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Distribution of Submerged Aquatic Vegetation in the Chesapeake Bay and Tributaries and Chincoteague Bay - 1990

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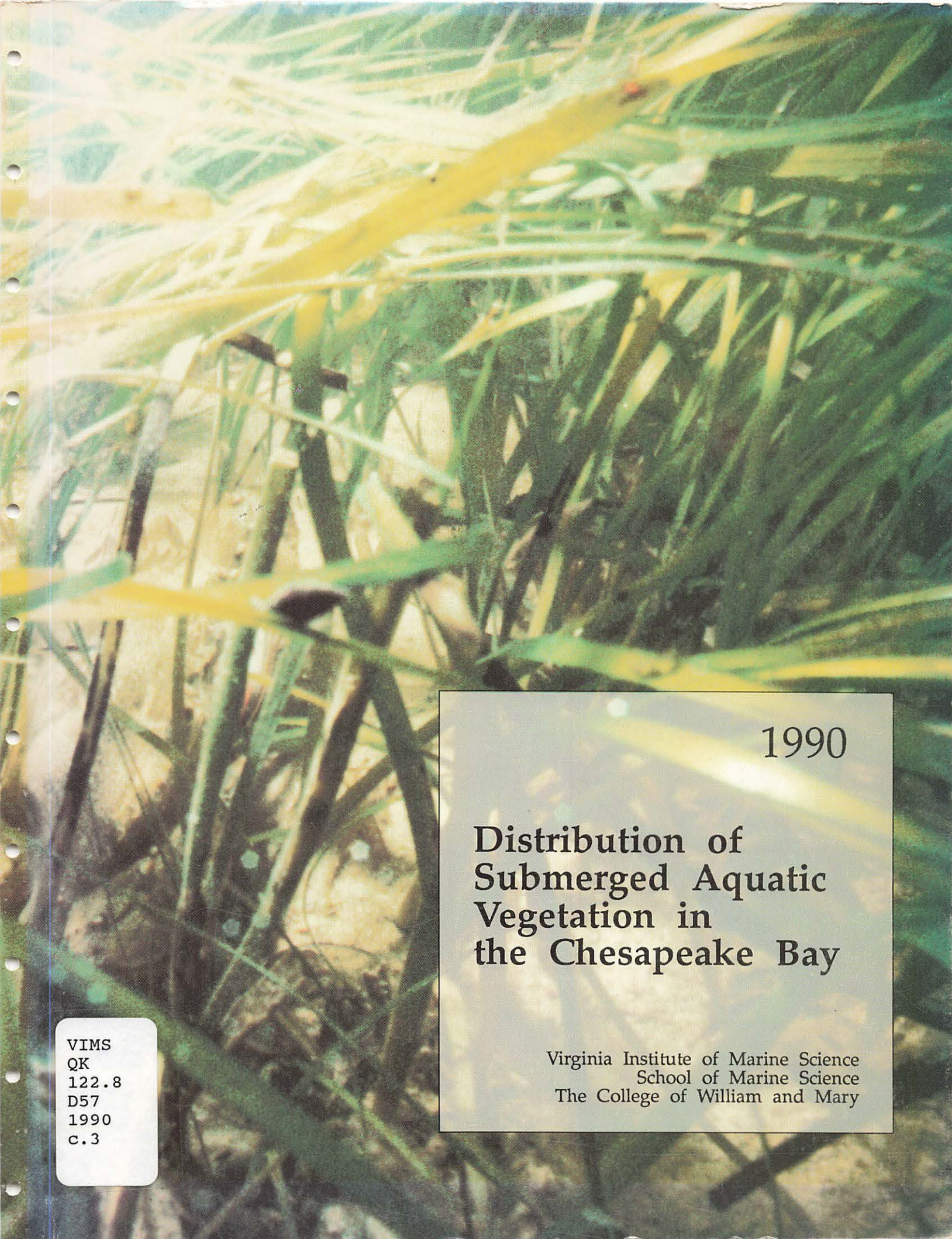


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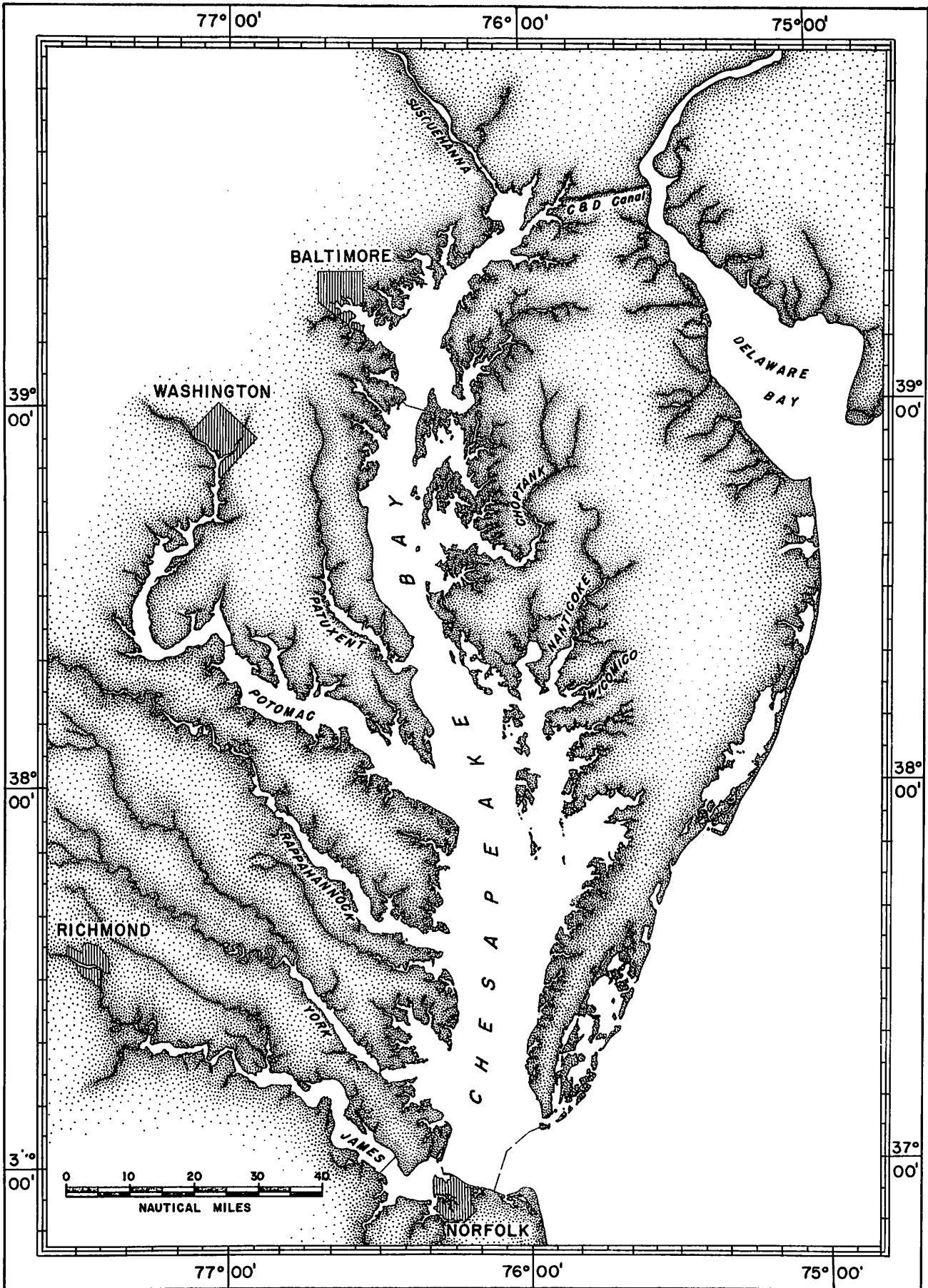


1990

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the Chesapeake Bay**

Virginia Institute of Marine Science
School of Marine Science
The College of William and Mary

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**Distribution of Submerged Aquatic Vegetation in
the Chesapeake Bay and Tributaries and Chincoteague Bay - 1990**

by

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Cover Photograph: Eelgrass (*Zostera marina*) beds with blue crab (*Callinectes sapidus*) in lower York River, Virginia. (Photograph by Curtis Harper, Virginia Institute of Marine Science, School of Marine Science, College of William and Mary.)

Inside Cover: Map of the Chesapeake Bay and tributaries.

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EXECUTIVE SUMMARY

The distribution of submerged aquatic vegetation, principally rooted vascular macrophytes, in the Chesapeake Bay, its tributaries, and Chincoteague Bay was mapped during May to October 1990 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. Fish and Wildlife Service, the University of Maryland Horn Point Environmental Laboratories, the Metropolitan Washington Council of Governments, Maryland-National Capital Parks and Planning Commission - Patuxent River Park, the Maryland Department of Natural Resources, Harford Community College, Essex Community College SAV Research Group of Baltimore County, and the College of William and Mary/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 1990, the Chesapeake Bay had 24,313 hectares of SAV, compared to 24,138 hectares in 1989, with 2,353 hectares (10%), 11,328 hectares (47%), and 10,632 hectares (44%) occurring in the Upper, Middle, and Lower Bay zones, respectively (Figs. 1, 2, and 3).

In 1990 seventy-five percent (1,774 hectares) of the SAV within the Upper Bay zone was located in the Susquehanna Flats (Section 1). Eight species of SAV were documented by ground truth surveys in this section, with *Myriophyllum spicatum* being dominant. A recently introduced exotic species, *Hydrilla verticillata*, was found in the Flats but occurred in small isolated beds. Overall abundance of SAV declined from 1989 (1,945 hectares) and 1987 (2,219 hectares) levels, but the density of beds increased slightly from 1989. Ninety-two percent of all SAV beds in the Flats were classified as very sparse (0-10% coverage), and 5% of beds were classified as dense (70-100% coverage). This is a slight improvement over 1989 coverage when 95% were very sparse and no beds were classified as dense. In the Upper Eastern Shore (Section 2) there were 421 hectares of SAV (113 hectares more than in 1989) located principally in the Elk and lower Sassafras rivers, and Swan, Stillpond, and Churn creeks, with many of the same species as reported in the Susquehanna Flats section. The Upper Western Shore (Section 3) had 90 hectares of SAV, primarily *M. spicatum* and *Vallisneria americana*, concentrated in Saltpeter and Dundee creeks. This is an increase of 52 hectares over 1989 and approaches the 1987 level of 117 hectares. In the Chester River (Section 4) SAV abundance (67 hectares) was down 100 hectares from 1989 and 448 hectares from 1987. SAV was most abundant adjacent to Eastern Neck, Eastern Neck Island, and in the lower Chester River. In this region *Ruppia maritima* was the most abundant of seven species reported.

In 1990 forty-eight percent (5,405 hectares) of the SAV in the Middle Bay zone was found in the Mid-Bay Island Complex (Section 13) which includes the broad shoal area between Smith and Tangier Islands. This is an increase of 206 hectares over 1989. The two dominant species were *R. maritima* and *Zostera marina*. Twenty percent (2,287 hectares) of the SAV in this zone was present in the Middle Eastern Shore (Section 12), primarily in the Barren Island-Honga River area, the Big and Little Annessex rivers, and the lower section of the Manokin River, with *R. maritima* being the dominant species reported. Little or no SAV was mapped or

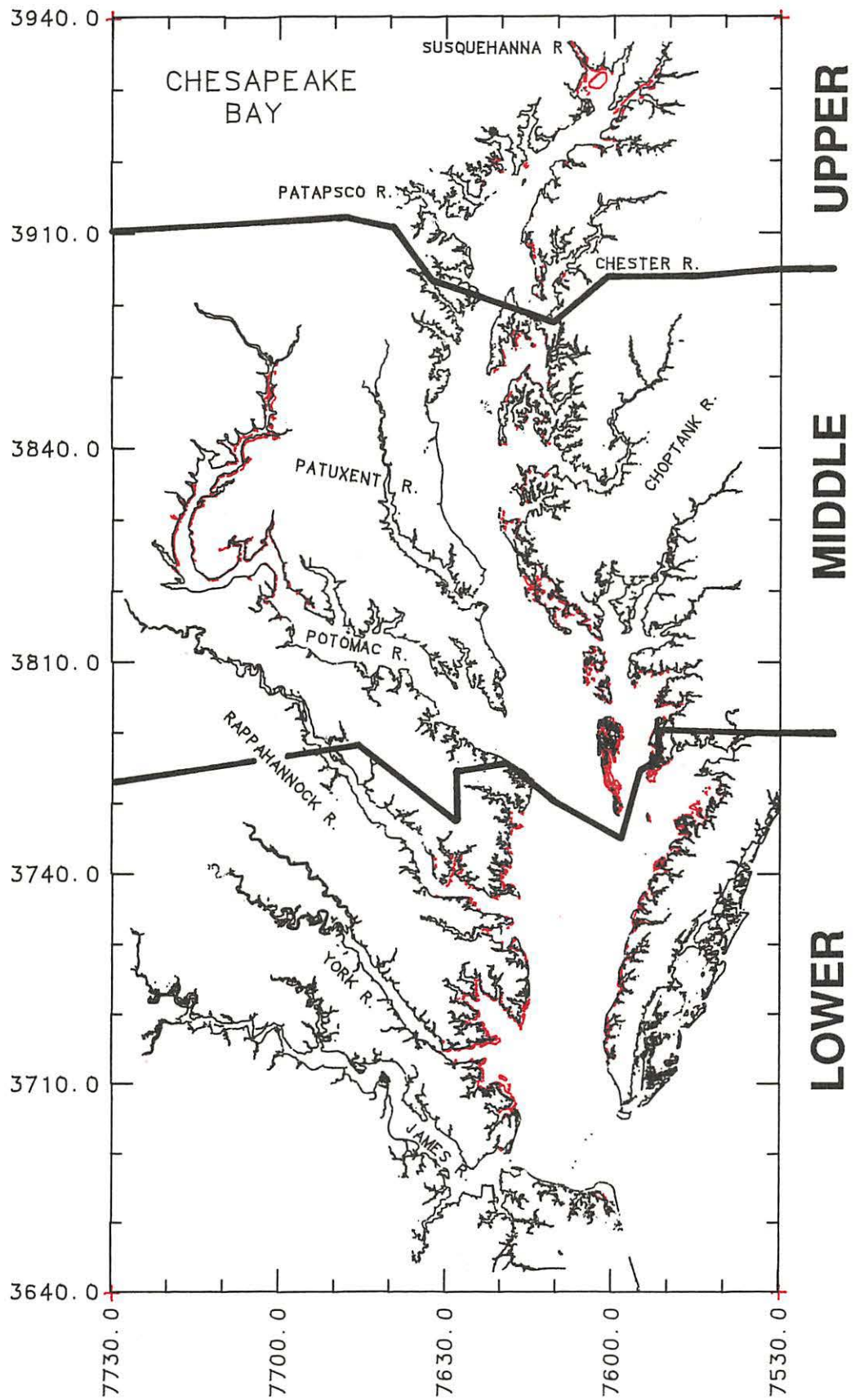


Figure 1. Map of the Chesapeake Bay and tributaries with Upper, Middle, and Lower zones and locations of all SAV beds in 1990. (SAV is shown in red. Latitude and longitude are in decimal degrees along the vertical and horizontal axes, respectively.)

HECTARES OF SAV IN EACH ZONE OF THE CHESAPEAKE BAY – 1990

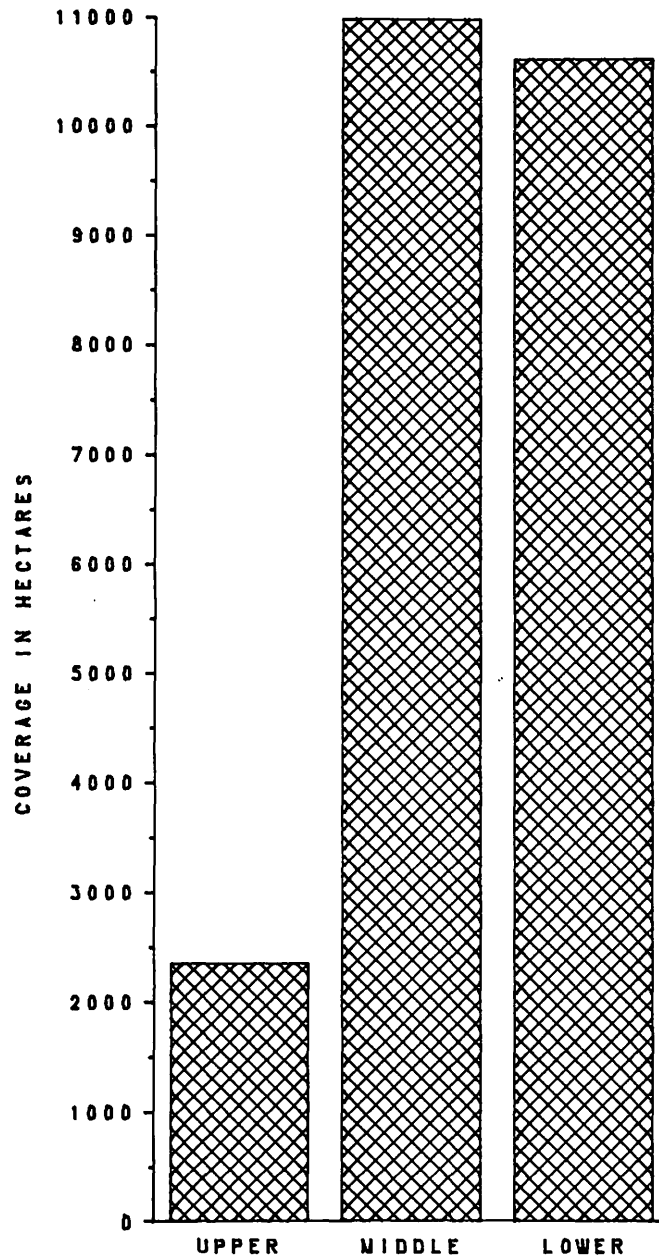


Figure 2. Total hectares of SAV for the Upper, Middle, and Lower zones of the Chesapeake Bay in 1990. (Refer to Figures 1 and 7 for zone locations.)

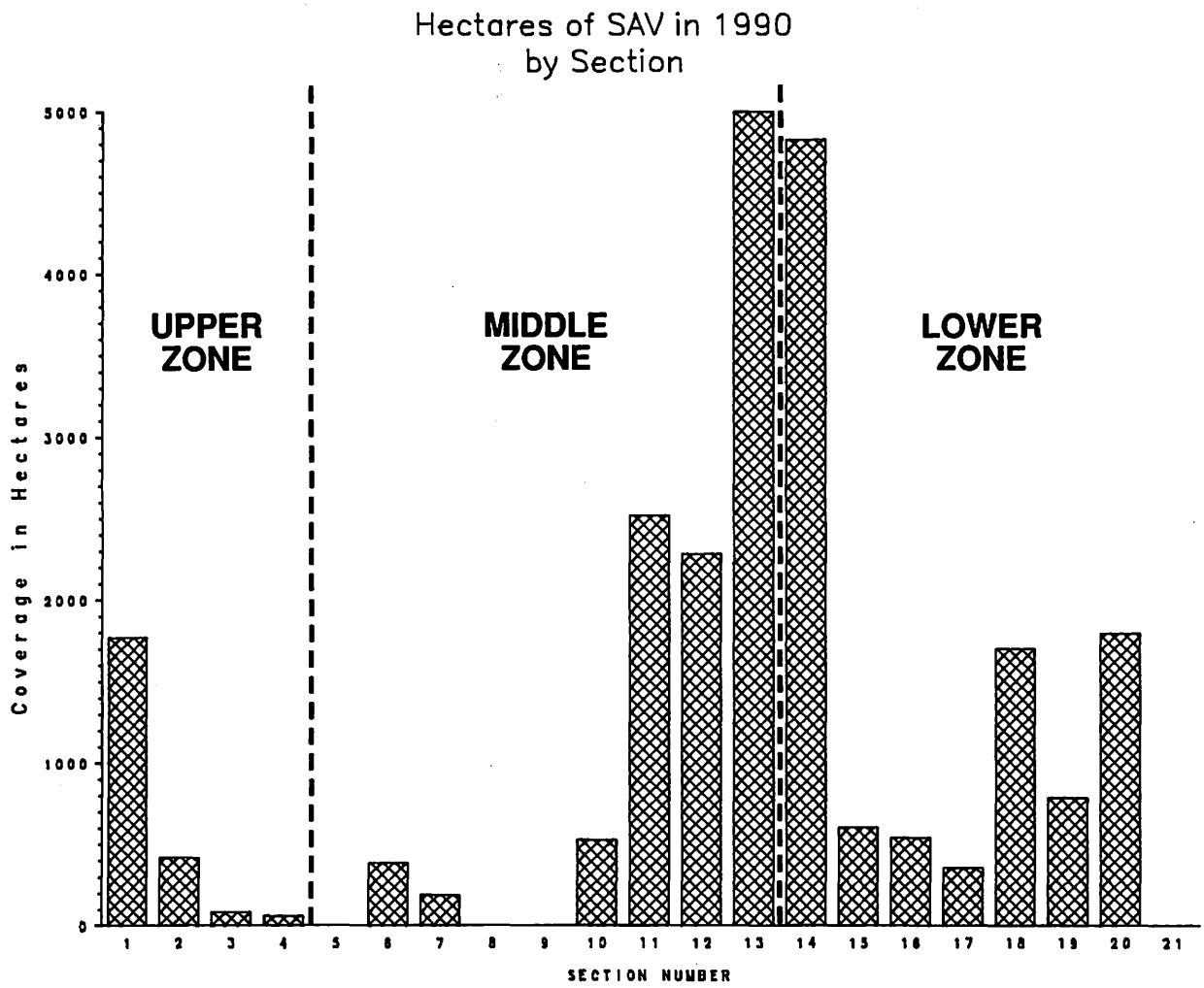


Figure 3. Total hectares of SAV in 1990 by section of the Chesapeake Bay. (Refer to Figure 7, Table 3, and Appendix B for section locations and boundaries.)

reported from the Central Western Shore (Section 5), Middle Western Shore (Section 9), and Patuxent River (Section 8).

The Middle Bay zone also includes the entire Potomac River, where 3,054 hectares of SAV were present in 1990. SAV was concentrated in two distinct regions: 1. the Upper Potomac River (Section 11) with 2,522 hectares, where *Hydrilla verticillata* remained the numerically dominant species (eight other species were reported by the COG, VIMS, USFWS, and Citizen's surveys); and 2. the upper portion of the Lower Potomac River (Section 10) with 532 hectares, including Nanjemoy Creek and Port Tobacco River, with *V. americana* and *M. spicatum* being the most frequently reported species. Although the total abundance of SAV in the Upper Potomac section increased from 1989 by 524 hectares, it decreased in the Lower Potomac section by 83 hectares. SAV in the Eastern Bay (Section 6) decreased 443 hectares from 1989 to a total of 389 hectares in 1990, while in the Choptank River (Section 7) it declined 672 hectares from 1989 to a total of 193 hectares in 1990.

Distribution and abundance in 1990 in the Lower Bay zone were similar to 1989. Forty-five percent (4,829 hectares) of SAV in this zone was found in the Lower Eastern Shore (Section 14) around the Fox Islands and the mouths of major creeks (i.e. Cherrystone Inlet and Hungars, Mattawoman, Occahannock, Craddock, Pungoteague, and Onancock creeks. Along the western shore of the Chesapeake Bay, SAV was abundant in Mobjack Bay (Section 18) (16% of SAV in the Lower Bay zone), in the lower York River (Section 19) (7% of SAV in the Lower Bay zone), and in the Lower Western Shore (Section 20), specifically Back River and Drum Island Flats area adjacent to Plum Tree Island (17% of SAV in the Lower Bay zone). There were 609 hectares of SAV mapped in the Reedville Region (Section 15) in 1990, a 24% increase over 1989. There were 357 hectares of SAV identified in 1990 in the New Point Comfort Region (Section 17) compared to 346 hectares in 1989. Both *R. maritima* and *Z. marina* were abundant throughout this zone. SAV abundance was down slightly from 1989 in both the Piankatank and Rappahannock rivers (Section 16). *Ruppia maritima* was the dominant species in those rivers, with *Zostera marina* also present as a result of previously successful transplant efforts. The James River (Section 21) had less than 3 hectares of SAV in 1990, which is one hectare less than in 1989.

SAV in Chincoteague Bay increased slightly in distribution from 1989, with 2,494 hectares mapped in 1990. 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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Aquatic plant illustrations were provided by the Information Office of the University of Florida, Institute of Food and Agricultural Sciences, Center for Aquatic Plants (Gainesville) and were drawn by Laura Line Reep, biological illustrator.

INTRODUCTION

Monitoring programs of living resources are being increasingly recognized as critical to contributing to our understanding fluctuations in abundance of these resources. In the Chesapeake Bay, monitoring submerged aquatic vegetation has been recognized as necessary to assess the success of the bay cleanup efforts. The baywide decline of SAV in the 1960's and 1970's followed by relatively rapid annual changes from 1984 through 1990 (Orth et al., 1985, 1986, 1987, 1989; Orth and Nowak, 1990), supports the suggestion that SAV may be a good barometer of the health of the bay (Orth and Moore, 1988).

The rapid changes observed in the late 1980's supported the need for an annual aerial monitoring program. Indeed, the simultaneously reported annual increases and decreases at different locations in one tributary of the bay, the Potomac River, has allowed scientists to more accurately determine the relative role of different factors controlling SAV abundance in this system (Carter and Rybicki, submitted).

SAV communities in the entire Chesapeake Bay and tributaries have been photographed and mapped, and the areas of the beds have been digitized in 1978, 1984, 1985, 1986, 1987, 1989, and 1990 (Orth et al., 1979; Anderson and Macomber, 1980; Orth et al., 1985, 1986, 1987, and 1989; Orth and Nowak, 1990). Portions of the upper bay were mapped and digitized in 1979, and the lower bay was mapped and digitized in 1980 and 1981. The bay shoreline was photographed in 1988 but was not mapped. Sections of the lower bay were mapped and digitized in 1971 and 1974.

The goal of the 1990 work was to continue the annual monitoring of SAV on a baywide basis using aerial photographic methods. Appropriate ground truth was used to substantiate presence or absence of SAV in particular sections.

SAV SPECIES

The term "submerged aquatic vegetation" for the purpose of this report encompasses 19 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; Figs. 30-40). 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 twelve 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 1990 in the Susquehanna Flats where its growth has not been as widespread as in the Potomac River (Kollar, pers. comm.).

Zostera marina and *Ruppia maritima* are the dominant species reported from Chincoteague Bay.

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 1990. 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 1990 was mapped onto the same topographic quadrangles.

Aerial Photography

The 1990 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 of the continued 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 approval by the VIMS staff 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

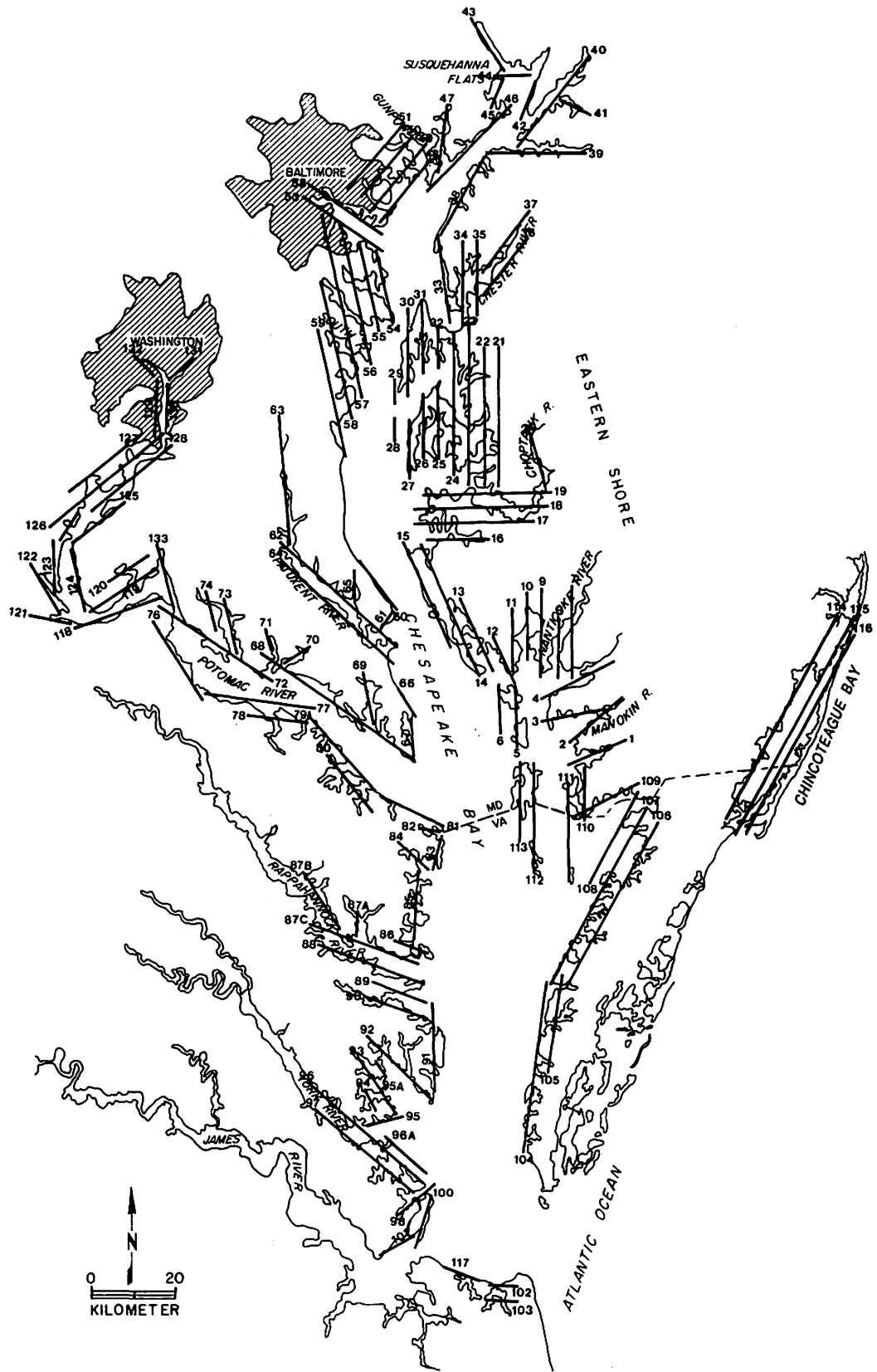


Figure 4. Map of the Chesapeake Bay, its tributaries, and Chincoteague Bay with approximate locations of flight lines for 1990 SAV photography.

Table 1

Guidelines Followed During Acquisition Of Aerial Photographs.

1. **Tidal Stage** - Photography was acquired at low tide, +/- 0-1.5 ft., as predicted by the National Ocean Survey tables.
2. **Plant Growth** - Imagery was acquired when growth stages ensured maximum delineation of SAV, and when phenologic stage overlap was greatest.
3. **Sun Angle** - Photography was acquired when surface reflection from sun glint did not cover more than 30 percent of frame. Sun angle was generally between 20° and 40° to minimize water surface glitter. At least 60 percent line overlap and 20 percent side lap was used to minimize image degradation due to sun glint.
4. **Turbidity** - Photography was acquired when clarity of water ensured complete delineation of grass beds. This was visually determined from the airplane to insure that SAV could be seen by the observer.
5. **Wind** - Photography was acquired during periods of no or low wind. Off-shore winds were preferred over on-shore winds when wind conditions could not be avoided.
6. **Atmospherics** - Photography was acquired during periods of no or low haze and/or clouds below aircraft. There could be no more than scattered or thin broken clouds, or thin overcast above aircraft, to ensure maximum SAV to bottom contrast.
7. **Sensor Operation** - Photography was acquired in the vertical mode with less than 5 degrees tilt. Scale/altitude/film/focal length combination permitted resolution and identification of one square meter area of SAV (at the surface).
8. **Plotting** - Each flight line included sufficient identifiable land area to assure accurate plotting of grass beds.

overlap of photography. To minimize image degradation due to sun glint, the camera was equipped with a computer controlled intervalometer which established 60% line overlap and 20% sidelap. An automatic bubble level held the camera to within one degree tilt. The scale/altitude/film/focal length combination was coordinated to produce one square meter 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 1990 from aerial photography, 1990 ground truth information, and aerial site surveys. USGS-published 7.5 minute topographic quadrangle masters (1:24,000 scale) printed by the Mid-Century Mapping Center of the USGS on stable transparent mylar were used as base maps. Identical copies of these base maps were made at

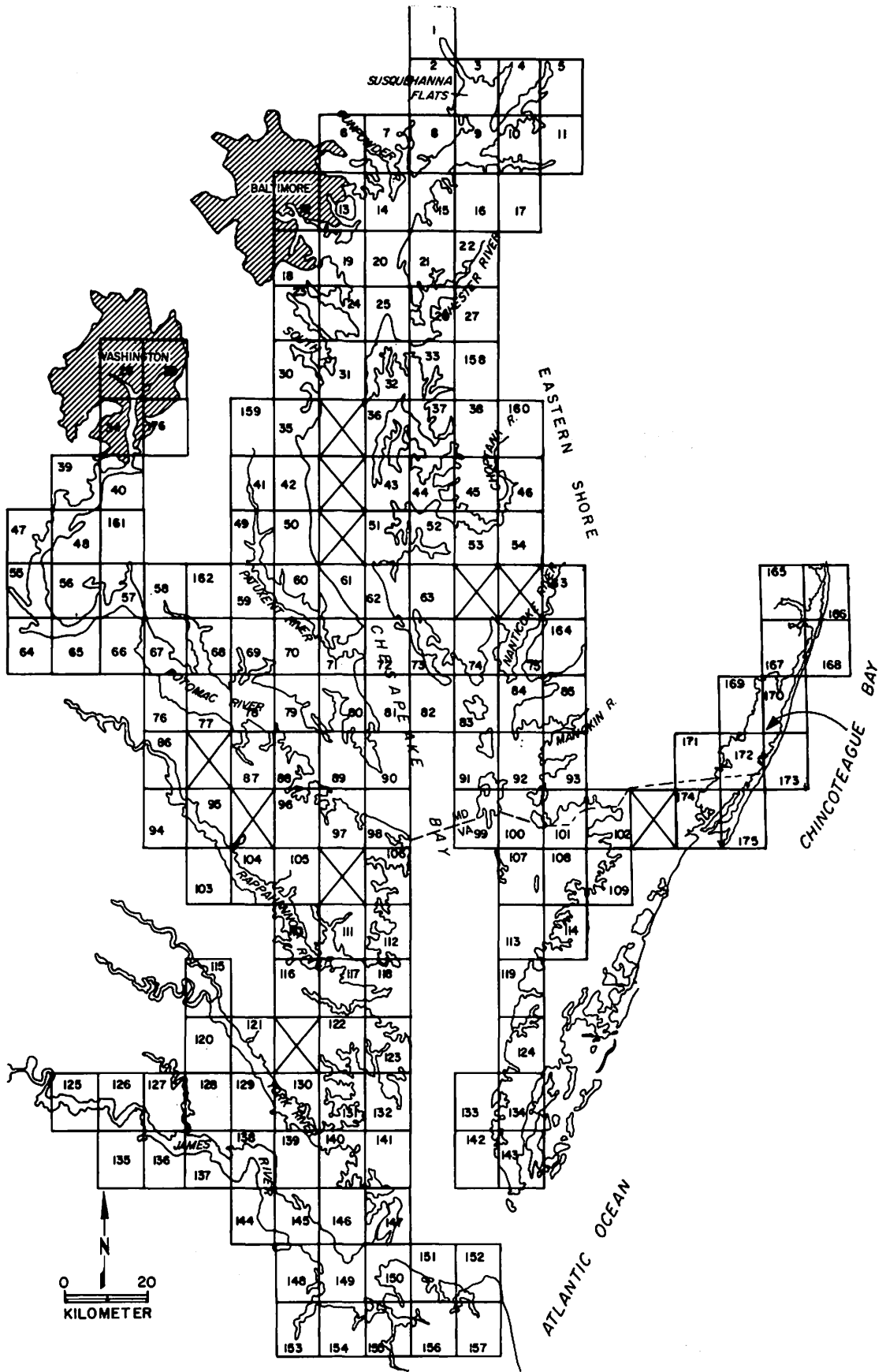


Figure 5. Location of USGS 7.5 minute topographic quadrangles for the Chesapeake Bay, its tributaries, and Chincoteague Bay with corresponding code numbers. (See Table 2 for quad names.)

Table 2

List Of USGS 7.5 Minute Topographic Quadrangles For The Chesapeake Bay And Chincoteague Bay SAV Study Areas With Corresponding Code Numbers. (See Fig. 5 for location of quadrangles. Topographic quadrangles with SAV beds can be found in Appendix C.)

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

Table 2 (continued)

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

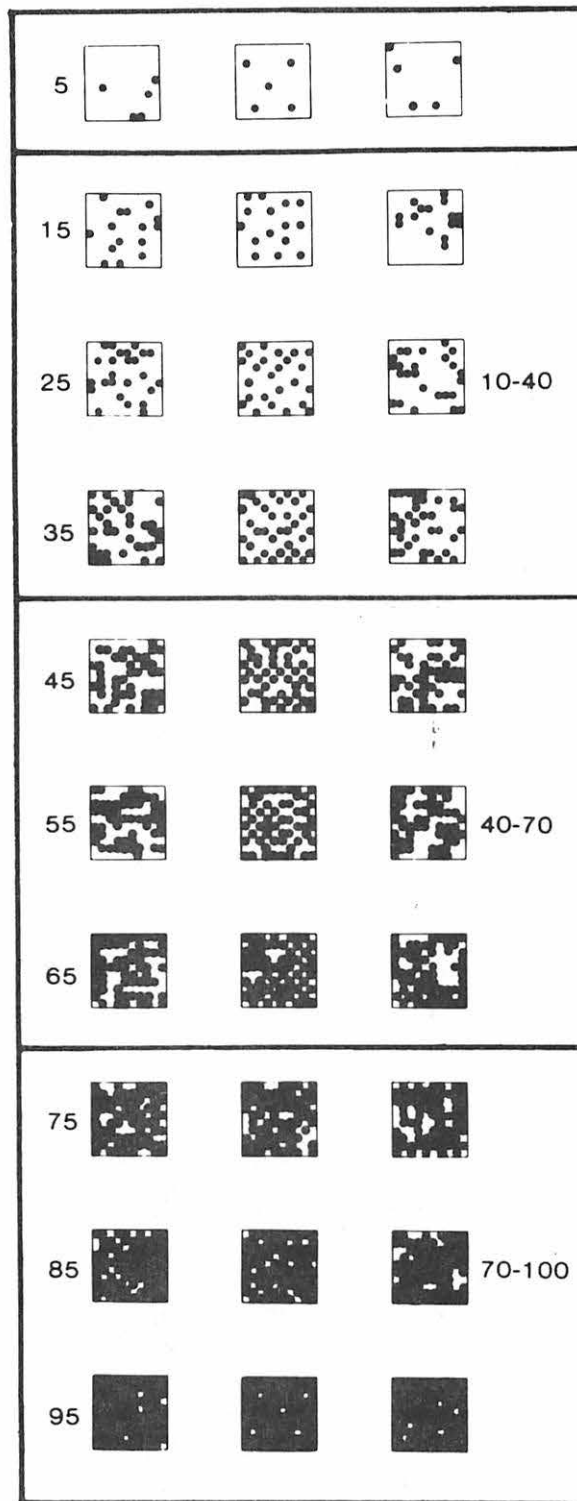
the same scale on stable transparent mylar using a contact diazo process. SAV from the 1990 aerial photographs was mapped onto these diazo copies of USGS topographic quadrangles. Delineation of SAV bed boundaries onto the topographic quadrangle maps was facilitated by superimposing the photographic print 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. 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%.

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:

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

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 as part of a quality assurance / quality control program designed to isolate and remove anomolous data and produce accurate and representative SAV bed polygons. The computer calculated area for 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 areas used in the mean area calculation had to be, by contract, within 5% or less from that of the mean area. All beds whose areal difference were in excess of 5% of the mean bed area were flagged by the VIMS quality assurance quality control computer program for additional error assesment. The VIMS error rate was normally less than 1%. The replicate bed whose area was most similar to the mean area was identified as the "best bed". The best bed area and perimeter coordinate points were then saved by the computer program as the representative area and perimeter for each specific SAV bed.

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 1990 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 Universal Transverse Mercator (UTM) Coordinates in ARC/INFO 5.0.1 Format

The EPA Chesapeake Bay Program Computer Center manages its geographic data base using Environmental Systems Research Institute (ESRI) ARC/INFO Geographic Information System (GIS) (ESRI, 1989). VIMS, with the assistance of the Virginia Council on the Environment EcoMAPS program, developed procedures to convert/transform the best bed perimeter points from X,Y centimeters to UTM based coordinates in ARC/INFO 5.0.1 format. This involved construction of data transfer files in an ARC/INFO standard format ("generate"). This was done on the VIMS PRIME for each topographic quadrangle with SAV beds present. Four files per quadrangle were produced:

1. Polygon file containing SAV bed coordinates in digitizer-based centimeters.
2. Attribute file containing SAV bed labels, density, species composition, and dates.

-
3. Tic file containing map corner locations in digitizer-based coordinates (cm).
 4. Geo file containing corresponding latitude and longitude positions for map corners.

The generate files were then copied to floppy disk(s) for subsequent transfer and processing at EcoMAPS, using their SUN Microsystems Spark 2 workstation-based ARC/INFO 5.0.1 GIS.

A set of automated ARC/INFO routines were developed by the EcoMAPS staff to input quadrangle-based SAV generate data into ARC/INFO 5.0.1 format, and to assist in interactive editing of SAV polygons. ARC-based SAV polygons were displayed and edited at the Council on the Environment by VIMS staff. SAV polygons appearing on the computer display screen were compared to their counterparts on the mylar quad maps. Discrepancies and artifacts were edited using a suite of ARC/INFO editing "tools". ARC/INFO-based data sets were considered satisfactory for submission to EPA when the shape, location, and label of all SAV beds corresponded to those on the base mylar quad input map. ARC/INFO-based SAV data was transformed to UTM coordinates, Zone 18, and submitted to EPA for final review, analysis, and deposition to archives.

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 Annessex River is referred to as the Lower Bay zone.

The area between the south shore of the Little Annessex 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 (18-25⁰/oo), Lower zone; mesohaline (5-18⁰/oo), Middle zone; oligohaline (0.5-5⁰/oo), Upper zone. Although the major rivers and smaller tributaries of the bay have their own salinity regimes, the distribution of SAV in each river is discussed within the zone where it connects to the bay proper.

In addition, 21 major sections of the bay are identified for more detailed discussion of SAV distribution (Fig. 7, Table 3). These sections, which were first delineated for the 1984 survey (Orth et al., 1985) and had been slightly modified for the 1987 survey (Orth et al., 1989), denote relatively distinct parts of the bay and its tributaries that are readily identifiable from a map. The section boundaries used for analysis and discussion of the 1990 SAV distribution and abundance data are those used for the 1987

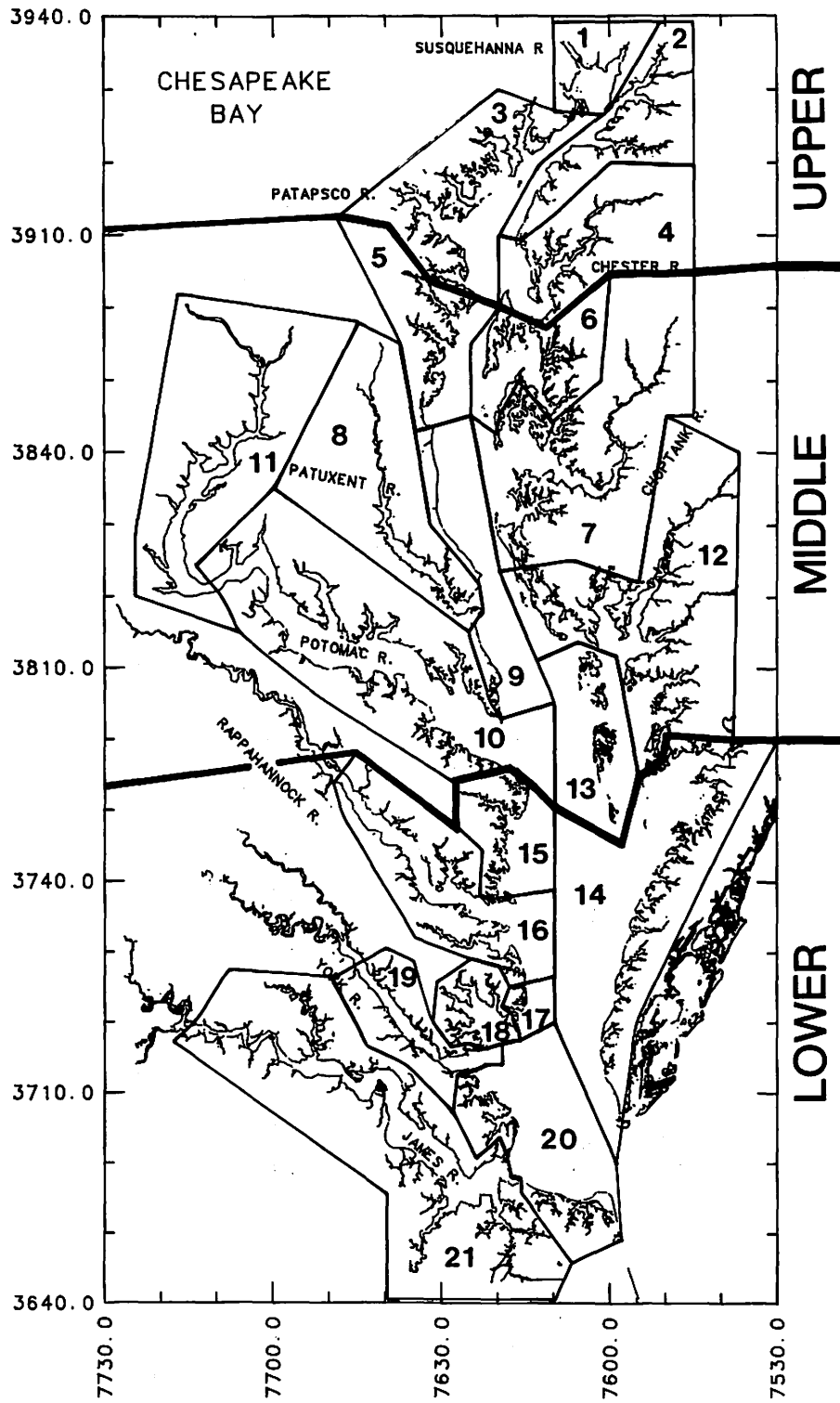


Figure 7. Location of Upper, Middle, and Lower zones of the Chesapeake Bay and the 21 major sections used for delineation of SAV distribution patterns. (Latitude and longitude are in decimal degrees along the vertical and horizontal axes, respectively. See Table 3 and Appendix B for exact boundary positions.)

Table 3**Area Descriptions For Each Of The 21 Major Sections Of The Chesapeake Bay SAV Study Area.**

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

Table 3 (continued)

- Section 12.**Middle Eastern Shore - all areas south of Taylor Island and north of a line bisecting Cedar Island to include the Big and Little Annemessex Rivers, Fishing Bay, and the Honga, Nanticoke, Wicomico, and Manokin Rivers.
- Section 13.**Mid-bay Island Complex - all areas in and adjacent to Bloodsworth, South Marsh, Smith, and Tangier Islands.
- Section 14.**Lower Eastern Shore - all areas south of a line bisecting Cedar Island and located just above the Maryland-Virginia line to Fisherman's Island.
- Section 15. Reedville Region - includes the area between Windmill Point on the Rappahannock River, and Smith Point at the mouth of the Potomac River.
- Section 16. Rappahannock River Complex - includes the entire Rappahannock River, Piankatank River, and Milford Haven area.
- Section 17. New Point Comfort Region - includes the area fronting the bay from the lighthouse at New Point Comfort north to, but not including, the bay entrance to Milford Haven.
- Section 18.**Mobjack Bay Complex - includes the East, North, Ware, and Severn Rivers, the north shore of the Mobjack Bay from New Pt. Comfort lighthouse to the North River, and north of a line bisecting the large shoal area around the Guinea Marsh area.
- Section 19.**York River - all areas along the north shore from Clay Bank to the Guinea Marsh area and south of a line bisecting the large shoal area around the Guinea Marsh area, and along the south shore to include the north shore of Goodwin Island.
- Section 20.**Lower Western Shore - includes all areas south of Goodwin Island to Broad Bay off Lynnhaven Inlet, excluding the James River.
- Section 21. James River - all SAV in the James River including the Chickahominy River.
- ** - Sections 12, 13, 14, 18, 19, and 20 were given new boundaries for the 1987 report (Orth et al., 1989) which also changed the delineation of the three major zones. These new boundaries were retained for the 1989 report (Orth and Nowak, 1990) and for this report. (Refer to Figure 7 and Appendix B for boundary locations.)

and 1989 report (Orth et al., 1989; Orth and Nowak, 1990). 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.

Ground Truth and Other Data Bases

Ground truthing was accomplished by cooperative efforts of a number of agencies and individuals. Although not all areas of the bay were groundtruthed this program does provide valuable supplemental information. This program confirmed the existence of some SAV beds mapped from 1990 aerial photography, located a few 1990 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 1990 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 1989 SAV maps was tabulated in Appendix E and cross-referenced at VIMS by 1990 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 were also examined carefully by divers for any extant SAV. VIMS scientists also surveyed a number of sites in the bay as part of an intensive quantitative SAV study (VIMS, unpublished data). Citizen Field Observation data for Virginia waters (compiled by the USFWS) were also added to the 1990 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 1990 by the Metropolitan Washington Council of Governments (COG) Potomac River survey, the Maryland-National Capital Parks and Planning Commission Patuxent River Park survey, three SAV research projects, a USFWS survey, and the Citizen's and Charterboat Captain's volunteer surveys (both data sets were compiled by the USFWS along with their own survey data). USFWS personnel surveyed selected locations in the upper bay, including the Potomac River, by boat using rakes to collect samples to determine presence or absence of SAV. All plant samples collected by USFWS were identified to species. Citizen groundtruthing identified plants 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 1989 SAV distribution maps (USGS 7.5

minute topographic quads with 1989 SAV beds). These USFWS-prepared survey maps were supplied to VIMS SAV researchers and survey data were transferred by VIMS staff to the 1990 SAV distribution maps reproduced in Appendix C. USFWS survey data was tabulated, locating each SAV siting by listing its associated 1989 bed. This table was supplied to VIMS where additional survey data were added and it became the basis for the 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 1990 bed locations as well as by 1989 bed locations.

The field study in the Potomac River by the COG, which covered the shoreline areas from the District of Columbia (D.C.) to Aquia Creek used shoreline surveys to document the distribution of SAV in the tidal freshwater and transition zones of the Potomac River and tributaries (Maps 29, 34, 39, 40, 47, 48, and 55) in September. 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. Survey maps were supplied to VIMS SAV researchers. The Patuxent River Park survey was carried out in July and August by park employees who provided survey maps (Maps 41, 49, and 159) with tables for each map listing species present and percent cover. These data and maps were supplied to VIMS. The USFWS, Citizen's, and Charterboat Captain's surveys also collected groundtruth data from these rivers. The Potomac and Patuxent River data were transferred by VIMS staff to the 1990 SAV distribution maps (reproduced in Appendix C) and were tabulated in Appendix E.

One 1990 SAV 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. A SAV research group headed by William Dennison at the University of Maryland Horn Point Environmental Laboratories (HPEL) also provided 1990 ground truth data in collaboration with the VIMS research team. This was part of the intensive quantitative study mentioned earlier (VIMS, unpublished data). The Essex Community College SAV Research Group of Baltimore County, Maryland, contributed groundtruth data for quads 13 and 14. Maps of these study sites with species data were provided to VIMS researchers. Species locations from these data were added to the 1990 SAV maps reproduced in Appendix C and were tabulated in Appendix E by VIMS staff.

In addition to the scientific surveys, private citizens participated in identifying 1990 SAV beds by checking for presence of SAV at previous years SAV bed locations in certain areas in the bay, and by locating SAV bed locations new in 1990. 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 1989 SAV quadrangle maps to aid in location of 1990 SAV beds and with data sheets on which to record information on each 1990 SAV bed identified. Sampling of SAV sites was undertaken at low tide. Samples were taken by hand, net or rake. Plants were identified as to species onsite or placed in zip-lock plastic bags and sent to the MD-DNR for identification.

Private citizens volunteered to assist in the 1990 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 1990. Volunteers, who were recruited through press releases, newsletters, and personal letters, were provided with a SAV identification guide, reduced 1989 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 to identify the species. All information from the Charterboat Captain's and the Citizen's surveys was submitted to Kathryn Reshetiloff (USFWS) for processing. SAV sitings reported by the Citizen's and Charterboat Captain's surveys were mapped on 1989 SAV maps. As previously explained, USFWS personnel also tabulated data from most of the 1990 Citizen's and Charterboat Captain's surveys along with their own survey's data, listing each SAV siting by 1989 bed location. VIMS staff mapped these data on maps reproduced in Appendix C, and data were tabulated in Appendix E.

RESULTS

Data Presentation

SAV distribution data are presented by topographic quadrangle (Table 4), by section and zone (Table 5), and by quadrangles within a section (Table 6). Topographic quadrangle maps annotated with all SAV beds are presented in Appendix C, while individual bed areas for each quadrangle are given in Appendix D. Appendix E tabulates all ground truth data for 1990. The 1990 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 1989 survey of SAV distribution and abundance (Orth and Nowak, 1990). 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.)

1990 SUMMARY

In 1990, the Chesapeake Bay had 24,313 hectares of SAV, compared to 24,138 hectares in 1989, with 2,353 hectares (10%), 11,328 hectares (47%), and 10,632 hectares (44%) occurring in the Upper, Middle, and Lower Bay zones, respectively (Figs. 1, 2, and 3).

Upper Bay Zone

In 1990 seventy-five percent (1,774 hectares) of the SAV within the Upper Bay zone was located in the Susquehanna Flats (Section 1). Eight species of SAV were documented by ground truth surveys in this section, with *Myriophyllum spicatum* being dominant. A recently introduced exotic species, *Hydrilla verticillata*, was found in the Flats but occurred in small isolated beds. Overall abundance of SAV declined from 1989 (1,945 hectares) and 1987 (2,219 hectares) levels, but the density of beds increased slightly from 1989. Ninety-two percent of all SAV beds in the Flats were classified as very sparse (0-10% coverage), and 5% of beds were classified as dense (70-100% coverage). This is a slight improvement over 1989 coverage when 95% were very sparse and no beds were classified as dense. In the Upper Eastern Shore (Section 2) there were 421 hectares of SAV (113 hectares more than in 1989) located principally in the Elk and lower Sassafras rivers, and Swan, Stillpond, and Churn creeks, with many of the same species as reported in the Susquehanna Flats section. The Upper Western Shore (Section 3) had 90 hectares of SAV, primarily *M. spicatum* and *Vallisneria americana*, concentrated in Saltpeter and Dundee creeks. This is an increase of 52 hectares over 1989 and approaches the 1987 level of 117 hectares. In the Chester River (Section 4) SAV abundance (67 hectares) was down 100 hectares from 1989 and 448 hectares from 1987. SAV was most abundant

Table 4**Total Area Of SAV In Hectares By USGS 7.5 Minute Topographic
Quadrangles For 1989 And 1990.**

QUADRANGLE	1989	1990
1. Conowingo Dam, Md.-Pa.	0	-
2. Aberdeen, Md.	0.66	2.12
3. Havre de Grace, Md.	1835.50	1770.03
4. North East, Md.	105.51	146.69
5. Elkton, Md.-Del.	5.70	39.59
6. White Marsh, Md.	0	-
7. Edgewood, Md.	#	0
8. Perryman, Md.	0	0
9. Spesutie, Md.	187.85	50.95
10. Earleville, Md.	97.87	166.92
11. Cecilton, Md.	0	-
12. Baltimore East, Md.	0	-
13. Middle River, Md.	3.61	0.69
14. Gunpowder Neck, Md	34.55	89.75
15. Hanesville, Md.	12.66	6.33
16. Betterton, Md.	1.09	4.23
17. Galena, Md.	2.79	7.94
18. Curtis Bay, Md.	#	#
19. Sparrows Pt., Md.	#	#
20. Swan Point, Md.	5.24	6.47
21. Rock Hall, Md.	19.16	12.00
22. Chestertown, Md.	0	0
23. Round Bay, Md.	#	#
24. Gibson Island, Md.	#	#
25. Love Point, Md.	0	0
26. Langford Creek, Md.	138.92	47.79
27. Centreville, Md.	0	0
28. Washington West, Md.-DC-Va.	0	0
29. Washington East, DC-Md.	0	#
30. South River, Md.	#	#
31. Annapolis, Md.	0	#

Table 4 (Continued)

QUADRANGLE	1989	1990
32. Kent Island, Md.	327.06	132.99
33. Queenstown, Md.	128.33	55.66
34. Alexandria, Va.-DC-Md.	368.44	399.54
35. Deale, Md.	#	#
36. Claiborne, Md	381.68	139.05
37. St. Michaels, Md.	172.44	62.67
38. Easton, Md.	0	#
39. Fort Belvoir, Va.-Md.	63.48	105.06
40. Mt. Vernon, Md.-Va.	334.61	358.25
41. Lower Marlboro, Md.	0	#
42. North Beach, Md.	0	0
43. Tilghman, Md.	231.11	11.81
44. Oxford, Md.	95.94	19.27
45. Trappe, Md.	0	0
46. Preston, Md.	0	0
47. Quantico, Va.-Md.	533.16	694.01
48. Indian Head, Va.-Md.	184.01	303.67
49. Benedict, Md.	#	#
50. Prince Frederick, Md.	0	0
51. Hudson, Md.	331.36	96.78
52. Church Creek, Md.	18.99	6.46
53. Cambridge, Md.	0	0
54. East New Market, Md.	0	0
55. Widewater, Va.-Md.	466.64	614.54
56. Nanjemoy, Md.	149.61	126.73
57. Mathias Pt., Md.-Va.	346.69	285.36
58. Popes Creek, Md.	6.20	4.86
59. Mechanicsville, Md.	0	0
60. Broomes Island, Md.	#	0
61. Cove Pt., Md.	0.48	#
62. Taylors Island, Md.	16.17	58.41

Table 4 (Continued)

QUADRANGLE	1989	1990
63. Golden Hill, Md.	2.49	4.05
64. Passapatanzy, Md.-Va.	0	0
65. King George, Va.-Md.	52.24	53.05
66. Dahlgren, Va.-Md.	65.33	51.65
67. Colonial Beach N., Md.-Va.	28.46	45.89
68. Rock Point, Md.	0	#
69. Leonardtown, Md.	#	#
70. Hollywood, Md.	#	#
71. Solomons Island, Md.	2.96	#
72. Barren Island, Md.	301.43	299.81
73. Honga, Md.	773.43	1006.05
74. Wingate, Md.	369.33	400.16
75. Nanticoke, Md.	5.02	0
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.	#	#
80. St. Marys City, Md.	#	0
81. Point No Point, Md.	0	0
82. Richland Point, Md.	24.02	30.83
83. Bloodworth Island, Md.	686.80	700.35
84. Deal Island, Md.	27.38	39.07
85. Monie, Md.	17.84	18.36
86. Champlain, Va.	-	-
87. Machodoc, Va.	0	0
88. Kinsale, Va.-Md.	0	0
89. St. George Island, Va.-Md.	2.84	0
90. Point Lookout, Md.	0	0
91. Kedges Straits, Md.	781.25	876.49
92. Terrapin Sand Point, Md.	218.21	256.81
93. Marion, Md.	199.80	192.22

Table 4 (Continued)

QUADRANGLE	1989	1990
94. Mount Landing, Va.	-	-
95. Tappahannock, Va.	-	-
96. Lottsburg, Va.	0	0
97. Heathsville, Va.-Md.	0	0
98. Burgess, Va.-Md.	0	0
99. Ewell, Va.-Md.	2423.98	2446.54
100. Great Fox Is., Va.-Md.	1381.77	1371.98
101. Crisfield, Va.-Md.	202.04	226.41
102. Saxis, Va.-Md.	2.08	0.78
103. Dunnsville, Va.	-	-
104. Morattico, Va.	0	0
105. Lively, Va.	0	0
106. Reedville, Va.	157.87	226.98
107. Tangier Island, Va.	699.37	751.90
108. Chesconessex, Va.	972.11	954.06
109. Parksley, Va.	320.18	339.88
110. Urbanna, Va.	200.66	15.89
111. Irvington, Va.	245.45	221.46
112. Fleets Bay, Va.	334.59	381.94
113. Nandua Creek, Va.	406.21	365.87
114. Pungoteague, Va.	795.10	824.70
115. West Point, Va.	-	0
116. Saluda, Va.	19.08	1.97
117. Wilton, Va.	43.07	48.67
118. Deltaville, Va.	81.06	90.48
119. Jamesville, Va.	496.40	509.86
120. Toano, Va.	-	-
121. Gressitt, Va.	-	-
122. Ware Neck, Va.	278.06	303.80
123. Mathews, Va.	110.18	196.38
124. Franktown, Va.	435.88	485.05

Table 4 (Continued)

QUADRANGLE	1989	1990
125. Westover, Va.	-	#
126. Charles City, Va.	-	-
127. Brandon, Va.	#	-
128. Norge, Va.	0**	**
129. Williamsburg, Va.	-	-
130. Clay Bank, Va.	#	1.48
131. Achilles, Va.	957.95	997.18
132. New Point Comfort, Va.	1273.85	1398.85
133. Cape Charles, Va.	271.66	318.97
134. Cheriton, Va.	73.21	70.69
135. Savedge, Va.	-	-
136. Claremont, Va.	-	-
137. Surry, Va.	-	-
138. Hog Island, Va.	-	-
139. Yorktown, Va.	1.58	1.68
140. Poquoson West, Va.	411.99	541.33
141. Poquoson East, Va.	994.84	1007.50
142. Elliotts Creek, Va.	15.90	28.20
143. Townsend, Va.	12.55	1.51
144. Bacons Castle, Va.	-	-
145. Mulberry Island, Va.	-	-
146. Newport News North, Va.	-	-
147. Hampton, Va.	304.06	342.00
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.	36.47	28.33
153. Chuckatuck, Va.	-	-
154. Bowers Hill, Va.	-	-
155. Norfolk South, Va.	-	-

Table 4 (Continued)

QUADRANGLE	1989	1990
156. Kempsville, Va.	-	-
157. Princess Anne, Va.	0	0.73
158. Wye Mills, Md.	0	0
159. Bristol, Md.	#	#
160. Fowling Creek, Md.	0	0
161. Port Tobacco, Md.	12.09	11.90
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.	4.98	6.33
168. Ocean City, Md.	3.45	19.79
169. Public Landing, Md.	0	0
170. Tingles Island, Md.	820.82	993.64
171. Girdle Tree, Md.-Va.	0	0
172. Boxiron, Md.-Va.	653.88	636.13
173. Whittington Point, Md.-Va.	161.79	239.86
174. Chincoteague West, Va.	0	0
175. Chincoteague East, Va.	665.58	598.70
176. Anacostia, D.C.-Md.	<u>0</u>	<u>0</u>
TOTAL SAV - Chesapeake Bay	24,137.63	24,312.55
TOTAL SAV - Chincoteague Bay	2,310.49	2,494.45

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 in 1987 revealed narrow beds fringing the shoreline of small tributaries of the Chickahominy River. (Area was not photographed in 1990).
- # SAV beds not detected from aerial photography. Ground truth information indicated presence of SAV.

Table 5

Number of Hectares of SAV in 1989 and 1990 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 (Orth and Nowak, 1990 and for 1990. See Figure 7, Table 3 and Appendix B for boundary locations.

ZONE	SECTION	AREA (HECTARES)	
		1989	1990
Upper	1. Susquehanna Flats	1,944.96	1,773.93
	2. Upper Eastern Shore	307.72	421.29
	3. Upper Western Shore	38.17	90.44
	4. Chester River	167.16	67.37
	Zone Total	2,458.01	2,353.03
Middle	5. Central Western Shore	0.00	0.00
	6. Eastern Bay	831.48	388.84
	7. Choptank River	864.70	192.74
	8. Patuxent River	3.44	0.00
	9. Middle Western Shore	0.00	0.00
	10. Lower Potomac River	615.62	532.16
	11. Upper Potomac River	1,998.16	2,522.34
	12. Middle Eastern Shore	1,997.99	2,286.72
	13. Mid-Bay Island Complex	5,199.04	5,405.12
	Zone Total	11,510.43	11,327.92
Lower	14. Lower Eastern Shore	4,718.41	4,828.67
	15. Reedville	492.34	608.93
	16. Rappahannock River Complex	669.22	544.37
	17. New Point Comfort Region	345.78	356.98
	18. Mobjack Bay Complex	1,592.59	1,703.40
	19. York River	676.89	789.95
	20. Lower Western Shore	1,670.08	1,796.57
	21. James River	3.86	2.73
	Zone Total	10,169.17	10,631.60
	Total SAV for Chesapeake Bay	24,137.61	24,312.55
	Total SAV for Chincoteague Bay	2,310.49	2,494.45

Table 6

**Number of Square Meters Of SAV in 1990 For Each Quadrangle of
The 21 Sections in the Chesapeake Bay and of Chincoteage Bay.
(Map code numbers from Table 2 in parentheses.)**

SECTION	QUADRANGLE	AREA
Susquehanna Flats - 1	Conowingo Dam (1)	0
	Aberdeen (2)	21,241
	Havre de Grace (3)	17,700,292
	North East (4)	0
	Elkton (5)	0
	Perryman (8)	0
	Spesutie (9)	17,727
	Earleville (10)	0
		<hr/>
		17,739,260 sq. m 1,773.93 hectares 4,383.37 acres
Upper Eastern Shore - 2	North East (4)	1,466,894
	Elkton (5)	395,899
	Perryman (8)	0
	Spesutie (9)	491,747
	Earleville (10)	1,669,177
	Cecilton (11)	0
	Gunpowder Neck (14)	0
	Hanesville (15)	63,326
	Betterton (16)	42,303
	Galena (17)	79,353
	Swan Point (20)	0
	Rock Hall (21)	4,197
	Chestertown (22)	0
		<hr/>
	4,212,896 sq. m 421.29 hectares 1,041.01 acres	
Upper Western Shore - 3	White Marsh (6)	0
	Edgewood (7)	0
	Perryman (8)	0
	Spesutie (9)	0
	Baltimore East (12)	0
	Middle River (13)	6,933
	Gunpowder Neck (14)	897,489

Table 6 (Continued)

SECTION	QUADRANGLE	AREA
Upper Western Shore - 3 (continued)		
	Hanesville (15)	0
	Curtis Bay (18)	0
	Sparrows Point (19)	0
	Swan Point (20)	0
	Round Bay (23)	0
	Gibson Island (24)	0
	Love Point (25)	0
		<hr/>
		904,422 sq. m
		90.44 hectares
		223.48 acres
Chester River - 4		
	Betterton (16)	0
	Galena (17)	0
	Swan Point (20)	64,658
	Rock Hall (21)	115,806
	Chestertown (22)	0
	Love Point (25)	0
	Langford Creek (26)	477,893
	Centreville (27)	0
	Kent Island (32)	0
	Queenstown (33)	15,321
		<hr/>
		673,678 sq. m
		67.37 hectares
		166.47 acres
Central Western Shore - 5		
	Curtis Bay (18)	0
	Round Bay (23)	0
	Gibson Island (24)	0
	Love Point (25)	0
	South River (30)	0
	Annapolis (31)	0
	Kent Island (32)	0
	Deale (35)	0
	North Beach (42)	0
		<hr/>
		0.00 sq. m
		0.00 hectares
		0.00 acres

Table 6 (Continued)

SECTION	QUADRANGLE	AREA
Eastern Bay - 6	Centreville (27)	0
	Annapolis (31)	0
	Kent Island (32)	1,329,908
	Queenstown (33)	541,305
	Claiborne (36)	1,390,455
	St. Michaels (37)	626,741
	Easton (38)	0
	Tilghman (43)	0
	Oxford (44)	0
	Wye Mills (158)	0
	<hr/>	
		3,888,409 sq. m
		388.84 hectares
		960.83 acres
Choptank River - 7	Centreville (27)	0
	Claiborne (36)	0
	St. Michaels (37)	0
	Easton (38)	0
	Tilghman (43)	118,127
	Oxford (44)	192,706
	Trappe (45)	0
	Preston (46)	0
	Hudson (51)	967,841
	Church Creek (52)	64,556
	Cambridge (53)	0
	East New Market (54)	0
	Taylor's Island (62)	584,126
	Golden Hill (63)	0
	Nanticoke (75)	0
	Wye Mills (158)	0
Fowling Creek (160)	0	
	<hr/>	
		1,927,356 sq. m
		192.74 hectares
		476.25 acres
Patuxent River - 8	Deale (35)	0
	Lower Marlboro (41)	0
	North Beach (42)	0

Table 6 (Continued)

SECTION	QUADRANGLE	AREA
Patuxent River - 8 (continued)		
	Benedict (49)	0
	Prince Frederick (50)	0
	Mechanicsville (59)	0
	Broomes Island (60)	0
	Cove Point (61)	0
	Leonardtown (69)	0
	Hollywood (70)	0
	Solomons Island (71)	0
	Bristol (159)	0
	Charlotte Hall (162)	0
		<hr/>
		0.00 sq. m
		0.00 hectares
		0.00 acres
Middle Western Shore - 9		
	North Beach (42)	0
	Prince Frederick (50)	0
	Hudson (51)	0
	Broomes Island (60)	0
	Cove Point (61)	0
	Taylor's Island (62)	0
	Solomons Island (71)	0
	Barren Island (72)	0
	St. Mary's City (80)	0
	Point No Point (81)	0
	Richland Point (82)	0
	Point Lookout (90)	0
		<hr/>
		0.00 sq. m
		0.00 hectares
		0.00 acres
Lower Potomac River - 10		
	Nanjemoy (56)	1,267,306
	Mathias Point (57)	2,853,555
	Popes Creek (58)	48,644
	Mechanicsville (59)	0
	King George (65)	176,643

Table 6 (Continued)

SECTION	QUADRANGLE	AREA
Lower Potomac River - 10 (continued)		
	Dahlgren (66)	516,549
	Colonial Beach North (67)	458,857
	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
	Piney Point (79)	0
	St. Mary's City (80)	0
	Champlain (86)	0
	Machodoc (87)	0
	Kinsale (88)	0
	St. George Island (89)	0
	Point Lookout (90)	0
	Lottsburg (96)	0
	Heathsville (97)	0
	Burgess (98)	0
	Port Tobacco (161)	0
	Charlotte Hall (162)	0
		<hr/>
		5,321,554 sq. m
		532.16 hectares
		1,314.96 acres
Upper Potomac River - 11		
	Washington West (28)	0
	Washington East (29)	0
	Alexandria (34)	3,995,384
	Fort Belvoir (39)	1,050,578
	Mt. Vernon (40)	3,582,541
	Quantico (47)	6,940,103
	Indian Head (48)	3,036,701
	Widewater (55)	6,145,398
	Nanjemoy (56)	0
	Mathias Point (57)	0
	Passapatanzy (64)	0

Table 6 (Continued)

SECTION	QUADRANGLE	AREA
Upper Potomac River - 11 (continued)		
	King George (65)	353,695
	Dahlgren (66)	0
	Port Tobacco (161)	118,994
		<hr/>
		25,223,394 sq. m
		2,522.34 hectares
		6,232.70 acres
Middle Eastern Shore - 12		
	Taylor's Island (62)	0
	Golden Hill (63)	40,528
	Barren Island (72)	2,998,076
	Honga (73)	10,060,454
	Wingate (74)	4,001,599
	Nanticoke (75)	0
	Point No Point (81)	0
	Richland Point (82)	308,287
	Bloodsworth Island (83)	964,794
	Deal Island (84)	390,746
	Monie (85)	183,570
	Terrapin Sand Point (92)	205,568
	Marion (93)	1,922,186
	Great Fox Island (100)	1,169,760
	Crisfield (101)	621,594
	Mardela Springs (163)	0
	Wetipquin (164)	0
		<hr/>
		22,867,162 sq. m
		2,286.72 hectares
		5,650.48 acres
Mid-Bay Island Complex - 13		
	Richland Point (82)	0
	Bloodsworth Island (83)	6,038,677
	Deal Island (84)	0
	Kedges Straits (91)	8,764,894
	Terrapin Sand Point (92)	2,362,497
	Ewell (99)	24,465,408
	Great Fox Island (100)	5,381,238

Table 6 (Continued)

SECTION	QUADRANGLE	AREA
Mid-Bay Island Complex - 13 (continued)		
	Tangier Island (107)	7,038,465
		<hr/>
		54,051,179 sq. m
		5,405.12 hectares
		13,356.05 acres
Lower Eastern Shore - 14		
	Marion (93)	0
	Great Fox Island (100)	7,168,122
	Crisfield (101)	1,642,408
	Saxis (102)	7,772
	Tangier Island (107)	480,540
	Chesconessex (108)	9,540,552
	Parksley (109)	3,398,758
	Nandua Creek (113)	3,658,735
	Pungoteague (114)	8,247,049
	Jamesville (119)	5,098,593
	Franktown (124)	4,850,463
	Cape Charles (133)	3,189,686
	Cheriton (134)	706,939
	Elliotts Creek (142)	281,996
	Townsend (143)	15,115
		<hr/>
		48,286,728 sq. m
		4,828.67 hectares
		11,931.65 acres
Reedville - 15		
	Heathsville (97)	0
	Burgess (98)	0
	Reedville (106)	2,269,830
	Irvington (111)	0
	Fleets Bay (112)	3,819,443
		<hr/>
		6,089,273 sq. m
		608.93 hectares
		1,504.66 acres

Table 6 (Continued)

SECTION	QUADRANGLE	AREA
Rappahannock River Complex - 16	Tappahannock (95)	0
	Lottsburg (96)	0
	Dunnsville (103)	0
	Morattico (104)	0
	Lively (105)	0
	Urbanna (110)	158,934
	Irvington (111)	2,214,585
	Fleets Bay (112)	0
	Saluda (116)	19,731
	Wilton (117)	486,692
	Deltaville (118)	904,796
	Ware Neck (122)	0
	Mathews (123)	1,658,974
		5,443,712 sq. m
		544.37 hectares
		1,345.14 acres
New Point Comfort Region - 17	Mathews (123)	0
	New Point Comfort (132)	3,569,822
		356.98 hectares
		882.10 acres
Mobjack Bay Complex - 18	Ware Neck (122)	3,038,030
	Mathews (123)	304,789
	Clay Bank (130)	0
	Achilles (131)	6,889,709
	New Point Comfort (132)	6,801,460
		1,703.40 hectares
		4,209.10 acres
York River - 19	Toano (120)	0
	Gressitt (121)	0
	Norge (128)	0
	Williamsburg (129)	0
	Clay Bank (130)	14,832
	Achilles (131)	3,081,945

Table 6 (Continued)

SECTION	QUADRANGLE	AREA
York River - 19 (continued)		
	New Point Comfort (132)	3,581,465
	Hog Island (138)	0
	Yorktown (139)	16,805
	Poquoson West (140)	1,204,477
	Poquoson East (141)	0
		<hr/>
		7,899,524 sq. m
		789.95 hectares
		1,951.97 acres
Lower Western Shore - 20		
	New Point Comfort (132)	0
	Poquoson West (140)	4,207,382
	Poquoson East (141)	10,075,026
	Elliotts Creek (142)	0
	Newport News North (146)	0
	Hampton (147)	3,392,666
	Norfolk North (150)	0
	Little Creek (151)	0
	Cape Henry (152)	283,343
	Kempsville (156)	0
	Princess Anne (157)	7,257
		<hr/>
		17,965,674 sq. m
		1,796.57 hectares
		4,439.32 acres
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
	Poquoson West (140)	0
	Bacons Castle (144)	0
	Mulberry Island (145)	0

Table 6 (Continued)

SECTION	QUADRANGLE	AREA
James River - 21 (continued)		
	Newport News North (146)	0
	Hampton (147)	27,328
	Benns Church (148)	0
	Newport News South (149)	0
	Norfolk North (150)	0
	Little Creek (151)	0
	Chuckatuck (153)	0
	Bowers Hill (154)	0
	Norfolk South (155)	0
	Kempsville (156)	0
	Princess Anne (157)	0
		<hr/>
		27,328 sq. m
		2.73 hectares
		6.75 acres
Chincoteague Bay		
	Selbyville (165)	0
	Assawoman Bay (166)	0
	Berlin (167)	63,349
	Ocean City (168)	197,897
	Public Landing (169)	0
	Tingles Island (170)	9,936,407
	Girdle Tree (171)	0
	Boxiron (172)	6,361,266
	Whittington Point (173)	2,398,610
	Chincoteague West (174)	0
	Chincoteague East (175)	5,987,004
		<hr/>
		24,944,533 sq. m
		2,494.45 hectares
		6,163.79 acres

adjacent to Eastern Neck, Eastern Neck Island, and in the lower Chester River. In this region *Ruppia maritima* was the most abundant of seven species reported.

Middle Bay Zone

In 1990 forty-eight percent (5,405 hectares) of the SAV in the Middle Bay zone was found in the Mid-Bay Island Complex (Section 13) which includes the broad shoal area between Smith and Tangier Islands. This is an increase of 206 hectares over 1989. The two dominant species were *R. maritima* and *Zostera marina*. Twenty percent (2,287 hectares) of the SAV in this zone was present in the Middle Eastern Shore (Section 12), primarily in the Barren Island-Honga River area, the Big and Little Annessex rivers, and the lower section of the Manokin River, with *R. maritima* being the dominant species reported. Little or no SAV was mapped or reported from the Central Western Shore (Section 5), Middle Western Shore (Section 9), and Patuxent River (Section 8).

The Middle Bay zone also includes the entire Potomac River, where 3,054 hectares of SAV were present in 1990. SAV was concentrated in two distinct regions: 1. the Upper Potomac River (Section 11) with 2,522 hectares, where *Hydrilla verticillata* remained the numerically dominant species (eight other species were reported by the COG, VIMS, USFWS, and Citizen's surveys); and 2. the upper portion of the Lower Potomac River (Section 10) with 532 hectares, including Nanjemoy Creek and Port Tobacco River, with *V. americana* and *M. spicatum* being the most frequently reported species. Although the total abundance of SAV in the Upper Potomac section increased from 1989 by 524 hectares, it decreased in the Lower Potomac section by 83 hectares. SAV in the Eastern Bay (Section 6) decreased 443 hectares from 1989 to a total of 389 hectares in 1990, while in the Choptank River (Section 7) it declined 672 hectares from 1989 to a total of 193 hectares in 1990.

Lower Bay Zone

Distribution and abundance in 1990 in the Lower Bay zone were similar to 1989. Forty-five percent (4,829 hectares) of SAV in this zone was found in the Lower Eastern Shore (Section 14) around the Fox Islands and the mouths of major creeks (i.e. Cherrystone Inlet and Hungars, Mattawoman, Occahannock, Craddock, Pungoteague, and Onancock creeks). Along the western shore of the Chesapeake Bay, SAV was abundant in Mobjack Bay (Section 18) (16% of SAV in the Lower Bay zone), in the lower York River (Section 19) (7% of SAV in the Lower Bay zone), and in the Lower Western Shore (Section 20), specifically Back River and Drum Island Flats area adjacent to Plum Tree Island (17% of SAV in the Lower Bay zone). There were 609 hectares of SAV mapped in the Reedville Region (Section 15) in 1990, a 24% increase over 1989. There were 357 hectares of SAV identified in 1990 in the New Point Comfort Region (Section 17) compared to 346 hectares in 1989. Both *R. maritima* and *Z. marina* were abundant throughout this zone. SAV abundance was down slightly from 1989 in both the Piankatank and Rappahannock rivers (Section 16). *Ruppia maritima* was the dominant species in those rivers, with *Zostera marina* also present as a result of previously successful transplant efforts. The James River (Section 21) had less than 3 hectares of SAV in 1990, which is one hectare less than in 1989.

Chincoteague Bay

SAV in Chincoteague Bay increased slightly in distribution from 1989, with 2,494 hectares mapped in 1990. All of the SAV consisted of *R. maritima* and *Z. marina*, and was located along the eastern side of the bay behind Assateague Island.

DISCUSSION OF SECTIONS ARRANGED WITHIN ZONES

Upper Bay Zone

1. SUSQUEHANNA FLATS

There were 1,774 hectares of SAV in the Susquehanna Flats section in 1990 (Tables 4-6; Fig. 8; Appendix C, Maps 2, 3, and 9) compared to 1,945 hectares mapped in 1989. The majority (92%) of the total SAV area is categorized as very sparse and one large bed in the Havre de Grace quadrangle comprises most of this area (1,496 hectares). Beds in the Susquehanna River are denser than what was reported in 1989. SAV beds were located principally in two main areas: 1. sparse to dense fringing beds in the Susquehanna River consisting primarily of *M. spicatum*, with *P. pectinatus*, *C. demersum*, *V. americana*, *Heteranthera dubia*, *H. verticillata*, and *Najas* spp. 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*.

A total of eight species (*M. spicatum*, *H. dubia*, *V. americana*, *H. verticillata*, *C. demersum*, *P. pectinatus*, *P. perfoliatus*, and *Najas* spp.) have been reported either by Stan Kollar of Harford Community College, the University of Maryland's HPEL, or the Citizen's and the Charterboat Captain's surveys. SAV beds consisted of up to six species, with *M. spicatum* being dominant in most beds while *V. americana* was dominant in three beds. *Heteranthera dubia*, *H. verticillata*, *C. demersum*, and *Najas* spp. also occurred in significant amounts. SAV remains virtually absent from the Northeast River, Swan Creek, Spesutie Island, and the western side of Elk Neck.

2. UPPER EASTERN SHORE

There were 421 hectares of SAV mapped for the Upper Eastern Shore section in 1990 (Tables 4-6; Fig. 9; Appendix C, Maps 4, 5, 9, 10, 15, 16, 17, and 21) compared to 308 hectares mapped for 1989, consisting of very sparse and sparse beds (10% and 90% respectively, of the total coverage within section 2). Principal locations of beds were in the Elk River, mouth of Bohemia River, Swan Creek, lower Sassafras River, Still Pond and the mouth of Churn Creek. Very little SAV was mapped in the Bohemia River and along the mainstem of the bay from Still Pond to Swan Point. This section has contained relatively little SAV since the first baywide SAV survey 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*, *Najas* spp., *P. pectinatus*, *H. dubia*,

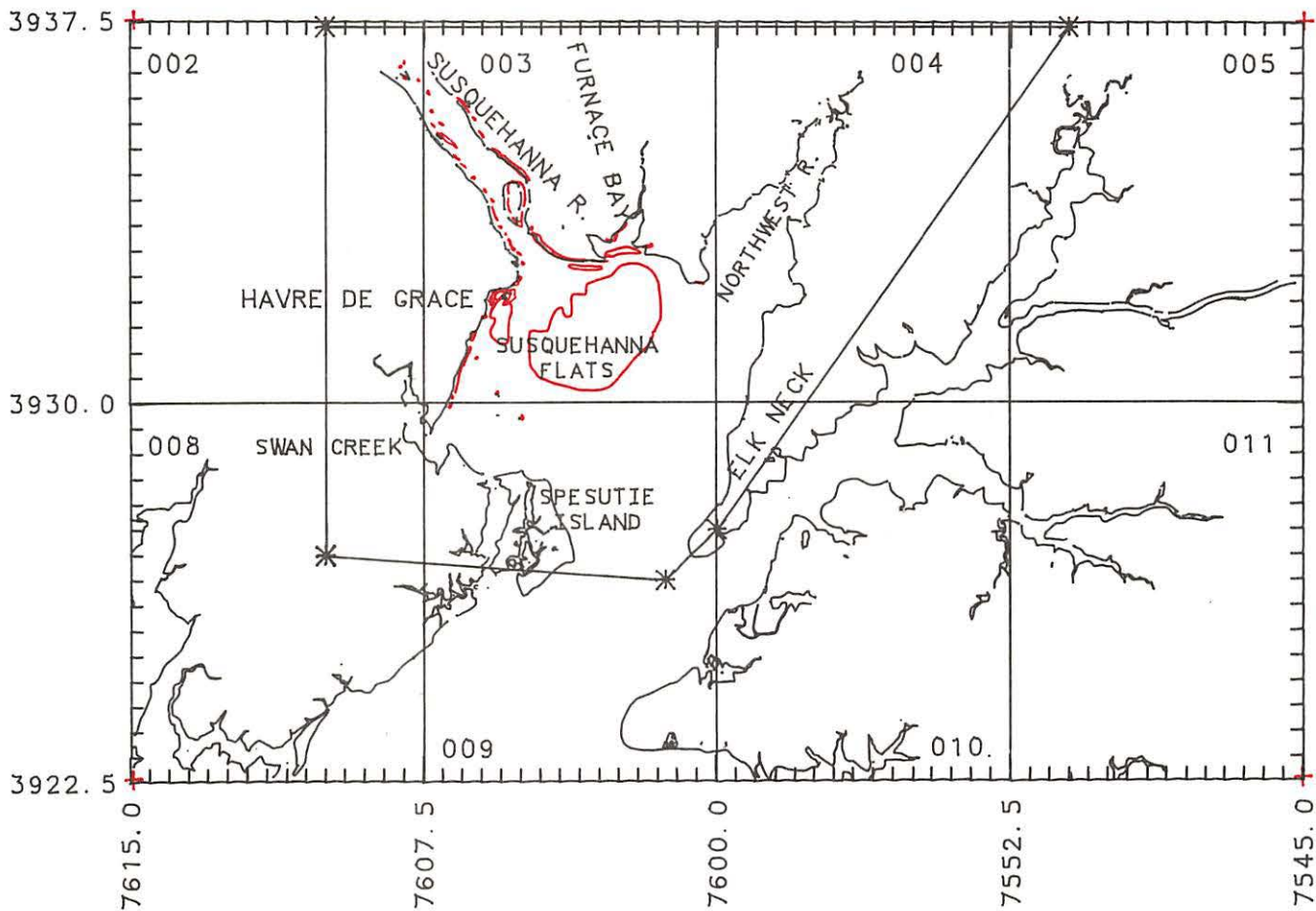


Figure 8. Distribution of SAV in the Susquehanna Flats (Section 1).

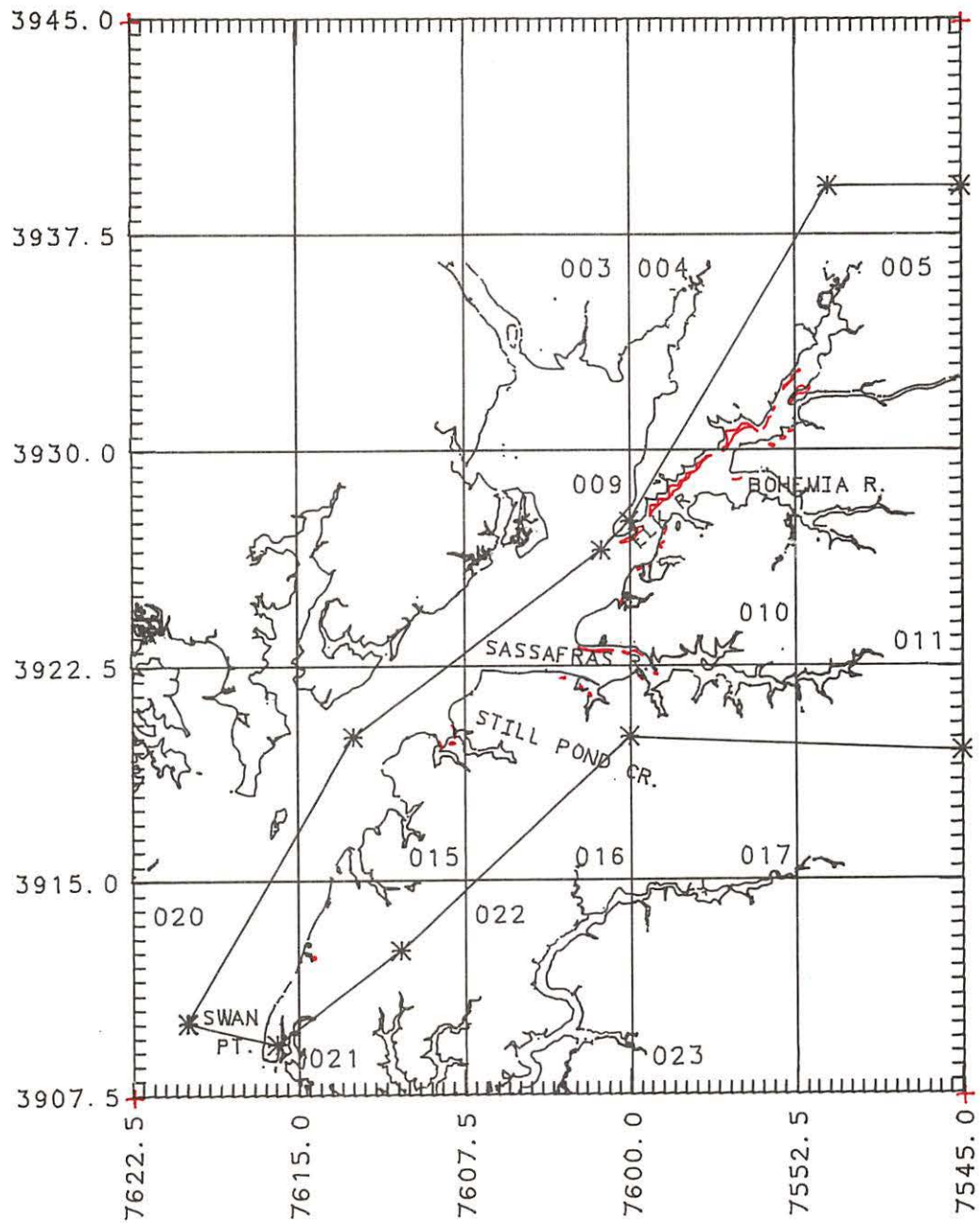


Figure 9. Distribution of SAV in the Upper Eastern Shore (Section 2).

and *Potamogeton crispus*) reported in lesser amounts as determined by Stan Kollar of Harford Community College and the Citizen's and Charterboat Captain's surveys.

3. UPPER WESTERN SHORE

There were 90 hectares of SAV mapped from the aerial photographs in 1990 for the Upper Western Shore section (Tables 4-6; Fig. 10; Appendix C, Maps 13 and 14) compared to 38 hectares in 1989. SAV beds were concentrated in Saltpeter and Dundee creeks. Very little or no SAV was reported in the Back, Patapsco, Bush, Gunpowder, Middle, and Magothy rivers.

Myriophyllum spicatum, *E. canadensis*, *Z. palustris*, *P. pectinatus*, *P. crispus*, *Chara* spp., *R. maritima*, *N. quadalupensis*, and *V. americana* were reported by the Citizen's and Charterboat Captain's surveys (Maps 13, 14, 18, 19, and 24).

4. CHESTER RIVER

There were 67 hectares of SAV in the Chester River section in 1990 (Tables 4-6; Fig. 11; Appendix C, Maps 20, 21, 26, and 33) compared to 167 hectares in 1989. SAV was located adjacent to Eastern Neck and Eastern Neck Island, especially near Eastern Neck Narrows, and in Robins Cove 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.

Five species of SAV were reported from this section in 1990 by the Citizen's, Charterboat Captain's, Univ. of Maryland's HPEL, and USFWS surveys. *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.

The large, dense beds of *R. maritima* present in previous surveys in the Chester River are no longer present, or are in very reduced abundance.

Middle Bay Zone

5. CENTRAL WESTERN SHORE

There was no SAV observed from the aerial photography in the Central Western Shore section in 1990 (Tables 4-6; Fig. 12) which was similar to 1989. Although not evident in the aerial photography, the USFWS and the Citizen's survey reported SAV from a few sites in this section, primarily the Severn River, Blackwalnut Creek, Lake Ogleton, South Creek of the West River, Duvall, Beards, and Almshouse Creeks and Selby Bay of the South River, and Burley Creek (Maps 23, 24, 30, 31, and 35). Species reported from this section include *Z. palustris* and *R. maritima*.

6. EASTERN BAY

There were 389 hectares of SAV identified from the Eastern Bay section in 1990 (Tables 4-6; Fig. 13; Appendix C, Maps 32, 33, 36, and 37) compared to 831 hectares reported in 1989. SAV occurred as very sparse to sparse beds throughout this section

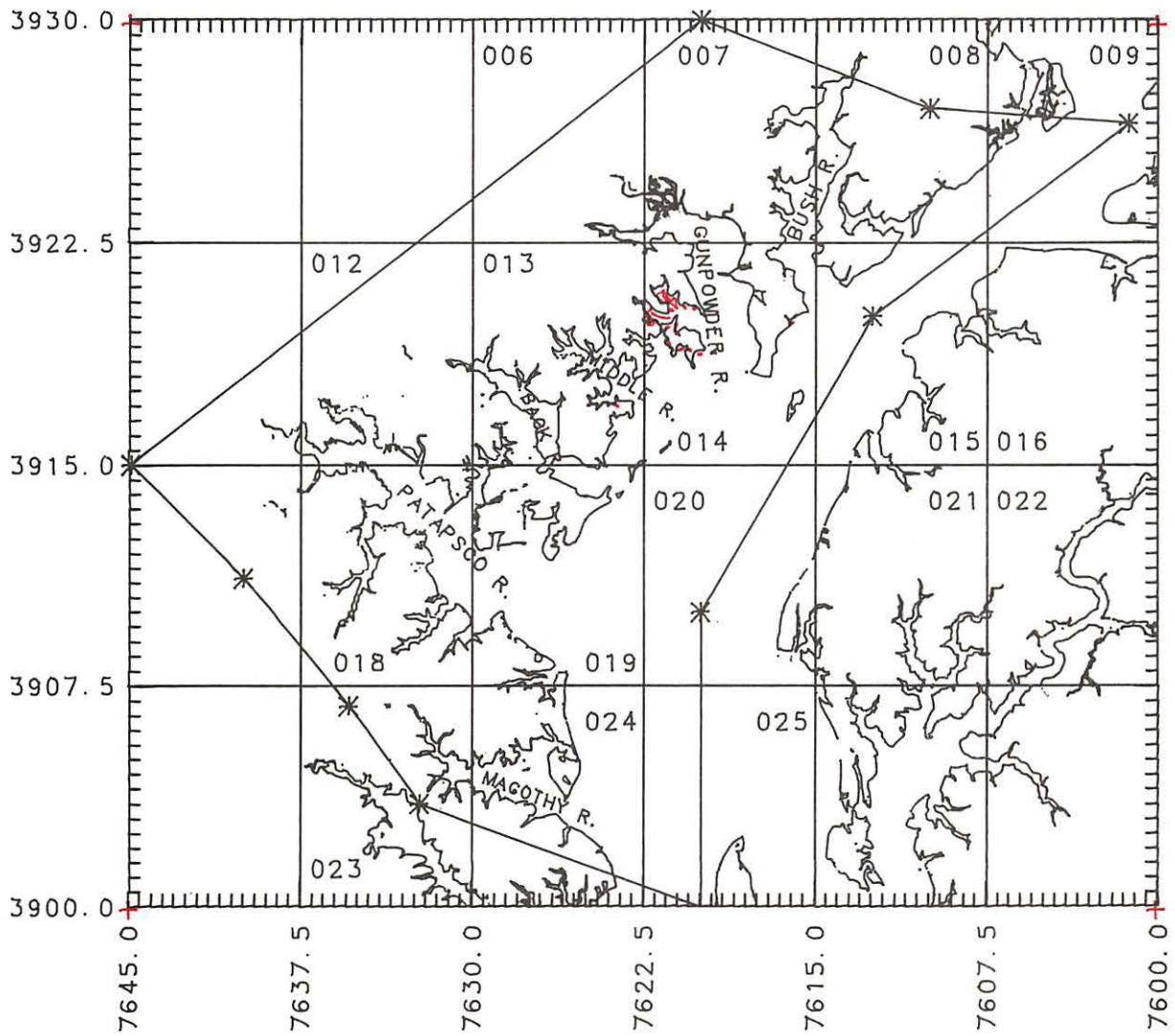


Figure 10. Distribution of SAV in the Upper Western Shore (Section 3).

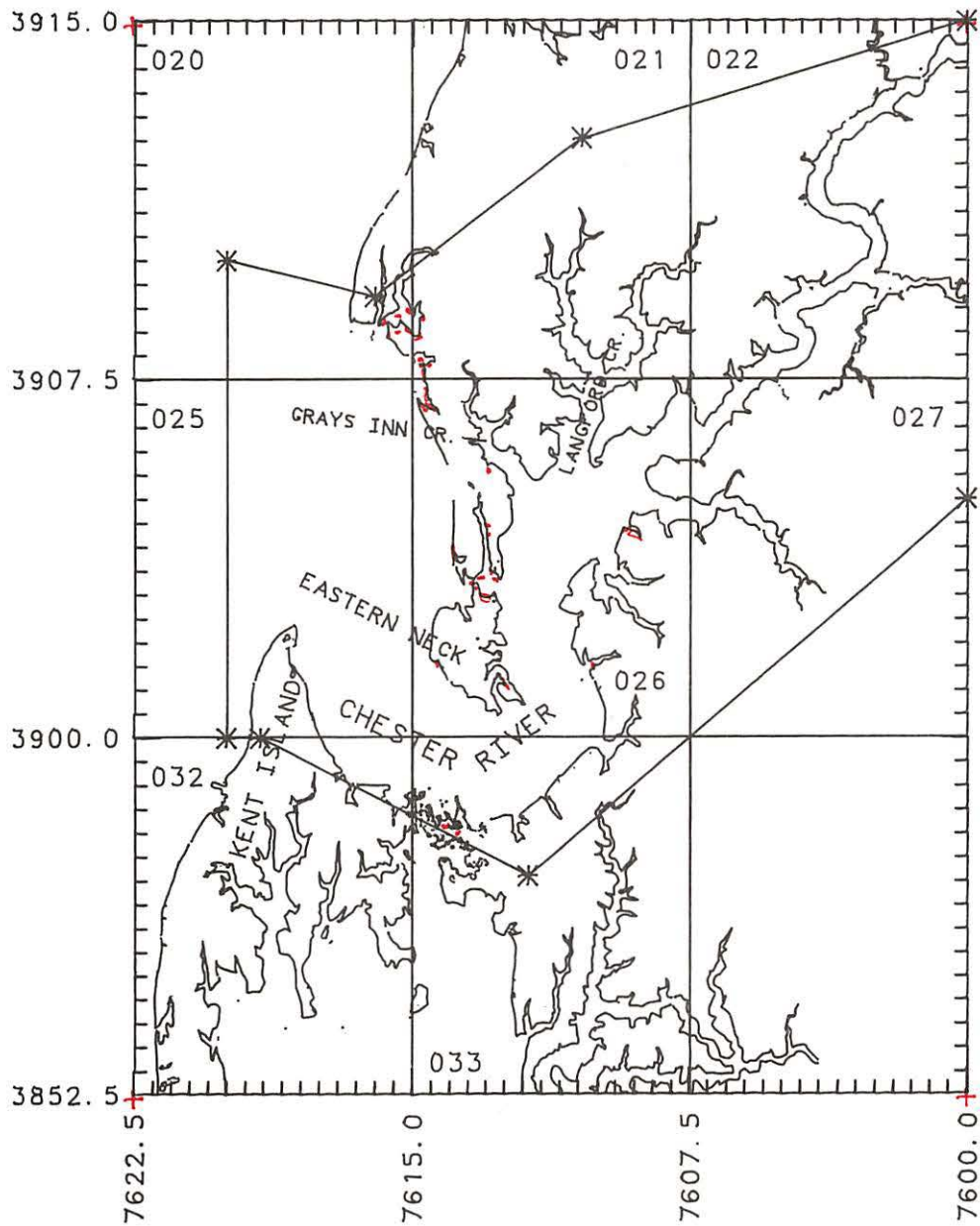


Figure 11. Distribution of SAV in the Chester River (Section 4).

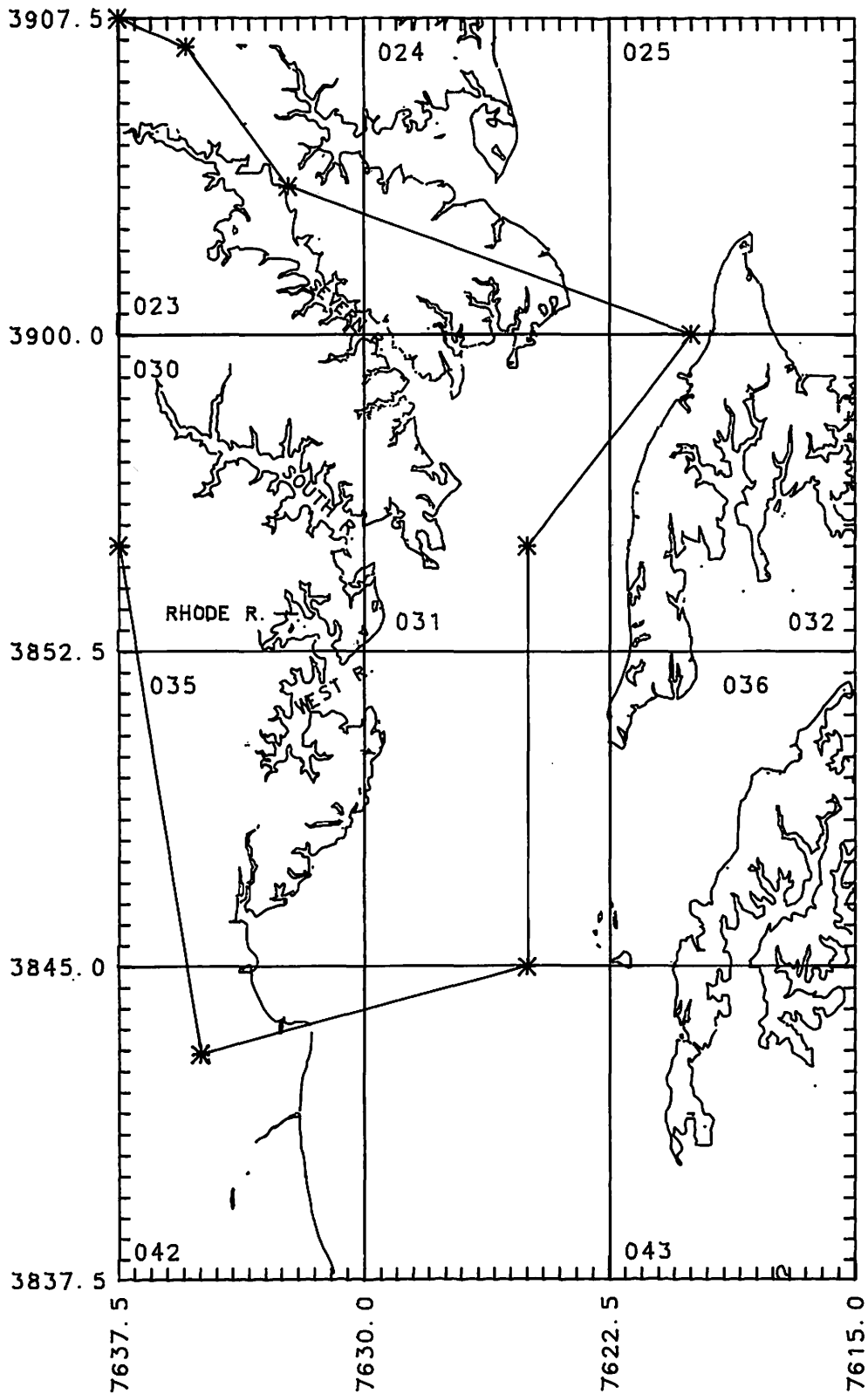


Figure 12. Distribution of SAV in the Central Western Shore (Section 5).

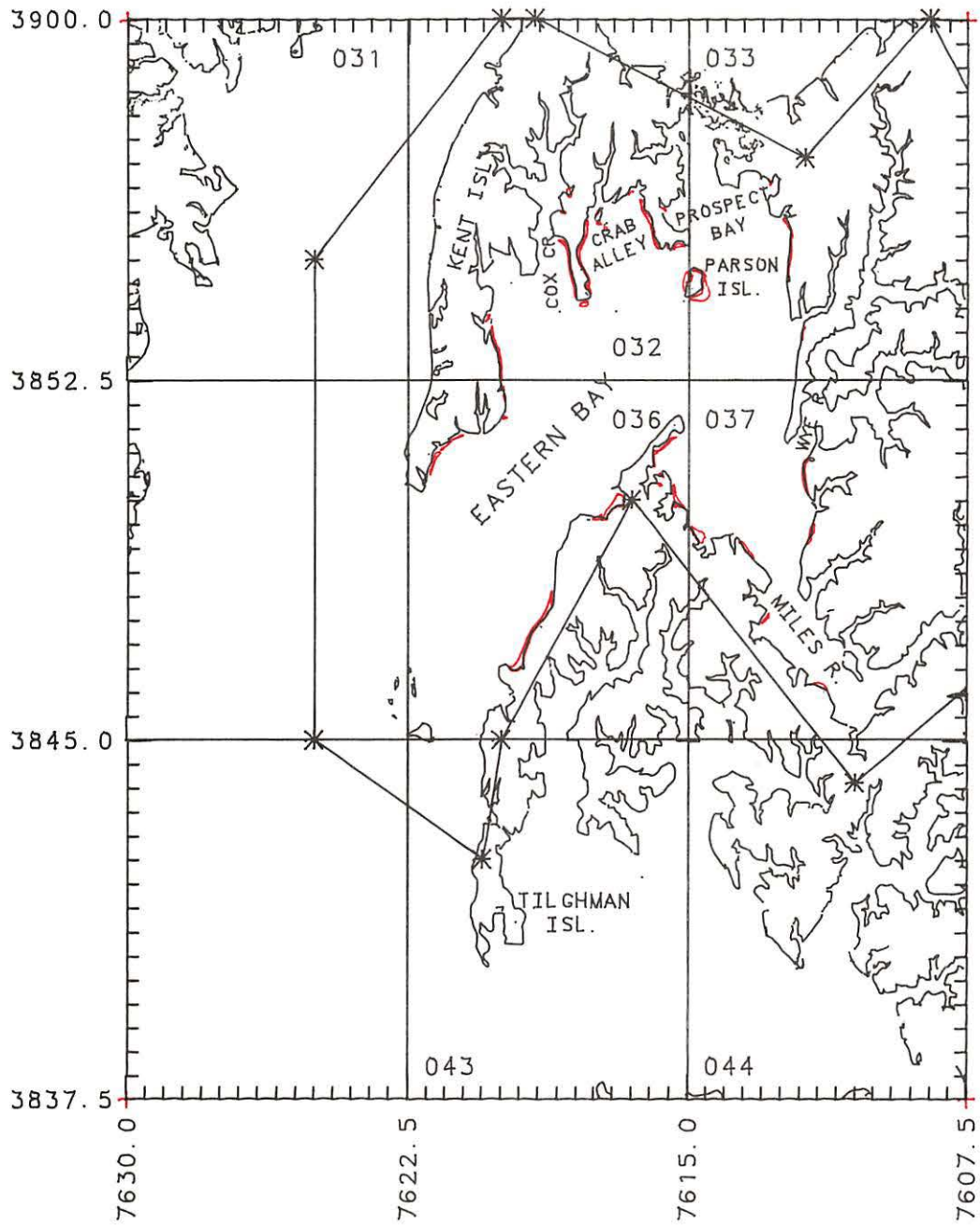


Figure 13. Distribution of SAV in the Eastern Bay (Section 6).

(22% and 54% of the total SAV coverage within section 6, respectively). In 1990 SAV was identified as being particularly abundant along both shorelines in Cox Creek, Crab Alley Bay, the eastern shore of lower Kent Island, 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*, *Z. palustris*, and *P. perfoliatus* were reported by the FWS, University of Maryland HPEL, the Charterboat Captain's, and the Citizen's surveys (Maps 32, 33, 36, 37, and 38).

7. CHOPTANK RIVER

There were 193 hectares of SAV observed in the Choptank River section in 1990 (Tables 4-6; Fig. 14; Appendix C, Maps 43, 44, 51, 52, and 62) compared to 865 hectares in 1989. Most of the SAV occurred in sparse (27%) to moderate (53%) beds in only a few areas. SAV was found at the mouth of Harris Creek, Leadenham Creek off Broad Creek, Brannock Bay, the mouth of Chapel Creek, Cook Point Cove, Covey Creek, and Cators Cove. There is little or no SAV in Broad Creek, 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 HPEL, located three species of SAV in this section (Maps 36, 43, 44, 51, 52, and 62) with *R. maritima* being the most prevalent. *Potamogeton pectinatus* and *Z. palustris* were observed in scattered locations.

8. PATUXENT RIVER

There was no SAV observed from the aerial photography in the Patuxent River section in 1990 (Tables 4-6; Fig. 15) compared to 3 hectares reported in 1989. There were sporadic sightings of four SAV species in the Patuxent River by the the Maryland Capital Parks and Planning Commission and Citizen's surveys (Maps 41, 49, 61, 70, 71, and 159). Those species reported from the lower sections of the river were *P. pectinatus*, *Z. palustris*, and *R. maritima*. Species found from the upper sections of the river were *V. americana*, *C. demersum*, *P. epihydrus*, *Najas guadalupensis*, *Najas gracillima*, *Najas minor*, *Z. palustris*, *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 1990 (Tables 4-6; Fig. 16) which was similar to 1989. There were three observations from Citizen's ground surveys in 1990 with reports of *R. maritima* at two sites and an unidentified species at the third (Map 71).

10. LOWER POTOMAC RIVER

There were 532 hectares of SAV identified in the Lower Potomac River section from the 1990 aerial photography (Tables 4-6; Fig. 17; Appendix C, Maps 56, 57, 58, 65, 66, and 67) compared to 616 hectares reported in 1989. Most of the SAV occurred

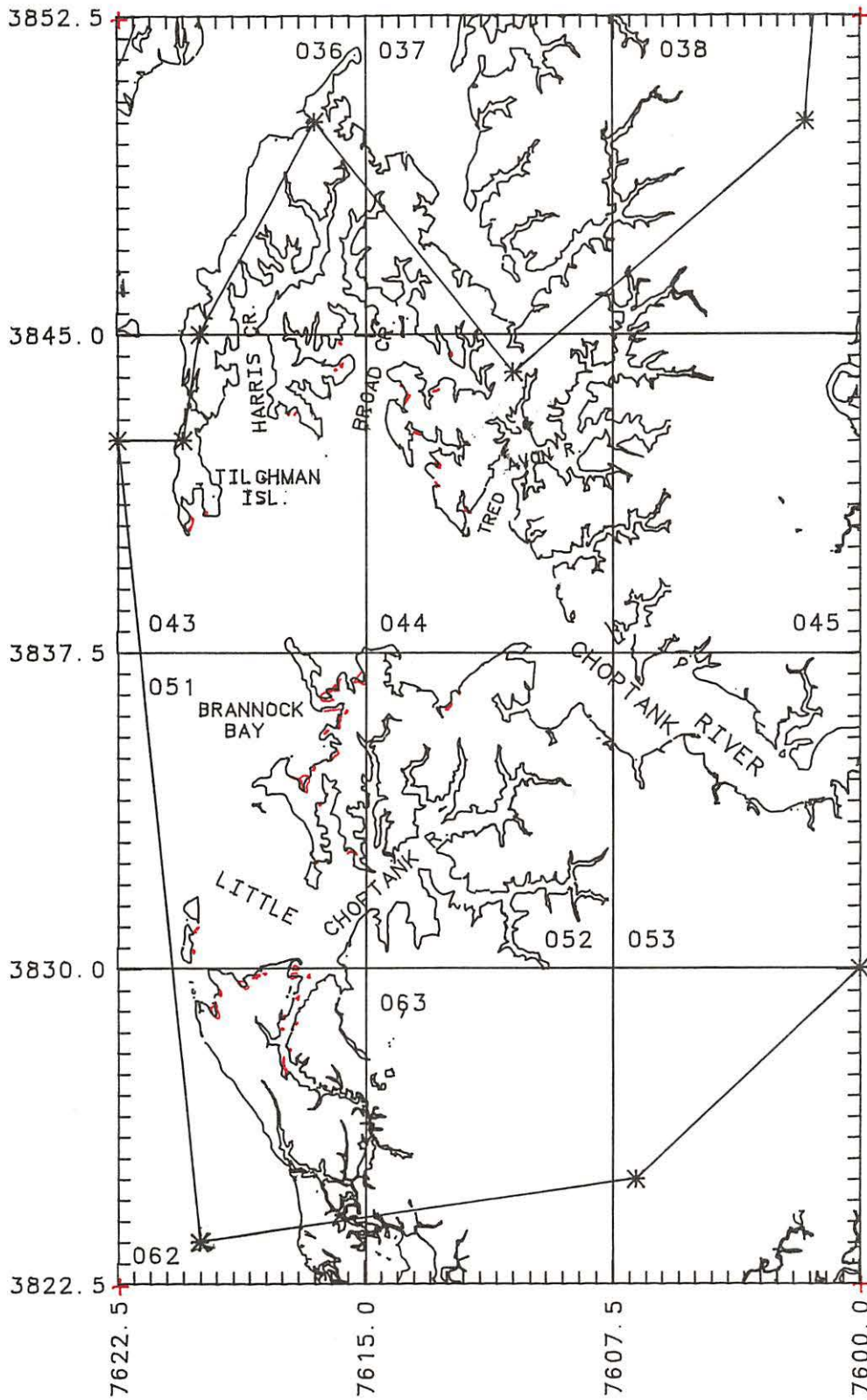


Figure 14. Distribution of SAV in the Choptank River (Section 7).

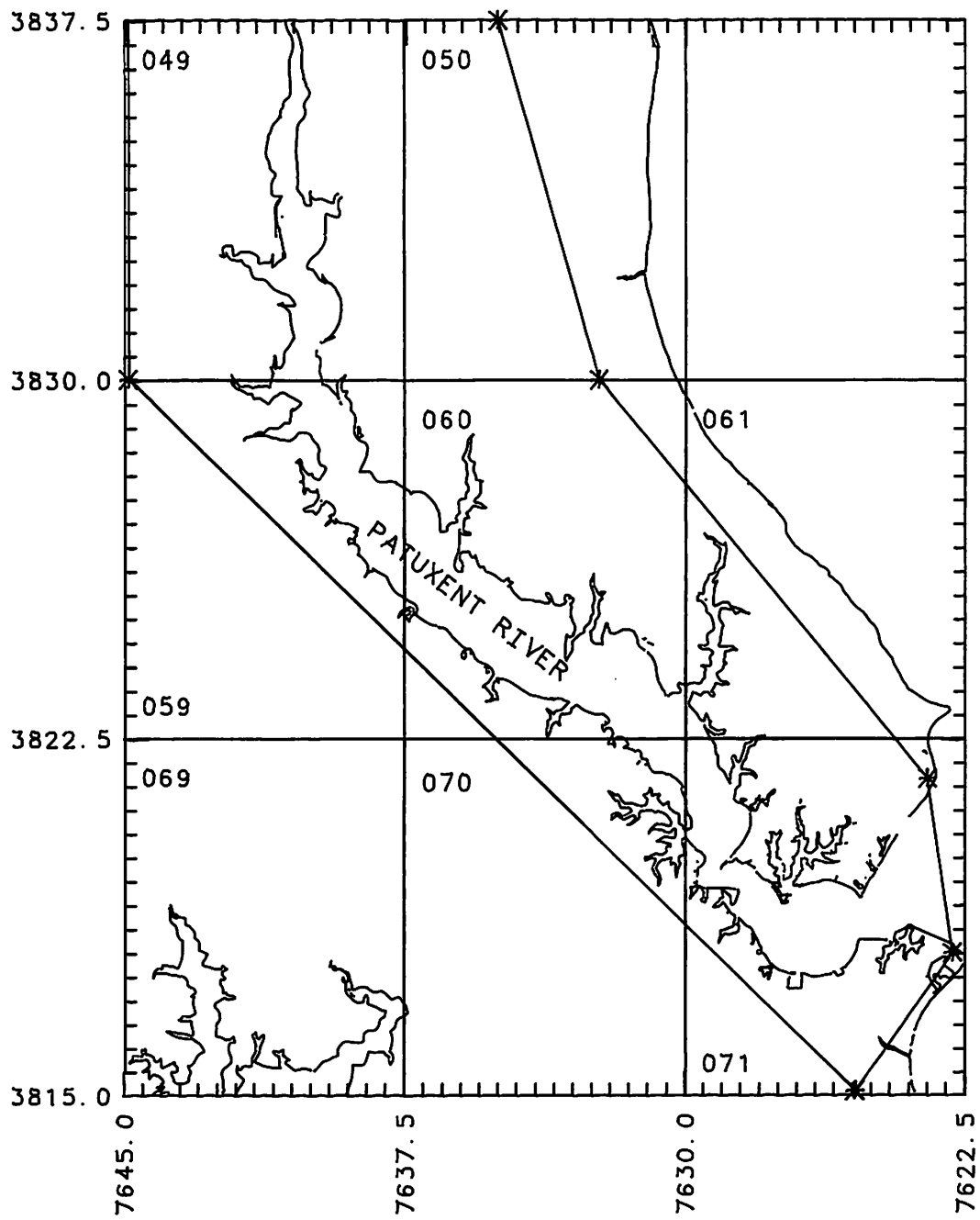


Figure 15. Distribution of SAV in the Patuxent River (Section 8).

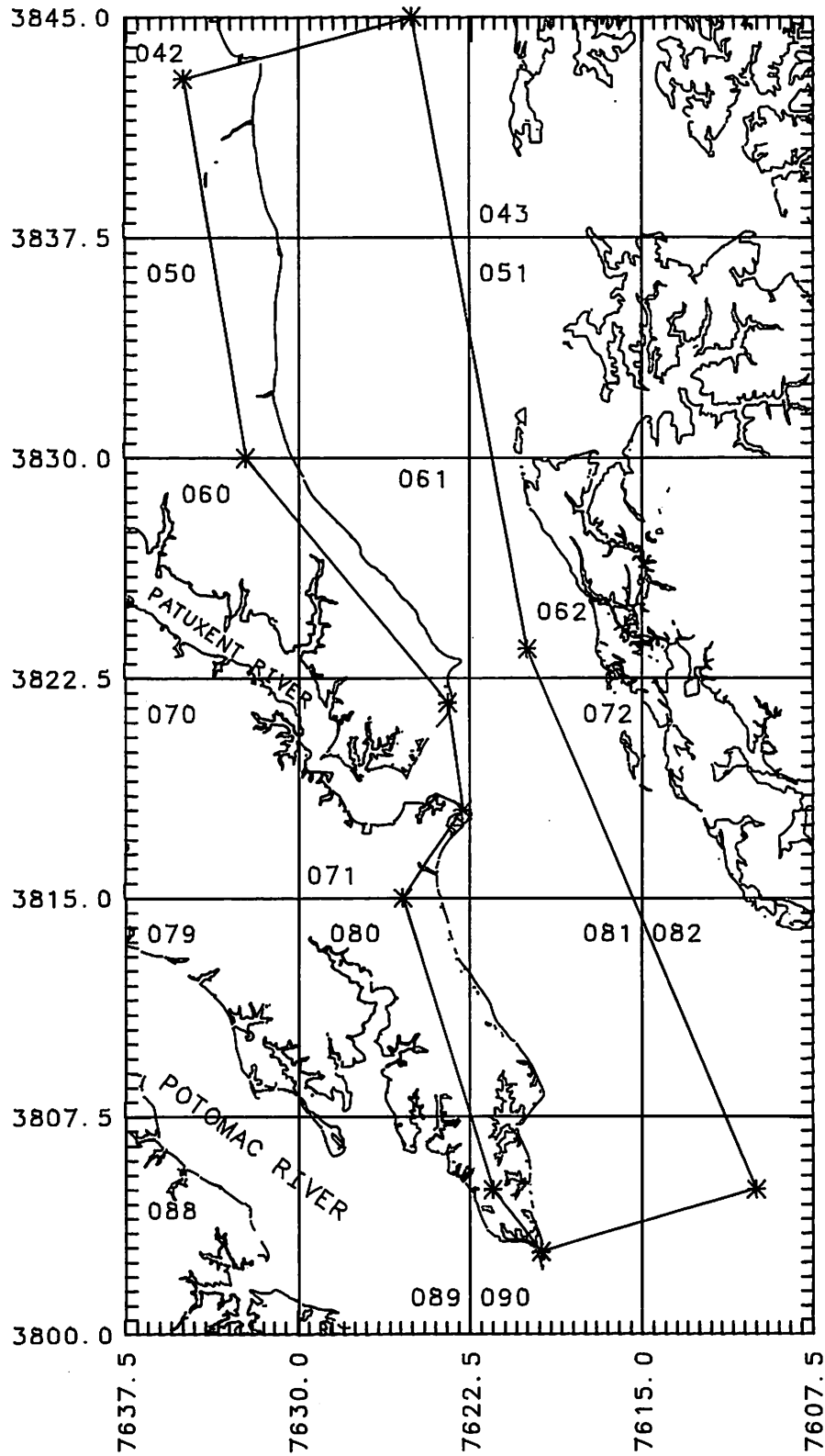


Figure 16. Distribution of SAV in the Middle Western Shore (Section 9).

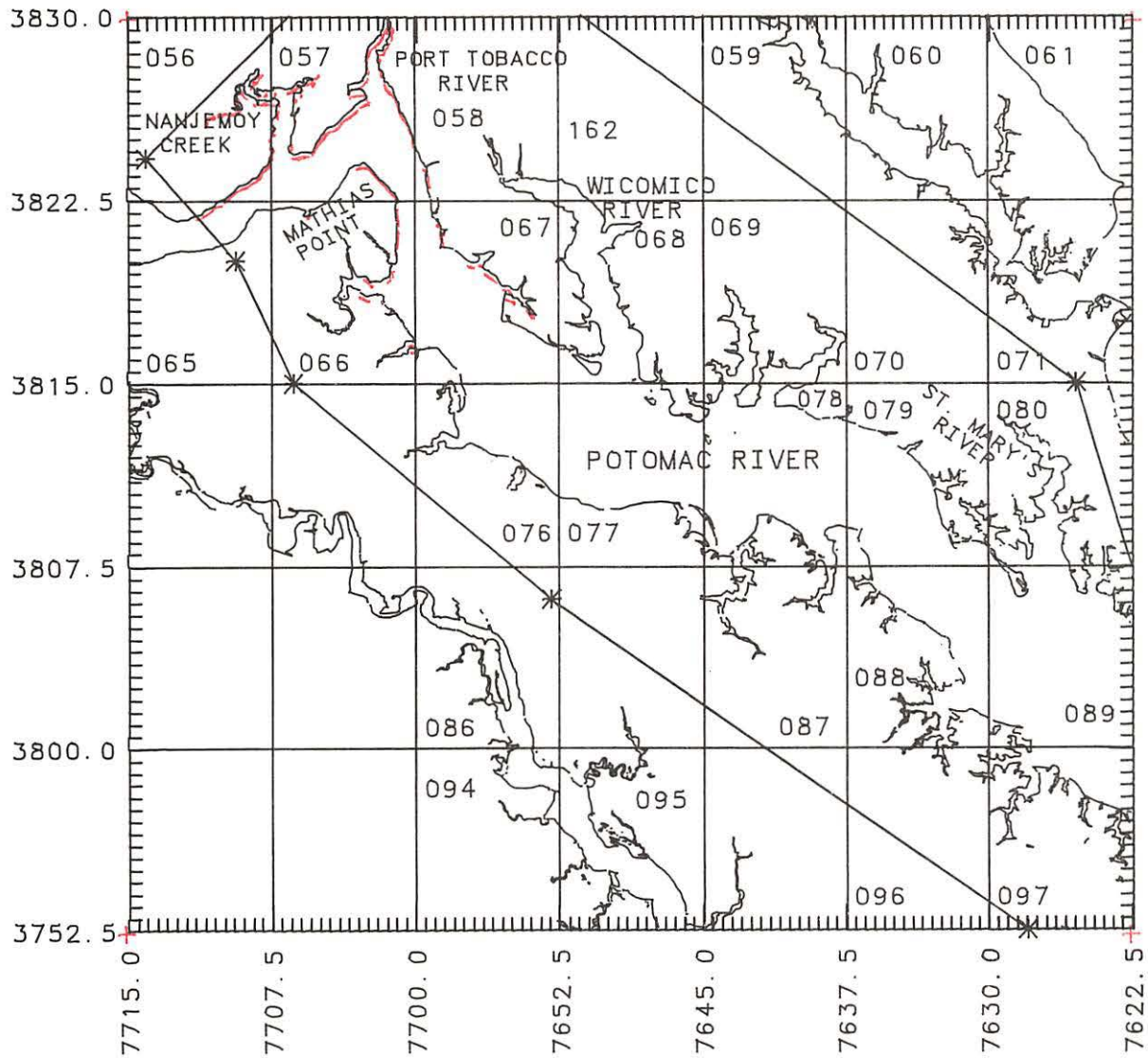


Figure 17. Distribution of SAV in the Lower Potomac River (Section 10).

in the region near the Route 301 bridge, in Nanjemoy Creek and Port Tobacco River, and in the shoreline adjacent to these two creeks. SAV beds were fringing along the eastern side of Mathias Point Neck to just below the Route 301 bridge. Several small beds were observed in Machodoc, Rosier, and Cuckhold Creeks.

VIMS surveys reported *V. americana*, *P. pectinatus*, and *P. perfoliatus* at Windmill Point on the Port Tobacco River, and *V. americana* at Upper Cedar Point, Mathias Point (Map 57), and below the Route 301 bridge on the mainstem Potomac River (Map 66). Citizen's survey observations reported *Z. palustris* at the mouth of the Wicomico River (Map 68), Breton Bay (Map 69), and Herring Creek (Map 79). The USFWS reported *V. americana*, *M. spicatum*, *P. perfoliatus*, *C. demersum*, *P. pectinatus*, *P. crispus*, *E. canadensis*, and *H. verticillata* in the Port Tobacco River. The Charterboat Captain's survey reported unidentified SAV from the Potomac River and tributary creeks (Maps 56, 66, and 67).

11. UPPER POTOMAC RIVER

There were 2,522 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) in 1990 compared to 1,998 hectares reported in 1989. A total of 72% of the SAV beds were densely vegetated (density class 4). SAV beds from the Woodrow Wilson Bridge (except those in the middle of the river - Map 34, beds BB4, HB4, and GB3) to just below Piscataway Creek remain reduced in coverage from 1987 as in 1989. SAV distribution in the Alexandria and Mount Vernon quadrangles increased 8% and 7% respectively from 1989 but was still less than that in 1987 (15% and 66%, respectively). In the portion from Quantico to Aquia Creek in 1990 SAV continued to increase from 1987 abundances, with large increases from 1989 in the Indian Head (184.01 to 303.67 hectares), Widewater (466.64 to 614.54 hectares), and Fort Belvoir (63.48 to 105.06 hectares) quadrangles. King George quad had similar SAV abundance (35.37 hectares) to that in 1989. SAV is still absent from Occoquan Bay and Belmont Bay.

Extensive groundtruth surveys were conducted by the Council of Governments (Maps 29, 34, 39, 40, 47, 48, and 55) while the Citizen's survey reported SAV from Maps 34, 40, and 47. There were nine species identified from this section in 1990. *Hydrilla verticillata* was reported from Aquia, Chopawamsic, Quantico, Mattawoman, Chicamuxen, Dogue, Pomonkey, Piscataway, Swan, and Broad Creeks, Gunston Cove, the Anacostia River, and both sides of the mainstem Potomac River from Washington D.C. to Aquia Creek. Other species reported from this section included *M. spicatum*, *C. demersum*, *H. dubia*, *N. minor*, *V. americana*, *N. guadalupensis*, *E. canadensis*, *N. gracillima*, and *Najas* spp.

12. MIDDLE EASTERN SHORE

There were 2287 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) in 1990 compared to 1,998 hectares reported in 1989. SAV beds, of which 39% were dense (class 4), 27% moderate (class 3), 25% sparse (class 2), and 8% very sparse (class 1) were very abundant in: 1. the Honga River, 2. between Barren Island and Meekins Neck-Upper Hooper Island, and 3. the lower Manokin and the Big and

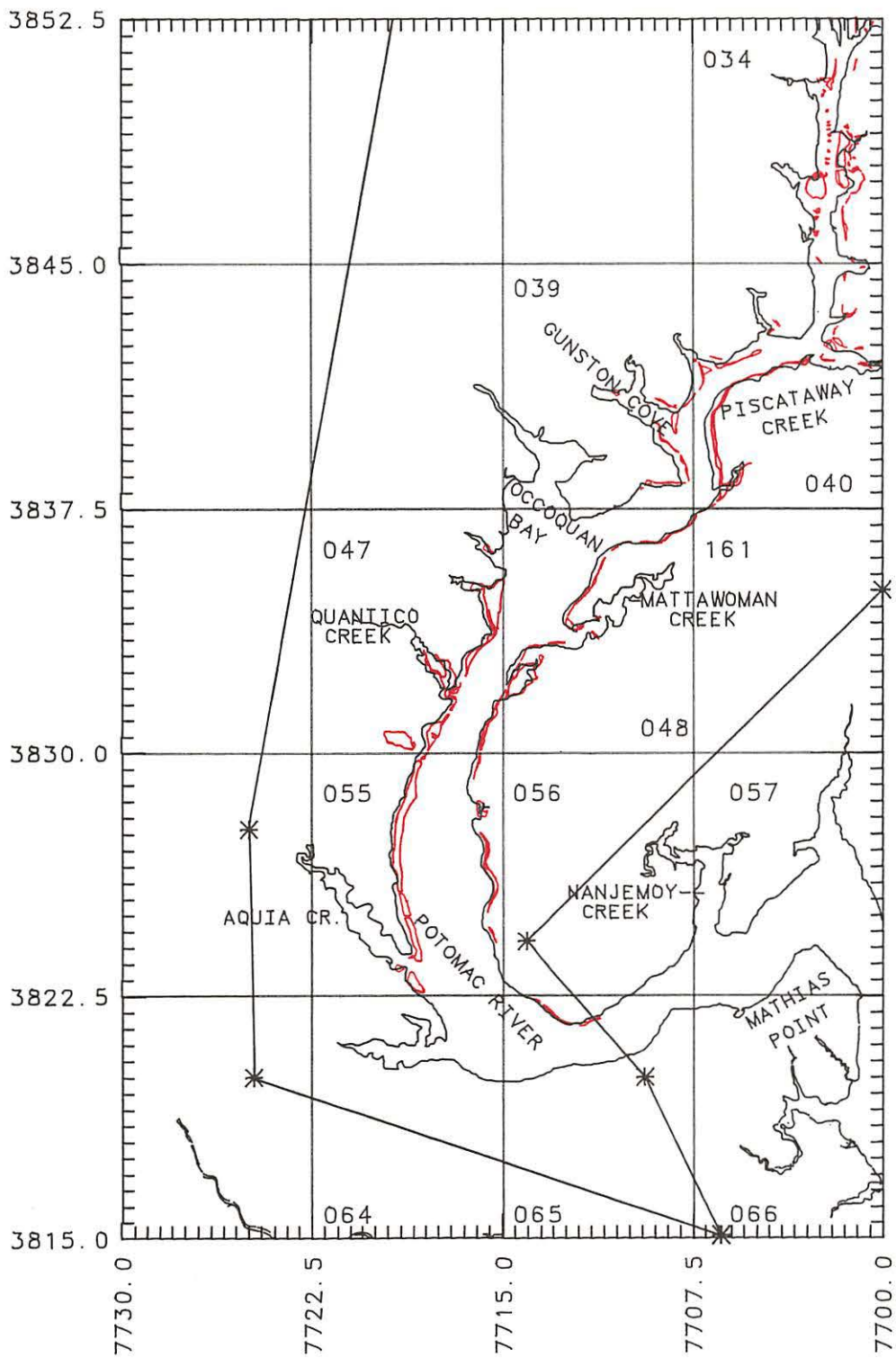


Figure 18. Distribution of SAV in the Upper Potomac River (Section 11).

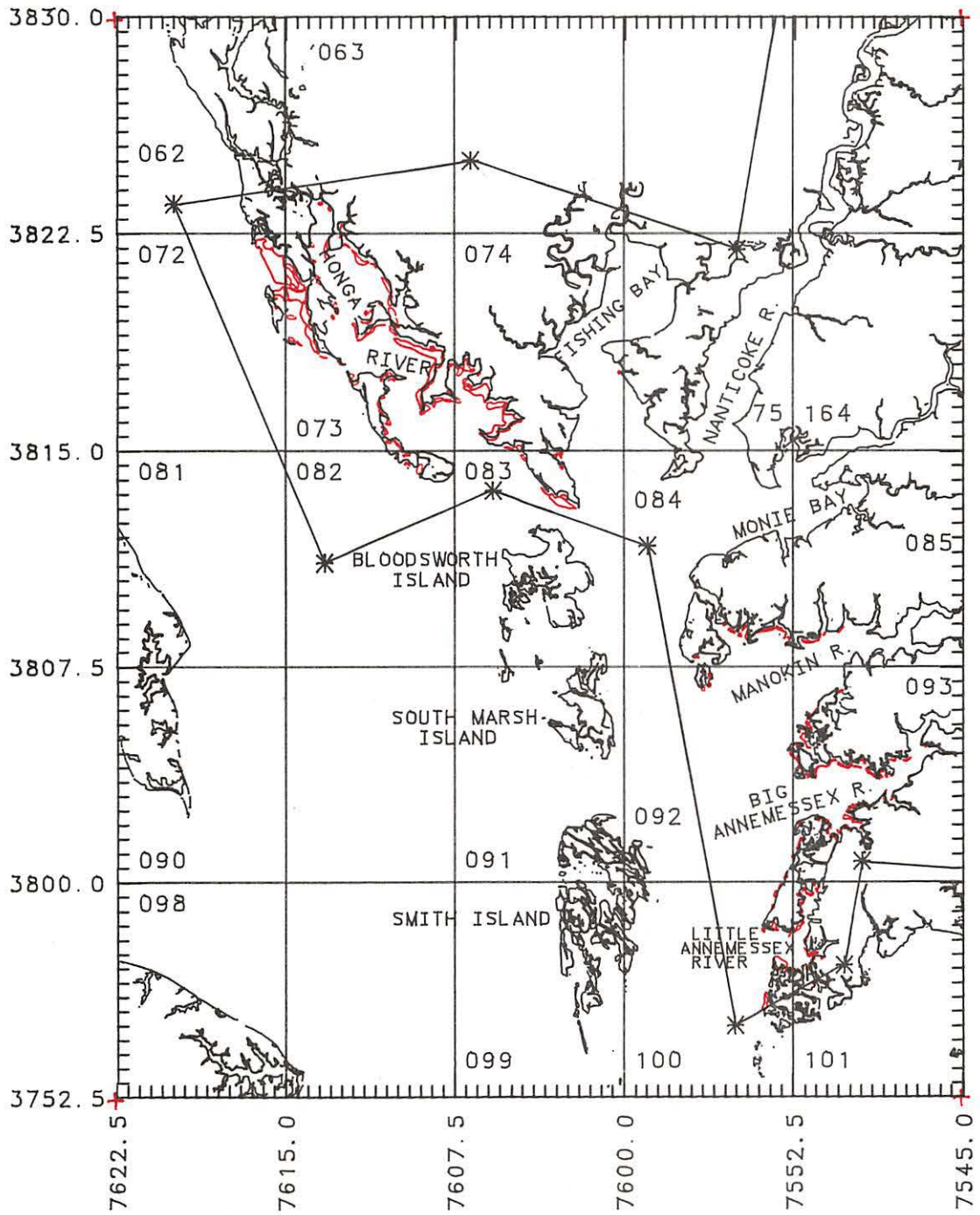


Figure 19. Distribution of SAV in the Middle Eastern Shore (Section 12).

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 HPEL, Citizen's, and Charterboat Captain's surveys (Maps 63, 72, 73, 74, 82, 83, 84, 85, 92, 93, 100, and 101). *Zostera marina* was reported from several locations on the Marion (Map 93), Great Fox Island (Map 100), and Crisfield (Map 101) quadrangles. *Zannichellia palustris* was reported from Crisfield quad (Map 101) and Marion quad (Map 93).

13. MID-BAY ISLAND COMPLEX

There were 5,405 hectares of SAV mapped in the Mid-Bay Island Complex in 1990 (Tables 4-6; Fig. 20; Appendix C, Maps 83, 91, 92, 99, 100, and 107) compared to 5,199 hectares reported in 1989. This section contains 22.1% of the SAV in the entire Chesapeake Bay, an increase of 0.6% over 1990. However, the density of SAV has decreased since 1989. Forty-five percent of the SAV within this section was in density class 4 compared to 80% in 1989. Twenty-four percent of SAV within this section in 1990 was moderate in density (class 3), 19% was sparse (class 2), and 12% was very sparse (class 1).

Groundtruth surveys were conducted by VIMS, HPEL, Citizens, and Charterboat Captains. The broad, expansive shoal area between Tangier Island and Smith Island continued to be densely vegetated by both *R. maritima* and *Z. marina*, and was by far the largest bed in the Chesapeake Bay. *Ruppia maritima* was the species most often reported by the surveys around these islands.

Lower Bay Zone

14. LOWER EASTERN SHORE

There were 4,829 hectares of SAV observed in the Lower Eastern Shore section in 1990 (Tables 4-6; Fig. 21; Appendix C, Maps 100, 101, 102, 107, 108, 109, 113, 114, 119, 124, 133, 134, 142, and 143) compared to 4,718 hectares reported in 1989. Fifty-four percent of the total SAV is in density class 4; 11% is in class 1; and 9% is in class 3. Species reported were primarily *Z. marina* and *R. maritima* with *Z. palustris* reported at a few sites. There were groundtruth observations from VIMS, Citizen's and Charterboat Captain's surveys (Maps 100, 101, 108, 113, 114, and 124). Large, dense beds continue to persist at the mouth of Cherrystone Inlet near Cape Charles, at the mouths of Hungars, Mattawoman, Occohannock, Craddock, Pungoteague, Onancock, and Chesconessex creeks, 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 and Cedar Islands. The only SAV in the Pocomoke Sound area was on the eastern side of Watts Island. There was no SAV south of Old Plantation Creek just below Cape Charles.

15. REEDVILLE REGION

There were 609 hectares of SAV identified in the Reedville Region in 1990 (Tables 4-6; Fig. 22; Appendix C, Maps 106 and 112) compared to 492 hectares reported in 1989. SAV beds were classified as 16% very sparse (class 1), 24% sparse

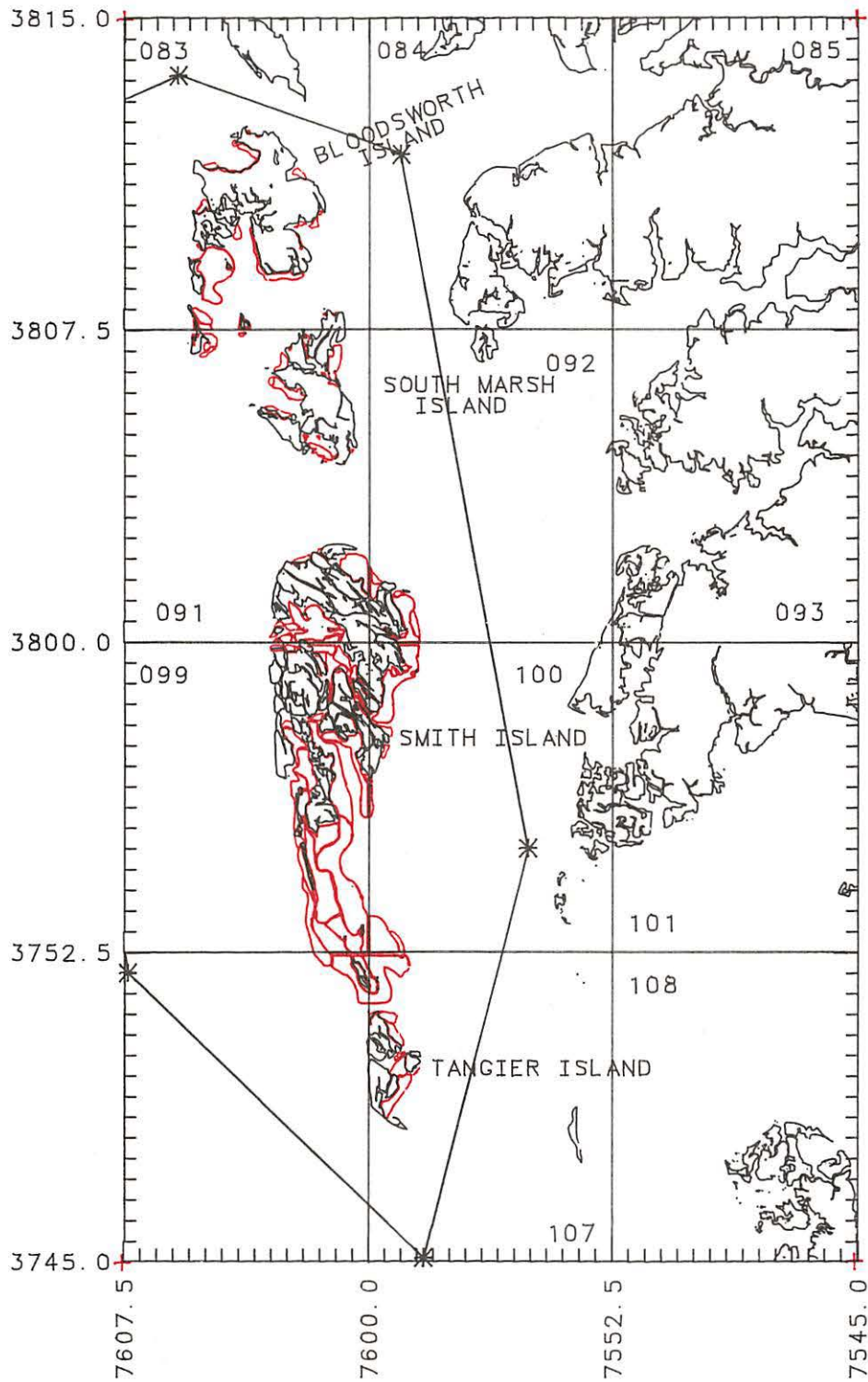


Figure 20. Distribution of SAV in the Mid-Bay Island Complex (Section 13).

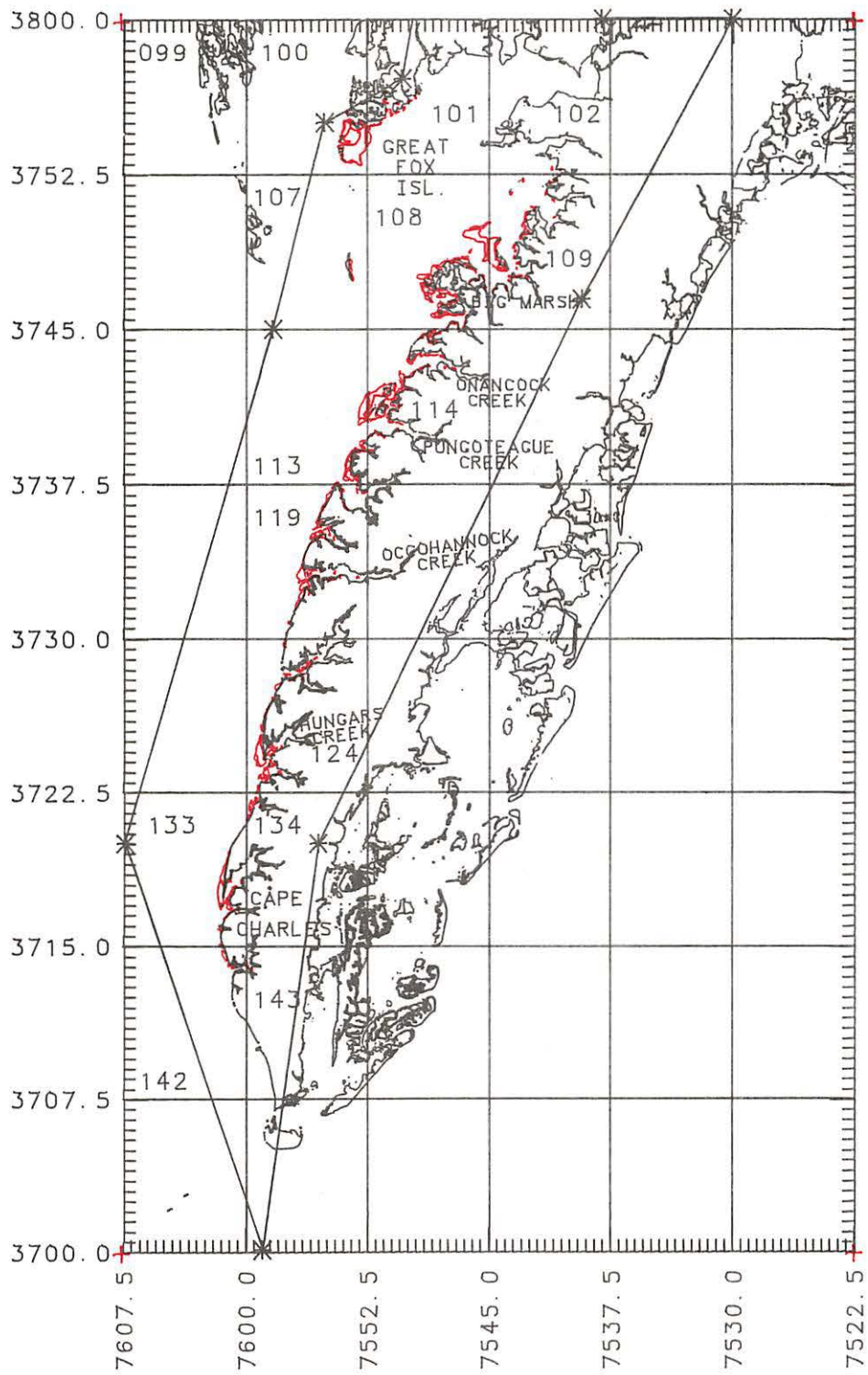


Figure 21. Distribution of SAV in the Lower Eastern Shore (Section 14).

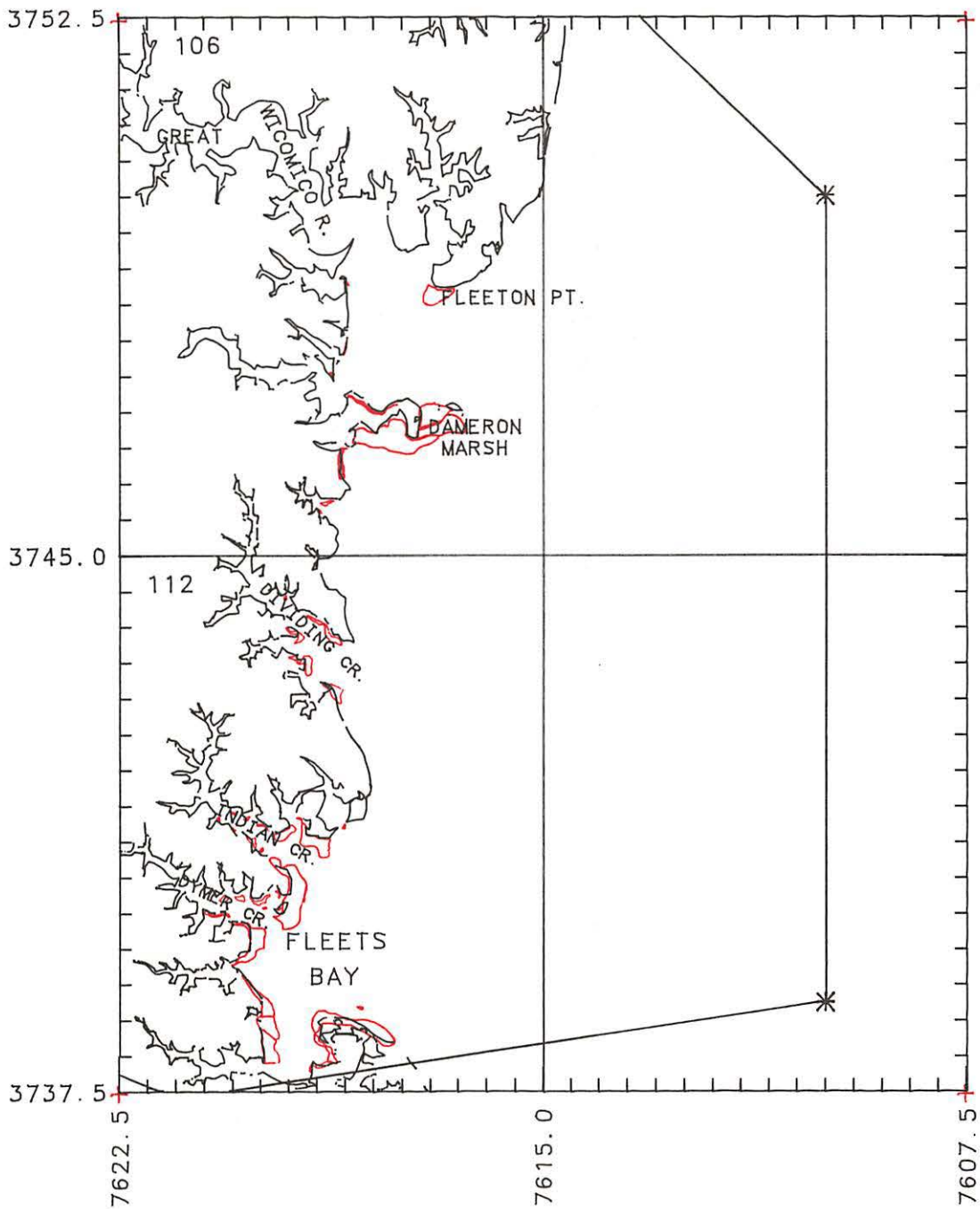


Figure 22. Distribution of SAV in the Reedville Region (Section 15).

(class 2), 41% moderate (class 3), and 19% dense (class 4). *Ruppia maritima* and *Z. marina* were the two species identified by VIMS and Citizen's surveys in 1990 (Maps 106 and 112). Most beds were found in Little Bay, Fleets Bay, Dymer Creek, Indian Creek, Dividing Creek, Ball Creek, Cloverdale Creek, Dameron Marsh, Ingram Bay, and Fleeton Point.

16. RAPPAHANNOCK RIVER COMPLEX

There were 544 hectares of SAV observed in the Rappahannock River Complex in 1990 (Tables 4-6; Fig. 23; Appendix C, Maps 110, 111, 116, 117, 118, and 123) compared to 669 hectares reported in 1989. Although this was an 18.7% drop in abundance, it still is a considerable increase from the 208 hectares mapped in 1987, or the 18 hectares mapped in 1986. SAV beds consisted mostly of sparse to moderate beds (35% in density class 2; 44% in class 3), and 20% was dense (class 4).

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; Maps 110, 111, 117, 118, and 123). *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 using both seeds and whole plants in a number of different areas since 1984 (VIMS, unpublished data) and as a result of natural propagation from nearby beds, especially in the Piankatank River. 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, at Ball Point, off Wharton Grove, and adjacent to Towles Point. Also reported by the VIMS survey at Parrot Island was *Z. palustris*. 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 357 hectares of SAV identified in the New Point Comfort Region in 1990 (Tables 4-6; Fig. 24; Appendix C, Map 132) compared to 346 hectares reported in 1989. As in 1989, SAV consisted of dense beds (68% in density class 4) of *Z. marina* and *R. maritima* between New Point Comfort and just north of Horn Harbor. Twenty-nine percent of the SAV was in density class 2 and the remainder was in density class 3. Groundtruth data was collected by the VIMS survey.

18. MOBJACK BAY COMPLEX

The Mobjack Bay Complex contained 1,703 hectares of SAV in 1990 (Tables 4-6; Fig. 25; Appendix C, Maps 122, 123, 131, and 132) compared to 1,593 hectares reported in 1989. SAV beds consisting of *Z. marina* and *R. maritima* were most abundant along the entire shoreline of Mobjack Bay as well as in the four tributaries:

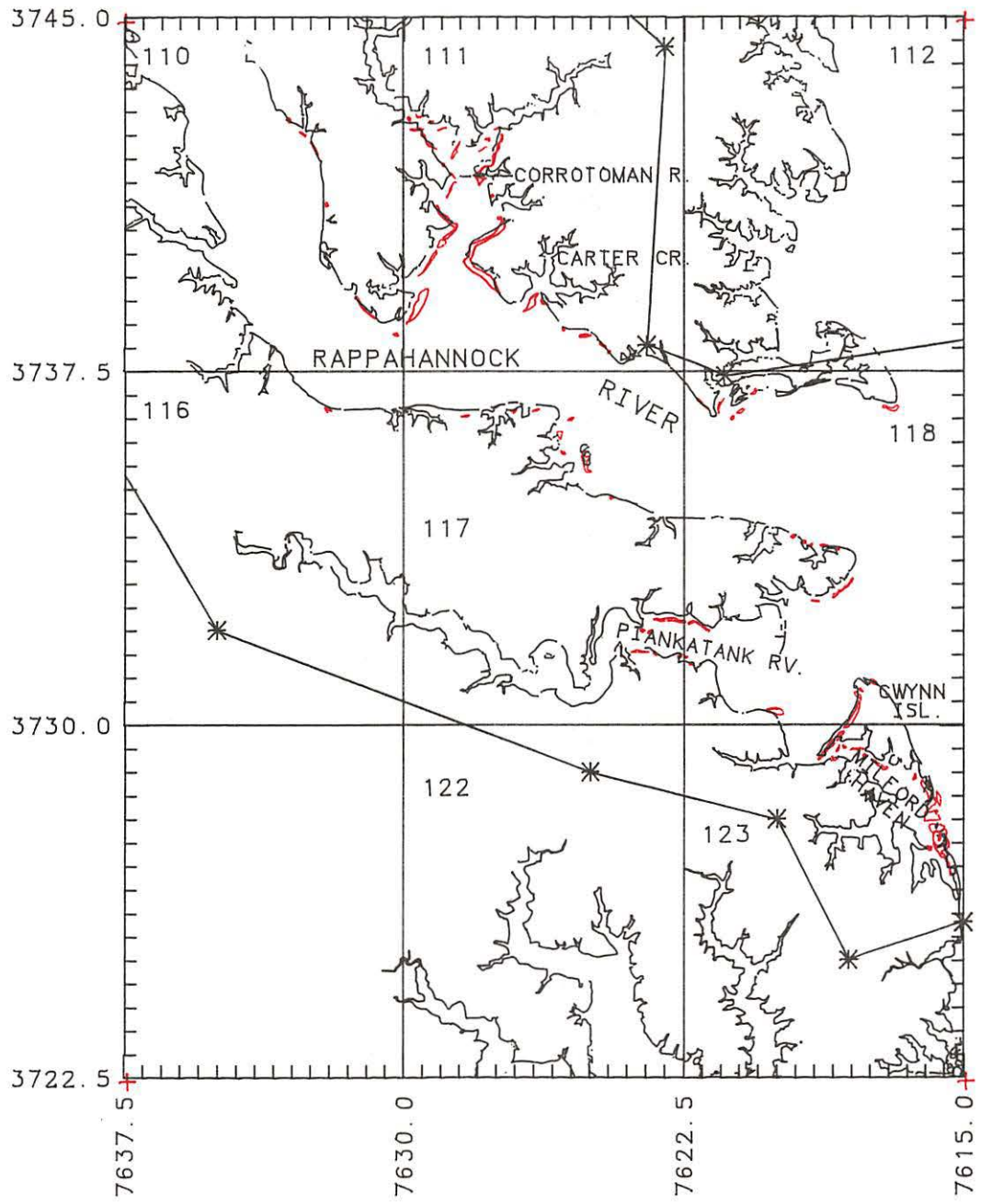


Figure 23. Distribution of SAV in the Rappahannock River Complex (Section 16).

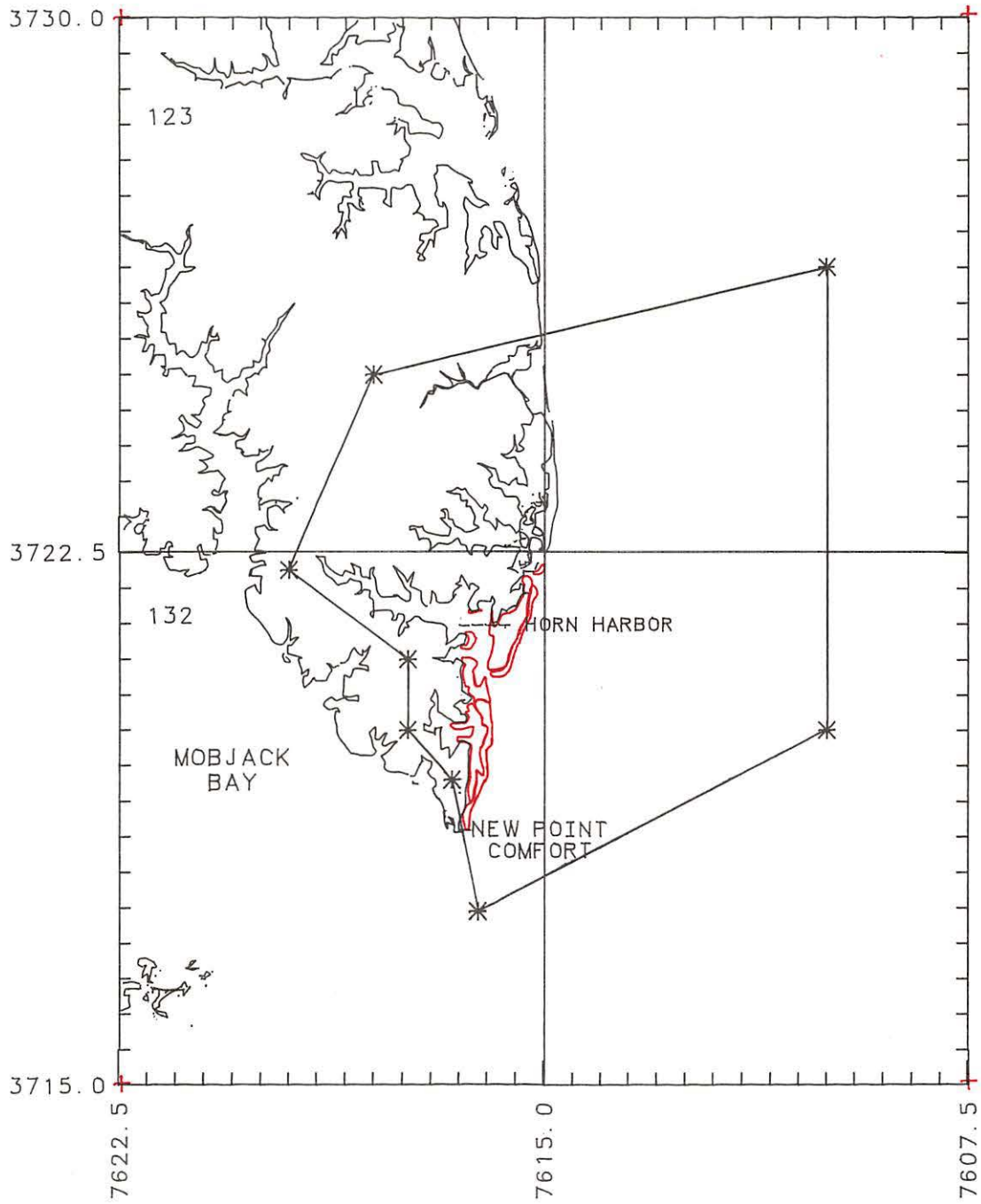


Figure 24. Distribution of SAV in the New Point Comfort Region (Section 17).

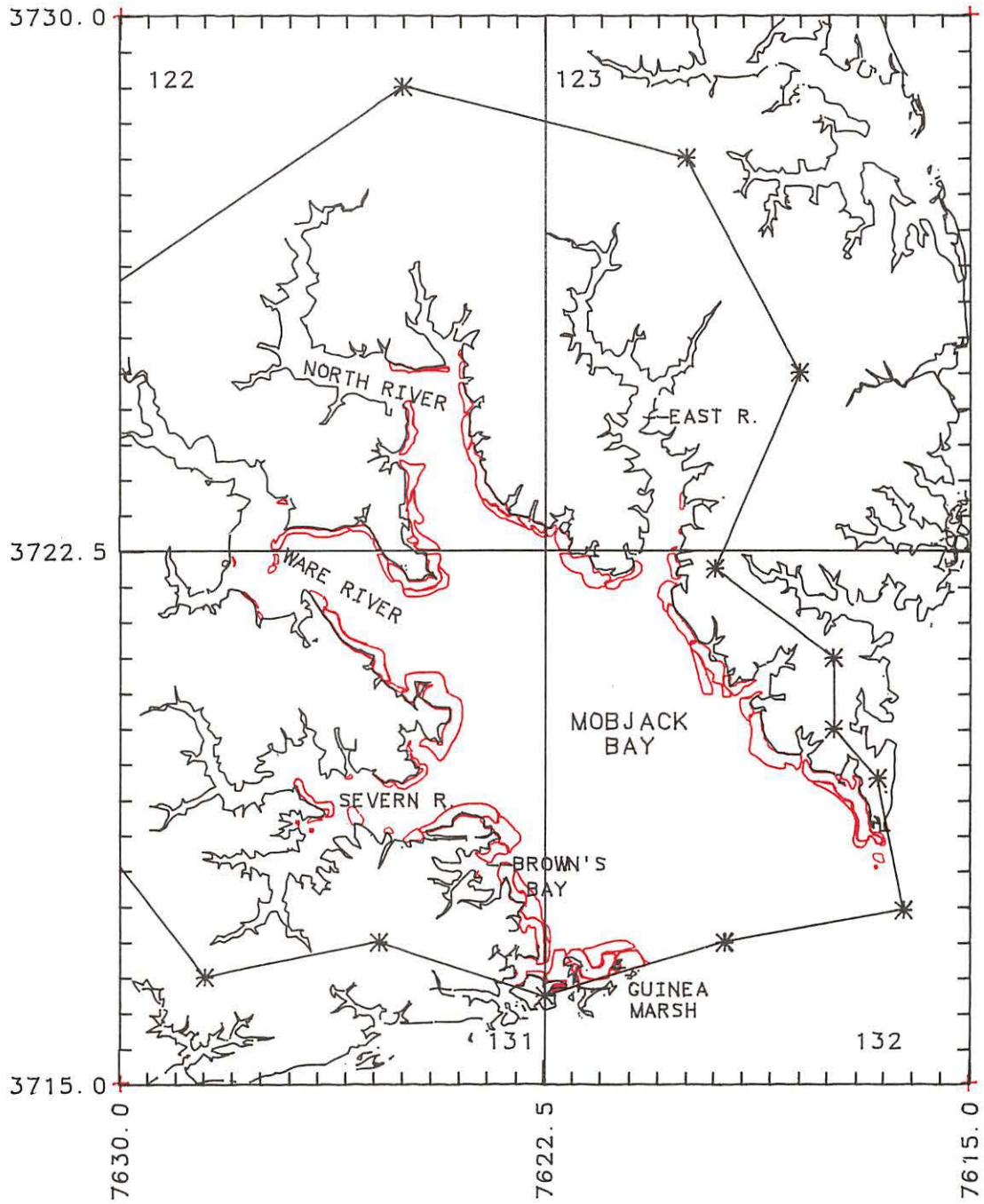


Figure 25. Distribution of SAV in the Mobjack Bay Complex (Section 18).

Severn, Ware, North, and East Rivers. The Mobjack Bay area continued to harbor some of the more extensive SAV beds on the western shore of the lower Chesapeake Bay. Sixty percent of the total coverage of SAV in this section is in density class 4, similar to 1989. The next largest density class was 26% sparse (class 2), while 10% was moderate (class 3) and 4% was very sparse (class 1). Groundtruth observations include those from the Citizen's and VIMS surveys (Maps 122, 131, and 132).

19. YORK RIVER

There were 790 hectares of SAV observed in the York River section in 1990 (Tables 4-6; Fig. 26; Appendix C, Maps 130, 131, 132, 139, and 140) compared to 677 hectares reported in 1989. Seventy-three percent of the total coverage in this section is classified as dense (class 4) compared to 80% in 1989. Twenty-three percent of the SAV was in density class 2, 3% was in class 1, and the remainder was in class 3. Groundtruth observations were made by VIMS surveys (Maps 130, 131, 132, 139, and 140). Dense SAV beds consisting of both *Z. marina* and *R. maritima* were located principally along the north shore from Gloucester Point to the mouth of the river. Three small SAV beds, and one large bed located on the north side of Goodwin Islands, were present along the south shore downstream from the Naval Weapons Station. SAV beds were absent upstream of Gloucester Point on the north shore except for one small bed of *Z. marina* near Gloucester Point and two small beds of *Z. marina* (less than 1.5 hectares) adjacent to Big Mumfort Island, a result of VIMS transplanting efforts using seeds in 1989. 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 1984 through 1988, continue to thrive in 1990 similar to many naturally expanding beds along the north shore.

20. LOWER WESTERN SHORE

There were 1,797 hectares of SAV mapped in the lower Western Shore section in 1990 (Tables 4-6; Fig. 27; Appendix C, Maps 140, 141, 147, 152, and 157) compared to 1,670 hectares reported in 1989. Groundtruth surveys by Citizen's and VIMS (Maps 141 and 152) reported *Z. marina* and *R. maritima*. As in 1989, 60% percent of the total coverage in this section remained in density class 4. SAV was mapped in Broad Bay, Linkhorn Bay, Back River, the mouth of the Poquoson River off Pasture and Hunts Neck, Drum Island Flats, Poquoson 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 not quite 3 hectares of SAV in the mainstem James River in 1990 (Tables 4-6; Fig. 28; Appendix C, Map 147), compared to 4 hectares in 1989. This small (2.7 hectare), dense bed located at the mouth of Hampton Creek adjacent to the Veteran's Hospital was not groundtruthed in 1990 but was reported to consist predominantly of *Z. marina* in 1989. A Citizen survey reported *C. demersum* and

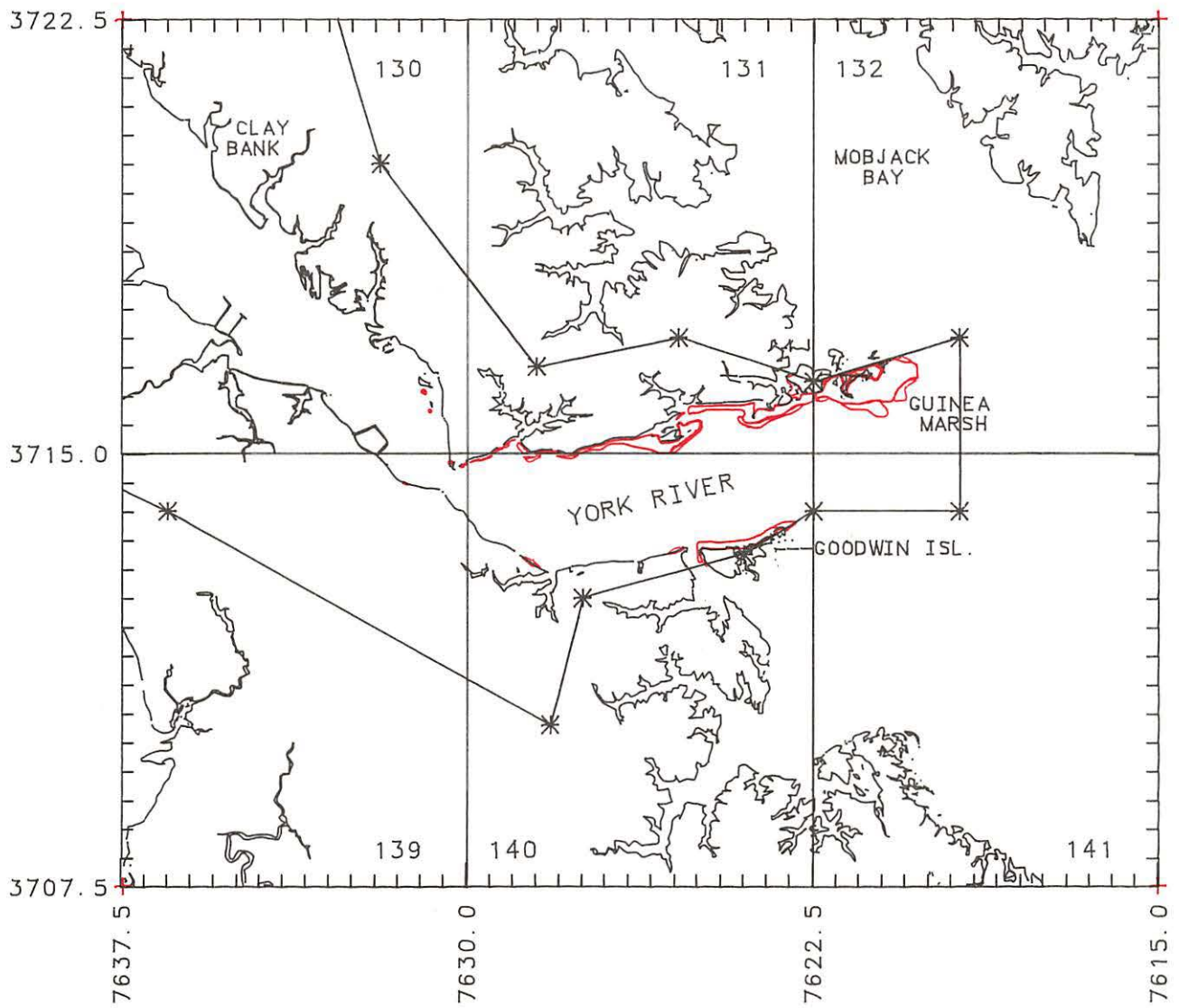


Figure 26. Distribution of SAV in the York River (Section 19).

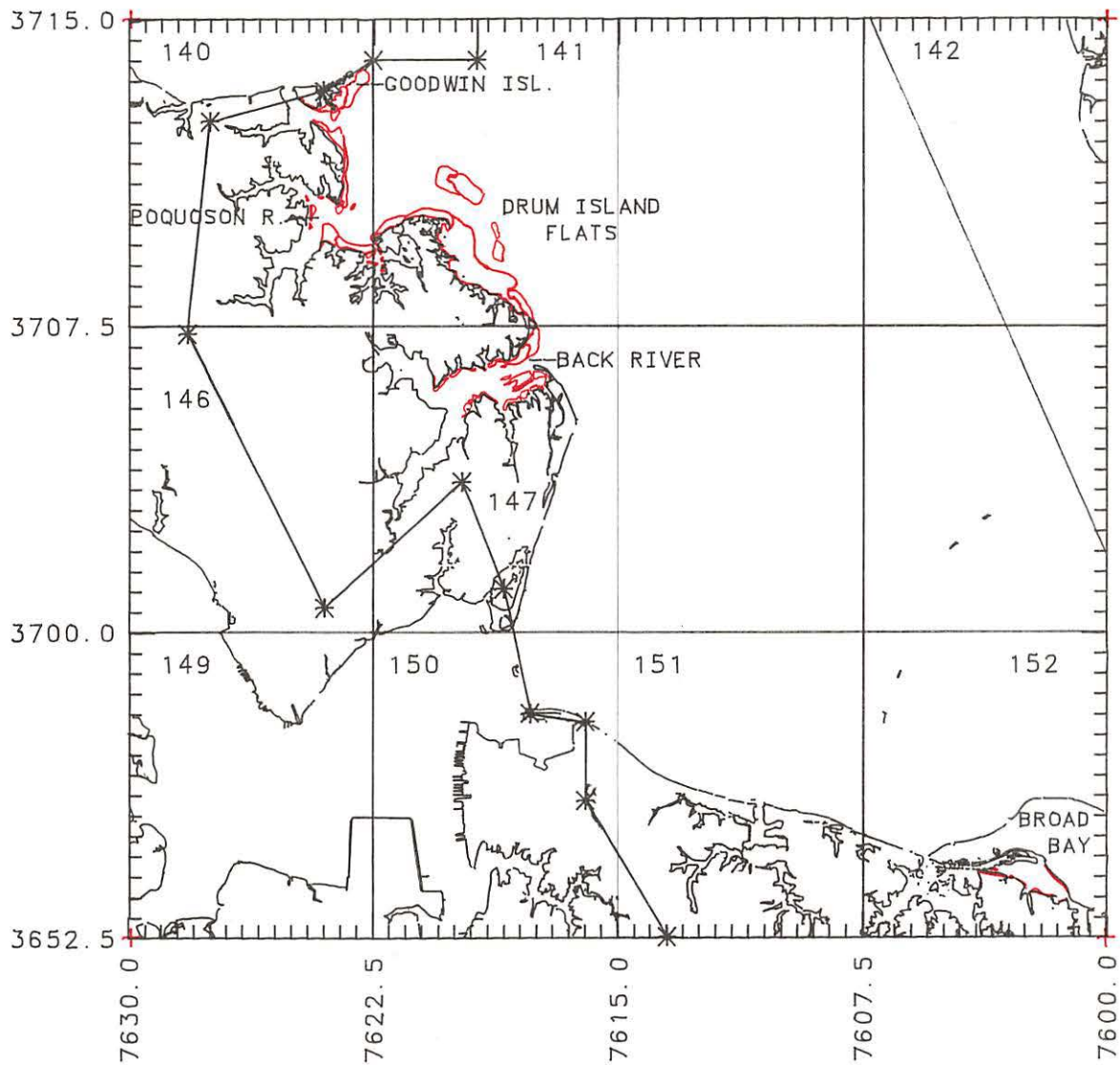


Figure 27. Distribution of SAV in the Lower Western Shore (Section 20).

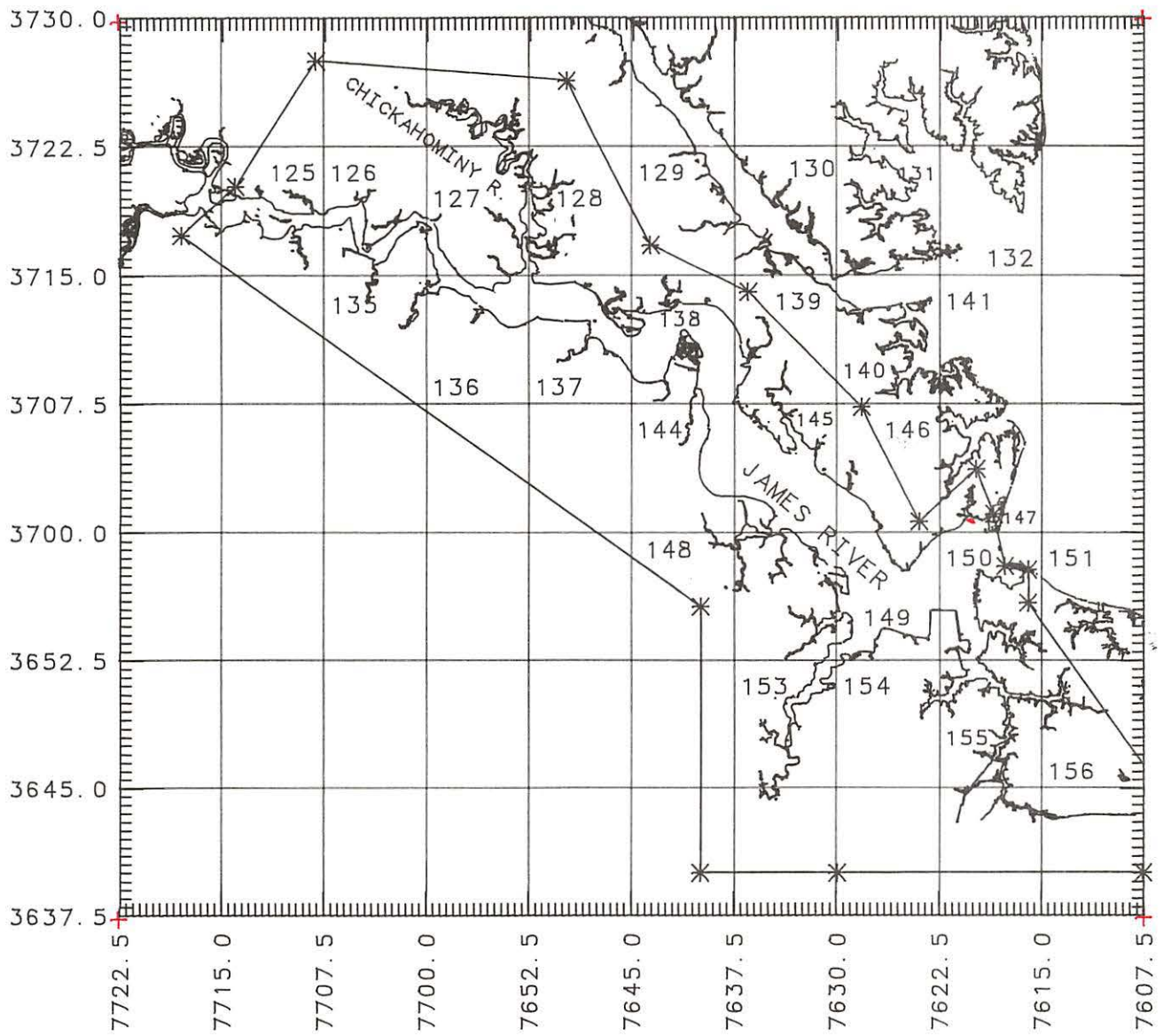


Figure 28. Distribution of SAV in the James River (Section 21).

Chara spp. further upstream in Herring Creek (Map 125), but no SAV was mapped from aerial photography for that quadrangle.

CHINCOTEAGUE BAY

There were 2,494 hectares of SAV identified in Chincoteague Bay in 1990 (Tables 4-6; Fig. 29; Appendix C, Maps 167, 168, 170, 172, 173, and 175) compared to 2,310 hectares reported in 1989. Eighty-four percent of the beds were moderate coverage (density class 3) and 9.8% were dense coverage (class 4). The Citizen's and MD-DNR surveys found both *Z. marina* and *R. maritima* throughout Chincoteague and Sinapuxent Bays (Maps 167, 168, 170, 172, 173, and 175). Only *R. maritima* was reported from Assawoman Bay (Map 166). 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, 1987, and 1989 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. Eight percent of the total bottom of this region (32,536 hectares) supported SAV in 1990 compared to 7% in 1989.

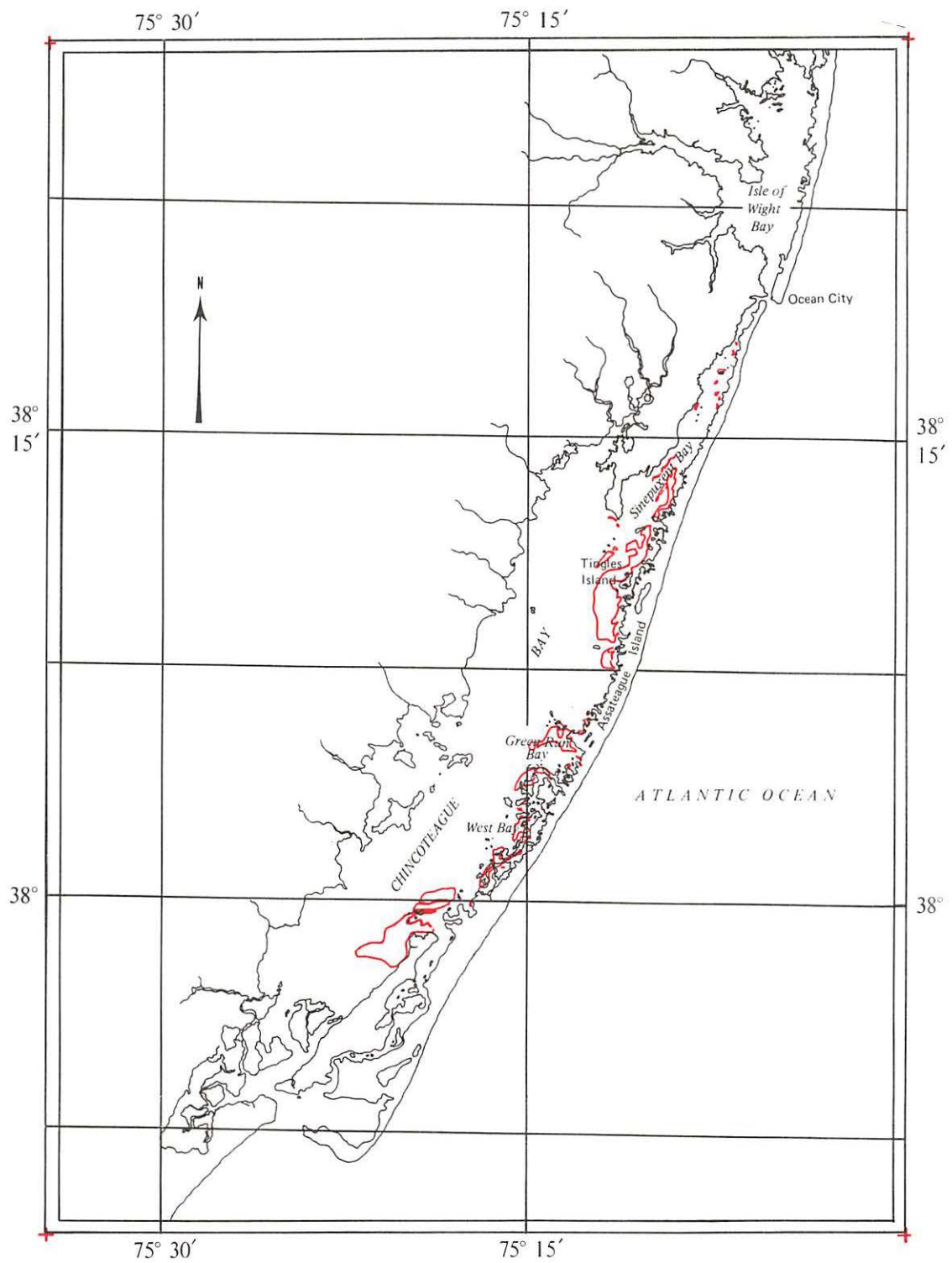


Figure 29. Distribution of SAV in Chincoteague Bay.

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APPENDICES

APPENDIX A

Species Of Submerged Aquatic Plants Found In The Chesapeake Bay And Tributaries Exclusive of the Marine Algae (Classification And Nomenclature Derived From: Godfrey And Wooten, 1979, 1981; Harvill et al., 1977, 1981; Kartesz And Kartesz, 1980; Radford et al., 1968; Wood And Imahori, 1965, 1965)

Family	Species	Common name
Characeae (muskgrass)	<i>Chara braunii</i> Gm.	Muskgrass
	<i>Chara zeylanica</i> Klein. ex Willd., em.	
	<i>Nitella flexilis</i> (L.) Ag., em.	Stonewort
Potamogetonaceae (pondweed)	<i>Potamogeton perfoliatus</i> L. var. <i>bupleuroides</i> (Fernald) Farwell	Redhead grass
	<i>Potamogeton epihydrus</i>	Leafy pondweed
	<i>Potamogeton pectinatus</i> L.	Sago pondweed
	<i>Potamogeton crispus</i> L.	Curly pondweed
	<i>Potamogeton pusillus</i> L.	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	Southern naiad
	<i>Najas gracillima</i> (A. Braun) Magnus	Naiad
	<i>Najas minor</i> Allioni	
Hydrocharitaceae (frogbit)	<i>Vallisneria americana</i> Michaux	Wild celery, tapegrass
	<i>Elodea canadensis</i> (Michaux)	Common elodea
	<i>Egeria densa</i> Planchon	Water-weed
	<i>Hydrilla verticillata</i> (L.f.) Boyle	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 (watermilfoil)	<i>Myriophyllum spicatum</i> L.	Eurasian watermilfoil
Zosteraceae	<i>Zostera marina</i> (L.)	Eelgrass

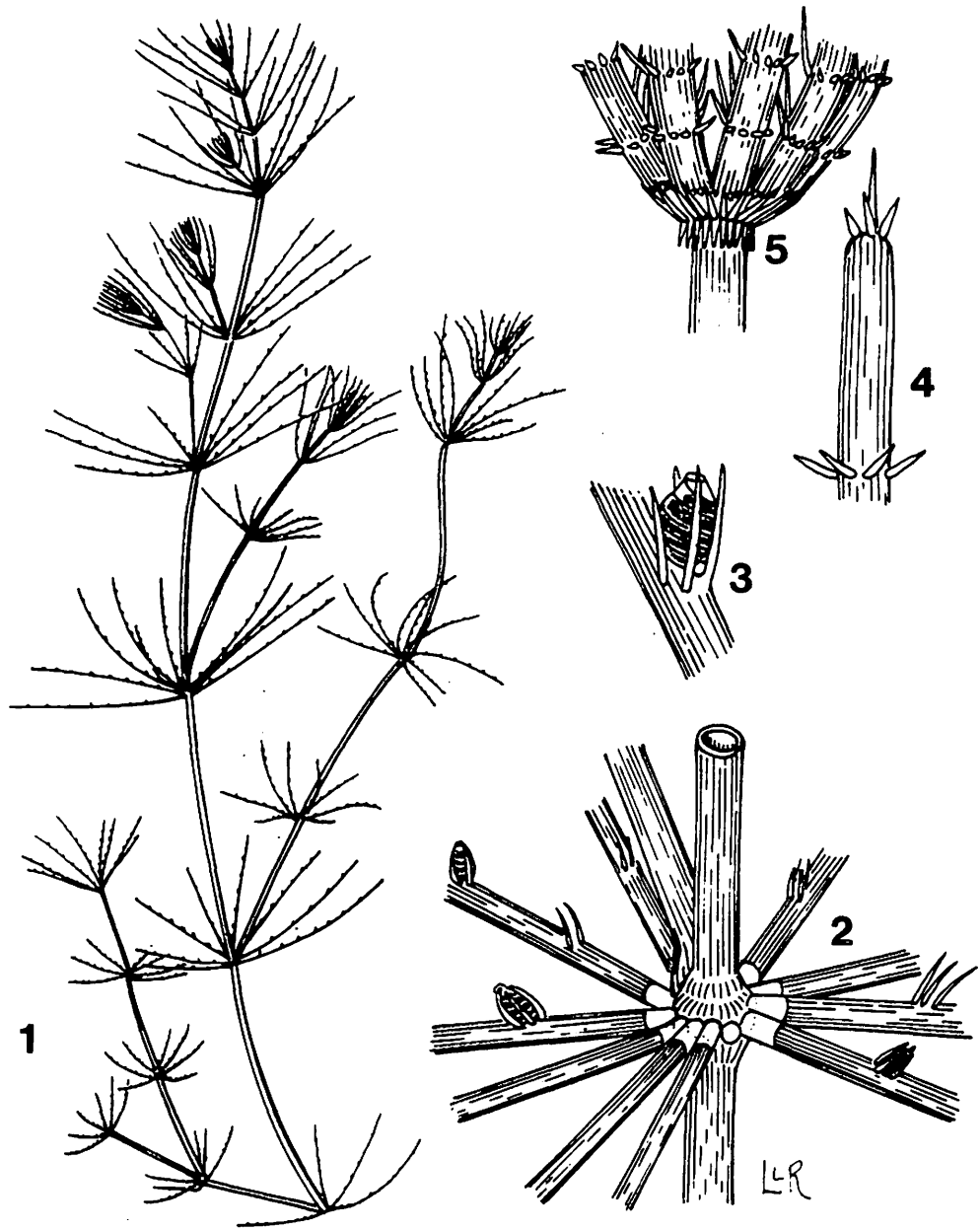


Figure 30. Illustration of *Chara* spp. (Muskgrass): 1. habit, upper portion of plant with branchlet whorls; 2. axial node and fertile branchlets with oogonia; 3. oogonium; 4. branchlet end segment; 5. axial node with 2 tier stipulodes.

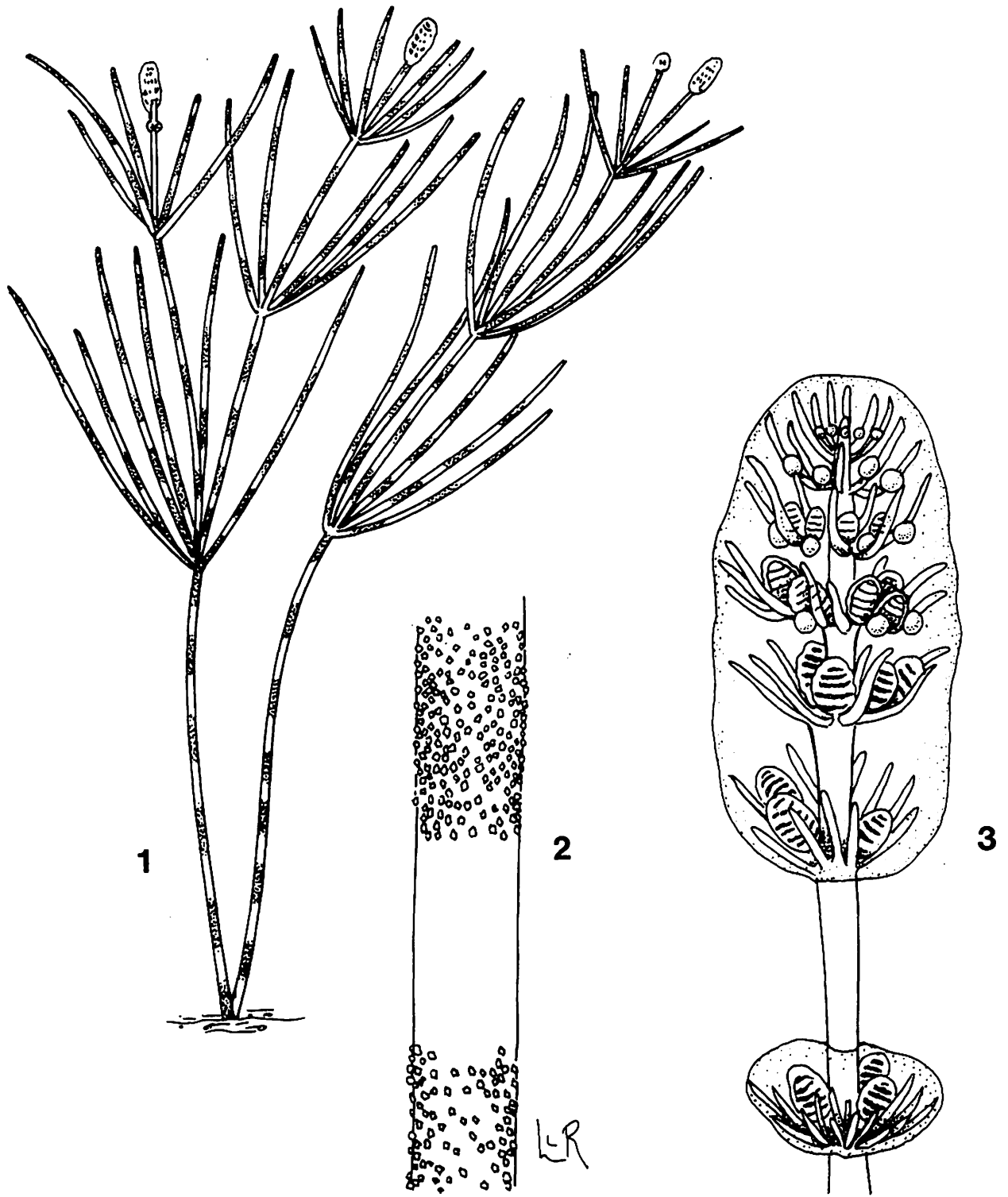


Figure 31. Illustration of *Nitella* spp. (Stonewort): 1. habit, entire plant; 2. portion of ecorticate branchlet; 3. mucus cloud surrounding compacted upper whorls with gametangia.

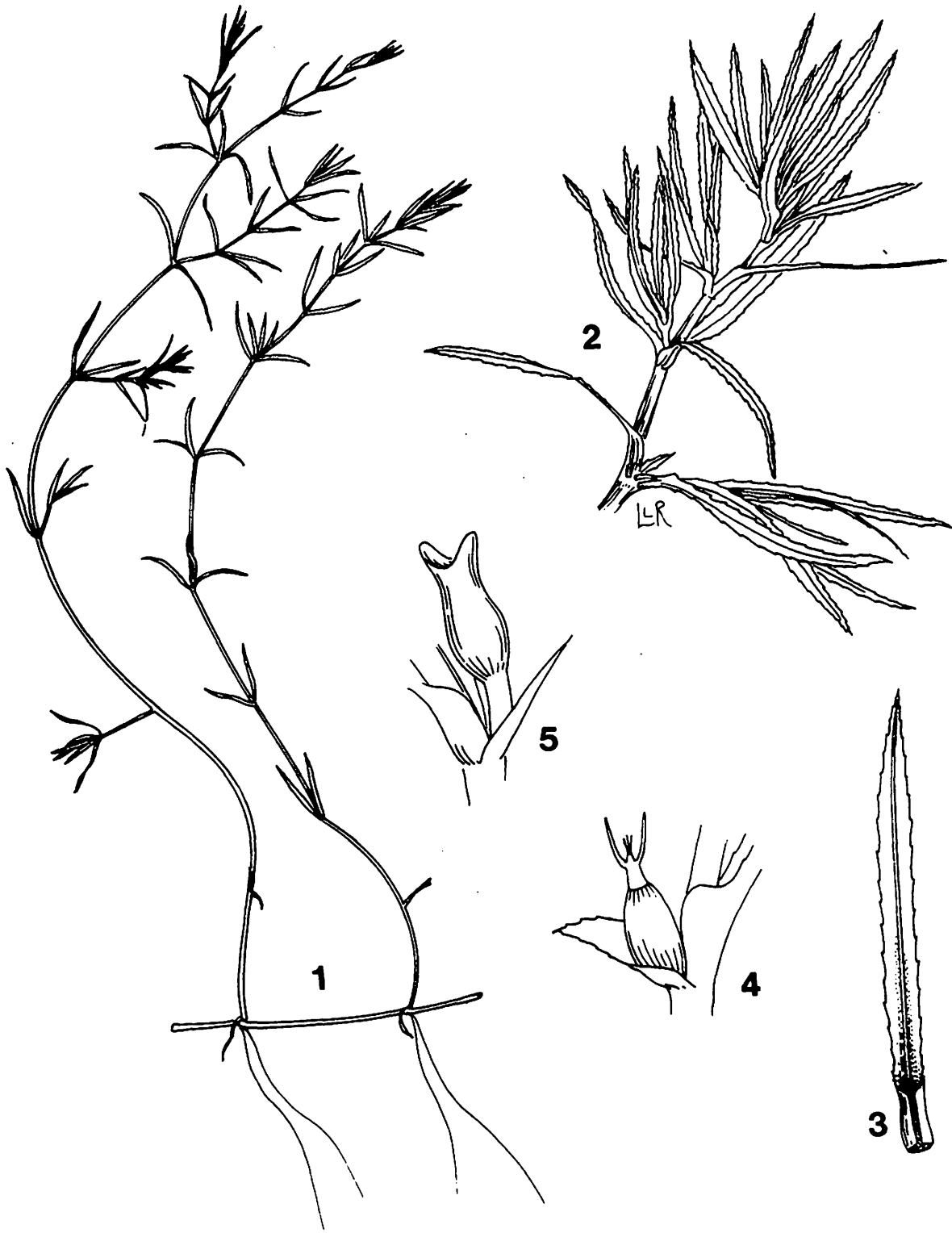


Figure 32. Illustration of *Najas guadalupensis* (Southern naiad): 1. habit, portion of plant; 2. branches; 3. leaf; 4. female flower; 5. male flower.

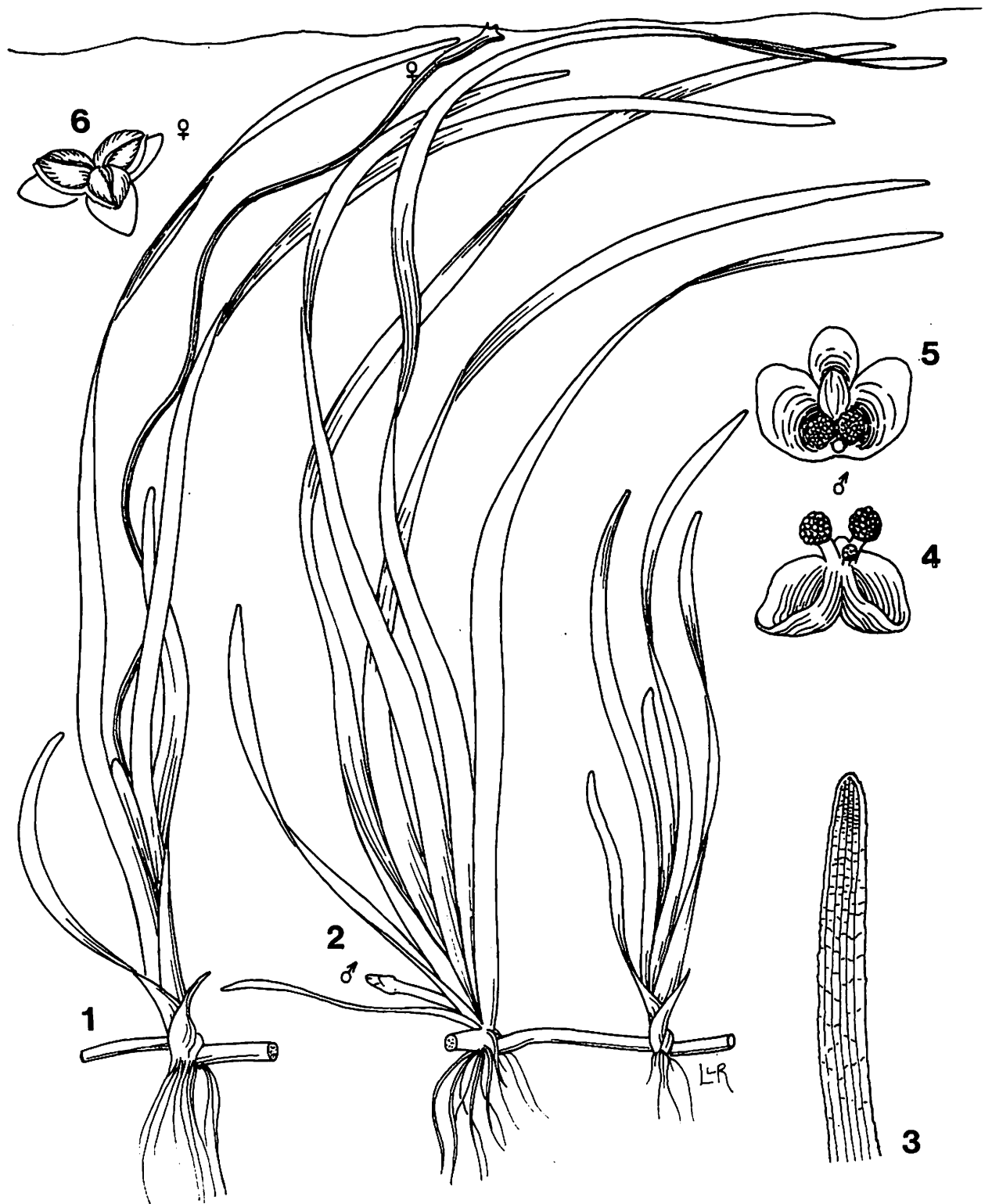


Figure 33. Illustration of *Vallisneria americana* (Tapegrass): 1. female plant; 2. male plant; 3. leaf tip with longitudinal air channels; 4-5. male flower (two views); 6. female flower.

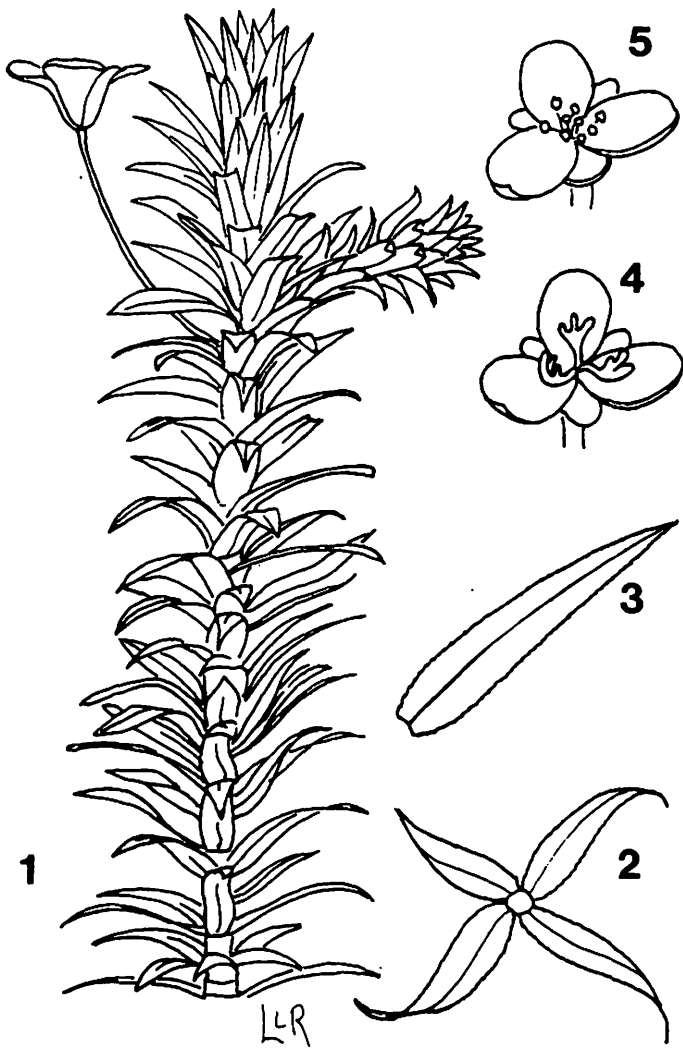


Figure 34. Illustration of *Egeria* spp. (Water-weed): 1. habit, end of branched stem with flower; 2. leaf whorl; 3. leaf; 4. female flower; 5. male flower.

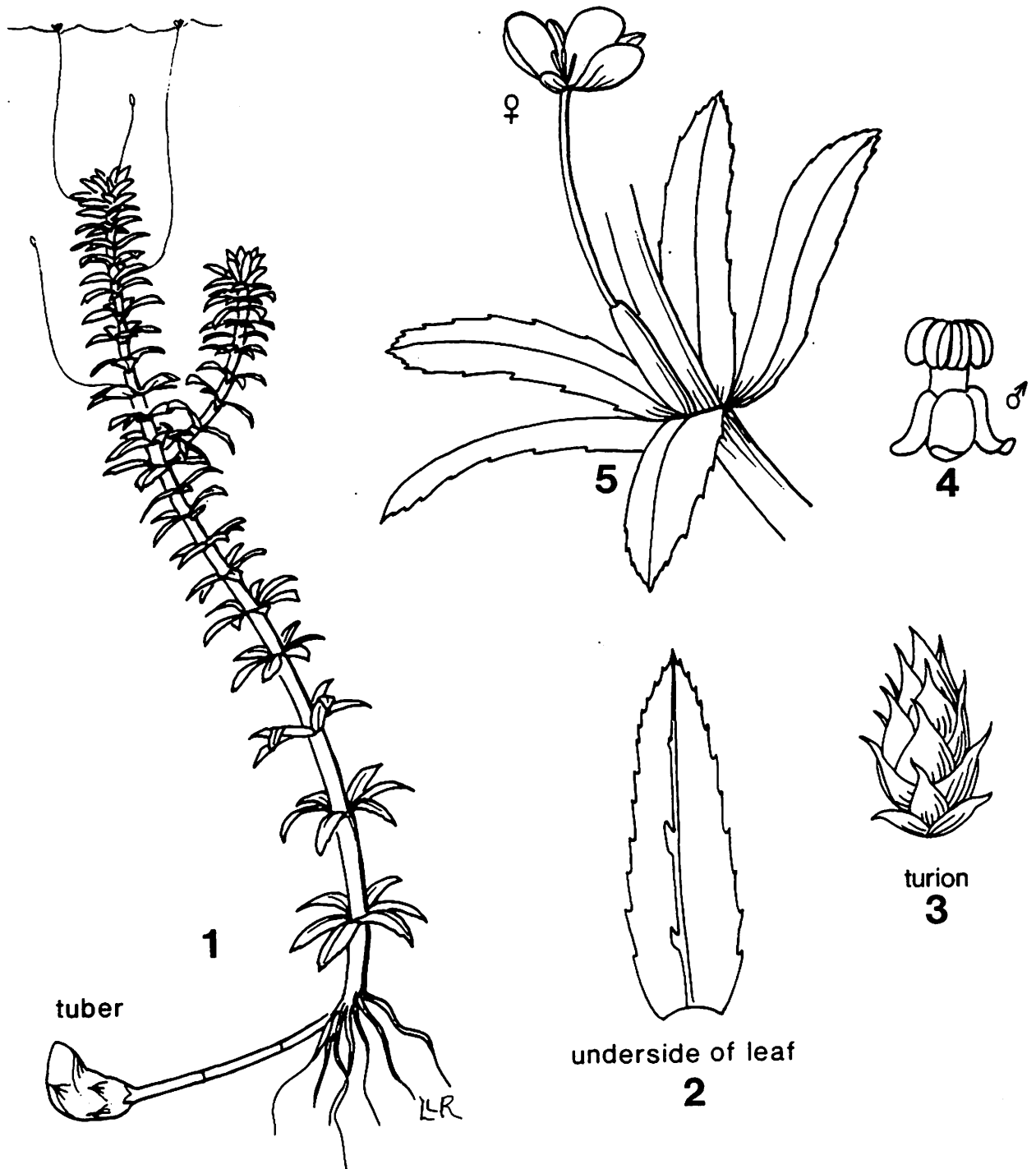


Figure 35. Illustration of *Hydrilla verticillata* (Hydrilla): 1. habit, entire plant; 2. leaf; 3. turion; 4. male flower; 5. female flower and leaf whorl.

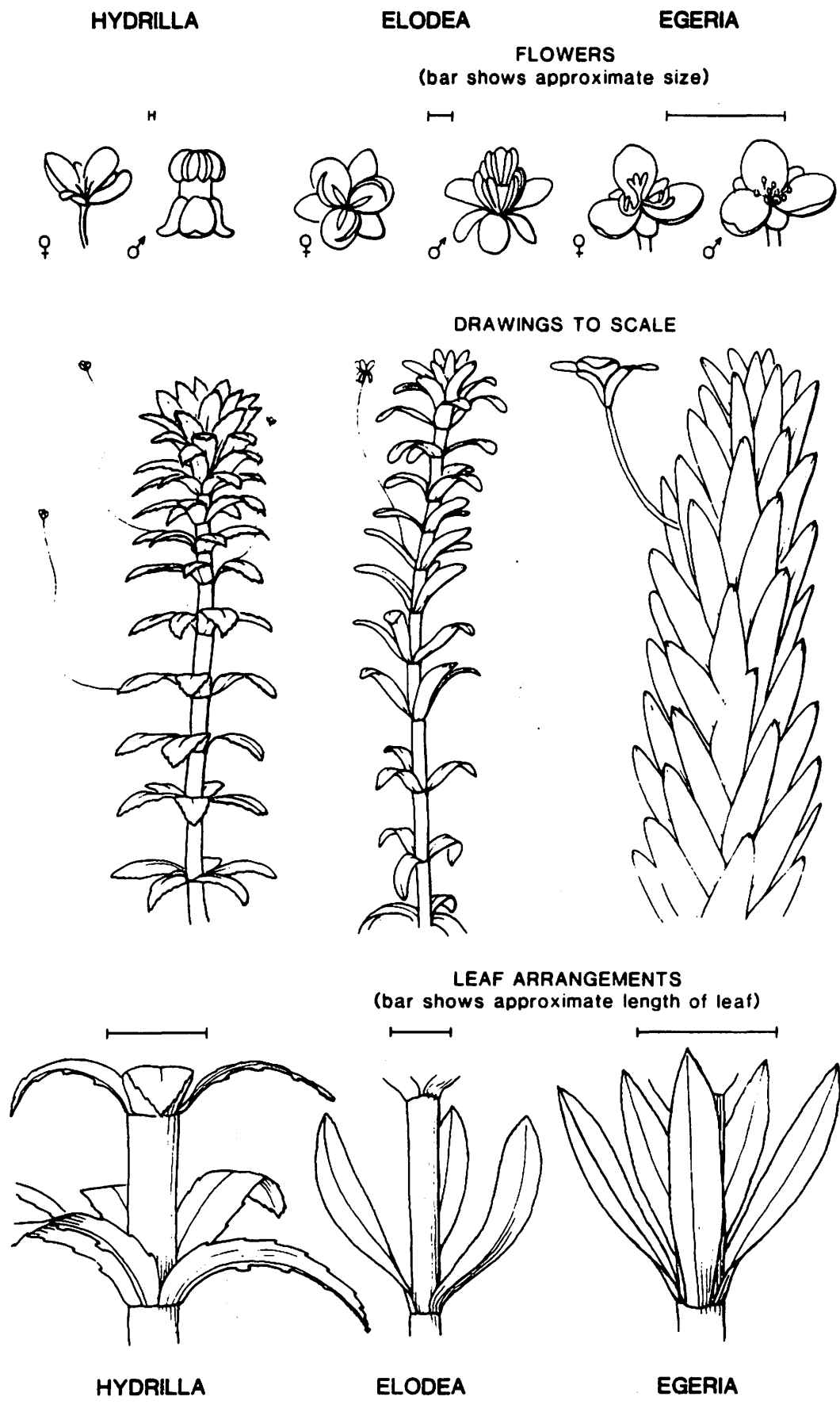
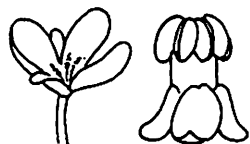


Figure 36. A comparison: illustrations of *Hydrilla verticillata*, *Elodea canadensis*, and *Egeria* spp.

HYDRILLA



ELODEA



EGERIA

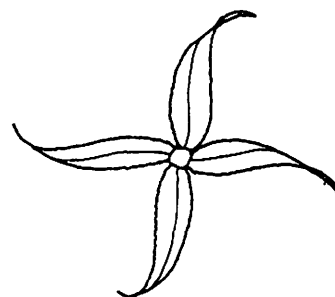
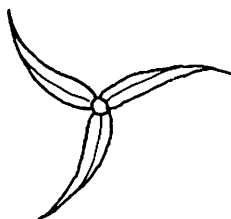
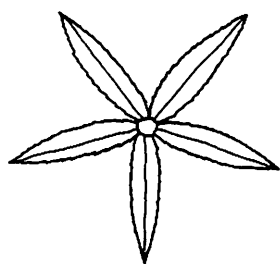
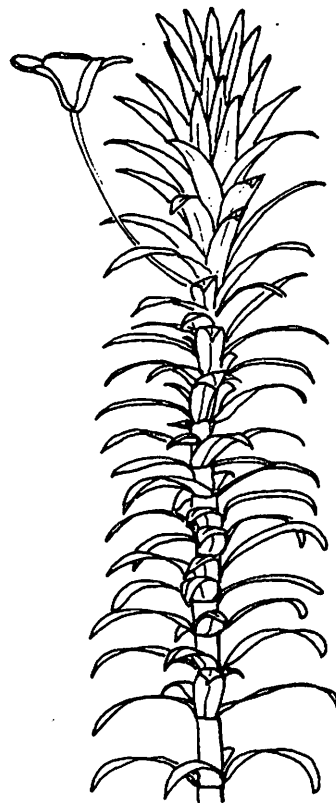
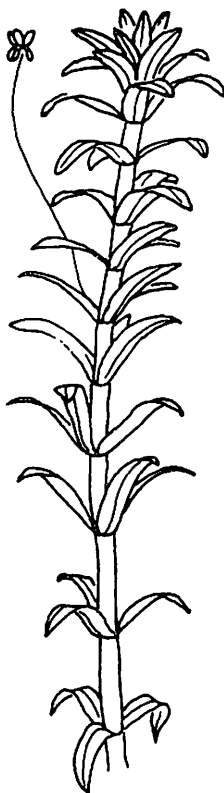
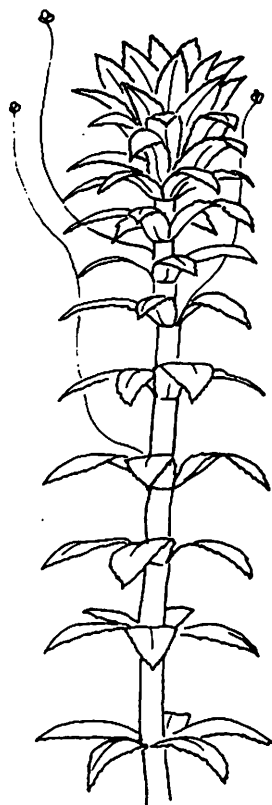


Figure 37. A comparison: illustrations of *Hydrilla verticillata*, *Elodea canadensis*, and *Egeria* spp. showing ends of stems with flowers; leaf whorls; single leaves.

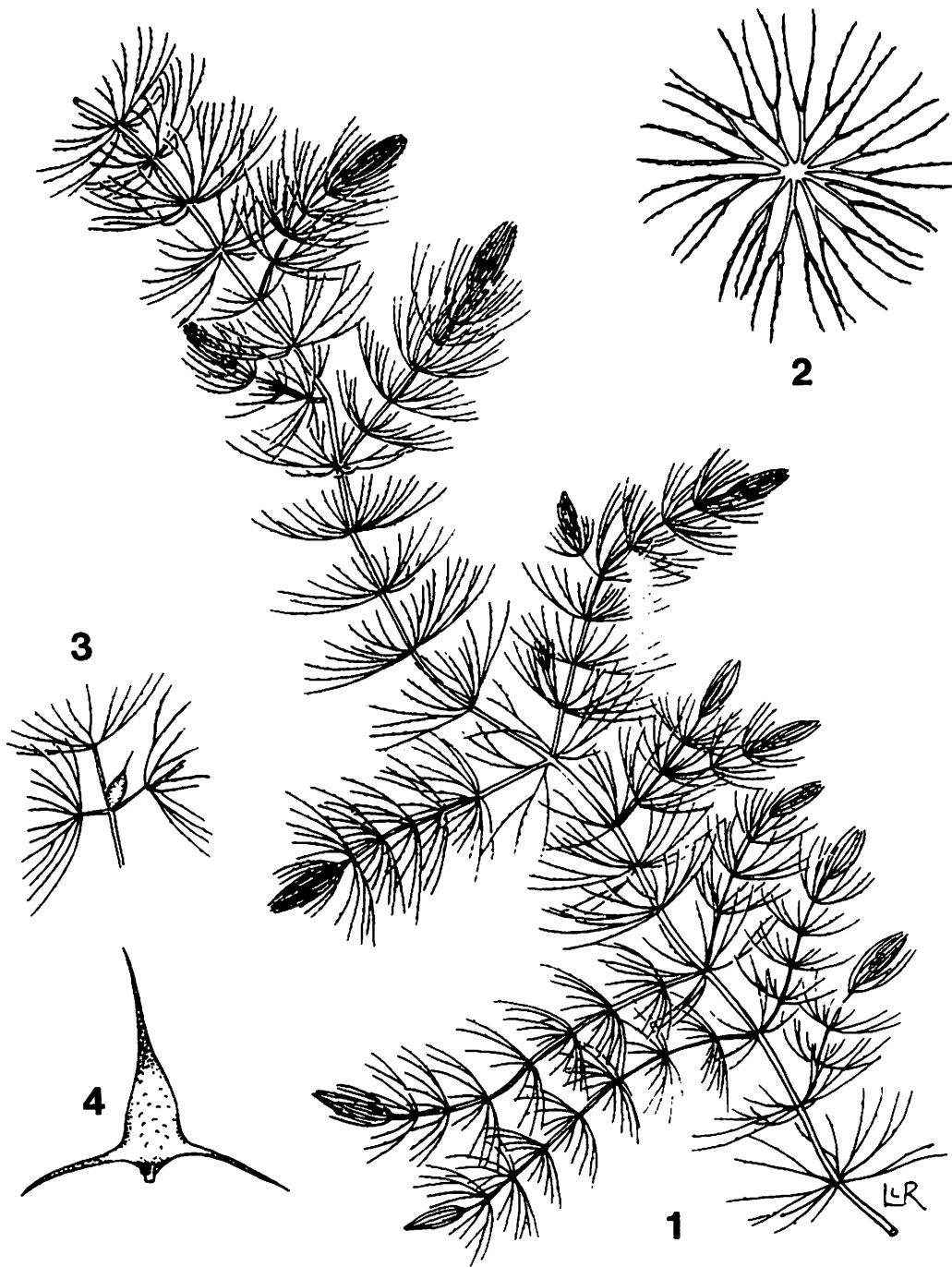


Figure 38. Illustration of *Ceratophyllum demersum* (Coontail): 1. habit, portion of plant; 2. leaf whorl; 3. flower in axil of whorl with branches; 4. fruit.

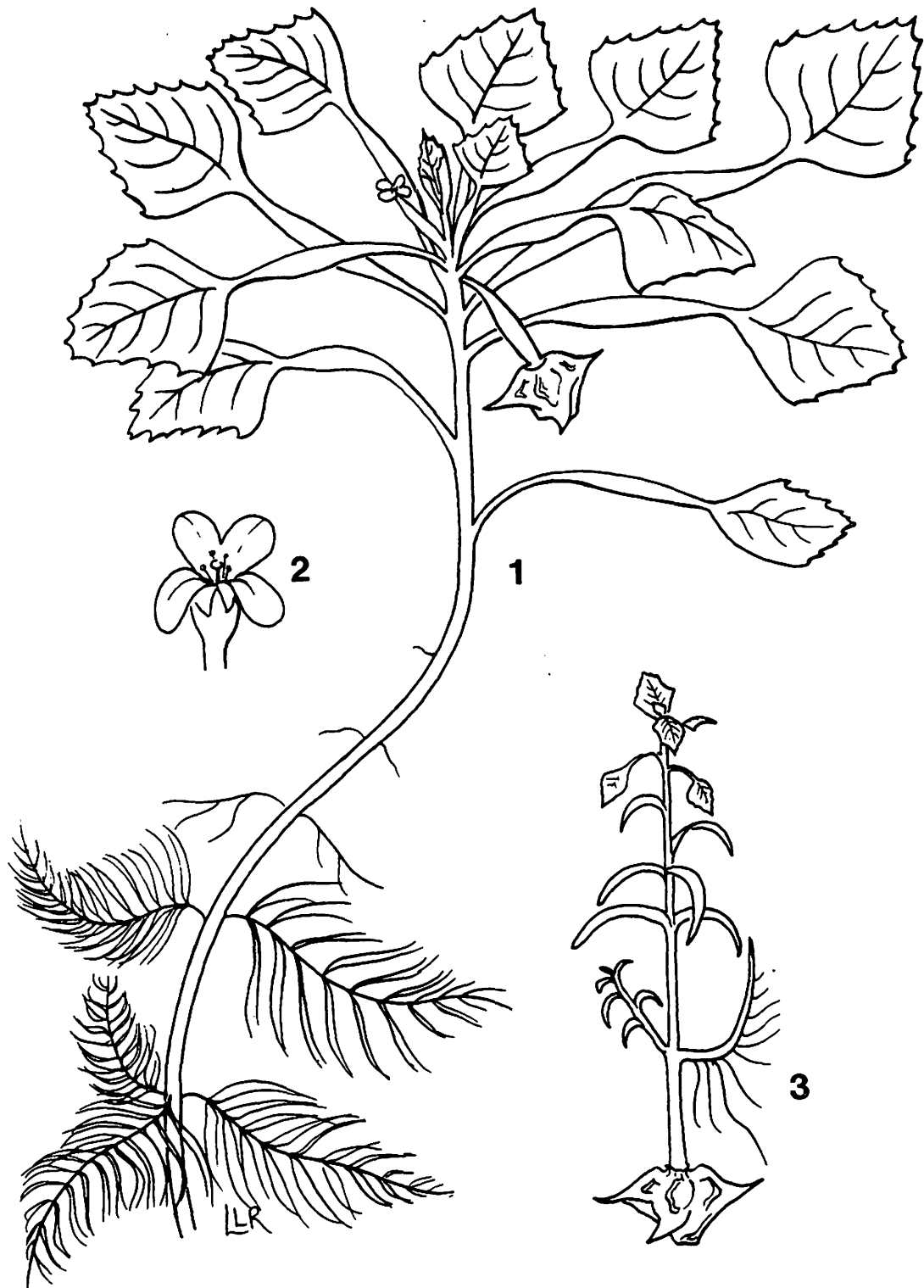


Figure 39. Illustration of *Trapa natans* (Water chestnut): 1. habit, portion of mature plant; 2. flower; 3. seedling.

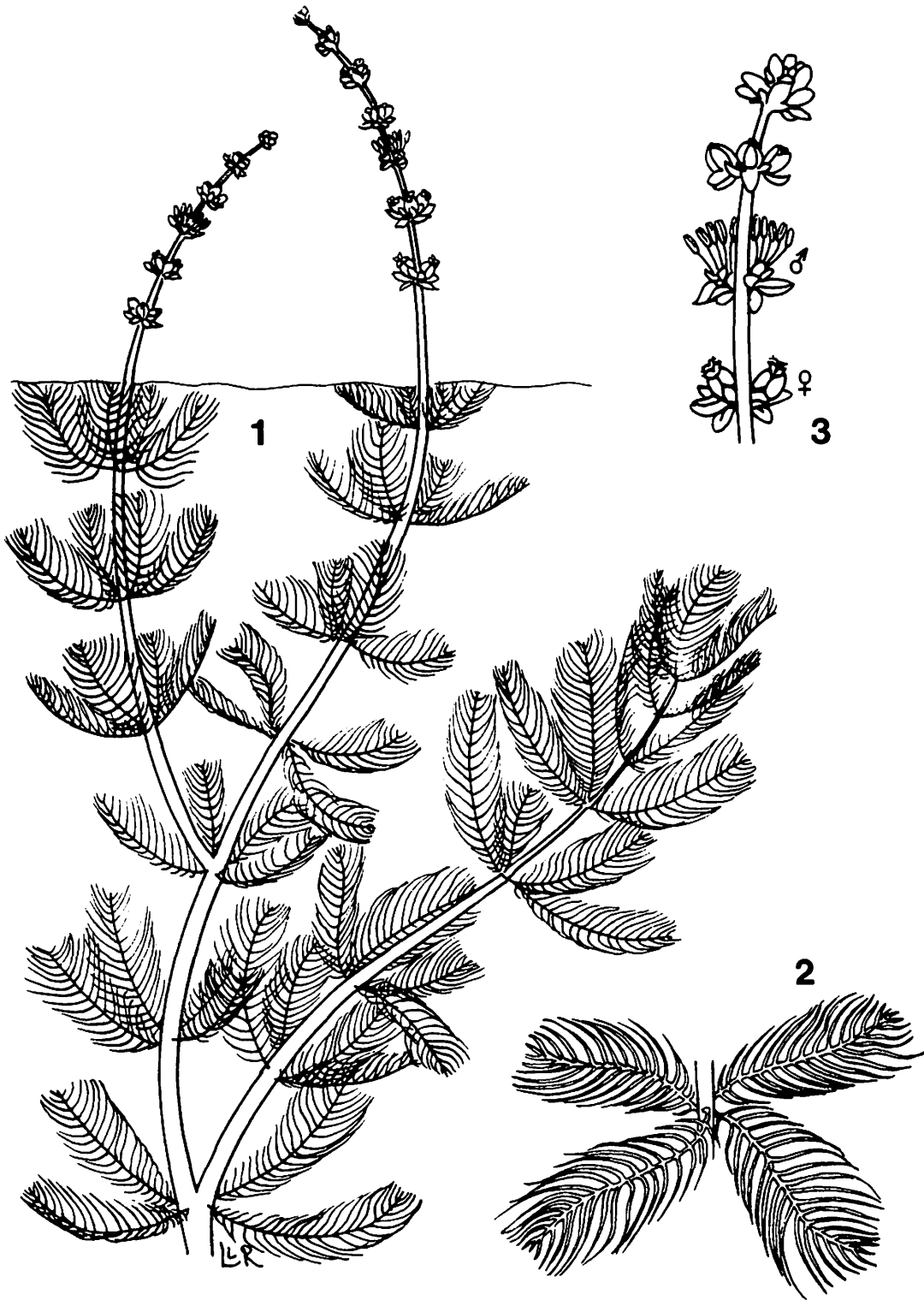


Figure 40. Illustration of *Myriophyllum spicatum* (Eurasian watermilfoil): 1. habit, upper portion of plant with flower spike borne above water; 2. leaf whorl; 3. female and male flowers on spike.

APPENDIX B

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

	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
SEC. 2. Upper Eastern Shore				39 03.50	76 32.30
	39 10.00	76 20.00		39 00.00	76 20.00
	39 20.00	76 12.50		38 55.00	76 25.00
	39 26.50	76 01.31		38 45.00	76 25.00
	39 27.50	76 00.00	SEC. 6. Eastern Bay		
	39 39.15	75 51.00		38 45.00	76 25.00
	39 39.15	75 45.00		38 55.00	76 25.00
	39 19.50	75 45.00		39 00.00	76 20.00
	39 20.00	76 00.00		39 00.00	76 19.10
	39 12.55	76 10.40		38 57.10	76 11.85
	39 09.25	76 16.00		39 05.00	76 00.00
SEC. 3. Upper Western Shore				38 50.00	76 01.65
	39 12.40	76 49.00		38 44.10	76 10.50
	39 30.00	76 20.00		38 50.00	76 16.50
	39 27.00	76 10.00		38 45.00	76 20.00
	39 26.50	76 01.31		38 42.50	76 20.50
	39 20.00	76 12.50	SEC. 7. Choptank River		
	39 10.00	76 20.00		38 23.50	76 20.00
	39 00.00	76 20.00		38 45.00	76 25.00
	39 03.50	76 32.30		38 42.50	76 20.50
	39 06.82	76 35.40		38 45.00	76 20.00
	39 11.15	76 40.00		38 50.00	76 16.50
SEC. 4. Chester River				38 44.10	76 10.50
	39 00.00	76 20.00		38 50.00	76 01.65
	39 10.00	76 20.00		39 05.00	76 00.00
	39 09.25	76 16.00		39 05.00	75 45.00
	39 12.55	76 10.40		38 45.00	75 45.00
	39 20.00	76 00.00		38 45.00	75 50.00
	39 19.50	75 45.00		38 21.93	75 55.00
	39 05.00	75 45.00		38 25.00	76 06.80
	39 05.00	76 00.00			
	38 57.10	76 11.85			
	39 00.00	76 19.10			

	Latitude Deg Min	Longitude Deg Min		Latitude Deg Min	Longitude Deg 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
	37 53.40	76 14.45		38 13.60	76 05.83
	37 55.50	76 18.15	SEC. 13. Mid-Bay Island Complex		
	37 53.85	76 28.00		37 45.00	75 58.30
	38 06.15	76 53.00		37 50.00	76 10.00
	38 15.00	77 06.40		38 05.00	76 10.00
	38 20.00	77 09.40		38 11.10	76 13.30
	38 24.20	77 14.08		38 13.60	76 05.83
	38 35.00	77 00.00		38 11.70	75 59.00
	38 15.00	76 25.45		37 55.00	75 55.10
	38 05.00	76 21.54	SEC. 14. Lower Eastern Shore		
	38 02.85	76 19.40		37 00.00	75 58.95
	38 05.00	76 10.00		37 20.00	76 10.00
	37 50.00	76 10.00		37 38.75	76 10.00
				37 50.00	76 10.00
				37 45.00	75 58.30
				37 55.00	75 55.10
				37 57.10	75 50.30
				38 00.73	75 49.50
				38 00.00	75 38.00
				38 00.00	75 30.00
				37 46.45	75 39.30
				37 20.00	75 55.50

	Latitude Deg Min	Longitude Deg Min		Latitude Deg Min	Longitude Deg Min
SEC. 15. Reedville			SEC. 18. Mobjack Bay Complex		
	37 38.75	76 10.00		37 17.00	76 19.33
	37 37.40	76 21.40		37 16.25	76 22.50
	37 38.05	76 23.50		37 17.00	76 25.42
	37 44.35	76 23.00		37 16.50	76 28.50
	37 48.00	76 28.00		37 20.00	76 31.88
	37 53.85	76 28.00		37 25.75	76 31.00
	37 55.50	76 18.15		37 29.00	76 25.00
	37 53.40	76 14.45		37 28.00	76 20.00
	37 50.00	76 10.00		37 25.00	76 18.00
				37 22.25	76 19.50
SEC. 16. Rappahannock River Complex				37 21.00	76 17.40
	37 26.50	76 10.00		37 20.00	76 17.40
	37 25.00	76 18.08		37 19.30	76 16.62
	37 28.00	76 20.00		37 17.45	76 16.16
	37 29.00	76 25.00	SEC. 19. York River		
	37 32.00	76 35.00		37 14.00	76 22.50
	37 49.15	76 48.00		37 13.25	76 24.00
	37 53.73	76 49.65		37 12.50	76 27.50
	37 58.00	76 45.45		37 07.30	76 28.20
	37 48.00	76 28.00		37 14.00	76 36.50
	37 44.35	76 23.00		37 16.72	76 43.65
	37 38.05	76 23.50		37 26.29	76 49.77
	37 37.40	76 21.40		37 30.55	76 40.00
	37 38.75	76 10.00		37 28.56	76 35.00
SEC. 17. New Point Comfort Region				37 20.00	76 31.88
	37 17.45	76 16.16		37 16.50	76 28.50
	37 19.45	76 16.62		37 17.00	76 25.42
	37 20.00	76 17.40		37 16.25	76 22.50
	37 21.00	76 17.40		37 17.00	76 19.33
	37 22.25	76 19.50		37 14.00	76 19.33
	37 25.00	76 18.00			
	37 26.50	76 10.00			
	37 20.00	76 10.00			

Latitude Longitude
Deg Min Deg Min

Latitude Longitude
Deg Min Deg Min

SEC. 20. Lower Western Shore

Chincoteague Bay

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

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

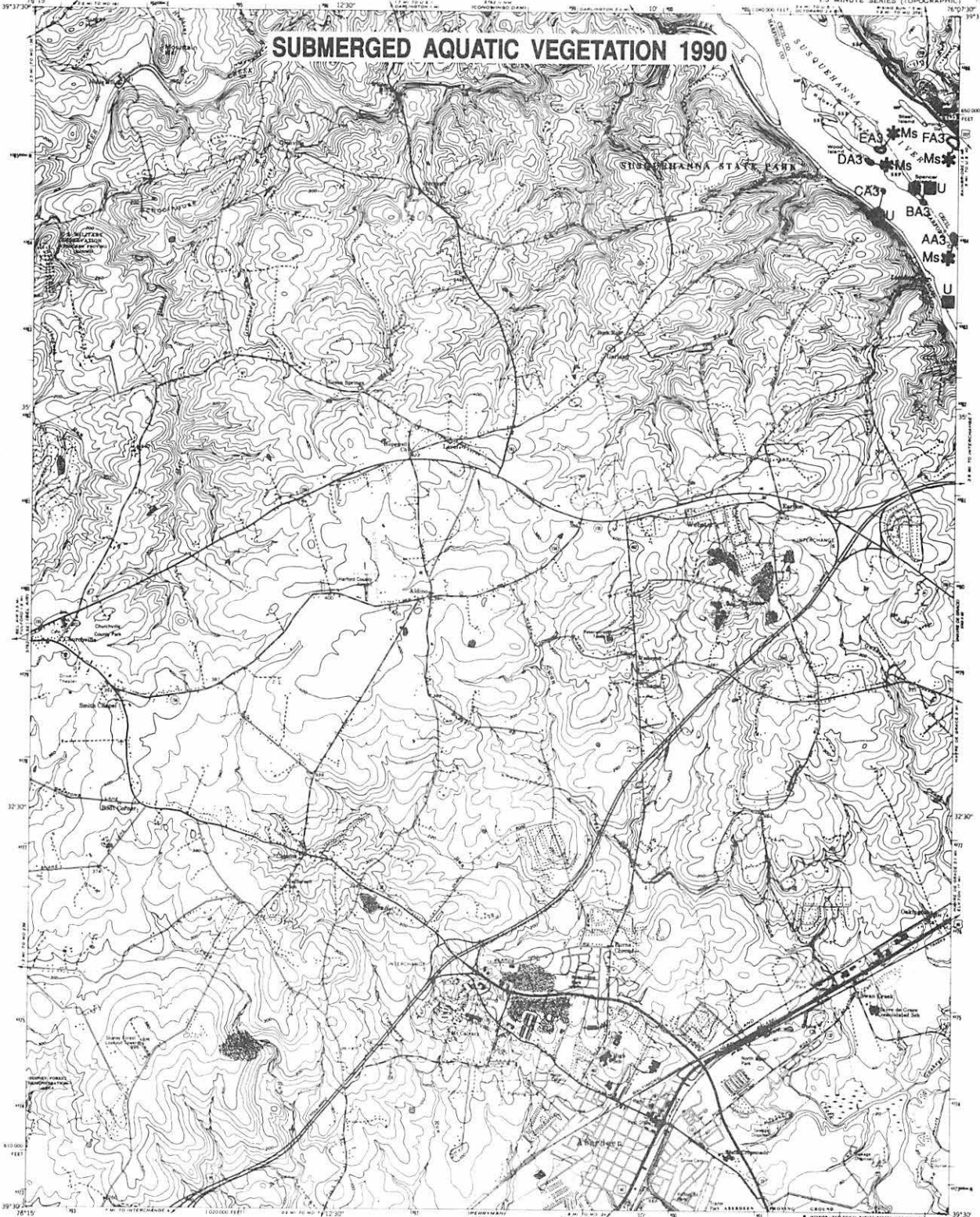
SEC. 21. James River

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

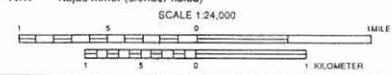
Topographic Quadrangles For The Chesapeake Bay And Chincoteague Bay Showing The 1990 Distribution And Abundance of SAV. (Boundaries Of Individual SAV Beds Are Delineated By Solid Lines. Each Is Identified With A Letter (A-Z) And A Number (1-4). These Numbers Represent The Density Classification Discussed In The Text And Fig. 6, i.e. 1 = <10%; 2 = 10-40%; 3 = 40-70%; 4 = 70-100%. Ground Truthing Represented By Symbols And Species Codes Which Are Explained In The Legend On Each Map.)

SUBMERGED AQUATIC VEGETATION 1990

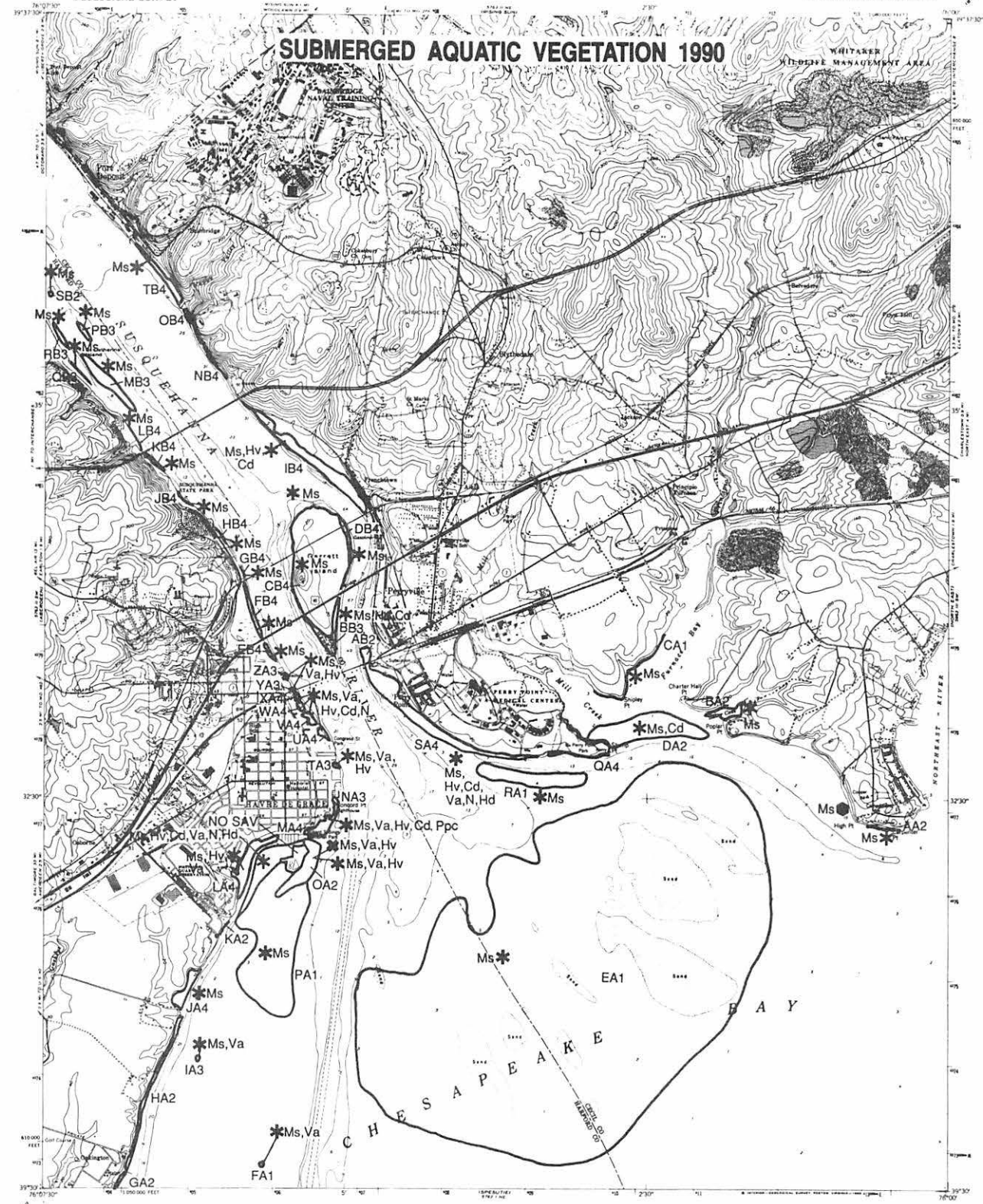


SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✱	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✱	University MD-HPEL
Ppf	<i>Potamogeton pectinatus</i> (redhead-grass)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	●	Council of Governments
Zp	<i>Zannichellia palustris</i> (horned pondweed)	■	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (naiad)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Vallisneria spiralis</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
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)		

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SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✳	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✳	University MD-HPCL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	✳	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	✳	Council of Governments
Zp	<i>Zannichellia palustris</i> (horned pondweed)	✳	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (naiad)	✳	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Vallisneria americana</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (teaty pondweed)		
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)		

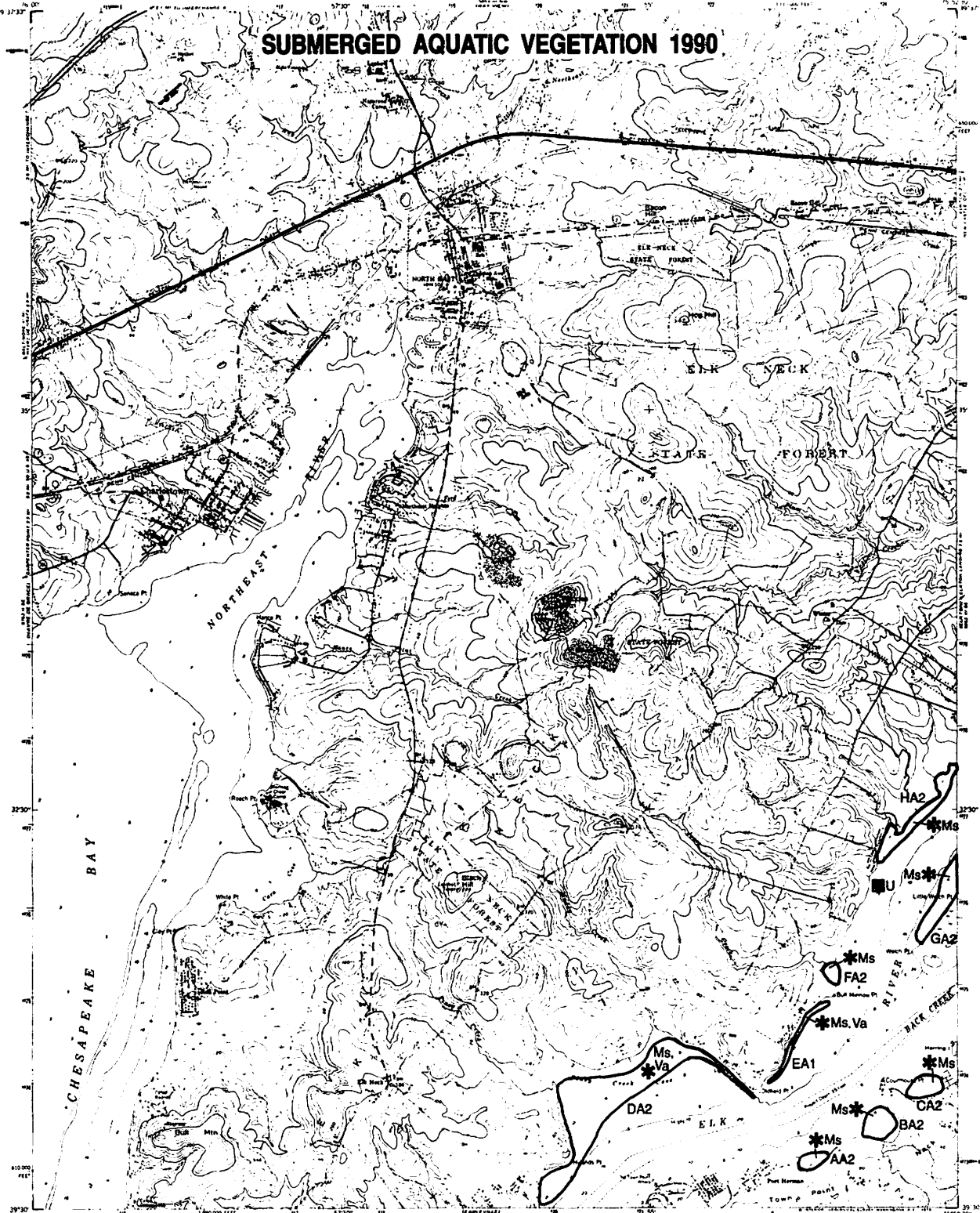
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1 MILE
1 KILOMETER

DATES FLOWN
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10-6-90

HAVRE DE GRACE, MD
003

SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✱	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✱	University MD-HPEL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	★	USF & WS Survey
Ppp	<i>Potamogeton pectinatus</i> (sago pondweed)	●	Council of Governments
Zp	<i>Zannichella peltustris</i> (horned pondweed)	■	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (nail)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Valisneria spiralis</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton epiphyllus</i> (leafy pondweed)		
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 nail)		
Ngr	<i>Najas gracillima</i> (nail)		
C	<i>Chara</i> sp. (muskgrass)		
Nm	<i>Najas minor</i> (slender nail)		

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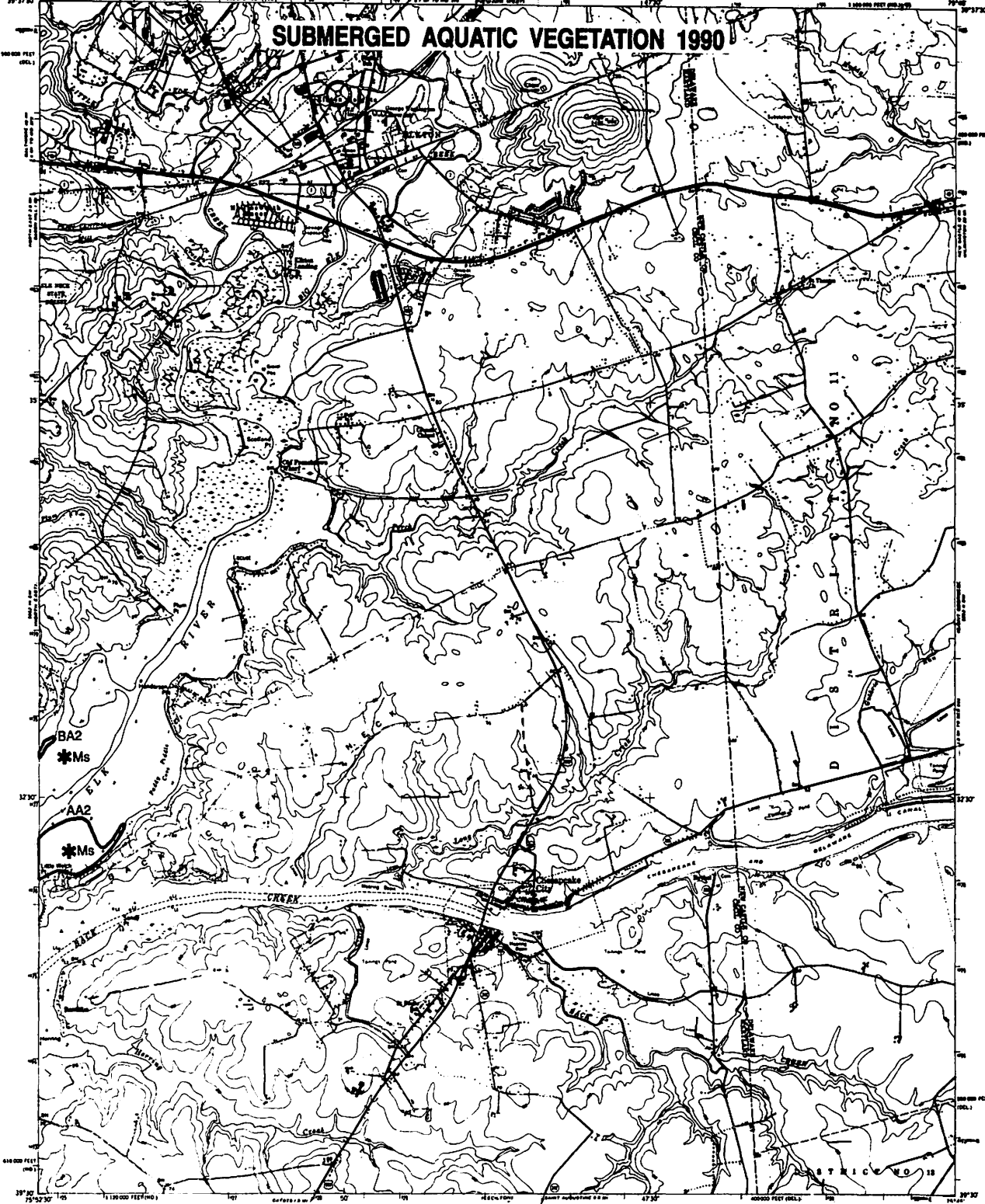
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1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

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9-18-90
**NORTH EAST,
MD
004**

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SUBMERGED AQUATIC VEGETATION 1990



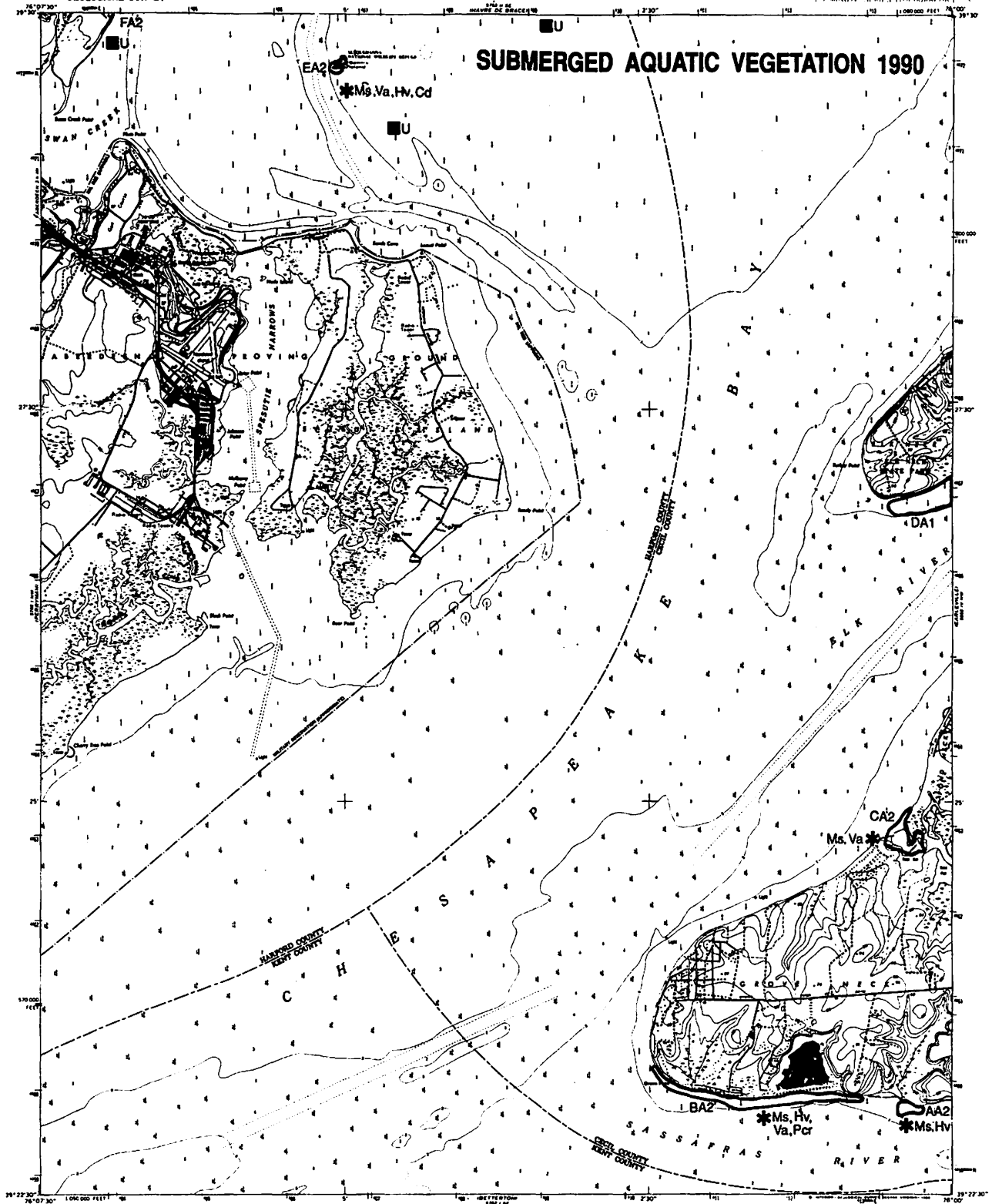
SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	Hv	<i>Hydrilla verticillata</i> (hydrilla)
Rm	<i>Ruppia maritima</i> (widgeon grass)	Hd	<i>Heteranthera dubia</i> (water stargrass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Ppf	<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)	Ngd	<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. (muskgrass)
Va	<i>Vallisneria spiralis</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapezium</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leaky pondweed)		
U	Unknown species composition		

SURVEY STATIONS	
▲	VIMS Field Survey
✱	Harford Community College
★	University MD-HPEL
☆	USF & WS Survey
●	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR

DATE FLOWN 9-18-90
ELKTON, MD-DE 005

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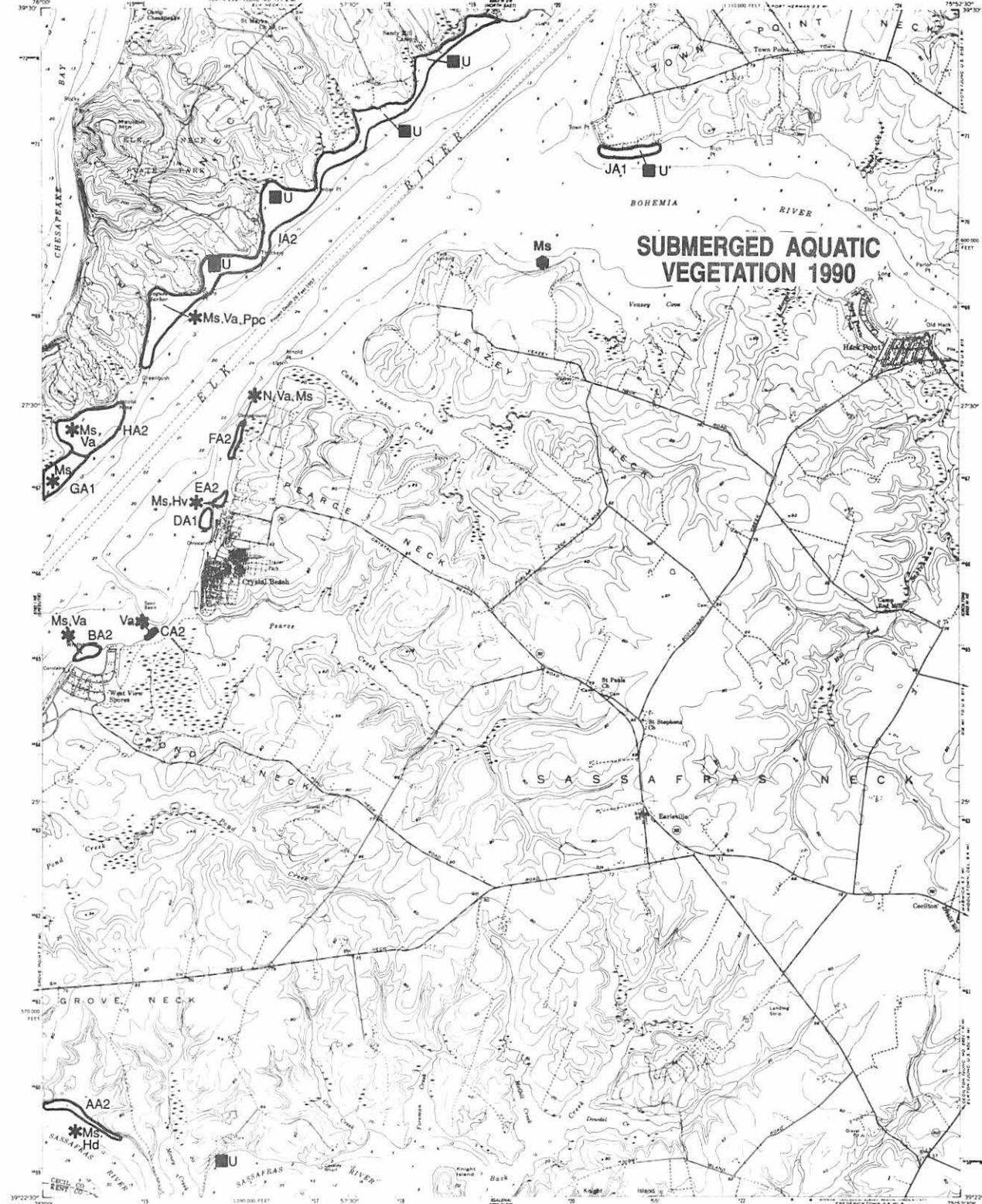


SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✱	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✱	University MD-HPCL
Ppf	<i>Potamogeton pectinatus</i> (redhead-grass)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	●	Council of Governments
Zp	<i>Zernichella palustris</i> (horned pondweed)	■	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (nailad)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Vallisneria spiralis</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
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 nailad)		
Ngr	<i>Najas gracillima</i> (nailad)		
C	<i>Chara</i> sp. (muskgrass)		
Nm	<i>Najas minor</i> (slender nailad)		

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SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✱	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✱	University MD-HPCL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	●	Council of Governments
Zp	<i>Zannichellia palustris</i> (horned pondweed)	■	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (naiad)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Vallisneria spiralis</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
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)		

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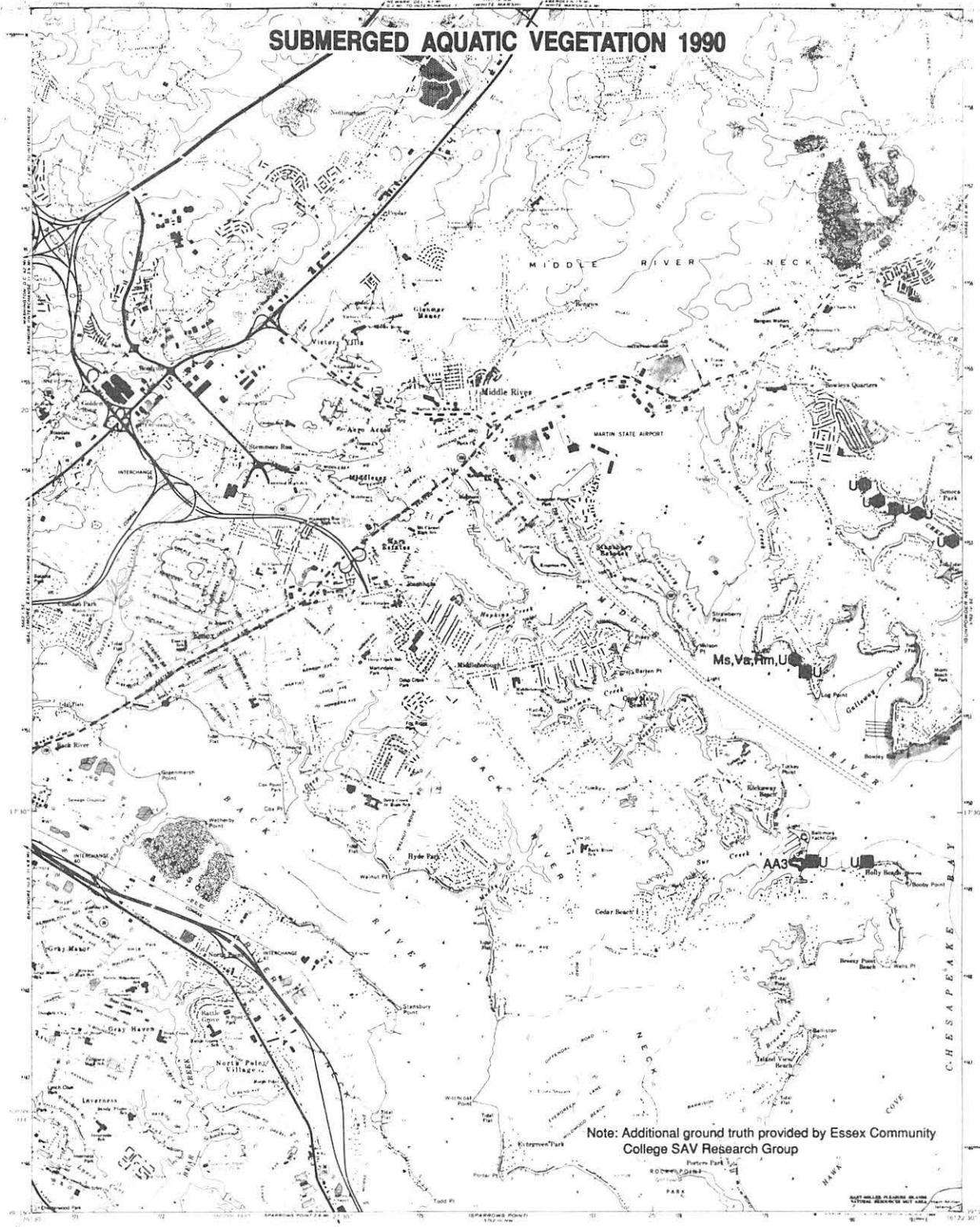
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9-18-90
EARLEVILLE,
MD
010

VIRGINIA INSTITUTE
OF MARINE SCIENCE

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SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✱	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✱	University MD-HPCL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	★	Council of Governments
Zp	<i>Zannichellia palustris</i> (horned pondweed)	■	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (naiad)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Vallisneria americana</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
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)		

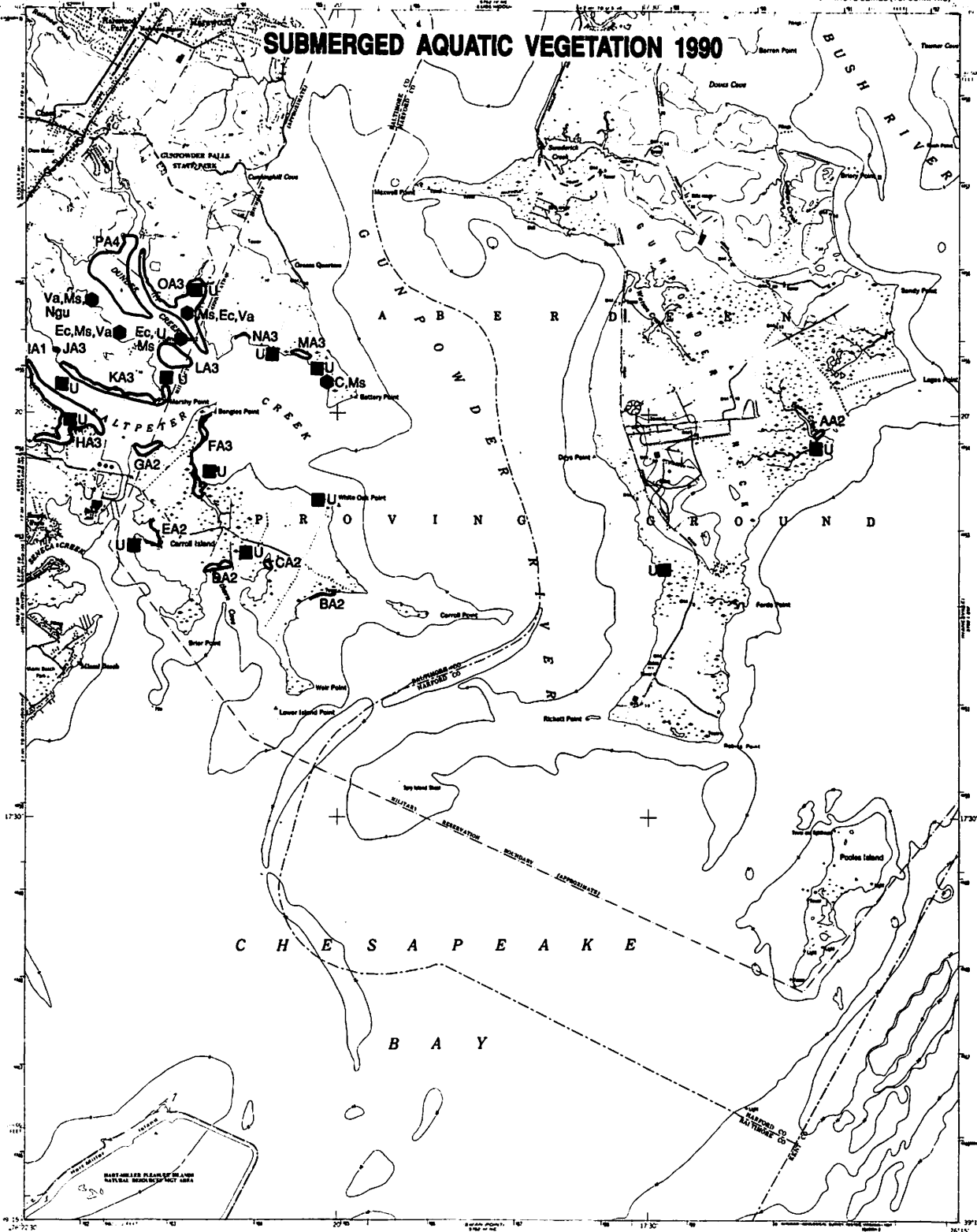
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1 5 0 1 KILOMETER

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DATE FLOWN
10-1-90
MIDDLE RIVER,
MD
013

SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
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</i> spp. (naiad)	Ngr	<i>Najas gracillima</i> (naiad)
Ec	<i>Elodea canadensis</i> (common elodee)	C	<i>Chara</i> sp. (muskgrass)
Va	<i>Vallisneria spiralis</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
U	Unknown species composition		

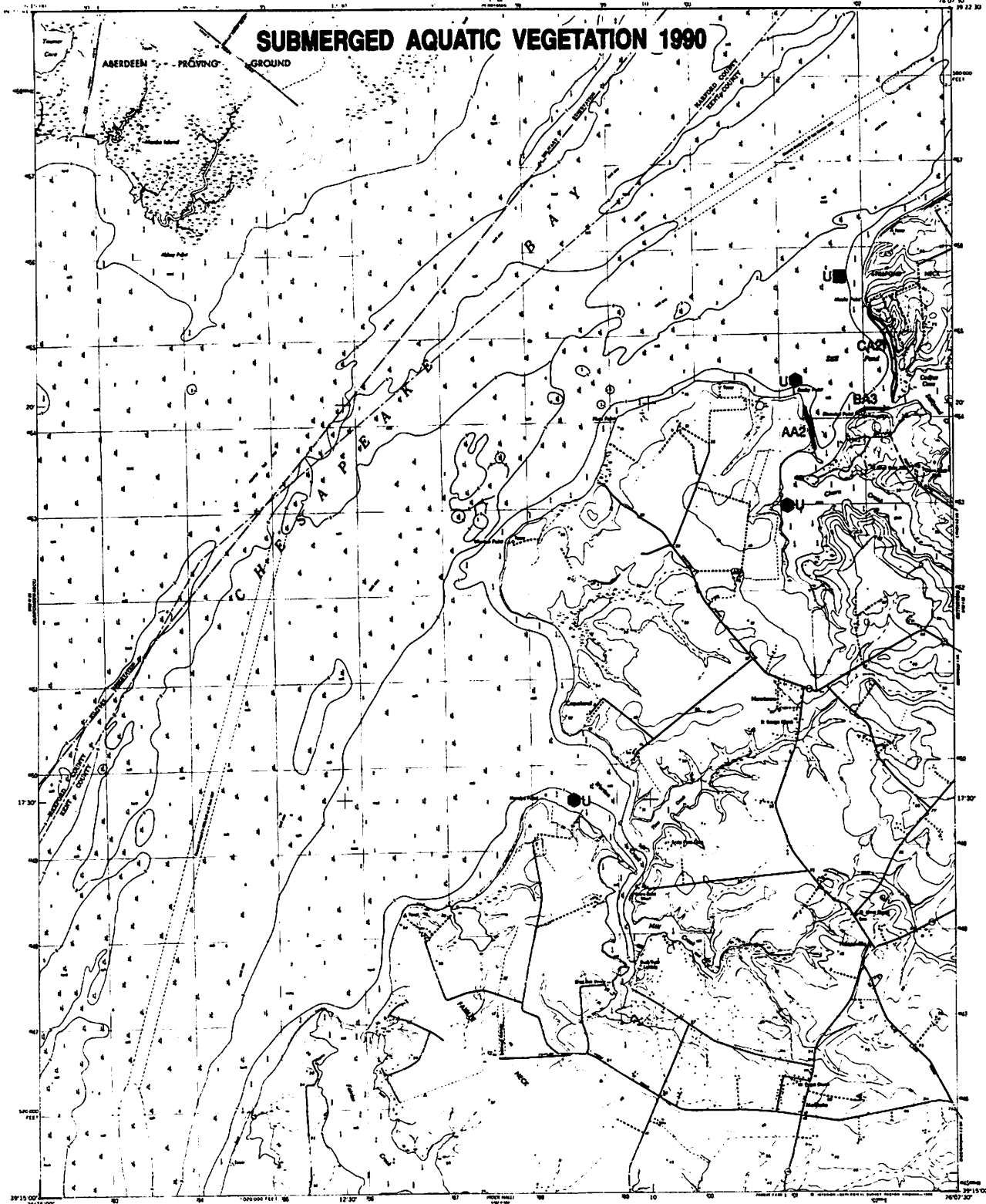
SURVEY STATIONS	
▲	VIMS Field Survey
✳	Harford Community College
✳	University MD-HPEL
★	USF & WS Survey
●	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR

SCALE 1:24,000

1 INCH = 2 KILOMETERS

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**GUNPOWDER
NECK, MD**
014

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SPECIES		SURVEY STATIONS	
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> (redweed-grass)	Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Zp	<i>Zarichetta 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>Chenopodium</i> sp. (muskgrass)
Va	<i>Vallisneria spiralis</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
U	Unknown species composition		

SURVEY STATIONS	
▲	VIMS Field Survey
✱	Harford Community College
★	University MD-HPEL
☆	USF & WS Survey
●	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR

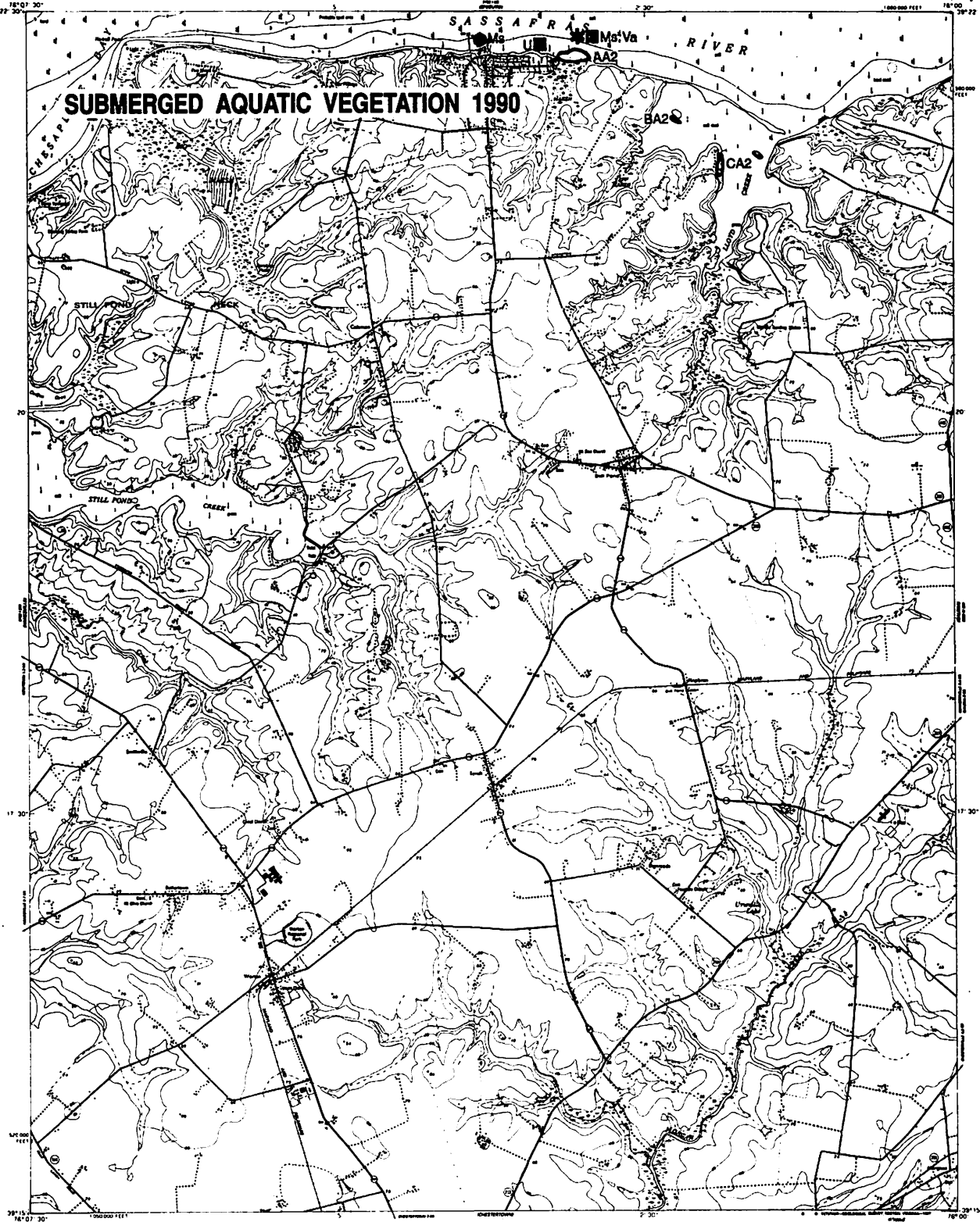
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1 KILOMETER

DATE FLOWN
9-01-90
**HANESVILLE,
MD
015**

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OF MARINE SCIENCE

SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
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> (coon tail)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Zp	<i>Zarnichellia palustris</i> (horned pondweed)	Ngv	<i>Najas guadalupensis</i> (southern naiad)
N	<i>Najas</i> spp. (naiad)	Ngv	<i>Najas gracillima</i> (naiad)
Ec	<i>Elodea canadensis</i> (common elodea)	C	<i>Chara</i> sp. (muskgrass)
Va	<i>Vallisneria spiralis</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
U	Unknown species composition		

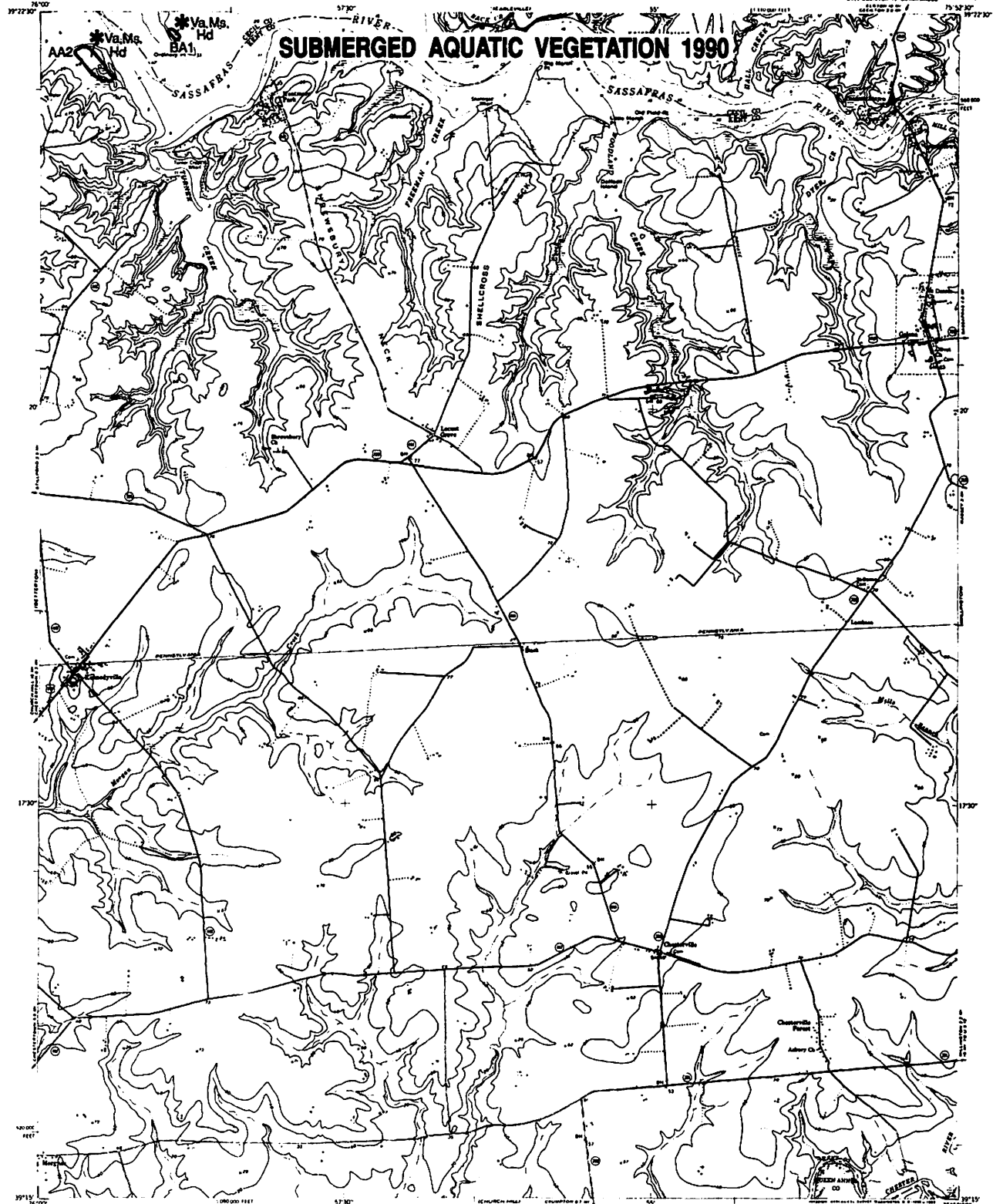
▲	VIMS Field Survey
✱	Harford Community College
✱	University MD-HP&EL
★	USF & WS Survey
□	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR

SCALE 1:24,000

1 KILOMETER

DATE FLOWN
9-18-90
**BETTERTON,
MD
016**

VIRGINIA INSTITUTE
OF MARINE SCIENCE



SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✳	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✳	University MD-HPCL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	●	Council of Governments
Zp	<i>Zernichellia palustris</i> (horned pondweed)	●	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (nailad)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Ve	<i>Vallisneria spiralis</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
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 puzosii</i> (slender pondweed)		
Ngu	<i>Najas guadalupensis</i> (southern nailad)		
Ngr	<i>Najas gracillima</i> (nailad)		
C	<i>Chara</i> sp. (muskgrass)		
Nm	<i>Najas minor</i> (slender nailad)		

SCALE 1:24,000

1 INCH = 2000 FEET
1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
9-18-90
GALENA, MD
017

SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✱	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✱	University MD-HPEL
Ppl	<i>Potamogeton perfoliatus</i> (redhead-grass)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	●	Council of Governments
Zp	<i>Zannichellia palustris</i> (horned pondweed)	■	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (nailad)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Vallisneria spiralis</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Po	<i>Potamogeton ephedrus</i> (leafy pondweed)		
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 nailad)		
Ngr	<i>Najas gracillima</i> (nailad)		
C	<i>Chara</i> sp. (muskgrass)		
Nm	<i>Najas minor</i> (slender nailad)		

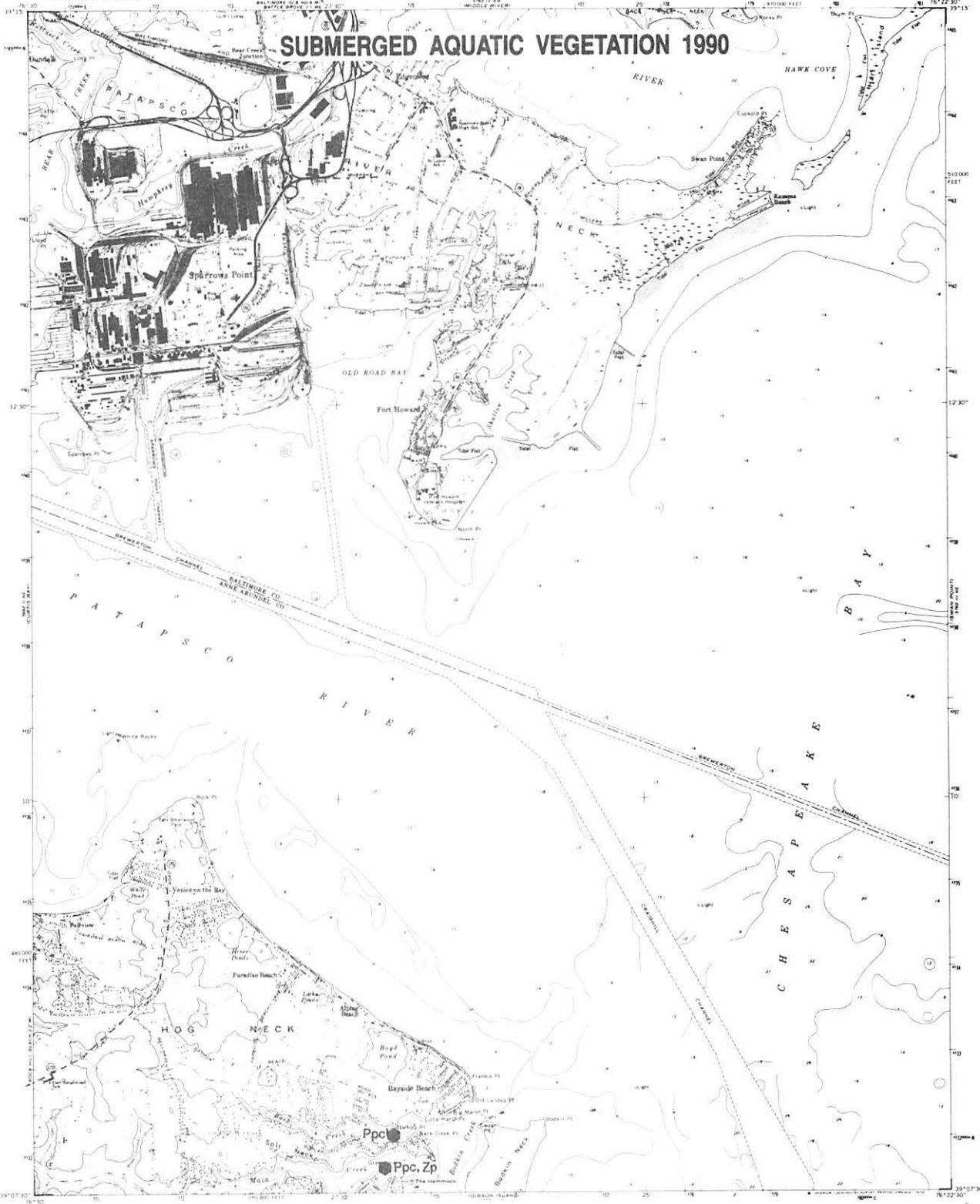
SCALE 1:24,000

1 2 3 4 5 6 7 8 9 10 METERS

1 2 3 4 5 6 7 8 9 10 KILOMETERS

DATE FLOWN
8-1-90
**CURTIS BAY,
MD
018**

VIRGINIA INSTITUTE
OF MARINE SCIENCE



SUBMERGED AQUATIC VEGETATION 1990

SPECIES		SURVEY STATIONS	
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</i> spp. (naiad)	Ngr	<i>Najas gracillima</i> (naiad)
Ec	<i>Elodea canadensis</i> (common elodea)	C	<i>Chara</i> sp. (muskgrass)
Va	<i>Vallisneria spiralis</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
U	Unknown species composition		

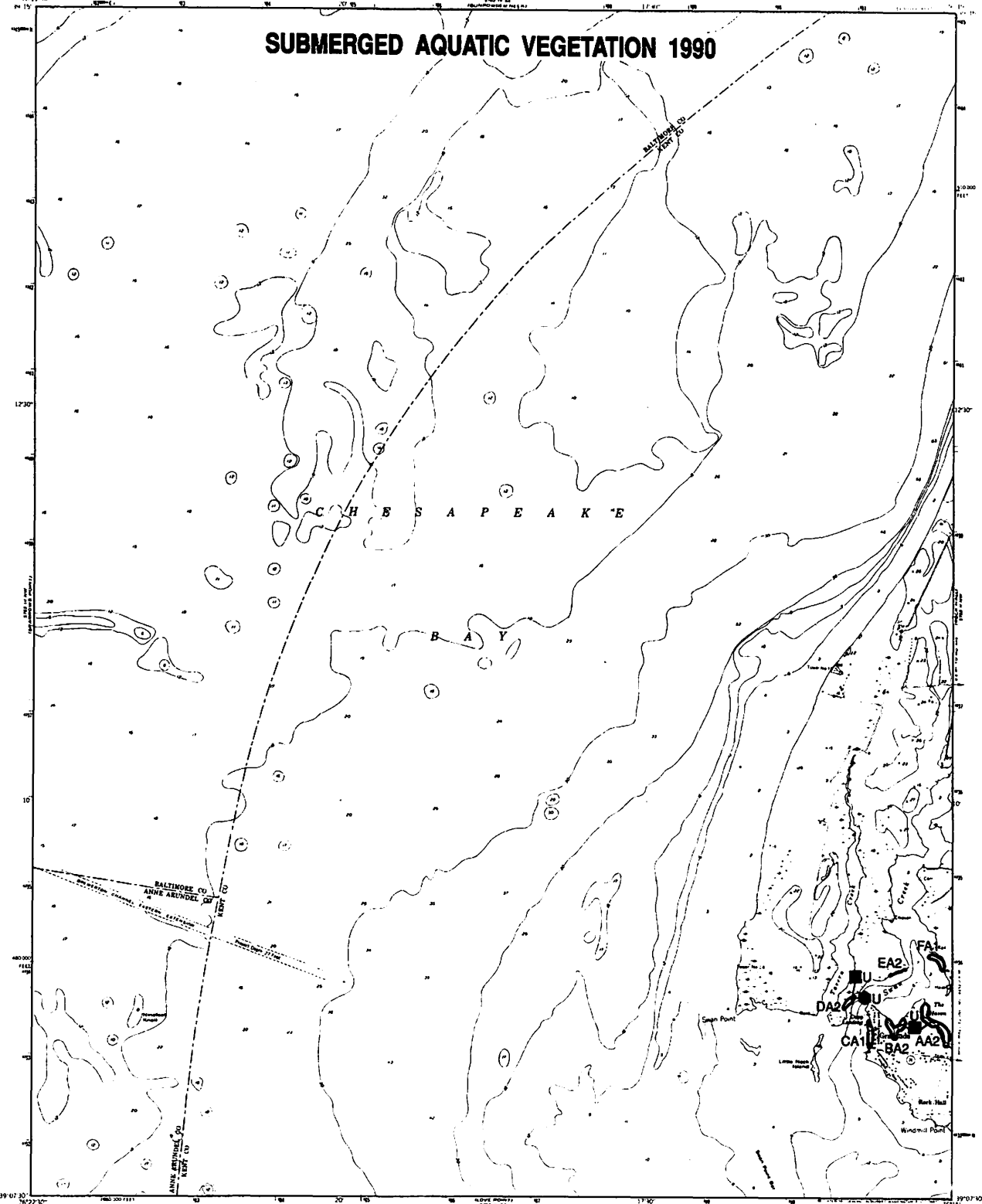
SURVEY STATIONS	
▲	VIMS Field Survey
✱	Harford Community College
✱	University MD-HPEL
★	USF & WS Survey
■	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR

DATE FLOWN 8-1-90
SPARROWS POINT, MD 019

SCALE 1:24,000

1 MILE / 1 KILOMETER

SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
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)	Ngv	<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. (muskgrass)
Va	<i>Vallisneria americana</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
U	Unknown species composition		

▲	VIMS Field Survey
✱	Harford Community College
✱	University MD-HPEL
★	USF & WS Survey
●	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR

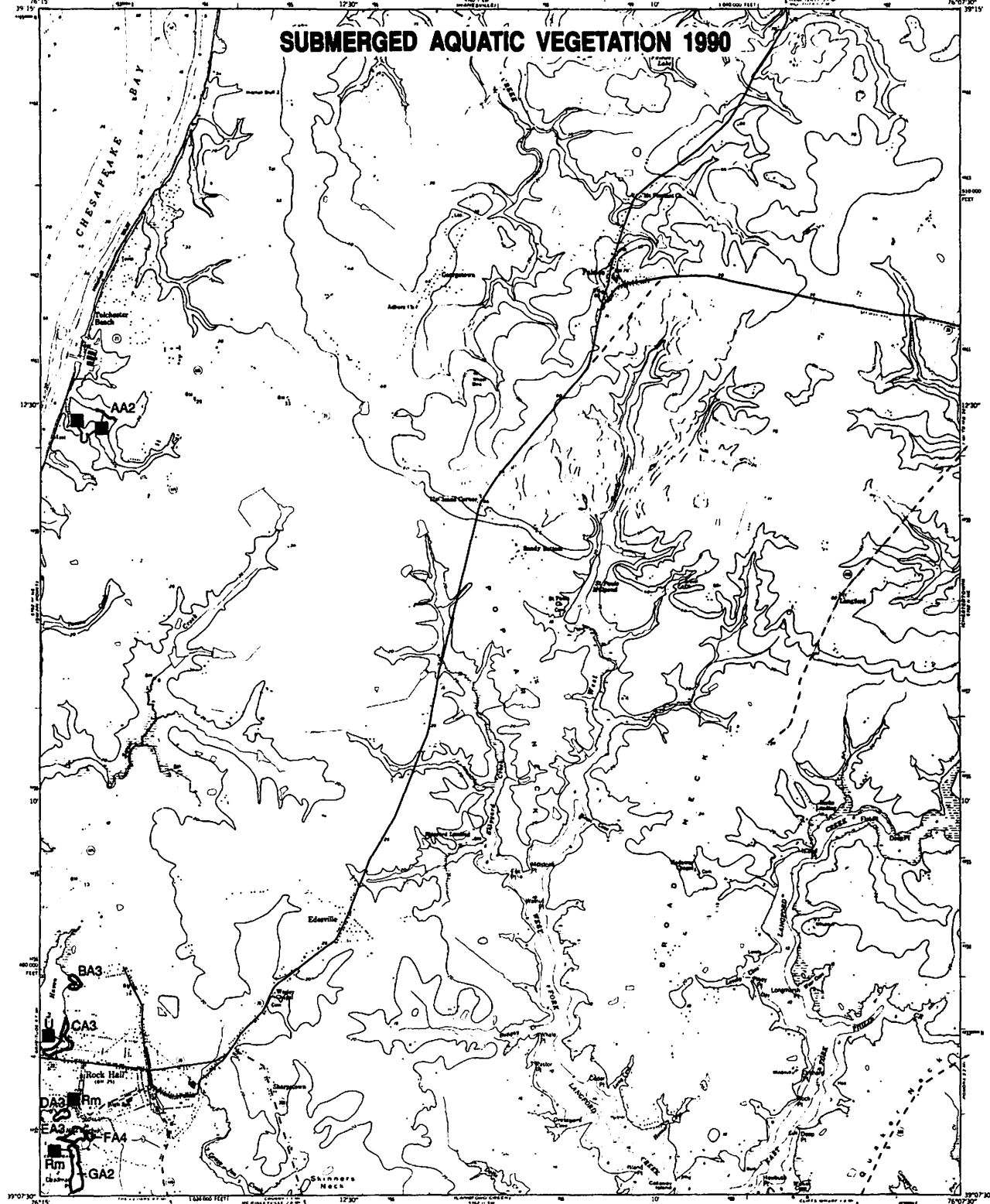
SCALE 1:24,000

1 MILE / 1 KILOMETER

DATE FLOWN
8-1-90
**SWAN POINT,
MD
020**

VIRGINIA INSTITUTE
OF MARINE SCIENCE

SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
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> (sage pondweed)	Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Zp	<i>Zannichetia 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. (muskgrass)
Va	<i>Vallisneria spiralis</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapezium</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
U	Unknown species composition		

SURVEY STATIONS	
▲	VIMS Field Survey
✱	Harford Community College
✱	University MD-HPEL
★	USF & WS Survey
●	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR

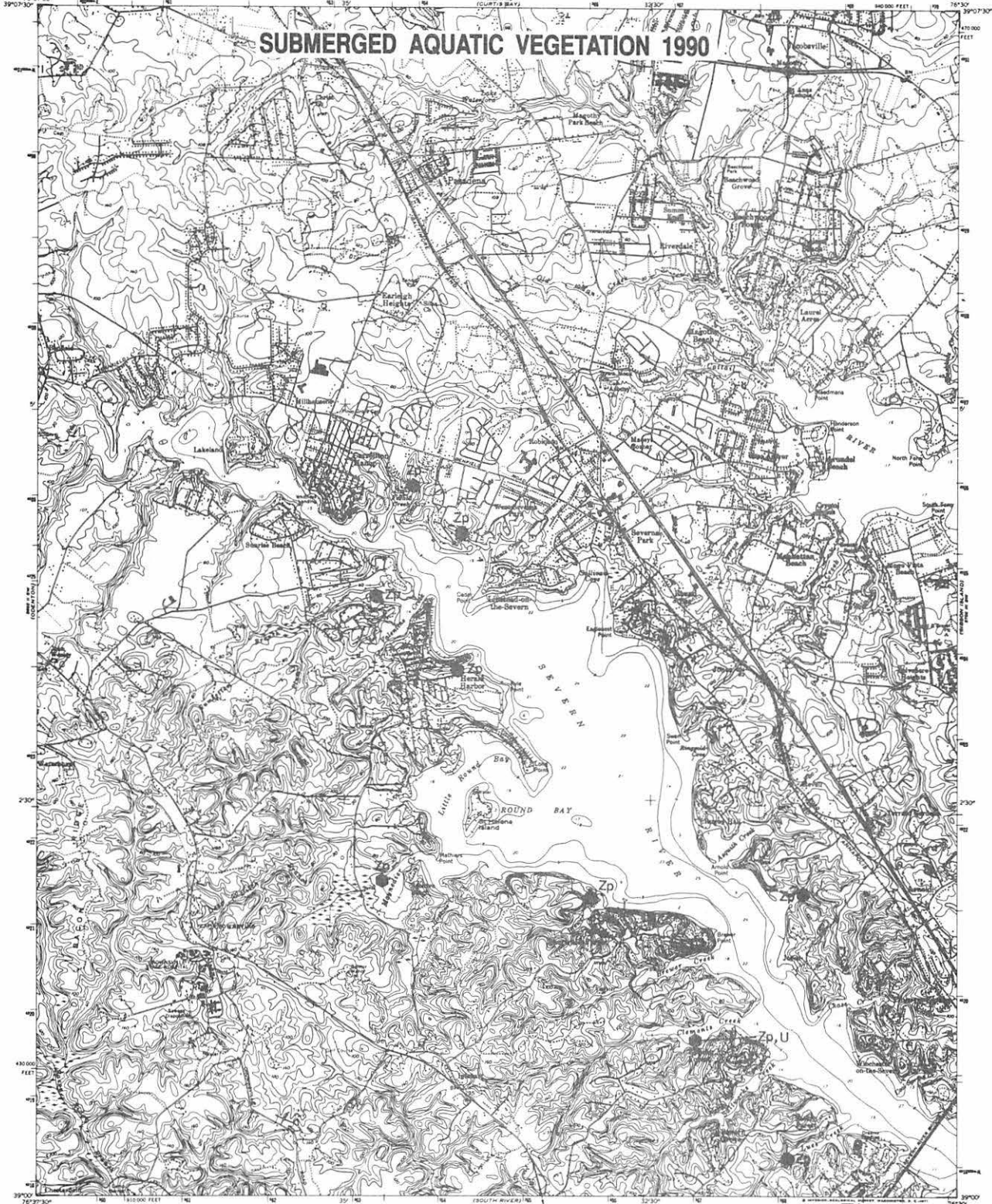
DATE FLOWN 8-1-90
ROCK HALL, MD 021

SCALE 1:24,000

1 INCH = 2000 FEET
1 CM = 10 METERS

VIRGINIA INSTITUTE OF MARINE SCIENCE

SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✱	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✱	University MD-HPEL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	■	Council of Governments
Zp	<i>Zannichellia palustris</i> (horned pondweed)	■	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (naiad)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Vallisneria spiralis</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
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)		

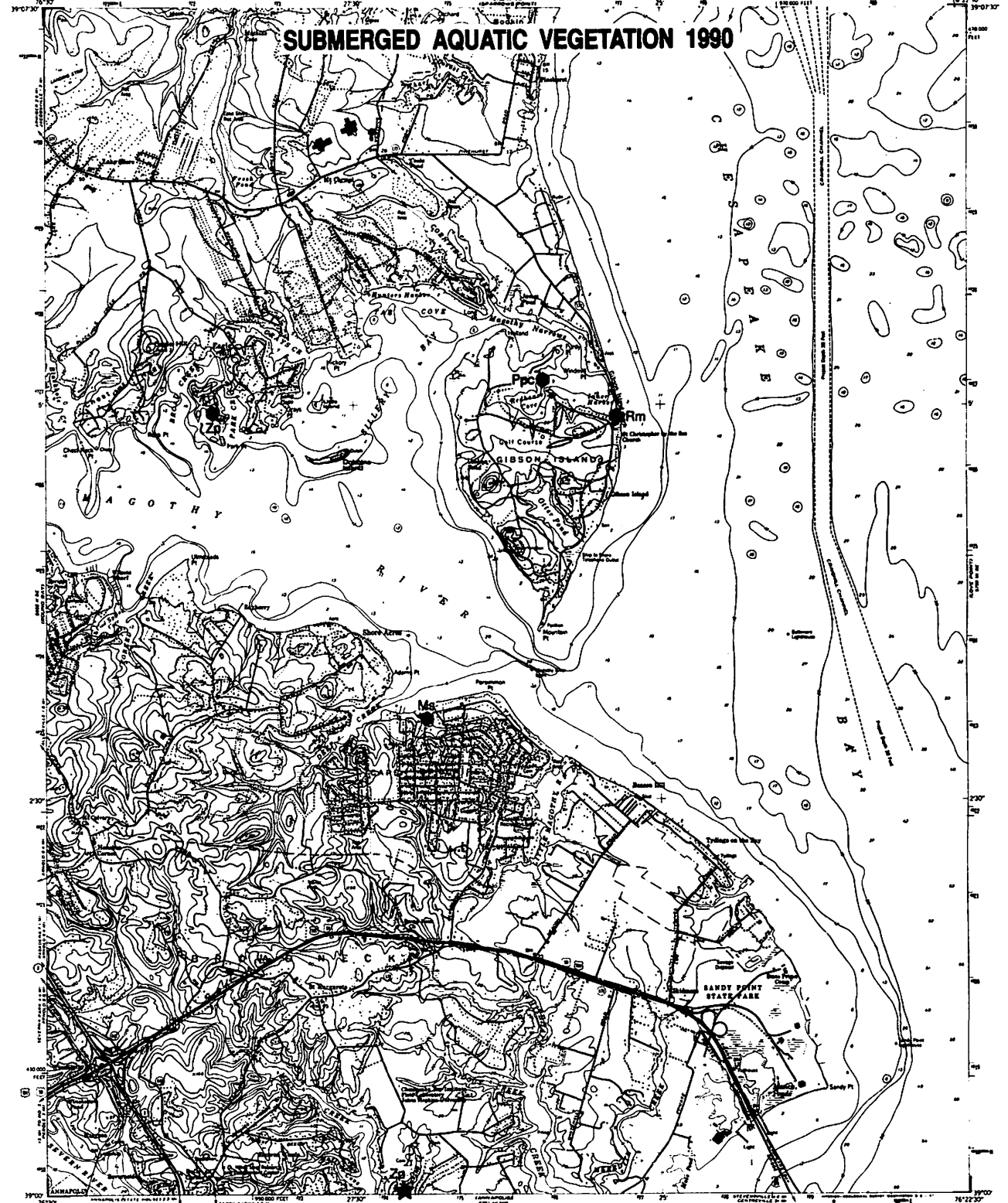
SCALE 1:24,000

1 MILE / 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
8-1-90
**ROUND BAY,
MD
023**

SUBMERGED AQUATIC VEGETATION 1990



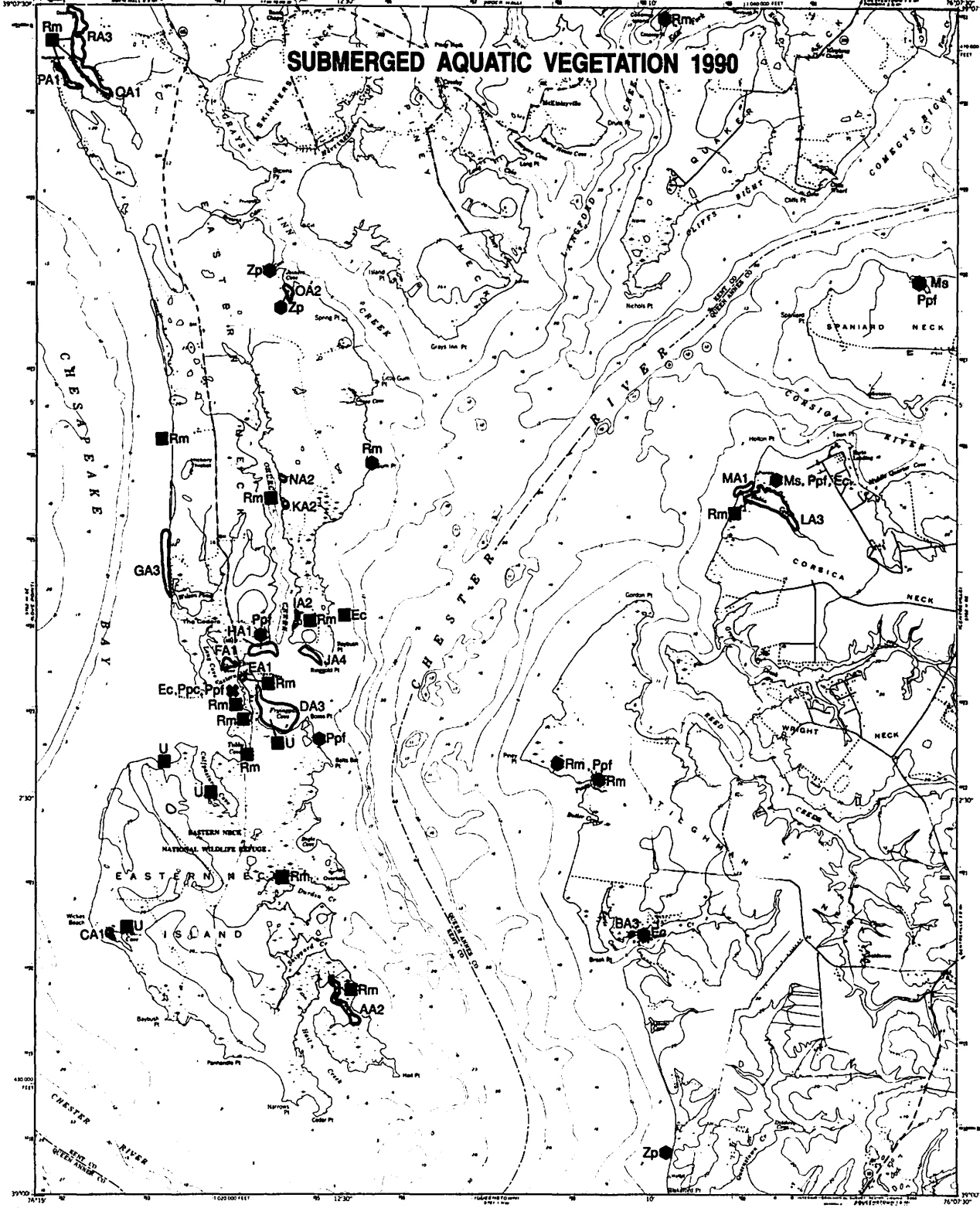
SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✳	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✳	University MD-HPEL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	●	Council of Governments
Zp	<i>Zannichellia palustris</i> (horned pondweed)	●	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (naked)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Vallisneria spiralis</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
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>Carotophyllum 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)		

SCALE 1:24,000

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
8-1-90
**GIBSON ISLAND,
MD
024**

SUBMERGED AQUATIC VEGETATION 1990



SPECIES

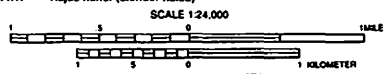
Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppf	<i>Potamogeton perfoliatus</i> (rechead-grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas</i> spp. (nald)
Ec	<i>Elodea canadensis</i> (common elodea)
Va	<i>Vallisneria spiralis</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
Pe	<i>Potamogeton ephedrus</i> (tealy pondweed)
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 nald)
Ngr	<i>Najas gracilima</i> (nald)
C	<i>Chara</i> sp. (muskgrass)
Nm	<i>Najas minor</i> (slender nald)

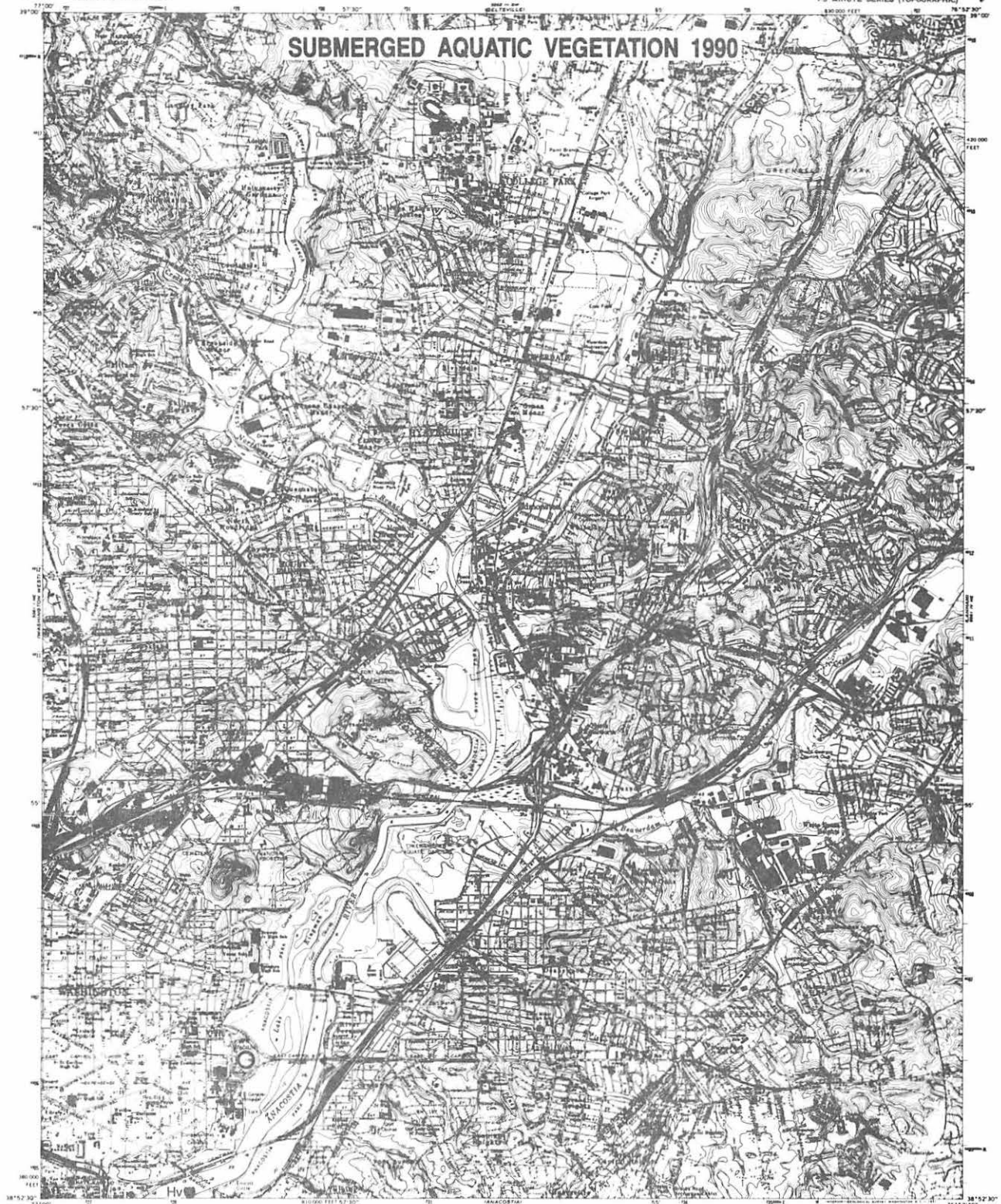
SURVEY STATIONS

- ▲ VIMS Field Survey
- * Harford Community College
- ✳ University MD-HPCL
- ★ USF & WS Survey
- Council of Governments
- MD Charter Boat Field Survey
- Citizens Field Observation
- MD-DNR

DATES FLOWN
Flight Line 35 8-1-90
Flight Line 36 9-1-90
LANGFORD CREEK, MD
026



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>Heteranthera dubia</i> (water stargrass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Ppf	<i>Potamogeton pectinatus</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)	Ng	<i>Najas guadalupensis</i> (southern naiad)
N	<i>Najas</i> spp. (naiad)	Ngr	<i>Najas gracilima</i> (naiad)
Ec	<i>Elodea canadensis</i> (common elodea)	C	<i>Chara</i> sp. (muskgrass)
Va	<i>Vallisneria spiralis</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton amphidrus</i> (leafy pondweed)		
U	Unknown species composition		

SURVEY STATIONS	
▲	VIMS Field Survey
✱	Harford Community College
✱	University MD-HPCL
★	USF & WS Survey
♣	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR

SCALE 1:24,000

1 5 0 1 MILE

1 5 0 1 KILOMETER

DATE FLOWN
9-18-90
**WASHINGTON
EAST, DC-MD**
29

VIRGINIA INSTITUTE
OF MARINE SCIENCE

SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✳	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✳	University MD-HPCL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	●	Council of Governments
Zp	<i>Zannichellia palustris</i> (horned pondweed)	■	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (nailad)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Vallisneria spiralis</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leaky pondweed)		
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 nailad)		
Ngr	<i>Najas gracillima</i> (nailad)		
C	<i>Chara</i> sp. (muskgrass)		
Nm	<i>Najas minor</i> (slender nailad)		

SCALE 1:24,000

1 MILE
1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
8-1-90
**SOUTH RIVER,
MD
030**



SUBMERGED AQUATIC VEGETATION 1990

SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✱	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✱	University MD-HPLE
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	●	Council of Governments
Zp	<i>Zannichellia palustris</i> (horned pondweed)	●	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (natid)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Vallisneria spiralis</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leaky pondweed)		
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 natid)		
Ngr	<i>Najas gracilima</i> (natid)		
C	<i>Chara</i> sp. (muskgrass)		
Nm	<i>Najas minor</i> (slender natid)		

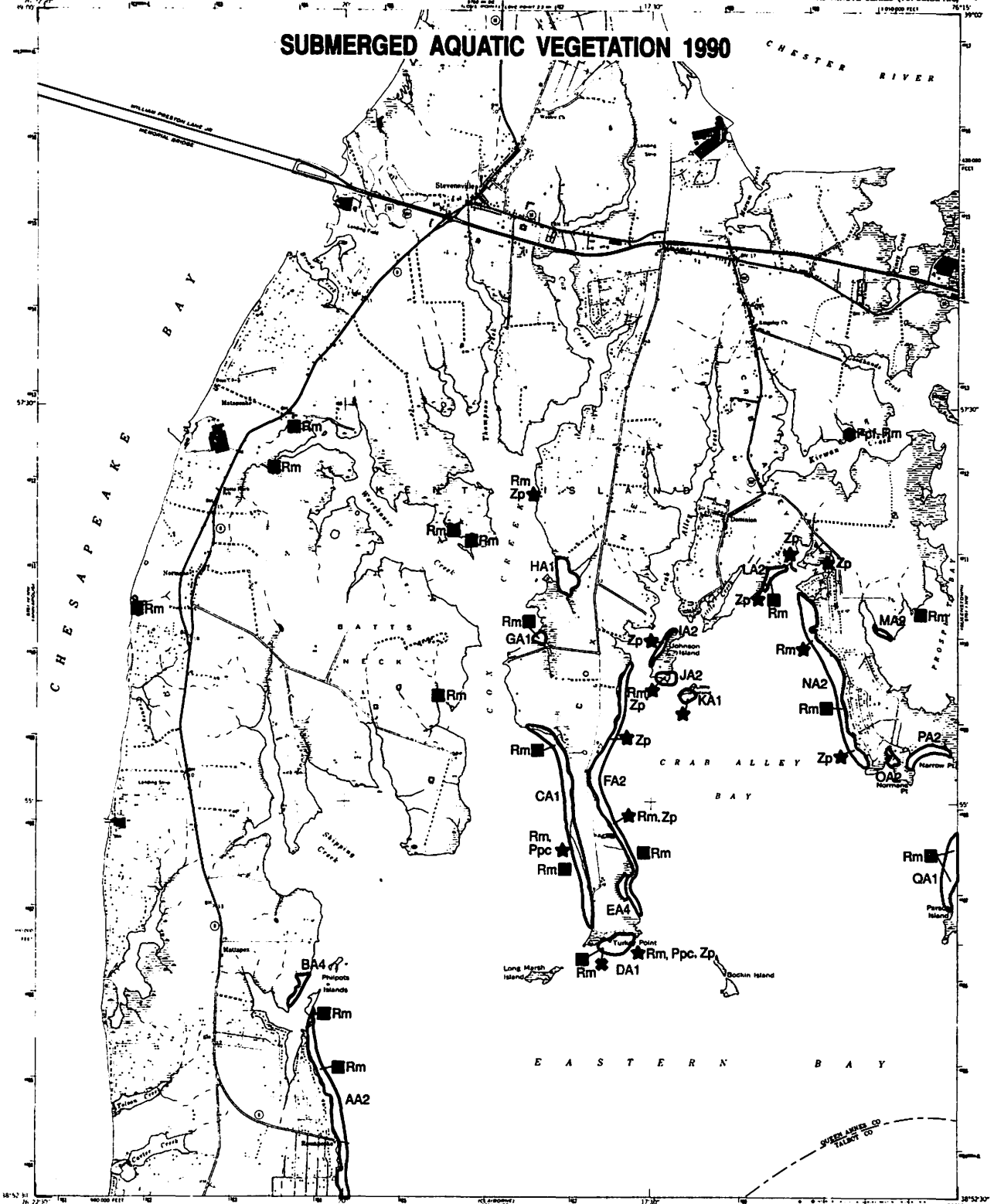
SCALE 1:24,000

1 MILE
1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

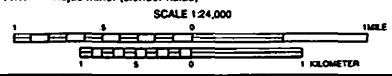
DATE FLOWN
8-1-90
**ANNAPOLIS,
MD
031**

SUBMERGED AQUATIC VEGETATION 1990



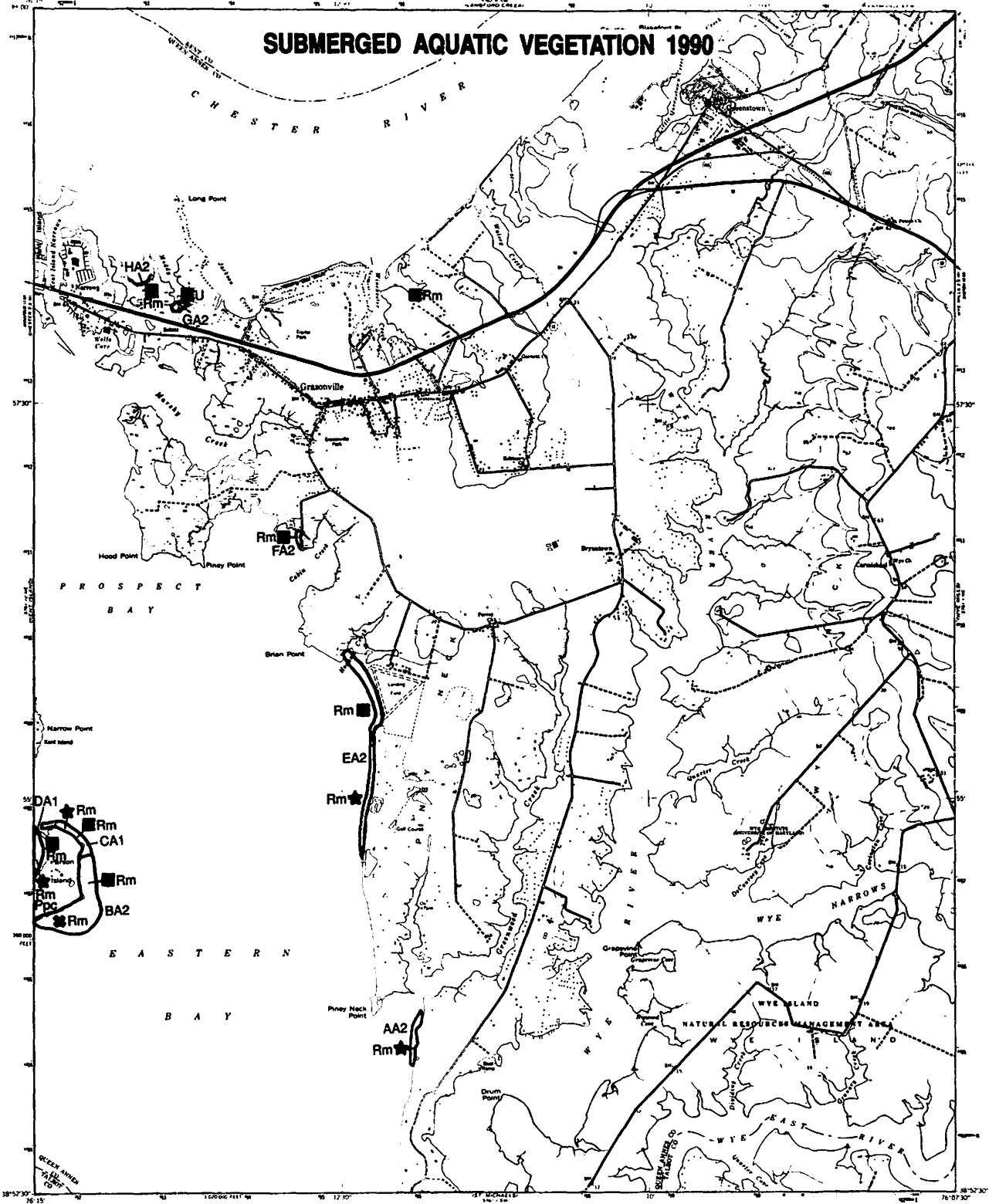
SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	★	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✳	University MD-HPEL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	☆	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	■	Council of Governments
Zp	<i>Zannichella palustris</i> (horned pondweed)	■	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (naked)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Vallisneria spiralis</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
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)		
Ngv	<i>Najas guadalupensis</i> (southern naked)		
Ngr	<i>Najas gracilima</i> (naked)		
C	<i>Chara</i> sp. (muskgrass)		
Nm	<i>Najas minor</i> (slender naked)		

DATE FLOWN
7-3-90
**KENT ISLAND,
MD
032**



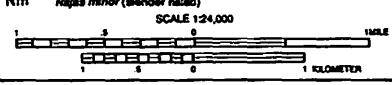
VIRGINIA INSTITUTE
OF MARINE SCIENCE

SUBMERGED AQUATIC VEGETATION 1990



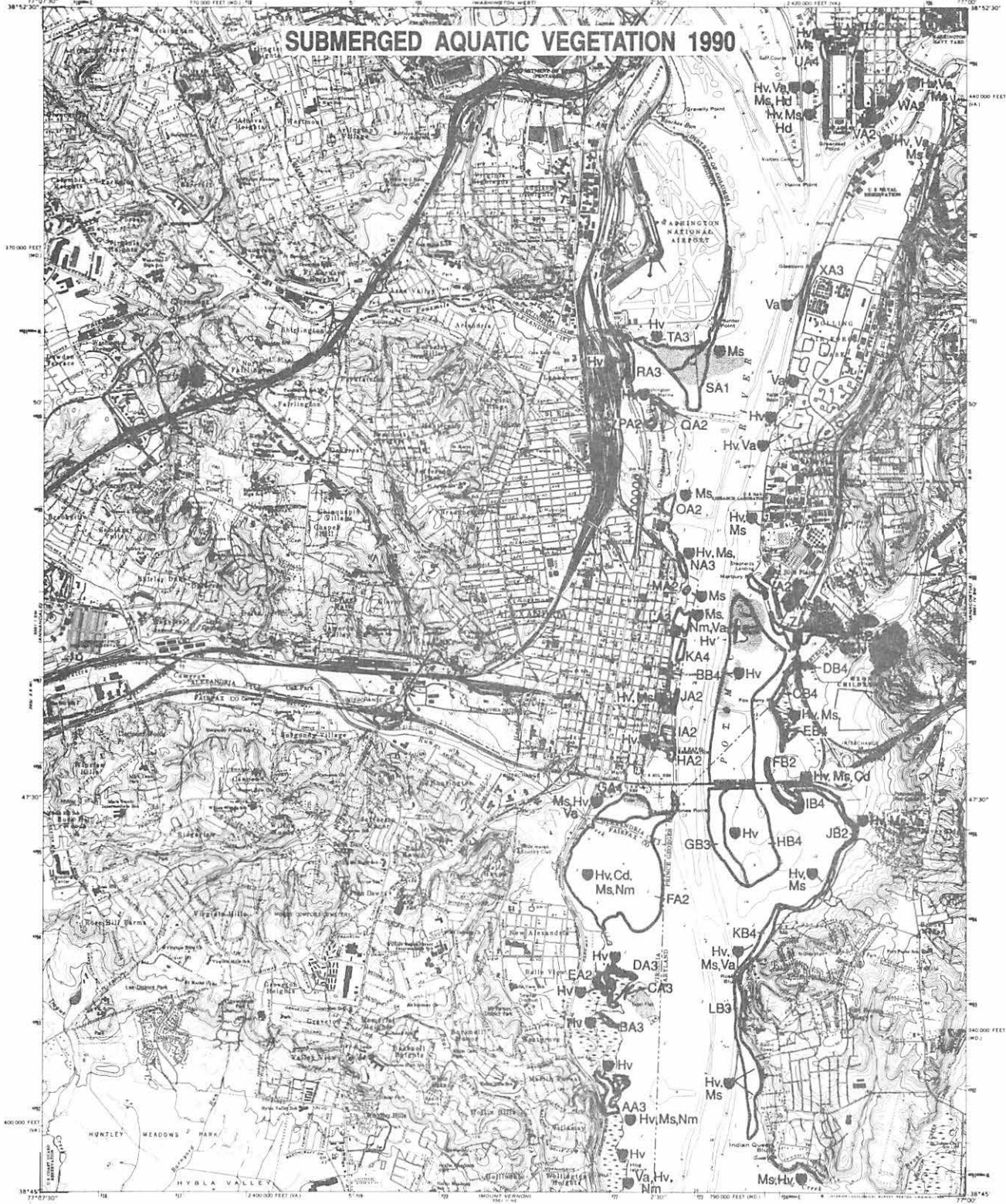
SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	Hv	<i>Hydrilla verticillata</i> (hydrilla)
Rm	<i>Ruppia maritima</i> (widgeon grass)	Hd	<i>Heteranthera dubia</i> (water stargrass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Ppf	<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 peltata</i> (horned pondweed)	Ngu	<i>Najas guadalupensis</i> (southern nald)
N	<i>Najas</i> spp. (nald)	Ngr	<i>Najas gracillima</i> (nald)
Ec	<i>Elodea canadensis</i> (common elodea)	C	<i>Chara</i> sp. (muskgrass)
Va	<i>Vallisneria spiralis</i> (wild celery)	Nm	<i>Najas minor</i> (slender nald)
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
U	Unknown species composition		

DATE FLOWN
7-3-90
**QUEENSTOWN,
MD
033**



VIRGINIA INSTITUTE
OF MARINE SCIENCE

SUBMERGED AQUATIC VEGETATION 1990



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 spiralis</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)
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)

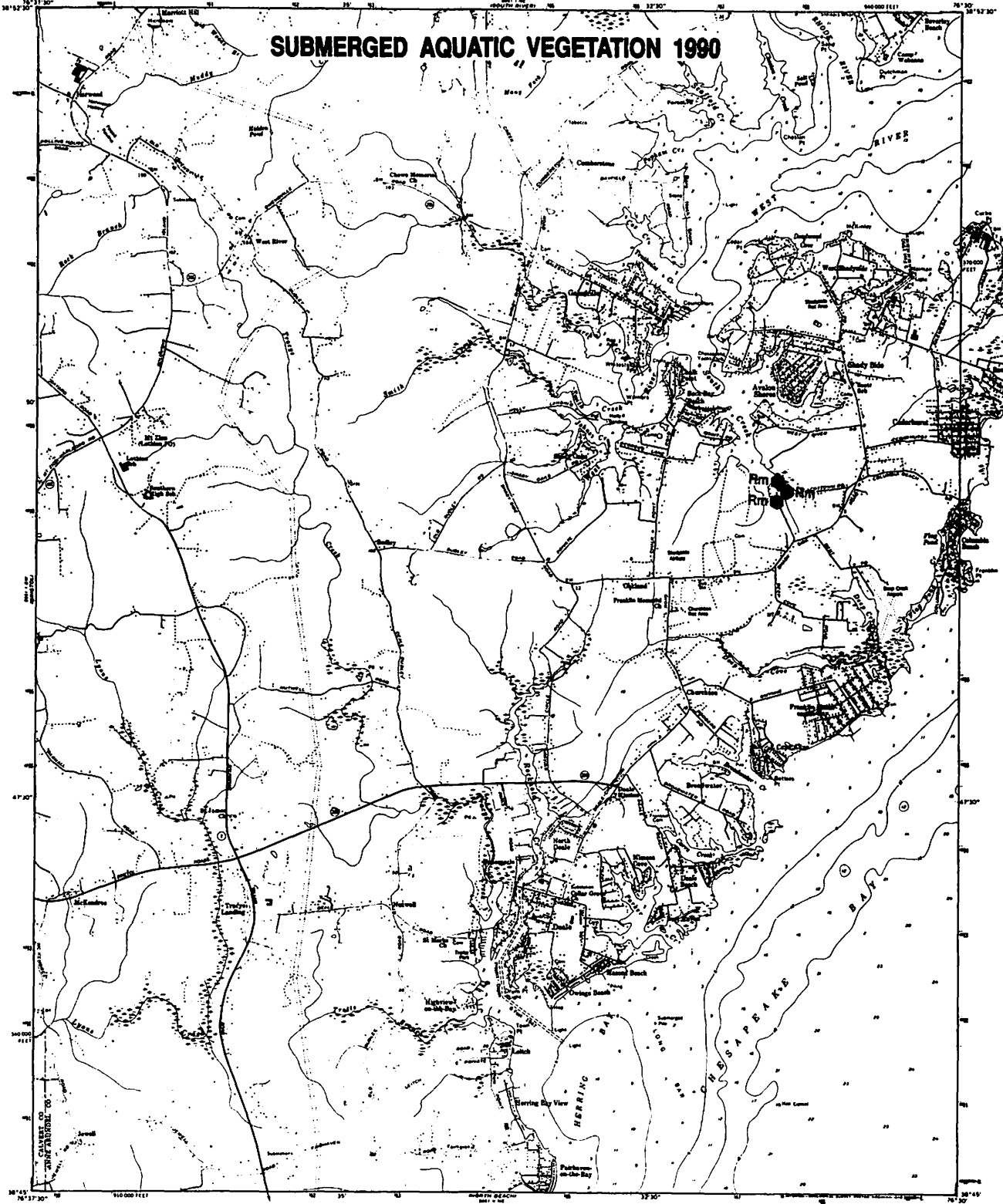
SURVEY STATIONS

- ▲ VIMS Field Survey
- ✱ Harford Community College
- ✱ University MD-HPCL
- ★ USF & WS Survey
- ☆ Council of Governments
- MD Charter Boat Field Survey
- Citizens Field Observation
- MD-DNR

SCALE 1:24,000

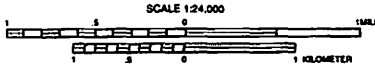
1 5 0 1 MILE
1 5 0 1 KILOMETER

DATE FLOWN
9-18-90
**ALEXANDRIA,
VA-DC-MD
034**



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. (naisid)
Ec	<i>Elodea canadensis</i> (common elodea)
Va	<i>Vallisneria spiralis</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
Pe	<i>Potamogeton ephedrus</i> (teaty pondweed)
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)
Ngv	<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)

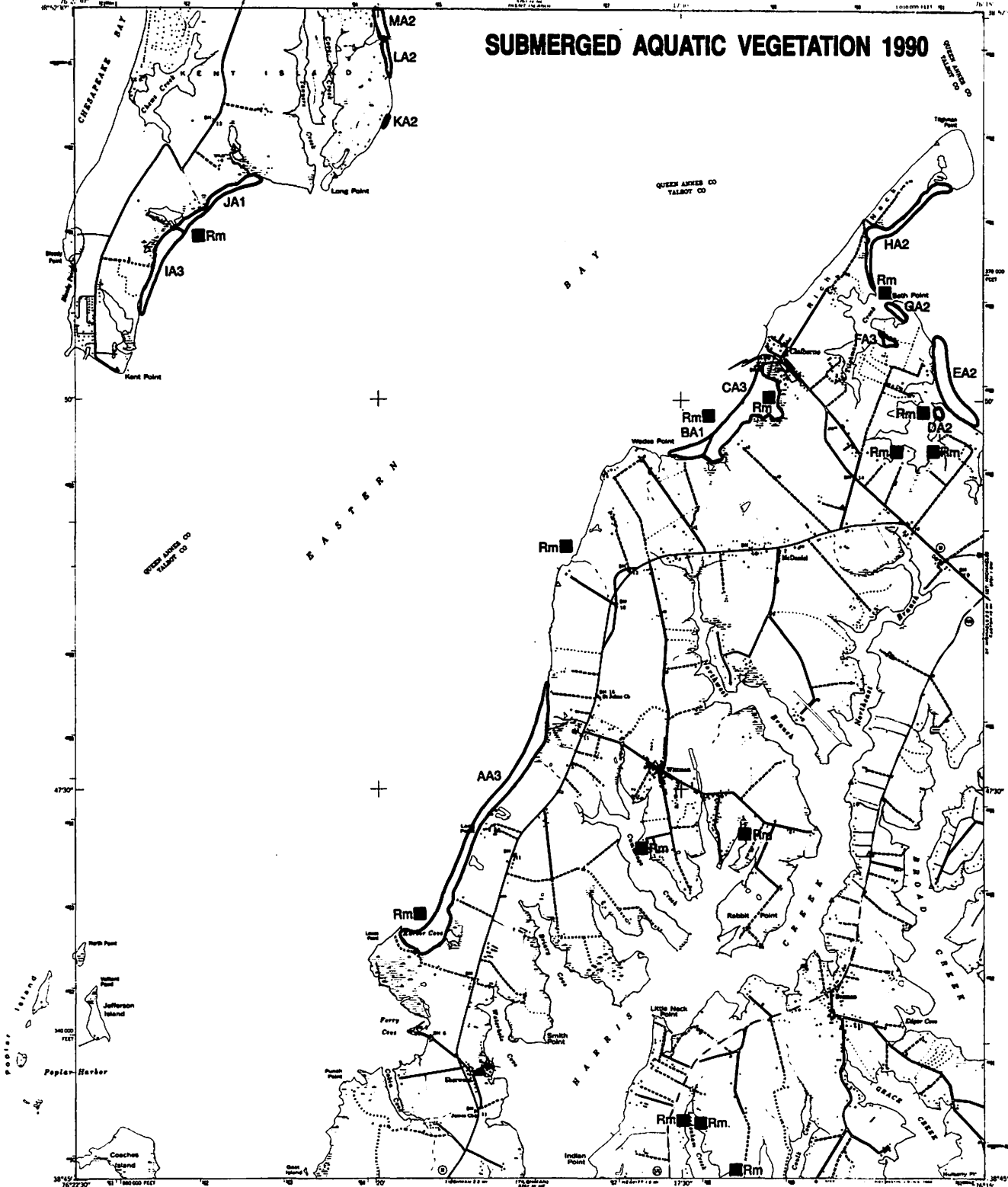


SURVEY STATIONS	
▲	VIMS Field Survey
✱	Harford Community College
✱	University MD-HPEL
★	USF & WS Survey
★	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR

ROAD — DATE FLOWN
8-1-90
**DEALE,
MD
035**

VIRGINIA INSTITUTE
OF MARINE SCIENCE

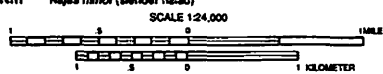
SUBMERGED AQUATIC VEGETATION 1990

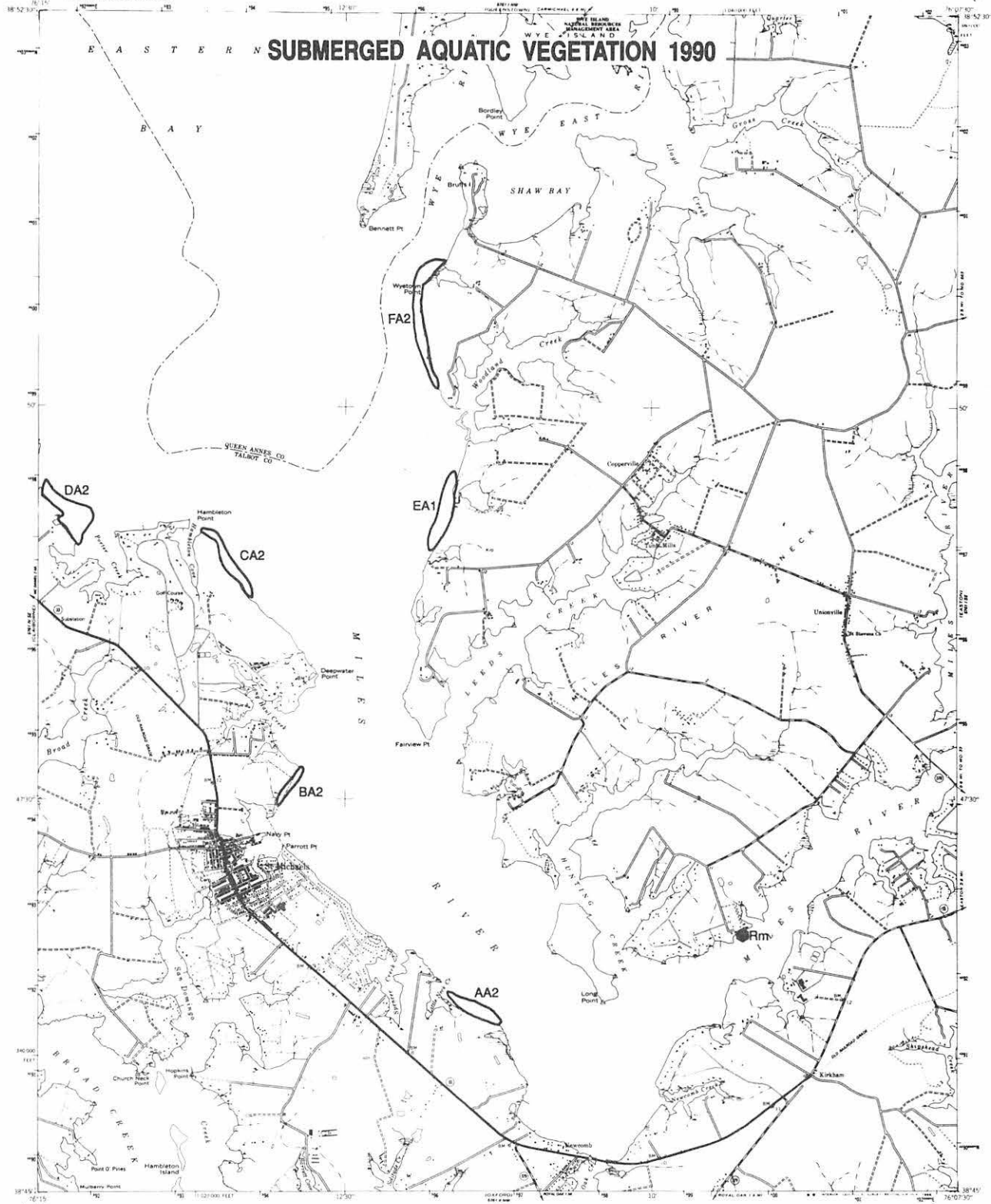


SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	Hv	<i>Hydrilla verticillata</i> (hydrilla)
Rm	<i>Ruppia maritima</i> (widgeon grass)	Hd	<i>Heteranthera dubia</i> (water stargrass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Ppf	<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</i> spp. (naiad)	Ngr	<i>Najas gracillima</i> (naiad)
Ec	<i>Elodea canadensis</i> (common elodea)	C	<i>Chara</i> sp. (muskgrass)
Va	<i>Vallisneria spiralis</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leaky pondweed)		
U	Unknown species composition		

SURVEY STATIONS	
▲	VIMS Field Survey
✱	Harford Community College
✱	University MD-HPEL
★	USF & WS Survey
●	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR

DATE FLOWN
7-3-90
CLAIBORNE, MD
036





SPECIES		SURVEY STATIONS	
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)	Ng	<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. (muskgrass)
Va	<i>Vallisneria spiralis</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton epihydrus</i> (leaty pondweed)		
U	Unknown species composition		

▲	VIMS Field Survey
✱	Harford Community College
✱	University MD-HPCL
★	USF & WS Survey
♥	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR

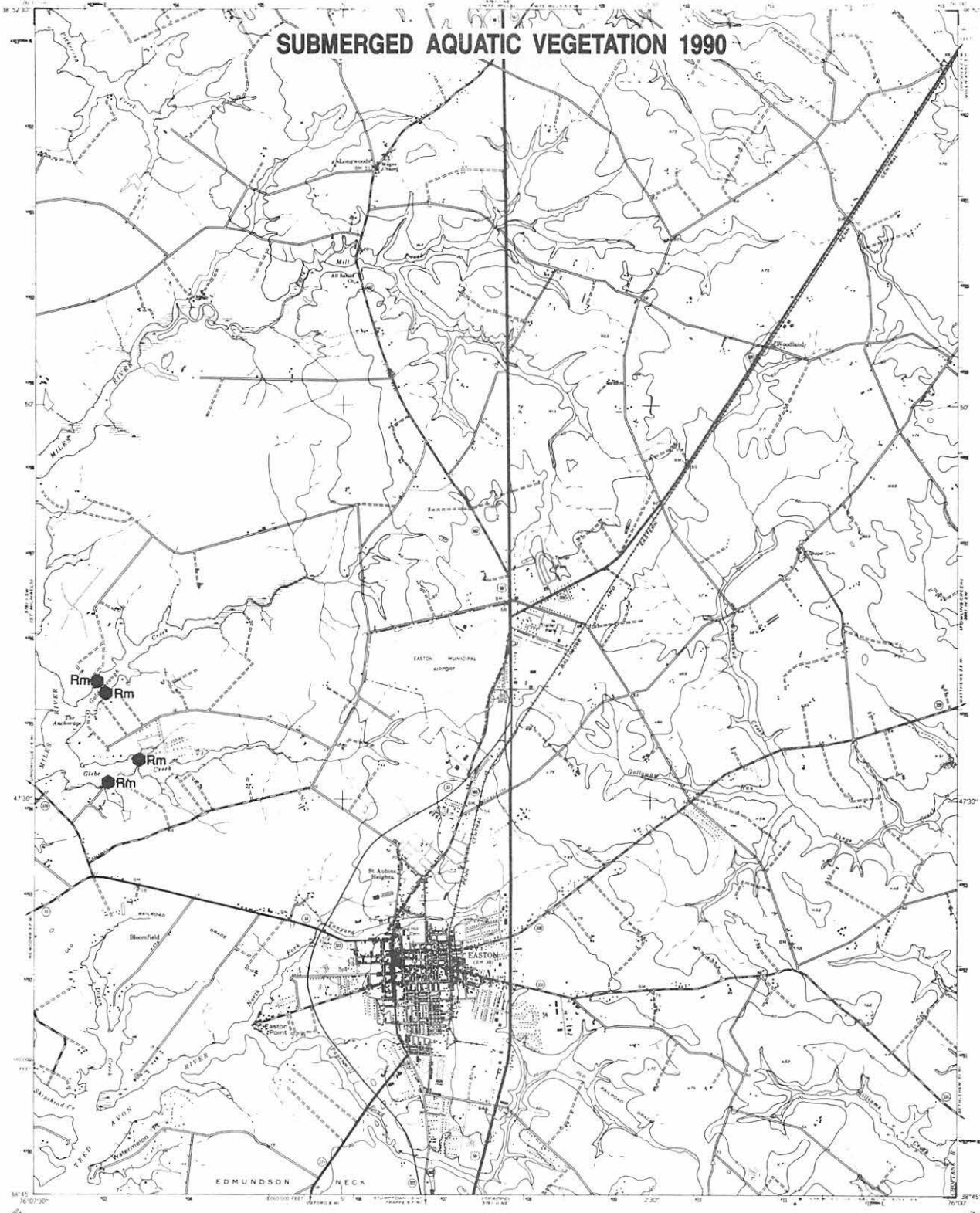
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1 5 0 1 MILE
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DATE FLOWN
7-3-90
**ST. MICHAELS,
MD
037**

VIRGINIA INSTITUTE
OF MARINE SCIENCE

SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
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</i> spp. (naiad)	Ngr	<i>Najas gracillima</i> (naiad)
Ec	<i>Elodea 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)		
Pe	<i>Potamogeton epihydrus</i> (leafy pondweed)		
U	Unknown species composition		

SURVEY STATIONS	
▲	VIMS Field Survey
✱	Hartford Community College
✱	University MD-HPEL
★	USF & WS Survey
♥	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR

DATE FLOWN
9-1-90
**EASTON,
MD
038**



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>Elodea canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)
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)

SCALE 1:24,000

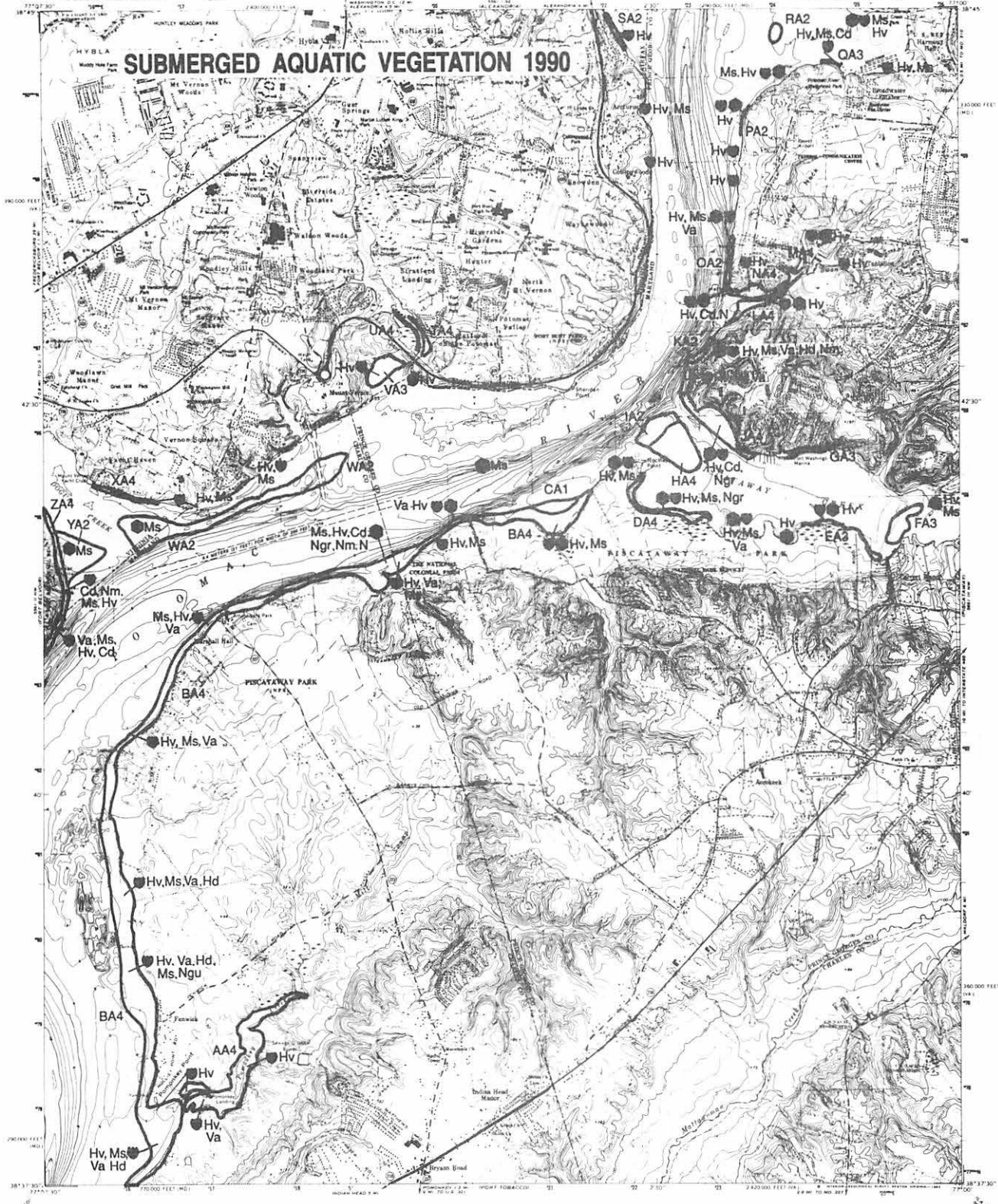
SURVEY STATIONS

▲	VIMS Field Survey
✱	Harford Community College
✱	University MD-HPEL
★	USF & WS Survey
●	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
8-31-90
**FORT BELVOIR,
VA-MD
039**

SUBMERGED AQUATIC VEGETATION 1990



SPECIES

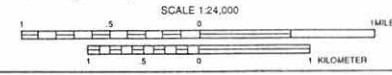
Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia patustris</i> (horned pondweed)
N	<i>Najas</i>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

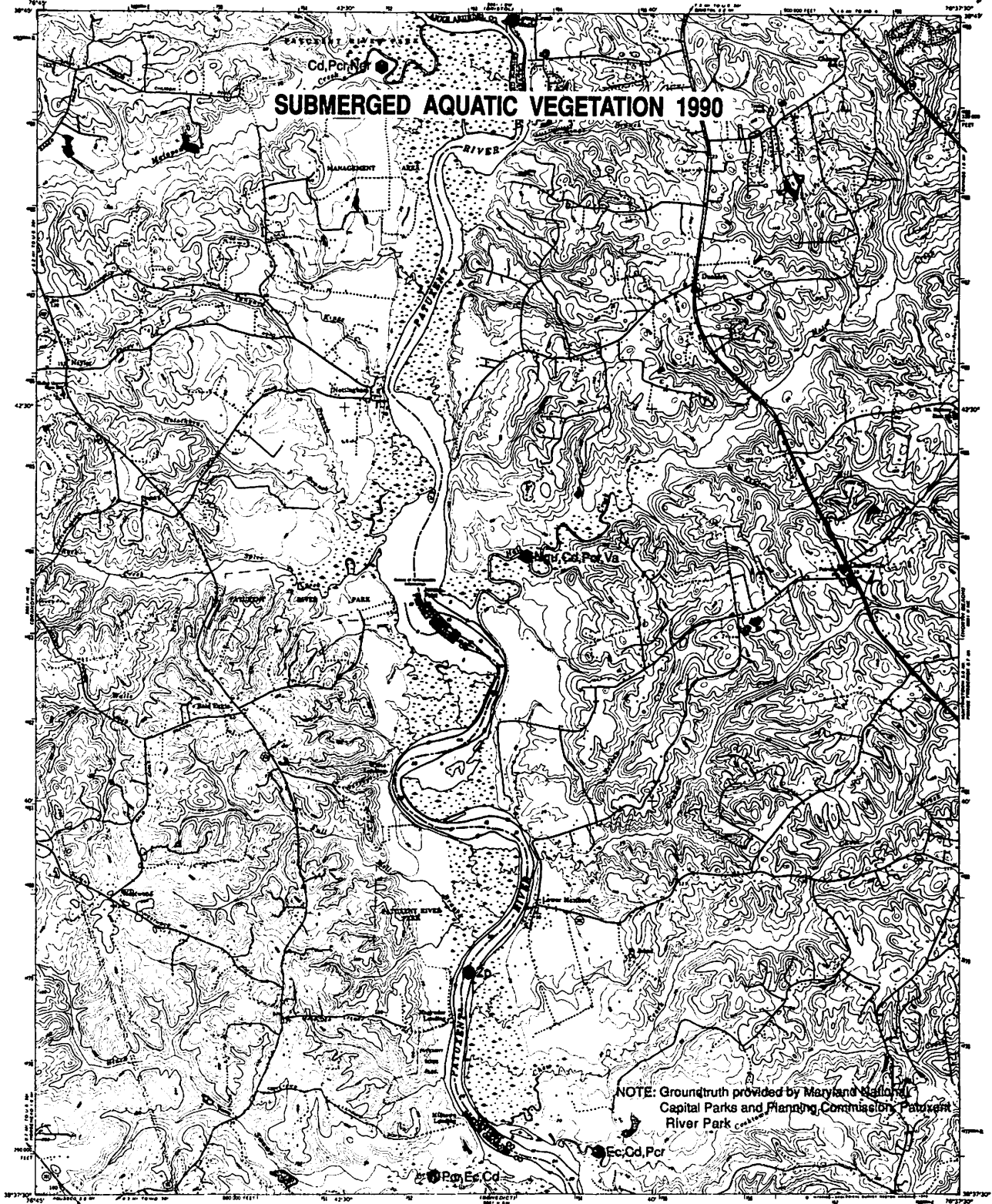
SURVEY STATIONS

▲	VIMS Field Survey
✱	Harford Community College
✱	University MD-HPEL
★	USF & WS Survey
☆	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR

VIRGINIA INSTITUTE OF MARINE SCIENCE

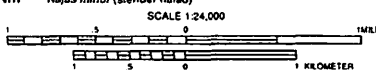


DATE FLOWN
8-31-90
MT. VERNON,
VA-MD
040

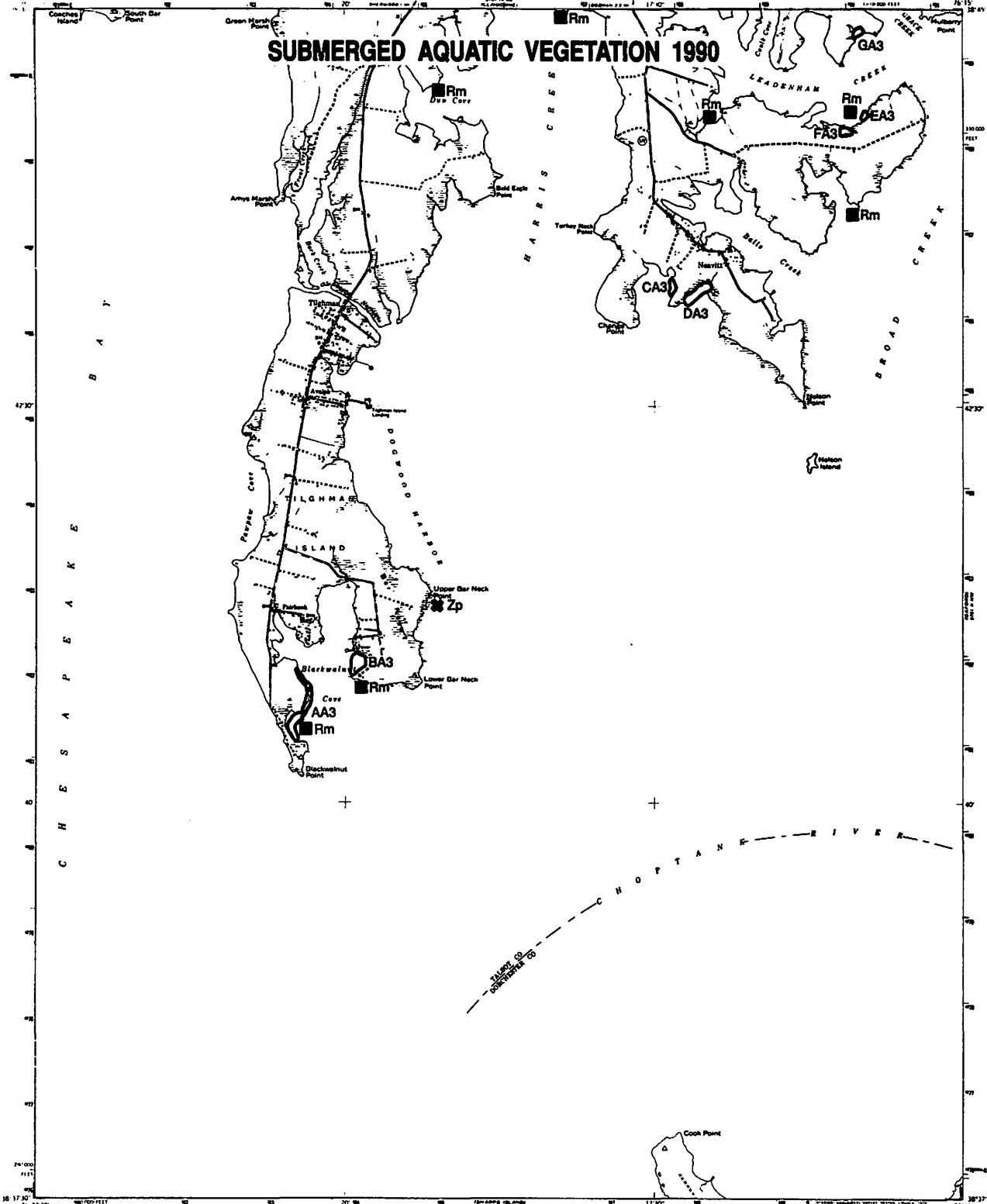


SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	Hv	<i>Hydrilla verticillata</i> (hydrilla)
Rm	<i>Ruppia maritima</i> (widgeon grass)	Hd	<i>Heteranthera dubia</i> (water stargrass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Ppf	<i>Potamogeton pectinatus</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. (muskgrass)
Va	<i>Vallisneria spiralis</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
U	Unknown species composition		

DATE FLOWN
8-1-90
**LOWER
MARLBORO, MD**
41

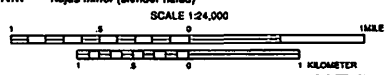


VIRGINIA INSTITUTE
OF MARINE SCIENCE

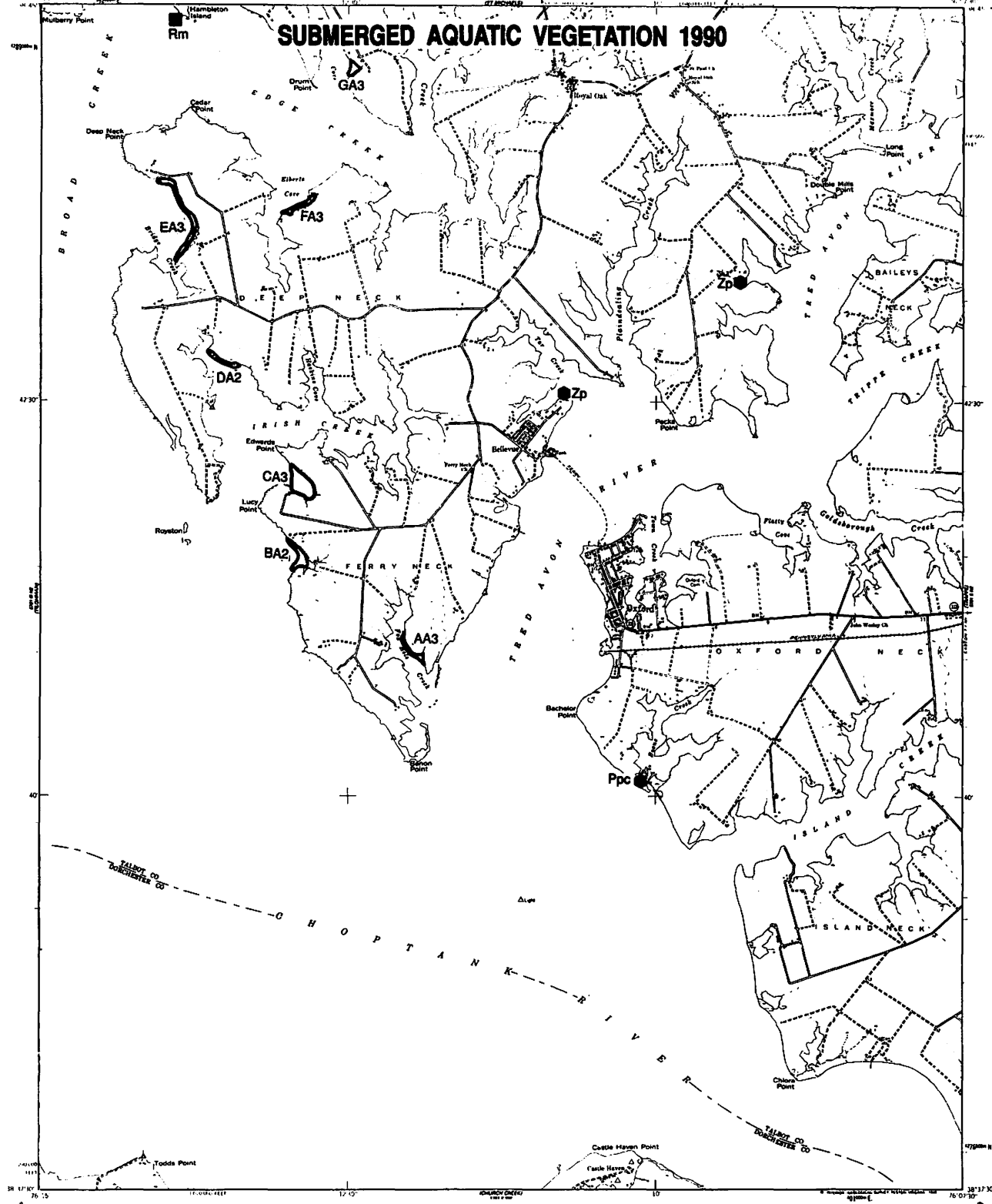


SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✳	Hartford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✳	University MD-HPEL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	●	Council of Governments
Zp	<i>Zannichellia palustris</i> (horned pondweed)	■	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (nailad)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Vallisneria spiralis</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
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 nailad)		
Ngr	<i>Najas gracillima</i> (nailad)		
C	<i>Chara</i> sp. (muskgrass)		
Nm	<i>Najas minor</i> (slender nailad)		

DATE FLOWN
7-3-90
TILGHMAN,
MD
043



SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
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)
Ppt	<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>Zannichella 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. (muskgrass)
Va	<i>Vallisneria spiralis</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
U	Unknown species composition		

DATE FLOWN
7-3-90
OXFORD, MD
044

VIRGINIA INSTITUTE OF MARINE SCIENCE



SUBMERGED AQUATIC VEGETATION 1990



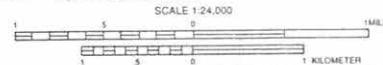
SPECIES

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 spiralis</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)
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)

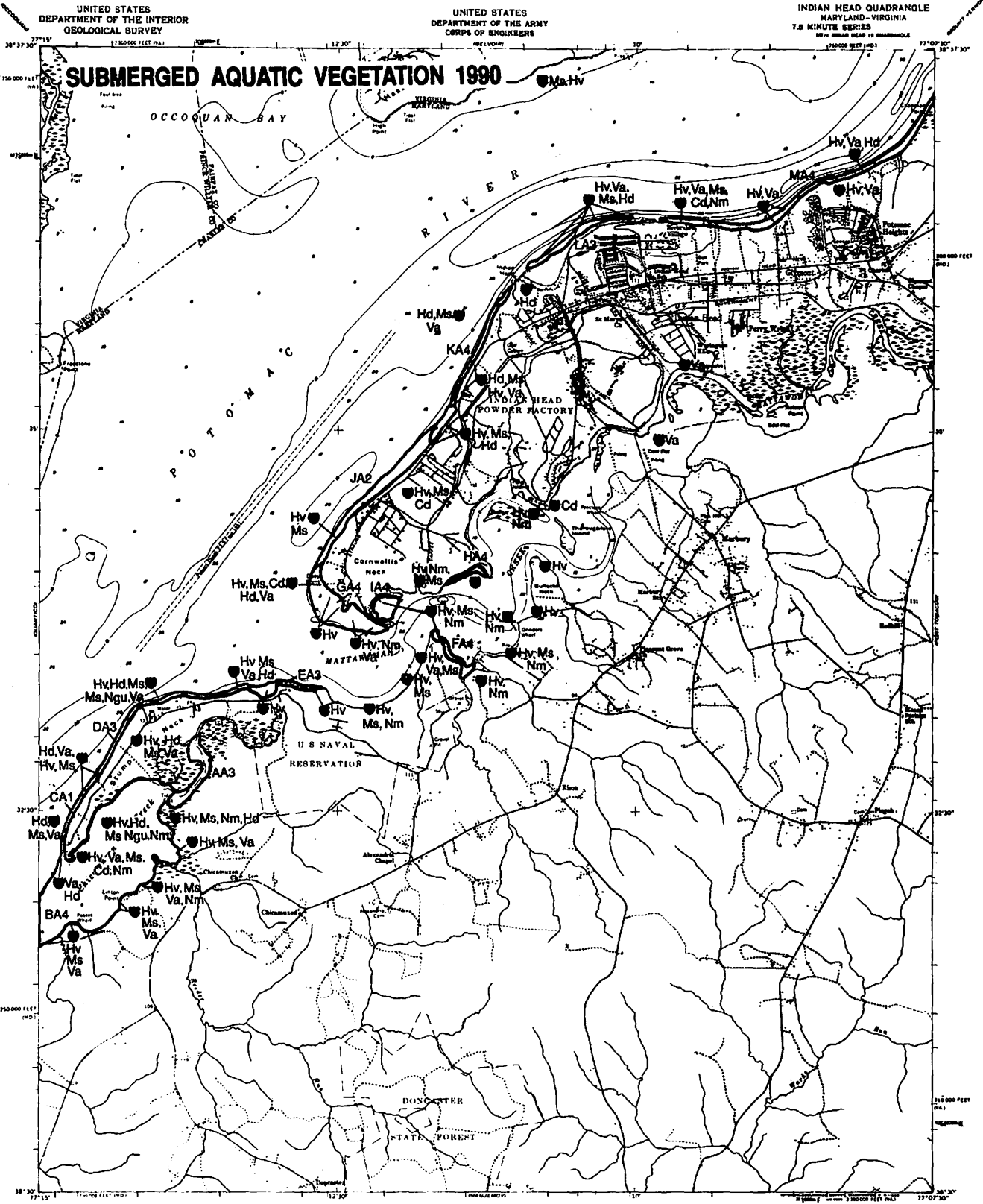
SURVEY STATIONS

- ▲ VIMS Field Survey
- ★ Harford Community College
- ✱ University MD-HPPEL
- ☆ USF & WS Survey
- Council of Governments
- MD Charter Boat Field Survey
- Citizens Field Observation
- MD-DNR



DATE FLOWN
8-31-90
**QUANTICO,
VA-MD**
047

VIRGINIA INSTITUTE
OF MARINE SCIENCE



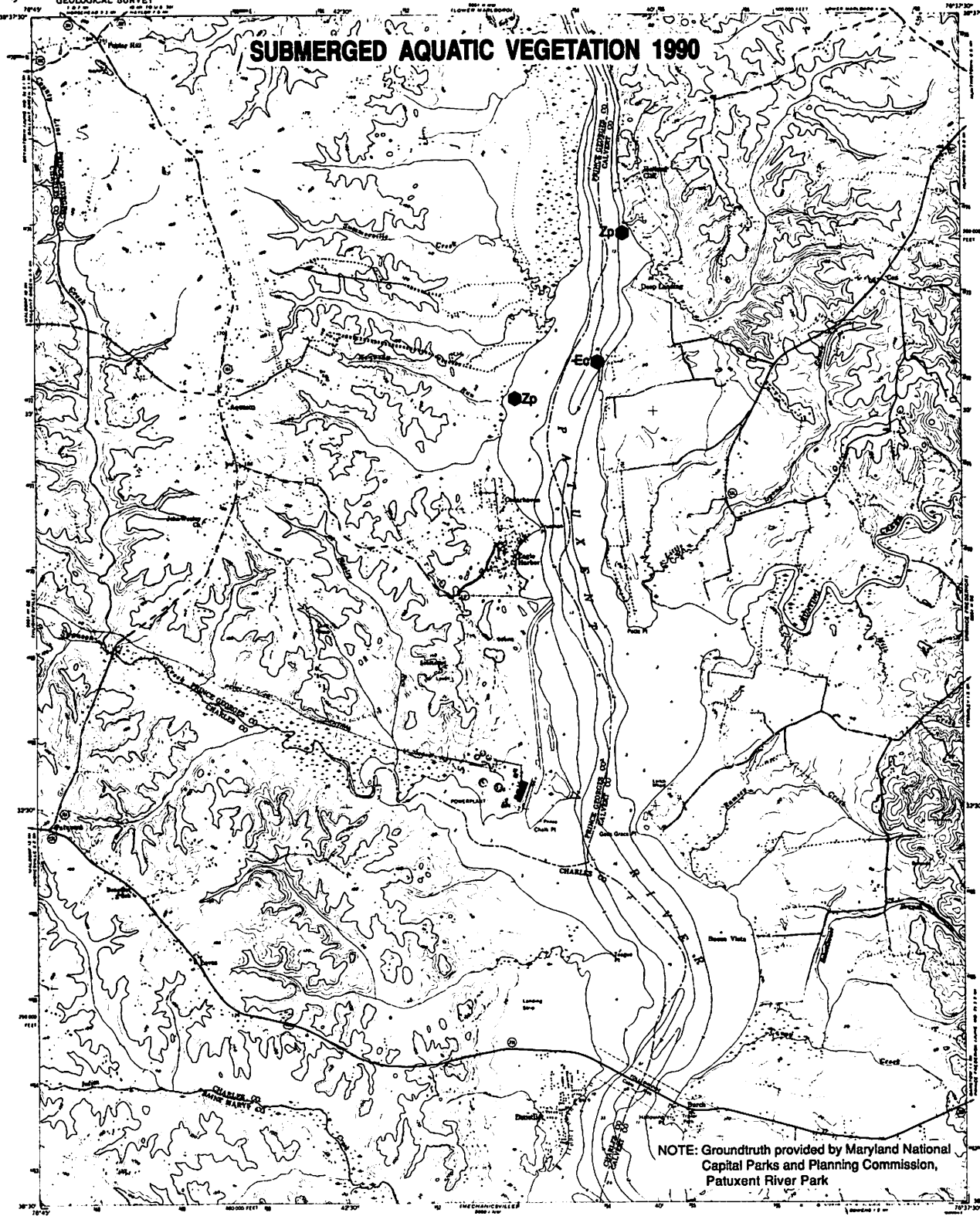
SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	Hv	<i>Hydrilla verticillata</i> (hydrilla)
Rm	<i>Ruppia maritima</i> (widgeon grass)	Hd	<i>Heteranthera dubia</i> (water stargrass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Ppf	<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> (naiad)
Ec	<i>Elodea canadensis</i> (common elodea)	C	<i>Chara</i> sp. (muskgrass)
Va	<i>Vallisneria spiralis</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (teaty pondweed)		
U	Unknown species composition		

SURVEY STATIONS	
▲	VIMS Field Survey
✱	Harford Community College
✱	University MD-HPCL
★	USF & WS Survey
★	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR

DATE FLOWN 8-31-90
INDIAN HEAD, MD-VA 048

VIRGINIA INSTITUTE OF MARINE SCIENCE

SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
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</i> spp. (naiad)	Ngr	<i>Najas gracillima</i> (naiad)
Ec	<i>Elodea canadensis</i> (common elodea)	C	<i>Chara</i> sp. (muskgrass)
Va	<i>Vallisneria spiralis</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapezium natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
U	Unknown species composition		

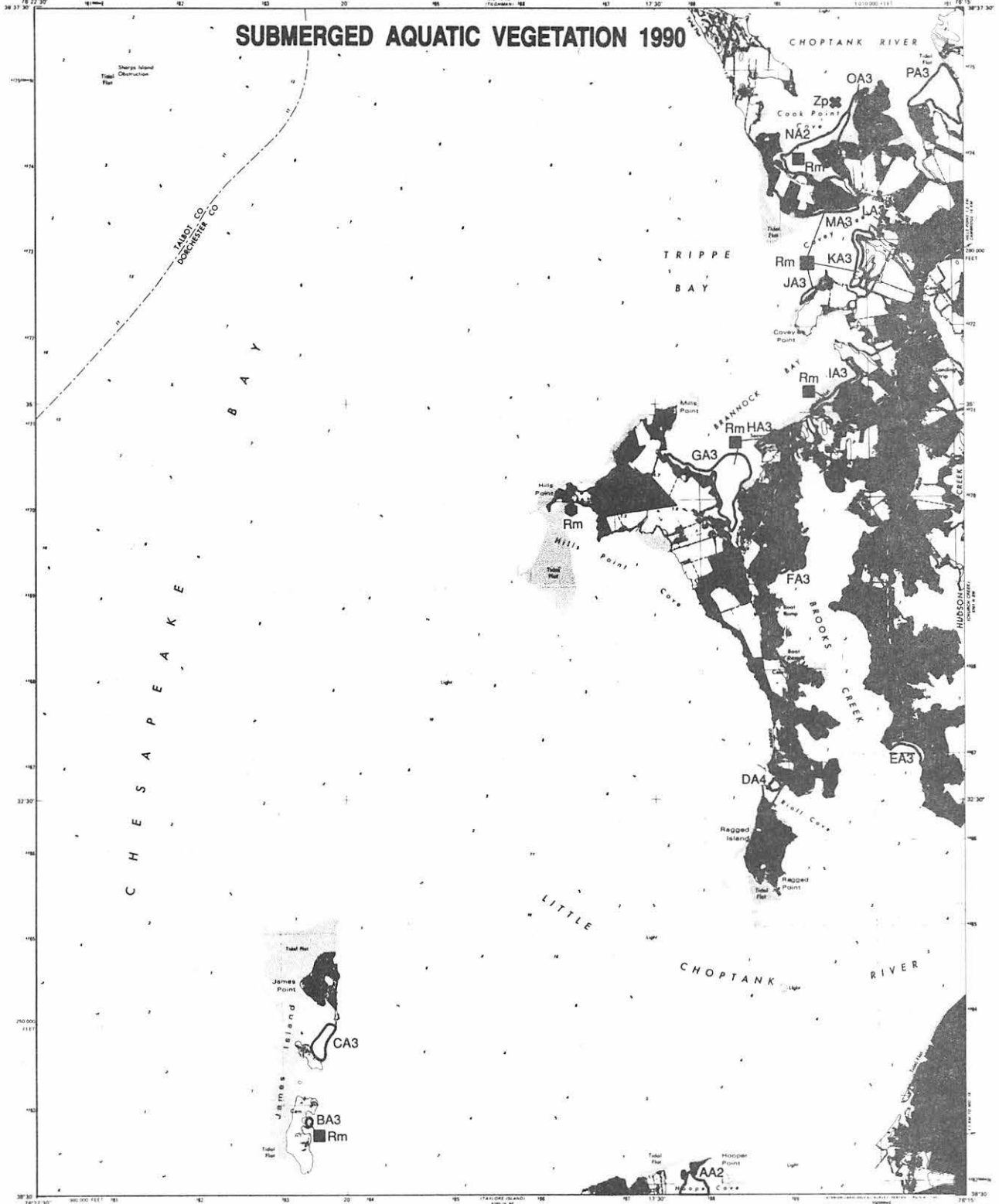
SURVEY STATIONS	
▲	VIMS Field Survey
✳	Harford Community College
✳	University MD-HPLE
★	USF & WS Survey
●	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR

SCALE 1:24,000

1 0 1 MILE
1 0 1 KILOMETER

DATE FLOWN
8-1-90
**BENEDICT,
MD
049**

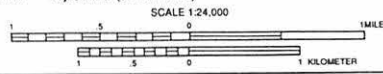
SUBMERGED AQUATIC VEGETATION 1990



SPECIES	
Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum 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</i> spp. (naiad)
Ec	<i>Elodea canadensis</i> (common elodea)
Va	<i>Vallisneria americana</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)
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)
Nrm	<i>Najas minor</i> (slender naiad)

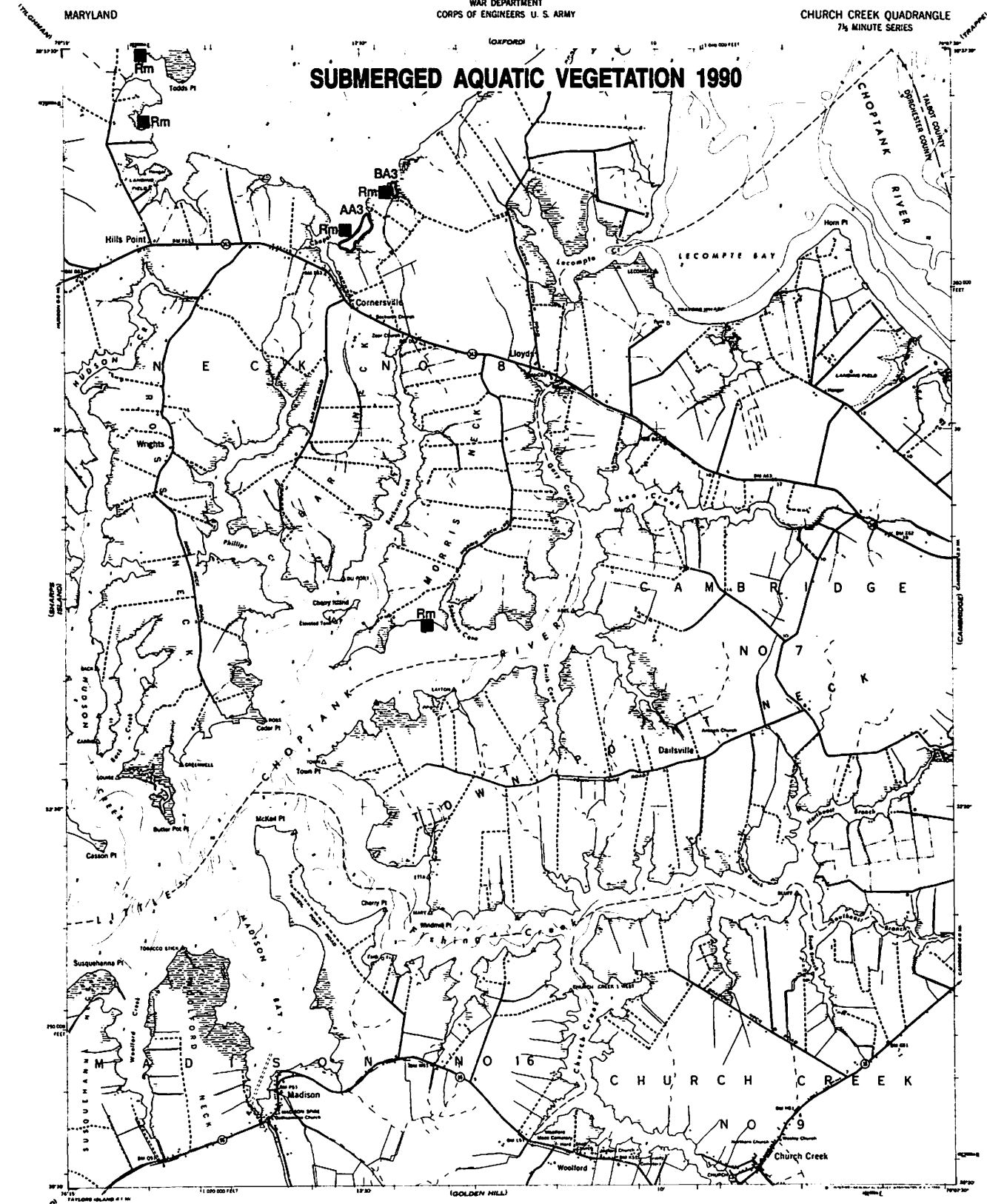
SURVEY STATIONS	
▲	VIMS Field Survey
✱	Harford Community College
★	University MD-HPCL
☆	USF & WS Survey
⬢	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR



DATE FLOWN
9-1-90
HUDSON,
MD
051

VIRGINIA INSTITUTE
OF MARINE SCIENCE

SUBMERGED AQUATIC VEGETATION 1990

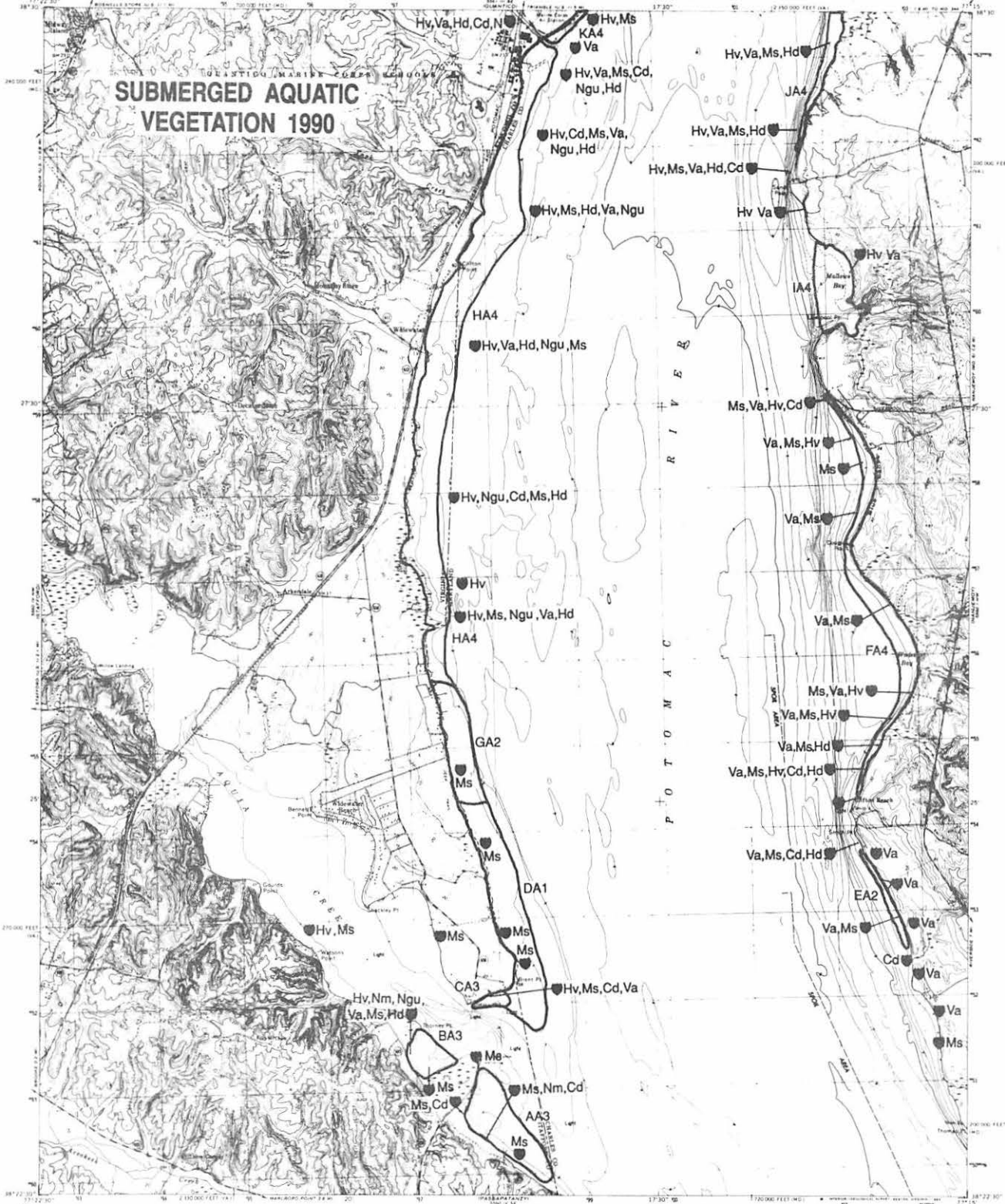


SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✱	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✱	University MD-HPCL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	●	Council of Governments
Zp	<i>Zannichellia palustris</i> (horned pondweed)	■	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (naked)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Vallisneria spiralis</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Po	<i>Potamogeton ephedrus</i> (leafy pondweed)		
U	Unknown species composition		
Hv	<i>Hydrilla verticillata</i> (hydrilla)		
Hd	<i>Heteranthera dubia</i> (water stargrass)		
Pcr	<i>Potamogeton crispus</i> (cutly pondweed)		
Cd	<i>Ceratophyllum demersum</i> (coontail)		
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)		
Ngu	<i>Najas guadalupensis</i> (southern naked)		
Ngr	<i>Najas gracillima</i> (naked)		
C	<i>Chara</i> sp. (muskgrass)		
Nm	<i>Najas minor</i> (slender naked)		

SCALE 1:24,000
1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
9-1-90
**CHURCH CREEK,
MD
052**



**SUBMERGED AQUATIC
VEGETATION 1990**

P O T O M A C
R I V E R

SPECIES

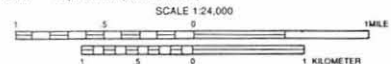
Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas</i>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

- ▲ VIMS Field Survey
- ✱ Harford Community College
- University MD-HPEL
- ★ USF & WS Survey
- ♥ Council of Governments
- MD Charter Boat Field Survey
- Citizens Field Observation
- MD-DNR

VIRGINIA INSTITUTE OF MARINE SCIENCE



DATE FLOWN
8-31-90
**WIDEWATER,
VA-MD
055**

SUBMERGED AQUATIC VEGETATION 1990



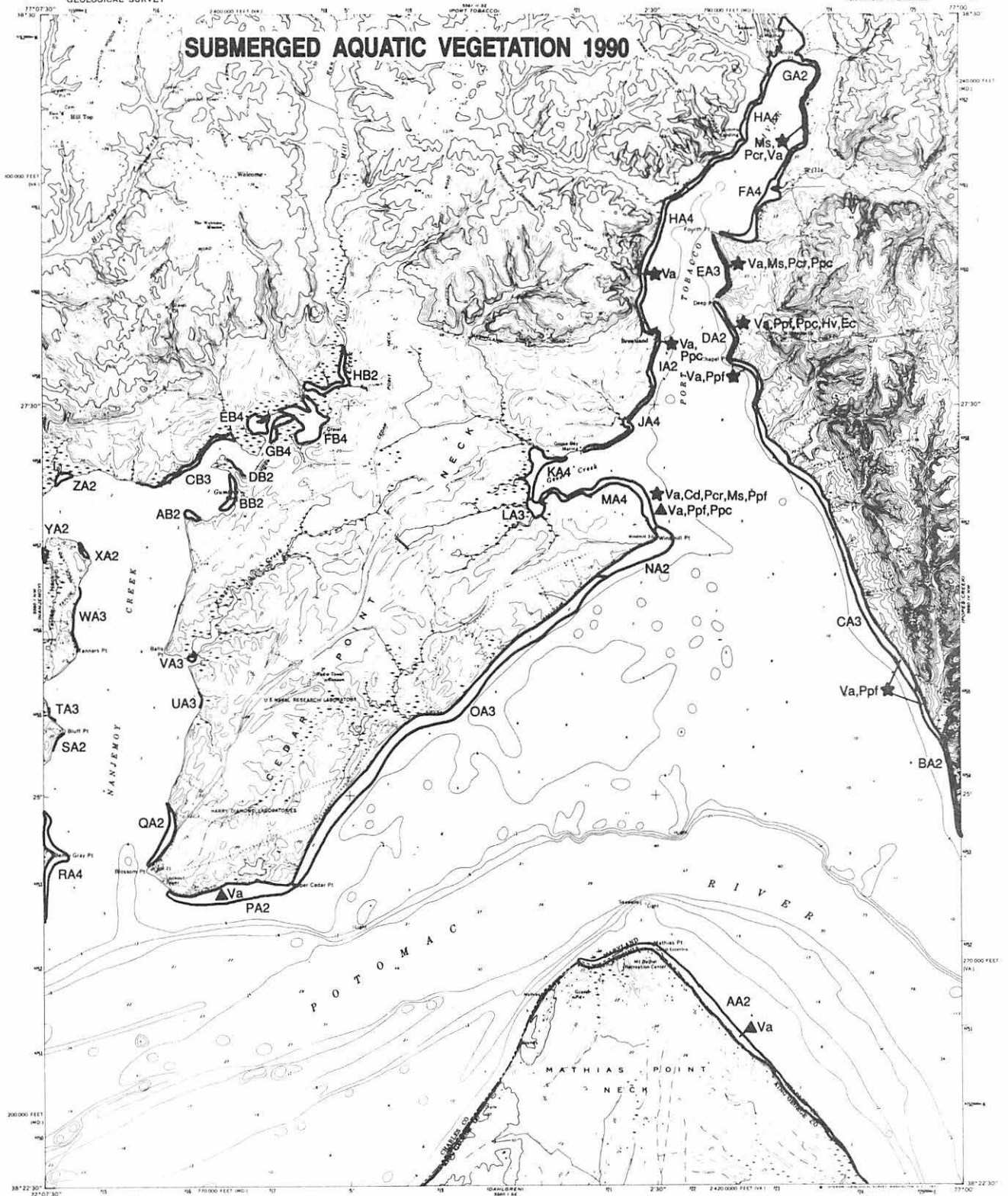
SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✱	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✱	University MD-HPEL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	♣	Council of Governments
Zp	<i>Zannichellia palustris</i> (horned pondweed)	■	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (naiad)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Vallisneria americana</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
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)		

DATE FLOWN
8-31-90
NANJEMOY,
MD
056



VIRGINIA INSTITUTE
OF MARINE SCIENCE

SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✳	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	□	University MD-HPEL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	●	Council of Governments
Zp	<i>Zannichellia palustris</i> (horned pondweed)	■	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (naked)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Vallisneria spiralis</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
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)		

SCALE 1:24,000

1 MILE / 1 KILOMETER

DATES FLOWN
Flight Lines 118, 119, 120 8-31-90
Flight Lines 76, 133 9-11-90
MATHIAS POINT,
MD-VA
057

VIRGINIA INSTITUTE
OF MARINE SCIENCE

SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✱	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✱	University MD-HPCL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	●	Council of Governments
Zp	<i>Zannichellia palustris</i> (horned pondweed)	■	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (naiad)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Vallisneria spiralis</i> (wild celery)		
Tn	<i>Trapezium natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
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)		
Ng	<i>Najas guadalupensis</i> (southern naiad)		
Ngr	<i>Najas gracilima</i> (naiad)		
C	<i>Chara</i> sp. (muskgrass)		
Nm	<i>Najas minor</i> (slender naiad)		

SCALE 1:24,000

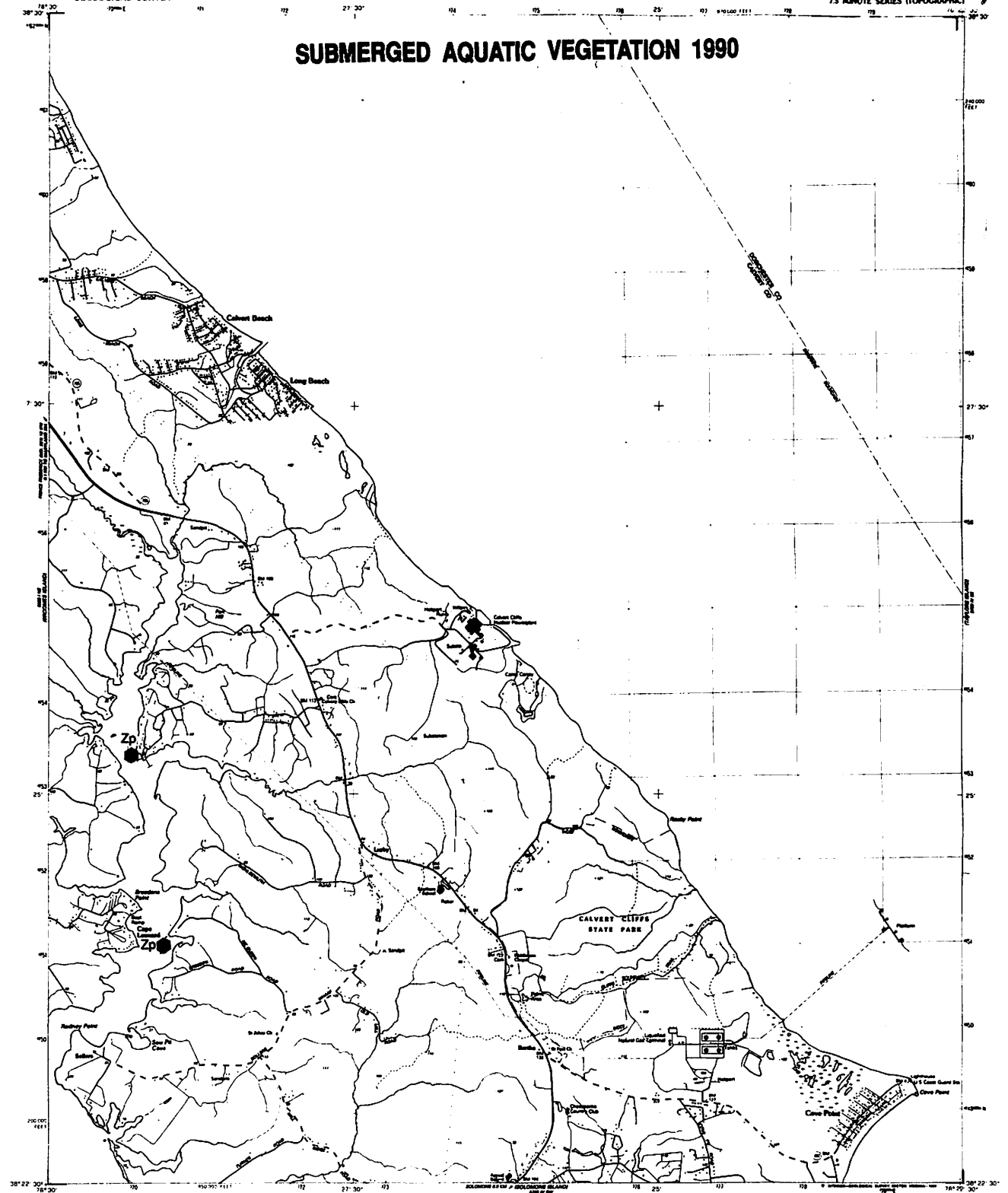
1 INCH = 2000 FEET

1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
9-11-90
POPES CREEK,
MD
058

SUBMERGED AQUATIC VEGETATION 1990



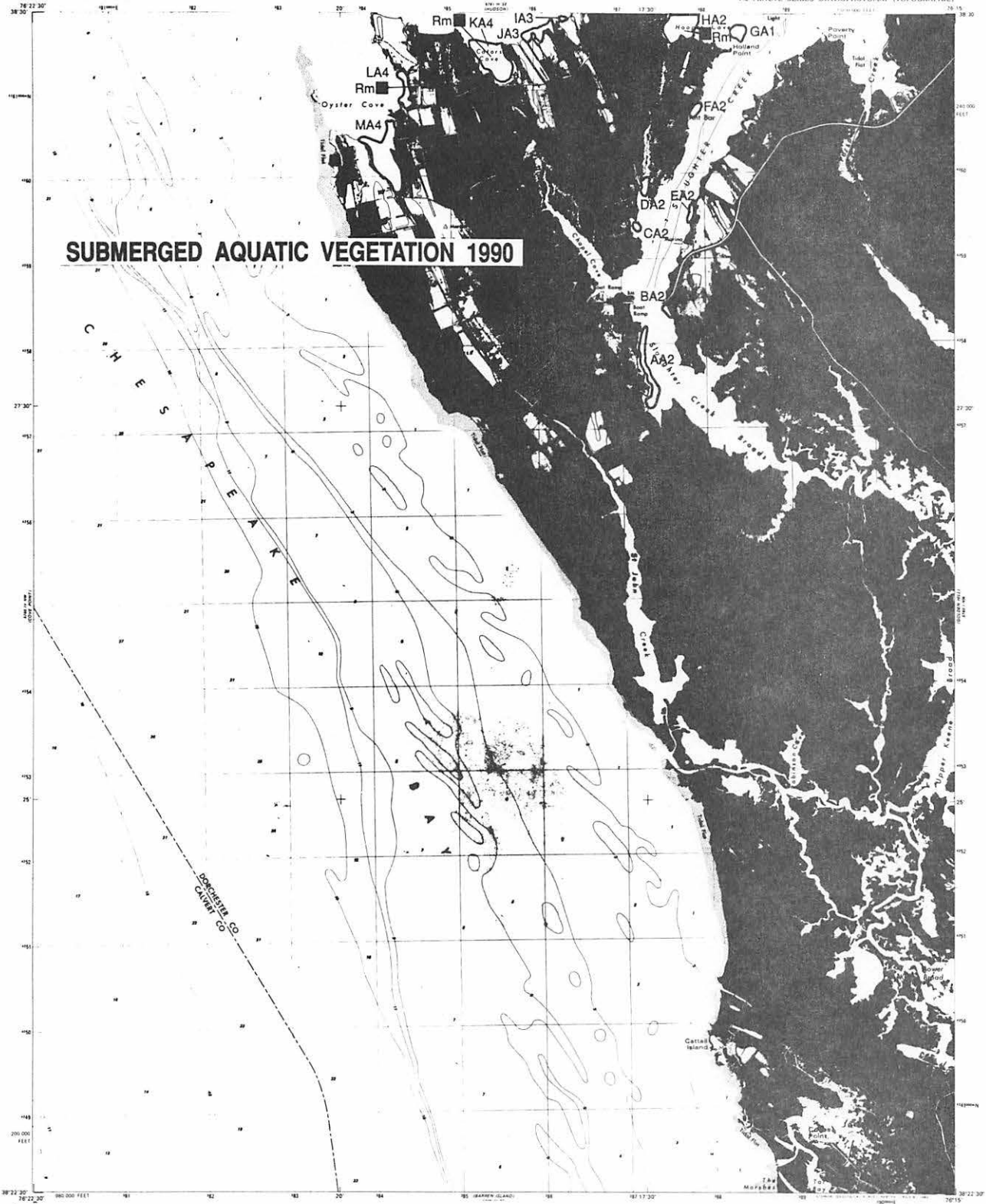
SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✳	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✳	University MD-HPCL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	●	Council of Governments
Zp	<i>Zannichellia peltata</i> (horned pondweed)	■	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (naiad)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Vallisneria spiralis</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
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)		

SCALE 1:24,000

1 MILE / 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
8-1-90
COVE POINT,
MD
061

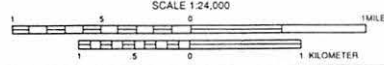


SUBMERGED AQUATIC VEGETATION 1990

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

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

- SURVEY STATIONS**
- ▲ VIMS Field Survey
 - * Harford Community College
 - ✖ University MD-HPEL
 - ★ USF & WS Survey
 - Council of Governments
 - MD Charter Boat Field Survey
 - Citizens Field Observation
 - MD-DNR



DATE FLOWN
6-5-90
TAYLORS
ISLAND, MD
062

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>Elodea canadensis</i> (common elodea)
Va	<i>Vallisneria spiralis</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)
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)

SCALE 1:24,000

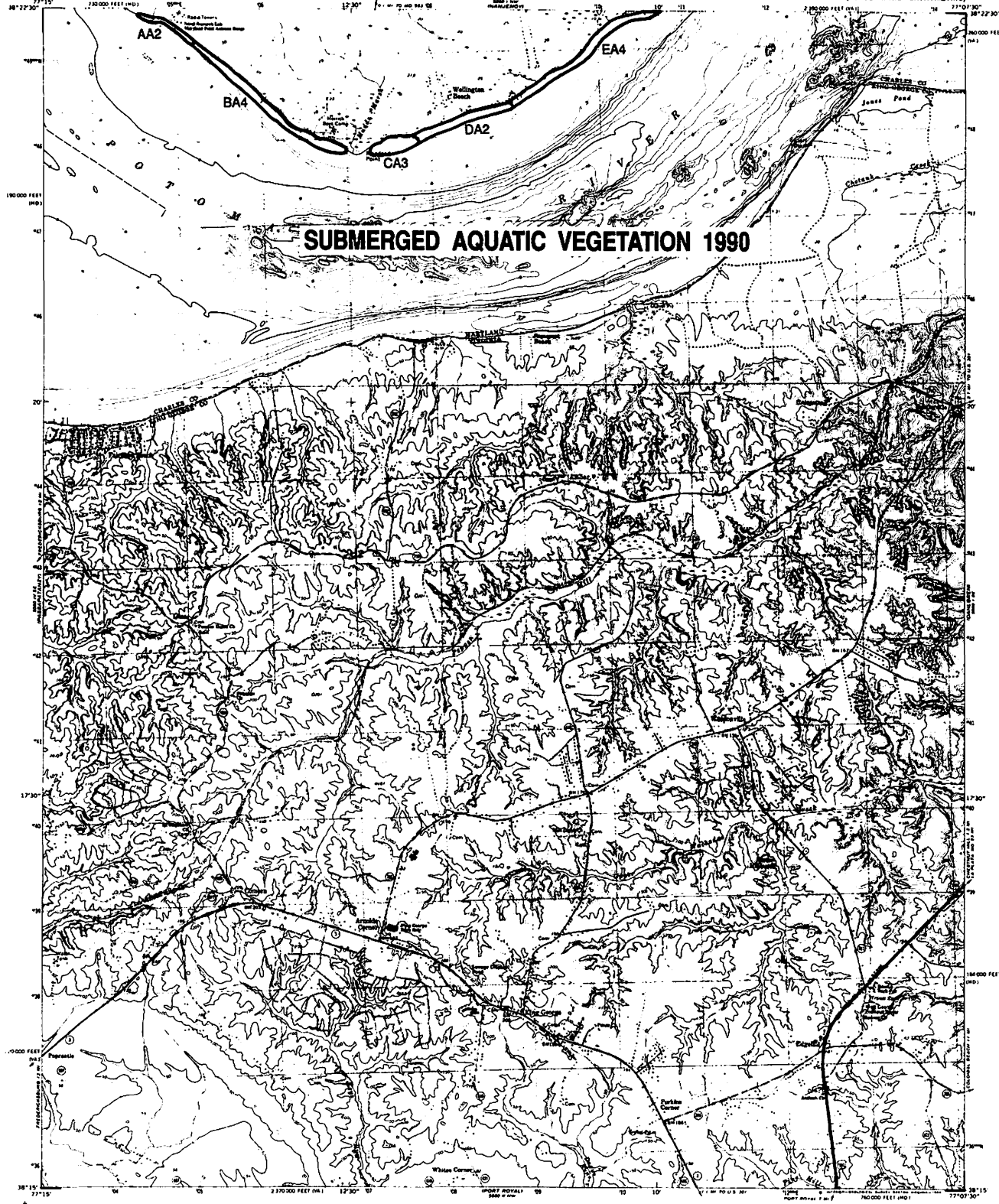
1 5 0 1 MILE
1 5 0 1 KILOMETER

SURVEY STATIONS

▲	VIMS Field Survey
✱	Harford Community College
✱	University MD-HPCL
★	USF & WS Survey
⬢	Council of Governments
⬢	MD Charter Boat Field Survey
⬢	Citizens Field Observation
●	MD-DNR

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-5-90
**GOLDEN HILL,
MD
063**



SUBMERGED AQUATIC VEGETATION 1990

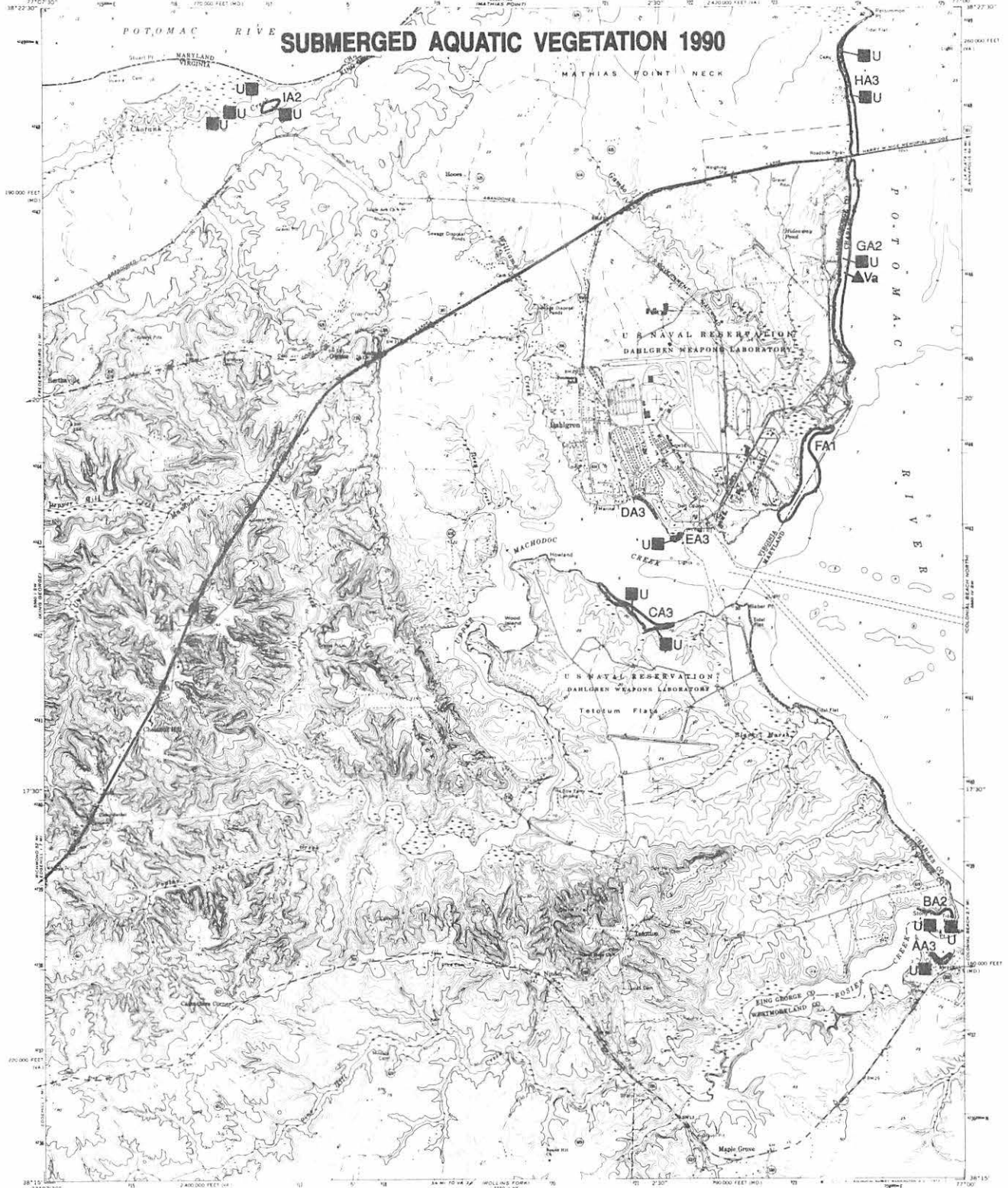
SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✱	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✱	University MD-HPEL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	●	Council of Governments
Zp	<i>Zannichellia palustris</i> (horned pondweed)	●	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (naiad)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Vallisneria spiralis</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
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</i> sp. (muskgrass)		
Nm	<i>Najas minor</i> (slender naiad)		

SCALE 1:24,000

1 MILE
1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
8-31-90
**KING GEORGE,
VA-MD**
065



SUBMERGED AQUATIC VEGETATION 1990

SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✳	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✳	University MD-HPEL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	●	Council of Governments
Zp	<i>Zannichellia palustris</i> (horned pondweed)	■	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (naiad)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Vallisneria spiralis</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
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)		
Ngv	<i>Najas guadalupensis</i> (southern naiad)		
Ngr	<i>Najas gracillima</i> (naiad)		
C	<i>Chera</i> sp. (muskgrass)		
Nm	<i>Najas minor</i> (slender naiad)		

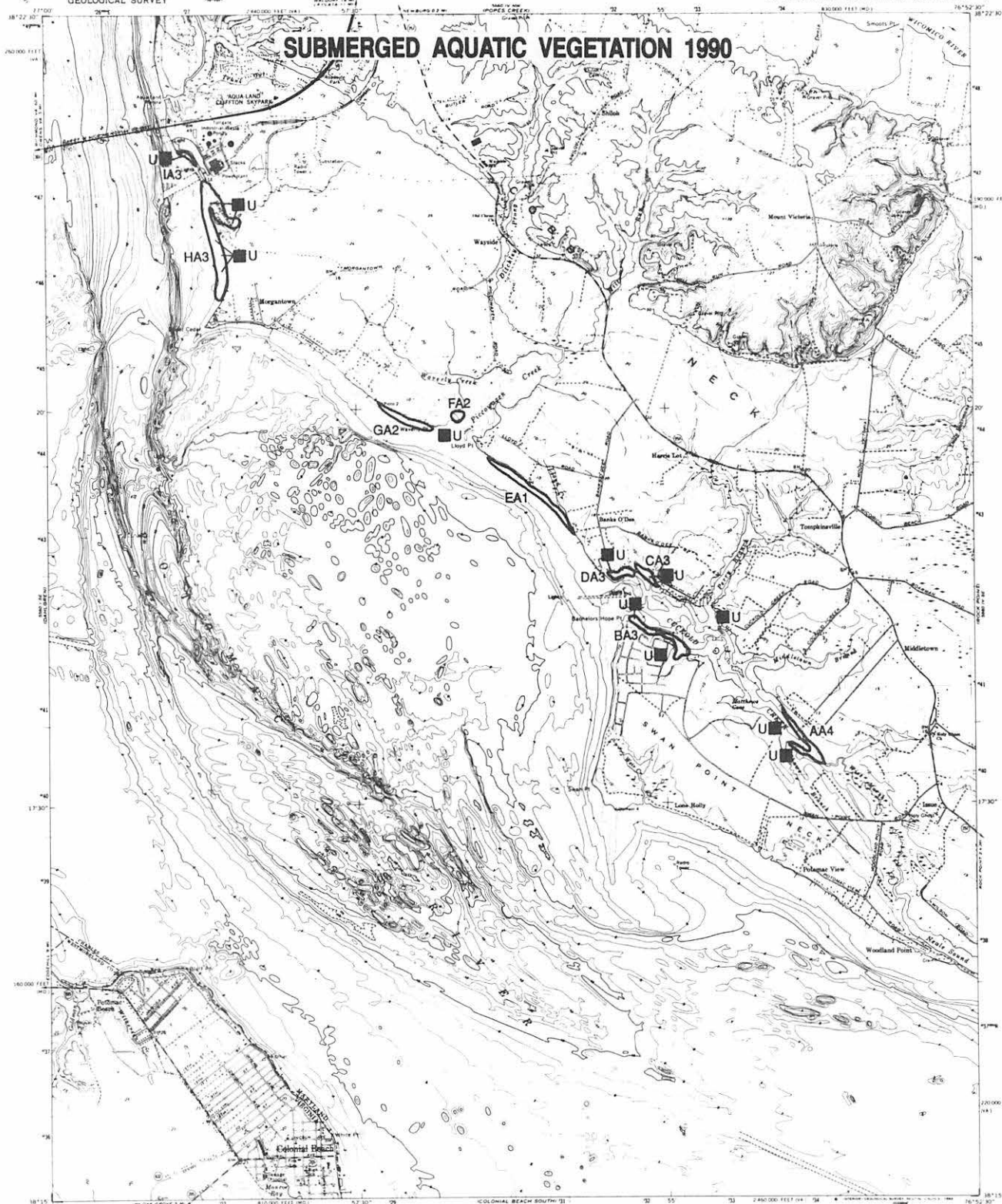
SCALE 1:24,000

1 MILE / 1 KILOMETER

DATE FLOWN
9-11-90
DAHLGREN
VA-MD
066



SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
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 pectinatus</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. (muskgrass)
Va	<i>Vallisneria spiralis</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
U	Unknown species composition		

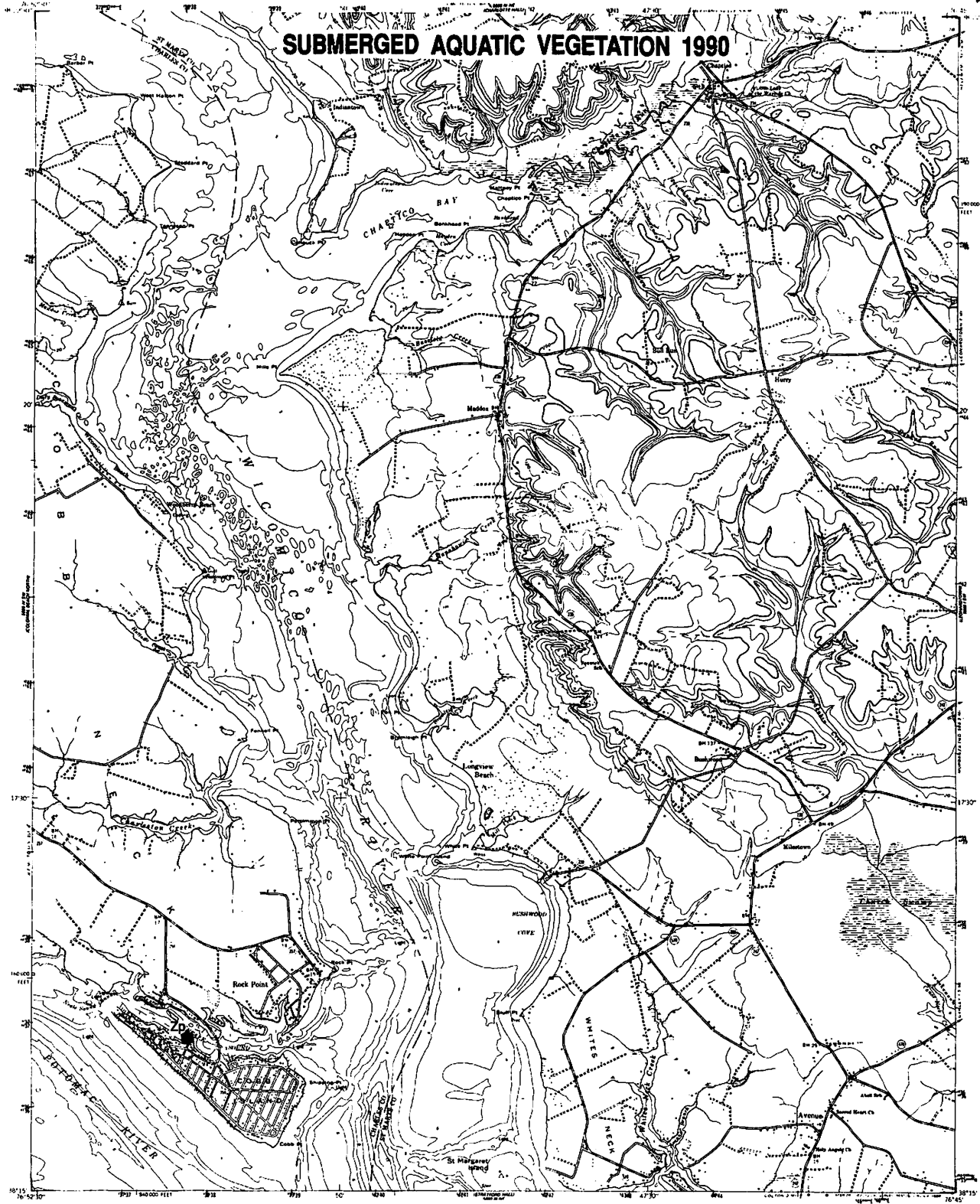
SURVEY STATIONS	
▲	VIMS Field Survey
✱	Harford Community College
✱	University MD-HPCL
★	USF & WS Survey
●	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR

SCALE 1:24,000

1 MILE / 1 KILOMETER

DATE FLOWN
8-1-90
**COLONIAL BEACH
NORTH, VA-MD**
067

SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✱	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✱	University MD-HPEL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	■	Council of Governments
Zp	<i>Zannichellia palustris</i> (horned pondweed)	■	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (naiad)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Vallisneria spiralis</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
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</i> sp. (muskgrass)		
Nm	<i>Najas minor</i> (slender naiad)		

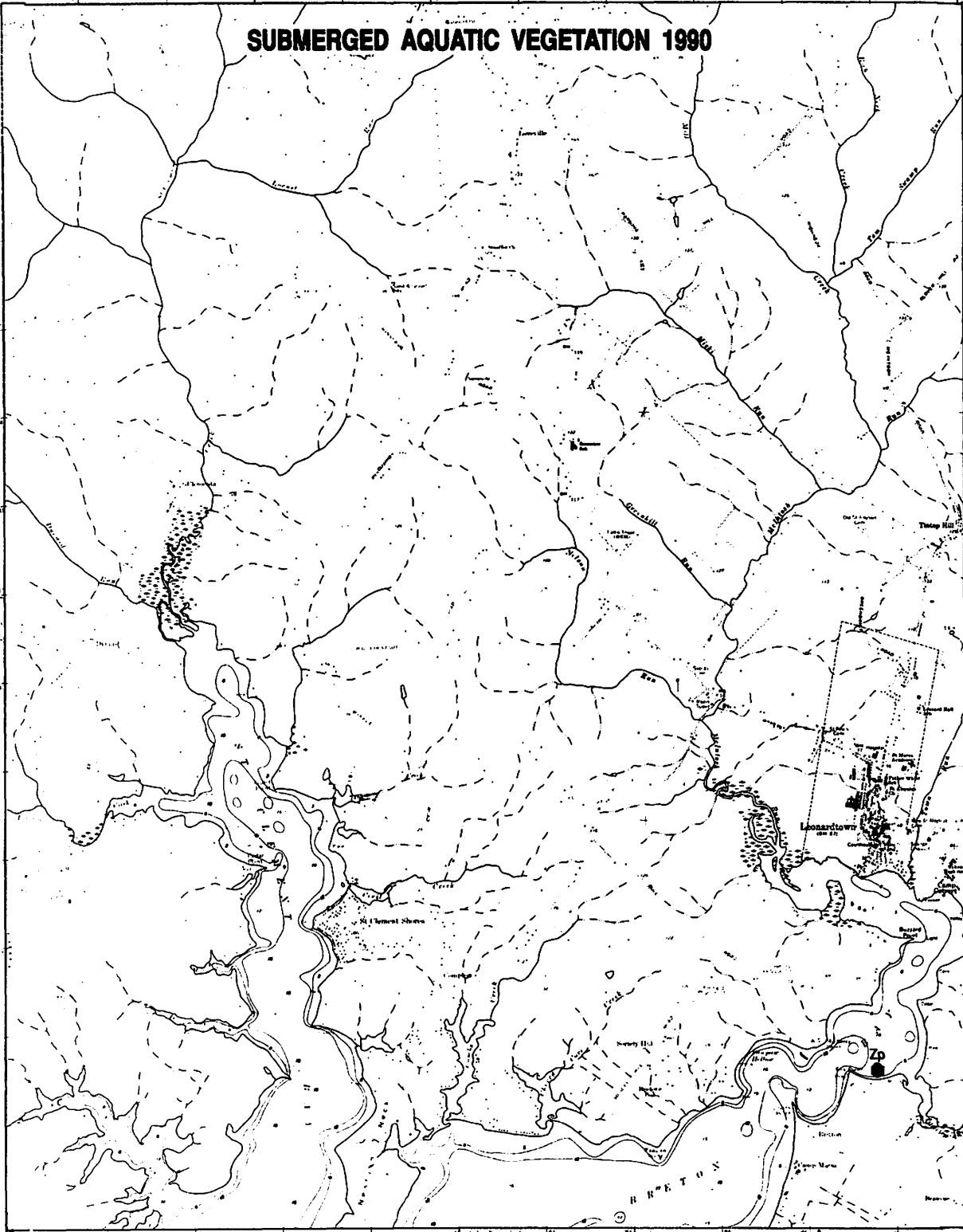
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1 MILE / 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
8-1-90
**ROCK POINT,
MD
068**

SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
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)	Ngv	<i>Najas guadalupensis</i> (southern netad)
N	<i>Najas</i> spp. (netad)	Ngr	<i>Najas gracillima</i> (netad)
Ec	<i>Elodea canadensis</i> (common elodea)	C	<i>Chara</i> sp. (muskgrass)
Va	<i>Vallisneria spiralis</i> (wild celery)	Nm	<i>Najas minor</i> (slender netad)
Tn	<i>Trapezium</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
U	Unknown species composition		

▲	VIMS Field Survey
✱	Harford Community College
■	University MD-HPEL
★	USF & WS Survey
●	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR

SCALE 1:24,000

1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
8-1-90

LEONARDTOWN,
MD
069



SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✱	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✱	University MD-HPEL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	★	USF & WS Survey
Pzp	<i>Potamogeton pectinatus</i> (sago pondweed)	●	Council of Governments
Zp	<i>Zannichellia palustris</i> (horned pondweed)	■	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (naiad)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Vallisneria spiralis</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
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)		

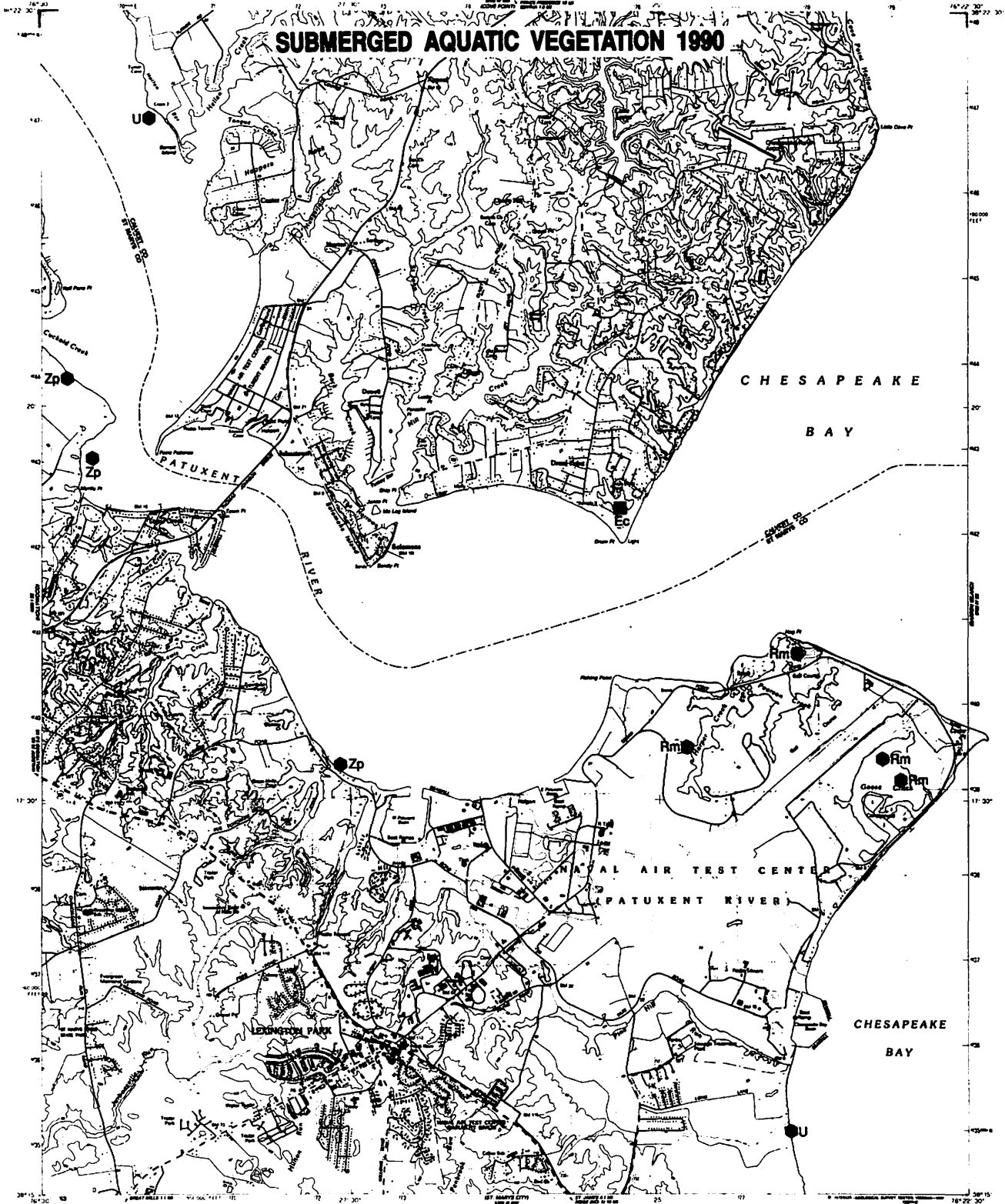
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1 MILE / 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
9-11-90
HOLLYWOOD,
MD
070

SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
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> (redweed-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)	Ngv	<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. (muskgrass)
Va	<i>Vallisneria spiralis</i> (wild celery)	Ntm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
U	Unknown species composition		

▲	VIMS Field Survey
✱	Harford Community College
✱	University MD-HPCL
★	USF & WS Survey
●	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR

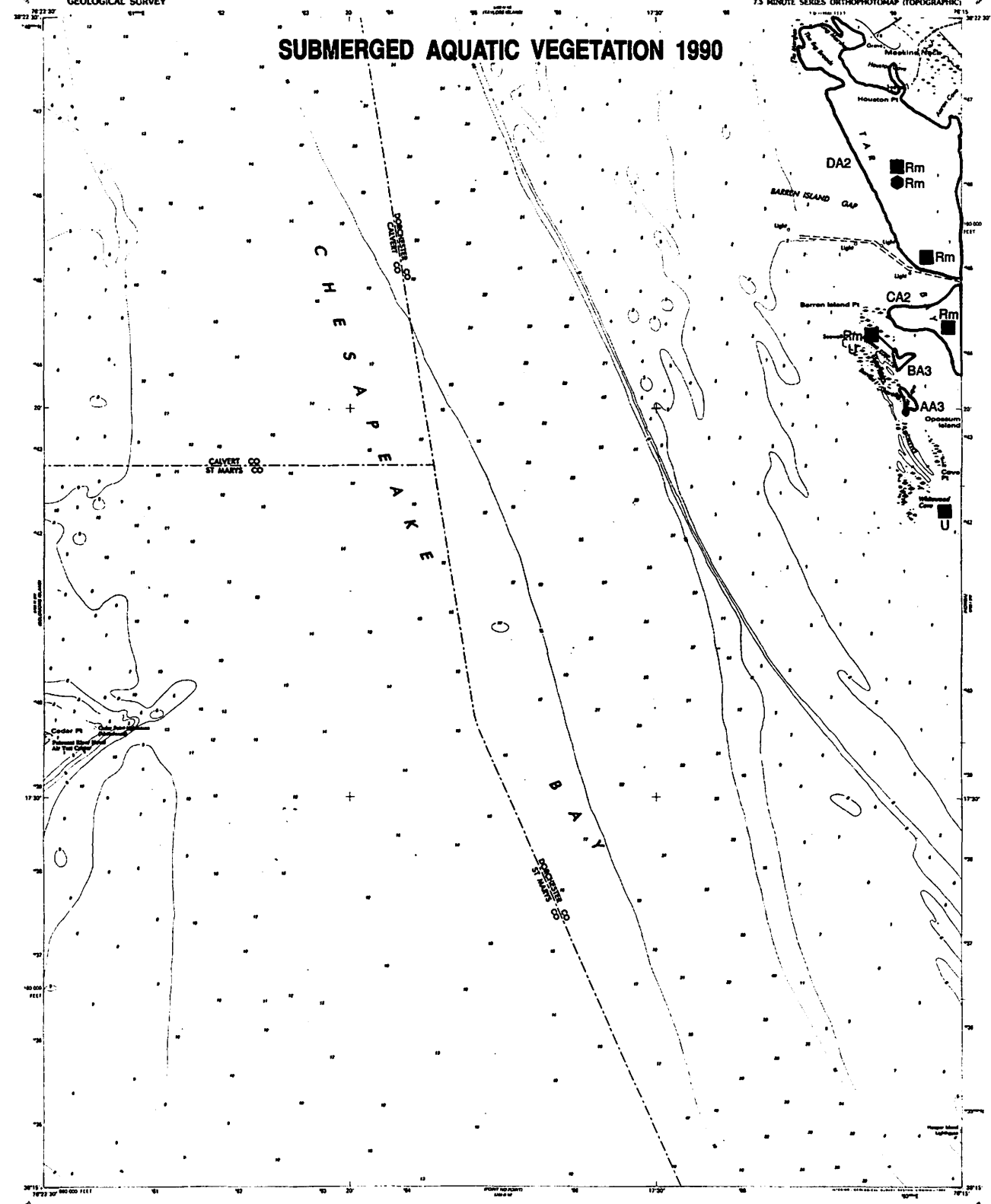
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1 MILE / 1 KILOMETER

DATES FLOWN
Flight Line 62 8-1-90
Flight Line 64 9-11-90
SOLOMONS ISLAND, MD 071

VIRGINIA INSTITUTE OF MARINE SCIENCE

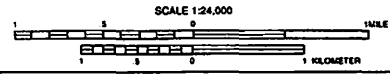
SUBMERGED AQUATIC VEGETATION 1990



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. (nailid)
Ec	<i>Elodea canadensis</i> (common elodea)
Va	<i>Vallisneria spiralis</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
Pe	<i>Potamogeton ephedrus</i> (leely pondweed)
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 nailid)
Ngr	<i>Najas gracillima</i> (nailid)
C	<i>Chara</i> sp. (muskgrass)
Nm	<i>Najas minor</i> (slender nailid)

SURVEY STATIONS	
▲	VIMS Field Survey
✱	Harford Community College
✱	University MD-HPCL
★	USF & WS Survey
●	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR

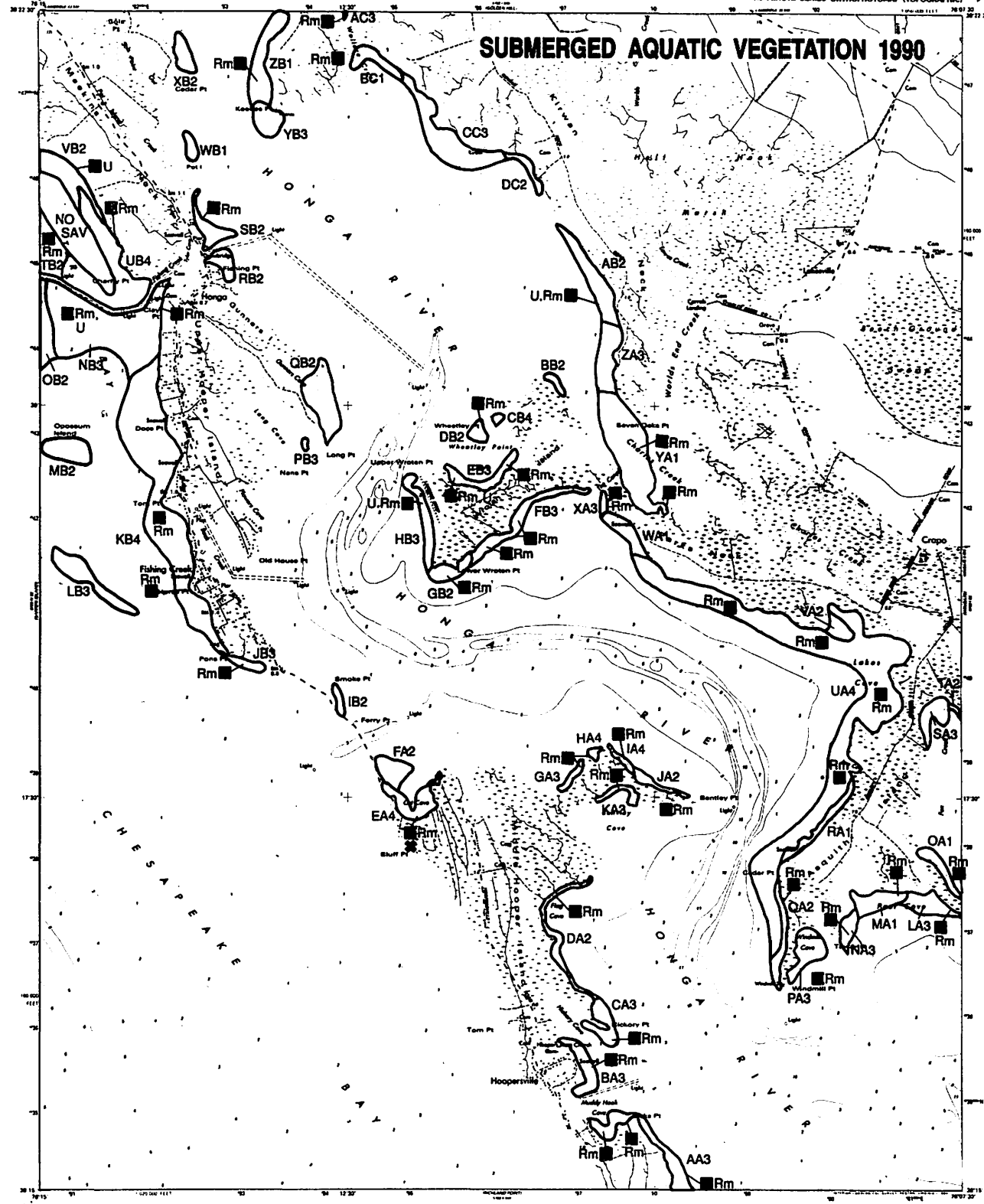


DATE FLOWN
6-5-90
BARREN ISLAND, MD
072

DATA FROM USGS SERIES 19820

VIRGINIA INSTITUTE
OF MARINE SCIENCE

SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✳	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✳	University MD-HPEL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	★	USF & WS Survey
Ppu	<i>Potamogeton pectinatus</i> (sago pondweed)	●	Council of Governments
Zp	<i>Zannichellia palustris</i> (horned pondweed)	■	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (natad)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Vallisneria spiralis</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
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 natad)		
Ngr	<i>Najas gracillima</i> (natad)		
C	<i>Chara</i> sp. (muskgrass)		
Nm	<i>Najas minor</i> (slender natad)		

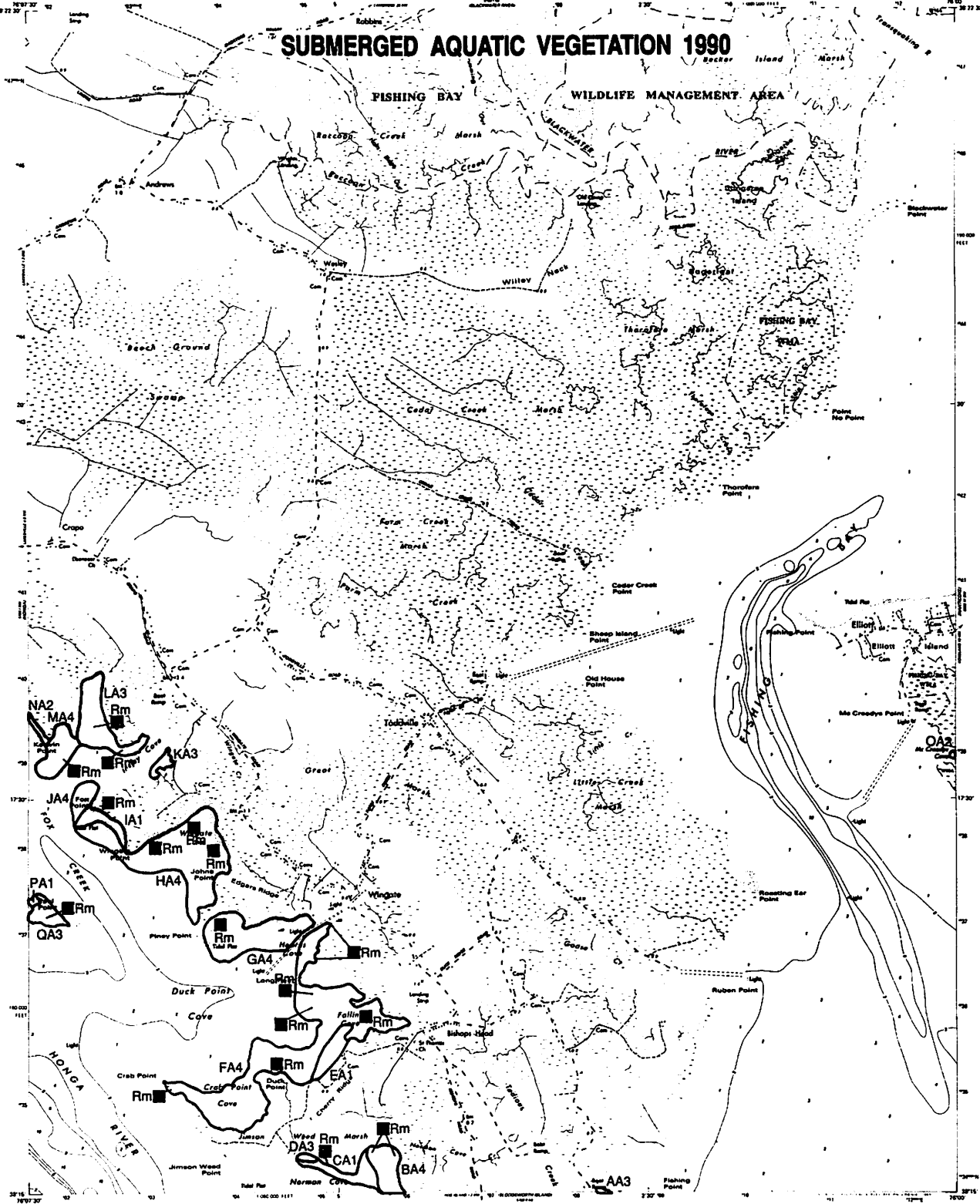
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1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-5-90
HONGA,
MD
073

SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✱	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (European watermilfoil)	✱	University MD-HPCL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	●	Council of Governments
Zp	<i>Zannichellia palustris</i> (horned pondweed)	■	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (nailad)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Vallisneria spiralis</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
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 nailad)		
Ngr	<i>Najas gracilima</i> (nailad)		
C	<i>Chara</i> sp. (muskgrass)		
Nm	<i>Najas minor</i> (slender nailad)		

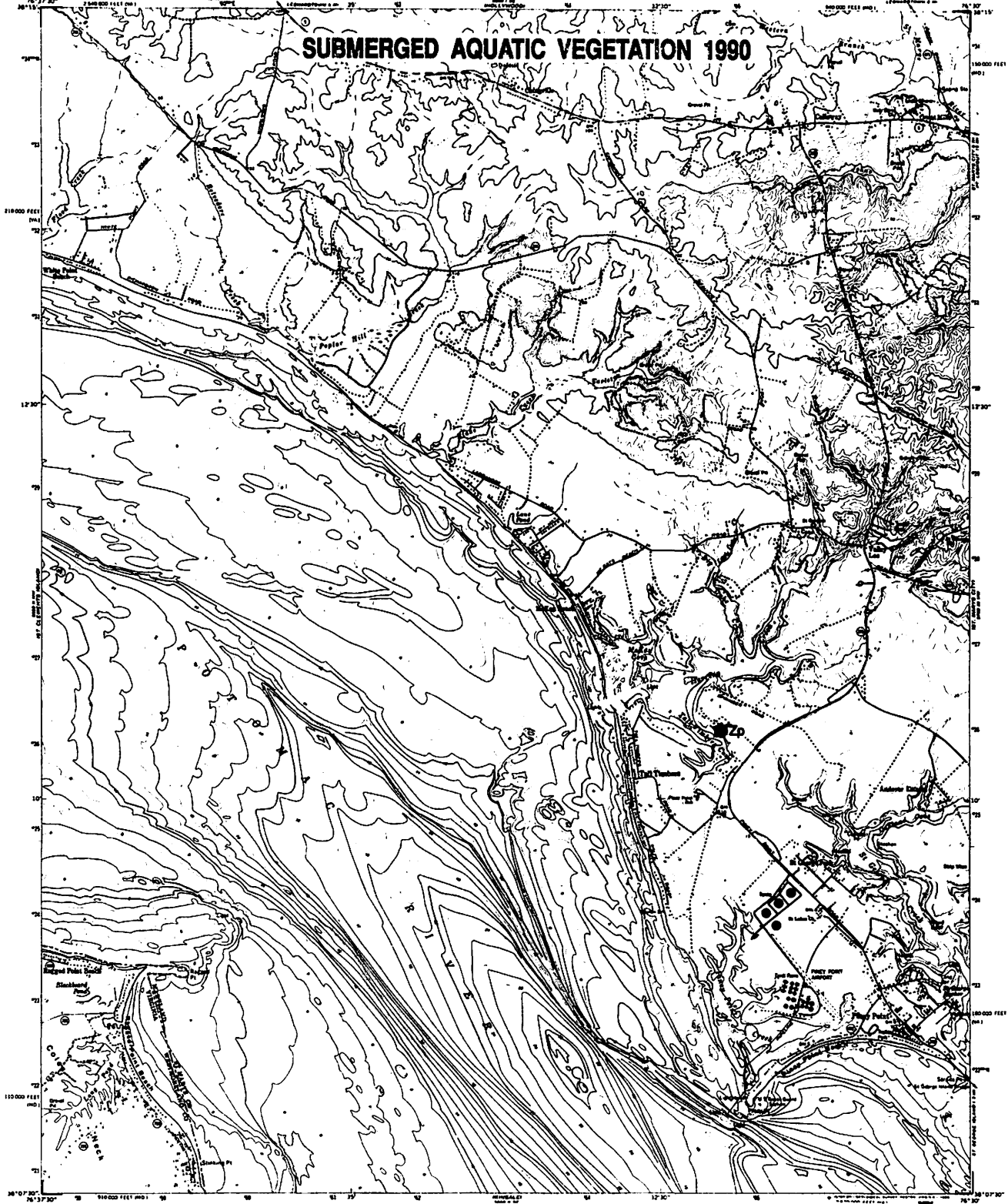
SCALE 1:24,000

1 INCH = 2000 FEET
1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-5-90
**WINGATE,
MD
074**

SUBMERGED AQUATIC VEGETATION 1990

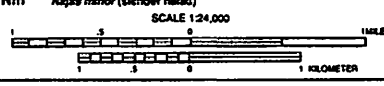


SPECIES

Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum 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</i> spp. (nailad)
Ec	<i>Elodea canadensis</i> (common elodea)
Va	<i>Vallisneria spiralis</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)
U	Unknown species composition

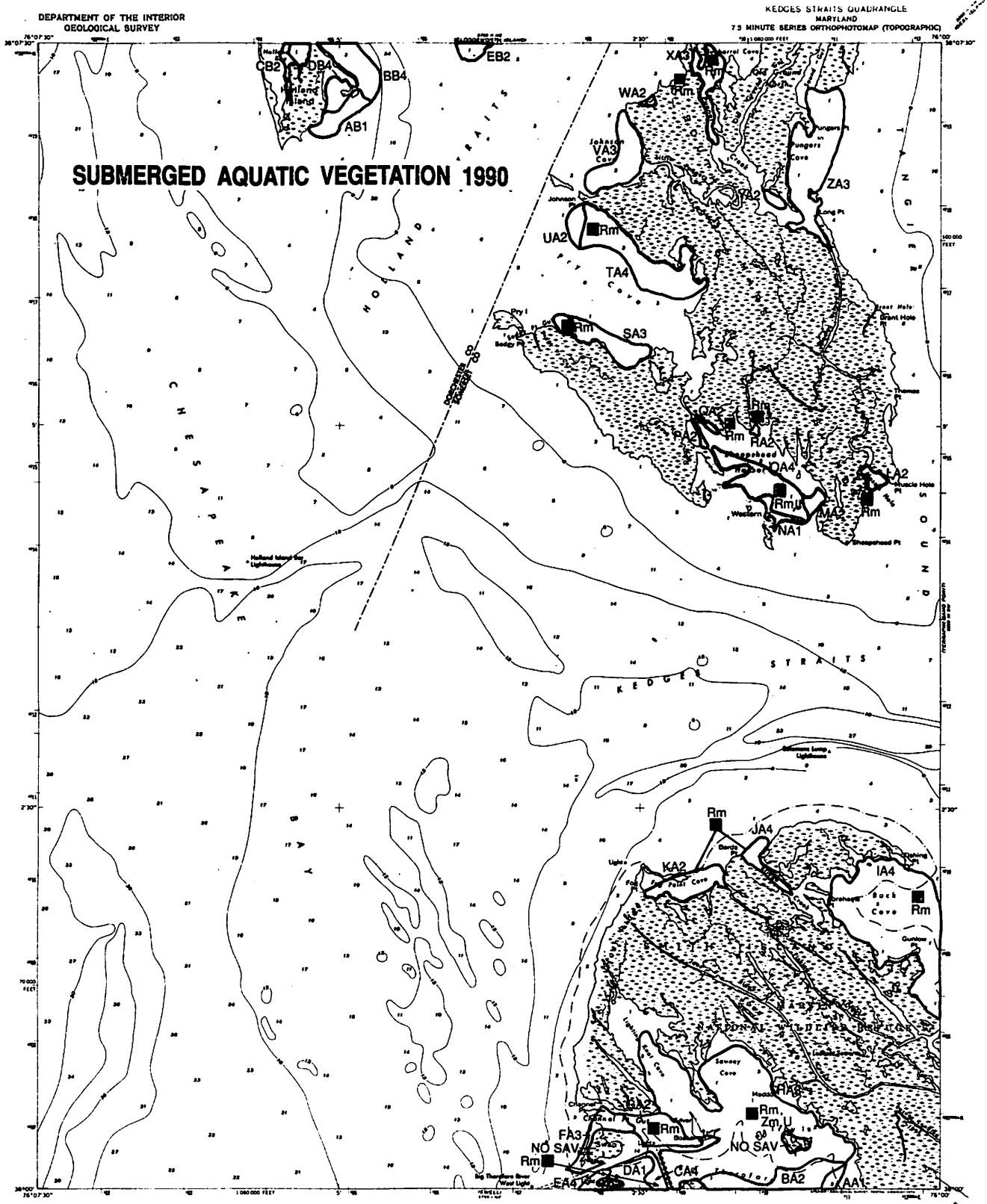
Hv	<i>Hydrilla verticillata</i> (hydrilla)
Hd	<i>Heteranthera dubia</i> (water stargrass)
Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Ceratophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guadalupensis</i> (southern nailad)
Ngr	<i>Najas gracilima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

- SURVEY STATIONS**
- ▲ VIMS Field Survey
 - ✱ Harford Community College
 - ✱ University MD-HPEL
 - ★ USF & WS Survey
 - Council of Governments
 - MD Charter Boat Field Survey
 - Citizens Field Observation
 - MD-DNR



DATE FLOWN
8-1-90
**PINEY POINT,
MD-VA
079**

VIRGINIA INSTITUTE
OF MARINE SCIENCE



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

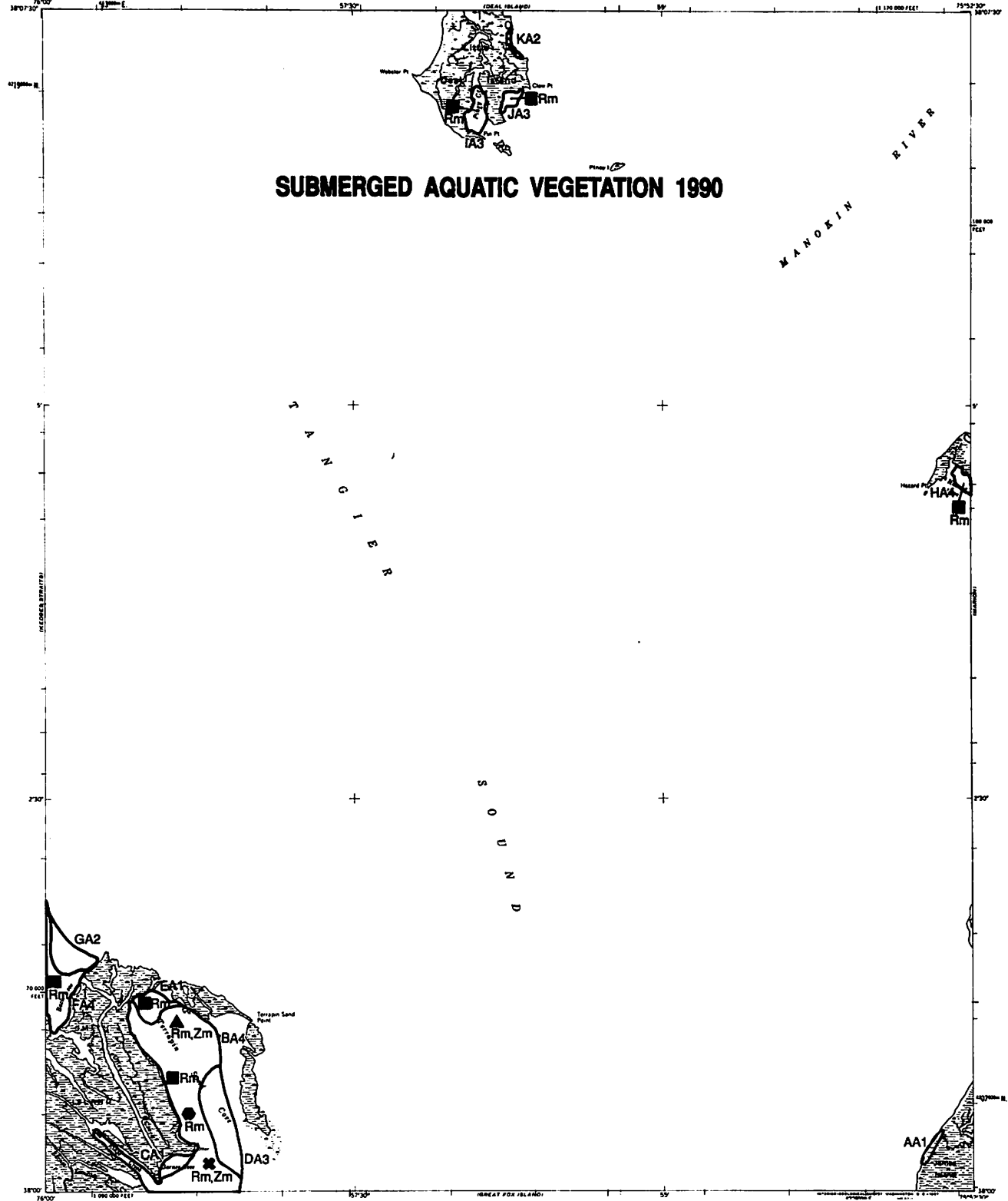
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1 5 0 5 10 METERS
1 5 0 5 10 KILOMETERS

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-5-90
KEDGES STRAITS, MD
091

SUBMERGED AQUATIC VEGETATION 1990

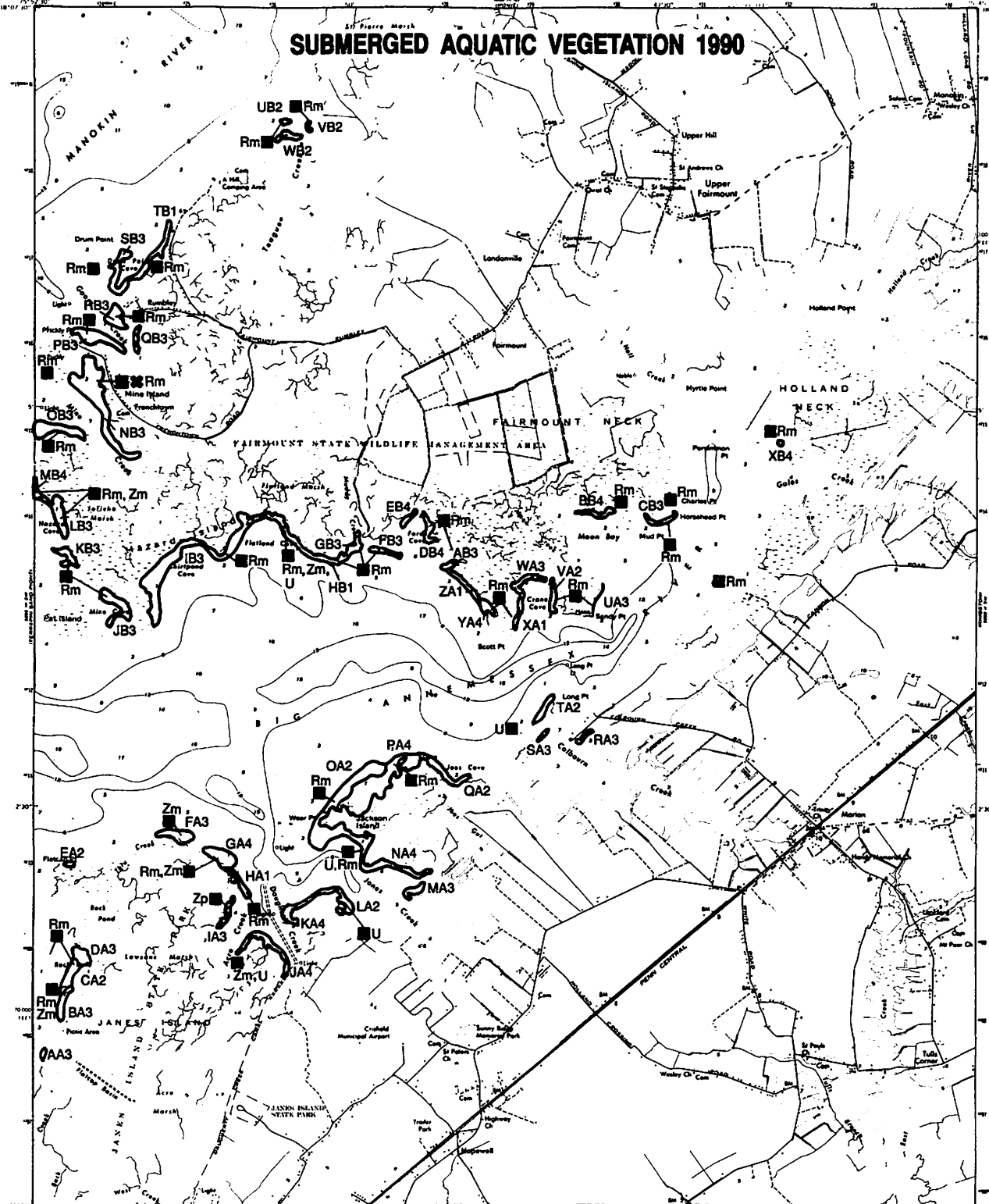


SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	Hv	<i>Hydrilla verticillata</i> (hydrilla)
Rm	<i>Ruppia maritima</i> (widgeon grass)	Hd	<i>Heteranthera dubia</i> (water stargrass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Ppf	<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)	Ngd	<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>Chera</i> sp. (muskgrass)
Va	<i>Vallisneria spiralis</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapezium natans</i> (water chestnut)		
Pe	<i>Potamogeton epiphyticus</i> (leaky pondweed)		
U	Unknown species composition		

DATES FLOWN
5-25-90 James & Smith Is.
6-5-90 Deal Is. & Hazard Pt.
**TERRAPIN SAND
POINT, MD
092**

VIRGINIA INSTITUTE
OF MARINE SCIENCE

SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
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</i> spp. (naiad)	Ngr	<i>Najas gracillima</i> (naiad)
Ec	<i>Elodea canadensis</i> (common elodea)	C	<i>Chara</i> sp. (muskgrass)
Va	<i>Vallisneria spiralis</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapezium natans</i> (water chestnut)		
Pt	<i>Potamogeton ephedrus</i> (leafy pondweed)		
U	Unknown species composition		

SURVEY STATIONS	
▲	VIMS Field Survey
✱	Hartford Community College
✱	University MD-HPEL
★	USF & WS Survey
●	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR

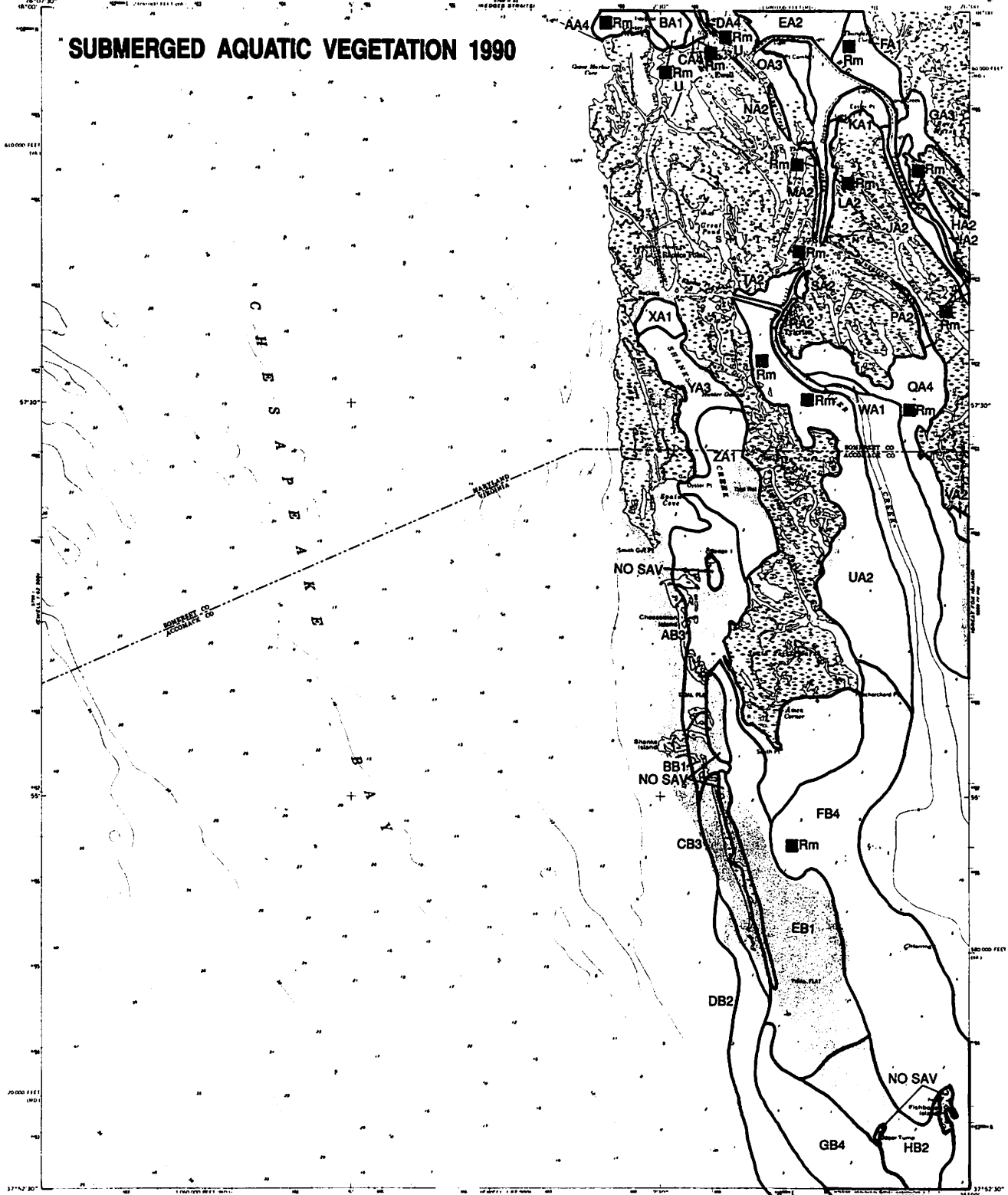
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1 0 1 MILE
1 0 1 KILOMETER

DATE FLOWN
6-5-90
**MARION,
MD
093**

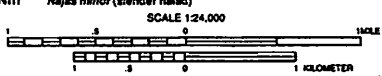
VIRGINIA INSTITUTE
OF MARINE SCIENCE

SUBMERGED AQUATIC VEGETATION 1990



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>Zannichella palustris</i> (horned pondweed)
N	<i>Najas</i> spp. (naiad)
Ec	<i>Elodea canadensis</i> (common elodea)
Va	<i>Vallisneria spiralis</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)
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> (coonstall)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngv	<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)

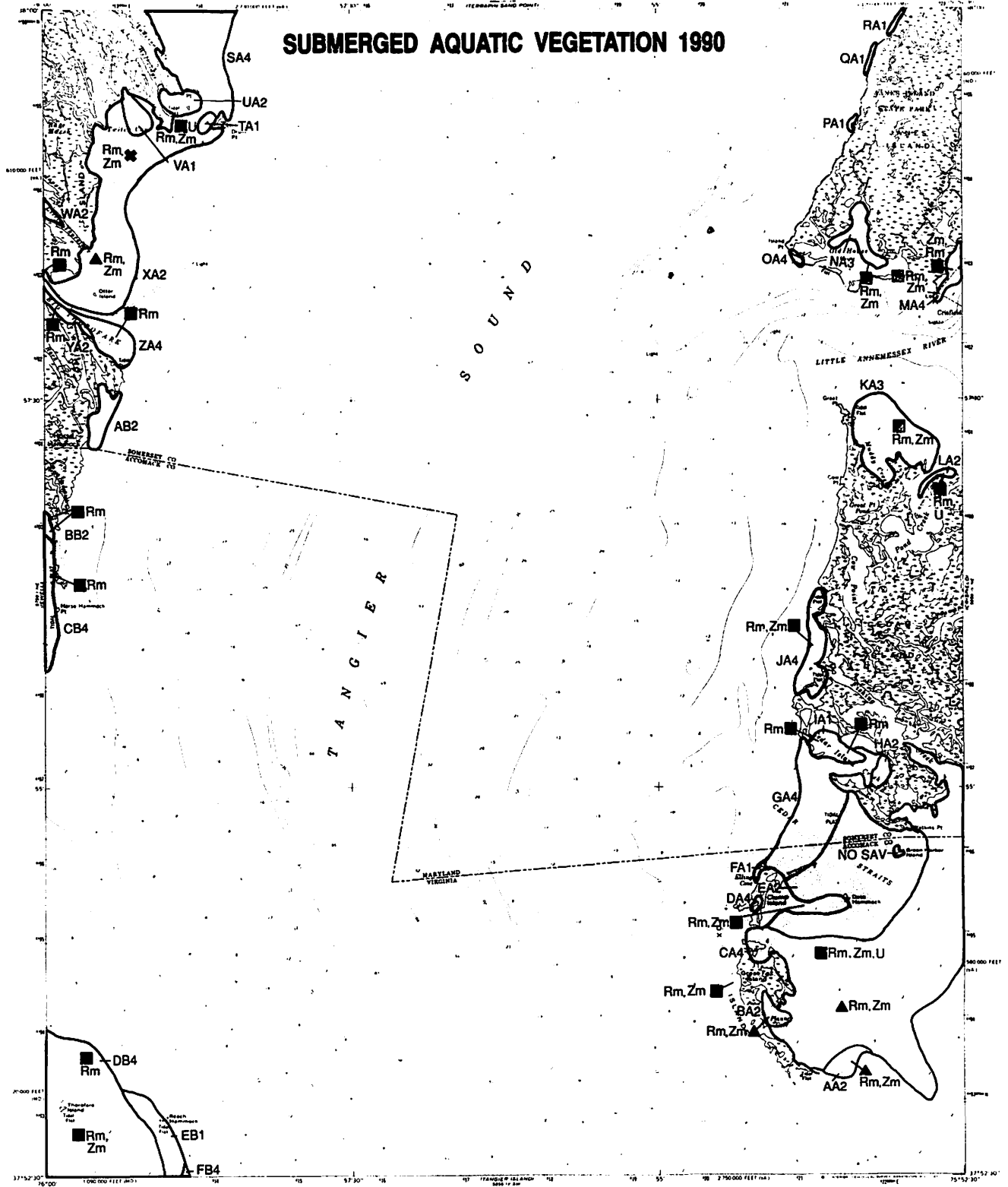


SURVEY STATIONS	
▲	VIMS Field Survey
✱	Harford Community College
✱	University MD-HPPEL
★	USF & WS Survey
●	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR

DATE FLOWN
6-5-90
**EWELL,
MD-VA
099**

VIRGINIA INSTITUTE
OF MARINE SCIENCE

SUBMERGED AQUATIC VEGETATION 1990



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

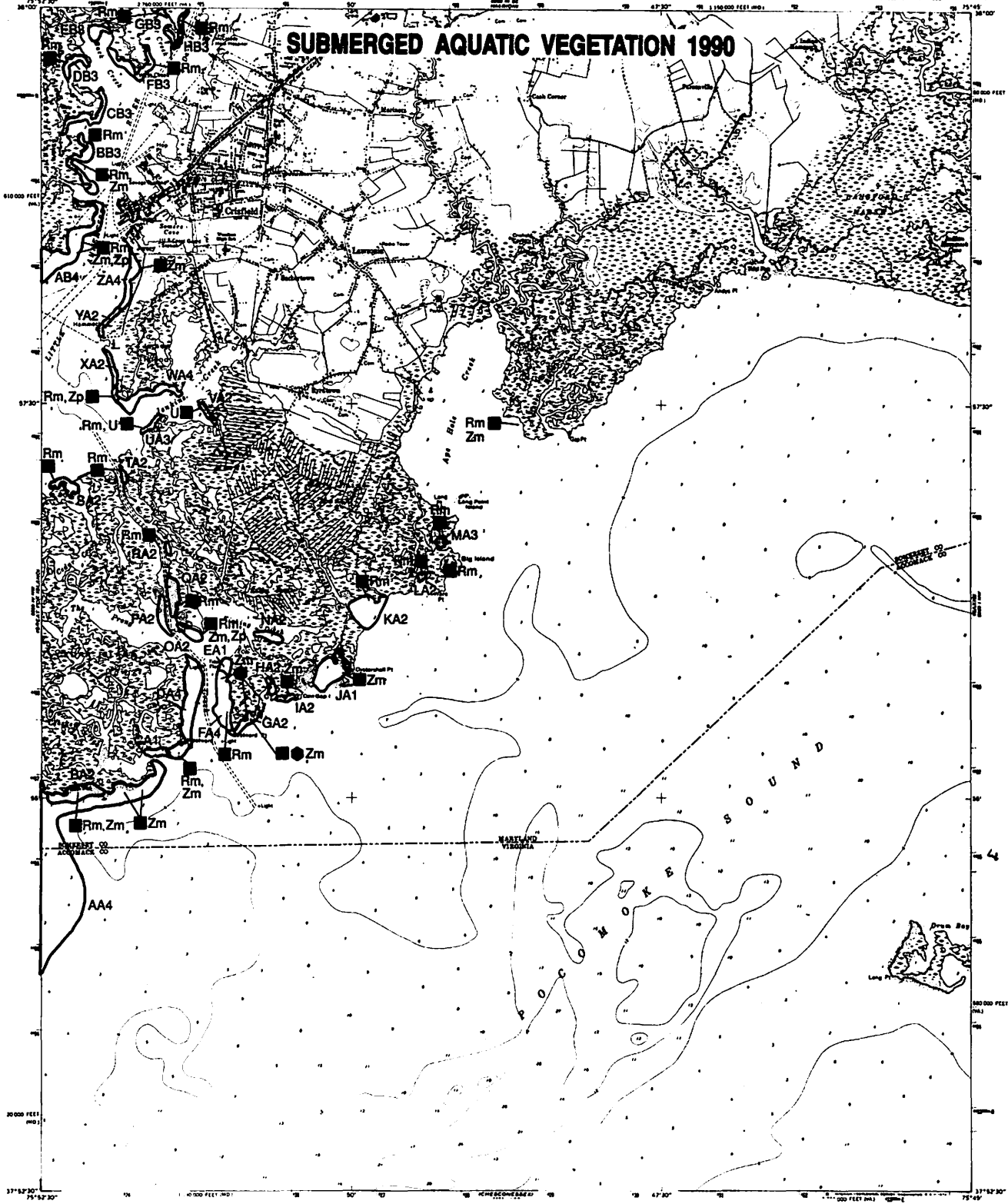
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1 5 0 5 1 MILE
1 5 0 5 1 KILOMETER

DATES FLOWN
6-5-90 Smith & Thoroare Is.
5-25-90 Cedar & James Is.
GREAT FOX ISLAND, MD-VA
100

VIRGINIA INSTITUTE OF MARINE SCIENCE

SUBMERGED AQUATIC VEGETATION 1990



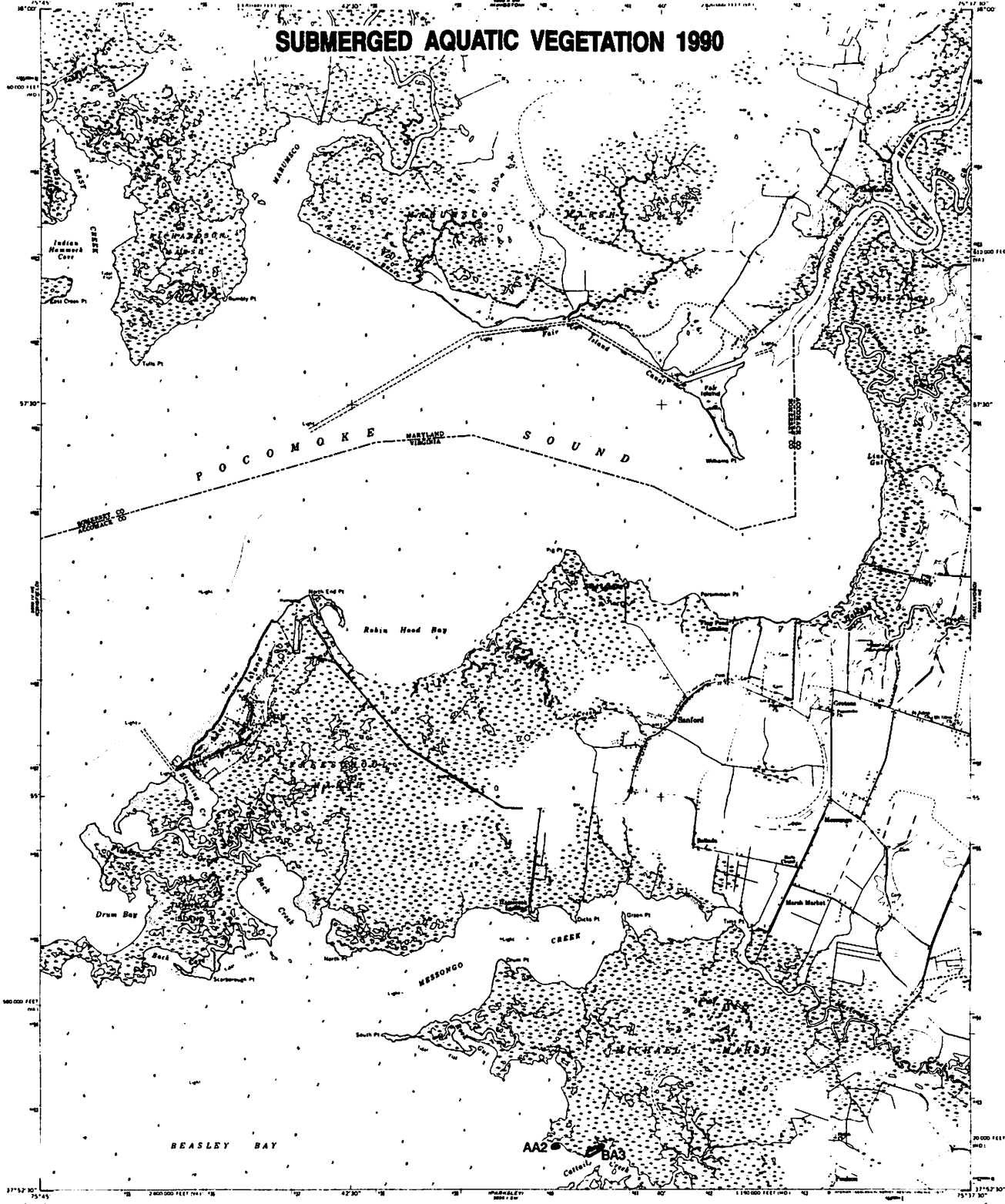
SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✳	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✳	University MD-HPPEL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	●	Council of Governments
Zp	<i>Zannichellia palustris</i> (horned pondweed)	■	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (naked)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Vallisneria spiralis</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leely pondweed)		
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>Nejia guadalupensis</i> (southern naiad)		
Ngr	<i>Nejia gracillima</i> (naiad)		
C	<i>Chara</i> sp. (muskgrass)		
Nm	<i>Nejia minor</i> (slender naiad)		

SCALE 1:24,000
1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
5-25-90
**CRISFIELD,
MD-VA
101**

SUBMERGED AQUATIC VEGETATION 1990



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

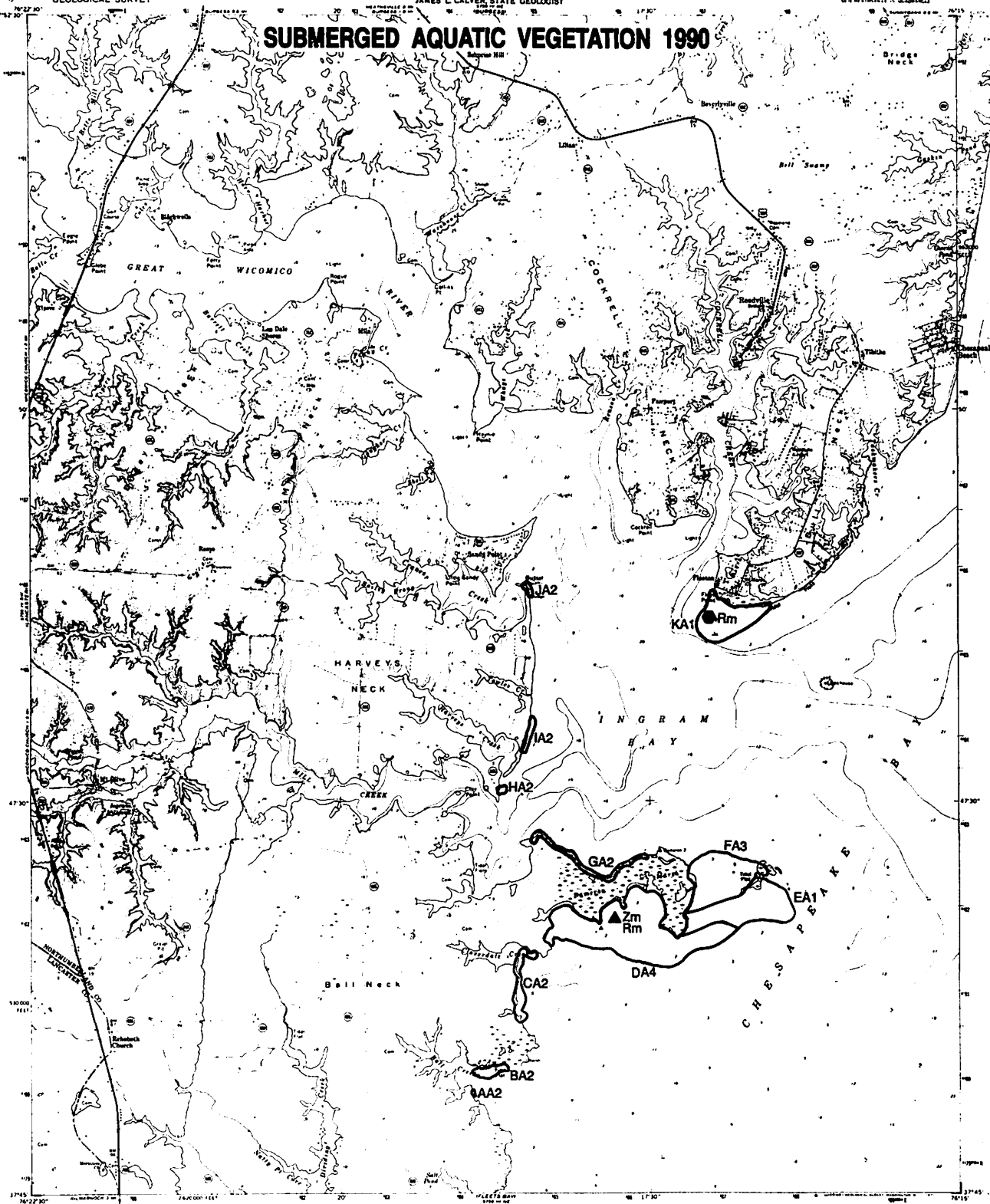
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1 MILE
1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
5-25-90
**SAXIS,
VA-MD
102**

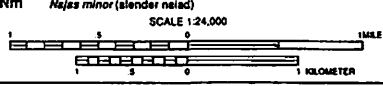
SUBMERGED AQUATIC VEGETATION 1990



SPECIES	
Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum 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</i> spp. (naiad)
Ec	<i>Elodea canadensis</i> (common elodea)
Va	<i>Vallisneria spiralis</i> (wild celery)
Tn	<i>Trapezium</i> (water chestnut)
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)
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 gracilima</i> (naiad)
C	<i>Chara</i> sp. (muskgrass)
Nm	<i>Najas minor</i> (slender naiad)

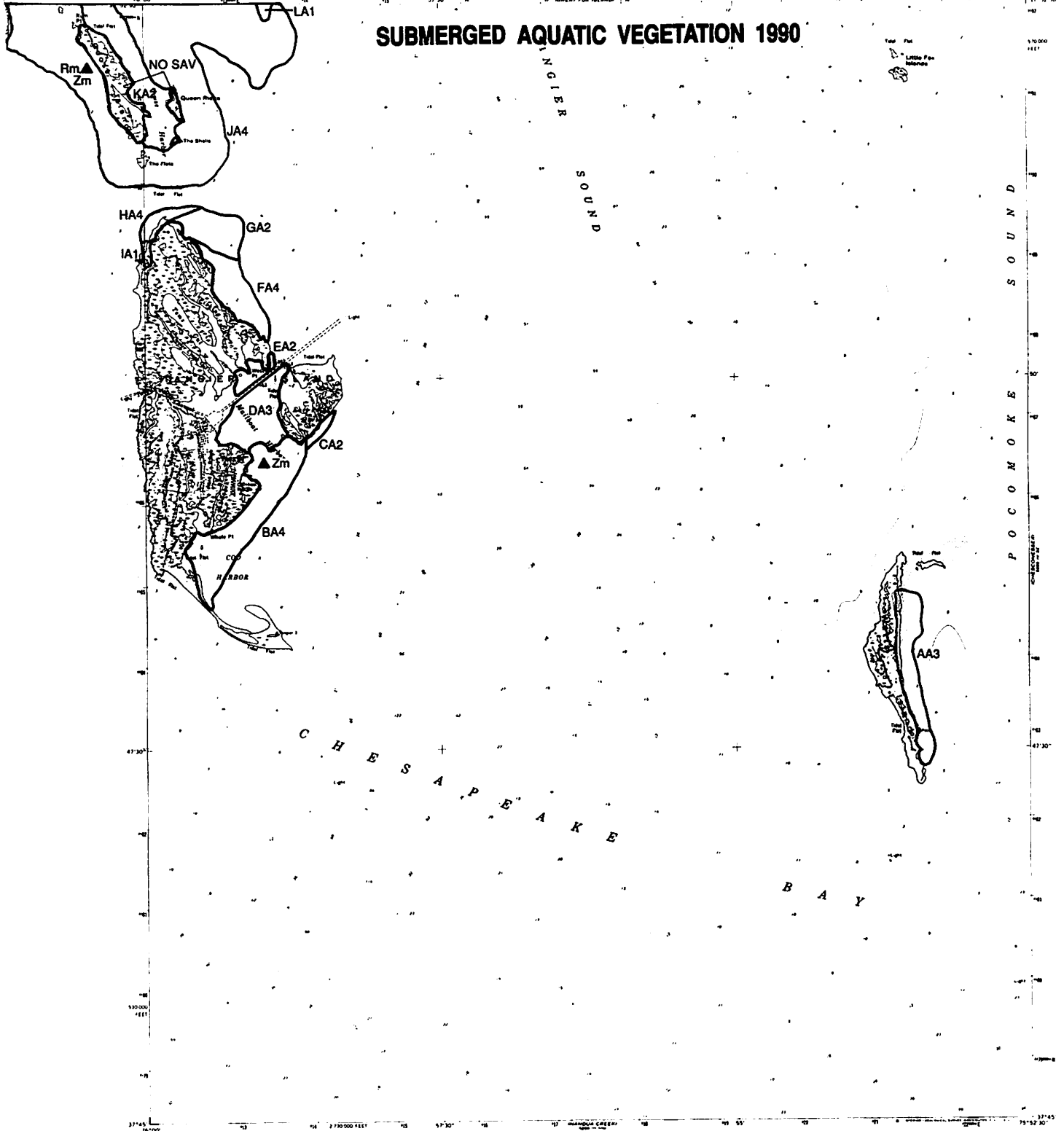
SURVEY STATIONS	
▲	VIMS Field Survey
✳	Harford Community College
✳	University MD-HPPEL
★	USF & WS Survey
★	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR



DATE FLOWN
5-25-90
REEDVILLE,
VA
106

VIRGINIA INSTITUTE
OF MARINE SCIENCE

SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✱	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✱	University MD-HPEL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	●	Council of Governments
Zp	<i>Zannichellia palustris</i> (horned pondweed)	■	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (naiad)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Vallisneria americana</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton epiphydrus</i> (leafy pondweed)		
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)		
Ngv	<i>Najas guadalupensis</i> (southern naiad)		
Ngr	<i>Najas gracilima</i> (naiad)		
C	<i>Chara</i> sp. (muskgrass)		
Nm	<i>Najas minor</i> (slender naiad)		

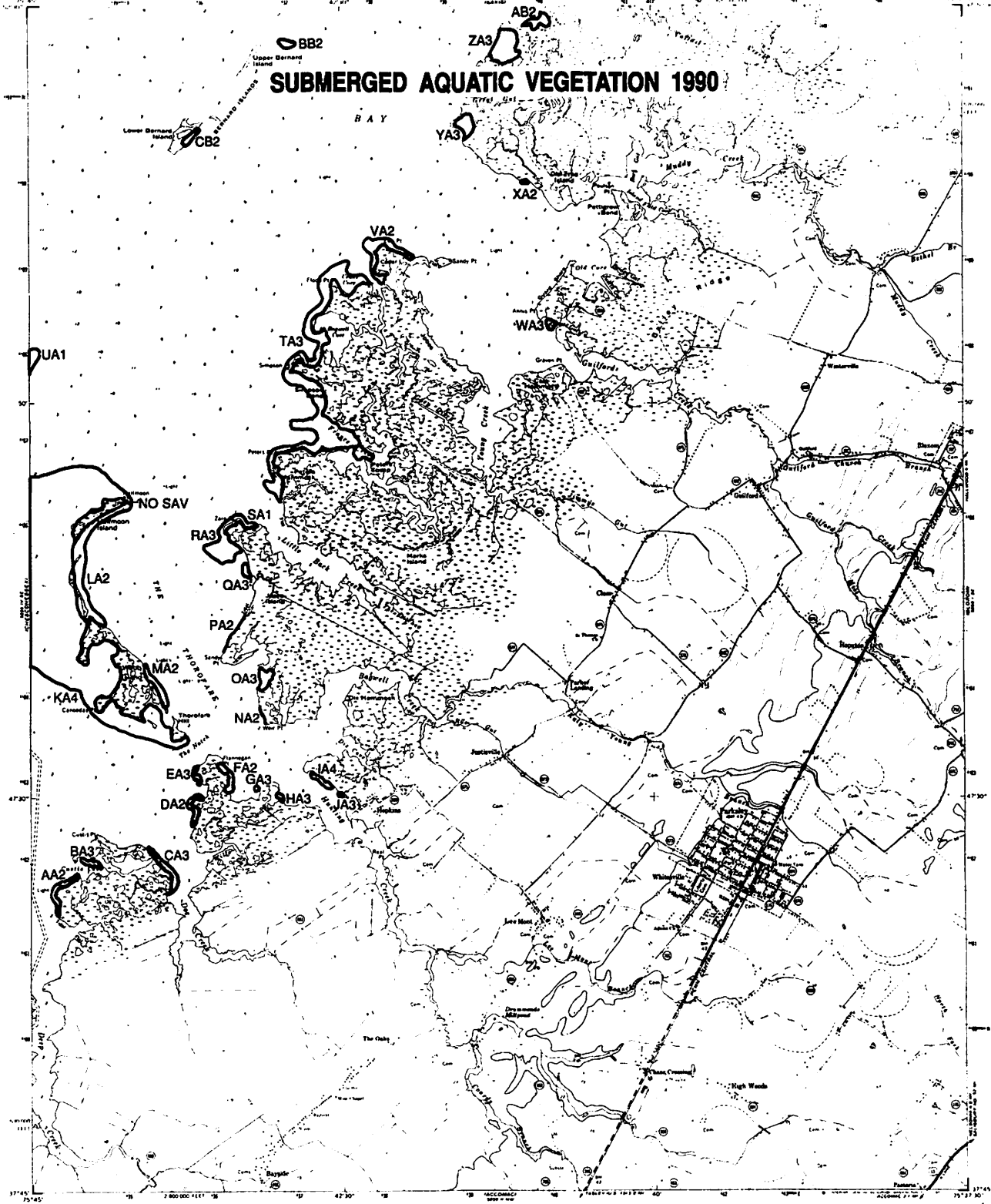
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1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-5-90
**TANGIER ISLAND,
VA
107**

SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
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</i> spp. (naiad)	Ngr	<i>Najas gracillima</i> (naiad)
Ec	<i>Elodea 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)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
U	Unknown species composition		

▲	VIMS Field Survey
✱	Harford Community College
✱	University MD-HPEL
★	USF & WS Survey
⊙	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR

SCALE 1:24,000

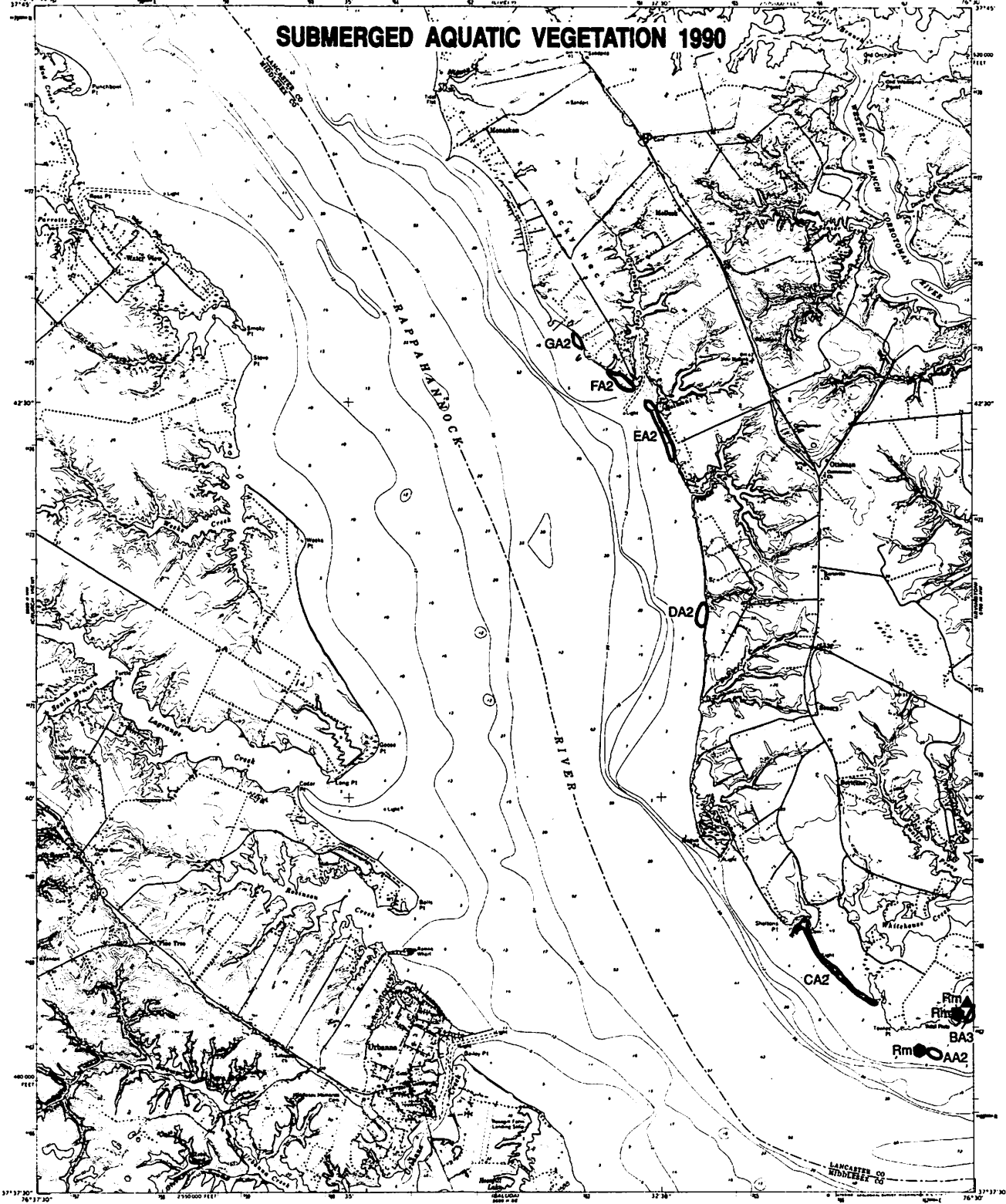
1 2 3 4 5 6 7 8 9 10 MILE

1 2 3 4 5 6 7 8 9 10 KILOMETER

DATE FLOWN
5-25-90
**PARKSLEY,
VA
109**

VIRGINIA INSTITUTE
OF MARINE SCIENCE

SUBMERGED AQUATIC VEGETATION 1990



SPECIES

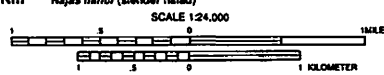
Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas</i> spp. (naiad)
Ec	<i>Elodea canadensis</i> (common elodea)
Va	<i>Vallisneria spiralis</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
Po	<i>Potamogeton ephedrus</i> (leafy pondweed)
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)
Ngv	<i>Najas guadalupensis</i> (southern naiad)
Ngr	<i>Najas gracilissima</i> (naiad)
C	<i>Chara</i> sp. (muskgrass)
Nm	<i>Najas minor</i> (slender naiad)

SURVEY STATIONS

- ▲ VIMS Field Survey
- ✱ Harford Community College
- ✱ University MD-HPPEL
- ★ USF & WS Survey
- Council of Governments
- MD Charter Boat Field Survey
- Citizens Field Observation
- MD-DNR

DATE FLOWN
6-5-90
**URBANNA,
VA
110**



VIRGINIA INSTITUTE
OF MARINE SCIENCE

SUBMERGED AQUATIC VEGETATION 1990



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

SCALE 1:24,000

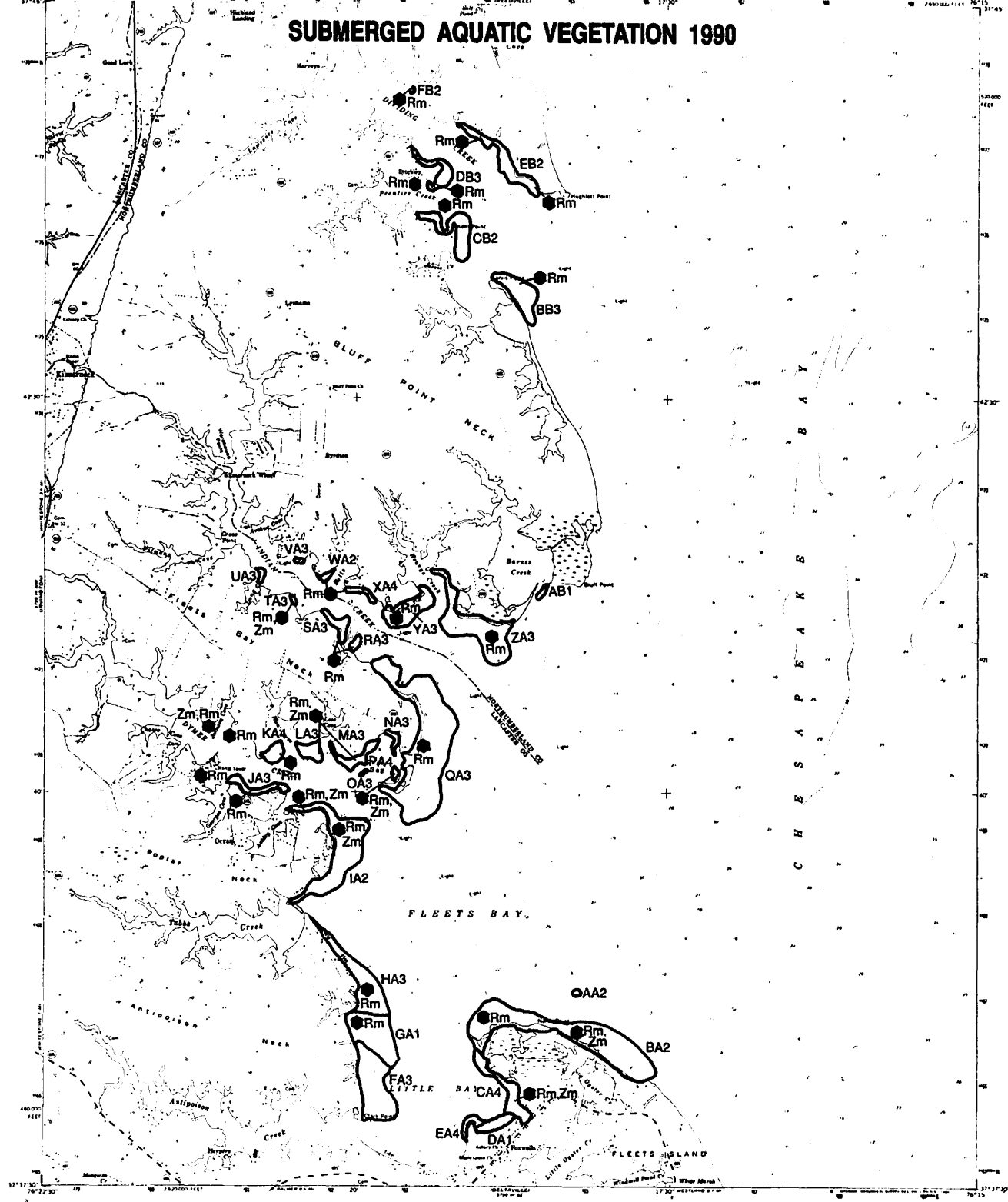
1 5 0 5 10 MILE

1 5 0 5 10 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-5-90
IRVINGTON,
VA
111

SUBMERGED AQUATIC VEGETATION 1990



SPECIES

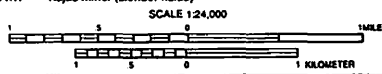
Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)
N	<i>Najas</i> spp. (nailad)
Ec	<i>Elodea canadensis</i> (common elodea)
Va	<i>Vallisneria spiralis</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)
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 guadelupensis</i> (southern nailad)
Ngr	<i>Najas gracillima</i> (nailad)
C	<i>Chara</i> sp. (muskgrass)
Nm	<i>Najas minor</i> (slender nailad)

SURVEY STATIONS

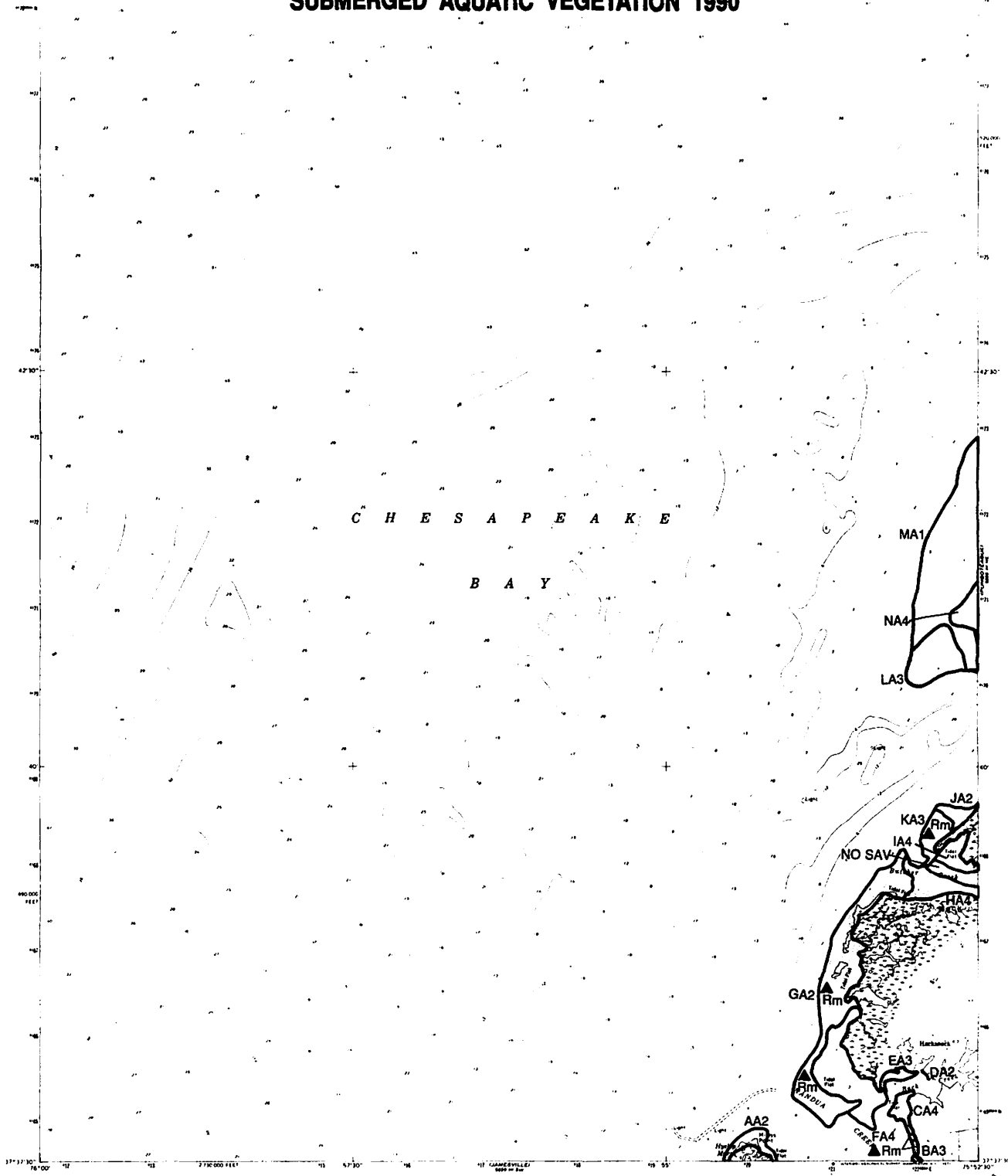
- ▲ VIMS Field Survey
- ✳ Harford Community College
- ✳ University MD-HPEL
- ★ USF & WS Survey
- Council of Governments
- MD Charter Boat Field Survey
- Citizens Field Observation
- MD-DNR

VIRGINIA INSTITUTE OF MARINE SCIENCE



DATE FLOWN
5-25-90
**FLEETS BAY,
VA
112**

SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✱	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✱	University MD-HPCL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	●	Council of Governments
Zp	<i>Zannichellia palustris</i> (horned pondweed)	■	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (naiad)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Vallisneria spiralis</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leaky pondweed)		
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)		

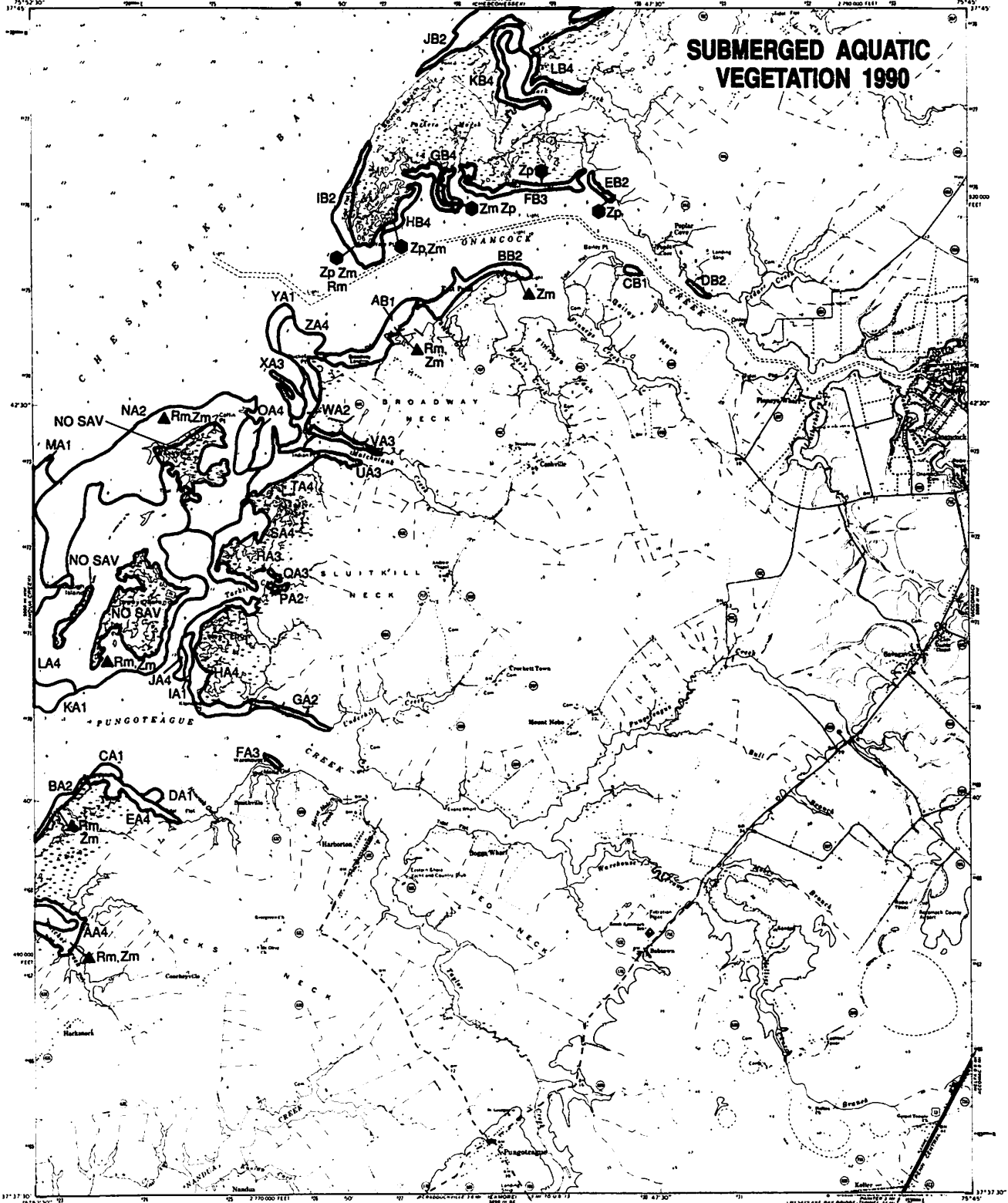
SCALE 1:24,000

1 MILE
1 KILOMETER

DATE FLOWN
5-25-90
**NANDUA
CREEK, VA
113**

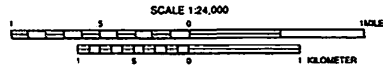
VIRGINIA INSTITUTE
OF MARINE SCIENCE

SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✱	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✱	University MD-HPPEL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	★	Council of Governments
Zp	<i>Zannichellia palustris</i> (horned pondweed)	■	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (natad)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Vallisneria spiralis</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton epiphythus</i> (leafy pondweed)		
U	Unknown species composition		
Hv	<i>Hydrilla verticillata</i> (hydrilla)		
Hd	<i>Heteranthera dubia</i> (water stargrass)		
Pcr	<i>Potamogeton crispus</i> (cuty pondweed)		
Cd	<i>Ceratophyllum demersum</i> (coontail)		
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)		
Ngu	<i>Najas guadalupensis</i> (southern natad)		
Ngr	<i>Najas gracillima</i> (natad)		
C	<i>Chara</i> sp. (muskgrass)		
Nm	<i>Najas minor</i> (slender natad)		

DATE FLOWN
5-25-80
**PUNGOTEAGUE,
VA
114**



SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
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</i> spp. (naiad)	Ngr	<i>Najas gracillima</i> (naiad)
Ec	<i>Elodea 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)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
U	Unknown species composition		

▲	VIMS Field Survey
✱	Harford Community College
✱	University MD-HPCL
★	USF & WS Survey
♣	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR

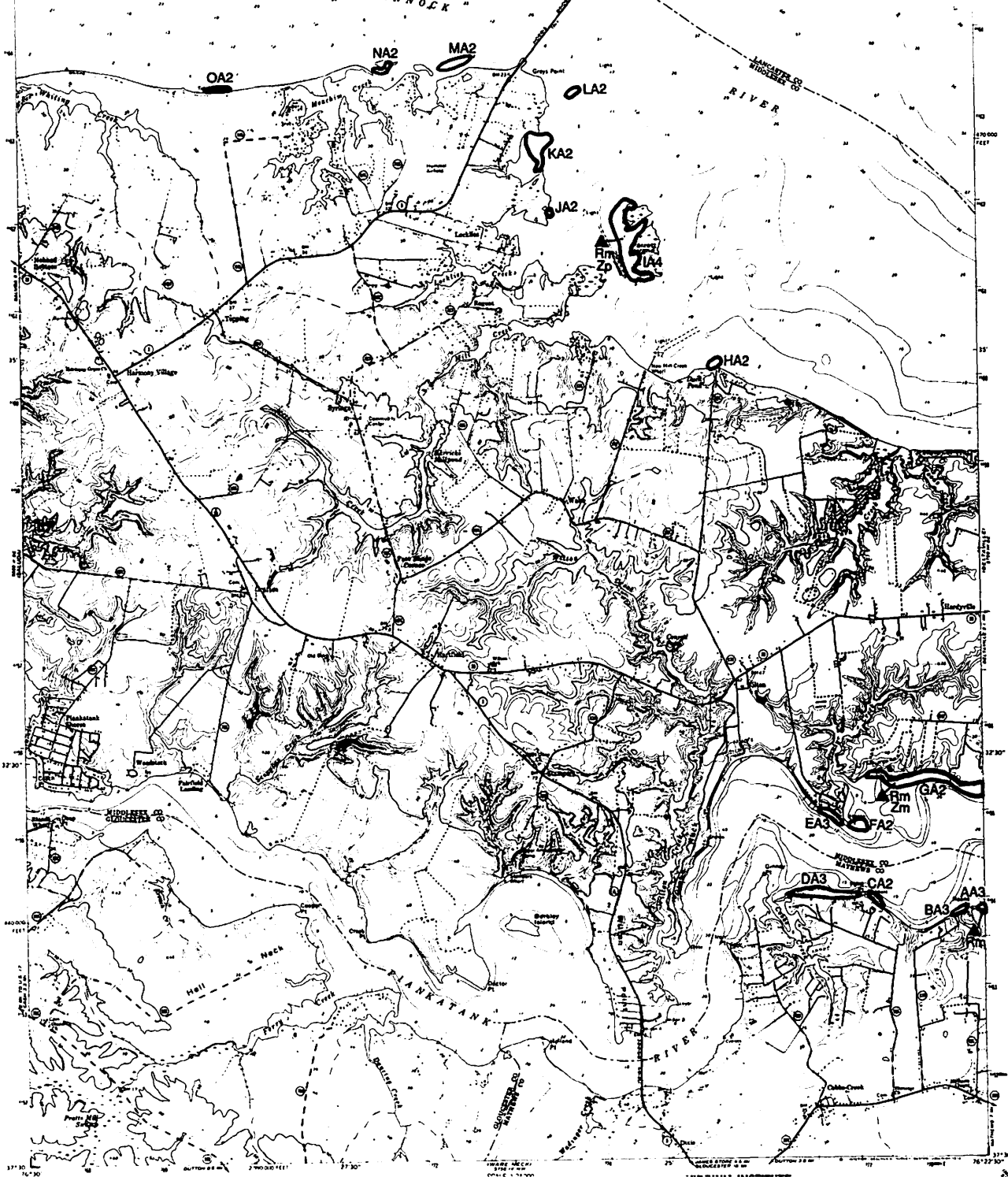
DATE FLOWN
6-5-90
**SALUDA,
VA
116**

SCALE 1:24,000

1 MILE
1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
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>Zernichellia palustris</i> (horned pondweed)	Ngu	<i>Najas guadalupensis</i> (southern netoid)
N	<i>Najas</i> spp. (netoid)	Ngr	<i>Najas gracilima</i> (netoid)
Ec	<i>Elodea canadensis</i> (common elodea)	C	<i>Chara</i> sp. (muskgrass)
Va	<i>Vallisneria spiralis</i> (wild celery)	Nm	<i>Najas minor</i> (slender netoid)
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
U	Unknown species composition		

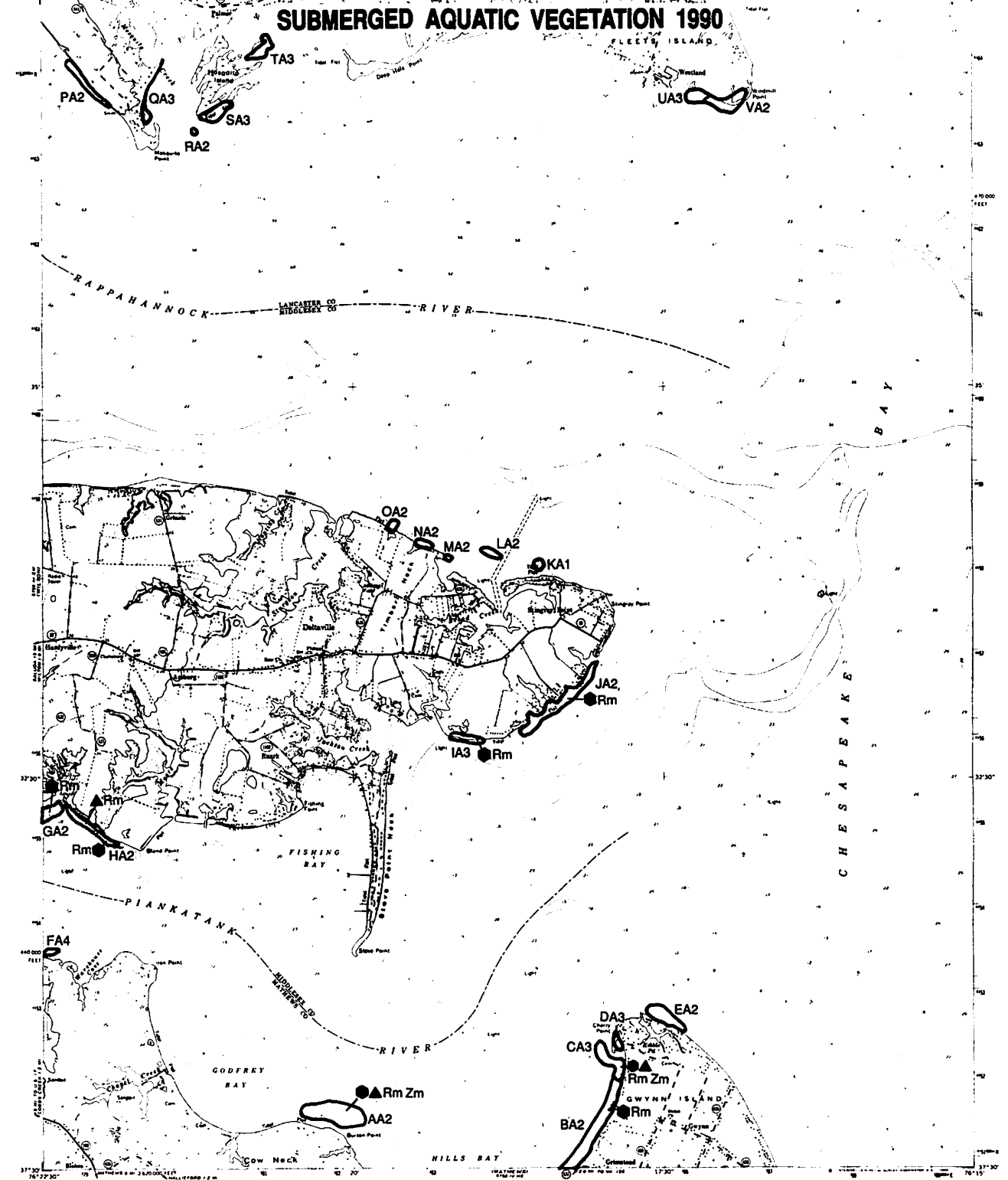
SURVEY STATIONS	
▲	VIMS Field Survey
✱	Harford Community College
✱	University MD-HPEL
★	USF & WS Survey
●	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR

SCALE 1:24,000

1 KILOMETER

DATE FLOWN
8-5-90
WILTON,
VA
117

SUBMERGED AQUATIC VEGETATION 1990



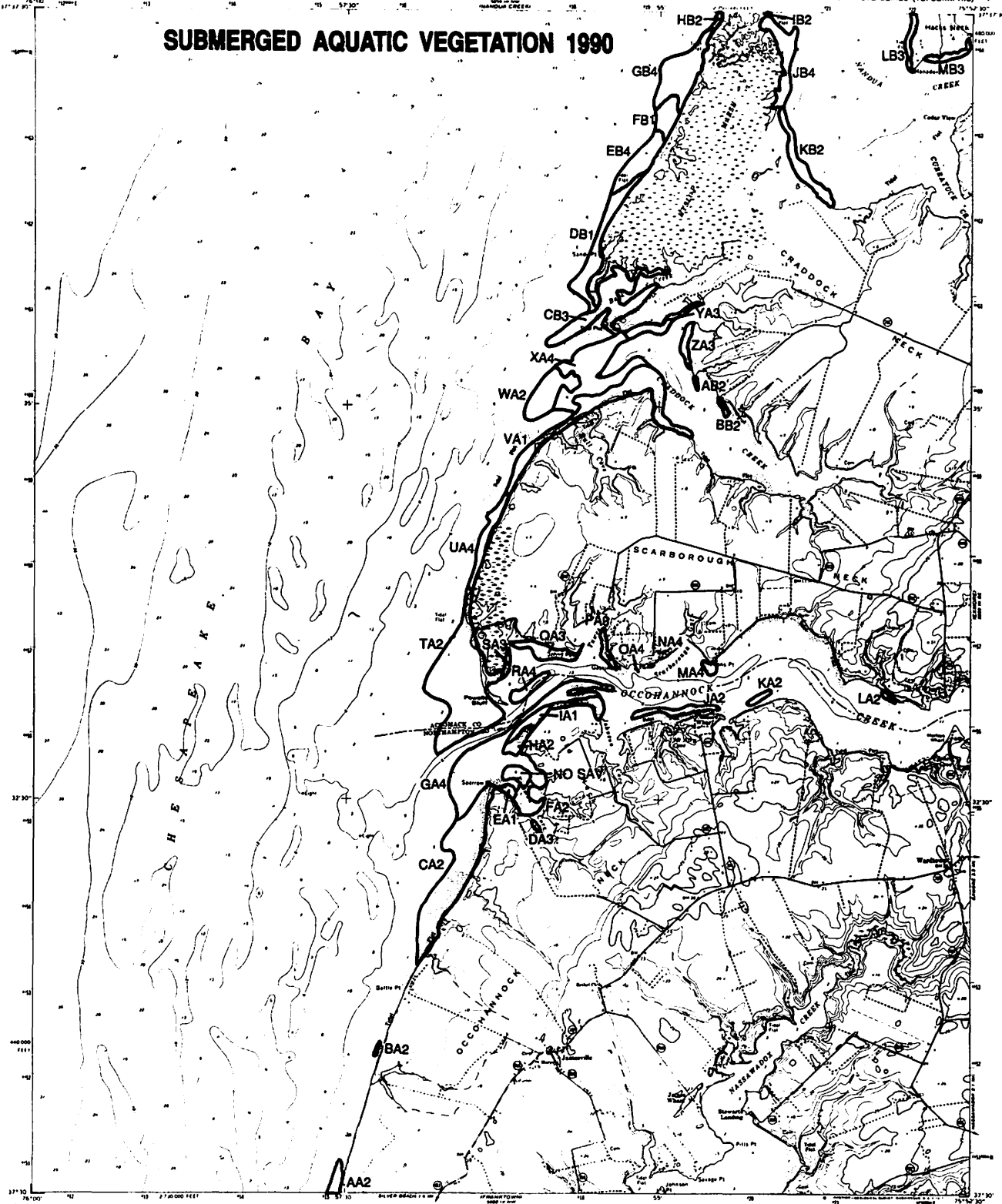
SPECIES		SPECIES		SURVEY STATIONS
Zm	<i>Zostera marina</i> (eelgrass)	Hv	<i>Hydrilla verticillata</i> (hydrilla)	
Rm	<i>Ruppia maritima</i> (widgeon grass)	Hd	<i>Heteranthera dubia</i> (water stargrass)	✱ Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr	<i>Potamogeton crispus</i> (curly pondweed)	✱ University MD-HPEL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	Cd	<i>Ceratophyllum demersum</i> (coontail)	★ USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	Npu	<i>Najas guadalupensis</i> (slender pondweed)	☆ Council of Governments
Zp	<i>Zannichellia palustris</i> (horned pondweed)	Ngr	<i>Najas gracillima</i> (naked)	■ MD Charter Boat Field Survey
N	<i>Najas</i> spp. (naked)	C	<i>Chara</i> sp. (muskgrass)	● Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	Nm	<i>Najas minor</i> (slender naked)	● MD-DNR
Va	<i>Vallisneria spiralis</i> (wild celery)			
Tn	<i>Trapa natans</i> (water chestnut)			
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)			
U	Unknown species composition			

SCALE 1:24,000
1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-5-90
DELTAVILLE,
VA
118

SUBMERGED AQUATIC VEGETATION 1990



SPECIES

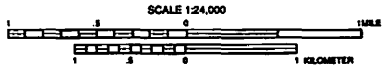
Zm	<i>Zostera marina</i> (eelgrass)
Rm	<i>Ruppia maritima</i> (widgeon grass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)
Zp	<i>Zernichella palustris</i> (horned pondweed)
N	<i>Najas</i> spp. (naked)
Ec	<i>Elodea canadensis</i> (common elodea)
Va	<i>Vallisneria spiralis</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)
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 naked)
Ngr	<i>Najas gracillima</i> (naked)
C	<i>Chara</i> sp. (muskgrass)
Nm	<i>Najas minor</i> (slender naked)

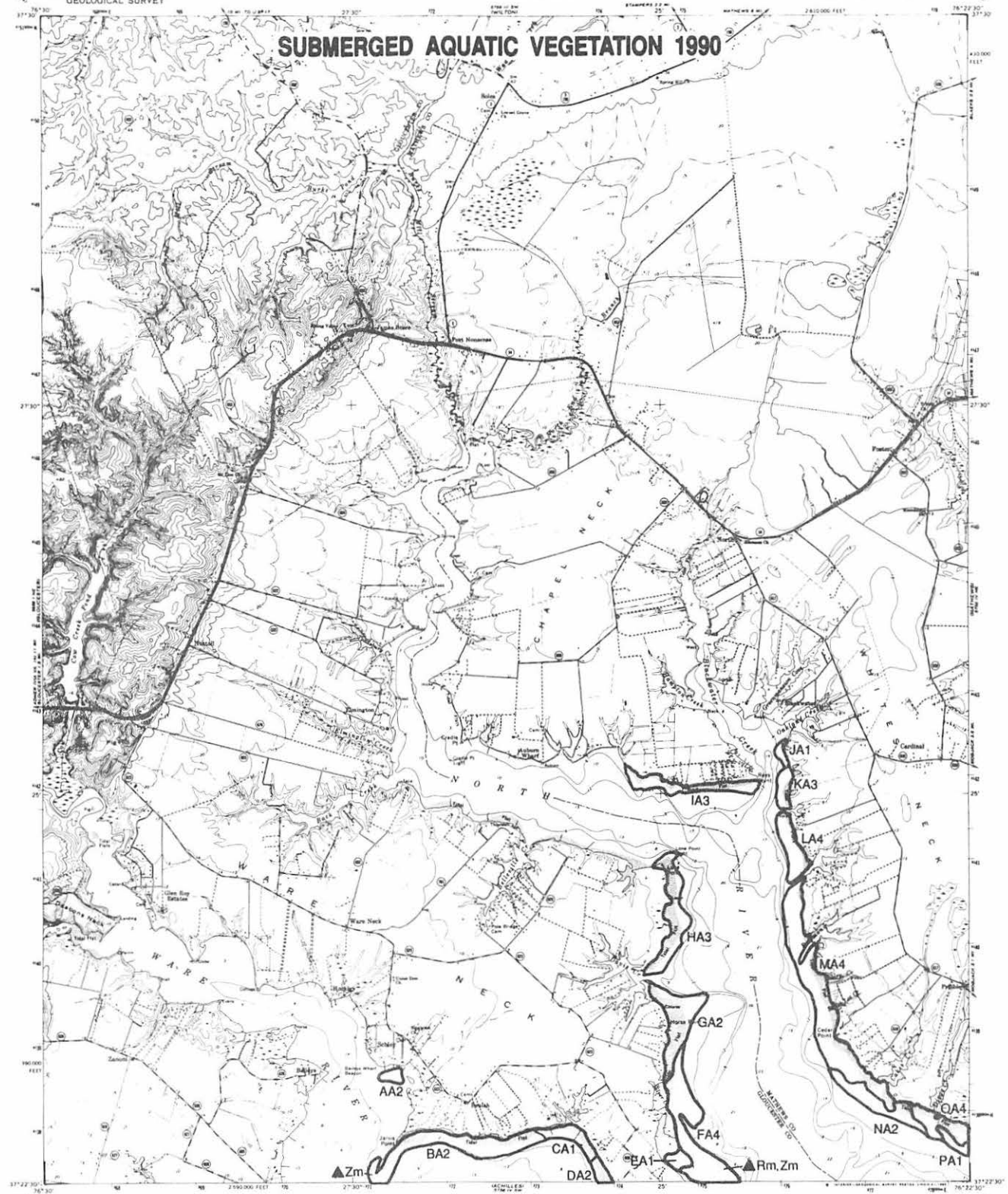
SURVEY STATIONS

- ▲ VIMS Field Survey
- ✳ Harford Community College
- ✳ University MD-HPCL
- ★ USF & WS Survey
- Council of Governments
- MD Charter Boat Field Survey
- Citizens Field Observation
- MD-DNR

DATE FLOWN
7-23-90
**JAMESVILLE,
VA
119**



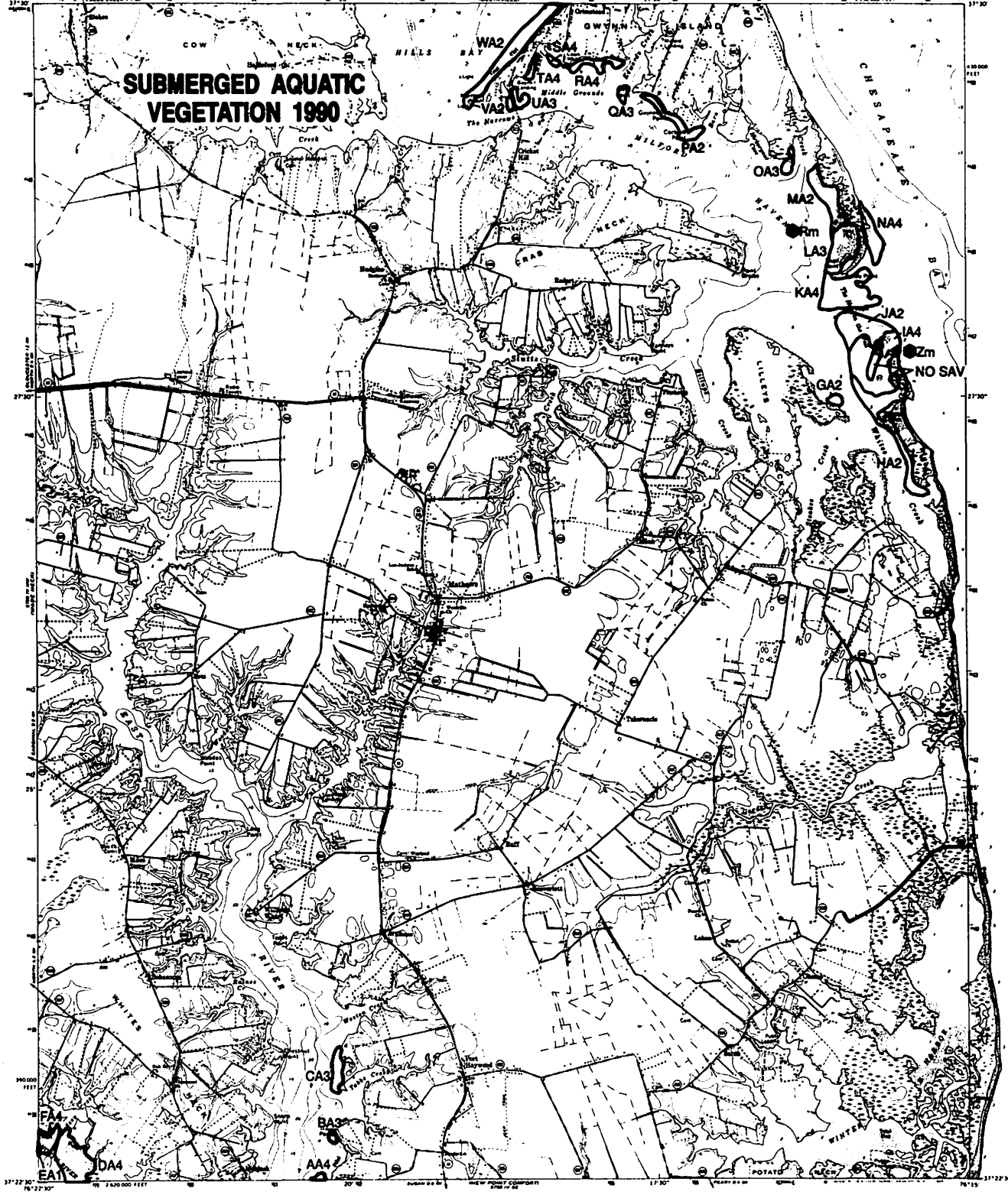
VIRGINIA INSTITUTE
OF MARINE SCIENCE



SPECIES		SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	Hv	<i>Hydrilla verticillata</i> (hydrilla)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widegeon grass)	Hd	<i>Heteranthera dubia</i> (water stargrass)	✱	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr	<i>Potamogeton crispus</i> (cutty pondweed)	✱	University MD-HPEL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	Cd	<i>Ceratophyllum demersum</i> (coontail)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	Ppu	<i>Potamogeton pusillus</i> (slender pondweed)	★	Council of Governments
Zp	<i>Zannichella palustris</i> (horned pondweed)	Ngu	<i>Najas guadalupensis</i> (southern naiad)	■	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (naiad)	Ngr	<i>Najas gracillima</i> (naiad)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	C	<i>Chara</i> sp. (muskgrass)	●	MD-DNR
Va	<i>Vallisneria americana</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)		
Tn	<i>Trapa natans</i> (water chestnut)				
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)				
U	Unknown species composition				

DATE FLOWN
6-1-90
**WARE NECK,
VA
122**

**SUBMERGED AQUATIC
VEGETATION 1990**



SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	Hv	<i>Hydrilla verticillata</i> (hydrilla)
Rm	<i>Ruppia maritima</i> (widgeon grass)	Hd	<i>Hydranthra dubia</i> (water stargrass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian waternut)	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 puzosii</i> (slender pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)	Ngu	<i>Najas guadalupensis</i> (southern netled)
N	<i>Najas</i> spp. (netled)	Ngr	<i>Najas gracillima</i> (netled)
Ec	<i>Elodea canadensis</i> (common elodea)	C	<i>Chara</i> sp. (muskgrasses)
Va	<i>Valisneria spiralis</i> (wild celery)	Nm	<i>Najas minor</i> (slender netled)
Tn	<i>Trapezium natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
U	Unknown species composition		

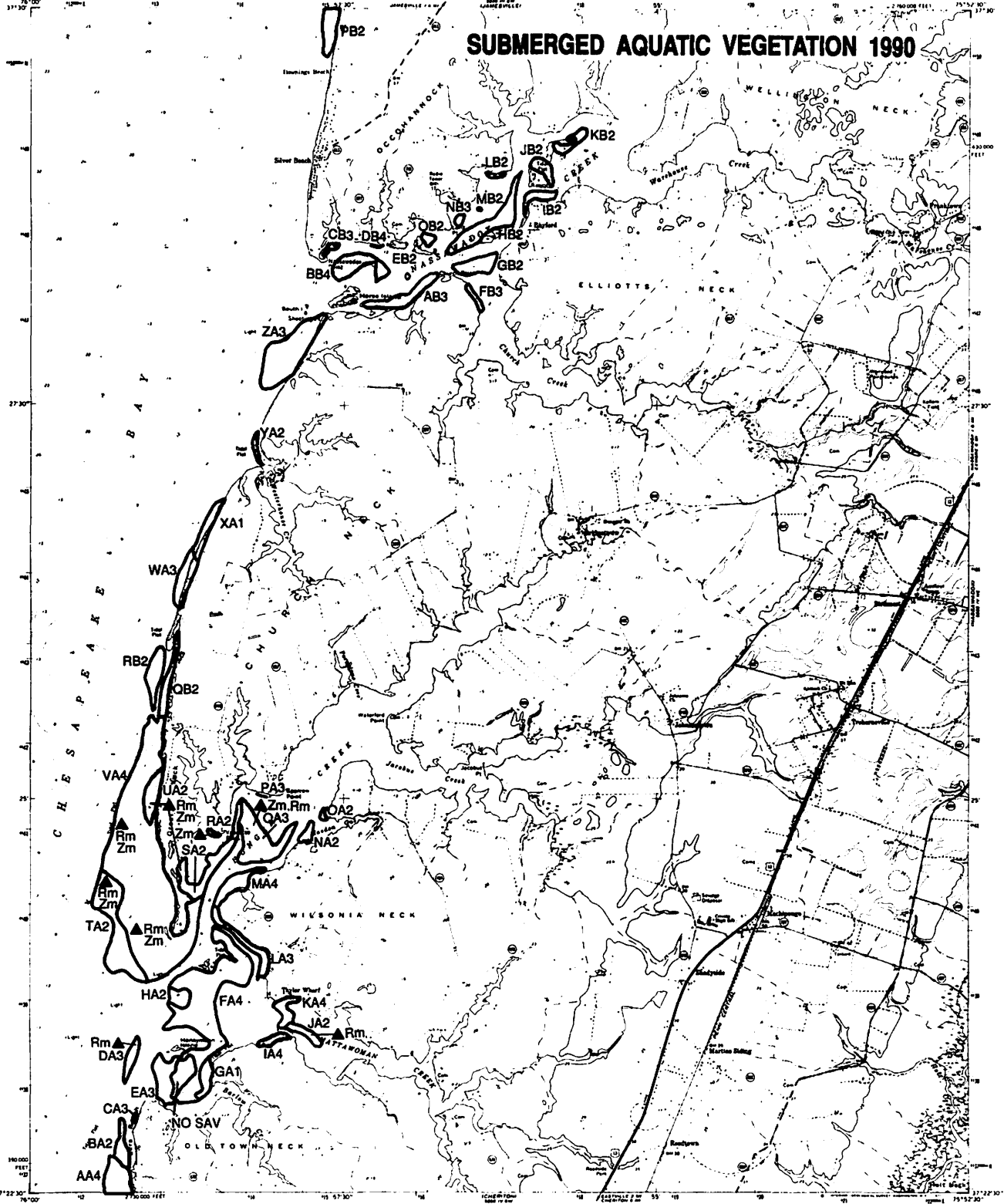
SCALE 1:24,000

1 INCH = 2 MILES
1 CENTIMETER = 0.2 KILOMETERS

DATE FLOWN
6-5-90
**MATHEWS,
VA
123**

VIRGINIA INSTITUTE
OF MARINE SCIENCE

SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✱	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✱	University MD-HPEL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	●	Council of Governments
Zp	<i>Zannichellia palustris</i> (horned pondweed)	●	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (naisid)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Vallisneria americana</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
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 naisid)		
Ngr	<i>Najas gracillima</i> (naisid)		
C	<i>Chara</i> sp. (muskgrass)		
Nm	<i>Najas minor</i> (slender naisid)		

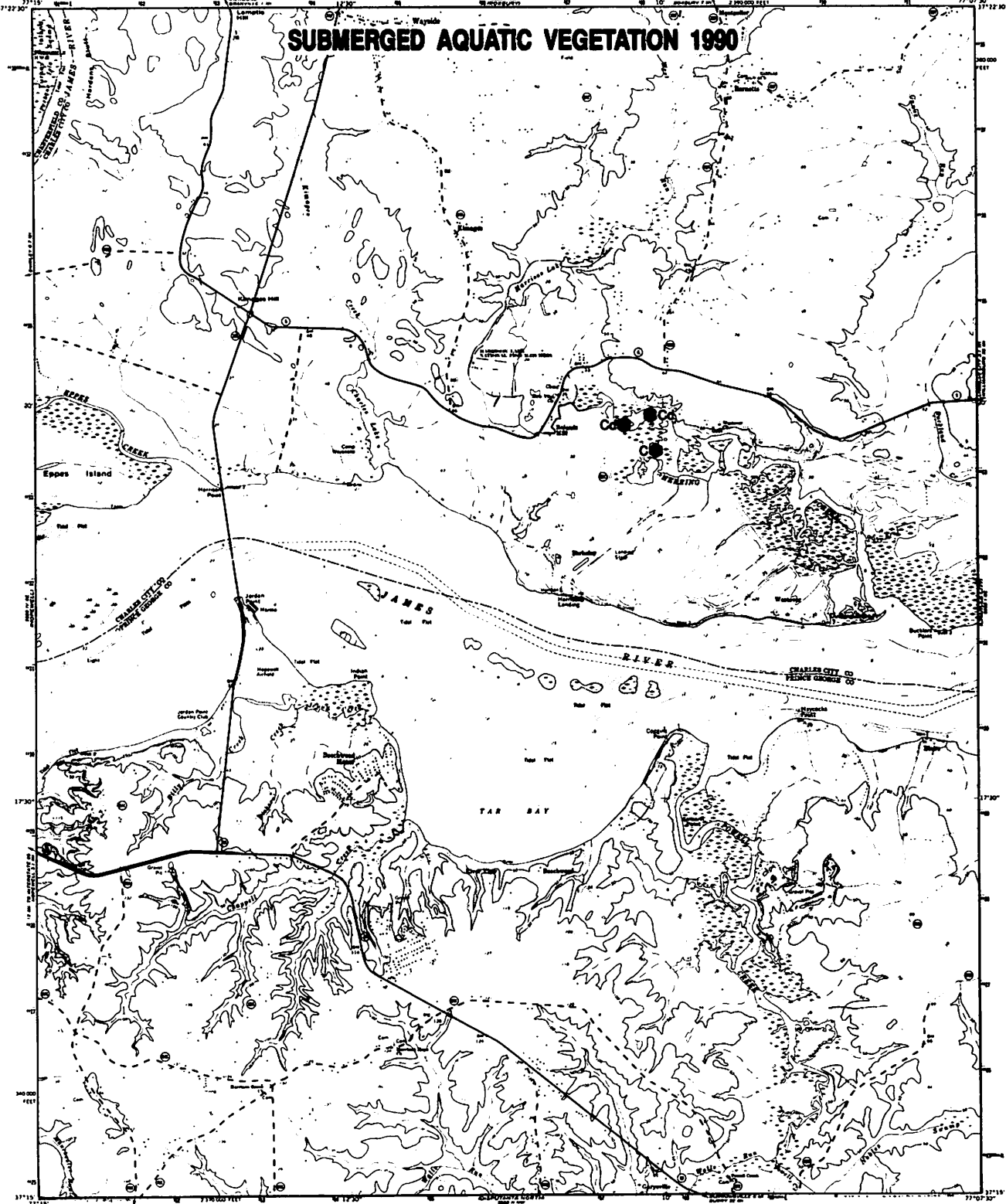
SCALE 1:24,000

1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
5-23-90
FRANKTOWN,
VA
124

SUBMERGED AQUATIC VEGETATION 1990



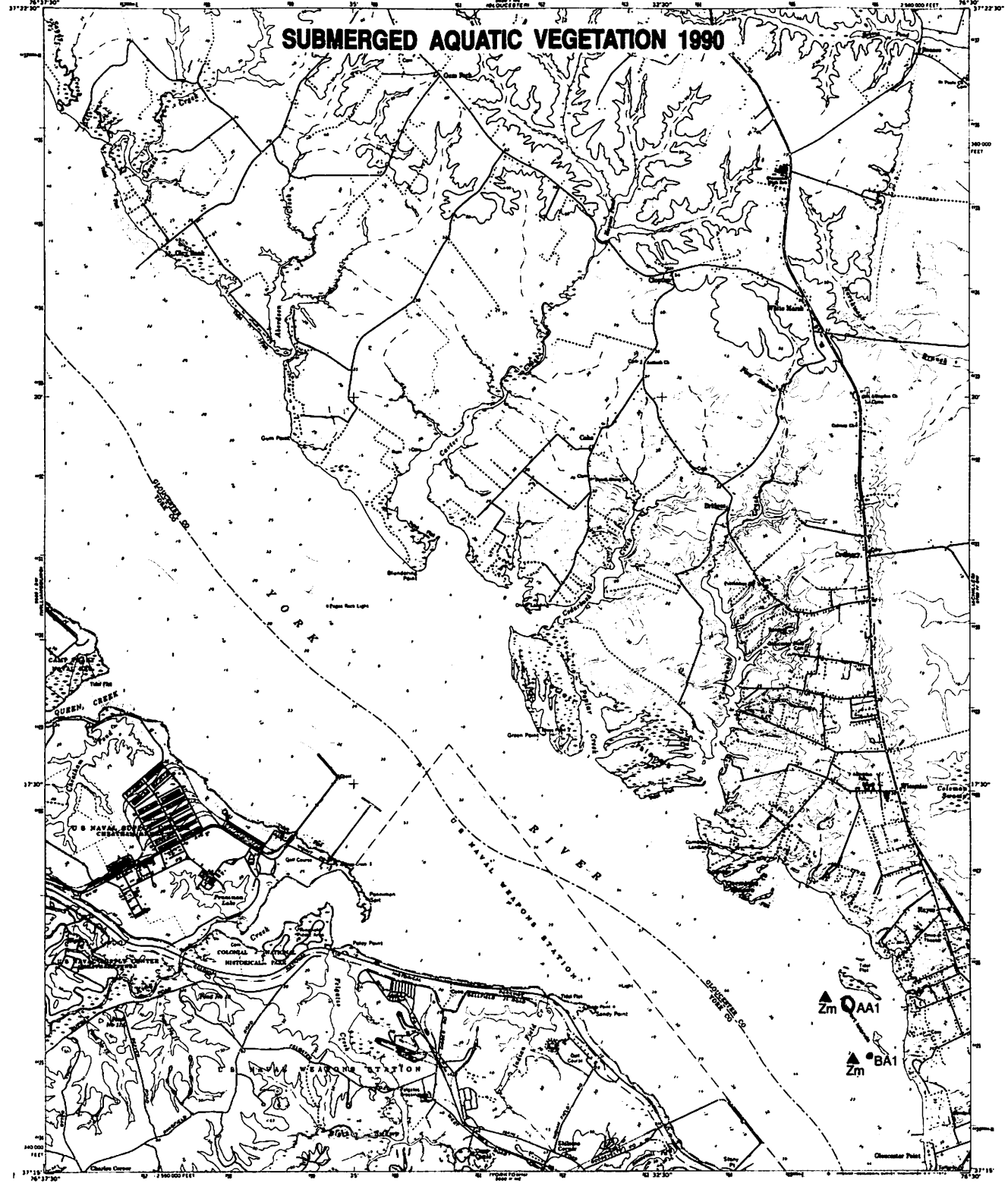
SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✱	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✱	University MD-HPEL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	●	Council of Governments
Zp	<i>Zannichellia peltata</i> (horned pondweed)	■	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (naked)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Valisneria spiralis</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
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 puzosii</i> (slender pondweed)		
Ngv	<i>Najas guadalupensis</i> (southern naked)		
Ngr	<i>Najas gracillima</i> (naked)		
C	<i>Chara</i> sp. (muskgrass)		
Nm	<i>Najas minor</i> (slender naked)		

SCALE 1:24,000

1 MILE
1 KILOMETER

NOT FLOWN
WESTOVER,
VA
125

VIRGINIA INSTITUTE
OF MARINE SCIENCE



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

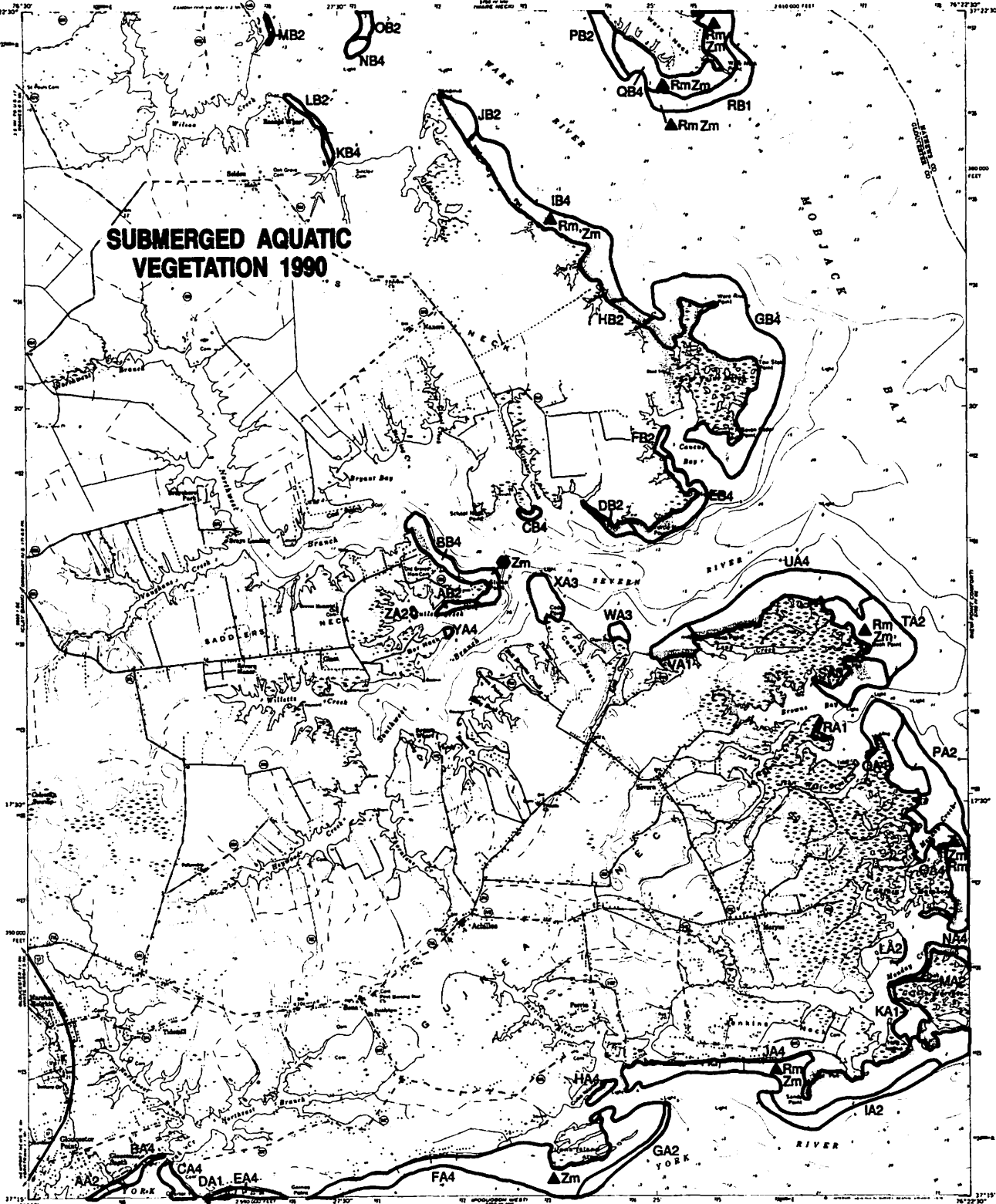
SCALE 1:24,000

1 INCH = 2 MILES
1 CENTIMETER = 1 KILOMETER

DATE FLOWN
6-1-90
**CLAY BANK,
VA
130**

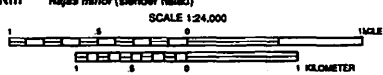
VIRGINIA INSTITUTE
OF MARINE SCIENCE

**SUBMERGED AQUATIC
VEGETATION 1990**

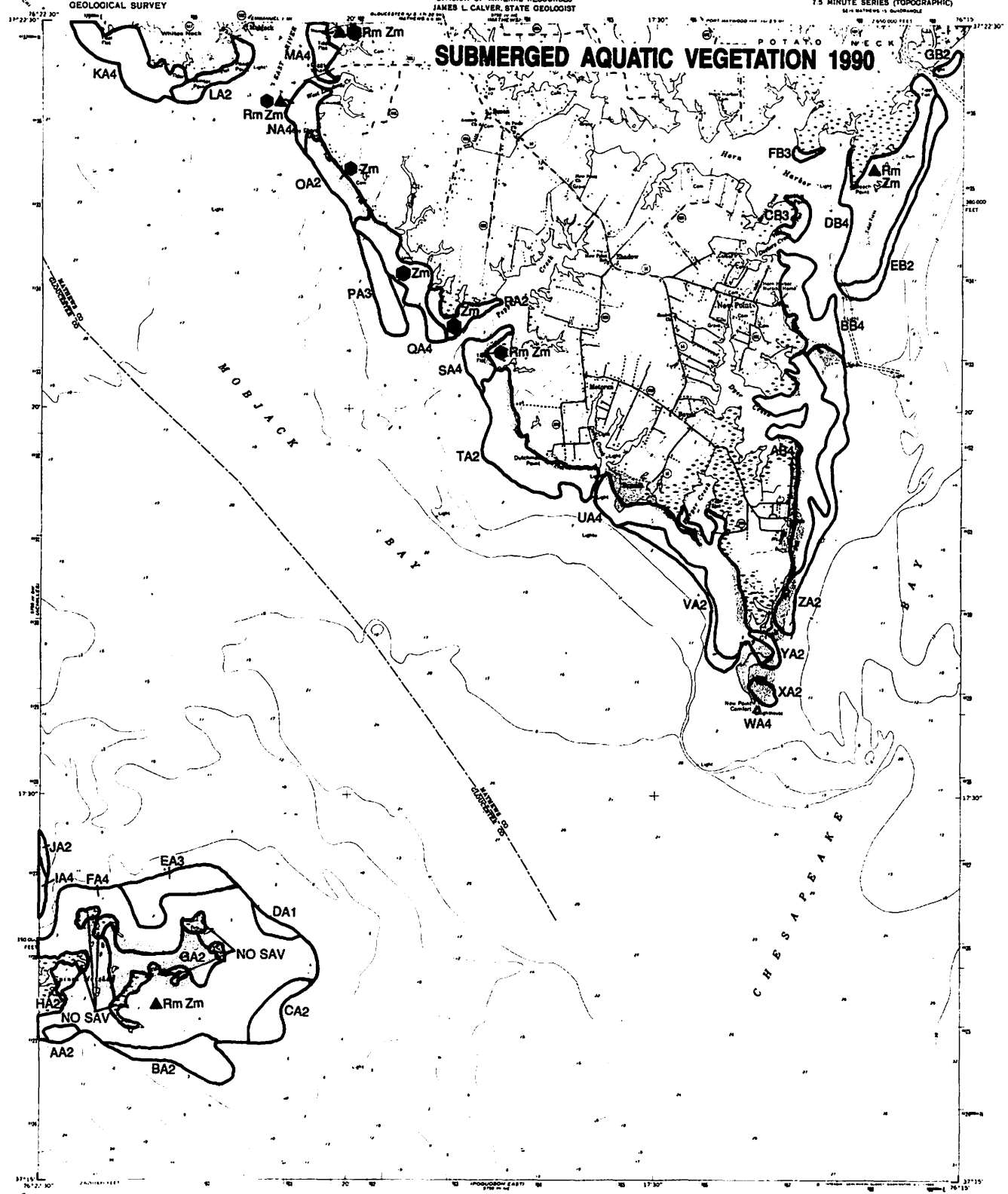


SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	★	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✳	University MD-HPEL
Ppf	<i>Potamogeton perfoliatus</i> (rechead-grass)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	●	Council of Governments
Zp	<i>Zernichella palustris</i> (horned pondweed)	■	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (naked)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Vallisneria spiralis</i> (wild celery)		
Tn	<i>Trapezium natans</i> (water chestnut)		
Po	<i>Potamogeton ephedrus</i> (leafy pondweed)		
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 naked)		
Ngr	<i>Najas gracilima</i> (naked)		
C	<i>Chara</i> sp. (muskgrass)		
Nrm	<i>Najas minor</i> (slender naked)		

DATES FLOWN
6-13-90
**ACHILLES,
VA
131**



SUBMERGED AQUATIC VEGETATION 1990

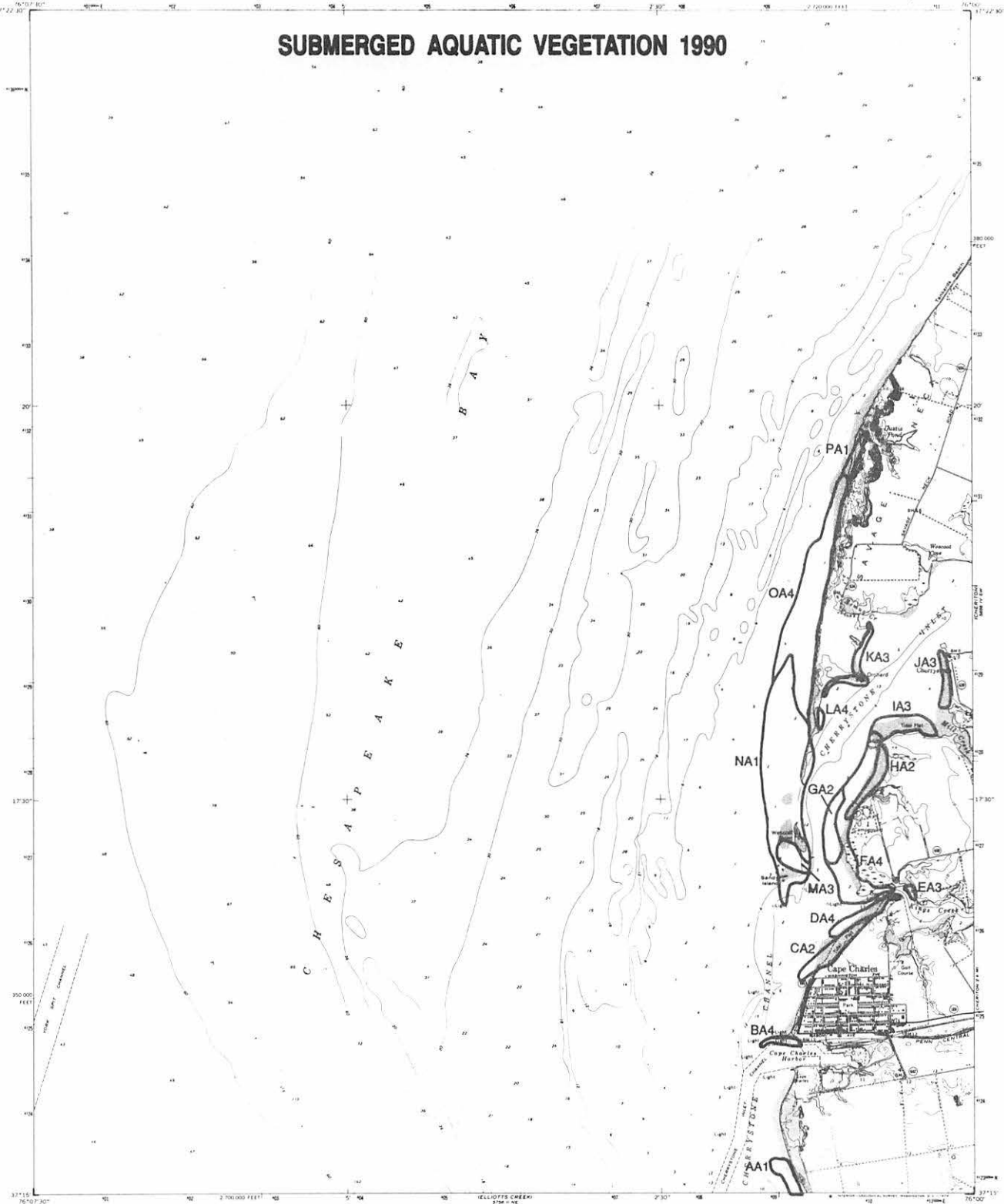


SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	Hv	<i>Hydrilla verticillata</i> (hydrilla)
Rm	<i>Ruppia maritima</i> (widgeon grass)	Hd	<i>Heteranthera dubia</i> (water stargrass)
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Ppf	<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>Zannichetia peltustris</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. (muskgrass)
Va	<i>Vallisneria spiralis</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapezium natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
U	Unknown species composition		

DATE FLOWN
8-5-90
**NEW POINT
COMFORT, VA**
132

VIRGINIA INSTITUTE
OF MARINE SCIENCE

SUBMERGED AQUATIC VEGETATION 1990



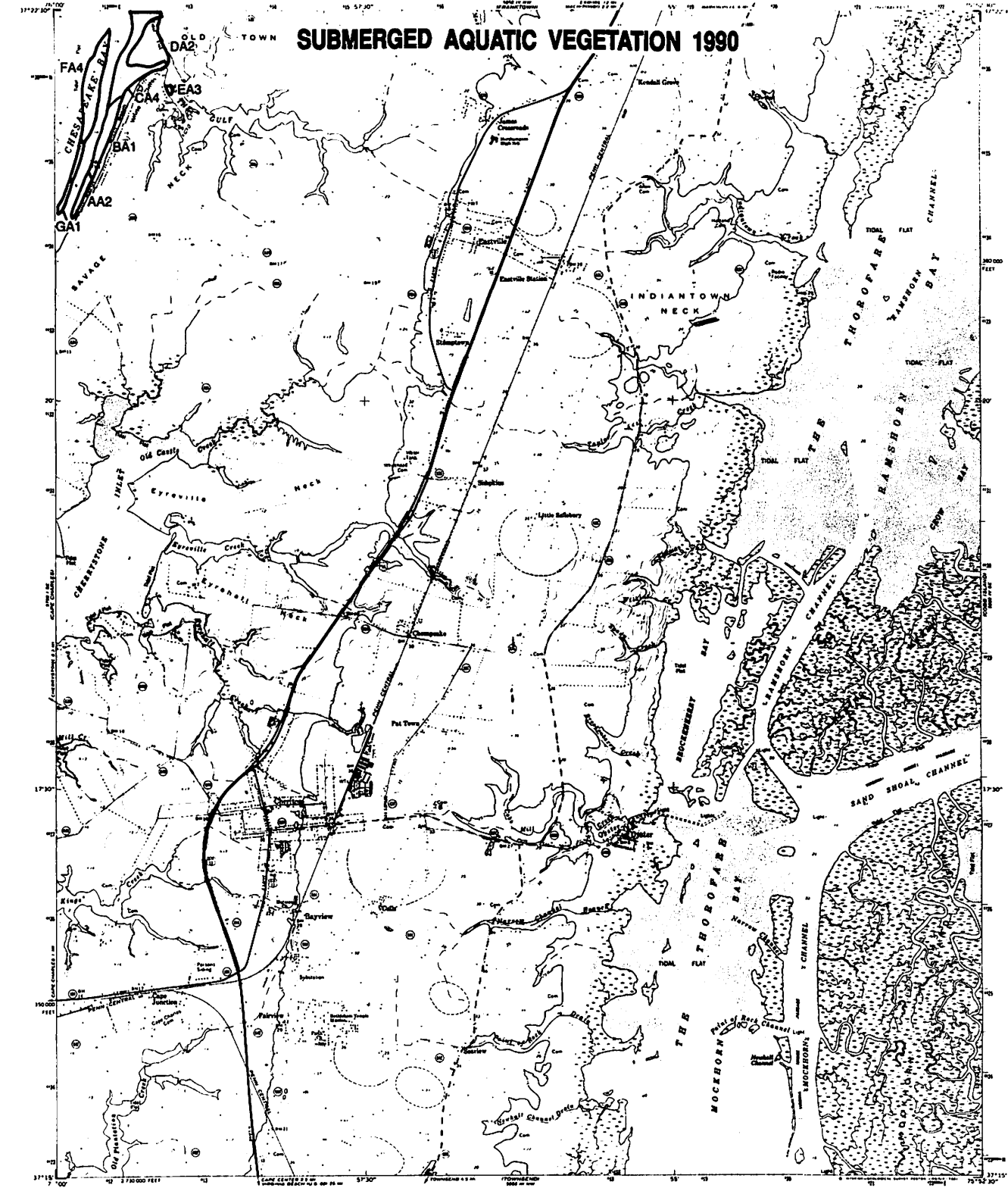
SPECIES		SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	Hv	<i>Hydrilla verticillata</i> (hydrilla)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	Hd	<i>Heteranthera dubia</i> (water stargrass)	✱	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)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

SCALE 1:24,000

1 MILE
1 KILOMETER

DATE FLOWN
5-23-90
CAPE CHARLES,
VA
133

SUBMERGED AQUATIC VEGETATION 1990



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. (naked)
Ec	<i>Elodea canadensis</i> (common elodea)
Va	<i>Vallisneria spiralis</i> (wild celery)
Tn	<i>Trapezium natans</i> (water chestnut)
Pe	<i>Potamogeton amplifolius</i> (leafy pondweed)
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)
Ngv	<i>Najas guadalupensis</i> (southern naked)
Ngr	<i>Najas gracillima</i> (naked)
C	<i>Chara</i> sp. (muskgrass)
Nm	<i>Najas minor</i> (slender naked)

SURVEY STATIONS

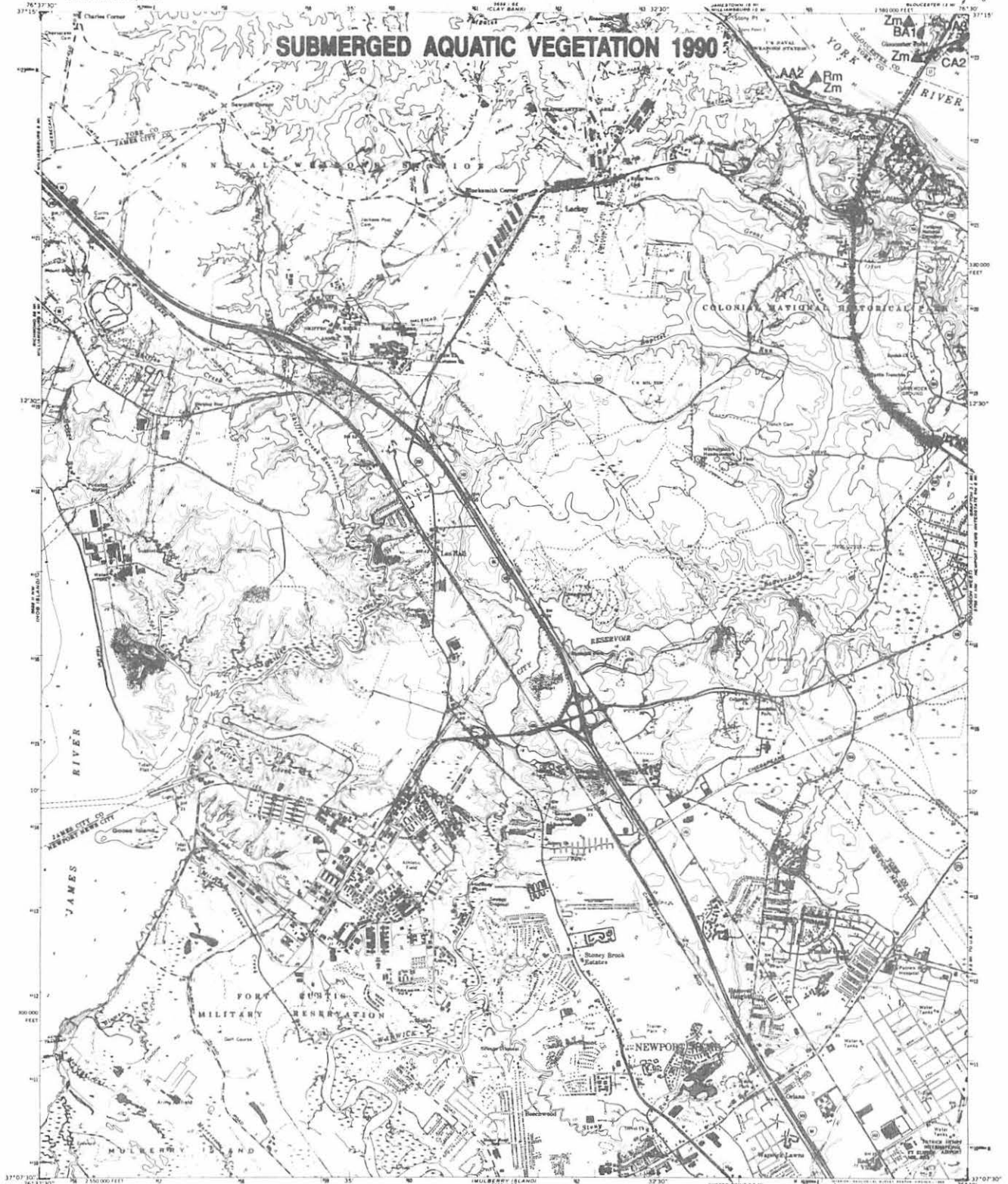
- ▲ VIMS Field Survey
- ✱ Harford Community College
- ✱ University MD-HPEL
- ★ USF & WS Survey
- Council of Governments
- MD Charter Boat Field Survey
- Citizens Field Observation
- MD-DNR

SCALE 1:24,000

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
5-23-90
**CHERITON,
VA
134**

SUBMERGED AQUATIC VEGETATION 1990



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

SCALE 1:24,000

1 MILE / 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-1-90
YORKTOWN,
VA
139

SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
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</i> spp. (naiad)	Ngr	<i>Najas gracillima</i> (naiad)
Ec	<i>Elodea 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)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
U	Unknown species composition		

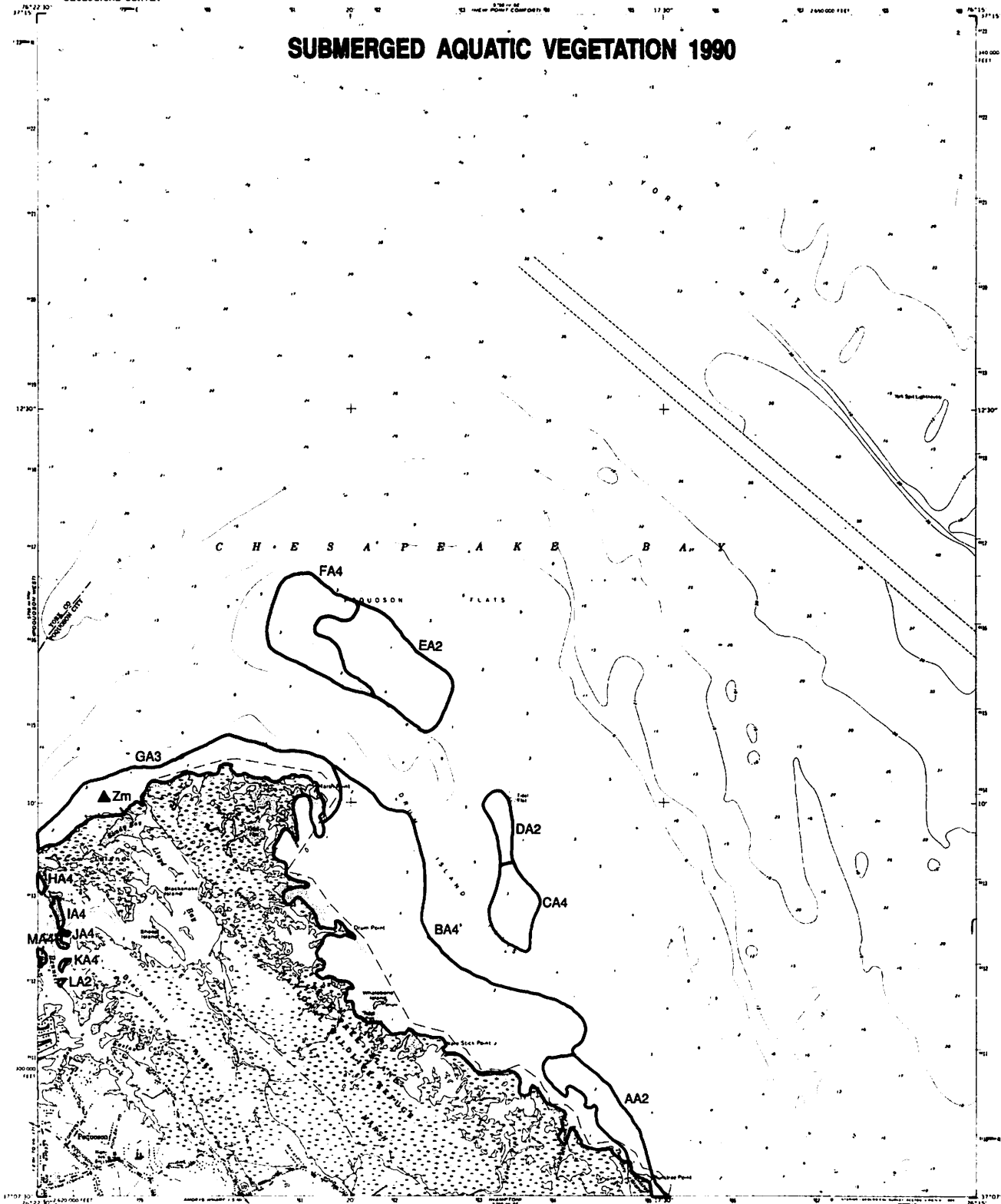
▲	VIMS Field Survey
✱	Harford Community College
✱	University MD-HPEL
★	USF & WS Survey
●	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR

DATE FLOWN
6-1-90
**POQUOSON
WEST, VA
140**



VIRGINIA INSTITUTE
OF MARINE SCIENCE

SUBMERGED AQUATIC VEGETATION 1990

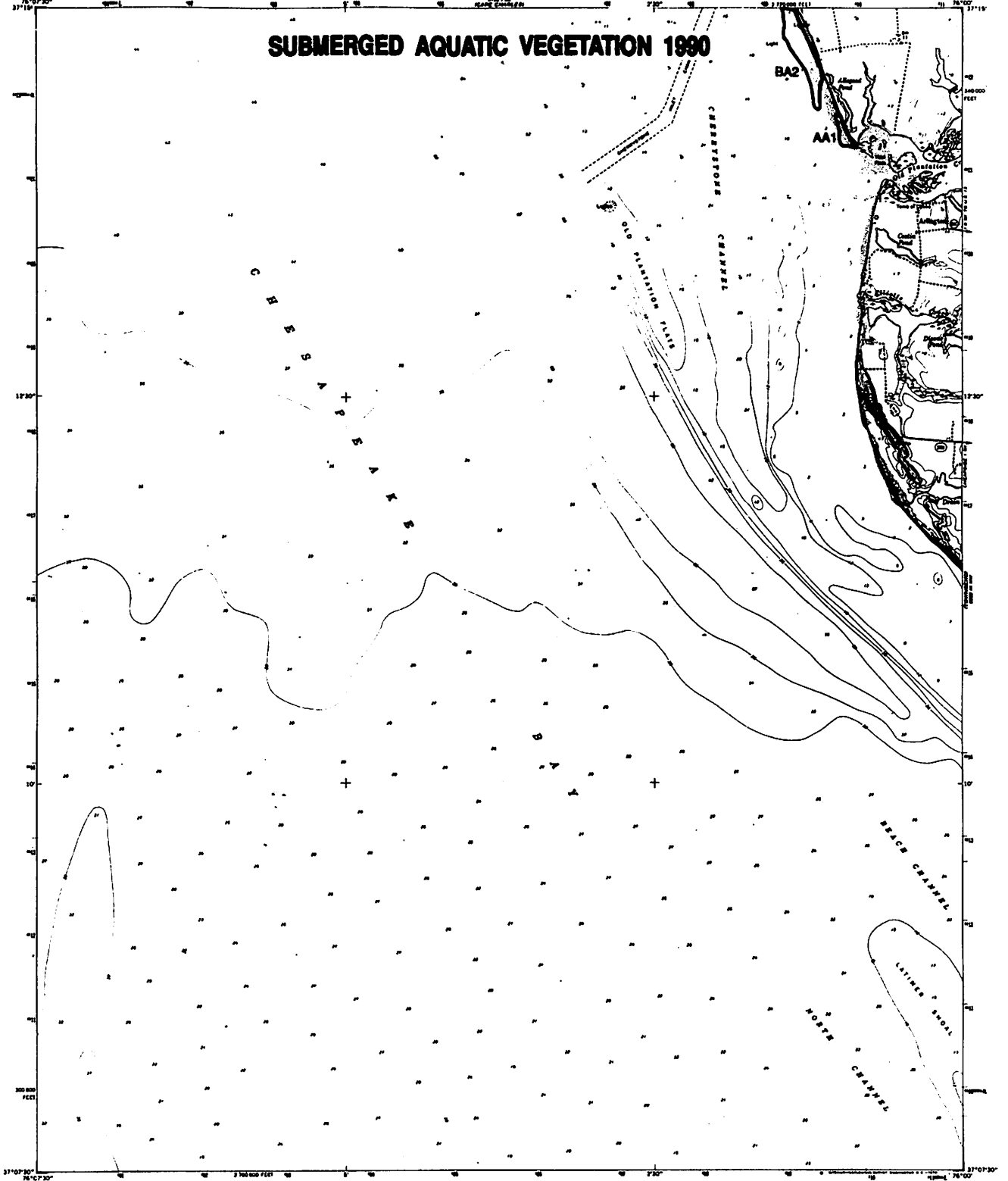


SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✱	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✱	University MD-HPCL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	★	Council of Governments
Zp	<i>Zernichellia palustris</i> (horned pondweed)	■	MD Charter Boat Field Survey
N	<i>Nejtes</i> spp. (naiad)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Vallisneria spiralis</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
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>Nejtes guadalupensis</i> (southern naiad)		
Ngr	<i>Nejtes gracillima</i> (naiad)		
C	<i>Chara</i> sp. (muskgrass)		
Nm	<i>Nejtes minor</i> (slender naiad)		

DATE FLOWN
6-1-90
**POQUOSON
EAST, VA
141**

VIRGINIA INSTITUTE
OF MARINE SCIENCE

SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	Hv	<i>Hydrilla verticillata</i> (hydrilla)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	Hd	<i>Heteranthera dubia</i> (water stargrass)	✳	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr	<i>Potamogeton crispus</i> (curly pondweed)	✳	University MD-HPEL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	Cd	<i>Ceratophyllum demersum</i> (coontail)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	Ppu	<i>Potamogeton puerilis</i> (slender pondweed)	★	Council of Governments
Zp	<i>Zannichella peltata</i> (horned pondweed)	Ngu	<i>Najas guadalupensis</i> (southern naited)	■	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (naited)	Ngr	<i>Najas gracillima</i> (naited)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	C	<i>Carex</i> sp. (mudgrass)	●	MD-DNR
Va	<i>Vallisneria spiralis</i> (wild celery)	Nm	<i>Najas minor</i> (slender naited)		
Tr	<i>Trapa natans</i> (water chestnut)				
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)				
U	Unknown species composition				

SCALE 1:24,000

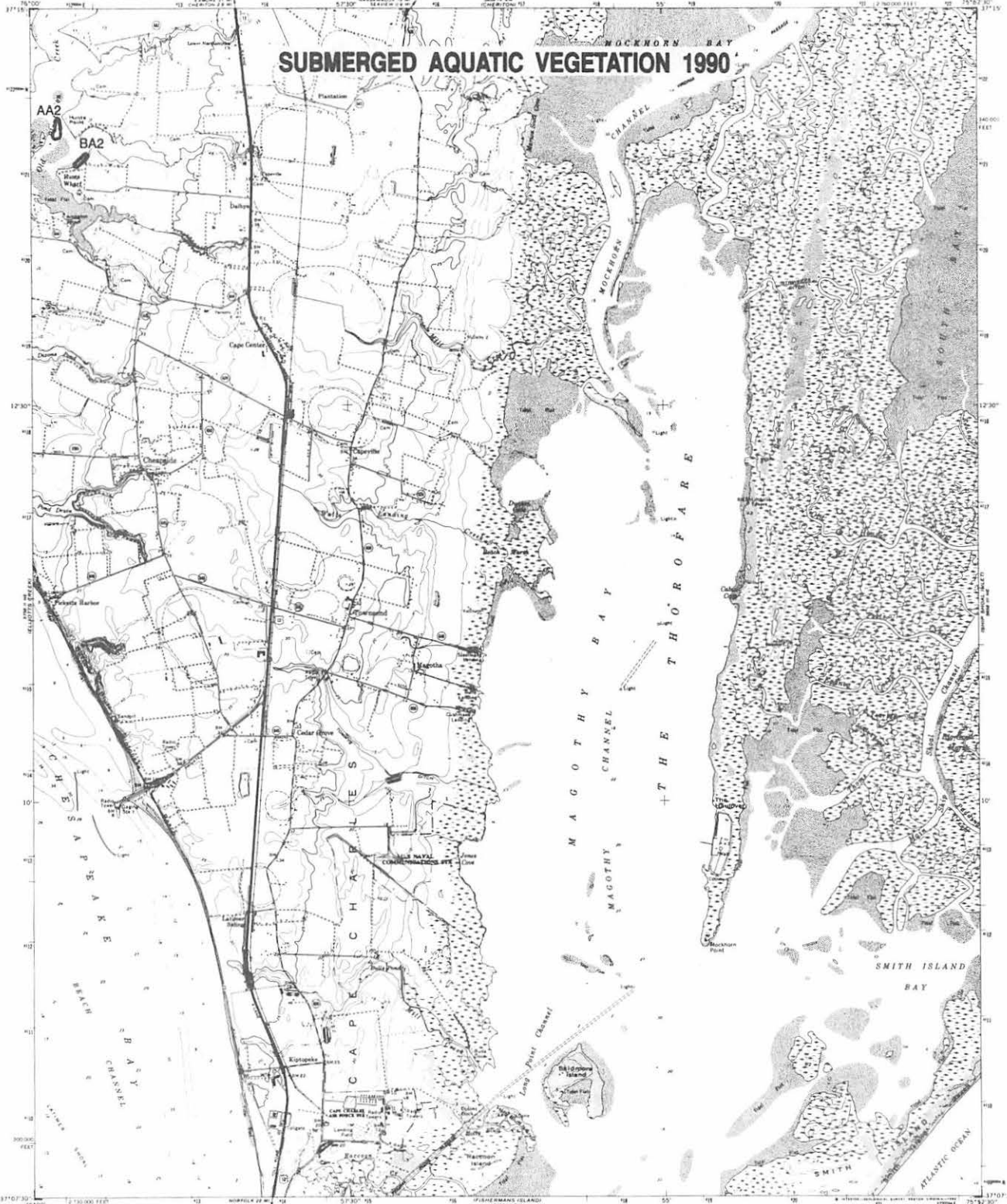
1 2 3 4 5 6 7 8 9 10 11 12 METERS

1 2 3 4 5 6 7 8 9 10 11 12 KILOMETERS

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
5-23-90
ELLIOTT'S
CREEK, VA
142

SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
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)	Ng	<i>Najas guadalupensis</i> (southern nald)
N	<i>Najas</i> spp. (nald)	Ngr	<i>Najas gracillima</i> (nald)
Ec	<i>Elodea canadensis</i> (common elodea)	C	<i>Chara</i> sp. (muskrass)
Va	<i>Vallisneria americana</i> (wild celery)	Nm	<i>Najas minor</i> (slender nald)
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
U	Unknown species composition		

▲	VIMS Field Survey
✱	Harford Community College
✱	University MD-HPEL
★	USF & WS Survey
●	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR

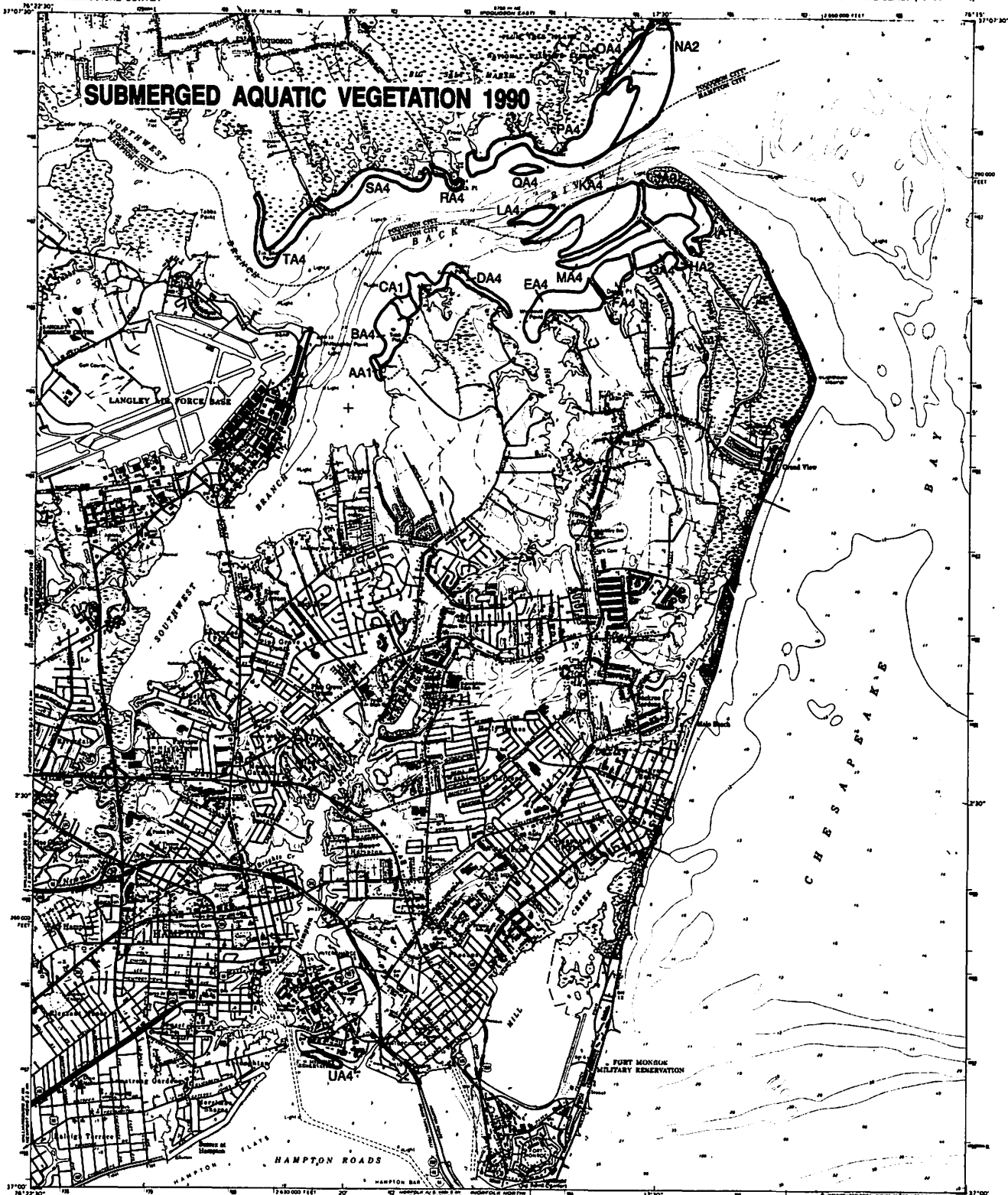
SCALE 1:24,000

1 MILE / 1 KILOMETER

DATE FLOWN
5-23-90
TOWNSEND,
VA
143

VIRGINIA INSTITUTE
OF MARINE SCIENCE

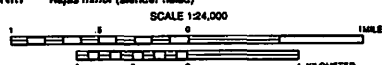
SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
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)	Ngv	<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. (muskgrass)
Va	<i>Vallisneria spiralis</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapezium natans</i> (water chestnut)		
Pe	<i>Potamogeton epiphyllus</i> (leafy pondweed)		
U	Unknown species composition		

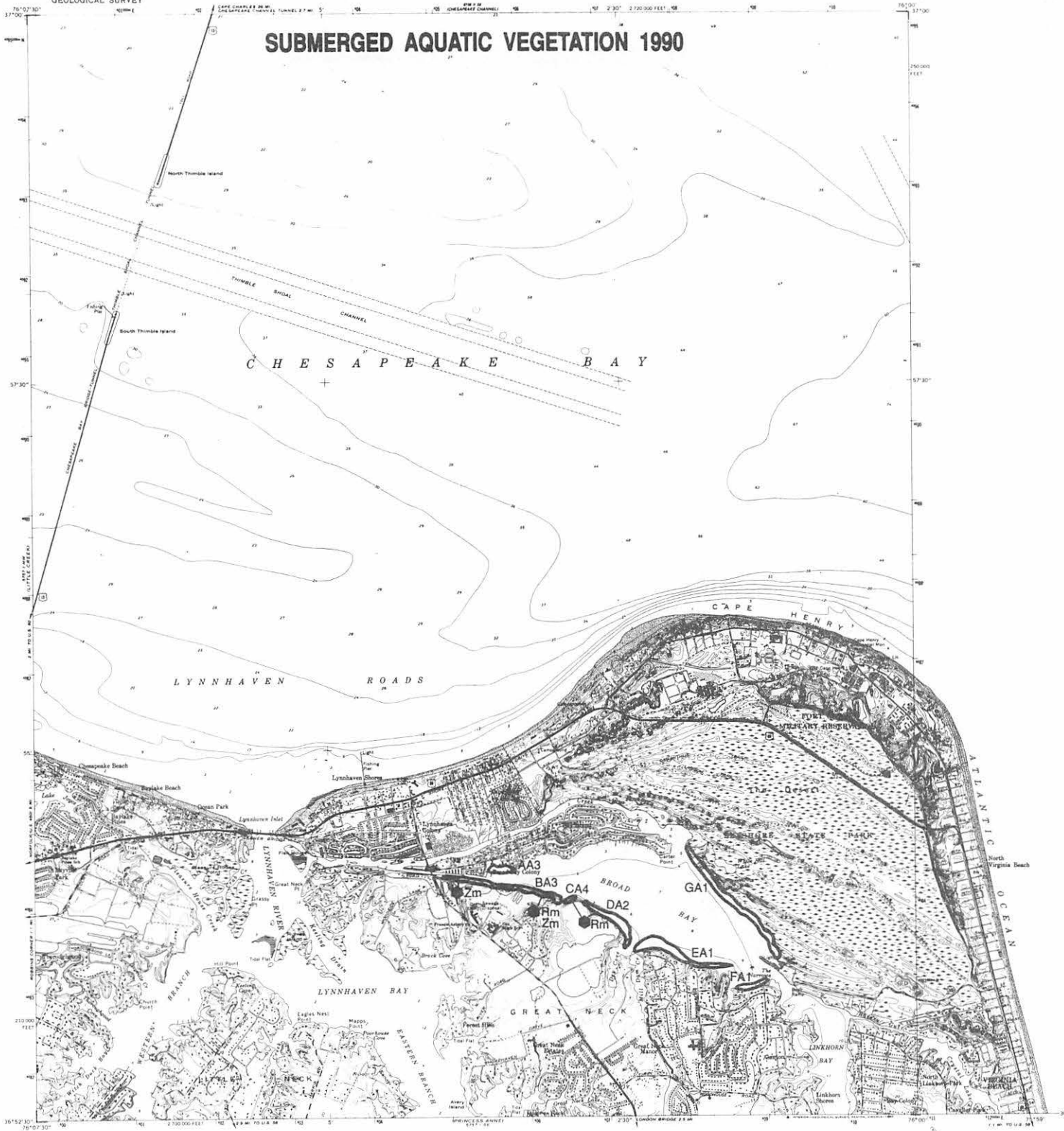
SURVEY STATIONS	
▲	VIMS Field Survey
✳	Harford Community College
✳	University MD-HPEL
★	USF & WS Survey
●	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR

DATES FLOWN
6-1-90
HAMPTON, VA
147



VIRGINIA INSTITUTE
OF MARINE SCIENCE

SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
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)
Ppu	<i>Potamogeton pectinatus</i> (sago pondweed)	Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)	Ng	<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. (muskgrass)
Va	<i>Vallisneria spiralis</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
U	Unknown species composition		

▲	VIMS Field Survey
✱	Harford Community College
✱	University MD-HPCL
★	USF & WS Survey
♥	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR

SCALE 1:24,000

1 5 10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 FEET

1 0.5 1 1.5 2 KILOMETER

DATE FLOWN
6-13-90
CAPE HENRY, VA
152

VIRGINIA INSTITUTE
OF MARINE SCIENCE



SPECIES		SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	Hv	<i>Hydrilla verticillata</i> (hydrilla)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	Hd	<i>Heteranthera dubia</i> (water stargrass)	✳	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr	<i>Potamogeton crispus</i> (curly pondweed)	✳	University MD-HPEL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	Cd	<i>Ceratophyllum demersum</i> (coontail)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	Ppu	<i>Potamogeton pusillus</i> (slender pondweed)	●	Council of Governments
Zp	<i>Zannichellia palustris</i> (horned pondweed)	NgU	<i>Najas guadalupensis</i> (southern nald)	■	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (nald)	Ngr	<i>Najas gracillima</i> (nald)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	C	<i>Chara</i> sp. (muskgrass)	●	MD-DNR
Va	<i>Vallisneria spiralis</i> (wild celery)	Nm	<i>Najas minor</i> (slender nald)		
Tn	<i>Trapezium natans</i> (water chestnut)				
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)				
U	Unknown species composition				

SCALE 1:24,000

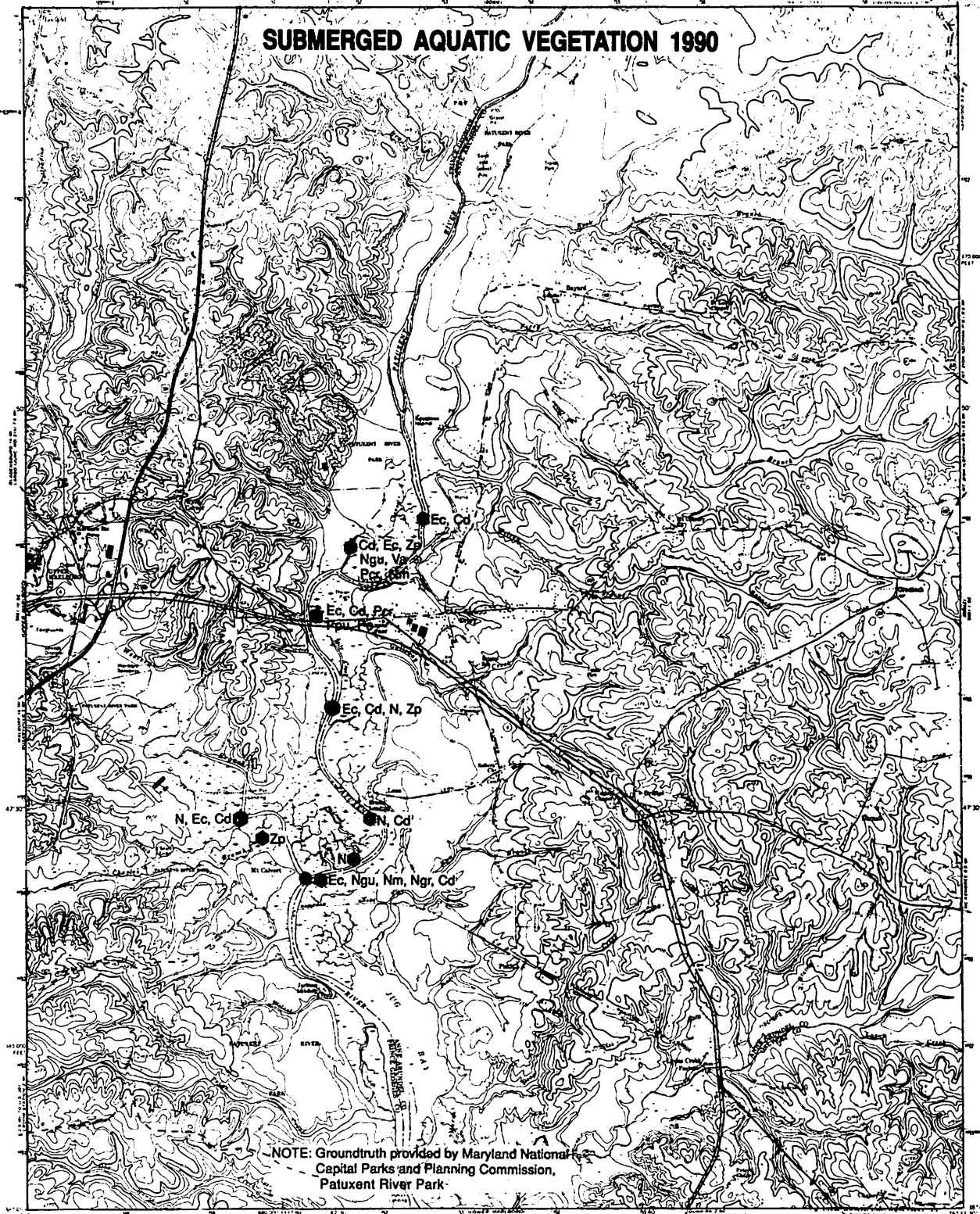
1 MILE
1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

DATE FLOWN
6-13-90
PRINCESS ANNE,
VA
157



SUBMERGED AQUATIC VEGETATION 1990



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. (nail)
Ec	<i>Elodea canadensis</i> (common elodea)
Va	<i>Vallisneria spiralis</i> (wild celery)
Tn	<i>Trapa natans</i> (water chestnut)
Pe	<i>Potamogeton ephedrus</i> (tasty pondweed)
U	Unknown species composition

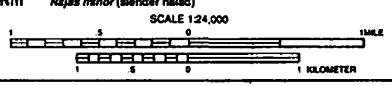
Hv	<i>Hydrilla verticillata</i> (hydrilla)
Hd	<i>Heteranthera dubia</i> (water stargrass)
Pcr	<i>Potamogeton crispus</i> (curly pondweed)
Cd	<i>Carotophyllum demersum</i> (coontail)
Ppu	<i>Potamogeton pusillus</i> (slender pondweed)
Ngu	<i>Najas guedehupensis</i> (southern nail)
Ngr	<i>Najas gracillima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

SURVEY STATIONS

- ▲ VIMS Field Survey
- ✱ Harford Community College
- ✱ University MD-HPPEL
- ★ USF & WS Survey
- Council of Governments
- MD Charter Boat Field Survey
- Citizens Field Observation
- MD-DNR

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8-1-90
**BRISTOL,
MD
159**





SUBMERGED AQUATIC VEGETATION 1990

SPECIES		SURVEY STATIONS	
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 puzosii</i> (slender pondweed)
Zp	<i>Zannichellia palustris</i> (horned pondweed)	Ngv	<i>Najas guadalupensis</i> (southern naiad)
N	<i>Najas</i> spp. (naiad)	Ngf	<i>Najas gracillima</i> (naiad)
Ec	<i>Elodea canadensis</i> (common elodea)	C	<i>Carex</i> sp. (muskgrass)
Va	<i>Vallisneria spiralis</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
U	Unknown species composition		

▲	VIMS Field Survey
★	Harford Community College
✱	University MD-HPEL
☆	USF & WS Survey
●	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR

SCALE 1:24,000

1 5 10 15 20 MILE

1 5 10 15 20 KILOMETER

DATES FLOWN
8-13-90
**PORT
TOBACCO, MD**
161

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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>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>Zannichetia peltustris</i> (horned pondweed)	Ngv	<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. (muskgrass)
Va	<i>Vallisneria spiralis</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)
Tn	<i>Trapa nasuta</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
U	Unknown species composition		

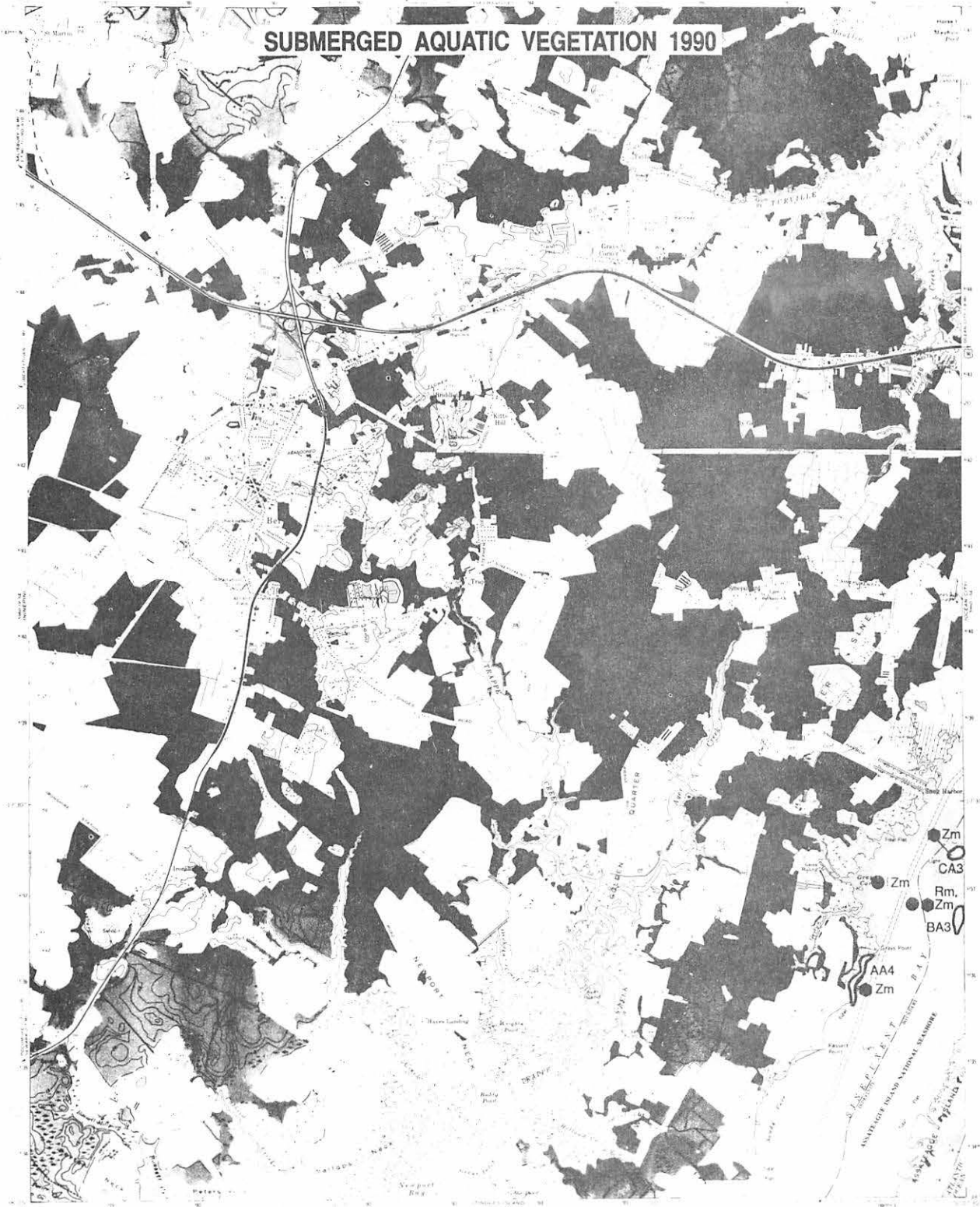
▲	VIMS Field Survey
✱	Harford Community College
✱	University MD-HPCL
★	USF & WS Survey
●	Council of Governments
■	MD Charter Boat Field Survey
●	Citizens Field Observation
●	MD-DNR

SCALE 1:24,000

1 MILE / 1 KILOMETER

DATE FLOWN
6-13-80
**ASSAWOMAN BAY,
MD
166**

SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	Hv	<i>Hydrilla verticillata</i> (hydrilla)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	Hd	<i>Heteranthera dubia</i> (water stargrass)	✱	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	Pcr	<i>Potamogeton crispus</i> (curly pondweed)	✱	University MD-HPEL
Ppf	<i>Potamogeton pectinatus</i> (redhead-grass)	Cd	<i>Ceratophyllum demersum</i> (coontail)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	Ppu	<i>Potamogeton pusillus</i> (slender pondweed)	☐	Council of Governments
Zp	<i>Zannichellia palustris</i> (horned pondweed)	Ngu	<i>Najas guadalupensis</i> (southern naiad)	☐	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (naiad)	Ngr	<i>Najas gracillima</i> (naiad)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	C	<i>Chara</i> sp. (muskgrass)	●	MD-DNR
Va	<i>Vallisneria spiralis</i> (wild celery)	Nm	<i>Najas minor</i> (slender naiad)		
Tn	<i>Trapa natans</i> (water chestnut)				
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)				
U	Unknown species composition				

SCALE 1:24,000

1 5 0 1 MILE
1 5 0 1 KILOMETER

VIRGINIA INSTITUTE OF MARINE SCIENCE

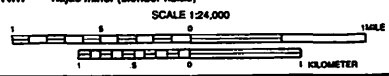
DATE FLOWN
6-13-90
BERLIN,
MD
167

SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✱	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✱	University MD-HPEL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	●	Council of Governments
Zp	<i>Zannichellia palustris</i> (horned pondweed)	■	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (nailad)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Vb	<i>Vallisneria spiralis</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leaky pondweed)		
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 nailad)		
Ngr	<i>Najas gracillima</i> (nailad)		
C	<i>Chara</i> sp. (muskgrass)		
Nm	<i>Najas minor</i> (slender nailad)		

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6-13-90
**OCEAN CITY,
MD
168**



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SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✱	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	✱	University MD-HPLE
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	★	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	●	Council of Governments
Zp	<i>Zannichellia peltata</i> (horned pondweed)	■	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (nailad)	●	Citizens Field Observation
Ngr	<i>Najas gracillima</i> (nailad)	●	MD-DNR
Ec	<i>Elodea canadensis</i> (common elodea)		
Va	<i>Vallisneria spiralis</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (leafy pondweed)		
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 nailad)		
C	<i>Chara</i> sp. (muskgrass)		
Nm	<i>Najas minor</i> (slender nailad)		

SCALE 1:24,000

1 KILOMETER

DATE FLOWN
6-13-90
TINGLES ISLAND,
MD
170

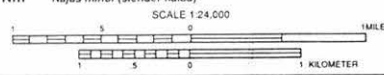
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OF MARINE SCIENCE

SUBMERGED AQUATIC VEGETATION 1990



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

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

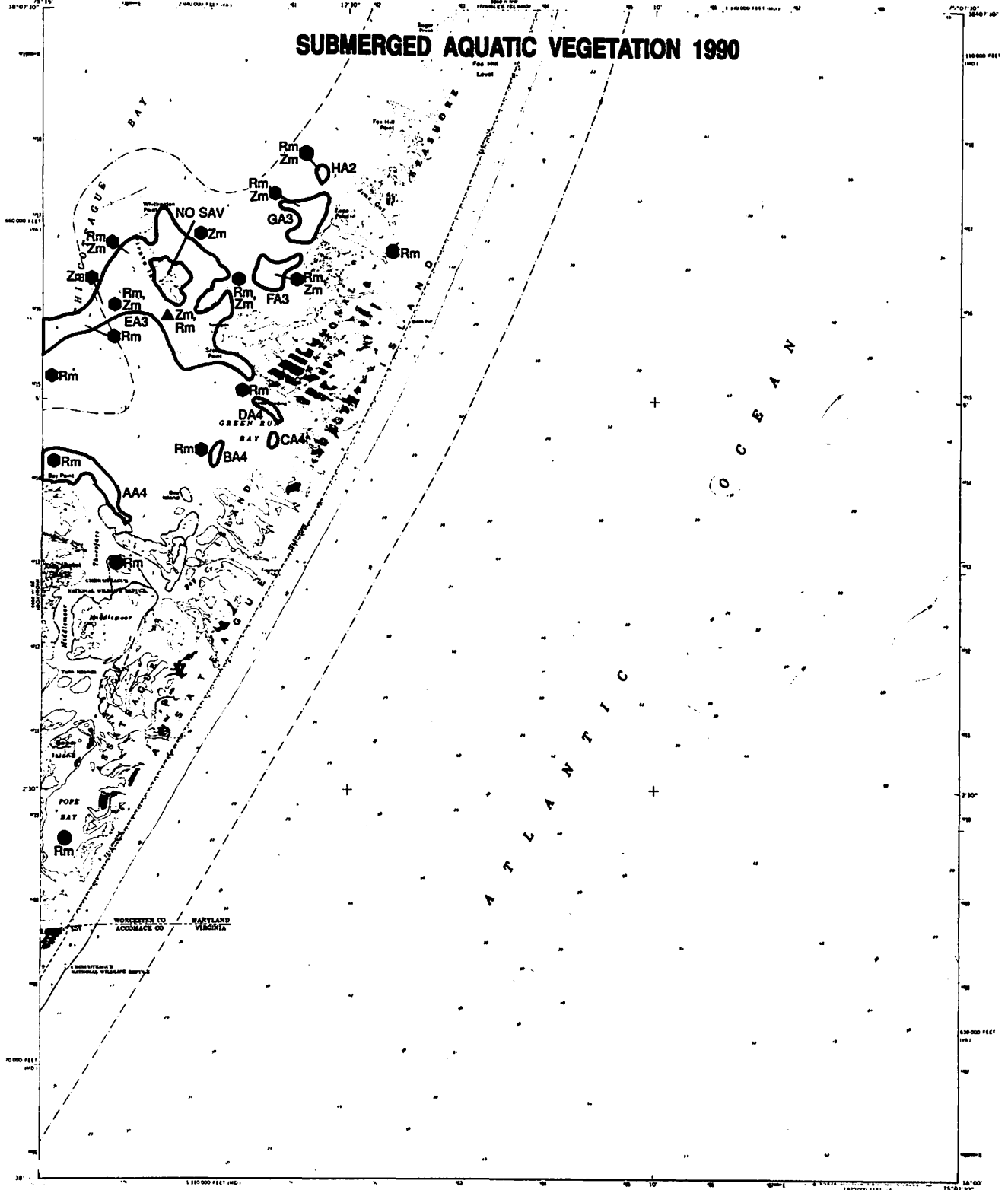


- SURVEY STATIONS**
- ▲ VIMS Field Survey
 - ✱ Harford Community College
 - ✱ University MD-HPEL
 - ★ USF & WS Survey
 - Council of Governments
 - MD Charter Boat Field Survey
 - Citizens Field Observation
 - MD-DNR

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6-13-90
**BOXIRON,
MD-VA
172**

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SUBMERGED AQUATIC VEGETATION 1990



SPECIES		SURVEY STATIONS	
Zm	<i>Zostera marina</i> (eelgrass)	▲	VIMS Field Survey
Rm	<i>Ruppia maritima</i> (widgeon grass)	✱	Harford Community College
Ms	<i>Myriophyllum spicatum</i> (Eurasian watermilfoil)	★	University MD-HPEL
Ppf	<i>Potamogeton perfoliatus</i> (redhead-grass)	☆	USF & WS Survey
Ppc	<i>Potamogeton pectinatus</i> (sago pondweed)	●	Council of Governments
Zp	<i>Zannichellia palustris</i> (horned pondweed)	■	MD Charter Boat Field Survey
N	<i>Najas</i> spp. (naked)	●	Citizens Field Observation
Ec	<i>Elodea canadensis</i> (common elodea)	●	MD-DNR
Va	<i>Vallisneria spiralis</i> (wild celery)		
Tn	<i>Trapa natans</i> (water chestnut)		
Pe	<i>Potamogeton ephedrus</i> (teasy pondweed)		
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)		
Ngv	<i>Najas guadalupensis</i> (southern naiad)		
Ngr	<i>Najas gracilima</i> (naiad)		
C	<i>Chara</i> sp. (muskgrass)		
Nm	<i>Najas minor</i> (slender naiad)		

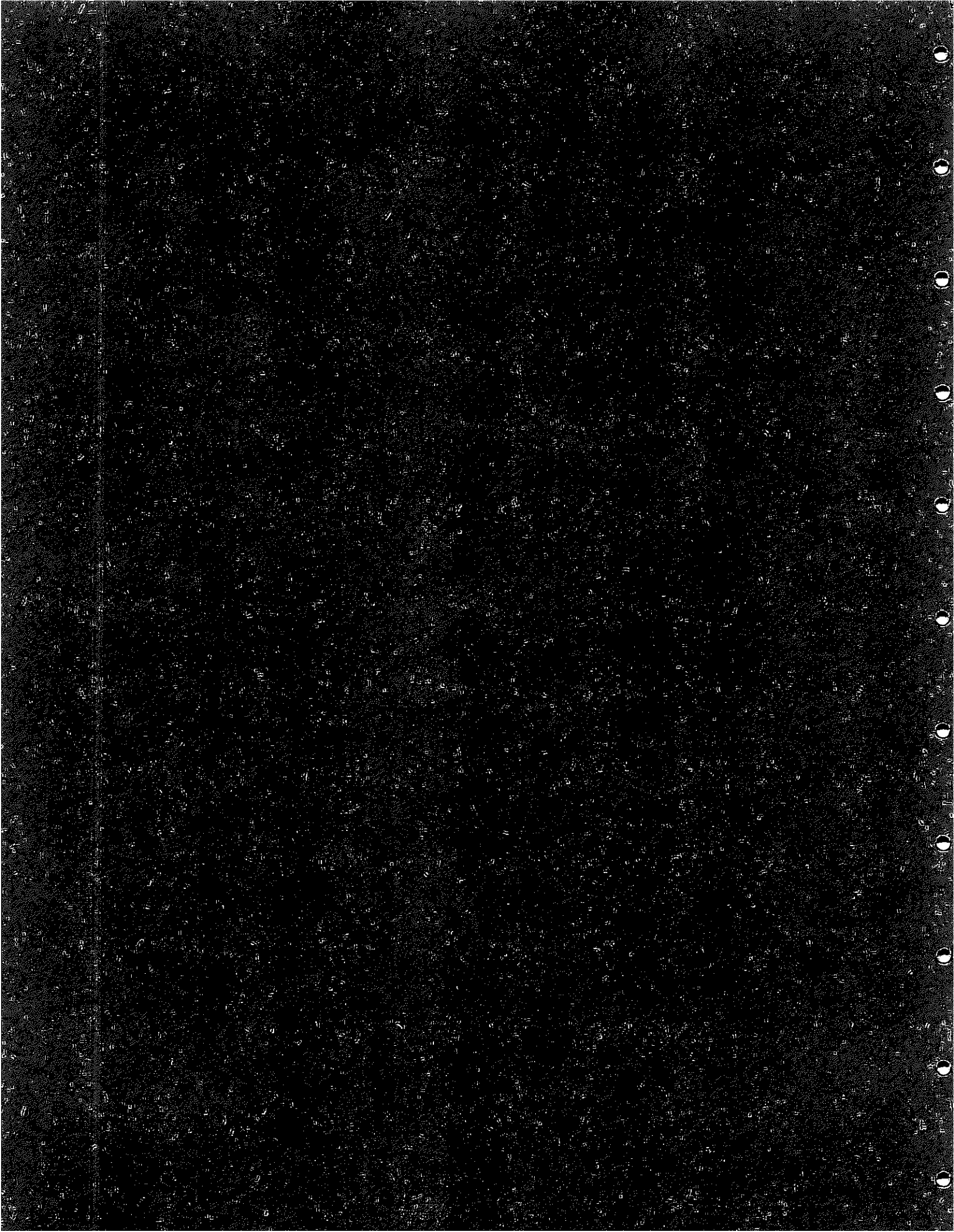
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6-13-90
**WHITTINGTON
POINT, MD-VA**
173

APPENDIX D

1990 SAV Bed Areas And Density Totals For Each Topographic
Quadrangle.



APPENDIX D

Number Of Square Meters Of SAV In 1990 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 Map Number. Slight Differences In Totals From Tables 4, 5, and 6 Are Due To Rounding.)

**ABERDEEN, MD.
VIMS MAP # 002**

AA3	5417
BA3	1961
CA3	742
DA3	1953
EA3	3676
FA3	7492

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	0
DENSITY 3 =	21241
DENSITY 4 =	0

TOTAL = 21241

**HAVRE DE GRACE, MD.
VIMS MAP # 003**

AA2	5845
BA2	29621
CA1	17996
DA2	314623
EA1	14962508
FA1	1557
GA2	3709
HA2	41436
IA3	2048
JA4	44308
KA2	2984
LA4	79217
MA4	160848
NA3	45773
OA2	116034
PA1	953472
QA4	9530

RA1	193657
SA4	222949
TA3	2882
UA4	9866
VA4	8999
WA4	5523
XA4	3540
YA3	937
ZA3	2657
AB2	16819
BB3	50806
CB4	11395
DB4	29607
EB4	5657
FB4	16800
GB4	2156
HB4	3161
IB4	169279
JB4	2682
KB4	7559
LB4	4054
MB3	77917
NB4	4987
OB4	3176
PB3	9119
QB3	3682
RB3	9813
SB2	1177
TB4	27927

TOTAL AREA

DENSITY 1 =	16129190
DENSITY 2 =	532248
DENSITY 3 =	205634
DENSITY 4 =	833220

TOTAL = 17700292

NORTH EAST, MD.
VIMS MAP # 004

AA2	45001
BA2	100212
CA2	80480
DA2	838265
EA1	45899
FA2	34310
GA2	159443
HA2	163284

TOTAL AREA

DENSITY 1 =	45899
DENSITY 2 =	1420995
DENSITY 3 =	0
DENSITY 4 =	0
TOTAL =	1466894

ELKTON, MD.-DEL.
VIMS MAP # 005

AA2	384482
BA2	11417

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	395899
DENSITY 3 =	0
DENSITY 4 =	0
TOTAL =	395899

SPEUTIE, MD.
VIMS MAP # 009

AA2	27581
BA2	189570
CA2	108398
DA1	166198
EA2	13285
FA2	4442

TOTAL AREA

DENSITY 1 =	166198
DENSITY 2 =	343276
DENSITY 3 =	0
DENSITY 4 =	0
TOTAL =	509474

EARLEVILLE, MD.
VIMS MAP # 010

AA2	55211
BA2	30277
CA2	5231
DA1	22433
EA2	12051
FA2	18184
GA1	126865
HA2	278450
IA2	1051871
JA1	68604

TOTAL AREA

DENSITY 1 =	217902
DENSITY 2 =	1451275
DENSITY 3 =	0
DENSITY 4 =	0
TOTAL =	1669177

MIDDLE RIVER, MD.
VIMS MAP # 013

AA3	6933
-----	------

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	0
DENSITY 3 =	6933
DENSITY 4 =	0
TOTAL =	6933

GUNPOWDER NECK, MD.
VIMS MAP # 014

AA2	4523
BA2	4884
CA2	4378
DA2	10807
EA2	7787
FA3	29324
GA2	19262
HA3	194422
IA1	10345
JA3	941
KA3	77083
LA3	61203
MA3	10017
NA3	3471
OA3	187544
PA4	271498

TOTAL AREA

<hr/>	
DENSITY 1 =	10345
DENSITY 2 =	51641
DENSITY 3 =	564005
DENSITY 4 =	271498
TOTAL =	897489

HANESVILLE, MD.
VIMS MAP # 015

AA2	11467
BA3	5536
CA2	46323

TOTAL AREA

<hr/>	
DENSITY 1 =	0
DENSITY 2 =	57790
DENSITY 3 =	5536
DENSITY 4 =	0
TOTAL =	63326

BETTERTON, MD.
VIMS MAP # 016

AA2	30264
BA2	2105
CA2	9934

TOTAL AREA

<hr/>	
DENSITY 1 =	0
DENSITY 2 =	42303
DENSITY 3 =	0
DENSITY 4 =	0
TOTAL =	42303

GAI.ENA, MD.
VIMS MAP # 017

AA2	74175
BA1	5178

TOTAL AREA

<hr/>	
DENSITY 1 =	5178
DENSITY 2 =	74175
DENSITY 3 =	0
DENSITY 4 =	0
TOTAL =	79353

SWAN POINT, MD.
VIMS MAP # 020

AA2	28482
BA2	14435
CA1	7652
DA2	3610
EA2	3519
FA1	6960

TOTAL AREA

<hr/>	
DENSITY 1 =	14612
DENSITY 2 =	50046

DENSITY 3 = 0
 DENSITY 4 = 0

TOTAL = 64658

ROCK HALL, MD.
 VIMS MAP # 021

BA3 7156
 CA3 28644
 DA3 9206
 EA3 23929
 FA4 4354
 GA2 42517
 AA2 4197

TOTAL AREA

DENSITY 1 = 0
 DENSITY 2 = 46714
 DENSITY 3 = 68935
 DENSITY 4 = 4354

TOTAL = 120003

LANGFORD CREEK, MD.
 VIMS MAP # 026

AA2 23829
 BA3 1009
 CA1 3052
 DA3 116525
 EA1 2248
 FA1 8719
 GA3 47056
 HA1 31841
 IA2 2545
 JA4 14261
 KA2 2931
 LA3 89791
 MA1 13168
 NA2 2799
 OA2 7562
 PA1 10637
 QA1 44485
 RA3 55435

TOTAL AREA

DENSITY 1 = 114150
 DENSITY 2 = 39666
 DENSITY 3 = 309816
 DENSITY 4 = 14261

TOTAL = 477893

KENT ISLAND, MD.
 VIMS MAP # 032

AA2 198425
 BA4 24113
 CA1 242991
 DA1 65018
 EA4 23411
 FA2 195611
 GA1 16132
 HA1 65399
 IA2 13374
 JA2 26198
 KA1 18971
 LA2 19673
 MA2 7946
 NA2 236690
 OA2 13150
 PA2 41358
 QA1 121448

TOTAL AREA

DENSITY 1 = 529959
 DENSITY 2 = 752425
 DENSITY 3 = 0
 DENSITY 4 = 47524

TOTAL = 1329908

QUEENSTOWN, MD.
 VIMS MAP # 033

AA2 28594
 BA2 290558
 CA1 52783
 DA1 35301
 EA2 127648

FA2	6421
GA2	9551
HA2	5770

TOTAL AREA

DENSITY 1 =	88084
DENSITY 2 =	468542
DENSITY 3 =	0
DENSITY 4 =	0

TOTAL = 556626

ALEXANDRIA, VA.-D.C.-MD.
VIMS MAP # 034

AA3	51534
BA3	4720
FA2	1192028
GA4	128434
HA2	5785
IA2	18455
JA2	4437
KA4	11462
LA3	34200
MA2	3603
NA3	10042
OA2	21854
PA2	5745
QA2	9209
RA3	16163
SA1	176193
TA3	99115
UA4	30293
VA2	3530
WA2	5823
XA3	24024
YA2	17006
ZA4	25925
AB4	32812
BB4	976595
CB4	36462
DB4	4200
EB4	5194
FB2	5707
GB3	168453
HB4	521114

IB4	49705
JB2	54935
KB4	44352
LB3	157204
CA3	4392
DA3	8879
EA2	25800

TOTAL AREA

DENSITY 1 =	176193
DENSITY 2 =	1373917
DENSITY 3 =	578726
DENSITY 4 =	1866548

TOTAL = 3995384

CLAIBORNE, MD.
VIMS MAP # 036

AA3	447400
BA1	50674
CA3	319089
DA2	5938
EA2	169332
FA3	10967
GA2	17267
HA2	122958
IA3	111437
JA1	77686
KA2	4287
LA2	20766
MA2	32654

TOTAL AREA

DENSITY 1 =	128360
DENSITY 2 =	373202
DENSITY 3 =	888893
DENSITY 4 =	0

TOTAL = 1390455

ST. MICHAELS, MD.
VIMS MAP # 037

AA2	77957
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BA2	31281
CA2	78893
DA2	163662
EA1	121941
FA2	153007

TOTAL AREA

DENSITY 1 =	121941
DENSITY 2 =	504800
DENSITY 3 =	0
DENSITY 4 =	0

TOTAL = 626741

FORT BELVOIR, VA.-MD.
VIMS MAP # 039

AA4	19355
BA4	98146
CA1	53343
DA3	163198
EA2	64021
FA1	416321
GA3	115505
HA4	52906
IA4	3825
JA4	60684
KA4	3274

TOTAL AREA

DENSITY 1 =	469664
DENSITY 2 =	64021
DENSITY 3 =	278703
DENSITY 4 =	238190

TOTAL = 1050578

MT. VERNON, VA.-MD.
VIMS MAP # 040

CA1	50991
DA4	40482
EA3	23202
FA3	77700
GA3	7952

HA4	197157
IA2	94995
JA4	148010
KA2	33969
LA4	48170
MA4	3051
NA4	40056
OA2	15310
PA2	5982
QA3	4267
RA2	23086
SA2	8540
TA4	21227
UA4	17924
VA3	73647
WA2	441880
XA4	16457
YA2	181493
ZA4	79038
AA4	334251
BA4	1593704

TOTAL AREA

DENSITY 1 =	50991
DENSITY 2 =	805255
DENSITY 3 =	186768
DENSITY 4 =	2539527

TOTAL = 3582541

TILGHMAN, MD.
VIMS MAP # 043

AA3	35901
BA3	23423
CA3	7224
DA3	32058
EA3	4129
FA3	7832
GA3	7560

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	0
DENSITY 3 =	118127

DENSITY 4 = 0
 TOTAL = 118127

OXFORD, MD.
 VIMS MAP # 044

AA3 14770
 BA2 26432
 CA3 61295
 DA2 13725
 EA3 48211
 FA3 15891
 GA3 12382

TOTAL AREA

DENSITY 1 = 0
 DENSITY 2 = 40157
 DENSITY 3 = 152549
 DENSITY 4 = 0
 TOTAL = 192706

QUANTICO, VA.-MD.
 VIMS MAP # 047

AA4 1136371
 BA4 811966
 CA4 101746
 DA4 139665
 EA4 496555
 FA4 1158295
 GA4 2582673
 HA4 332762
 IA4 180070

TOTAL AREA

DENSITY 1 = 0
 DENSITY 2 = 0
 DENSITY 3 = 0
 DENSITY 4 = 6940103
 TOTAL = 6940103

INDIAN HEAD, MD.-VA.
 VIMS MAP # 048

AA3 123864
 BA4 1770423
 CA1 27497
 DA3 70063
 EA3 56469
 FA4 35935
 GA4 295472
 HA4 18693
 IA4 63837
 JA2 208580
 KA4 90992
 LA3 67228
 MA4 207648

TOTAL AREA

DENSITY 1 = 27497
 DENSITY 2 = 208580
 DENSITY 3 = 317624
 DENSITY 4 = 2483000

TOTAL = 3036701

HUDSON, MD.
 VIMS MAP # 051

AA2 58603
 BA3 5094
 CA3 44080
 DA4 13488
 EA3 24492
 FA3 4152
 GA3 223870
 HA3 5513
 IA3 37324
 JA3 6591
 KA3 45497
 LA3 6298
 MA3 23699
 NA2 210110
 OA3 69393
 PA3 189637

TOTAL AREA

DENSITY 1 = 0
DENSITY 2 = 268713
DENSITY 3 = 685640
DENSITY 4 = 13488
TOTAL = 967841

CHURCH CREEK, MD.
VIMS MAP # 052

AA3 57766
BA3 6790

TOTAL AREA

DENSITY 1 = 0
DENSITY 2 = 0
DENSITY 3 = 64556
DENSITY 4 = 0
TOTAL = 64556

WIDEWATER, VA.-MD.
VIMS MAP # 055

AA3 536737
BA3 181255
CA3 50042
DA1 956228
EA2 71767
FA4 666861
GA2 451771
HA4 2609258
IA4 428393
JA4 141004
KA4 52082

TOTAL AREA

DENSITY 1 = 956228
DENSITY 2 = 523538
DENSITY 3 = 768034
DENSITY 4 = 3897598
TOTAL = 6145398

NANJEMOY, MD.
VIMS MAP # 056

AA4 407300
BA4 29057
CA4 15337
DA4 4908
EA4 14348
FA4 25938
GA4 7693
HA3 20311
IA4 51781
KA4 11600
LA4 5920
MA3 23847
NA2 2963
JA4 37866
OA4 30959
PA3 19469
QA2 43861
RA4 22276
SA2 48025
TA3 118790
UA4 277163
VA3 47894

TOTAL AREA

DENSITY 1 = 0
DENSITY 2 = 94849
DENSITY 3 = 230311
DENSITY 4 = 942146
TOTAL = 1267306

MATHIAS POINT, MD.-VA.
VIMS MAP # 057

AA2 301261
BA2 69546
CA3 315248
DA2 51063
EA3 21329
FA4 92416
GA2 151424
HA4 149256
IA2 10036

JA4	39952
KA4	63514
LA3	27283
MA4	112283
NA2	152610
OA3	641704
PA2	194200
QA2	44768
RA4	78312
SA2	4098
TA3	2367
UA3	2678
VA3	3508
WA3	8838
XA2	3985
YA2	5025
ZA2	10886
AB2	7841
BB2	21828
CB3	32631
DB2	4744
EB4	36621
FB4	122831
GB4	20933
HB2	48536

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	1081851
DENSITY 3 =	1055586
DENSITY 4 =	716118

TOTAL = 2853555

POPES CREEK, MD.
VIMS MAP # 058

AA2	27012
BA3	21632

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	27012
DENSITY 3 =	21632

DENSITY 4 = 0

TOTAL = 48644

TAYLORS ISLAND, MD.
VIMS MAP # 062

AA2	61414
BA2	6892
CA2	5361
DA2	13249
EA2	7429
FA2	9339
GA1	23403
HA2	103967
IA3	2333
JA3	35131
KA4	129510
LA4	27451
MA4	158647

TOTAL AREA

DENSITY 1 =	23403
DENSITY 2 =	207651
DENSITY 3 =	37464
DENSITY 4 =	315608

TOTAL = 584126

GOLDEN HILL, MD.
VIMS MAP # 063

AA3	2763
BA3	3553
CA1	12045
DA3	4380
EA2	17787

TOTAL AREA

DENSITY 1 =	12045
DENSITY 2 =	17787
DENSITY 3 =	10696
DENSITY 4 =	0

TOTAL = 40528

KING GEORGE, VA.-MD.
VIMS MAP # 065

AA2	20934
BA4	174638
CA3	87626
DA2	97671
EA4	149612

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	118605
DENSITY 3 =	87626
DENSITY 4 =	324250

TOTAL = 530481

DAHLGREN, VA.-MD.
VIMS MAP # 066

AA3	7704
BA2	8389
CA3	50685
DA3	6001
EA3	2532
FA1	154857
GA2	196204
HA3	73718
IA2	16459

TOTAL AREA

DENSITY 1 =	154857
DENSITY 2 =	221052
DENSITY 3 =	140640
DENSITY 4 =	0

TOTAL = 516549

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

AA4	45345
BA3	47524
CA3	18026

DA3	21199
EA1	67161
FA2	11167
GA2	41324
HA3	199938
IA3	7173

TOTAL AREA

DENSITY 1 =	67161
DENSITY 2 =	52491
DENSITY 3 =	293860
DENSITY 4 =	45345

TOTAL = 458857

BARREN ISLAND, MD.
VIMS MAP # 072

AA3	27771
BA3	25205
CA2	371630
DA2	2573470

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	2945100
DENSITY 3 =	52976
DENSITY 4 =	0

TOTAL = 2998076

HONGA, MD.
VIMS MAP # 073

AA3	206541
BA3	119036
CA3	99155
DA2	88984
EA4	132053
FA2	112196
GA3	26628
HA4	12743
IA4	20375
JA2	42078
KA3	31139

LA3	114428	TOTAL AREA	
MA1	126040		
NA3	62732	DENSITY 1 =	1254681
OA1	70491	DENSITY 2 =	1922037
PA3	154865	DENSITY 3 =	3048038
QA2	98962	DENSITY 4 =	3835698
RA1	95791		
SA3	107007	TOTAL =	10060454
TA2	10128		
UA4	1990961	WINGATE, MD.	
VA2	58544	VIMS MAP # 074	
WA1	104183		
XA3	21579	AA3	9901
YA1	539753	BA4	169660
ZA3	182974	CA1	135579
AB2	212960	DA3	15437
BB2	20857	EA1	119282
CB4	13823	FA4	1366392
DB2	40172	GA4	465748
EB3	100896	HA4	873437
FB3	164522	IA1	88156
GB2	87831	JA4	92888
HB3	121760	KA3	39685
IB2	27156	LA3	311564
JB3	40805	MA4	176918
KB4	1184490	NA2	21711
LB3	164185	OA2	4072
MB2	130883	PA1	12440
NB3	877963	QA3	98729
OB2	134308		
PB3	5578	TOTAL AREA	
QB2	232275		
RB2	70734	DENSITY 1 =	355457
SB2	89300	DENSITY 2 =	25783
TB2	167598	DENSITY 3 =	475316
UB4	481253	DENSITY 4 =	3145043
VB2	182564		
WB1	31848	TOTAL =	4001599
XB2	70054		
YB3	103628	RICHLAND POINT, MD.	
ZB1	203687	VIMS MAP # 082	
AC3	2493		
BC1	82888	AA2	239605
CC3	340124	BA3	26471
DC2	44453	CA3	42211

TOTAL AREA

DENSITY 1 = 0
DENSITY 2 = 239605
DENSITY 3 = 68682
DENSITY 4 = 0

TOTAL = 308287

BLOODSWORTH ISLAND,
MD.

VIMS MAP # 083

AA3 6479
BA3 6691
CA2 155420
DA4 200471
EA2 369411
FA4 17472
GA2 50481
HA3 2611462
IA1 23379
JA4 262771
KA3 200188
LA3 767667
MA3 73165
NA3 93398
OA1 165476
PA2 36068
QA4 199632
RA4 236573
SA2 198823
TA4 250532
UA2 67696
VA3 34405
WA3 11017
XA4 649111
YA2 129192
ZA1 43128
AB4 101906
BB4 13711
CB3 9736
DB3 18010

TOTAL AREA

DENSITY 1 = 231983
DENSITY 2 = 1007091
DENSITY 3 = 3832218
DENSITY 4 = 1932179

TOTAL = 7003471

DEAL ISLAND, MD.
VIMS MAP # 084

AA1 13575
BA2 41335
CA2 4811
DA3 2483
EA3 41988
FA2 56133
GA3 73472
HA3 47794
IA2 14016
JA3 13939
KA3 27950
LA1 5753
MA2 32552
NA3 14945

TOTAL AREA

DENSITY 1 = 19328
DENSITY 2 = 148847
DENSITY 3 = 222571
DENSITY 4 = 0

TOTAL = 390746

MONIE, MD.
VIMS MAP # 085

AA3 29970
BA2 5975
CA3 147625

TOTAL AREA

 DENSITY 1 = 0
 DENSITY 2 = 5975
 DENSITY 3 = 177595
 DENSITY 4 = 0

 TOTAL = 183570

KEDGES STRAITS, MD.
 VIMS MAP # 091

AA1 49479
 BA2 339225
 CA4 74769
 EA4 52566
 FA3 183763
 GA2 224989
 HA3 2402244
 IA4 1445112
 JA4 106319
 KA2 225370
 LA2 50762
 MA2 50578
 NA1 50723
 OA4 361575
 PA2 8900
 QA2 13809
 RA2 8911
 DA1 166344
 SA3 287813
 TA4 585697
 UA2 89667
 VA3 309027
 WA2 12814
 XA3 185280
 YA2 33913
 ZA3 742449
 AB1 157429
 BB4 369702
 CB2 49595
 DB4 59303
 EB2 66767

TOTAL AREA

 DENSITY 1 = 423975

DENSITY 2 = 1175300
 DENSITY 3 = 4110576
 DENSITY 4 = 3055043

 TOTAL = 8764894

TERRAPIN SAND POINT,
 MD.
 VIMS MAP # 092

AA1 23709
 BA4 1386039
 CA1 60304
 DA3 355071
 EA1 115165
 FA4 266096
 GA2 179822
 HA4 45127
 IA3 93065
 JA3 36349
 KA2 7318

TOTAL AREA

 DENSITY 1 = 199178
 DENSITY 2 = 187140
 DENSITY 3 = 484485
 DENSITY 4 = 1697262

 TOTAL = 2568065

MARION, MD.
 VIMS MAP # 093

AA3 6012
 BA3 28652
 CA2 38598
 DA3 33111
 EA2 5363
 FA3 41593
 GA4 52998
 HA1 21247
 IA3 10176
 JA4 29961
 KA4 20499
 LA2 34289
 MA3 17202

NA4	160218
OA2	109443
PA4	202917
QA2	30834
RA3	5178
SA3	3603
TA2	18337
UA3	5557
VA2	15303
WA3	15762
XA1	14187
YA4	16526
ZA1	20239
AB3	8893
BB4	12800
CB3	7611
DB4	17979
EB4	8010
FB3	11008
GB3	25230
HB1	42789
IB3	241322
JB3	50975
KB3	24922
LB3	44426
MB4	11501
NB3	184102
OB3	58069
PB3	56306
QB3	6324
RB3	39567
SB3	64023
TB1	25215
UB2	5035
VB2	3178
WB2	13283
XB4	1813

TOTAL AREA

DENSITY 1 =	123677
DENSITY 2 =	273663
DENSITY 3 =	989624
DENSITY 4 =	535222

TOTAL = 1922186

EWELL, MD.-VA.
VIMS MAP # 099

AA4	216569
BA1	157313
CA4	65071
DA4	15493
EA2	410431
FA1	458151
GA3	227099
HA2	64906
IA2	140970
JA2	198960
KA1	189794
LA2	109019
MA2	47674
NA2	58865
OA3	214557
PA2	57451
QA4	1661754
RA2	34775
SA2	28867
TA2	143100
UA2	2724058
VA2	51633
WA1	76581
XA1	174750
YA3	648720
ZA1	1080559
DB2	1479620
AB3	2481119
BB1	226993
CB3	613683
EB1	2910050
FB4	4926580
GB4	1314807
HB2	1255436

TOTAL AREA

DENSITY 1 =	5274191
DENSITY 2 =	6805765
DENSITY 3 =	4185178
DENSITY 4 =	8200274

TOTAL = 24465408

GREAT FOX ISLAND, MD.-VA.
VIMS MAP # 100

AA2	115213
BA2	73110
CA4	4180644
DA4	11656
EA2	1705095
FA1	14504
GA4	872292
HA2	55529
IA1	139266
JA4	238870
KA3	623479
LA2	22095
NA3	149111
OA4	13135
PA1	8103
QA1	15384
RA1	10188
SA4	2510401
TA1	31131
UA2	101949
VA1	109852
WA2	23580
XA2	5807
YA2	56933
ZA4	221364
AB2	126941
BB2	27414
CB4	175680
MA4	90862
DB4	1728544
EB1	253022
FB4	8620

TOTAL AREA

DENSITY 1 =	581450
DENSITY 2 =	2313666
DENSITY 3 =	772590
DENSITY 4 =	10052068
TOTAL =	13719774

CRISFIELD, MD.-VA.
VIMS MAP # 101

AA4	887960
BA2	78527
CA1	18526
DA4	167882
EA1	15422
FA4	100328
GA2	24228
HA2	9559
IA2	6747
JA1	94529
KA2	100567
LA2	6405
MA3	7932
NA2	23353
OA2	24904
PA2	32737
QA2	39481
RA2	6101
SA2	26095
TA2	5046
UA3	10959
VA2	8036
WA4	63870
XA2	17961
YA2	12507
ZA4	41037
AB4	186812
BB3	65732
CB3	45591
DB3	20871
EB3	24209
FB3	59496
GB3	6653
HB3	24007

TOTAL AREA

DENSITY 1 =	128477
DENSITY 2 =	422254
DENSITY 3 =	265450
DENSITY 4 =	1447889
TOTAL =	2264070

SAXIS, VA.-MD.
VIMS MAP # 102

AA2 1300
BA3 6472

TOTAL AREA

DENSITY 1 = 0
DENSITY 2 = 1300
DENSITY 3 = 6472
DENSITY 4 = 0

TOTAL = 7772

REEDVILLE, VA.
VIMS MAP # 106

AA2 1123
BA2 35915
CA2 78878
EA1 438014
FA3 370001
GA2 58675
HA2 5707
IA2 16812
JA2 10575
KA1 255821
DA4 998309

TOTAL AREA

DENSITY 1 = 693835
DENSITY 2 = 207685
DENSITY 3 = 370001
DENSITY 4 = 998309

TOTAL = 2269830

TANGIER ISLAND, VA.
VIMS MAP # 107

AA3 480540
BA4 937202
CA2 42557
DA3 501844

EA2 102553
FA4 410660
GA2 339129
HA4 124136
IA1 29911
LA1 30037
JA4 3862602
KA2 657834

TOTAL AREA

DENSITY 1 = 59948
DENSITY 2 = 1142073
DENSITY 3 = 982384
DENSITY 4 = 5334600

TOTAL = 7519005

CHESCONESSEX, VA.
VIMS MAP # 108

AA2 70341
BA2 45461
CA4 150162
DA2 8603
EA1 9586
FA4 17737
GA1 10321
HA2 1428
IA4 569039
JA2 250394
KA2 45324
LA4 256870
MA3 365204
NA4 70877
OA2 62757
PA4 257370
QA2 41188
RA4 271319
SA1 13672
TA2 98398
UA4 714719
VA2 106677
WA2 191487
XA2 516532
YA4 381348
AB1 153873

BB4	310357	SA1	11433
CB1	249493	TA3	577903
DB4	43120	UA1	22758
EB2	123171	VA2	57775
FB4	725121	WA3	7916
GB4	47504	XA2	1747
HB2	52539	YA3	32066
IB4	108733	ZA3	87834
JB3	7911	AB2	21104
KB2	106517	BB2	12549
LB4	2017715	CB2	11733
MB1	142952		
NB2	160502	TOTAL AREA	
OB1	146118		
ZA4	583494	DENSITY 1 =	34191
PB2	34618	DENSITY 2 =	387178
		DENSITY 3 =	873428
TOTAL AREA		DENSITY 4 =	2103961
DENSITY 1 =	726015	TOTAL =	3398758
DENSITY 2 =	1915937		
DENSITY 3 =	373115	URBANNA, VA.	
DENSITY 4 =	6525485	VIMS MAP # 110	
TOTAL =	9540552	AA2	9793
		BA3	7429
PARKSLEY, VA.		CA2	56298
VIMS MAP # 109		DA2	19862
		EA2	32906
AA2	17602	FA2	22251
BA3	5427	GA2	10395
CA3	24721		
DA2	15465	TOTAL AREA	
EA3	9314		
FA2	23312	DENSITY 1 =	0
GA3	893	DENSITY 2 =	151505
HA3	3725	DENSITY 3 =	7429
IA4	13687	DENSITY 4 =	0
JA3	1893		
KA4	2090274	TOTAL =	158934
LA2	186512		
MA2	26342	IRVINGTON, VA.	
NA2	3719	VIMS MAP # 111	
OA3	27493		
PA2	9318	AA2	1135
QA3	7892	BA2	4101
RA3	86351	CA2	16000

DA3	50293
EA3	8994
FA4	24209
GA3	9762
HA3	148272
IA3	371189
JA3	766624
KA3	19848
LA4	89548
MA3	98390
NA3	190429
OA3	1795
PA4	60555
QA3	13736
RA3	1946
SA3	147744
TA3	10287
UA3	2456
VA3	9908
WA4	86648
XA3	43341
YA3	16185
ZA3	8012
AB3	10373
BB3	2805

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	21236
DENSITY 3 =	1932389
DENSITY 4 =	260960

TOTAL = 2214585

FLEETS BAY, VA.
VIMS MAP # 112

AA2	5027
BA2	643646
CA4	104979
DA1	40525
EA4	21611
FA3	285867
GA1	227781
HA3	211952
IA2	340344

JA3	35735
KA4	36863
LA3	41748
MA3	49754
NA3	9361
OA3	2085
PA4	8067
QA3	827518
RA3	13090
SA3	36717
TA3	3085
UA3	5644
VA3	2666
WA2	10248
XA4	14887
YA3	128794
ZA3	290146
AB1	9141
BB3	125839
CB2	120632
DB3	51512
EB2	112900
FB2	1279

TOTAL AREA

DENSITY 1 =	277447
DENSITY 2 =	1234076
DENSITY 3 =	2121513
DENSITY 4 =	186407

TOTAL = 3819443

NANDUA CREEK, VA.
VIMS MAP # 113

AA2	99258
BA3	10723
CA4	64961
DA2	2676
EA3	34307
FA4	499193
GA2	913803
HA4	199368
IA4	101979
JA2	67427
KA3	129335

LA3 304061
 MA1 1120435
 NA4 111209

TOTAL AREA

DENSITY 1 = 1120435
 DENSITY 2 = 1083164
 DENSITY 3 = 478426
 DENSITY 4 = 976710

TOTAL = 3658735

PUNGOTEAGUE, VA.
 VIMS MAP # 114

AA4 145608
 BA2 47752
 CA1 33974
 DA1 23882
 EA4 118864
 FA3 7836
 GA2 46282
 HA4 250365
 IA1 45311
 JA4 24379
 KA1 116331
 LA4 2395272
 MA1 261814
 NA2 2017470
 OA4 129690
 PA2 9198
 QA3 4896
 RA3 2208
 SA4 249581
 TA4 203817
 UA3 33208
 VA3 38726
 WA2 114340
 XA3 66000
 YA1 77259
 ZA4 226754
 AB1 211720
 BB2 167949
 CB1 11589
 DB2 10105
 EB2 18478

FB3 118935
 GB4 79307
 HB4 56561
 JB2 491223
 LB4 55593
 KB4 123010
 IB2 211762

TOTAL AREA

DENSITY 1 = 781880
 DENSITY 2 = 3134559
 DENSITY 3 = 271809
 DENSITY 4 = 4058801

TOTAL = 8247049

SALUDA, VA.
 VIMS MAP # 116

AA2 19731

TOTAL AREA

DENSITY 1 = 0
 DENSITY 2 = 19731
 DENSITY 3 = 0
 DENSITY 4 = 0

TOTAL = 19731

WILTON, VA.
 VIMS MAP # 117

AA3 6372
 BA3 3489
 CA2 8014
 DA3 43165
 EA3 13085
 FA2 19443
 GA2 106326
 HA2 9962
 IA4 164328
 JA2 3341
 KA2 60938
 LA2 8809
 MA2 25423

NA2 7552
 OA2 6445

JAMESVILLE, VA.
 VIMS MAP # 119

TOTAL AREA

 DENSITY 1 = 0
 DENSITY 2 = 256253
 DENSITY 3 = 66111
 DENSITY 4 = 164328

 TOTAL = 486692

AA2 44977
 BA2 3754
 CA2 593019
 DA3 3283
 EA1 19711
 FA2 71327
 GA4 620313
 HA2 48711
 JA2 46438
 KA2 11028
 LA2 6425
 MA4 15122
 NA4 1216
 OA4 1014
 PA3 28014
 QA3 89778
 RA4 40404
 IA1 105825
 SA3 14642
 TA2 775982
 UA4 86180
 VA1 395924
 WA2 192177
 XA4 382181
 YA3 64006
 ZA3 31883
 AB2 3196
 BB2 5848
 CB3 323056
 DB1 212951
 EB4 166834
 FB1 90227
 GB4 274933
 HB2 11079
 IB2 1973
 JB4 148551
 KB2 115952
 LB3 28727
 MB3 21932

DELTAVILLE, VA.
 VIMS MAP # 118

AA2 155781
 BA2 161210
 CA3 61077
 DA3 13099
 EA2 56282
 FA4 7109
 GA2 27674
 HA2 32478
 IA3 26170
 JA2 103136
 KA1 9607
 LA2 17471
 MA2 2830
 NA2 12901
 OA2 8528
 PA2 35406
 QA3 17250
 RA2 1524
 SA3 36834
 TA3 30632
 UA3 25142
 VA2 62655

TOTAL AREA

 DENSITY 1 = 9607
 DENSITY 2 = 677876
 DENSITY 3 = 210204
 DENSITY 4 = 7109

TOTAL = 904796

TOTAL AREA

_____ DENSITY 1 = 824638
 DENSITY 2 = 1931886

DENSITY 3 = 605321
 DENSITY 4 = 1736748
 TOTAL = 5098593

WARE NECK, VA.
 VIMS MAP # 122

AA2 35435
 BA2 391615
 CA1 107091
 DA2 39855
 EA1 52273
 FA4 418202
 GA2 281929
 HA3 249939
 IA3 161293
 JA1 22794
 KA3 67835
 LA4 163267
 MA4 673238
 OA4 141231
 PA1 51246
 NA2 180787

TOTAL AREA

DENSITY 1 = 233404
 DENSITY 2 = 929621
 DENSITY 3 = 479067
 DENSITY 4 = 1395938
 TOTAL = 3038030

MATHEWS, VA.
 VIMS MAP # 123

AA4 7859
 BA3 9371
 CA3 55531
 DA4 176327
 EA1 3723
 FA4 51978
 GA2 14239
 HA2 236572
 IA4 284798
 JA2 173378

KA4 222508
 LA3 144132
 MA2 119105
 NA4 80569
 OA3 21237
 PA2 56556
 QA3 15382
 RA4 43164
 SA4 9581
 TA4 11569
 UA3 23860
 VA2 7312
 WA2 195012

TOTAL AREA

DENSITY 1 = 3723
 DENSITY 2 = 802174
 DENSITY 3 = 269513
 DENSITY 4 = 888353
 TOTAL = 1963763

FRANKTOWN, VA.
 VIMS MAP # 124

AA4 108405
 BA2 50498
 CA3 3544
 DA3 36431
 EA3 110017
 FA4 636161
 IA4 17446
 JA2 36018
 KA4 43638
 LA3 66994
 MA4 74492
 NA2 18954
 OA2 7250
 PA3 2169
 WA3 86039
 XA1 65162
 YA2 12795
 ZA3 278972
 AB3 83849
 BB4 108149
 CB3 4484

DB4	3072
EB2	922
FB3	15668
GB2	74745
HB2	161342
IB2	47683
JB2	38411
KB2	38182
LB2	5163
MB2	1551
NB3	9807
OB2	17079
PB2	79785
QB2	54342
GA1	54384
HA2	48038
QA3	220956
RA2	3712
SA2	156585
TA2	285233
UA2	65472
VA4	1533516
RB2	83348

TOTAL AREA

DENSITY 1 =	119546
DENSITY 2 =	1287108
DENSITY 3 =	918930
DENSITY 4 =	2524879

TOTAL = 4850463

CLAY BANK, VA.
VIMS MAP # 130

AA1	13685
BA1	1147

TOTAL AREA

DENSITY 1 =	14832
DENSITY 2 =	0
DENSITY 3 =	0
DENSITY 4 =	0

TOTAL = 14832

ACHILLES, VA.
VIMS MAP # 131

AA2	22439
BA4	36129
CA4	73704
DA1	3643
EA4	70060
FA4	1157133
GA2	132101
HA4	32301
IA2	302984
JA4	1141752
KA1	104818
LA2	6856
MA2	16725
NA4	61593
OA4	395044
PA2	423373
QA4	344228
RA1	14171
SA3	218925
TA2	462693
UA4	678722
VA1	129257
WA3	36947
XA3	146392
YA4	8800
ZA2	4700
AB2	36371
BB4	234492
CB4	21685
DB2	44687
EB4	224454
FB2	24365
GB4	1444949
HB2	57397
IB4	619483
JB2	120164
KB4	16809
LB2	28374
MB2	10752
NB4	45417
OB2	39753
PB2	120207
QB4	581116
RB1	275820

TOTAL AREA

DENSITY 1 = 527709
DENSITY 2 = 1853941
DENSITY 3 = 402264
DENSITY 4 = 7187871

TOTAL = 9971785

NEW POINT COMFORT, VA.
VIMS MAP # 132

AA2 71056
BA2 373983
CA2 242614
DA1 90745
EA3 464611
FA4 3791223
GA2 470194
HA2 75508
IA4 52071
JA2 39819
KA4 583127
LA2 230882
MA4 151733
NA4 227048
OA2 261586
PA3 276498
QA4 435254
RA2 195723
SA4 197934
TA2 779112
UA4 1006518
VA2 249651
WA4 1818
XA2 66305
YA2 58504
ZA2 676966
AB4 865203
BB4 443653
CB3 102634
DB4 1108712
EB2 321902
FB3 25538
GB2 50395

TOTAL AREA

DENSITY 1 = 90745
DENSITY 2 = 4164200
DENSITY 3 = 869281
DENSITY 4 = 8864294

TOTAL = 13988520

CAPE CHARLES, VA.
VIMS MAP # 133

AA1 68552
BA4 21579
CA2 139505
DA4 88097
EA3 9858
FA4 434674
GA2 128174
HA2 94471
IA3 142336
JA3 53655
KA3 65407
LA4 11607
MA3 84774
NA1 1049628
OA4 746432
PA1 50937

TOTAL AREA

DENSITY 1 = 1169117
DENSITY 2 = 362150
DENSITY 3 = 356030
DENSITY 4 = 1302389

TOTAL = 3189686

CHERITON, VA.
VIMS MAP # 134

AA2 25537
BA1 92220
CA4 214862
DA2 155521
EA3 3894
FA4 187850

GA1 27055

TOTAL AREA

DENSITY 1 = 119275
 DENSITY 2 = 181058
 DENSITY 3 = 3894
 DENSITY 4 = 402712

TOTAL = 706939

YORKTOWN, VA.
 VIMS MAP # 139

AA2 8205
 BA1 2338
 CA2 3569
 DA3 2693

TOTAL AREA

DENSITY 1 = 2338
 DENSITY 2 = 11774
 DENSITY 3 = 2693
 DENSITY 4 = 0

TOTAL = 16805

POQUOSON WEST, VA.
 VIMS MAP # 140

AA4 8174
 BA4 18984
 CA4 29896
 DA1 82609
 EA3 7252
 FA4 72338
 GA2 478960
 HA4 542857
 IA2 16648
 JA4 119488
 KA2 18729
 LA3 15666
 MA4 36569
 NA4 144838

OA1 21253
 PA2 471195
 QA3 519273
 RA1 30419
 SA3 301926
 TA2 975186
 UA4 445135
 VA4 728336
 WA2 81059
 XA2 57520
 YA4 21368
 ZA2 23503
 AB4 40016
 BB1 56639
 CB4 47509

TOTAL AREA

DENSITY 1 = 190920
 DENSITY 2 = 2122800
 DENSITY 3 = 844117
 DENSITY 4 = 2255508

TOTAL = 5413345

POQUOSON EAST, VA.
 VIMS MAP # 141

AA2 573463
 BA4 5543807
 CA4 420173
 DA2 173641
 EA2 1149443
 FA4 855950
 GA3 1285263
 HA4 15715
 IA4 27159
 JA4 11491
 KA4 5414
 LA2 1958
 MA4 11549

TOTAL AREA

DENSITY 1 = 0
 DENSITY 2 = 1898505

DENSITY 3 = 1285263
 DENSITY 4 = 6891258
 TOTAL = 10075026

ELLIOTTS CREEK, VA.
 VIMS MAP # 142

AA1 46167
 BA2 235829

TOTAL AREA

DENSITY 1 = 46167
 DENSITY 2 = 235829
 DENSITY 3 = 0
 DENSITY 4 = 0
 TOTAL = 281996

TOWNSEND, VA.
 VIMS MAP # 143

AA2 11223
 BA2 3892

TOTAL AREA

DENSITY 1 = 0
 DENSITY 2 = 15115
 DENSITY 3 = 0
 DENSITY 4 = 0
 TOTAL = 15115

HAMPTON, VA.
 VIMS MAP # 147

AA1 13951
 BA4 155606
 CA1 47238
 DA4 153734
 EA4 262743
 FA4 150341
 GA4 100602
 HA2 12923
 IA1 111246

JA3 199112
 KA4 449925
 LA4 54299
 MA4 103679
 NA2 565417
 OA4 68881
 PA4 574188
 QA4 20287
 RA4 28351
 SA4 169023
 TA4 151120
 UA4 27328

TOTAL AREA

DENSITY 1 = 172435
 DENSITY 2 = 578340
 DENSITY 3 = 199112
 DENSITY 4 = 2470107

TOTAL = 3419994

CAPE HENRY, VA.
 VIMS MAP # 152

AA3 17115
 BA3 37196
 CA4 3439
 DA2 41738
 EA1 86219
 FA1 15048
 GA1 82588

TOTAL AREA

DENSITY 1 = 183855
 DENSITY 2 = 41738
 DENSITY 3 = 54311
 DENSITY 4 = 3439

TOTAL = 283343

PRINCESS ANNE, VA.
 VIMS MAP # 157

AA2 2707
 BA2 4550

TOTAL AREA

 DENSITY 1 = 0
 DENSITY 2 = 7257
 DENSITY 3 = 0
 DENSITY 4 = 0
 TOTAL = 7257

PORT TOBACCO, MD.
 VIMS MAP # 161

AA4 118994

TOTAL AREA

 DENSITY 1 = 0
 DENSITY 2 = 0
 DENSITY 3 = 0
 DENSITY 4 = 118994
 TOTAL = 118994

BERLIN, MD.
 VIMS MAP # 167

AA4 24313
 CA3 13413
 BA3 25623

TOTAL AREA

 DENSITY 1 = 0
 DENSITY 2 = 0
 DENSITY 3 = 39036
 DENSITY 4 = 24313
 TOTAL = 63349

OCEAN CITY, MD.
 VIMS MAP # 168

AA2 15264
 BA3 14983

CA2 145423
 DA2 9785
 EA4 8424
 FA3 4018

TOTAL AREA

 DENSITY 1 = 0
 DENSITY 2 = 170472
 DENSITY 3 = 19001
 DENSITY 4 = 8424

TOTAL = 197897

TINGLES ISLAND, MD.
 VIMS MAP # 170

AA3 685389
 BA3 7264869
 CA3 338924
 DA3 73519
 EA3 1102207
 FA1 29681
 GA4 171239
 HA4 66268
 IA1 15638
 JA4 49989
 KA1 26084
 LA3 65559
 MA4 32014
 NA2 15027

TOTAL AREA

 DENSITY 1 = 71403
 DENSITY 2 = 15027
 DENSITY 3 = 9530467
 DENSITY 4 = 319510

TOTAL = 9936407

BOXIRON, MD.-VA.
 VIMS MAP # 172

AA2 901619
 BA3 1584838
 CA3 66367

DA3 1276754
 EA1 265474
 FA4 22245
 GA3 236428
 HA4 740234
 IA4 8887
 JA4 21718
 KA3 105015
 LA4 948056
 MA3 183631

TOTAL AREA

 DENSITY 1 = 265474
 DENSITY 2 = 901619
 DENSITY 3 = 3453033
 DENSITY 4 = 1741140

TOTAL = 6361266

WHITTINGTON POINT, MD.-
 VA.
 VIMS MAP # 173

AA4 296475
 BA4 22802
 CA4 9929
 DA4 28578
 EA3 1717544
 FA3 132264
 GA3 173879
 HA2 17139

TOTAL AREA

 DENSITY 1 = 0
 DENSITY 2 = 17139
 DENSITY 3 = 2023687
 DENSITY 4 = 357784

TOTAL = 2398610

CHINCOTEAGUE EAST, VA.
 VIMS MAP # 175

AA3 5771516
 BA2 215488

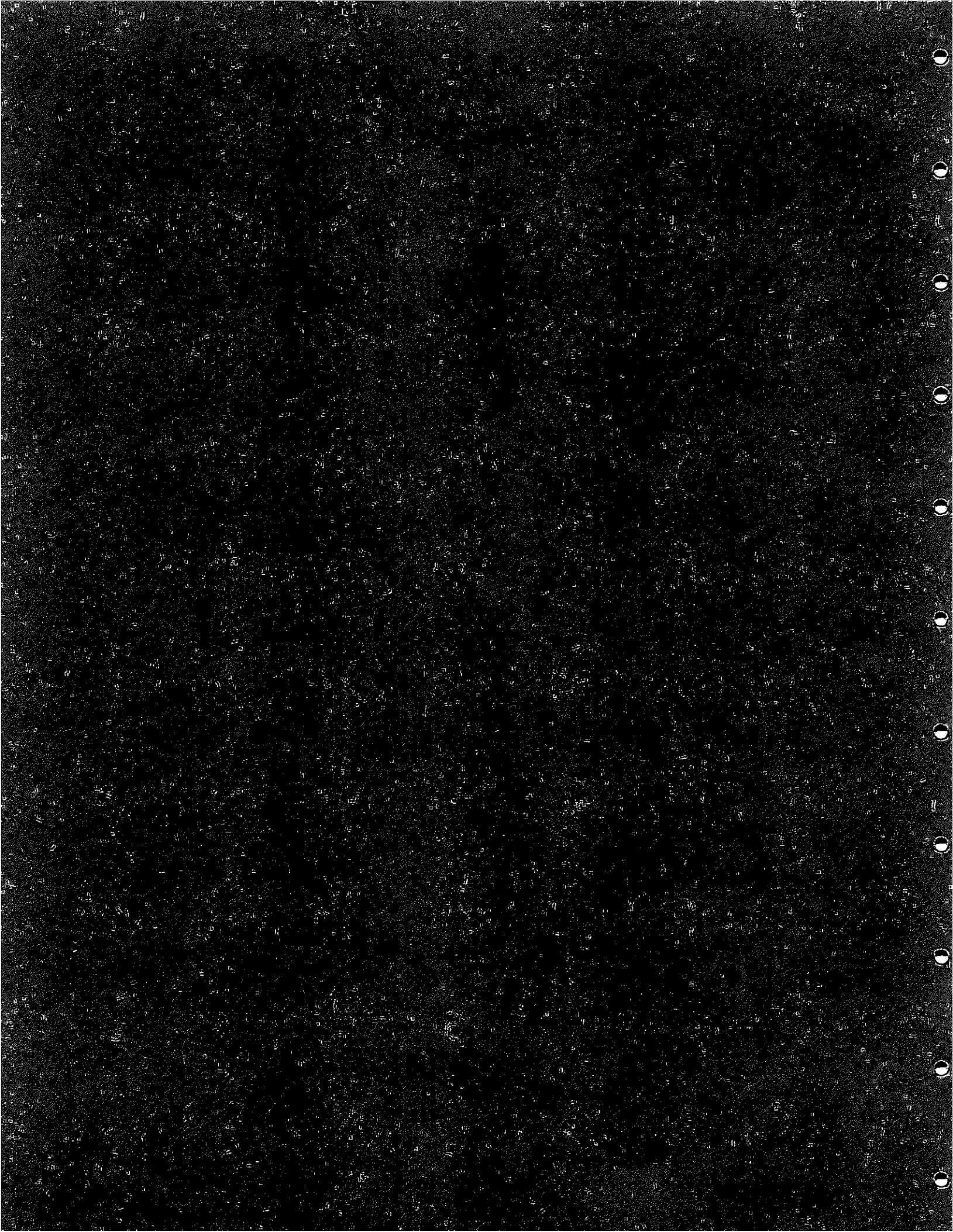
TOTAL AREA

 DENSITY 1 = 0
 DENSITY 2 = 215488
 DENSITY 3 = 5771516
 DENSITY 4 = 0

TOTAL = 5987004

APPENDIX E

1990 Submerged Aquatic Vegetation Ground Truth Surveys



1990 SUBMERGED AQUATIC VEGETATION GROUND TRUTH SURVEYS

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE
002	*	AA3	U	Capt.	6/18-21
	BA3	BA2	U	Capt.	6/18-21
	BA3	BA2	U	Cit.	9/24
	EA3	*	Ms	Harford	8/15
	DA3	*	Ms	Harford	8/15
	CA3	*	U	Cit.	9/24
	AA3	*	Ms	Harford	8/15
	FA3	*	Ms	Harford	8/15
	003	EA1	AA1	Ms	Harford
FA1		BA1	Ms, Va	Harford	8/15
JA4		FA1	Ms	Harford	8/15
OA2, PA1, CA2		HA1	Ms, Hv, Va	HPEL	7/4
OA2		HA1	Ms, Hv, Va	Harford	8/15
PA1		HA1	Ms	Harford	8/15
MA4		IA2	Ms, Hv, Va, Cd, N, Hd	Harford	8/15
LA4		JA2	Hv, Ms, Va	Harford	8/15
NA3		KA2	Ms, Va, Hv, Cd, Ppc	Harford	8/15
TA3		LA2	Ms, Hv, Va	Harford	8/15
UA4		MA2	Ms, Va, Hv, Cd, N	Harford	8/15
VA4		NA2	Ms, Va, Hv, Cd, N	Harford	8/15
WA4		OA2	Ms, Va, Hv, Cd, N	Harford	8/15
XA4		PA2	Ms, Va, Hv, Cd, N	Harford	8/15
YA3		QA4	Va, Ms, Hv	Harford	8/15
ZA3		RA2	Va, Ms, Hv	Harford	8/15
FB4		SA3	Ms	Harford	8/15
JB4		TA2	Ms	Harford	8/15
KB4		UA2	Ms	Harford	8/15
LB4		VA2	Ms	Harford	8/15
MB3		WA2	Ms	Harford	8/15
QB3		XA3	Ms	Harford	8/15

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE
003	RB3	YA3	Ms	Harford	8/15
	TB4	ZA2	Ms	Harford	8/15
	IB4	AB3	Ms,Hv,Cd	Harford	8/15
	DB4	BB3	Ms	Harford	8/15
	DB4	CB3	Ms	Harford	8/15
	DB4	DB3	Ms	Harford	8/15
	DB4	EB3	Ms	Harford	8/15
	BB3	GB2	Ms,Hd,Cd	Harford	8/15
	SA4	IB3	Ms,Hv,Cd,Va,N,Hd	Harford	8/15
	DA2	KB2	Ms,Cd	Harford	8/15
	AA2	NB2	Ms	Harford	8/15
	EB4	OB3	Ms	Harford	8/15
	BA2	*	Ms	Harford	8/15
	CA1	*	Ms	Harford	8/15
	IA3	*	Ms	Harford	8/15
	GB3	*	Ms	Harford	8/15
	HB3	*	Ms	Harford	8/15
	PB3	*	Ms	Harford	8/15
	SB2	*	Ms	Harford	8/15
		High Point #		Ms	Cit.
004	AA2	GA2	Ms	Harford	8/15
	CA2	FA2	Ms	Harford	8/15
	GA2	EA2	Ms	Harford	8/15
	*	CA1	U	Capt.	6/18-21
	EA1	BA1	Ms,Va	Harford	8/15
	DA2	AA1	Ms,Va	Harford	8/15
	FA2	*	Ms	Harford	8/15
	BA2	GA2	Ms	Harford	8/15
	HA2	DA1	Ms	Harford	8/15
005	AA2	BA2	Ms	Harford	8/15
	BA2	AA2	Ms	Harford	8/15

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE
009	EA2	GA2	Ms,Va,Hv,Cd	Harford	8/15
	*	DA1	U	Capt.	6/18-21
	EA2	FA2	Ms, Va,Hv,Cd	Harford	8/15
	*	EA1	U	Capt.	6/18-21
	FA2	HA1	U	Capt.	6/18-21
	CA2	CA2	Ms,Va	Harford	8/15
	CA2	BA2	Ms,Va	Harford	8/15
	AA2	AA2	Ms,Hv	Harford	8/15
	BA2	AA2	Ms,Hv,Va,Per	Harford	8/15
010	IA2	LA2	Ms,Va,Ppc	Harford	8/15
	HA2	MA1	Ms,Va	Harford	8/15
	HA2	NA4	Ms,Va	Harford	8/15
	FA2	FA2	N,Va,Ms	Harford	8/15
	EA2	EA1	Ms,Hv	Harford	8/15
	CA2	DA2	Va	Harford	8/15
	BA2	CA2	Ms,Va	Harford	8/15
	JA1	GA1	U	Capt.	6/18-21
	IA2	HA2	U	Capt.	6/18-21
	IA2	IA1	U	Capt.	6/18-21
	IA2	JA1	U	Capt.	6/18-21
	IA2	KA1	U	Capt.	6/18-21
	*	AA2	U	Capt.	No Date
	AA2	BA2	Ms,Hd	Harford	8/15
	Veazy Cove #		U	Cit.	7/20
013	*	BA1	U	Capt.	6/18-21
	*	CA2	U	Capt.	6/18-21
	*	EA1	U	Capt.	6/18-21
	*	EA1	Ms,Va,Rm,U	Cit.	5/90
	Seneca Cr. #		U	Essex	7/7
	Seneca Cr. #		U	Essex	7/7
	Seneca Cr. #		U	Essex	7/7

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE	
013	Seneca Cr. #		U	Essex	7/7	
	Seneca Cr. #		U	Essex	7/7	
014	OA3	GA3	U\Ms,C,Ec,Va	Capt.\Essex	6/18-21\7/30-10/26	
	*	FA3	U	Capt.	6/18-21	
	*	EA3	U\Ms,C	Capt.\Essex	6/18-21\7-24	
	*	DA4	U	Capt.	6/18-21	
	AA2	CA2	U	Capt.	6/18-21	
	EA2	SA3	U	Capt.	6/18-21	
	DA2	RA2	U	Capt.	6/18-21	
	CA2	QA2	U	Capt.	6/18-21	
	*	OA3	U	Capt.	6/18-21	
	FA3	NA3	U	Capt.	6/18-21	
	FA3	MA3	U	Capt.	6/18-21	
	HA3	LA3	U	Capt.	6/18-21	
	HA3,IA1	KA3	U	Capt.	6/18-21	
	KA3	JA3	U	Capt.	6/18-21	
	LA3,JA3	IA2	U\Ec,Cd,Ms	Capt.\Essex	6/18-21\7/30	
	Dundee Cr. #		Ec,Ms,Va	Essex	7/30	
	Dundee Cr. #		Va,Ms,Ngu	Essex	7/30	
	015	*	DA1	U	Capt.	6/18-21
		AA2	BA3	U	Cit.	8/3
Worton Cr.#			U	Cit.	7/20	
Churn Cr. #			U	Cit.	8/31	
016	AA2	BA2	U\Ms,Va	Capt.\Harford	6/18-21\8/15	
	*	AA2	U	Capt.	6/18-21	
	Betterton Pier #		Ms	Cit.	11/6	
	Sassafrass R. #		Ms	Harford	8/15	
017	BA1	BA2	Ms,Va,Hd	Harford	8/15	
	AA2	AA3	Ms,Va,Hd	Harford	8/15	

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE
018	Stony Cr. #		Rm	Cit.	6/4
	Stony Cr. #		Rm	Cit.	6/4
	Nabbs Cr. #		Rm	Cit.	6/4
019	Main Cr. #		Zp,Ppc	Cit.	5/1,7/15
	Back Cr. #		Ppc	Cit.	5/1,7/15
020	BA2	AA2	U	Capt.	6/27-30
	AA2	BA3	U	Capt.	6/27-30
	DA2	DA4	U\U	Capt.\Cit.	6/27-30\7-8
021	AA2	HA2	U	Capt.	6/27-30
	*	GA2	U	Capt.	6/27-30
	DA3	CA3	Rm	Capt.	6/27-30
	GA2	AA2	Rm	Capt.	6/27-30
	CA3	DA4	U	Capt.	6/27-30
023	Forked Cr. #		Zp	Cit.	6/30
	Branch Cr. #		Zp	Cit.	5/10
	Severn R. #		Zp	Cit.	5/10
	Herald Harbor #		Zp	Cit.	5/10
	Clements Cr. #		Zp,U	Cit.	6/16
	Luce Cr. #		Zp	Cit.	6/16
	Brewer Pond #		Zp	Cit.	5/10
	Maynedier Cr. #		Zp	Cit.	5/10
	Severn R. #		Zp	Cit.	5/10
	024	Burley Cr. #		Zp	FWS
Broad Cr. #			Zp	Cit.	6/24
Inner Harbor #			Rm	Cit.	8/2
Redhouse Cove #			Ppc	Cit.	8/23
Deep Cr. #			Ms	Cit.	9/9

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE
026	*	FA3	Rm	Capt.	6/27-30
	AA2	BA3	Rm	Capt.	6/27-30
	CA1	AA3	U	Capt.	6/27-30
	*	IA2	U	Capt.	6/27-30
	*	JA3	U	Capt.	6/27-30
	*	KA4	Rm	Capt.	6/27-30
	*	LA4	Rm	Capt.	6/27-30
	*	NA1	Rm	Capt.	6/27-30
	*	WA1	Rm	Capt.	6/27-30
	IA2	TA4	Rm	Capt.	6/27-30
	KA2	UA3	Rm	Capt.	6/27-30
	NA2	VA3	Rm	Capt.	6/27-30
	EA1	PA2	Rm	Capt.	6/27-30
	*	SA1	Ec	Capt.	6/27-30
	DA3	MA3	U	Capt.	6/27-30
	MA1	BB1	Rm	Capt.	6/27-30
	LA3	CB2	Rm	Capt.	6/27-30
	RA3,QA1	YA3	Rm	Capt.	6/27-30
	PA1	XA2	Rm	Capt.	6/27-30
	HA1	QA1	Ppf	Cit.	7/22
	OA2	*	Zp	Cit.	6/9
	LA3	CB2	Ms,Ppf,Ec	Cit.	7/2
	Piney Point #		Rm,Ppf	Cit.	7/24
	Piney Cove #		Rm	Cit.	7/24
	Cacaway Point #		Rm	Cit.	8/3
	Boxes Point #		Ppf	Cit.	7/22
	Blakeford Point #		Zp,U	Cit.	7/22
	Spaniard Neck #		Ms,Ppf,U	Cit.	8/90
	Lucy Cove #		Zp	Cit.	6/9
	Tilghman Cr. #		Ec	Cit.	No Date
	Gum Point #		Rm	Cit.	No Date
	Eastern Neck Narrows #		Ec,Ppf,Ppc	HPEL	7/10

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE
029	Anacostia R. #		Hv	COG	No Date
030	Selby Bay #		Zp	FWS	6/5
	Almshouse Cr. #		Zp	Cit.	6/13
	Beards Cr. #		Rm	Cit.	6/3,9/9
031	Lake Ogleton #		Zp	Cit.	7/2
	Lake Ogleton #		Zp	Cit.	7/2
	Lake Ogleton #		Zp	Cit.	7/2
	Lake Ogleton #		Zp	Cit.	7/2
	Lake Ogleton #		Zp	Cit.	7/2
	Black Walnut Cr. #		Zp,U	Cit.	7/2
	Black Walnut Cr. #		Zp,U	Cit.	7/2
	Black Walnut Cr. #		Zp,U	Cit.	7/2
	Black Walnut Cr. #		Zp,U	Cit.	7/2
	Black Walnut Cr. #		Zp,U	Cit.	7/2
	Black Walnut Cr. #		Zp,U	Cit.	7/2
	Black Walnut Cr. #		Zp,U	Cit.	7/2
	Kitty Duvall Cr. #		U	Cit.	6/90,7/90
	Kitty Duvall Cr. #		U	Cit.	6/90,7/90
032	IA2	*	Zp	FWS	6/28
	LA2	WA2	Zp\Rm	FWS\Capt.	6/28\No Date
	NA2	YA2	Rm,Zp\Rm	FWS\Capt.	6/28\No Date
	CA1	QA3	Rm,Ppc	FWS	6/28
	QA1	AB4	Rm	FWS	6/28
	QA1	BB1	Rm	Capt.	No Date
	KA1	VA2	Rm	FWS	6/28
	JA2	UA2	Rm,Zp	FWS	6/28
	FA2,EA4	TA2	Rm,Zp\Rm	FWS\Capt.	6/28\No Date
	DA1	SA3	Rm,Ppc,Zp\Rm	FWS\Capt.	6/28\No Date
	DA1	SA3	Rm	HPEL	8/7
	CA1	QA3	Rm	Capt.	No Date
	CA1	PA2	Rm	Capt.	No Date

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE	
032	GA1	OA2	Rm	Capt.	No Date	
	*	MA3	Rm	Capt.	No Date	
	*	LA3	Rm	Capt.	No Date	
	*	KA3	Rm	Capt.	No Date	
	*	GA3	Rm	Capt.	No Date	
	AA2	BA1	Rm	Capt.	No Date	
	AA2	AA3	Rm	Capt.	No Date	
	*	IA2	Rm	Capt.	No Date	
	*	JA3	Rm	Capt.	No Date	
	*	ZA1	Rm	Capt.	No Date	
	Kirwan Cr. #		Ppf,Rm	Cit.	10/12	
	Cox Cr. #		Rm,Zp	FWS	7/13	
	Crab Alley Neck #		Zp	FWS	6/28	
	Crab Alley Neck #		Zp	FWS	6/28	
033	HA2	MA3	Rm	Capt.	6/27-30	
	GA2	NA3	U	Capt.	6/27-30	
	*	OA3	Rm	Capt.	6/27-30	
	FA2	KA2	Rm	Capt.	6/27-30	
	EA2	HA2	Rm	Capt.	6/27-30	
	BA2	DA2	Rm	Capt.	6/27-30	
	BA2	CA1	Rm\Rm	Capt.\HPEL	7/2-6\7/18	
	BA2	EA4	Rm	Capt.	7/2-6	
	DA1	GA4	Rm	Capt.	7/2-6	
	CA1	FA2	Rm\Rm	Capt.\FWS	7/2-6\8/2	
	EA2	HA2	Rm	FWS	8/2	
	AA2	AA2	Rm	FWS	8/2	
	DA1	GA4	Rm,Ppc	FWS	8/2	
	034	UA4	RA4	Hv,Va,Hd,Ms\Hv,Ms,Va,Hd	Cit.\COG	9/3\9/10-11
		VA2	SA2	Hv,Va,Ms	Cit.	9/3
AA3		AA2	Hv,Ms,Nm	COG	9/10-11	
AA3		BA4	Hv	COG	9/10-11	

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE
034	BA3	CA2	Hv	COG	9/10-11
	EA2	DA4	Hv	COG	9/10-11
	*	FA3	Hv	COG	9/10-11
	FA2	GA4	Ms,Cd,Nm	COG	9/10-11
	FA2	HA2	Hv,Cd	COG	9/10-11
	GA4	IA4	Hv,Ms,Va	COG	9/10-11
	FA2	JA1	Hv,Cd	COG	9/10-11
	FA2	KA4	Hv,Cd	COG	9/10-11
	HA2	LA4	Hv	COG	9/10-11
	IA2	MA2	Hv	COG	9/10-11
	JA2	NA3	Hv,Ms	COG	9/10-11
	LA3,MA2	PA2	Ms,Nm,Va,Hv	COG	9/10-11
	TA3	QA2	Hv	COG	9/10-11
	XA3	TA4	Va	COG	9/10-11
	ZA4	VA4	Ms,Hv	COG	9/10-11
	AB4	WA4	Hv	COG	9/10-11
	EB4	ZA4	Hv, Ms	COG	9/10-11
	BB4	AB4	Hv	COG	9/10-11
	IB4	CB4	Hv,Ms,Cd	COG	9/10-11
	GB3,HB4	DB2	Hv	COG	9/10-11
	HB4	EB4	Hv	COG	9/10-11
	LB3,KB4	GB4	Ms,Va,Hv	COG	9/10-11
	LB3	HB2	Hv,Ms	COG	9/10-11
	NA3	*	Ms,Hv	COG	9/10-11
	OA2	*	Ms	COG	9/10-11
	PA2	*	Hv	COG	9/10-11
	QA2	*	Hv	COG	9/10-11
	RA3	*	Hv	COG	9/10-11
	SA1	*	Ms	COG	9/10-11
	WA2	*	Ms	COG	9/10-11
	Yacht Basin #		Va	COG	9/10-11
	Yacht Basin #		Hv	COG	9/10-11
	Yacht Basin #		Hv,Va	COG	9/10-11

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE
034	Sheperds Landing #		Hv,Ms	COG	9/10-11
	Interchange #		Hv,Ms	COG	9/10-11
	Indian Queen Bluff #		Hv	COG	9/10-11
	Indian Queen Bluff #		Hv,Ms	COG	9/10-11
	Indian Queen Bluff #		Hv,Ms	COG	9/10-11
	Indian Queen Bluff #		Hv	COG	9/10-11
	Indian Queen Bluff #		Hv,Ms	COG	9/10-11
	Anacostia R. #		Hv,Va,Ms	Cit.	9/3
	Hog Island #		Hv,Va,Nm	COG	9/10-11
	Hog Island #		Hv	COG	9/10-11
	Hog Island #		Hv	COG	9/10-11
	Hog Island #		Hv	COG	9/10-11
	Potomac R. #		Hv	COG	9/10-11
	Potomac R. #		Hv	COG	9/10-11
	Potomac R. #		Hv	COG	9/10-11
035	South Cr. #		Rm	Cit.	6/21
	South Cr. #		Rm	Cit.	6/21
	South Cr. #		Rm	Cit.	6/21
036	*	BB3	Rm	Capt.	7/10-24
	*	YA3	Rm	Capt.	7/10-24
	DA2	TB2	Rm	Capt.	7/2-6
	*	RB3	Rm	Capt.	7/2-6
	*	SB3	Rm	Capt.	7/2-6
	*	EA3	Rm	Capt.	7/2-6
	*	FA4	Rm	Capt.	7/2-6
	*	GA2	Rm	Capt.	7/2-6
	IA3,JA1	CC1	Rm	Capt.	7/2-6
	BA1,CA3	YB2	Rm	Capt.	7/2-6
	CA3	XB4	Rm	Capt.	7/2-6
	*	FB2	Rm	Capt.	7/2-6
	AA3	DB2	Rm	Capt.	7/2-6

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE
037	GA2	WB2	Rm	Capt.	7/2-6
	Miles R. #		Rm	Cit.	8/9
038	Glebe Cr. #		Rm	Cit.	7/5,9/4
	Glebe Cr. #		Rm	Cit.	7/5,9/4
	Goldborough Cr. #		Rm	Cit.	7/5,9/4
	Goldborough Cr. #		Rm	Cit.	7/5,9/4
039	DA3	CA4	Va,Hv,Ms	COG	9-4
	DA3	DA3	Va,Hv,Ms,Cd,Nm	COG	9-4
	EA2	EA3	Va,Hv,Ms	COG	9-4
	EA2	FA1	Hv,Ms,Va	COG	9-4
	IA4,HA4	IA4	Va,Ms,Hv,Nm,Ngr,Hd	COG	9-4
	GA3	JA3	Hv,Cd,Nm	COG	9-4
	CA1	*	Va,Hv,Ms	COG	9-4
	EA2	*	Hv,Ms,Va	COG	9-4
	Sycamore Pt. #		Hv,Ms,Nm	COG	9-4
	Sycamore Pt. #		Hv,Ms,Nm	COG	9-4
	Hallowing Pt. #		Va,Ms,Hv	COG	9-4
	Gunston Cove #		Hv	COG	9-4
	Pohick Bay #		Cd,Hv	COG	9-4
	Pohick Bay #		Cd,Hv	COG	9-4
	Accotink Bay #		Hv	COG	9-4
040	AA4	AA3	Hv,Va	COG	9/13-14
	BA4	BA4	Hv,Ms,Va,Hd,Ngu	COG	9/13-14
	BA4	BA4	Hv,Ms,Ngr,Cd,N,Nm	Cit.	7/19
	BA4	CA2	Hv,Va	Cit.	7/19
	CA1	DA3	Hv,Ms\Hv,Ms	COG\Cit.	9/13-14\7/19
	DA4	EA4	Hv\Hv,Ms,Ngr	COG\Cit.	9/13-14\7/30
	EA3	FA4	Hv\Hv	COG\Cit.	9/13-14\7/19
	JA4	HA4	Hv\Hv,Ngr,Cd	COG\Cit.	9/13-14\7/19
	KA2	IA2	Hv,Va,Ms,Hd	COG	9/13-14

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE
040	KA2	IA2	Hv,Ms,Va,Hd,Nm	Cit.	7/19
	LA4	JA4	Hv\Hv	COG\Cit.	9/13-14\7/19
	NA4	KA4	Hv\Hv,Cd,N	COG\Cit.	9/13-14\7/19
	OA2	LA2	Va,Ms,Hv\Va,Ms,Hv	COG\Cit.	9/13-14\7/19
	MA4,NA4	*	Hv	Cit.	7/19
	SA2	OA2	Hv	COG	9/13-14
	VA3	PA4	Hv	COG	9/13-14
	*	QA4	Ms	Cit.	10/1
	WA2	TA2	Ms	Cit.	8/16,4/9
	YA2	UA2	Ms	Cit.	8/16,4/9
	ZA4	VA4	Cd,Nm,Hv,Ms	COG	9/13-14
	ZA4	WA2	Va,Ms,Hv,Cd	COG	9/13-14
	FA3	*	Hv,Ms	Cit.	7/19
	MA4	*	Hv	COG	9/13-14
	PA2	*	Hv\Hv	COG\Cit.	9/13-14\7/19
	QA3	*	Hv,Ms,Cd	COG	9/13-14
	XA4	*	Hv	COG	9/13-14
	Mockley Point #		Hv,Ms	COG	9/13-14
	Mockley Point #		Hv	Cit.	7/19
	Piscataway Park #		Hv	Cit.	7/19
	Piscataway Park #		Hv	COG\Cit.	9/13-14\7/30
	Potomac R. #		Va,Ms,Hv	Cit.	7/19
	Swan Tantallon #		Hv,Ms	COG	9/13-14
	Swan Tantallon #		Hv	COG	9/13-14
	Swan Tantallon #		Hv	COG	9/13-14
	Riverview #		Hv	COG	9/13-14
	Riverview #		Hv	COG	9/13-14
	Hulks #		Hv,Ms\Hv	COG\Cit.	9/13-14\7/19
	Spoil areas #		Hv,Ms	COG	9/13-14
	Harmon Hall #		Hv,Ms	COG	9/13-14
	Henson Cr. Park #		Hv	COG	9/13-14
	Henson Cr. Park #		Hv,Ms\Hv	COG\Cit.	7/19
	Potomac R. #		Hv	COG	9/13-14

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE
040	Potomac R. #		Hv	COG	9/13-14
	Potomac R. #		Hv,Ms	COG	9/13-14
	Potomac R. #		Hv	COG	9/13-14
	Potomac R. #		Hv	COG	9/13-14
	Potomac R. #		Hv	COG	9/13-14
	Mount Vernon #		Hv	COG	9/13-14
	Potomac R. #		Hv,Ms	COG	9/13-14
	Potomac R. #		Hv,Ms	COG	9/13-14
	Potomac R. #		Ms	COG	9/13-14
041	Mattaponi Cr. #		Cd,Pcr,Ngr	Park	8/17
	Lyons Cr. #		Cd	Park	8/17
	Hall Cr. #		Ngu,Cd,Pcr,Va	Park	8/17
	Patuxent R. #		Zp	Park	8/17
	Black Swamp Cr. #		Pcr,Ec,Cd	Park	8/17
	Cocktown Cr. #		Ec,Cd,Pcr	Park	8/17
043	*	QA3	Rm	Capt.	7/2-6
	FA3,EA3	RA2	Rm	Capt.	7/2-6
	*	SA3	Rm	Capt.	7/2-6
	*	KA2	Rm	Capt.	7/10-24
	AA3	AA2	Rm	Capt.	7/10-24
	*	BA2	Rm	Capt.	7/10-24
	*	IA2	Rm	Capt.	7/10-24
	Upper Bar Neck #		Zp	HPEL	6/20
044	*	JA3	Rm	Cit.	6/7
	Boone Cr. #		Ppc	Cit.	6/2
	Tar Cr. #		Zp	Cit.	6/7
	Tred Avon R. #		Zp	Cit.	6/7
047	BA4	JA4	Cd,Hv,Va,Ms	Cit.	7/9
	EA4	AA4	Hv,Va,Ms,Hd	COG	9/5-6,9/14

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE
047	EA4	CA4	Hv,Va,Ms,Hd,Nm	COG	9/5-6,9/14
	EA4	FA2	Hv,Va	COG	9/5-6,9/14
	EA4	GA1	Hv,Va	COG	9/5-6,9/14
	AA4	HA4	Hv,Ms,Hd,Cd,Ngu	COG	9/5-6,9/14
	BA4	IA2	Ms,Hv,Va,Hd	COG	9/5-6,9/14
	BA4	JA4	Hv,Ms,Va,Cd,Ngu,Hd	COG	9/5-6,9/14
	CA4	KA4	Hv,Ms	COG	9/5-6,9/14
	CA4	LA2	Hv,Va,Ms	COG	9/5-6,9/14
	FA4	NA4	Hv	COG	9/5-6,9/14
	FA4	OA2	Hv,Ms	COG	9/5-6,9/14
	FA4	RA2	Hv	COG	9/5-6,9/14
	FA4	SA4	Hv,Va	COG	9/5-6,9/14
	FA4	TA4	Hv,Cd,Hd,Va	COG	9/5-6,9/14
	DA4	UA4	Hv,Ms,Va,Hd,Cd	COG	9/5-6,9/14
	DA4	VA1	Hv,Ms,Va,Cd,Hd	COG	9/5-6,9/14
	GA4	WA4	Hv,Cd,Hd,Ms	COG	9/5-6,9/14
	GA4	XA1	Hv,Ms,Hd,Va	COG	9/5-6,9/14
	GA4	YA4	Hv,Ms,Hd,Va	COG	9/5-6,9/14
	GA4	ZA2	Hv,Va,Cd,Hd	COG	9/5-6,9/14
	HA4	AB4	Hv	COG	9/5-6,9/14
	HA4	BB2	Hv	COG	9/5-6,9/14
	IA4	*	Hv,Nm,Cd	COG	9/5-6,9/14
	Quantico #		Hv	COG	9/5-6,9/14
	Shipping Pt. #		Hv,Cd,Va,Hd	COG	9/5-6,9/14
	Quantico Cr. #		Hv	COG	9/5-6,9/14
	Quantico Cr. #		Hv,Ms	COG	9/5-6,9/14
	Quantico Cr. #		Hv	COG	9/5-6,9/14
	Quantico Cr. #		Hv,Va	COG	9/5-6,9/14
	Quantico Cr. #		Hv	COG	9/5-6,9/14
	Quantico Cr. #		Hv,Va	COG	9/5-6,9/14
	Neabsco #		Ms,Hv	COG	9/5-6,9/14
	Neabsco #		Hv,Ms,Hd	COG	9/5-6,9/14

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE	
048	BA4	AA2	Hv,Va,Ms	COG	9-5	
	BA4	BA4	Hv,Ms,Va	COG	9-5	
	BA4	CA1	Va,Hd,Ms,Nm	COG	9-5	
	BA4	DA4	Hv,Ms,Va,Cd,Nm	COG	9-5	
	CA1,DA3	EA4	Hv,Hd,Ngu,Va	COG	9-5	
	EA3	FA1	Ms,Hv,Va,Hd	COG	9-5	
	EA3	GA3	Ms,Hv,Va,Hd	COG	9-5	
	BA4	JA4	Hv,Ms,Va	COG	9-5	
	*	KA4	Hv	COG	9-5	
	HA4	LA3	Hv,Nm	COG	9-5	
	*	MA3	Hv,Nm,Ms	COG	9-5	
	IA4	MA3	Hv,Ms,Nm	COG	9-5	
	GA4	NA4	Nm,Hv,Va,Ms,Cd,Hd	COG	9-5	
	JA2	OA1	Hv,Ms,Cd	COG	9-5	
	KA4	PA4	Hv,Ms,Hd,Va	COG	9-5	
	LA3	QA3	Va,Ms,Hv,Hd	COG	9-5	
	MA4	RA4	Hv,Va,Ms,Cd,Nm	COG	9-5	
	MA4	SA2	Hv,Va,Hd	COG	9-5	
	Mattawoman Cr. #		Hv	COG	9-5	
	Mattawoman Cr. #		Hv,Ms,Nm	COG	9-5	
	Mattawoman Cr. #		Hv,Ms	COG	9-5	
	Mattawoman Cr. #		Hv,Ms,Va	COG	9-5	
	Grinders Wharf #		Hv,Nm	COG	9-5	
	Grinders Wharf #		Hv,Ms,Nm	COG	9-5	
	Bullocks Neck #		Hv	COG	9-5	
	Marsh Island #		Hv,Nm,Cd	COG	9-5	
	Thorofare Island #		Cd	COG	9-5	
	Tidal Flat #		Va	COG	9-5	
	Mattingly Wharf #		Va	COG	9-5	
	Mason Neck #		Hv,Ms	COG	9-5	
	049	Holland Cliff #		Zp	Cit.	7/1
		Patuxent R. #		Ec	Park	8/17

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE
049	Kennedy Run #		Zp	Park	8/17
051	MA3,KA3,JA3,IA3,HA3,GA3	FA3	Rm	Capt.	7/2-6
	NA2,OA3	GA3	Rm	Capt.	7/2-6
	BA3	AA3	Rm	Capt.	7/2-6
	*	EA3	Rm	Cit.	8/10
	OA3	GA3	Zp	HPEL	6/22
052	*	DA3	Rm	Capt.	7/2-6
	*	CA2	Rm	Capt.	7/2-6
	BA3	FA3	Rm	Capt.	7/2-6
	AA3	EA4	Rm	Capt.	7/2-6
	*	BA3	Rm	Capt.	7/2-6
055	AA3	AA1	Ms,Nm,Cd	COG	9/6,9/14
	BA3	BA2	Hv,Nm,Ngu,Va,Ms,Hd	COG	9/6,9/14
	CA3	CA4	Hv,Ms,Cd,Va	COG	9/6,9/14
	DA1	*	Ms	COG	9/6,9/14
	GA2	DA1	Ms	COG	9/6,9/14
	GA2,HA4	EA2	Ms	COG	9/6,9/14
	HA4	HA4	Hv,Ms,Ngu,Va,Hd,Cd	COG	9/6,9/14
	HA4	IA3	Hv,Ngu,Cd,Ms,Hd	COG	9/6,9/14
	KA4	JA4	Hv,Ms	COG	9/6,9/14
	JA4	KA4	Hv,Va,Ms,Hd	COG	9/6,9/14
	*	LA1	Va,Hv	COG	9/6,9/14
	IA4	MA4	Hv,Va	COG	9/6,9/14
	FA4	NA1	Ms,Va,Hv,Cd	COG	9/6,9/14
	FA4	OA4	Ms,Va,Hv	COG	9/6,9/14
	FA4	QA2	Va,Ms,Hv,Cd,Hd	COG	9/6,9/14
	EA2	RA2	Va,Ms	COG	9/6,9/14
	EA2	RA2	Cd	COG	9/6,9/14
	Aquia Cr. #		Hv,Ms	COG	9/6,9/14
	Aquia Cr. #		Ms	COG	9/6,9/14

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE
055	Thomas Point #		Ms	COG	9/6,9/14
	Thomas Point #		Ms,Va	COG	9/6,9/14
	Sandy Point #		Hv,Ms,Va,Hd,Cd	COG	9/6,9/14
	Sandy Point #		Va,Hv	COG	9/6,9/14
	Smith Point #		Va,Ms,Cd,Hd	COG	9/6,9/14
	Thomas Point #		Va	COG	9/6,9/14
	M.C. Air Station #		Hv,Hd,Va,Cd,Ngu	COG	9/6,9/14
056	BA4	CA4	U	Capt.	8/24
	AA4	AA4	U	Capt.	8/24
	SA2,RA4,TA3,UA4,VA3	IA4	U	Capt.	8/24
	TA3	LA2	U	Capt.	8/24
	VA3	JA2	U	Capt.	8/24
	VA3	KA3	U	Capt.	8/24
	EA4,GA4,DA4	SA4	U	Capt.	8/24
	DA4,FA4	RA4	U	Capt.	8/24
	HA3	TA2	U	Capt.	8/24
	IA4	QA4	U	Capt.	8/24
	JA4	UA4	U	Capt.	8/24
	LA4	PA4	U	Capt.	8/24
	MA3	OA2	U	Capt.	8/24
	NA2	NA4	U	Capt.	8/24
	OA4,IA4	MA4	U	Capt.	8/24
	QA2,PA3	GA4	U	Capt.	8/25
	QA2	FA1	U	Capt.	8/25
	QA2	EA4	U	Capt.	8/25
CA4	DA4	U	Capt.	8/25	
AA4	BA3	U	Capt.	8/25	
057	DA2,CA3,BA2	VB4	Va,Ppf	FWS	7/20
	DA2	UB3	Va,Ppf,Hv,Ec,Ppc	FWS	7/20
	EA3	TB4	Va,Ppc,Ms,Pcr	FWS	7/20
	GA2,FA4	RB4	Va,Ms,Pcr	FWS	7/20

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE
057	HA4	OB4	Va	FWS	7/20
	IA2	NB1	Va,Ppc	FWS	7/20
	MA4	JB4	Va,Per,Cd,Ms,Ppf	FWS	7/20
	MA4	JB4	Va,Ppc,Ppf	VIMS	8/20
061	Cape Leonard # Leonard Cr. #		Zp	Cit.	4/90,6/90
			Zp	Cit.	4/90,6/90
062	LA4	AA3	Rm	Capt.	6/30
	KA4	BA2	Rm	Capt.	6/30
	HA2	CA4	Rm	Capt.	6/30
063	DA3	BA4	Rm	Capt.	9/10
	DA3	CA2	Rm	Capt.	9/10
	AA3	EA4	Rm	Capt.	9/10
	CA1	DA3	Rm	Capt.	9/10
066	*	PA4	U	Capt.	7/16
	*	OA4	U	Capt.	7/16
	AA3	AA4	U	Capt.	7/16
	*	BA4	U	Capt.	7/16
	BA2	CA4	U	Capt.	7/16
	CA3	EA1	U	Capt.	7/16
	CA3	FA3	U	Capt.	7/16
	EA3	IA3	U	Capt.	7/16
	GA2	KA2	U\Va	Capt.\VIMS	7/16\8/3
	HA3	LA4	U	Capt.	7/16
	HA3	MA2	U	Capt.	7/16
	*	QA4	U	Capt.	7/16
	IA2	NA3	U	Capt.	7/16
	067	AA4	AA4	U	Capt.
*		BA4	U	Capt.	7/16

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE
067	*	DA4	U	Capt.	7/16
	BA3	EA2	U	Capt.	7/16
	BA3	FA4	U	Capt.	7/16
	CA3	GA4	U	Capt.	7/16
	DA3	IA4	U	Capt.	7/16
	*	JA1	U	Capt.	7/16
	HA3	LA2	U	Capt.	7/16
	HA3	MA3	U	Capt.	7/16
	HA3	NA2	U	Capt.	7/16
	HA3	OA4	U	Capt.	7/16
	IA3	PA3	U	Capt.	7/16
068	Neale Sound #		Zp	Cit.	6/29
069	Fox Point #		Zp	Cit.	6/90
070	Cuckold Cr. #		Zp	Cit.	6/25
	Sam Abell Cove #		Zp,Ppc	Cit.	5/15
	Cuckold Cr. #		Zp	Cit.	5/15
	Cuckold Cr. #		Zp	Cit.	5/15
071	*	AA3	Ec	Capt.	9/18
	Patuxent R. #		Zp	Cit.	6/3
	Goose Cr. #		Rm	Cit.	7/5
	Goose Cr. #		Rm	Cit.	7/5
	Pearson Cr. #		Rm	Cit.	7/5
	Patuxent R. #		Zp	Cit.	5/15
	Cuckold Cr. #		Zp	Cit.	5/15
	Harpers Cr. #		Rm	Cit.	9/10-11
N. Barrett Island #		U	Cit.	9/21	
072	BA3	EA2	Rm,U	Capt.	8/24

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE
072	CA2	GA4	Rm	Capt.	8/24
	DA2	IA4	Rm	Capt.	8/24
	DA2	HA2	Rm	Capt.	8/24
	*	CA4	U	Capt.	8/24
	DA2	IA4	Rm	Cit.	10/20
073	KB4	QA2	Rm	Capt.	8/24
	JB3	NA3	Rm	Capt.	8/24
	NB3	TA4	Rm,U	Capt.	8/24
	TB2	UA4	Rm	Capt.	8/24
	SB2	ZA3	Rm	Capt.	8/24
	NB3	VA3	Rm	Capt.	8/24
	AA3	BA1	Rm	Capt.	8/24
	UB4,VB2	WA2	Rm,U	Capt.	8/24
	LA3	XB2	Rm	Capt.	9/5
	MA1,LA3	WB4	Rm	Capt.	9/5
	NA3	VB2	Rm	Capt.	9/5
	PA3	UB4	Rm	Capt.	9/5
	QA2	TB2	Rm	Capt.	9/5
	UA4,VA2	RB4	Rm	Capt.	9/5
	YA1	PB3	Rm	Capt.	9/5
	XA3	OB2	Rm	Capt.	9/5
	FB3	NB3	Rm	Capt.	9/5
	FB3,GB2	MB2	Rm	Capt.	9/5
	HB3	LB3	Rm,U	Capt.	9/5
	EB3	KB3	Rm	Capt.	9/5
	EB3	JB4	Rm,U	Capt.	9/5
	AB2,ZA3,YA1	GB4	Rm,U	Capt.	9/5
	YA1	HB2	Rm	Capt.	9/5
	ZB1	CB3	Rm	Capt.	9/10
	*	EB2	Rm	Capt.	9/10
	AC3	DB4	Rm	Capt.	9/10
	AA3	AA1	Rm	Capt.	9/13

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE	
073	EA4	LA4	Rm\Rm	Capt.\HPEL	9/13\6/29	
	GA3	KA3	Rm	Capt.	9/13	
	HA4	JA3	Rm	Capt.	9/13	
	IA4	IA2	Rm	Capt.	9/13	
	*	GA2	Rm	Capt.	9/13	
	KA3	HA3	Rm	Capt.	9/13	
	DA2	FA3	Rm	Capt.	9/13	
	CA3	EA3	Rm	Capt.	9/13	
	BA3	DA3	Rm	Capt.	9/13	
	AA3	BA1	Rm	Capt.	9/13	
	AA3	CA4	Rm	Capt.	9/13	
	OA1	*	Rm	Capt.	9/13	
	074	*	LA4	Rm	Capt.	9/7
		*	KA2	Rm	Capt.	9/7
BA4		CA4	Rm	Capt.	9/7	
CA1		DA2	Rm	Capt.	9/7	
FA4		EA2	Rm	Capt.	9/7	
FA4		FA4	Rm	Capt.	9/7	
FA4		GA2	Rm	Capt.	9/7	
FA4		HA2	Rm	Capt.	9/7	
FA4		IA3	Rm	Capt.	9/7	
GA4		JA3	Rm	Capt.	9/7	
HA4		MA3	Rm	Capt.	9/7	
IA1		NA4	Rm	Capt.	9/7	
MA4		QA4	Rm	Capt.	9/7	
LA3		PA2	Rm	Capt.	9/7	
LA3		OA3	Rm	Capt.	9/7	
Fallins Cove #			Rm	Capt.	9/7	
079	Tall Timbers Cove #		Zp	Cit.	6/90	
082	*	CA2	Rm	Capt.	9/13	

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE	
082	BA3	AA3	Rm	Capt.	9/13	
	AA2	BA4	Rm	Capt.	9/13	
083	EA2,DA4	EA4	Rm	Capt.	7/8	
	LA3	MA4	Rm	Capt.	7/8	
	MA3	NA4	Rm	Capt.	7/8	
	MA3,NA3,OA1	OA4	Rm	apt.	7/8	
	OA1	PA4	Rm	Capt.	7/8	
	QA4	RA4	Rm	Capt.	7/8	
	VA3	TA4	Rm	Capt.	7/8	
	SA2,TA4,UA2	UA4	Rm	Capt.	7/8	
	RA4	VA4	Rm	Capt.	7/8	
	KA3	LA4	Rm	Capt.	7/8	
	HA3	JA2	Rm	Capt.	7/8	
	HA3,IA3	HA4	Rm	Capt.	7/8	
	HA3	IA2	Rm	Capt.	7/9	
	AB4	WA2	Rm	Capt.	9/7	
	AB4	XA4	Rm	Capt.	9/7	
	ZA1	YA2	Rm	Capt.	9/7	
	XA4,YA2	ZA4	Rm	Capt.	9/7	
	Okahanikan Cove #			Rm	Capt.	No Date
	084	KA3	EA3	Rm	Cit.	10/15
		HA3,JA3	FA3	Rm	Cit.	10/15
GA3		GA3	Rm	Cit.	10/15	
FA2		IA1	Rm	Cit.	10/15	
FA2		JA2	Rm	Cit.	10/15	
*		KA3	Rm	Cit.	10/15	
EA3		LA2	Rm	Cit.	10/15	
*		MA3	Rm	Cit.	10/15	
AA1		OA4	Rm	Cit.	10/15	
BA2		NA3	Rm	Cit.	10/15	
LA1		DA3	Rm	Cit.	10/15	

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE
085	CA3	AA3	Rm	Capt.	9/10
	BA2	CA3	Rm	Capt.	9/10
	AA3	DA4	Rm	Capt.	9/10
091	KA2	IA2	Rm	Capt.	6/27
	JA4	HA3	Rm	Capt.	6/27
	IA4	GA4	Rm	Capt.	6/27
	EA4	AA4	Rm	Capt.	7/11
	DA1	BA2	Rm	Capt.	7/11
	DA1,CA4	CA4	Rm	Capt.	7/11
	GA2	EA2	Rm	Capt.	7/11
	BA2,AA1,HA3	DA4	Rm,Zm,U	Capt.	7/10
	XA3	TA3	Rm	Capt.	7/10
	*	SA3	Rm	Capt.	7/10
	VA2,TA4	OA4	Rm	Capt.	7/10
	QA2	MA3	Rm	Capt.	7/10
	RA2	LA4	Rm	Capt.	7/10
	LA2	JA4	Rm	Capt.	7/10
	OA4,NA1,MA2	KA4	Rm,U	Capt.	7/10
SA3	NA4	Rm	Capt.	No Date	
092	FA4,GA2	AA4	Rm	Capt.	6/27
	EA1	BA1	Rm	Capt.	6/27
	BA4,DA3	CA4	Rm	Capt.	6/27
	HA4	FA4	Rm	Capt.	6/27
	IA3	DA4	Rm	Capt.	9/10
	JA3	EA4	Rm	Capt.	9/10
	BA4,DA3	CA4	Rm	Cit.	9/1
	BA4	CA4,BA1	Rm,Zm	VIMS	8/27
093	*	QA1	U	Capt.	6/29
	PA4	PA4	Rm	Capt.	6/29

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE
093	OA2	OA2	Rm	Capt.	6/29
	NA4	NA4	Rm,U	Capt.	6/29
	*	LA2	U	Capt.	6/29
	KA4	KA4	U	Capt.	6/29
	KA4	JA2	Rm	Capt.	6/29
	JA4	HA3	Zm,U	Capt.	6/29
	IA3	GA3	Zp	Capt.	6/29
	HA1	FA2	Rm	Capt.	6/29
	GA4	EA4	Rm,Zm	Capt.	6/29
	FA3	DA3	Zm	Capt.	6/29
	*	CA2	Rm	Capt.	6/29
	CA2,DA3	BA2	Rm	Capt.	6/29
	BA3,CA2	AA2	Rm,Zm	Capt.	6/29
	XB4	SA2	Rm	Capt.	6/30
	*	TA4	Rm	Capt.	6/30
	CB3	UA4	Rm	Capt.	6/30
	*	VA4	Rm	Capt.	6/30
	BB4	WA4	Rm	Capt.	6/30
	VA2	XA3	Rm	Capt.	6/30
	XA1	YA2	Rm	Capt.	6/30
	YA4	ZA4	Rm	Capt.	6/30
	AB3	AB2	Rm	Capt.	6/30
	EB4,DB4	BB4	Rm	Capt.	6/30
	FB3	CB2	Rm	Capt.	6/30
	GB3	DB4	Rm	Capt.	6/30
	HB1	EB1	Rm	Capt.	6/30
	IB3	FB3	Rm,U	Capt.	6/30
	LB3,MB4	KB4	Rm,Zm	Capt.	6/30
	KB3	IB4	Rm	Capt.	6/30
	JB3	HB3	Rm	Capt.	6/30
	IB3	GB4	Rm	Capt.	6/30
	OB3	MB2	Rm	Capt.	9/22
	NB3	NB3	Rm	Capt.	9/22

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE
093	*	OB2	Rm	Capt.	9/22
	*	XB3	Rm	Capt.	9/22
	VB2	WB4	Rm	Capt.	9/22
	WB2	VB2	Rm	Capt.	9/22
	UB2	UB2	Rm	Capt.	9/22
	TB1,SB3	TB3	Rm	Capt.	9/22
	*	SB2	Rm	Capt.	9/22
	PB3	PB4	Rm	Capt.	9/22
	RB3	RB3	Rm	Capt.	9/22
	VA3	*	Rm	Capt.	No Date
	Annemessex R. #		Rm	Capt.	No Date
099	BA1	BA2	Rm,U	Capt.	7/8
	AA4	AA4	Rm	Capt.	7/8
	CA4	CA4	Rm	Capt.	7/8
	DA4	DA2	Rm,U	Capt.	7/8
	QA4	PA4	Rm	Capt.	7/8
	FB4,SA2	SA4	Rm	Capt.	7/8
	UA2	RA2	Rm	Capt.	7/8
	UA2	QA3	Rm	Capt.	7/8
	TA2	OA3	Rm	Capt.	7/8
	SA2	NA3	Rm	Capt.	7/8
	MA2	HA2	Rm	Capt.	7/8
	FA1	EA4	Rm	Capt.	7/8
	LA2,KA1	IA3	Rm	Capt.	7/8
	IA2,GA3	JA2	Rm	Capt.	7/8
	IA2	LA3	Rm	Capt.	7/8
	JA2	MA2	Rm	Capt.	7/8
	IA2	WA2	Rm	Capt.	7/8
	100	DB4,EB1,FB4	SA2	Rm	Capt.
DB4		TA4	Rm,Zm	Capt.	7/11
EA2		BA2	Rm,Zm	Capt.	7/11

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE
100	BA2,CA4,EA2,FA1,GA4	AA4	Rm,Zm,U\Rm,Zm	Capt.\VIMS	7/11\8-12
	AA2	AA4	Rm,Zm	VIMS	8/12
	IA1	CA1	Rm	Capt.	7/11
	*	DA4	Rm	Capt.	7/11
	JA4	EA3	Rm,Zm	Capt.	7/11
	LA2	FA4	Rm,U	Capt.	7/11
	KA3	GA4	Rm,Zm	Capt.	7/11
	NA3	JA4	Zm,Rm	Capt.	7/11
	*	IA1	Rm,Zm	Capt.	7/11
	MA4	HA4	Rm,Zm	Capt.	7/11
	CB4	RA4	Rm	Capt.	7/11
	BB2	QA1	Rm	Capt.	7/11
	BB2	UA4	Rm	Capt.	7/11
	ZA4	OA4	Rm	Capt.	7/11
	YA2	NA2	Rm	Capt.	7/11
	XA2	MA2	Rm	Capt.	7/11
	SA4,UA2,VA1,TA1	KA4	Rm,Zm,U	Capt.	7/11
	SA4	MA2,KA4	Rm,Zm	VIMS	8/27
	Fox Islands #		Rm,Zm	Capt.	7/11
101	ZA4,YA2	XA4	Rm	Capt.	6/30
	XA2,WA4	WA4	Rm,Zp	Capt.	6/30
	VA2	VA3	U	Capt.	6/30
	UA3	UA3	Rm,U	Capt.	6/30
	SA2	RA3	Rm	Capt.	6/30
	SA2	SA4	Rm	Capt.	6/30
	TA2	TA4	Rm	Capt.	6/30
	*	MA3	Rm,Zm	Capt.	6/30
	MA3	LA2	Rm	Capt.	6/30
	*	KA3	Rm	Capt.	6/30
	LA2	JA3	Rm	Capt.	6/30
	KA2	IA4	Rm	Capt.	6/30
	JA1	HA4	Zm	Capt.	6/30

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE
101	IA2,HA2	GA3	Zm	Capt.	6/30
	FA4,GA2	FA1	Zm	Capt.	6/30
	FA4,GA2	EA3	Zm	Capt.	6/30
	OA2	NA3	Rm,Zm,Zp	Capt.	6/30
	QA2	PA2	Rm	Capt.	6/30
	RA2	QA2	Rm	Capt.	6/30
	PA2	OA3	Rm	Capt.	6/30
	AA4,BA2	AA4	Rm,Zm	Capt.	6/30
	AA4	BA1	Zm	Capt.	6/30
	AA4	CA4	Zm	Capt.	6/30
	CA1,DA4	DA3	Rm,Zm	Capt.	6/30
	AB4	YA4	Rm,Zm	Cit.	7/9
	AB4	ZA3	Rm,Zm	Cit.	7/9
	BB3	AB4	Rm,Zm	Cit.	7/9
	CB3	BB4	Rm	Cit.	7/9
	DB3	CB3	Rm	Cit.	7/9
	EB3	DB3	Rm	Cit.	7/9
	FB3	EB3	Rm	Cit.	7/9
	GB3	FB4	Rm	Cit.	7/9
	HB3	GB3	Rm	Cit.	7/9
	HB3	HB3	Rm	Cit.	7/9
	EA1,GA2	EA3	Zm	Cit.	7/9
	IA2	GA3	Zm	Cit.	7/9
GA2	FA1	Zm	Cit.	7/9	
Prong Cr. #			Rm	Cit.	7/9
106	KA1	QA4	Rm	Cit.	8/30
	DA4	FA2,GA4	Zm,Rm	VIMS	7/24
107	BA4	BA4,CA2	Zm	VIMS	8/26
	JA4	KA4,LA4,IA2	Rm,Zm	VIMS	8/26
108	ZA4	CB4,DB2	Rm,Zm	VIMS	8/13

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE
110	BA3	AA2	Rm	VIMS	7/3
111	JA3	FA2,GA3,HA1	Rm	VIMS	7/3
	HA3	EA1,DA3	Rm,Zm	VIMS	7/3
	IA3	FB2,EB4,DB2	Rm	VIMS	7/3
	NA3	XA3,YA3	Rm	VIMS	7/3
	DA3	BA4	Rm,Zm	VIMS	7/3
112	CB2	IB3	Rm	Cit.	6/20
	BB3	FB3	Rm	Cit.	6/20
	EB2	NB3	Rm	Cit.	6/20
	EB2	MB3	Rm	Cit.	6/20
	DB3	KB3	Rm	Cit.	6/20
	*	JB3	Rm	Cit.	6/20
	FB2	*	Rm	Cit.	6/20
	IA2	HA2	Rm,Zm	Cit.	9/2
	CA4	CA3	Rm	Cit.	9/2
	QA3	TA3	Rm	Cit.	7/5,9/4
	BA2	AA1	Rm,Zm	Cit.	7/5,9/4
	BA2	BA2	Rm	Cit.	7/5,9/4
	CA4	CA3	Rm,Zm	Cit.	7/5,9/4
	GA1,HA3	FA1	Rm	Cit.	7/5,9/4
	IA2	HA2	Rm,Zm	Cit.	7/5,9/4
	JA3	JA4	Rm	Cit.	7/5,9/4
	*	KA4	Rm	Cit.	7/5,9/4
	*	NA3	Rm	Cit.	7/5,9/4
	KA4	OA4	Rm	Cit.	7/5,9/4
	YA3	CB3	Rm	Cit.	7/5,9/4
	ZA3	EB2	Rm	Cit.	7/5,9/4
	XA4	BB4	Rm	Cit.	7/5,9/4
	WA2	AB3	Rm	Cit.	7/5,9/4
	RA3	VA4	Rm	Cit.	7/5,9/4

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE
112	RA3	UA2	Rm	Cit.	7/5,9/4
	TA3	WA3	Rm,Zm	Cit.	8/15
	PA4	SA2	Rm,Zm	Cit.	8/15
	MA3	QA2	Rm,Zm	Cit.	8/15
	LA3	PA3	Rm,Zm	Cit.	8/15
	*	MA3	Rm,Zm	Cit.	8/15
	IA2	IA3	Rm,Zm	Cit.	8/15
113	KA3	BA3	Rm	VIMS	No Date
	GA2	EA1,DA2	Rm	VIMS	No Date
	CA4	HA4	Rm	VIMS	No Date
	BA3	HA4	Rm	VIMS	No Date
114	EB2	CB3	Zp	Cit.	8/18
	FB3	DB3	Zp	Cit.	8/18
	GB4	EB4	Zp,Zm	Cit.	8/18
	HB4	FB4	Zp,Zm	Cit.	8/18
	IB2	GB1	Rm,Zm,Zp	Cit.	8/18
	AA4	AA3,BA3	Zm,Rm	VIMS	No Date
	BA2	DA3	Rm,Zm	VIMS	No Date
	LA4	LA4,KA1,NA2	Rm,Zm	VIMS	No Date
	NA2	NA2,MA1	Rm,Zm	VIMS	8/13
	AB1	TA2,UA1,VA3	Rm,Zm	VIMS	No Date
117	AA3	*	Rm	VIMS	6/29
	IA4	HA4	Rm,Zp	VIMS	7/3
	GA2	FA3	Rm,Zm	VIMS	6/29
118	GA2	FA3	Rm\Rm	Cit.\VIMS	6/24\6/29
	HA2	EA3	Rm\Rm	Cit.\VIMS	6/24\6/29
	IA3	GA3	Rm	Cit.	6/24
	JA2	HA2	Rm	Cit.	6/24
	JA2	IA3	Rm	Cit.	6/24

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE
118	JA2	JA2	Rm	Cit.	6/24
	BA2,CA2,DA3	BA3	Rm,Zm	Cit.	6/24
	AA2	CA2	Rm,Zm	Cit.	6/24
	AA2	DA1	Rm\Rm	Cit.\VIMS	6/24\6/29
	CA3	BA3	Zm,Rm	VIMS	6/29
122	BA2	KA2,JA3	Zm	VIMS	8/90
	FA4	IA4,HA2	Zm,Rm	VIMS	8/90
123	IA4	BA4	Zm	Cit.	7/27
	LA3	FA2	Rm	Cit.	7/27
124	QA3	LA4	Rm,Zm	VIMS	No Date
	JA2	IA4	Rm	VIMS	No Date
	RA2	*	Zm	VIMS	No Date
	SA2	PA3	Rm,Zm	VIMS	No Date
	TA2	MA2,NA2,PA3	Rm,Zm	VIMS	6/5
	UA2	OA2	Rm,Zm	VIMS	6/5
	VA4	PA3,QA2,RA4	Rm,Zm	VIMS	6/4-5
125	Herring Cr. #		Cd	Cit.	9/15
	Herring Cr. #		C	Cit.	9/15
	Herring Cr. #		Cd	Cit.	9/15
130	AA1	*	Zm	VIMS	No Date
	BA1	*	Zm	VIMS	No Date
131	BB4	DB4	Zm	Cit.	6/17
	JA4	KA4	Zm,Rm	VIMS	6/29
	FA4	GA4	Zm	VIMS	6/26
	TA2	WA4	Rm,Zm	VIMS	6/21
	QB4	RB4	Rm,Zm	VIMS	7/9
	RB1	SB2	Rm,Zm	VIMS	7/9

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE
131	IB4	JB4	Rm,Zm	VIMS	8/90
	OA4	QA4	Rm,Zm	VIMS	6/21
132	RA2	PA4	Zm	Cit.	6/17
	RA2	OA2	Zm	Cit.	6/17
	QA4	NA4	Zm	Cit.	6/17
	SA4	QA4	Rm,Zm	Cit.	6/17
	OA2	MA2	Zm	Cit.	6/17
	NA4	LA4	Rm,Zm\Rm,Zm	Cit.\VIMS	6/17\7/11
	MA4	KA3	Rm,Zm\Rm,Zm	Cit.\VIMS	6/17\7/11
	FA4	GA4	Rm,Zm	VIMS	7/18
	DB4	CB2	Rm,Zm	VIMS	7/30
139	AA2	BA2	Rm,Zm	VIMS	No Date
	BA1	*	Zm	VIMS	No Date
	DA3	AA3	Zm	VIMS	No Date
140	YA4	XA3,YA1	Zm	VIMS	No Date
	VA4	QA4,VA4	Zm,Rm	VIMS	No Date
141	GA3	FA3	Zm	VIMS	6/18
152	BA3	*	Zm	Cit.	9/8
	BA3	AA3	Zm,Rm	Cit.	9/8
	DA2,CA4	BA3	Zm	Cit.	9/8
159	Patuxent R. #		Ec,Nm,Ngu,Ngr,Cd	Cit.	8/13
	Patuxent R. #		Ec,Ngu,Cd	DNR	8/18
	Patuxent R. #		Ec,Cd	Park	7/14
	Back Channel #		Cd,Ec,Zp,Ngu,Va,Pcr,Nm	Park	7/14
	Patuxent R. #		Ec,Cd,Pcr,Ppu,Pe	Park	7/14
	Mill Cr. #		Ec,Cd,N,Zp	Park	7/14
Galloway Gut #		N,Cd	Park	7/14	

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE
159	Railroad Cr. #		N	Park	7/14
	Western Branch #		N,Ec,Cd	Park	7/14
	Charles Branch #		Zp	Park	7/14
166	Caine Harbor Mile #		Rm	Cit.	9/5
167	CA3	CA3	Zm	Cit.	9/21
	BA3	BA3	Zm,Rm	Cit.	9/21
	AA4	AA4	Zm	Cit.	9/21
	BA3	BA3	Rm	DNR	No Date
	Gray's Cove #		Zm	DNR	No Date
168	CA2	AA3	Zm	Cit.	9/21
	EA4	*	Rm	DNR	No Date
	BA3	*	Rm	DNR	No Date
	Isle of Wright Bay #		Rm	DNR	No Date
	Isle of Wright Bay #		Zm	Cit.	No Date
	Isle of Wright Bay #		Rm	Cit.	No Date
	Turville Cr. #		Rm	Cit.	No Date
170	CA3	EA3	Zm	Cit.	9/2
	DA3	FA3	Zm,Rm	Cit.	9/2
	BA3	GA3	Zm	Cit.	9/2
	EA3	IA3	Zm	Cit.	9/2
	EA3	JA3	Zm,Rm	Cit.	9/2
	EA3	LA3	Zm	Cit.	9/2
	AA3	AA3	Zm,Rm	Cit.	9/21
	BA3	CA3	Zm,Rm	Cit.	9/21
	BA3	BA1	Zm,Rm	Cit.	9/21
	BA3	DA3	Zm,Rm	Cit.	9/21
	EA3	JA3	Zm,Rm	Cit.	9/21
	BA3	HA3	Zm,Rm	Cit.	9/21
	BA3	GA3	Zm,Rm	Cit.	9/21

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE	
170	DA3	FA3	Zm	Cit.	9/21	
	CA3	EA3	Zm	Cit.	9/21	
	BA3	IA3	Zm	Cit.	9/24	
	LA3	QA4	Zm	Cit.	9/24	
	JA4	PA4	Zm	Cit.	9/24	
	HA4	OA4	Zm	Cit.	9/24	
	EA3	LA3	Zm,Rm	Cit.	9/24	
	GA4	NA4	Zm,Rm	Cit.	9/24	
	BA3	HA3	Rm	DNR	No Date	
	Newport Bay #		Zm	DNR	No Date	
	Newport Bay #		Zm	DNR	No Date	
	Newport Bay #		Zm	DNR	No Date	
	Chincoteague Bay #		Rm	DNR	No Date	
	Tingles Narrows #		Rm	DNR	No Date	
	Sinepuxent Bay #		Rm,Zm	Cit.	No Date	
	172	DA3	FA3	Zm,Rm	Cit.	9/24
		EA1	DA3	Zm,Rm	Cit.	9/24
*		CA4	Zm	Cit.	9/24	
HA4		HA3	Zm,Rm	Cit.	9/24	
GA3		GA4	Zm	Cit.	9/24	
FA4		EA4	Zm	Cit.	9/24	
KA3		JA3	Zm,Rm	Cit.	9/24	
LA4		LA4	Zm,Rm	Cit.	9/24	
LA4		KA1	Zm	Cit.	9/24	
MA3		NA4	Zm,Rm	Cit.	9/24	
MA3		MA1	Zm,Rm	Cit.	9/24	
IA4		IA4	Rm	DNR	No Date	
Blue Pond #			Zm	DNR	No Date	
Martin Bay #			Rm	DNR	No Date	
Purnell Pond #			Rm	DNR	No Date	
Scott Landing #			Rm	DNR	No Date	
Brockatonorton Bay #			Rm	DNR	No Date	

QUAD	1990 BED	1989 BED	SPECIES**	SOURCE***	1990 SURVEY DATE
172	Brockatonorton Bay #		Rm	DNR	No Date
	Bridge Cr. #		Rm	DNR	No Date
	Johnson Bay #		Rm	DNR	No Date
	Purnell Bay #		Zm	DNR	No Date
	Parker Bay Tumps #		Rm	DNR	No Date
	Parker Bay #		Zm	DNR	No Date
	Rowley Cove #		Rm	DNR	No Date
	Muddy Thorofare #		Rm	DNR	No Date
	Big Bay Marsh #		Rm,Zm	DNR	No Date
173	GA3	EA3	Zm,Rm	Cit.	9/21
	HA2	DA3	Zm,Rm	Cit.	9/21
	EA3	IA2	Zm	Cit.	9/21
	EA3	KA2	Zm,Rm	Cit.	9/21
	EA3	LA4	Zm	Cit.	9/21
	EA3	HA3	Zm,Rm	Cit.	9/21
	EA3	GA3	Zm,Rm	Cit.	9/21
	FA3	FA3	Zm,Rm	Cit.	9/21
	BA4	BA4	Rm	Cit.	9/27
	AA4	AA4	Zm	Cit.	9/27
	EA3	MA1	Zm,Rm	Cit.	9/27
	EA3	OA1	Rm	Cit.	9/27
	EA3	NA4	Zm,Rm	Cit.	9/27
	DA4	CA4	Rm	Cit.	9/27
	Lone Pond #		Rm	DNR	No Date
	Middlemoor Thorofare #		Rm	DNR	No Date
Pope Bay #		Rm	DNR	No Date	
175	AA3	AA4,BA3	Zm,Rm	VIMS	No Date

** 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* sp. (naiad)
- Ec - *Elodea canadensis* (common elodea)
- Va - *Vallisneria americana* (wild celery)
- Tn - *Trapa natans* (water chestnut)
- Pe - *Potamogeton epihydrus* (leafy pondweed)
- 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

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

- Capt. - Charterboat Captain's Survey
- Cit. - Citizen's Survey
- FWS - U. S. Fish and Wildlife Service Surveys
- DNR - Maryland Department of Natural Resources
- COG - Metropolitan Washington Council of Governments
- HPEL - University of Maryland Horn Point Environmental Laboratory
- Harford - Harford Community College - Stan Kollar
- VIMS - Virginia Institute of Marine Science/School of Marine Science/College of William and Mary
- Park - Maryland-National Capital Parks and Planning Commission, Patuxent River Park.
- Essex - Essex Community College SAV Research Group

- \ - **Slash mark separates species data of independent survey sources and independent survey dates.**
- # - **No SAV bed mapped from 1989 or 1990 aerial photography but SAV bed presence was verified by 1990 groundtruth survey at this location.**
- * - **No SAV bed mapped from 1990 aerial photography but SAV bed presence was verified in 1990 at the 1989 bed location by groundtruth survey.**