULY-OCT. JULY-OCT. JULY-OCT.
48	NA4		Ms,Cd,Va,Hv Ngu,Ms,Hv,Va,Cd	USGS USGS	7-28 10-12
48	NA4	DA2	Hv,Cd,Ms,Va,Ngu Hd,Va,Cd,Hv	USGS USGS	7-28 7-28
48	Tidal Flats #		Nm,Va,Hd,Hv,Ms,Cd	USGS	7-28
48	Foul Area Piling #		Hd,Cd,Hv,Va	USGS	7-28
48	AA2	AA2	Ms	USGS	10-12
48	AA2	BA4	Ppu,Hd,Ms,Va,Cd,Hv Va,Hv,Nm	USGS USGS	7-28 7-28
48	BA4		Hv,Va,Nm,Ms	USGS	7-28
48	AA2		Ms,Hd,Cd,Hv	USGS	7-28
48	CA1		Ms,Hd,Cd,Hv	USGS	7-28
48	CA1		Ms,Hv	USGS	7-28
48	CA1		Ms,Hv	USGS	7-28
48	EA1		Hv	USGS	7-28
48	EA4		Hv,Ms,Va	USGS	7-28
48	EA4				
48	GA3				
48	NA4	CA3 DA2			
48	NA4				
48	NA4				
48	OA1				
48	OA1				
48	OA1				
48	PA4				

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
48	PA4		V <sub>a</sub> ,H <sub>d</sub> ,H <sub>v</sub> ,C <sub>d</sub> ,M <sub>s</sub>	USGS	7-28
48	PA4		H <sub>v</sub> ,M <sub>s</sub> ,H <sub>d</sub> ,C <sub>d</sub>	USGS	7-28
48	PA4		H <sub>v</sub> ,M <sub>s</sub> ,H <sub>d</sub> ,C <sub>d</sub>	USGS	7-28
48	FA4		H <sub>v</sub>	USGS	7-28
48	Indian Head #		H <sub>d</sub> ,H <sub>v</sub> ,V <sub>a</sub> ,M <sub>s</sub> ,C <sub>d</sub>	USGS	7-28
48	QA3	FA3	H <sub>v</sub>	USGS	7-28
48	QA3	GA2	H <sub>v</sub>	USGS	7-28
48	QA3		V <sub>a</sub> ,M <sub>s</sub> ,H <sub>v</sub> ,H <sub>d</sub> ,C <sub>d</sub>	USGS	7-28
48	RA4	HA2	V <sub>a</sub> ,M <sub>s</sub> ,H <sub>v</sub> ,C <sub>d</sub>	USGS	7-28
48	RA4	IA1	C <sub>d</sub> ,V <sub>a</sub> ,H <sub>d</sub> ,H <sub>v</sub> ,M <sub>s</sub>	USGS	7-28
48	SA2		V <sub>a</sub> ,C <sub>d</sub> ,M <sub>s</sub> ,H <sub>v</sub>	USGS	7-28
48	TA4	LA4	H <sub>v</sub> ,M <sub>s</sub>	USGS	7-28
48	TA4	MA3	H <sub>d</sub> ,H <sub>v</sub> ,M <sub>s</sub> ,V <sub>a</sub>	USGS	7-28
48	TA4	MA3	C <sub>d</sub> ,V <sub>a</sub> ,H <sub>v</sub> ,M <sub>s</sub>	USGS	7-28
48	Chapman Point #		H <sub>v</sub> ,M <sub>s</sub> ,V <sub>a</sub> ,C <sub>d</sub>	USGS	7-28
49	Kennedy Run #		Zp	CIT.	8-29
49	Deep Landing #		Ec,Zp	CIT.	8-29
51		-	AA3	Rm	9-1
51		-	KA4	Rm	9-17
51		-	IA3	Rm	9-1
51		-	HA3	Rm	9-1
51		-	GA3	Rm	9-1
51		-	FA3	Rm	9-1
51		-	DA3	Rm	9-1
51		-	EA3	Rm	9-1
51		-	NA2	Rm	8-29/8-12
			EA3	CAPT./CIT.	

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	FA3	Rm	COURT STEVENSON	NO DATE
51	FA3	FA3	Rm	COURT STEVENSON	NO DATE
51	GA3	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
		Casson Point #			Ppc	CIT.	NO DATE
55	55	CA4				USGS	10-12
55	55	GA1	Hv			USGS	10-12
55	55	Potomac-Brent Pt. #		AA4	Cd,Ms	USGS	10-12
55	55			BA2	Cd,Ngu,Ms	USGS	10-12
55	55	HA4			Cd,Ngu,Ms	USGS	10-12
55	55	HA4			Cd,Ngu,Ms	USGS	10-12
55	55	HA4			Ms,Cd	USGS	10-12
55	55	MA4	Hv			USGS	10-12
56	56	LA4		FA4	Ms,Cd	USGS	8-15
57	57	HB4		DB4	Cd,Ms,Rm,Va	FWS	9-20
57	57	HB4		DB4	Va,Ppf	USGS	8-15
57	57	AB4		LB4	Ms,Ppf,Va	FWS	9-20
57	57	TB4			Ppf,Va	FWS	9-20
57	57	UB3,VB4		QB3	Ms,Ppf,Va	FWS	9-20
57	57	UB3		QB3	Va	USGS	8-15
57	57	VB4		QB3	Va,Ppf	USGS	8-15
57	57			IB4	Va,Ms,Va	USGS/FWS	8-15/9-20
57	57	OB4				FWS	9-20
57	57	NB1		HB3		USGS/FWS	8-15/9-20
57	57	MB4		GB4	Va,Rm,N,Ppc/Va	USGS/FWS	8-15/9-20
57	57	LB4		FB4	Va,Ms/Ms	USGS/FWS	8-15
57	57	JB4		FB4	Ms,Cd	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 #			CIT.	7-21
69	Brenton Bay #			CIT.	7-21
69	Brenton Bay #			CIT.	7-21
69	Brenton Bay #			CIT.	7-21
69	Brenton Bay #			CIT.	7-21
69	Brenton Bay #			CIT.	7-21
69	Brenton Bay #			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	WB2	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	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 CA4	BA3 AA4 VA4	Rm Rm Rm	CAPT. CAPT. CAPT.	NO DATE NO DATE NO DATE
74	-				
74					
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 CA2	BA3 AA1 DA2 EA4	Rm Rm Rm Rm	CAPT. CAPT. CAPT. CAPT.	NO DATE NO DATE NO DATE NO DATE
82	-				
82	-				
82	-				
83	-	CB3 BB4 AB4 WA2,XA4	Rm Rm Rm Rm	CAPT. CAPT. CAPT. CAPT.	NO DATE NO DATE NO DATE NO DATE
83	AB4	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	ZB4	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	PA4	Rm	CAPT.	NO DATE
99	PA4	PA4	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		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	DA4	Rm	CIT.	AUG.
100	GA4		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,RA4	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,BA1,CA4	AA4	AA4	CAPT.	NO DATE
101		BA2	BA2	CAPT.	NO DATE
101		CA3	CA3	CAPT.	NO DATE
101		DA3	DA3	CIT.	NO DATE
101		DA3	Zm	CAPT.	NO DATE
101		NA3	DA3	CAPT.	NO DATE
101		EA2	EA2	CAPT.	NO DATE
101		PA2	GA2	CAPT.	NO DATE
101		OA3	FA4	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 #			CIT.	NO DATE
101	RA3,SA4			CIT.	NO DATE
101	UA3	HA3	Rm	CAPT.	NO DATE
101	WA4	IA4	Rm	CAPT.	NO DATE
101	WA4			CIT.	NO DATE
101	XA4			CIT.	NO DATE
101	YA4			CIT.	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	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	6-21
111	AA3		Rm	VIMS	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 CA3 TA3	Rm Rm Rm	CIT. CIT. CIT.	9-2 9-2 9-2
112	CA3				
112	QA2				
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 Rm	VIMS/CIT. VIMS	6-22/10-28 8-9
117	Roand Point #				
117	AA2	BA2	Rm	VIMS	8-9
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	FA3		Zm	VIMS	6-14/6-20/6-23
117	Parrot Island #				
117	HA4	IA2	Zm,Rm	VIMS	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	Zm/Zm	VIMS/CIT.	3-20/3-JULY-SEPT.
131		CA4	Zm/Zm	VIMS/CIT.	3-20/3-JULY-SEPT.
131		DA2,EA4	Zm	CIT.	JULY-SEPT.
131		FA2,GA4	Zm	CIT.	JULY-SEPT.
131		GA4,IA2,HA2	DA2	CIT.	JULY-SEPT.
131			EA4	CIT.	JULY-SEPT.
131		GA4	EA4	VIMS	5-18
131		GA4,HA2	FA2	CIT.	JULY-SEPT.
131			GA4	CIT.	JULY-SEPT.
131		KA4	IA4	CIT.	JULY-SEPT.
131			JA2	CIT.	JULY-SEPT.
131		KA4	KA4	VIMS/CIT.	5-18/6-1/JULY-SEPT.
131			LA2	CIT.	JULY-SEPT.
131		MA2,LA2,KA4	MA4	CIT.	JULY-SEPT.
131			QA2	CIT.	JULY-SEPT.
131		KA4	NA3	CIT.	JULY-SEPT.
131			KA4	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			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	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					NO DATE
159					NO DATE
					Cd,Ec,Per,N
					Va,Cd,Zp,Per
					Patuxent River #
					Patuxent River #

QUAD.	1989 BED	1987 BED	SPECIES**	SOURCE ***	1989 SURVEY DATE
159	Patuxent River #	Cd,Ec,Per,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,Per,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 BA4	Zm Zm	CIT. CIT.	NO DATE NO DATE
168	-	AA3 BA4	Zm Zm	CAPL./CIT. CIT.	NO DATE/9-11 9-11
170	CA3	AA3	Rm,Zm	CAPL./CIT.	NO DATE/9-11
170	EA3	BA4	Rm,Zm	CAPL./CIT.	9-11
170	GA3	DA3	Rm,Zm	CAPL./CIT.	NO DATE/NO DATE
170	JA3	EA3	Rm,Zm	CAPL./CIT.	NO DATE/9-11
170	NA4	FA4	Rm,Zm	CIT.	9-11
170	LA3	GA4	Rm,Zm	CAPL./CIT.	NO DATE/9-11
170	LA3	HA4	Rm,Zm	CAPL./CIT.	NO DATE/9-11
172	AA3	AA3	Rm	CAPT.	NO DATE
172	BA3	BA4	Rm	CAPT.	NO DATE
172	DA3	CA3	Rm,Zm	CAPL./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.