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

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

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by

Robert J. Orth, Adam A. Frisch, Judith F. Nowak, and Kenneth A. Moore

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

Contributions by:

Nancy Rybicki
R.T. Anderson
Virginia Carter
U.S. Geological Survey
Reston, VA 22092

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EXECUTIVE SUMMARY

The distribution of submerged aquatic vegetation during 1987 in the Chesapeake Bay, its tributaries, and Chincoteague Bay, was mapped at a scale of 1:24,000 using color aerial photography. SAV bed perimeter information was digitized and stored in a computerized data base. Ground truth information was obtained from the U.S. Geological Survey, the Maryland Department of Natural Resources, the University of Maryland Horn Point Laboratory, Harford Community College and the Virginia Institute 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 DNR Watermen's Assistance Program, provided additional ground truth information.

In 1987, the Chesapeake Bay had 20,119 hectares of SAV, with 2,954 , 9,202 and 7,963 hectares occurring in the Upper, Middle and Lower Bay zones, respectively (Fig. 1). Seventy-five percent of the SAV in the Upper Bay zone was located in the Susquehanna Flats section. Nine species of SAV were documented by ground truth surveys in this section, with Myriophyllum spicatum being the dominant species. Hydrilla verticillata was found in the Flats but occurred in small isolated beds, as did all SAV in this area. In the Upper Western Shore section SAV was concentrated in the Bush, Gunpowder, and Middle Rivers, in particular Saltpeter and Seneca Creeks, with M. spicatum and Vallisneria americana being most abundant. In the Chester River section, SAV was most abundant adjacent to Eastern Neck and Eastern Neck Island and in Langford Creek. In this region Ruppia maritima was the most abundant of six species which were reported.

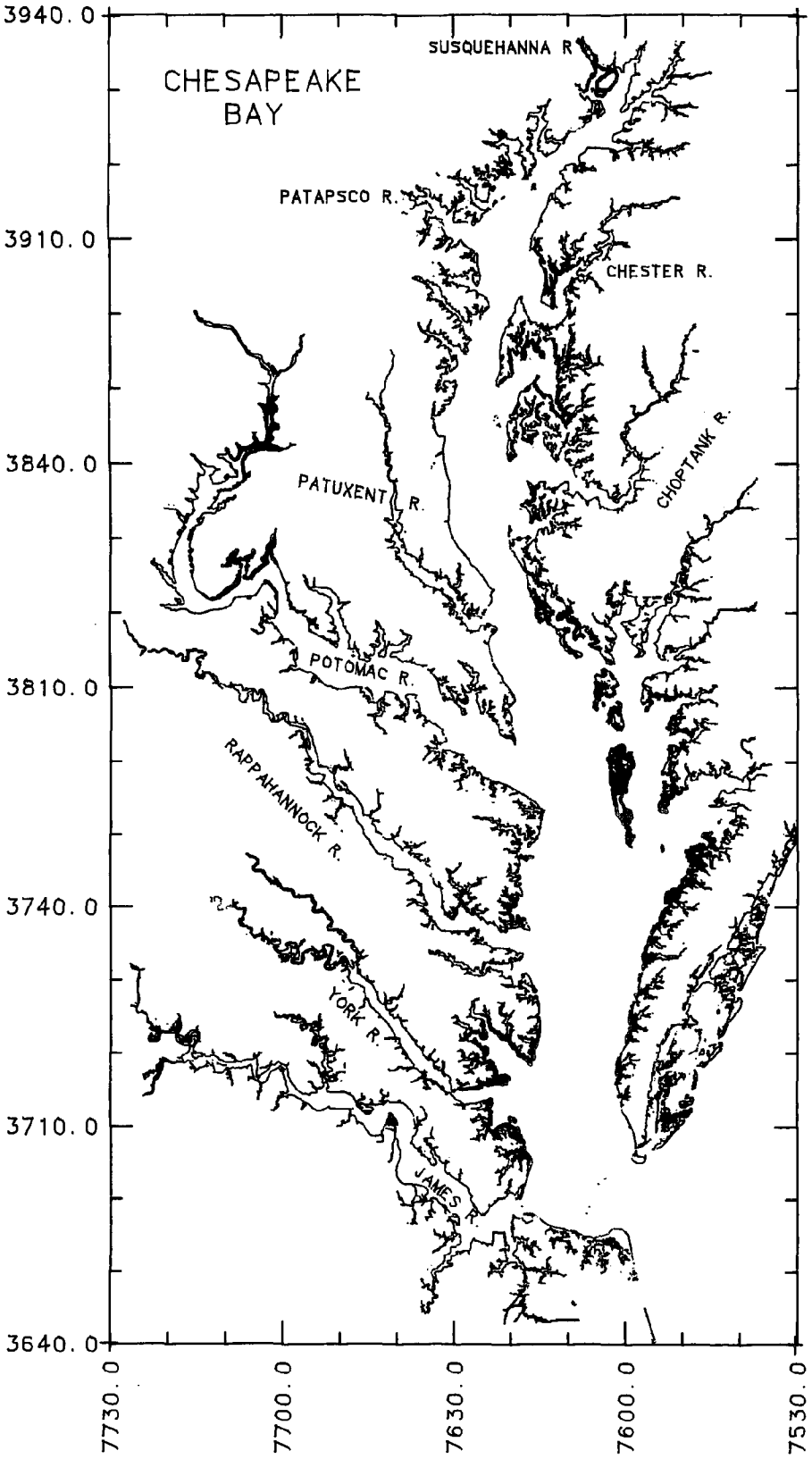

Figure 1. Map of Chesapeake Bay and tributaries with locations of all SAV beds in 1987.

In the Middle Bay Zone SAV was abundant in: the Eastern Bay; the lower Honga River area including Barren Island; Big and Little Annemessex Rivers; the lower sections of the Manokin River; Bloodsworth, Southmarsh, Smith and Tangier Islands, and the broad shoal area between Smith and Tangier Islands. This Middle Bay zone was redrawn from earlier surveys and now includes additional areas of SAV formerly designated to the Lower Bay zone. R. maritima was the dominant species reported for this mid-bay area, with Z. marina being abundant in the Smith-Tangier Island area.

The Middle Bay zone also includes the entire Potomac River. SAV was concentrated in two distinct zones: the tidal freshwater region where H. verticillata was the numerically dominant species, and in the region around the Rt. 301 bridge, including the Nanjemoy and Port Tobacco Creeks. V. americana and M. spicatum were dominant species in this area. The total SAV in the Hydrilla dominated areas has not increased appreciably during the last 2 years, although Hydrilla has been reported further downriver.

SAV was abundant throughout the entire Lower Bay zone except for the James River. Fifty-one percent of SAV in the Lower Bay zone was found in the Lower Eastern Shore section, around the Fox Islands and the mouths of major creeks (i.e Cherrystone Inlet, Hungars Creek, Mattawoman Creek, Occahannock Creek, Craddock Creek, Pungoteague Creek and Onancock Creek). Along the western shore, SAV was abundant in Mobjack Bay (15% of SAV in the Lower Bay zone), lower York River, Back River and Drum Island Flats area adjacent to Plum Tree Island. Both R. maritima and Z. marina were abundant throughout this zone. R. maritima had rapidly spread in both the Piankatank and Rappahannock Rivers in the last year, occurring in sparse to dense beds in many previously unvegetated areas, especially in the Corrotoman River.

SAV in Chincoteague Bay was little changed in distribution from 1986. All of the SAV consisted of R. maritima and Z. marina and was located along the eastern side of the bay behind Assateague Island.

SAV distribution since the 1970's was examined for three locations in the Chesapeake Bay which represent different scenarios of change that SAV has undergone: 1. The York River (1971-1987) where SAV declined in upstream sites in the early 1970's but has been slowly returning over the last five years; 2. The Rappahannock River (1971-1987) where SAV almost completely disappeared in the early 1970's and has just recently been returning to a few sections, and 3. The lower Eastern Shore (1978-1987) where SAV had only slightly declined in the 1970's. Continued monitoring of the changes in SAV populations at these sites as well as others, coupled with detailed water quality measurements and laboratory experimentation, should lead to a much greater understanding of those factors that control the distribution and abundance of SAV in the Chesapeake Bay.

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SECTION 1

INTRODUCTION

A major goal of the Chesapeake Bay cleanup program is to insure that the living resources of the bay remain viable and productive components of the bay ecosystem. Understanding the complexity of the Chesapeake Bay, in particular those factors that affect the distribution and abundance of the living resources, is critical if we are to develop effective management strategies to improve the quality of the Chesapeake Bay environment.

Submerged aquatic vegetation (SAV) is one of the most important living resources of the Chesapeake Bay. Because of its sensitivity to small changes in environmental conditions, SAV can serve as a barometer of the health of the bay (Orth and Moore, 1988). A key component to understanding factors affecting spatial and temporal changes in distribution and abundance of SAV is documentation of annual changes in abundance of SAV beds over a long period.

The Chesapeake Bay Program includes a component which emphasizes the monitoring of living resources on a regular basis. Since SAV communities can respond quickly to changes in water quality, comprehensive monitoring of this resource can provide an integrated view of the status of eutrophication and relative health of the system throughout much of the bay region.

SAV communities in the entire Chesapeake Bay and tributaries have been photographed, mapped and the areas of the beds digitized in 1978, 1984, 1985, 1986 and 1987 while portions of the upper bay were mapped and

digitized in 1979 and the lower bay was mapped and digitized in 1980 and 1981 (Orth, et. al., 1979; Anderson and Macomber, 1980; Orth, et. al., 1985, 1986, 1987). Numerous SAV ground surveys have been conducted but most have been limited to specific sections. No one ground survey has delineated baywide SAV patterns. Aerial photography has proved to be a useful tool in examining SAV distribution patterns and, when combined with appropriate ground data, has provided an accurate, synoptic picture of baywide SAV distribution. The goal of the 1987 work was to continue the annual monitoring of SAV on a baywide basis using aerial photographic methods with appropriate ground truth to substantiate presence or absence of SAV in particular sections.

SECTION 2

SAV SPECIES

Ten species of submerged aquatic vegetation are commonly found in the Chesapeake Bay and its tributaries. Zostera marina (eelgrass) is dominant in the lower reaches of the bay. Myriophyllum spicatum (water milfoil), Potamogeton pectinatus (sago pondweed), Potamogeton perfoliatus (redhead grass), 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 (widgeongrass) is tolerant of a wide range of salinities and is found from the bay mouth to the Susquehanna Flats. Approximately eleven other species are only occasionally found, and when present, occur primarily in the middle and upper reaches of the bay and the tidal rivers (Appendix A). Hydrilla verticillata (hydrilla), presently dominates SAV beds in the tidal freshwater reaches of the Potomac River and has also been reported from the Susquehanna Flats, where its growth has not been as widespread (Kollar, pers. comm.).

SECTION 3

METHODS

Introduction

Color 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 1987. SAV beds mapped from photographs onto United States Geological Survey (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 1987 was mapped onto the same topographic quadrangles.

Aerial Photography

The 1987 SAV photography was obtained by AEROECO (Edgewater, MD) using a Zeiss Jena LMK 15/2323 camera, a 153 mm (6 inch) focal length Zeiss Jena Lamegon PI/C lens, and Kodak 24 cm (9 1/2 inch) square negative Aerochrome MS type 2445 film. The camera was mounted in the bottom fuselage of AEROECO'S Partenavia P68 Observer, a twin engine high wing reconnaissance aircraft. Photography was acquired at approximately 12,000 feet altitude, yielding a 1:24,000 photographic scale.

Flight lines for photography were predetermined by AEROECO (and approved by the Principal Investigators) 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), as well as land features necessary as control points for accurate mapping.

Flight lines were drawn on 1:250,000 scale USGS maps (Fig. 2).

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

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

Quality assurance and calibration procedures are as follows. 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 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

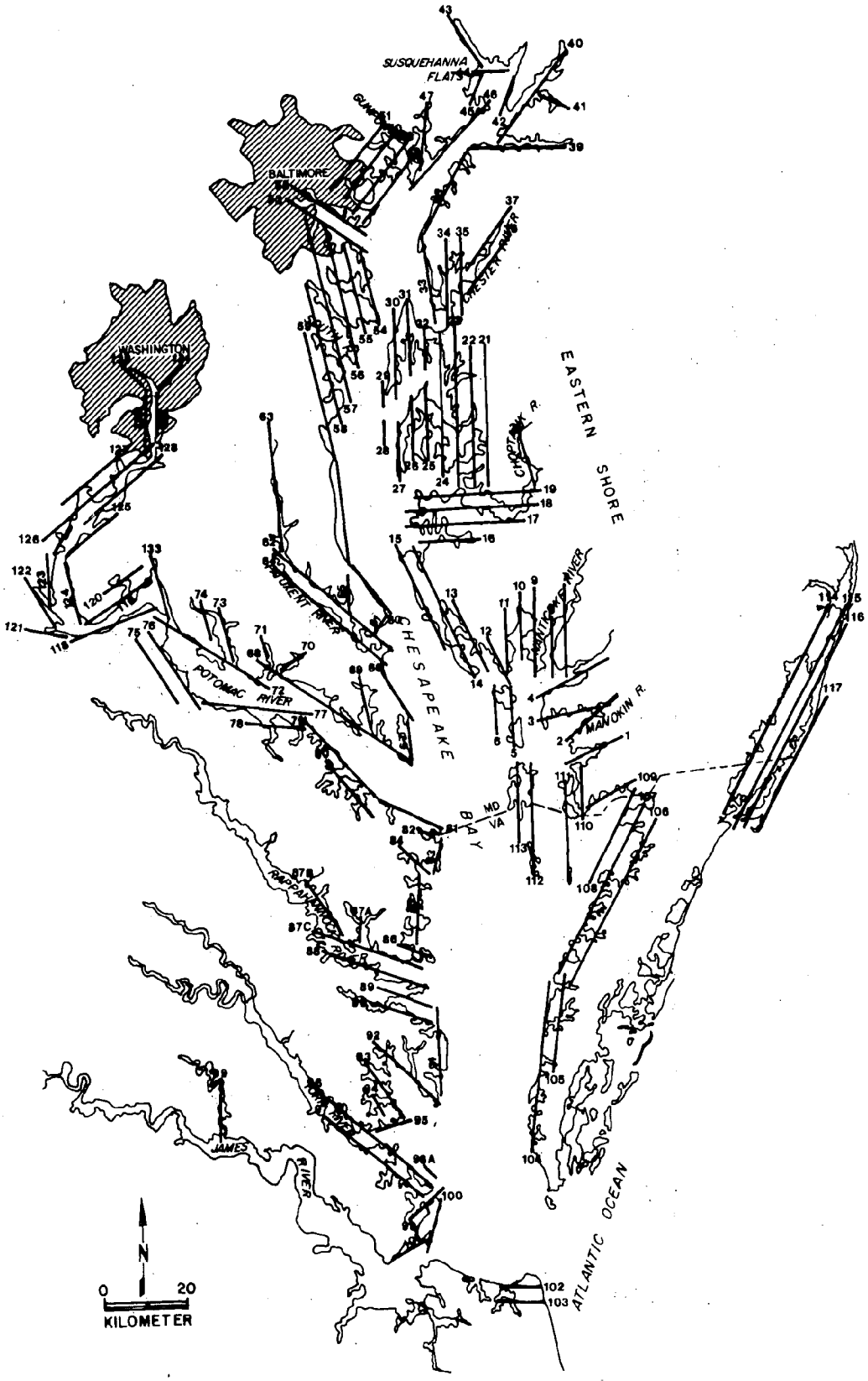

Figure 2. Map of Chesapeake Bay and tributaries with approximate locations of flight lines for 1987 photography.

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 20^0 and 40^0 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. Offshore winds were preferred over on-shore winds when wind conditions could not be avoided.

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

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

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

tilt. The scale/altitude/film/focal length combination was coordinated to produce two foot resolution. Wind speed was monitored hourly from the flight service available in the region. Under normal operating conditions, flights were usually conducted under wind speeds less than 10 mph. (Above this, wind generated waves stir the bottom sediments which can easily obscure SAV beds in less than one hour.) Pilot experience determined what acceptable level of turbidity would insure complete delineation of SAV beds. (Robert Macomber of AEROCOo, personally responsible for acquisition of the photography, has had 10 years experience in aerial photography of SAV and is knowledgeable of the Chesapeake Bay and tributaries.) 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 proiritizing and executing the photography, flights were planned to coincide with these atmospheric conditions.

Exposed film was processed by AEROECO. A contact print was produced for each exposed frame. Each photograph was labeled with date and time of acquisition as well as location. 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 3 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 3 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 1986 from aerial photography, 1987 ground truth information, and aerial site surveys. USGS published 7.5 minute topographic quadrangle masters (1:24,000 scale) printed by the Mid-continent Mapping Center of the USGS on stable transparent mylar were used as base maps. Identical copies of these base maps were made at the same scale on stable transparent mylar by the Virginia Department of Highways using a diazo process. SAV from the 1987 aerial photographs was mapped onto these diazo copies of USGS topographic quadrangles. Delineation of SAV bed boundaries onto the topgraphic 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.

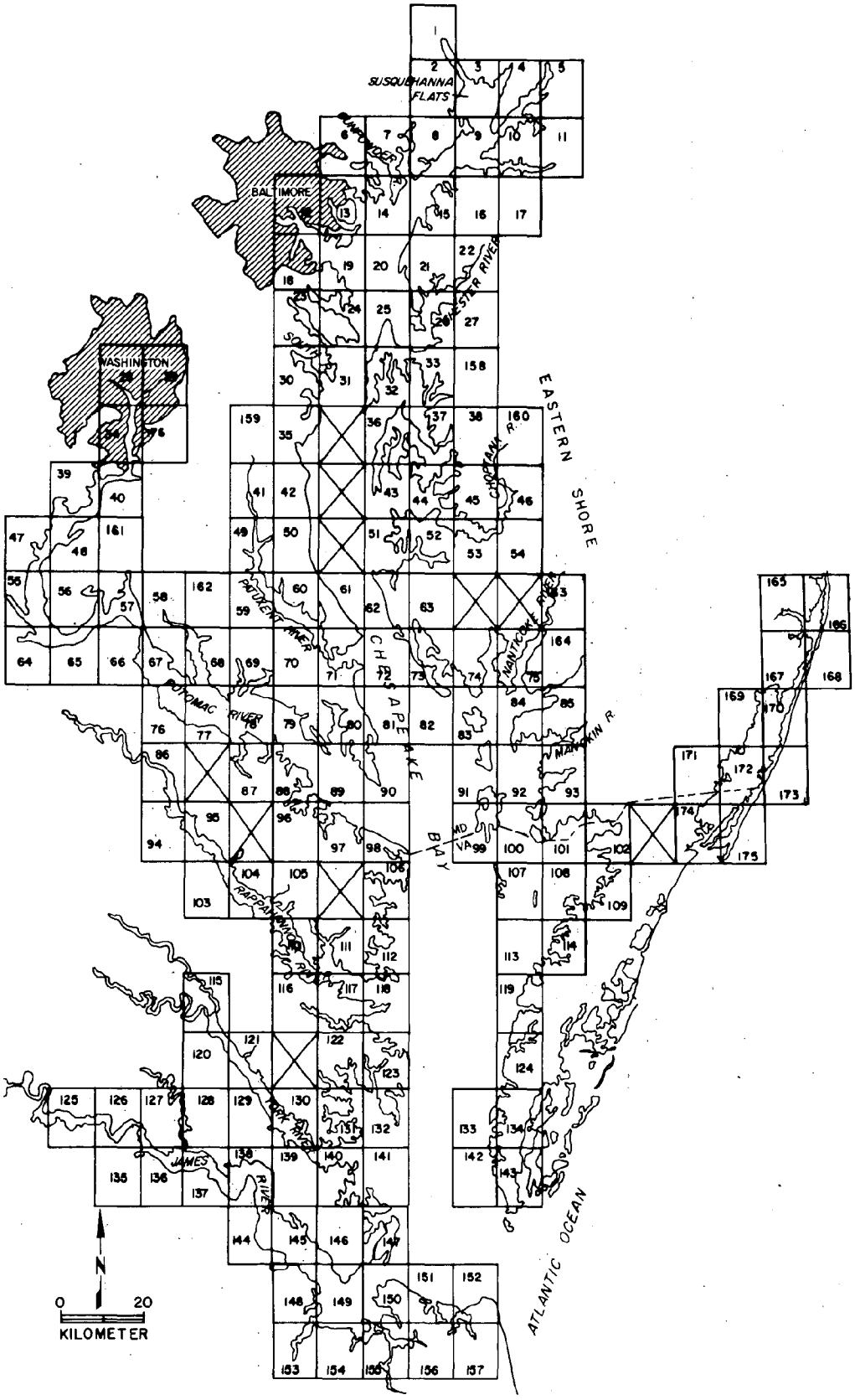

Figure 3. Location of USGS topographic quadrangles in the Chesapeake Bay, its tributaries and Chincoteague Bay.

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

1. Conowingo Dam, Md.-Pa.
2. Aberdeen, Md.
3. Havre de Grace, Md.
4. North East, Md.
5. Elkton, Md.
6. White Marsh, Md.
7. Edgewood, Md.
8. Perryman, Md.
9. Spesutie, Md.
10. Earleville, Md.
11. Cecilton, Md.
12. Baltimore East, Md.
13. Middle River, Md.
14. Gunpowder Neck, Md.
15. Hanesville, Md.
16. Betterton, Md.
17. Galena, Md.
18. Curtis Bay, Md.
19. Sparrows Point, Md.
20. Swan Point, Md.
21. Rock Hall, Md.
22. Chestertown, Md.
23. Round Bay, Md.
24. Gibson Island, Md.
25. Love Point, Md.
26. Langford Creek, Md.
27. Centreville, Md.
28. Washington West, Md.-D.C.-Va.
29. Washington East, D.C.-Md.
30. South River, Md.
31. Annapolis, Md.
32. Kent Island, Md.
33. Queenstown, Md.
34. Alexandria, Va.-D.C.-Md.
35. Deale, Md.
36. Claiborne, Md.
37. St. Michaels, Md.
38. Easton, Md.
39. Fort Belvoir, Va.-Md.
40. Mt. Vernon, Md.-Va.
41. Lower Marlboro, Md.
42. North Beach, Md.
43. Tilghman, Md.
44. Oxford, Md.
45. Trappe, Md.
46. Preston, Md.
47. Quantico, Va.-Md.
48. Indian Head, Va.-Md.
49. Benedict, Md.
50. Prince Frederick, Md.
51. 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.	134.	Cheriton, Va.
92.	Terrapin Sand Point, Md.	135.	Savedge, Va.
93.	Marion, Md.	136.	Claremont, Va.
94.	Mount Landing, Va.	137.	Surry, Va.
95.	Tappahannock, Va.	138.	Hog Island, Va.
96.	Lottsburg, Va.	139.	Yorktown, Va.
97.	Heathsville, Va.-Md.	140.	Poquoson West, Va.
98.	Burgess, Va.-Md.	141.	Poquoson East, Va.
99.	Ewell, Md.-Va.	142.	Elliotts Creek, Va.
100.	Great Fox Island, Va.-Md.	143.	Townsend, Va.
101.	Crisfield, Md.-Va.	144.	Bacons Castle, Va.
102.	Saxis, Va.-Md.	145.	Mulberry Island, Va.
103.	Dunnsville, Va.	146.	Newport News North, Va.
104.	Morattico, Va.	147.	Hampton, Va.
105.	Lively, Va.	148.	Benns Church, Va.
106.	Reedville, Va.	149.	Newport News South, Va.
107.	Tangier Island, Va.	150.	Norfolk North, Va.
108.	Chesconessex, Va.	151.	Little Creek, Va.
109.	Parksley, Va.	152.	Cape Henry, Va.
110.	Urbanna, Va.	153.	Chuckatuck, Va.
111.	Irvington, Va.	154.	Bowers Hill, Va.
112.	Fleets Bay, Va.	155.	Norfolk South, Va.
113.	Nandua Creek	156.	Kempsville, Va.
114.	Pungoteague, Va.	157.	Princess Anne, Va.
115.	West Point, Va.	158.	Wye Mills, Md.
116.	Saluda, Va.	159.	Bristol, Md.
117.	Wilton, Va.	160.	Fowling Creek, Md.
118.	Deltaville, Va.	161.	Port Tobacco, Md.
119.	Jamesville, Va.	162.	Charlotte Hall, Md.
120.	Toano, Va.	163.	Mardela Springs, Md.
121.	Gressitt, Va.	164.	Wetipquin, Md.
122.	Ware Neck, Va.	165.	Selbyville, Md.
123.	Mathews, Va.	166.	Assawoman Bay, Md.
124.	Franktown, Va.	167.	Berlin, Md
125.	Westover, Va.	168.	Ocean City, Md.
126.	Charles City, Va.	169.	Public Landing, Md.
127.	Brandon, Va.	170.	Tingles Island, Md.
128.	Norge, Va.	171.	Girdle Tree, Md.-Va.
129.	Williamsburg, Va.	172.	Boxiron, Md.-Va.
130.	Clay Bank, Va.	173.	Whittington Point, Md.-Va.
131.	Achilles, Va.	174.	Chincoteague West, Va.
132.	New Point Comfort, Va.	175.	Chincoteague East, Va.
133.	Cape Charles, Va.	176.	Anacostia, D.C.-Md.

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. 4). 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 in the tracking of a single bed between quad sheets as well as the analysis of those beds that had to be separated due to variation in SAV density.

SAV Perimeter Digitization and Area Calculation

The perimeters of all SAV beds mapped from the aerial photography were digitized in a clockwise direction using a Numonics Model 2400/2200 DigiTablet Graphics Analysis System having a resolution of .001 inches (.00254 cm) and an accuracy of .005 inches (.0127 cm). Coordinates were transmitted to a PRIME 9955 computer for area calculations and data manipulation via software developed at VIMS. Each SAV bed was digitized at least four times and the area reported as a mean of three.

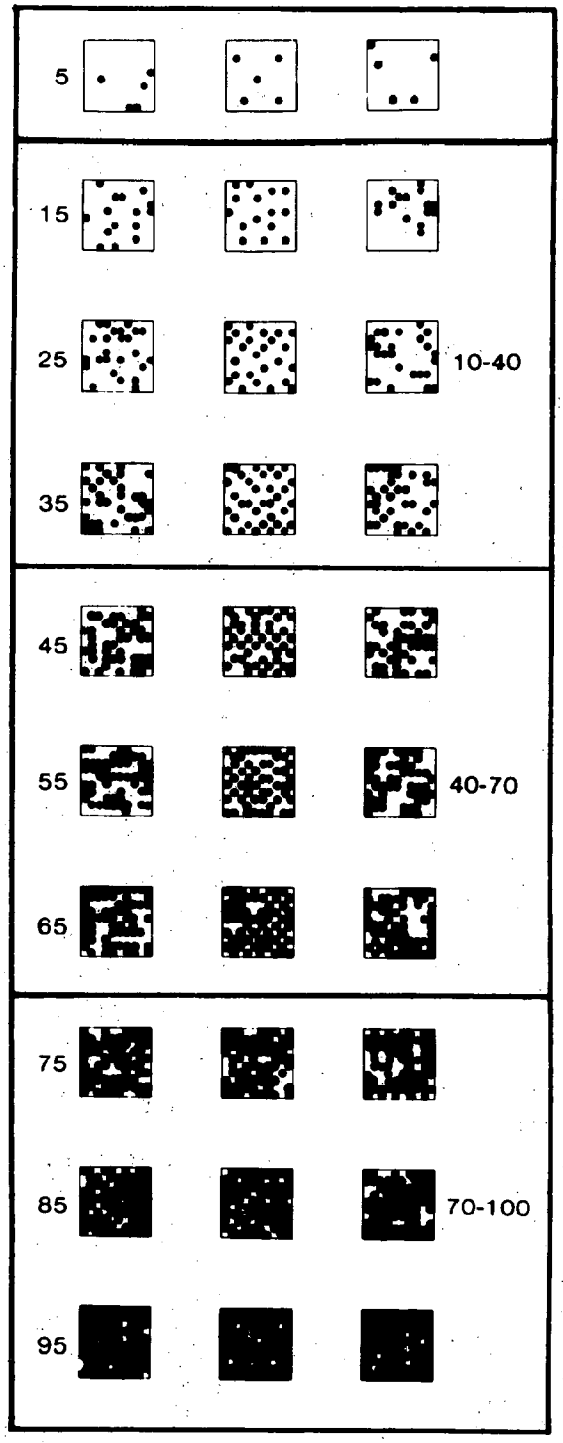

Figure 4. Crown density scale used for determining density of SAV beds: (1) Very sparse, 0-10%; (2) Sparse, 10-40%; (3) Moderate, 40-70%; (4) Dense, 70-100%.

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.

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

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

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 1:24000:

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

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

Tests of Precision and Accuracy

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

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

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

Every SAV bed mean area was the result of at least four independent digitizations of the outline of each SAV bed. The computer made an area calculation of each replication and the 3 bed outlines or perimeters most similar in terms of area were then used for the calculation of a mean area. The perimeter defining the area most similar to the mean area was then saved by the computer program as the representative perimeter for this specific SAV bed. Representative perimeters for all 1987 SAV beds were later converted to Latitude and Longitude and a copy of each on computer tape was then sent to the EPA Chesapeake Bay Program. The areas used in the mean area calculation do not by contract requirements have a range in excess of 5% of the mean area. All bed areas having an error rate in excess of 5% are flagged by the VIMS quality assurance quality control computer program for additional error assesment. In fact, the VIMS error rate is normally less than 1%.

A complete outline of the digitization procedure can be found in the quality assurance project plan for the 1987 submerged aquatic vegetation, distribution and abundance survey of the Chesapeake and Chincoteague Bays (available from the EPA Chesapeake Bay Program Office).

Standard Operating Procedures for Quality Assurance/Quality Control

Standard operating procedures (SOPs) were developed to facilitate orderly and efficient processing of the 1987 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 the quality assurance project plan for the 1987 submerged aquatic vegetation, distribution and abundance survey of the Chesapeake and Chincoteague Bays.

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

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

1 = lower left corner or chart origin

2 = upper left corner

3 = upper right corner

4 = lower right corner

These corner points are then used to convert each individual X,Y perimeter point to latitude and longitude. If additional files are needed

for a given chart, a new set of corner points are digitized and stored at the head of these files.

The steps for the conversion of from X,Y cm to lat. and long. are:

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

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

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

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

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

YLAT = YCHART(1) + (YPORTH * YCONV)

XLON = XCHART(1) - (XPORTH * XCONV)

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

These new Lat,Lon perimeter points are then stored in a special EPA submission file for VIMS SAV Data. The submission file structure is fully documented in the VIMS 1987 QA project plan.

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). The area between the mouth of the bay to a line stretching from the mouth of the Potomac River at Smith Point in Virginia to approximately 3 nautical miles south of Tangier Island then extending to the eastern side of the bay to an area just south of the mouth of the Little Annemessex River is referred to as the Lower Bay zone (Fig. 5).
(It is important to note here that the designation for the Lower Bay and Middle Bay zone has been altered to facilitate a more accurate way of

reporting SAV distribution in the mid-section of the bay, in particular in and around the major island complex from Tangier to Bloodsworth Island.)

The area between the south shore of the Little Annemessex River and the south shore of the Potomac River to the Chesapeake Bay bridge at Kent Island is referred to as the Middle Bay zone. The area between the Chesapeake Bay bridge and the Susquehanna Flats is referred to as the Upper Bay zone. The salinity within each zone roughly coincides with the major salinity zones of estuaries: polyhaline (18-25°/oo), Lower zone; mesohaline (5-18°/oo), Middle zone; oligohaline (0.5-5°/oo), Upper zone. Although the major rivers and smaller tributaries of the bay have their own salinity regimes, the distribution of SAV in each river is discussed within the zone where it connects to the bay proper.

In addition, 21 major sections of the bay are identified for more detailed discussion of SAV distribution (Fig. 5, Table 3). These sections, which were first delineated for the 1984 survey (Orth, et. al, 1985) and have been slightly modified for the 1987 survey, denote relatively distinct parts of the bay and its tributaries that are readily identifiable from a map. 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 lat. and long. of the boundary points of each Chesapeake Bay section. SAV distribution in Chincoteague Bay is presented and discussed as a separate section.

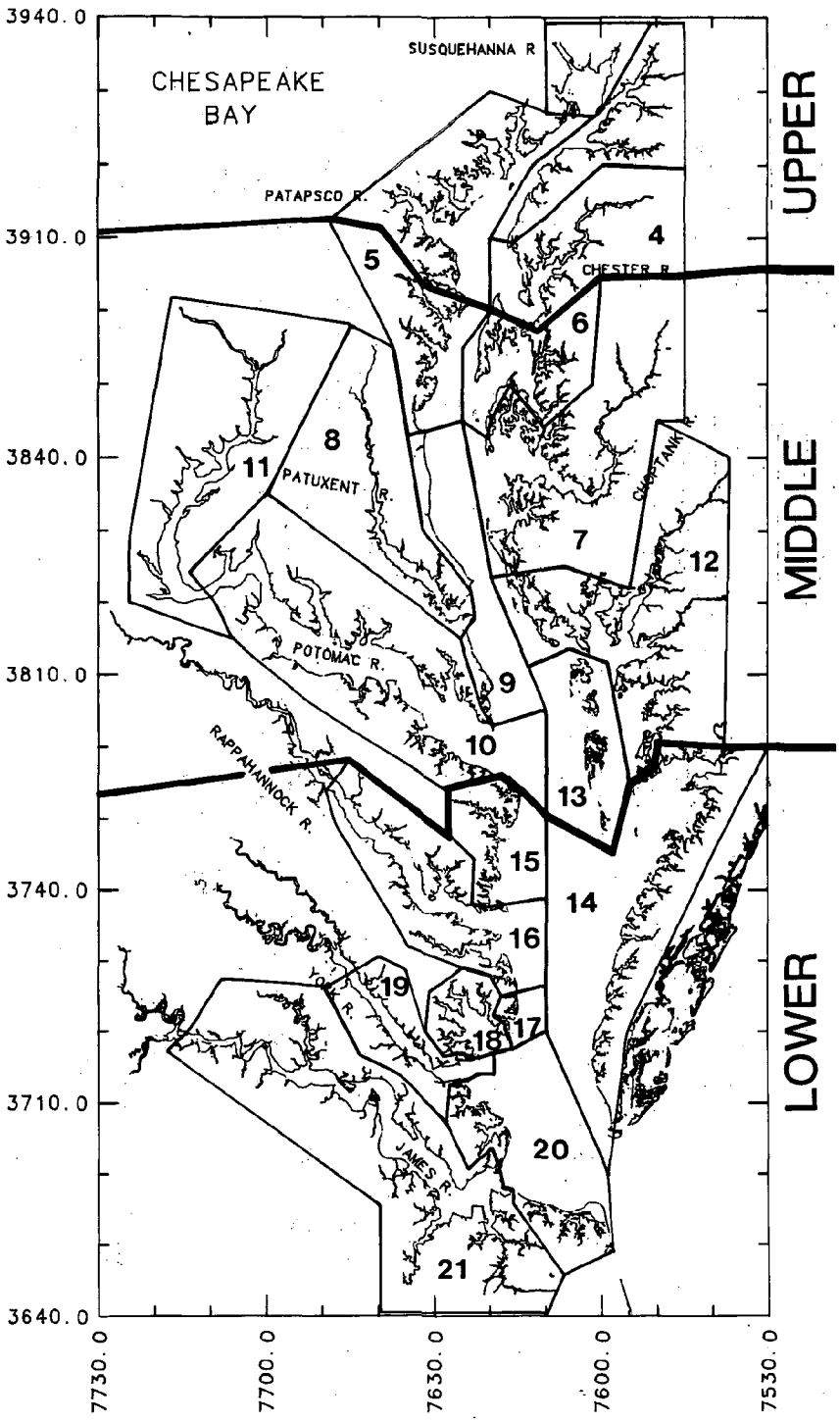

Figure 5. Location of upper, middle and lower zones of the Chesapeake Bay and the 21 major sections used for delineation of SAV distribution patterns. (See Table 3 and text for exact boundary positions)

TABLE 3. AREA DESCRIPTION FOR EACH OF 21 MAJOR SECTIONS OF THE CHESAPEAKE BAY SAV STUDY AREA.**

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

continued

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 - 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 which also changes the delineation of the three major zones. (See report for these changes and see Figure 5 and Appendix B for boundary locations).

Ground Truth and Other Data Bases

Ground truthing was accomplished by cooperative efforts of a number of agencies and individuals. Although incomplete for most areas, ground truthing confirmed the existence of some SAV beds mapped from 1987 aerial photography, located a few SAV beds not visible from the photography, and provided species data for most of these beds.

For those areas in Virginia waters where aerial photographic evidence of SAV beds was inconclusive, photo-verification was accomplished by ground truthing. Observations were principally made from small boats and by divers snorkeling over areas indicated from the photographs. In several river systems included in this survey (York, Piankatank and Rappahannock) where VIMS researchers transplanted SAV (principally eelgrass), transplant sites also were examined carefully by divers for any extant SAV. U.S. F&WS Citizen survey data were also added to the Virginia maps 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 since the first bay-wide survey in 1978.

In Maryland, ground truth data were obtained in 1987 by the USGS Potomac River study, two SAV research and transplanting projects, and the Citizen and Charterboat Captain volunteer surveys. The field study in the Potomac River by the USGS (Rybicki et al., 1988) from the Chain Bridge near Pimmit Run at Washington, D.C. to the 301 bridge near Morgantown, Md. (Figs. 6, 7) used shoreline surveys and sampled transects to document the distribution of SAV in the tidal Potomac River and transition zone.

The USGS conducted shoreline surveys in the tidal freshwater portion of the river and tributaries (Fig. 6) in late June and early October of 1987 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 topo maps. The transition zone (Fig. 7) was surveyed in late July by raking for SAV at previously established vegetation transects and by spot-checking between transects and in small tributaries. Transects were perpendicular to shoreline and terminated just beyond vegetation or at 60 meters when no SAV was present. All species were identified and tabulated by transect. Codes for the transects in Figs. 6 and 7 contain the location and the river or tributary mile. For example, in MN-01T-2, MN is Mattawoman Creek (Fig. 6), 01T is one nautical mile up the tributary from the mouth, -2 is the second transect; in PY-06R, PY is Piscataway Creek (Fig. 7), 06R is the sixth transect on the edge of the main river. Data from these surveys were transferred to the SAV distribution maps in Appendix C.

One SAV transplanting project being conducted on the Susquehanna Flats by Stan Kollar of Harford Community College (HCC) provided data in the form of species presence by percentage, primarily by visual estimates. Species locations from these data were added to the SAV maps in Appendix C.

A SAV research group at University of Maryland Horn Point Environmental Laboratory (HPL) headed by Court Stevenson also provided ground truth data. Maps of their study sites on the Choptank River were annotated on the maps for this report (Appendix C) indicating the species reported for 1987.

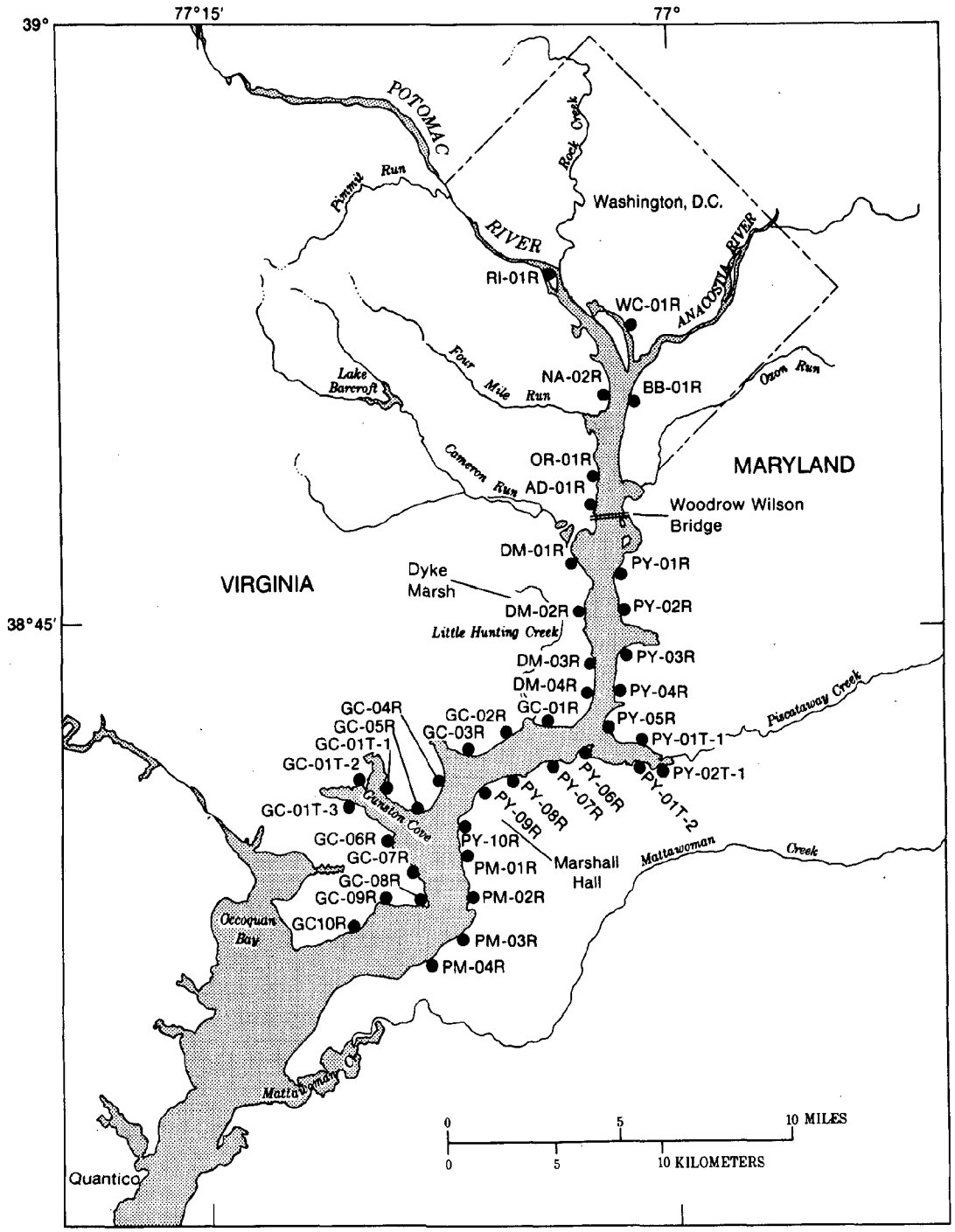

Figure 6. Location of vegetation sampling transects in the tidal Potomac River above Mattawoman Creek.

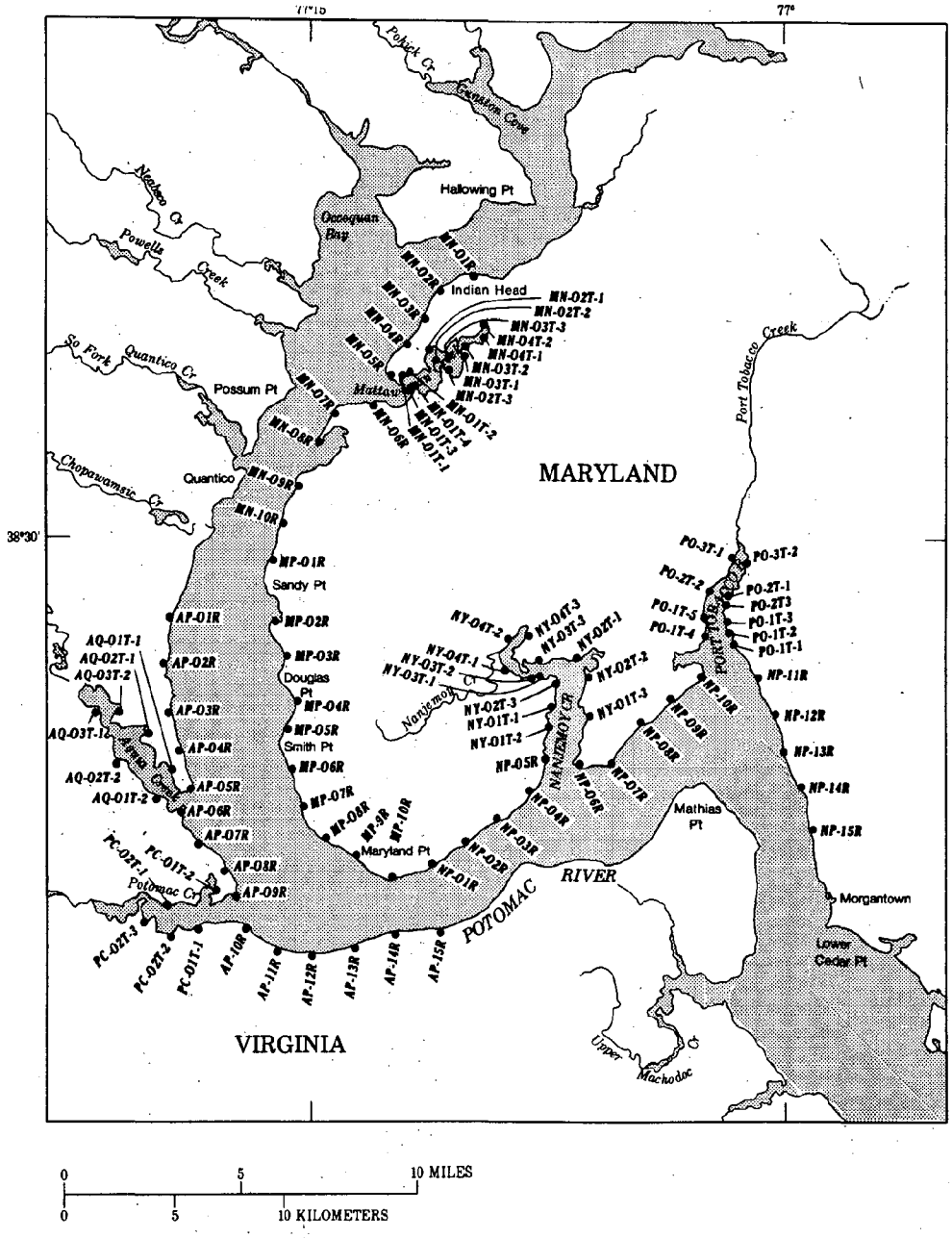

Figure 7 Location of USGS vegetation sampling transects from Mattawoman Creek to Port Tobacco River.

In addition to the scientific surveys, private citizens participated in identifying SAV beds by checking areas in the bay for SAV. Two groups were responsible for looking for SAV under the sponsorship of separate organizations. The Maryland Charterboat Association participated in the baywide effort, funded by the Maryland Department of Natural Resources (DNR) Watermen's Assistance Program. Boat captains were provided with reduced SAV quadrangle maps to aid in location of SAV beds and with data sheets on which to record information on each 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 DNR for identification. (See maps, Appendix C, for these data.)

Private citizens volunteered to assist in the SAV ground survey under guidance of the United States Fish and Wildlife Service (F&WS) and the Chesapeake Bay Foundation (CBF). This program entailed identifying and recording the location of SAV in the bay. Volunteers were recruited through press releases, newsletters and personal letters. Volunteers, provided with an identification guide of SAV, reduced 1986 SAV maps, and data sheets, visited numerous sites around the bay. Each volunteer was asked to identify the location where SAV was sighted, as well as water conditions, how many and which kind of species, grass bed size, percentage area covered, and location description. All information from the Charterboat Captain's survey and Citizen's survey was submitted to Linda Hurley (F&WS) and Margaret Podlich (CBF) for processing. Species locations were mapped in Appendix C.

Ground survey information was included on the SAV distribution and abundance maps in Appendix C to show positions of the survey stations in relation to the beds of SAV mapped from the aerial photographs. Each survey was designated by a unique symbol to identify the different methods. In

most cases, the symbols on the SAV maps (Appendix C) have been enlarged and offset from the actual sampling point to avoid confusion with the mapped SAV bed. Where species information was available, it was included on the map unless it was redundant.

Data Presentation

SAV distribution data 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.

TABLE 4. TOTAL AREA OF SAV IN HECTARES BY TOPOGRAPHIC QUADRANGLES FOR 1978, 1984, 1985, 1986 AND 1987.

	QUADRANGLE	1978	1984	1985	1986	1987
1.	Conowingo Dam, Md.-Pa.	-	-	0	0	-
2.	Aberdeen, Md.	-	0	6.34	5.77	4.18
3.	Havre de Grace, Md.	803.67	1741.85	1605.81	1977.42	1857.89
4.	North East, Md.	5.62	13.31	29.46	6.95	5.99
5.	Elkton, Md.	0.75	0	0	0	0
6.	White Marsh, Md.	-	0	0	0	0
7.	Edgewood, Md.	10.48	49.81+	6.31	+++	0.52
8.	Perryman, Md.	-	2.01	4.64	0	2.93
9.	Spesutie, Md.	0.84	411.38	439.96	369.54	379.65
10.	Earleville, Md.	4.67	3.47	11.60	9.72	4.69
11.	Cecilton, Md.	-	0	0	0	0
12.	Baltimore East, Md.	-	0	0	0	0
13.	Middle River, Md.	90.06	0	74.80	+++	22.04
14.	Gunpowder Neck, Md.	200.71	183.99+	132.99	+++	90.54
15.	Hanesville, Md.	9.31	5.48	10.10	7.70	42.35
16.	Betterton, Md.	6.40	5.74	12.89	8.40	19.81
17.	Galena, Md.	1.46	11.88	0.61	10.91	7.57
18.	Curtis Bay, Md.	33.40	0	0	0	0
19.	Sparrows Pt., Md.	10.52	0	5.56	0	#
20.	Swan Point, Md.	29.86	18.65	10.25	3.33	1.60
21.	Rock Hall, Md.	127.25	30.13	14.71	5.97	5.31
22.	Chestertown, Md.	12.31	0	1.92	0	0
23.	Round Bay, Md.	137.15	0	0	0	0
24.	Gibson Island, Md.	139.45	7.61	16.07	4.09	0.26
25.	Love Point, Md.	11.81	0	3.94	0	0
26.	Langford Creek, Md.	1255.20	599.72	586.06	294.89	499.17
27.	Centreville, Md.	38.75	0	0	0.52	1.45
28.	Washington West, Md.-DC-Va.	-	0++	0	0	0
29.	Washington East, DC-Md.	-	0	0	0	0
30.	South River, Md.	15.14	0	0	0	#
31.	Annapolis, Md.	27.15	0	0.28	0.12	#

TABLE 4. (continued)

	QUANDRANGLE	1978	1984	1985	1986	1987
32.	Kent Island, Md.	513.68	26.28	48.36	30.80	322.50
33.	Queenstown, Md.	492.10	89.45	97.9	36.57	216.74
34.	Alexandria, Va.-DC-Md.	-	160.40	512.70	495.80	470.96
35.	Deale, Md.	61.51	0	2.43	0.57	#
36.	Claiborne, Md.	421.08	52.25	346.69	165.06	136.89
37.	St. Michaels, Md.	366.09	11.14	223.91	64.03	231.60
38.	Easton, Md.	1.19	0	14.33	0	0
39.	Fort Belvoir, Va.-Md.	-	0.91	1.73	7.16	19.35
40.	Mt. Vernon, Md.-Va.	-	420.34	857.81	1080.23	1056.79
41.	Lower Marlboro, Md.	-	0	0	0	0
42.	North Beach, Md.	-	0	18.88	0	#
43.	Tilghman, Md.	478.15	6.87	253.74	37.48	85.45
44.	Oxford, Md.	562.96	23.25	329.10	51.91	5.51
45.	Trappe, Md.	64.75	0	33.16	0	#
46.	Preston, Md.	-	0	0	0	0
47.	Quantico, Va.-Md.	-	0	6.67	19.23	46.27
48.	Indian Head, Va.-Md.	-	0++	0.21	7.51	17.59
49.	Benedict, Md.	1.58	0	0	4.23	1.27
50.	Prince Frederick, Md.	-	0	0	0	0
51.	Hudson, Md.	377.08	4.42	229.75	193.59	167.74
52.	Church Creek, Md.	208.94	9.00	322.63	141.52	49.46
53.	Cambridge, Md.	48.96	0	0	0	#
54.	East New Market, Md.	-	0	0.75	0	#
55.	Widewater, Va.-Md.	-	4.59	38.21	39.36	39.17
56.	Nanjemoy, Md.	28.03	30.92	106.68	102.74	108.45
57.	Mathias Pt., Md.-Va.	194.12	121.11	228.66	210.70	284.18
58.	Popes Creek, Md.	-	0	0	0	#
59.	Mechanicsville, Md.	13.62	0	0	7.59	2.08
60.	Broomes Island, Md.	4.94	4.37	24.71	4.14	20.20
61.	Cove Pt., Md.	2.97	3.75	2.46	0.74	4.62
62.	Taylors Island, Md.	-	8.55	47.53	12.38	47.47

TABLE 4. (continued)

	QUANDRANGLE	1978	1984	1985	1986	1987
63.	Golden Hill, Md.	-	0.42	10.90	1.07	2.53
64.	Passapatanzy, Md.-Va.	-	0	0	0	0
65.	King George, Va.-Md.	2.25	13.44	22.15	22.95	16.10
66.	Dahlgren, Va.-Md.	8.32	2.67	1.97	2.41	14.29
67.	Colonial Beach North, Md.-Va.	87.44	25.63	15.66	18.42	17.79
68.	Rock Pt., Md.	22.85	0	0.27	0	0
69.	Leonardtown, Md.	2.44	0	0	0	0
70.	Hollywood, Md.	-	0	0	1.33	4.97
71.	Solomons Island, Md.	10.54	0.76	15.52	2.63	8.33
72.	Barren Island, Md.	-	0	264.99	177.17	269.81
73.	Honga, Md.	126.94	5.05	178.58	194.48	632.04
74.	Wingate, Md.	2.64	8.81	97.99	90.83	171.97
75.	Nanticoke, Md.	-	0	0	0	0
76.	Colonial Beach South, Va.-Md.	61.95	11.26	0	0	0
77.	Stratford Hall, Va.-Md.	5.53	2.16	0	0	0
78.	St. Clements Island, Va.-Md.	0.13	0	0	0	0
79.	Piney Point, Md.-Va.	-	-	0.51	1.51	0
80.	St. Marys City, Md.	-	-	19.01	16.66	10.48
81.	Point No Point, Md.	-	-	16.50	0	0
82.	Richland Pt., Md.	0.73	0.38	24.28	3.76	42.46
83.	Bloodsworth Island, Md.	66.07	18.29	285.53	385.28	555.76
84.	Deal Island, Md.	3.01	0	16.65	60.48	60.24
85.	Monie, Md.	9.15	0	1.93	18.69	24.60
86.	Champlain, Va.	-	-	0	-	-
87.	Machodoc, Va.	-	-	0	0	0
88.	Kinsale, Va.-Md.	-	-	0	0	0
89.	St. George Island, Va.-Md.	-	-	8.82	6.91	5.73
90.	Point Lookout, Md.	-	-	5.76	0.58	0
91.	Kedges Straits, Md.	156.09	366.42	474.91	637.99	693.37
92.	Terrapin Sand Point, Md.	314.48	187.00	180.48	209.35	93.26
93.	Marion, Md.	289.33	0	200.29	243.13	160.14

TABLE 4. (continued)

	QUANDRANGLE	1978	1984	1985	1986	1987
94.	Mount Landing, Va.	-	-	-	-	-
95.	Tappahannock, Va.	-	-	-	-	-
96.	Lottsburg, Va.	-	-	-	0	-
97.	Heathsville, Va.-Md.	-	-	-	0	0
98.	Burgess, Va.-Md.	-	-	-	0	0
99.	Ewell, Va.-Md.	1483.30	2308.58	2129.67	2324.36	2012.93
100.	Great Fox Island, Va.-Md.	540.65	807.81	1074.25	1362.12	1089.95
101.	Crisfield, Va.-Md.	7.48	113.01	79.22	180.46	123.22
102.	Saxis, Va.-Md.	-	-	-	-	0
103.	Dunnsville, Va.	-	-	-	-	-
104.	Morattico, Va.	-	-	0	-	0
105.	Lively, Va.	-	-	0	-	0
106.	Reedville, Va.	230.40	108.56	51.17	71.28	87.99
107.	Tangier Island, Va.	405.06	614.44	613.55	651.89	499.15
108.	Chesconessex, Va.	482.54	808.61	827.28	920.15	911.70
109.	Parksley, Va.	80.35	264.80	241.16	318.28	235.80
110.	Urbanna, Va.	-	-	-	-	36.16
111.	Irvington, Va.	5.31	9.33	8.26	7.50	97.34
112.	Fleets Bay, Va.	133.23	155.45	120.91	132.88	235.67
113.	Nandua Creek, Va.	184.86	345.10	350.51	375.97	378.70
114.	Pungoteague, Va.	401.63	716.76	691.94	706.23	696.73
115.	West Point, Va.	-	-	-	-	-
116.	Saluda, Va.	-	-	-	-	0
117.	Wilton, Va.	10.43	0	0	-	26.75
118.	Deltaville, Va.	59.43	6.62	0.70	0.52	18.88
119.	Jamesville, Va.	406.04	367.36	327.20	404.46	419.53
120.	Toano, Va.	-	-	-	-	-
121.	Gressitt, Va.	-	-	-	-	-
122.	Ware Neck, Va.	256.00	203.15	171.91	168.59	194.32
123.	Mathews, Va.	63.88	30.32	37.39	37.03	58.08
124.	Franktown, Va.	504.49	395.26	419.66	441.77	392.70

TABLE 4. (continued)

	QUANDRANGLE	1978	1984	1985	1986	1987
125.	Westover, Va.	-	-	-	-	-
126.	Charles City, Va.	-	-	-	-	-
127.	Brandon, Va.	-	-	-	++++	0
128.	Norge, Va.	46.48	46.48**	46.48**	13.66**	0**
129.	Williamsburg, Va.	-	-	-	-	-
130.	Clay Bank, Va.	-	-	-	-	0
131.	Achilles, Va.	797.92	741.50	710.16	702.91	755.41
132.	New Point Comfort, Va.	1096.31	1092.71	1154.55	1155.33	1048.89
133.	Cape Charles, Va.	321.42	308.32	329.48	255.33	266.42
134.	Cheriton, Va.	85.20	55.99	63.58	72.74	73.50
135.	Savedge, Va.	-	-	-	-	-
136.	Claremont, Va.	-	-	-	-	-
137.	Surry, Va.	-	-	-	-	-
138.	Hog Island, Va.	-	-	-	-	-
139.	Yorktown, Va.	1.92	0.23	0.21	0.28	0.98
140.	Poquoson West, Va.	210.44	216.93	237.70	235.96	290.53
141.	Poquoson East, Va.	516.63	687.16	784.53	762.30	752.42
142.	Elliotts Creek, Va.	44.58	14.48	8.41	19.91	9.43
143.	Townsend, Va.	42.70	4.80	17.72	14.42	11.97
144.	Bacons Castle, Va.	-	-	-	-	-
145.	Mulberry Island, Va.	-	-	-	-	-
146.	Newport News North, Va.	-	-	-	-	0
147.	Hampton, Va.	218.25	233.15	287.10	270.40	283.99
148.	Benns Church, Va.	-	-	-	-	-
149.	Newport News South, Va.	1.87	0	0	-	0
150.	Norfolk North, Va.	-	-	-	-	0
151.	Little Creek, Va.	-	0	0	-	0
152.	Cape Henry, Va.	*	37.87	36.76	43.31	40.50
153.	Chuckatuck, Va.	-	-	-	-	-
154.	Bowers Hill, Va.	-	-	-	-	-
155.	Norfolk South, Va.	-	-	-	-	-

TABLE 4. (continued)

	QUANDRANGLE	1978	1984	1985	1986	1987
156.	Kempsville, Va.	-	-	-	-	-
157.	Princess Anne, Va.	-	-	-	-	-
158.	Wye Mills, Md.	-	-	1.10	-	-
159.	Bristol, Md.	-	-	2.08	0	#
160.	Fowling Creek, Md.	-	-	0	0	-
161.	Port Tobacco, Md.	-	-	0	1.10	5.64
162.	Charlotte Hall, Md.	-	-	0	0	0
163.	Mardela Springs, Md.	-	-	0	0	0
164.	Wetipquin, Md.	-	-	0	0	0
165.	Selbyville, Md.	-	-	-	-	0
166.	Assawoman Bay, Md.	-	-	-	-	0
167.	Berlin, Md.	-	-	-	-	7.06
168.	Ocean City, Md.	-	-	-	-	8.42
169.	Public Landing, Md.	-	-	-	-	0
170.	Tingles Island, Md.	-	-	-	852.47	1020.60
171.	Girdle Tree, Md.-Va.	-	-	-	-	0
172.	Boxiron, Md.-Va.	-	-	-	687.95	664.94
173.	Whittington Point, Md.-Va.	-	-	-	189.94	207.90
174.	Chincoteague West, Va.	-	-	-	0	0
175.	Chincoteague East, Va.	-	-	0	403.57	401.00
176.	Anacostia, D.C.-Md.	-	-	-	-	#
	TOTAL SAV - Chesapeake Bay	16,622.40	15,399.70	19,390.64	19,165.44	20,119.39
	TOTAL SAV - Chincoteague Bay				2,133.93	2,309.92

TABLE 4. (continued)

NOTES:
- Indicates quadrangle not photographed and assumed to have no SAV.
0 Indicates quadrangle photographed and no SAV noted.
* Area not flown in 1978 but most likely had SAV in 1978 based on data collected in subsequent years.
** Area not photographed in 1984 or 1985. We made the assumption that the 1984 and 1985 distributions would be similar to the 1978 distribution. Area was photographed and mapped in 1986. Area was photographed in 1987 and was known to have SAV in 1987 but was not mapped because SAV beds were too narrow and obscured by the shoreline at 1:24000 scale. In 1987 ground truthing revealed narrow beds fringing the shoreline of small tributaries of the Chickahominy River (see map, Appendix C).
\+ Information on SAV distribution taken from 1983 aerial photographs provided by Willie Burton of Martin Marietta Corp.
++ Presence of SAV beds not detected from 1984 aerial photography. Information provided by Virginia Carter of the USGS for the 1984 Potomac River Shoreline Survey indicated presence of SAV.
+++ Aerial photography unavailable in 1986, therefore, SAV acreage data not collected. SAV presence verified by ground truth surveys. See 1986 SAV report (Orth, et. al., 1987) for discussion of Section 2, Upper Eastern Shore, and Section 3, Upper Western Shore, in Results, and maps in APPENDIX C.
++++ Aerial photography unavailable in 1986, therefore, SAV acreage data not collected. SAV presence verified by ground truth surveys. See 1986 SAV report (Orth, et. al., 1987) for discussion of Section 21, James River, in Results.
\# Presence of SAV beds not detected from 1987 aerial photography. Information provided by Linda Hurley of the USF&WS indicated presence of SAV.

TABLE 5. NUMBERS OF HECTARES OF BOTTOM COVERED WITH SUBMERGED AQUATIC VEGETATION IN 1987 FOR SECTIONS WITHIN THE THREE ZONES OF THE CHESAPEAKE BAY AND IN CHINCOTEAGUE BAY. (Section boundaries redefined for 1987. See Figure 5, Table 3 and Appendix B for boundary locations.)

Zone		Section	AREA (HECTARES)
Upper	1.	Susquehanna Flats	2,219
	2.	Upper Eastern Shore	103
	3.	Upper Western Shore	117
	4.	Chester River	515
		Zone Total	2,954
Middle	5.	Central Western Shore	0
	6.	Eastern Bay	900
	7.	Choptank River	356
	8.	Patuxent River	41
	9.	Middle Western Shore	0
	10.	Lower Potomac River	458
	11.	Upper Potomac River	1,655
	12.	Middle Eastern Shore	1,527
	13.	Mid-Bay Island Complex	4,265
		Zone Total	9,202
Lower	14.	Lower Eastern Shore	4,036
	15.	Reedville	324
	16.	Rappahannock River Complex	208
	17.	New Point Comfort Region	238
	18.	Mobjack Bay Complex	1,227
	19.	York River	608
	20.	Lower Western Shore	1,322
	21.	James River	0
		Zone Total	7,963
		TOTAL SAV FOR CHESAPEAKE BAY	20,119
		TOTAL SAV FOR CHINCOTEAGUE BAY	2,301

TABLE 6. NUMBER OF SQUARE METERS OF SAV IN 1987 FOR EACH QUADRANGLE CONTAINED WITHIN THE 21 SECTIONS OF THE CHESAPEAKE BAY AND FOR CHINCOTEAGUE BAY. MAP CODE NUMBERS FROM TABLE 2 IN PARENTHESES.

SECTION	QUADRANGLE	AREA	
Susquehanna Flats - 1	Conowingo Dam (1)	0	
	Aberdeen (2)	41,803	
	Havre de Grace (3)	18,578,920	
	North East (4)	3,414	
	Elkton (5)	0	
	Perryman (8)	0	
	Spesutie (9)	3,566,251	
	Earleville (10)	0	
		22,187,300	sq.m
		2,218.73	hectares
		5,482.48	acres
Upper Eastern Shore - 2	North East (4)	56,482	
	Elkton (5)	0	
	Perryman (8)	0	
	Spesutie (9)	225,071	
	Earleville (10)	46,884	
	Cecilton (11)	0	
	Gunpowder Neck (14)	0	
	Hanesville (15)	423,504	
	Betterton (16)	198,125	
	Galena (17)	75,689	
	Swan Point (20)	0	
	Rock Hall (21)	0	
		1,025,740	sq.m
		102.57	hectares
		253.47	acres
Upper Western Shore - 3	White Marsh (6)	0	
	Edgewood (7)	5,175	
	Perryman (8)	29,281	
	Spesutie (9)	4,792	
	Baltimore East (12)	0	
	Middle River (13)	220,435	
	Gunpowder Neck (14)	905,434	
	Hanesville (15)	0	
	Curtis Bay (18)	0	
	Sparrows Point (19)	0	
	Swan Point (20)	0	
	Round Bay (23)	0	
	Gibson Island (24)	2,581	

continued

TABLE 6. (continued)

Upper Western Shore - 3 (continued)	Love Point (25)	0	
		1,167,700	sq.m
		116.77	hectares
		288.54	acres
Chester River - 4	Betterton (16)	0	
	Galena (17)	0	
	Swan Point (20)	16,049	
	Rock Hall (21)	53,110	
	Chestertown (22)	0	
	Love Point (25)	0	
	Langford Creek (26)	4,991,752	
	Centreville (27)	14,474	
	Kent Island (32)	0	
	Queenstown (33)	74,591	
		5,150,020	sq.m
		515.00	hectares
		1,272.57	acres
Central Western Shore - 5	Curtis Bay (18)	0	
	Round Bay (23)	0	
	Gibson Island (24)	0	
	South River (30)	0	
	Annapolis (31)	0	
	Deale (35)	0	
	North Beach (42)	0	
		0	sq.m
		0	hectares
		0	acres
Eastern Bay - 6	Annapolis (31)	0	
	Kent Island (32)	3,225,038	
	Queenstown (33)	2,092,820	
	Claiborne (36)	1,368,954	
	St. Michaels (37)	2,315,957	
	Easton (38)	0	
	Tilghman (43)	0	
	Oxford (44)	0	
		9,002,720	sq.m
		900.27	hectares
		2,224.57	acres

continued

TABLE 6. (continued)

Choptank River - 7	Claiborne (36)	0
	St. Michaels (37)	0
	Easton (38)	0
	Tilghman (43)	854,462
	Oxford (44)	55,139
	Trappe (45)	0
	Preston (46)	0
	Hudson (51)	1,677,407
	Church Creek (52)	494,585
	Cambridge (53)	0
	East New Market (54)	0
	Taylors Island (62)	474,703
	Golden Hill (63)	0
	Fowling Creek (160)	0
		3,556,280 sq.m
		355.63 hectares
		878.76 acres
Patuxent River - 8	Deale (35)	0
	Lower Marlboro (41)	0
	North Beach (42)	0
	Benedict (49)	12,655
	Prince Frederick (50)	0
	Mechanicsville (59)	20,782
	Broomes Island (60)	202,040
	Cove Point (61)	46,206
	Hollywood (70)	49,740
	Solomons Island (71)	83,334
	Bristol (159)	0
		414,758 sq.m
		41.47 hectares
		102.49 acres
Middle Western Shore - 9	North Beach (42)	0
	Prince Frederick (50)	0
	Hudson (51)	0
	Broomes Island (60)	0
	Cove Point (61)	0
	Taylors Island (62)	0
	Solomons Island (71)	0
	Barren Island (72)	0
	St. Marys City (80)	0
	Point No Point (81)	0
	Richland Point (82)	0

continued

TABLE 6. (continued)

Middle Western Shore - 9 (continued)	Point Lookout (90)	0
		0 sq.m 0 hectares 0 acres
Lower Potomac River - 10	Nanjemoy (56)	1,084,509
	Mathias Point (57)	2,841,829
	Popes Creek (58)	0
	Mechanicsville (59)	0
	King George (65)	124,893
	Dahlgren (66)	142,880
	Colonial Beach North (67)	177,861
	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. Marys City (80)	104,834
	Machodoc (87)	0
	Kinsale (88)	0
	St. George Island (89)	57,317
	Point Lookout (90)	0
	Lottsburg (96)	0
	Heathsville (97)	0
	Burgess (98)	0
	Port Tobacco (161)	47,515
	Charlotte Hall (162)	0
		4,581,660 sq.m 458.17 hectares 1,132.13 acres
Upper Potomac River - 11	Washington West (28)	0
	Washington East (29)	0
	Alexandria (34)	4,709,559
	Fort Belvoir (39)	193,510
	Mt. Vernon (40)	10,567,873
	Quantico (47)	462,680

continued

TABLE 6.* (continued)

Upper Potomac River - 11 (continued)			
	Indian Head (48)	175,902	
	Widewater (55)	391,663	
	Nanjemoy (56)	0	
	Mathias Point (57)	0	
	Passapatanzy (64)	0	
	King George (65)	36,080	
	Dahlgren (66)	0	
	Port Tobacco (161)	8,868	
		16,546,000	sq.m
		1,654.60	hectares
		4,088.52	acres
Middle Eastern Shore - 12	Taylors Island (62)	0	
	Golden Hill (63)	25,312	
	Barren Island (72)	2,698,140	
	Honga (73)	6,320,436	
	Wingate (74)	1,719,705	
	Nanticoke (75)	0	
	Richland Point (82)	424,582	
	Bloodsworth Island (83)	631,752	
	Deal Island (84)	602,364	
	Monie (85)	245,963	
	Terrapin Sand Point (92)	116,443	
	Marion (93)	1,601,402	
	Great Fox Island (100)	405,412	
	Crisfield (101)	474,794	
	Mardela Springs (163)	0	
	Wetipquin (164)	0	
		15,266,300	sq.m
		1,526.63	hectares
		3,772.30	acres
Mid-Bay Island Complex - 13	Richland Point (82)	0	
	Bloodsworth Island (83)	4,925,260	
	Deal Island (84)	0	
	Kedges Straits (91)	6,933,686	
	Terrapin Sand Point (92)	816,166	
	Ewell (99)	20,129,335	
	Great Fox Is. (100)	5,070,650	

continued

TABLE 6. -(continued)

Mid-Bay Island Complex - 13 (continued)	Tangier Island (107)	4,776,080	
		42,646,200	sq.m
		4,264.62	hectares
		10,537.88	acres
Lower Eastern Shore - 14	Great Fox Island(100)	5,423,941	
	Crisfield (101)	757,425	
	Saxis (102)	0	
	Tangier Island (107)	215,117	
	Chesconessex (108)	9,117,026	
	Parksley (109)	2,358,039	
	Nandua Creek (113)	3,787,050	
	Pungoteague (114)	6,967,337	
	Jamesville (119)	4,195,310	
	Franktown (124)	3,927,005	
	Cape Charles (133)	2,664,183	
	Cheriton (134)	735,050	
	Elliotts Creek (142)	94,300	
	Townsend (143)	119,663	
		40,362,000	sq.m
		4,036.20	hectares
		9,973.45	acres
Reedville - 15	Heathsville (97)	0	
	Burgess (98)	0	
	Reedville (106)	879,860	
	Irvington (111)	0	
	Fleets Bay (112)	2,356,672	
		3,236,500	sq.m
		323.65	hectares
		574.88	acres
Rappahannock River Complex - 16	Tappahannock (95)	0	
	Dunnsville (103)	0	
	Morattico (104)	0	
	Lively (105)	0	
	Urbanna (110)	361,581	
	Irvington (111)	973,454	
	Fleets Bay (112)	0	
	Saluda (116)	0	
	Wilton (117)	267,491	
	Deltaville (118)	188,821	
	Ware Neck (122)	0	

continued

TABLE 6. (continued)

Rappahannock River Complex - 16 (continued)	Mathews (123)	285,143	
		2,076,490	sq.m
		207.65	hectares
		513.10	acres
New Point Comfort Region - 17	Mathews (123)	0	
	New Point Comfort (132)	2,384,410	
		2,384,410	sq.m
		238.44	hectares
		589.19	acres
Mobjack Bay Complex - 18	Ware Neck (122)	1,943,175	
	Mathews (123)	295,692	
	Achilles (131)	5,133,250	
	New Point Comfort (132)	4,902,160	
		12,274,200	sq.m
		1,227.42	hectares
		3,032.95	acres
York River - 19	Toano (120)	0	
	Gressitt (121)	0	
	Williamsburg (129)	0	
	Clay Bank (130)	0	
	Achilles (131)	2,420,750	
	New Pt. Comfort (132)	3,196,458	
	Hog Island (138)	0	
	Yorktown (139)	9,776	
	Poquoson West (140)	452,685	
	Poquoson East (141)	0	
		6,079,660	sq.m
		607.97	hectares
		1,502.28	acres
Lower Western Shore - 20	Poquoson West (140)	2,452,510	
	Poquoson East (141)	7,524,160	
	Elliotts Creek (142)	0	
	Newport News North (146)	0	
	Hampton (147)	2,839,868	
	Norfolk North (150)	0	

continued

TABLE 6. (continued)

Lower Western Shore - 20 (continued)			
	Little Creek (151)	0	
	Cape Henry (152)	405,040	
	Kempsville (156)	0	
	Princess Anne (157)	0	
		13,222,100	sq.m
		1,322.21	hectares
		3,267.18	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	
	Bacons Castle (144)	0	
	Mulberry Island (145)	0	
	Newport News North (146)	0	
	Hampton (147)	0	
	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	
		0	sq.m
		0	hectares
		0	acres

continued

TABLE 6. (continued)

Chincoteague Bay	Berlin (167)	70,564	
	Public Landing (169)	0	
	Tingles Island (170)	10,205,999	
	Girdle Tree (171)	0	
	Boxiron (172)	6,649,380	
	Whittington Point (173)	2,079,020	
	Chincoteague West (174)	0	
	Chinoteague East (175)	4,010,000	
		23,014,963	sq.m
		2,301.50	hectares
		5,687.00	acres

SECTION 4

RESULTS

1. SUSQUEHANNA FLATS

There were 2219 hectares of SAV in the Susquehanna Flats section in 1987 (Tables 4-6, Fig. 8). SAV beds were located principally in two main areas: 1. moderate to dense fringing beds in the Susquehanna River consisting primarily of M. spicatum, with P. pectinatus, C. demersum, V. americana and N. guadalupensis in lesser amounts from Robert, Wood and Spencer Islands 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 patchy SAV located in the broad shoal area at the river mouth. This broad shoal consisted primarily of small patches of M. spicatum, with P. pectinatus, C. demersum and N. guadalupensis.

A total of nine species (M. spicatum, H. dubia, V. americana, H. verticillata, C. demersum, P. pectinatus, N. guadalupensis, P. perfoliatus, and Najas spp.) have been reported either by Stan Kollar of Harford Community College or the citizens' field survey. SAV beds consisted of up to six species, with M. spicatum being dominant. H. dubia, V. americana, H. verticillata and C. demersum also occurred in significant abundance. The total SAV abundance in this section has remained relatively stable since 1984, although beds in the river portion have increased in density. SAV is virtually absent from Mill Creek, Furnace Bay, Northwest River, Swan Creek, Spesutie Island and western Elk Neck. The charterboat captain survey located only several small beds of M. spicatum in the Northeast River, including two SAV beds identified from aerial photographs.

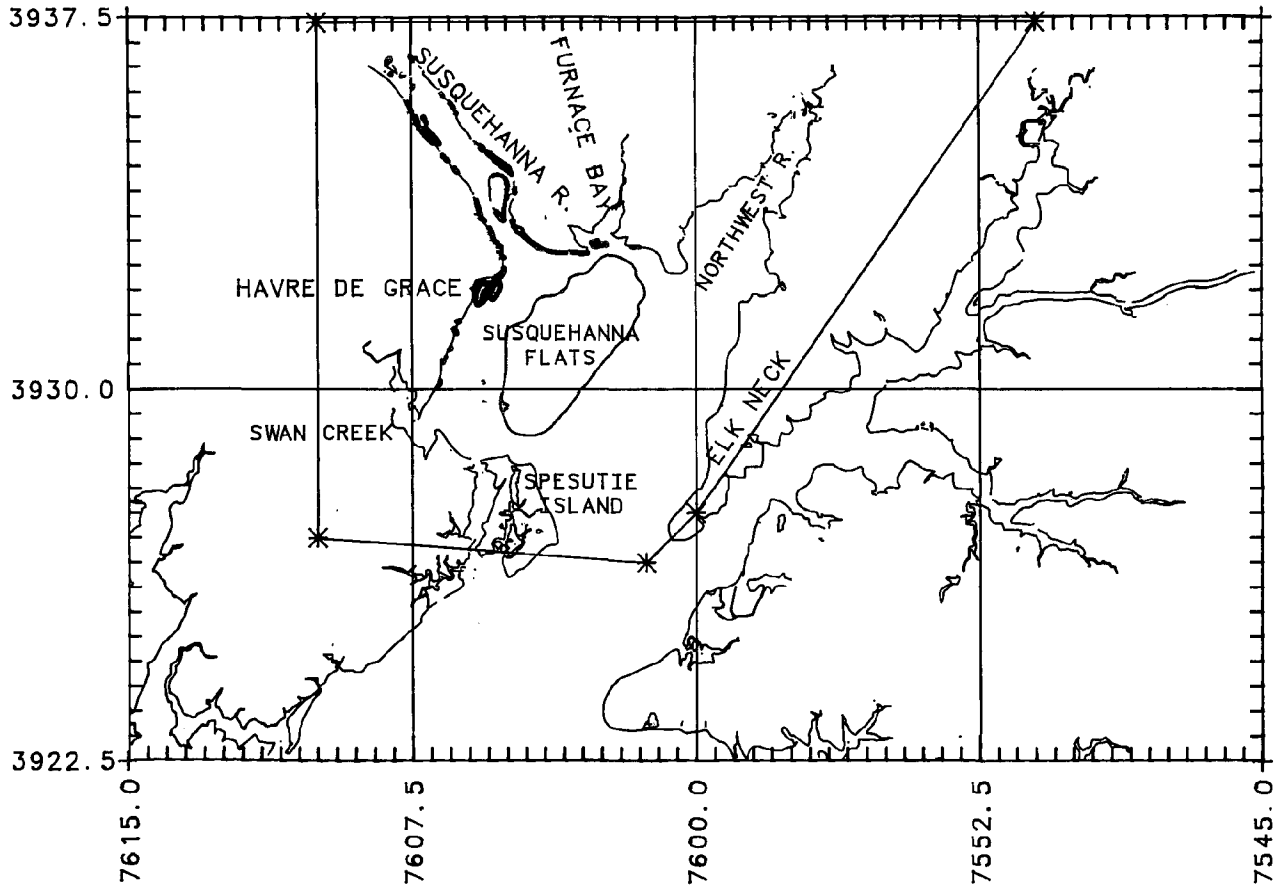

Figure 8. Distribution of SAV in Susquehanna Flats (Section 1).

2. UPPER EASTERN SHORE

There were 103 hectares of SAV mapped for the Upper Eastern Shore section in 1987 (Tables 4-6, Fig. 9), consisting of sparse to moderately dense, small beds. Principal locations of beds were in the lower Elk River, Swan Creek, lower Sassafras River, Stillpond Creek, and the mouth of Churn Creek. Very little SAV was mapped in the Bohemia River and along the mainstem of the bay from Stillpond Creek to Swan Point. This section has contained relatively little SAV since the baywide SAV survey began in 1978, although, historically, this section has contained abundant SAV.

M. spicatum and V. americana were the two most commonly reported species, with six other species reported in lesser amounts as determined by the citizen and charterboat captain surveys.

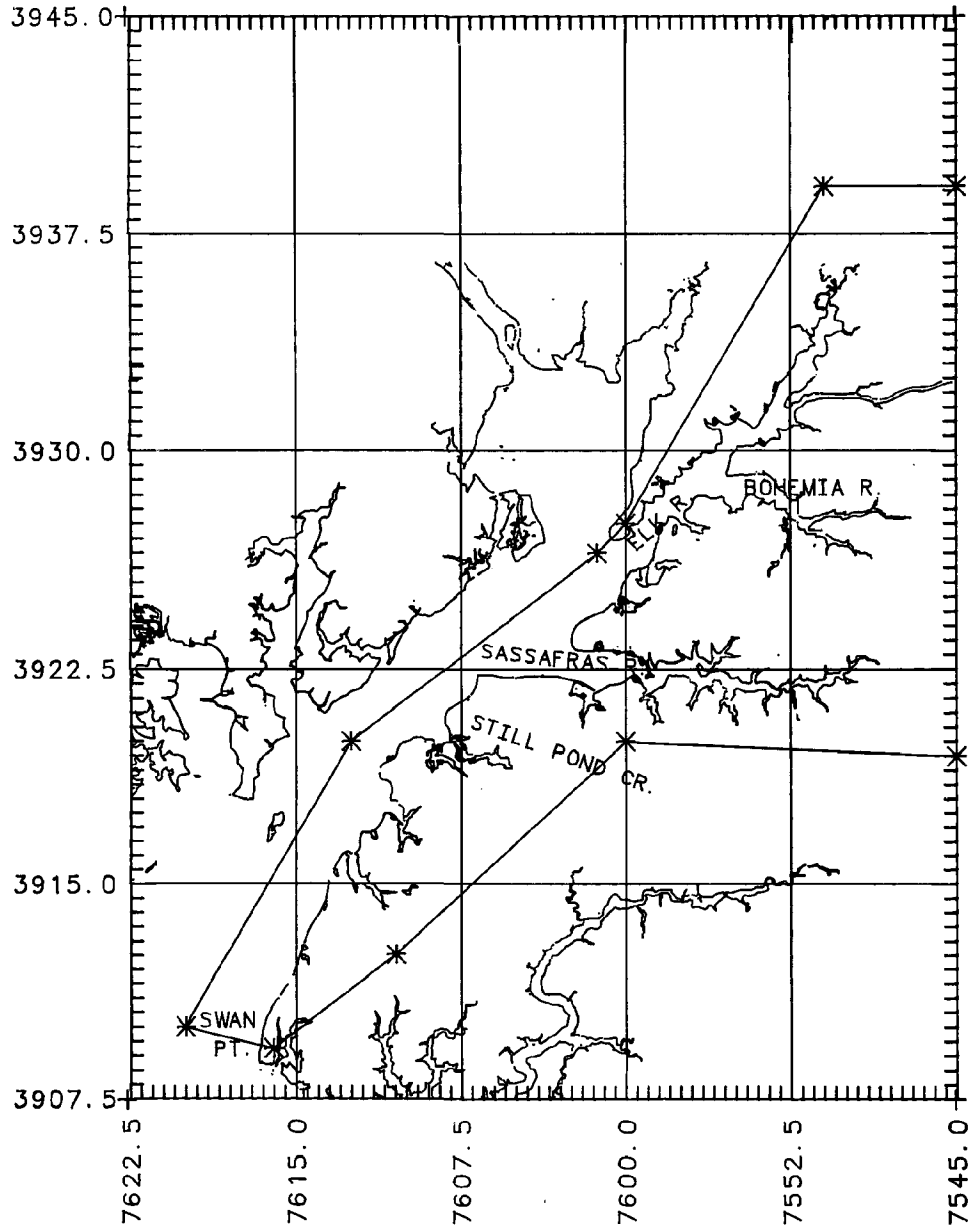

Figure 9. Distribution of SAV in Upper Eastern Shore (Section 2).

3. UPPER WESTERN SHORE

There were 117 hectares of SAV mapped from the aerial photographs in 1987 for the Upper Western Shore section (Tables 4-6, Fig. 10). SAV beds were concentrated in the Bush, Gunpowder, and Middle River areas and in Saltpeter and Seneca Creeks. Very little SAV was reported in the Back, Patapso, and Magothy Rivers.

M. spicatum and V. americana were the two most abundant species as reported by the citizen and charterboat captain surveys, with E. canadensis, Z. palustris, P. pectinatus, E. canadensis, P. perfoliatus and C. demersum being occasionally reported. The amount of SAV reported for 1987 is less than previous years. SAV in this section appears to be quite dynamic, with potential for the many small areas that only are reported in the ground truth surveys to rapidly expand if water quality conditions improve.

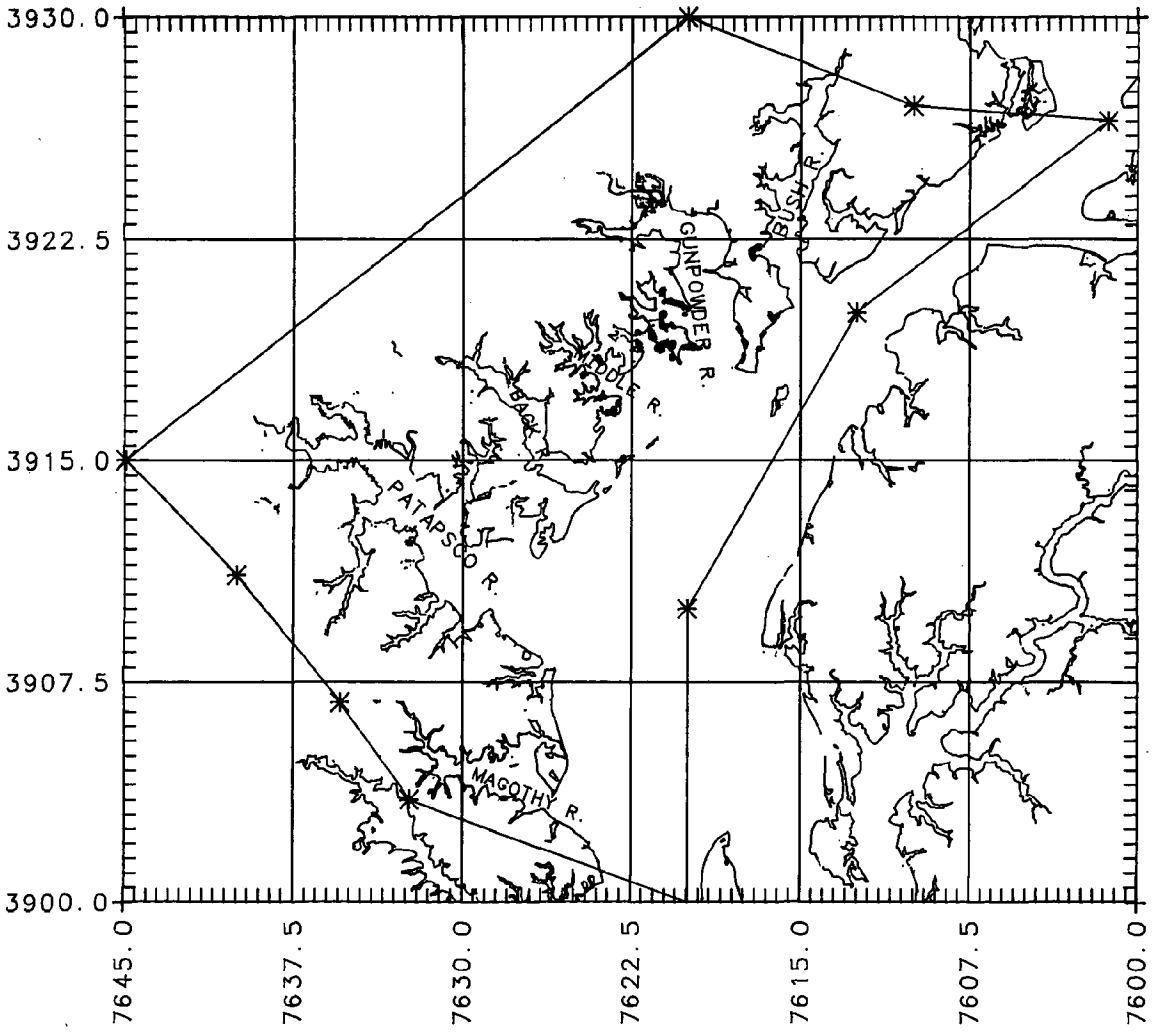

Figure 10. Distribution of SAV in Upper Western Shore (Section 3).

4. CHESTER RIVER

There were 515 hectares of SAV in the Chester River section in 1987 (Tables 4-6, Fig. 11). Most of the SAV was located adjacent to Eastern Neck and Eastern Neck Island, and in the Chester River. Dense beds were found in Grays Inn and Langford Creeks off the Chester River. The remainder of Chester River, including the area adjacent to Kent Island, was relatively unvegetated. Additional beds are found in Swan and Huntingfield Creeks, located above Eastern Neck on the Chesapeake Bay.

Six species of SAV were reported from this section in 1987 by the citizen and charterboat captain surveys. R. maritima was by far the most abundant species in this section with P. pectinatus, P. perfoliatus, M. spicatum, E. canadensis, and Z. palustris being reported less frequently. The Chester River area, historically, supported some of the most dense and diverse stands of SAV in the middle reaches of the bay (some of which are still present today).

5. CENTRAL WESTERN SHORE

There was no SAV observed from the aerial photography in the Central Western Shore section in 1987 (Tables 4-6, Fig. 12). In fact, this area has had very little SAV since 1984. Although not evident in the aerial photography, the citizens' survey reported SAV in the Deale and South River quadrangles, with R. maritima and Z. palustris found in Deale and Z. palustris found in South River. Z. palustris has been reported from the headwaters of the Magothy, Severn and South Rivers (F. Dawson, pers. comm.).

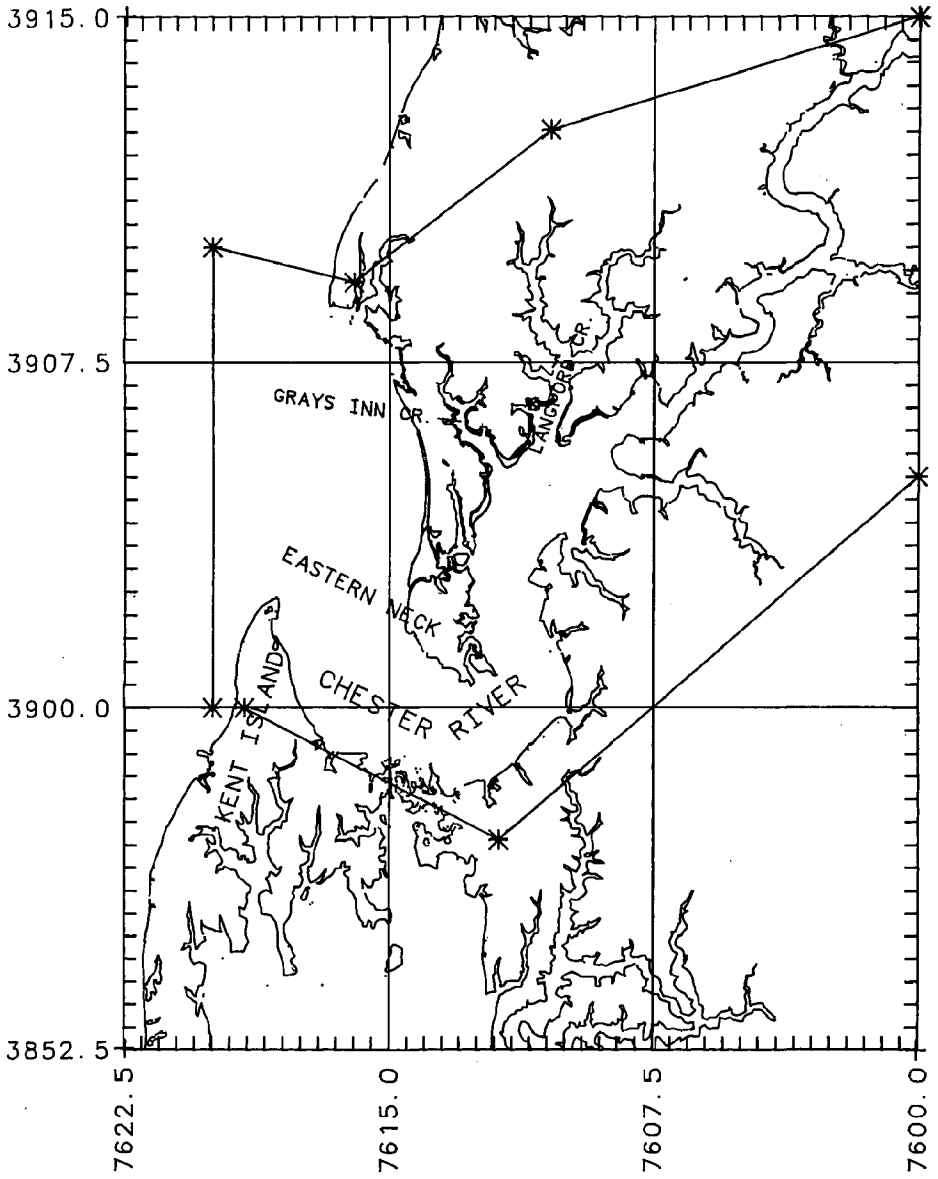

Figure 11. Distribution of SAV in Chester River (Section 4).

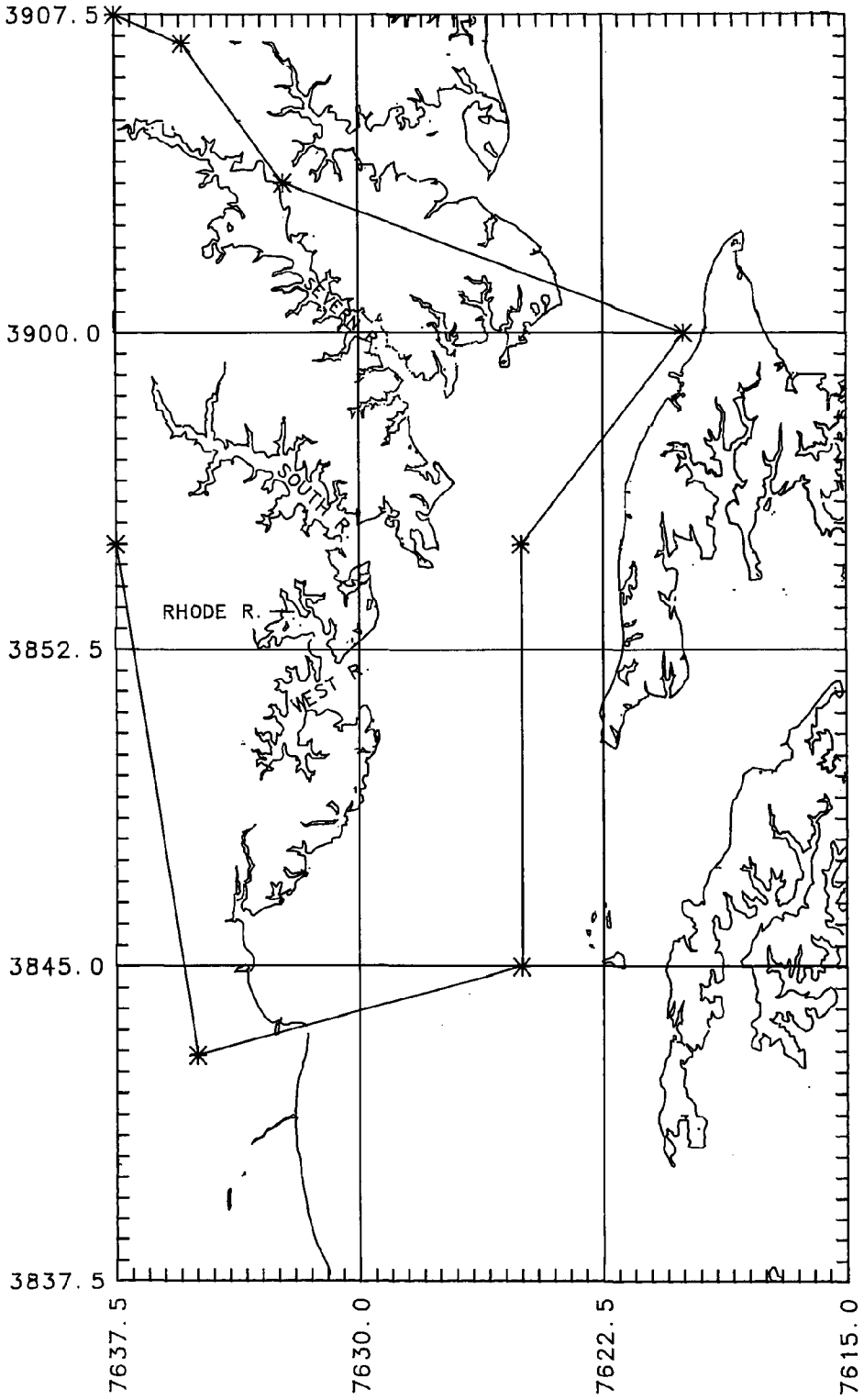

Figure 12. Distribution of SAV in Central Western Shore (Section 5).

6. EASTERN BAY

There were 900 hectares of SAV identified from the Eastern Bay section in 1987 (Tables 4-6, Fig. 13). SAV occurred as mostly sparse to dense beds throughout this section and is the most that has been observed since 1978. The large increase in SAV abundance from 1986 may represent an artifact of the aerial photographs, since SAV was reported throughout this section by the charterboat captain survey in 1986. In 1987, the SAV was identified as being particularly abundant along both shorelines in Crab Alley Bay, Prospect Bay, Parson Island, Piney Neck and the lower portion of the Miles River. Little SAV was present from Punch Point on the Western shore of Eastern Bay to Pawpaw Cove on Tilghman Island. R. maritima is, by far, the most abundant species as reported by both the citizens and charterboat captain surveys, with only one other species, P. perfoliatus, reported once from the Eastern Bay region. There are numerous reports of R. maritima in areas where beds were not identified from the photographs. These sightings probably represent areas that are sparse and patchy and would not show up on the imagery. Therefore, estimates may be low.

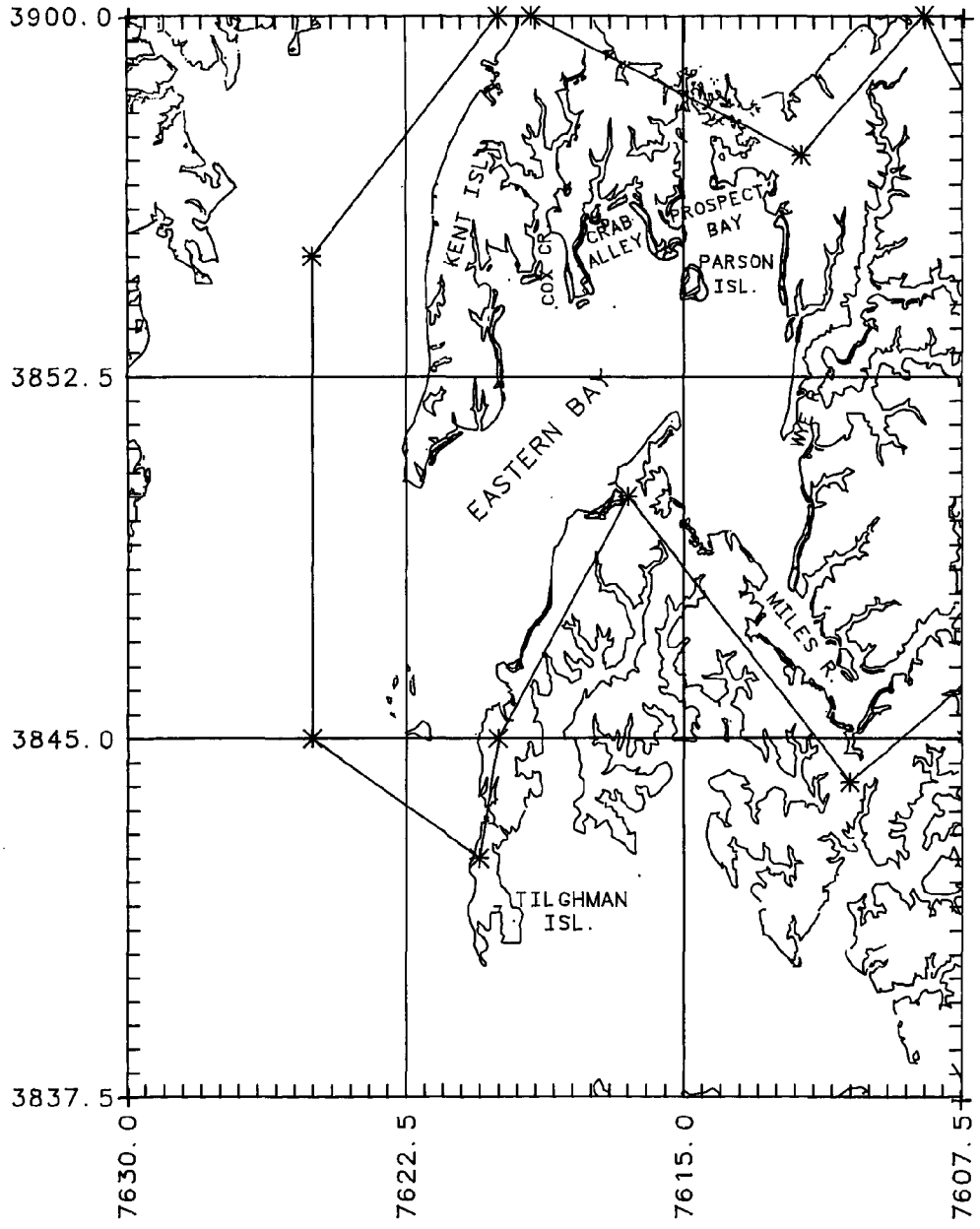

Figure 13. Distribution of SAV in Eastern Bay (Section 6).

7. CHOPTANK RIVER

There were 356 hectares of SAV observed in the Choptank River section in 1987 (Tables 4-6, Fig. 14). Most of the SAV occurred in sparse to dense beds in only a few areas. These were principally along the eastern side of Tilghman Island, the lower portion of Harris Creek, the mouth of Chapel Creek, Cook Point Cove, Covey Creek, Brannock Bay, and Cators Cove. There was almost 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. R. maritima was found by HPEL personnel behind Hambrooks Bar near Cambridge, and in front of the Horn Point Laboratory boat basin. Z. palustris grew in Dickerson Bay, Trappe Creek, Bolingbroke Creek and Foxhole Creek in the early part of the growing season.

Ground surveys in the river by citizen and charterboat captain surveys, as well as scientists from the University of Maryland's Horn Point Environmental Laboratories, located four species of SAV in this section, with R. maritima being the most prevalent. P. pectinatus and Z. palustris was observed in scattered locations, while Z. marina was reported at only one location. R. maritima was reported from a number of areas in this section that did not appear to have SAV from the aerial photographs.

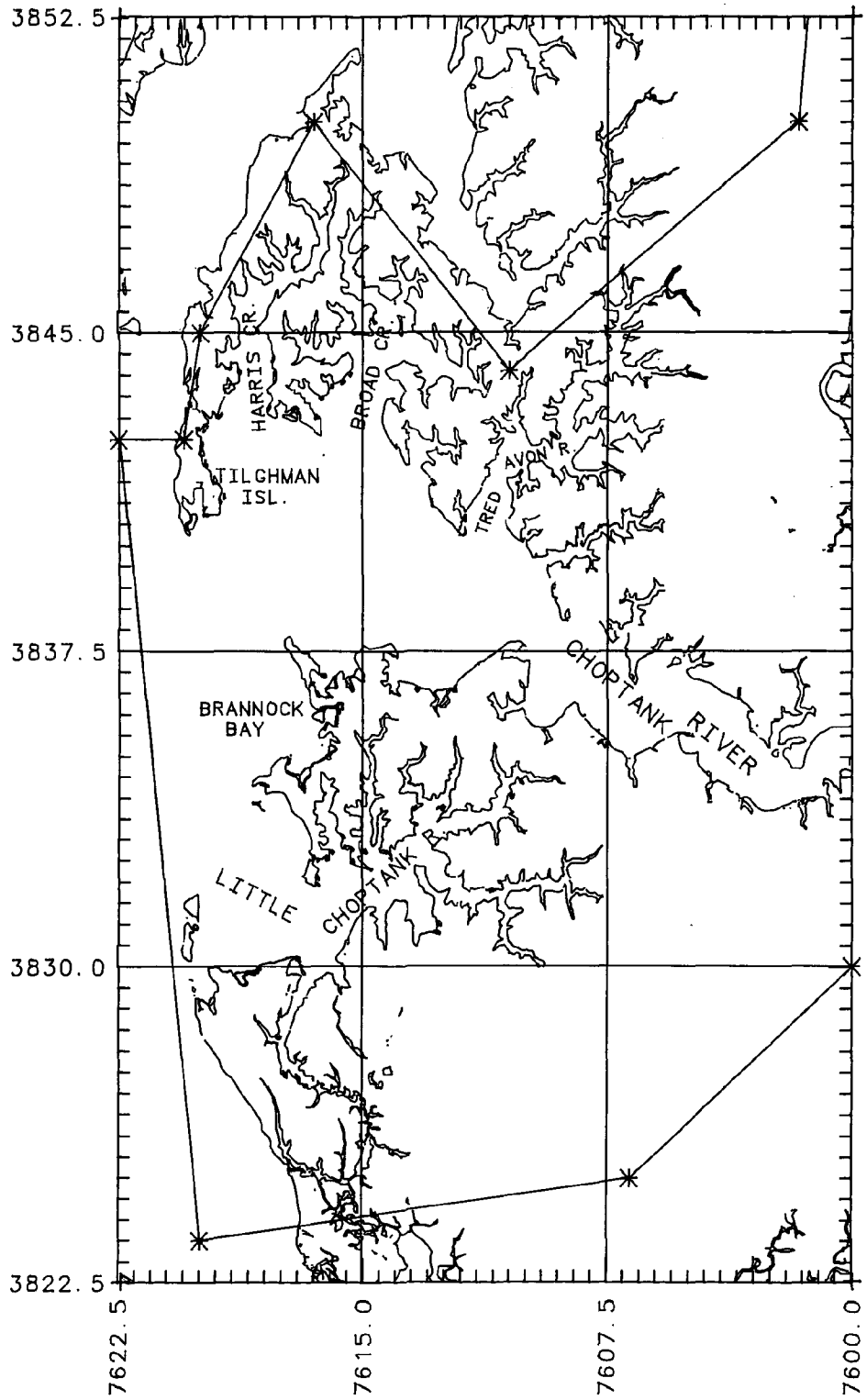

Figure 14. Distribution of SAV in Choptank River (Section 7).

8. PATUXENT RIVER

There were 41 hectares of SAV reported in the Patuxent River section in 1987 (Tables 4-6, Fig. 15). SAV in the Patuxent River has always been at very low levels of abundance and has not exceeded 50 hectares in any year since the baywide effort began in 1978. There were sporadic sightings of four SAV species in the Patuxent River by citizens and charterboat captains. Those species reported were: Z. palustris, P. pectinatus, M. spicatum, and R. maritima.

9. MIDDLE WESTERN SHORE

There were no SAV beds identified in the Middle Western Shore section in 1987 (Tables 4-6, Fig. 16). Four species cited by the citizens' survey (R. maritima, C. demersum, Z. palustris, P. pectinatus) occurred on the St. Marys quadrangle. Most of the area in this broad section of the bay is of high energy, exposed beaches that are unsuitable for SAV growth. We would therefore not expect large expanses of SAV, rather only small pockets of SAV in creeks or ponds that empty into the bay. Previous surveys have reported no more than 23 hectares of SAV.

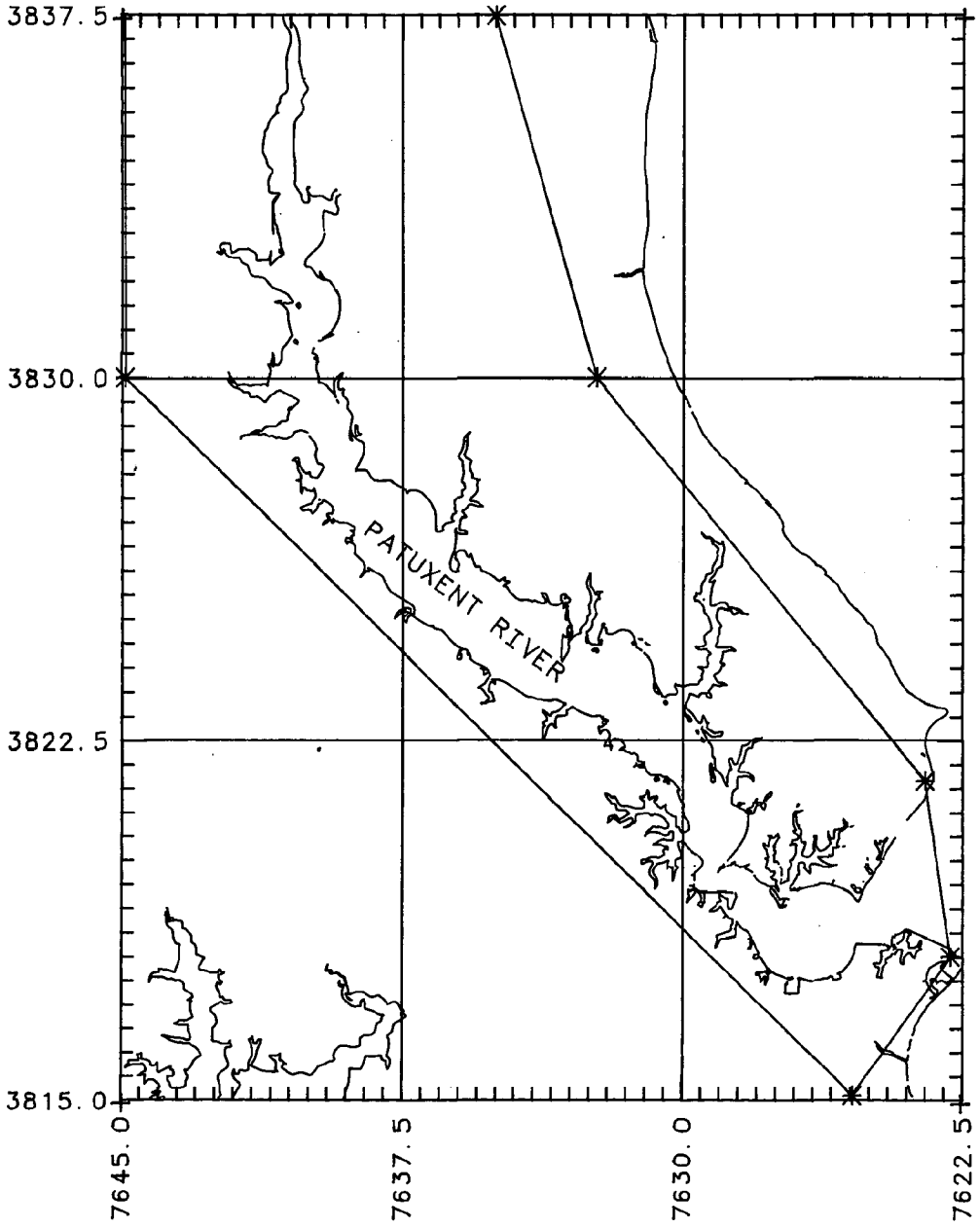

Figure 15. Distribution of SAV in Patuxent River (Section 8).

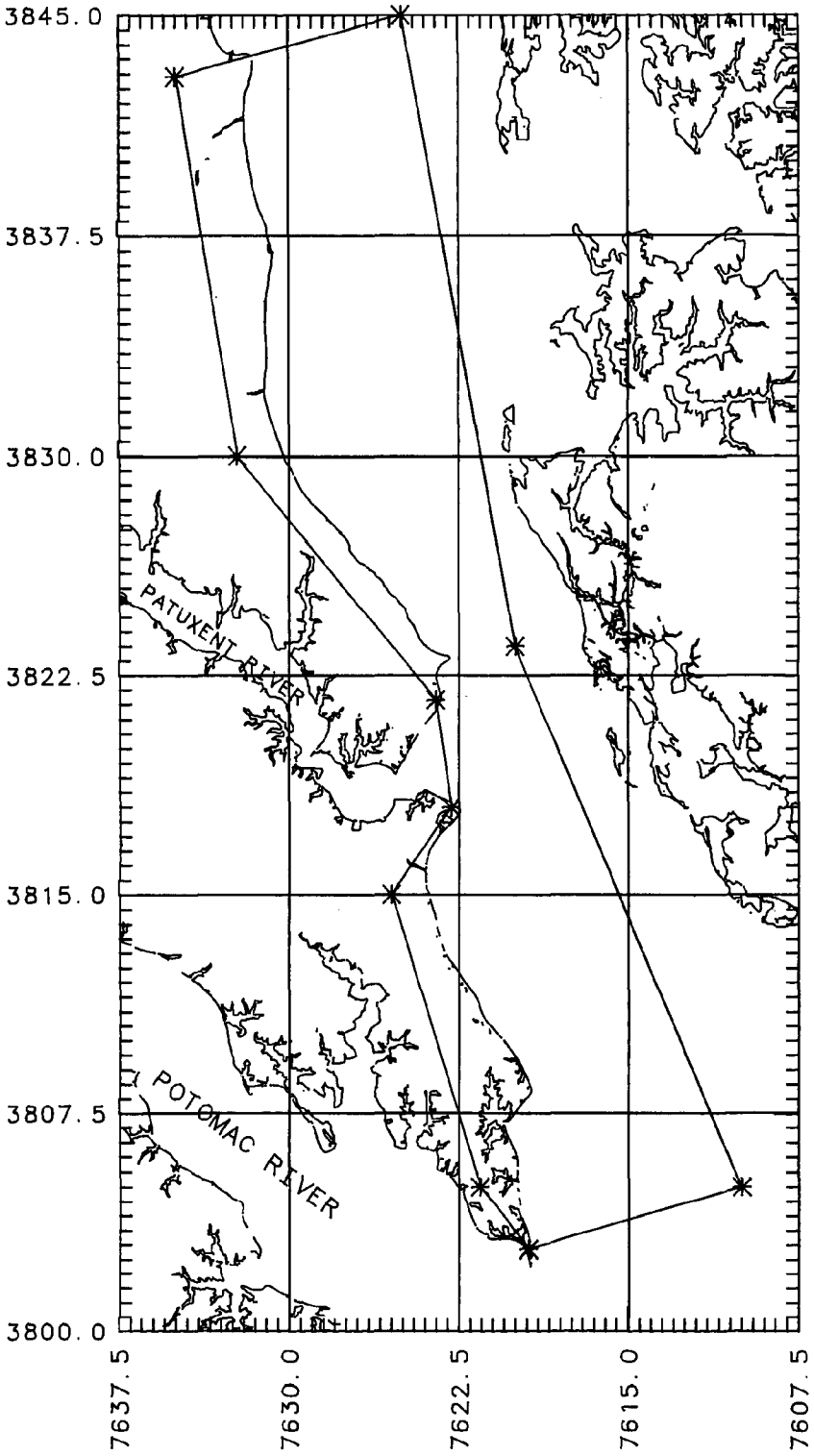

Figure 16. Distribution of SAV in Middle Western Shore (Section 9).

10. LOWER POTOMAC RIVER

There were 458 hectares of SAV identified in the Lower Potomac River section from the 1987 aerial photography (Tables 4-6, Fig. 17). Most of the SAV in this section occurred in the region near the Rt. 301 bridge, in Nanjemoy and Port Tobacco Creeks and in the shoreline adjacent to these two creeks. A majority of SAV beds were moderately to densely vegetated. SAV beds were identified as fringing along the eastern side of Mathias Point Neck to the Rt. 301 bridge. Several small beds were observed in Machodoc and Cuckhold Creeks, just below the Rt. 301 bridge. The USGS survey found V. americana to be the most common species here, with M. spicatum, P. perfoliatus, P. pectinatus, C. demersum, and Z. palustris also being reported (see quadrangles in Appendix C for USGS species information). Citizen volunteers reported many of these same species.

SAV was absent in the remainder of this section from just below the Rt. 301 bridge to the river mouth except for small but moderately dense beds in and adjacent to the St. Marys River. Citizen survey observations indicate that R. maritima was the only species present here.

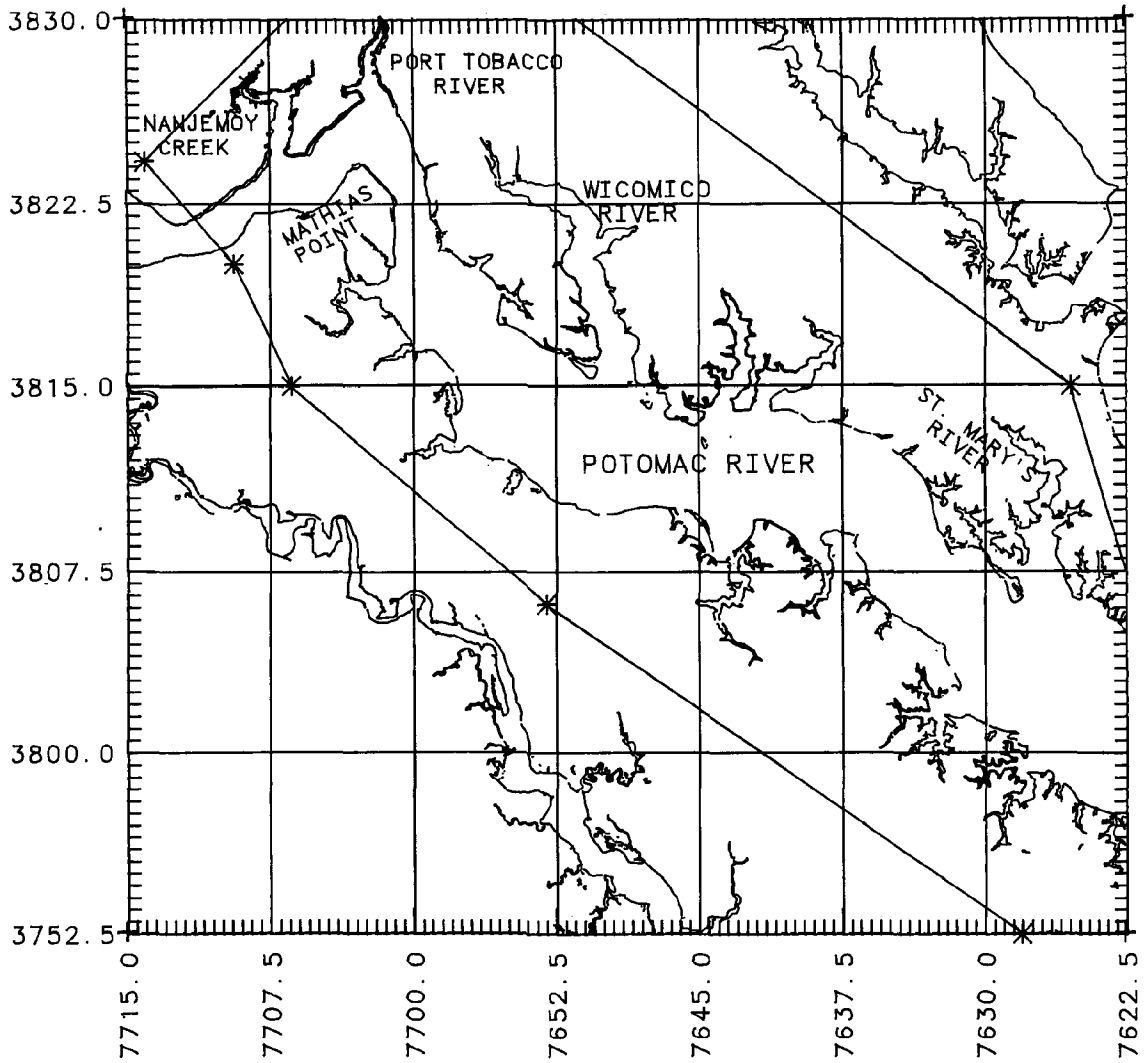

Figure 17. Distribution of SAV in Lower Potomac River (Section 10).

11. UPPER POTOMAC RIVER

There were 1,655 hectares of SAV mapped in the Upper Potomac River section from the 1987 aerial photographs (Tables 4-6, Fig. 18). The area of the river between Marshall Hall and the Woodrow Wilson bridge was very densely vegetated, with H. verticillata being by far the dominant species here. Although the total abundance of SAV in this section had not changed as dramatically in the last three years as before that time, SAV continued to be observed further down river in smaller, but densely vegetated beds. H. verticillata is found down to Quantico and Mallows Bay. Numerous SAV species were present, with M. spicatum, C. demersum, H. dubia, Najas spp. and V. americana being reported most commonly in this region, while Z. palustris, P. pectinatus and N. guadalupensis were reported less frequently.

Results from the USGS survey of this region were very similar to the data collected from the aerial photography (Rybicki, et al., 1988) (Figs. 19, 20). Species information from the USGS survey can be found on the topographic quadragles located in Appendix C. Their survey continued to confirm aerial photographic observations of the absence of SAV from Occoquan Bay south to Quantico. SAV was present around Quantico but, except for a few scattered beds, is absent along the western side of the river from Quantico south to Mathias Point Neck.

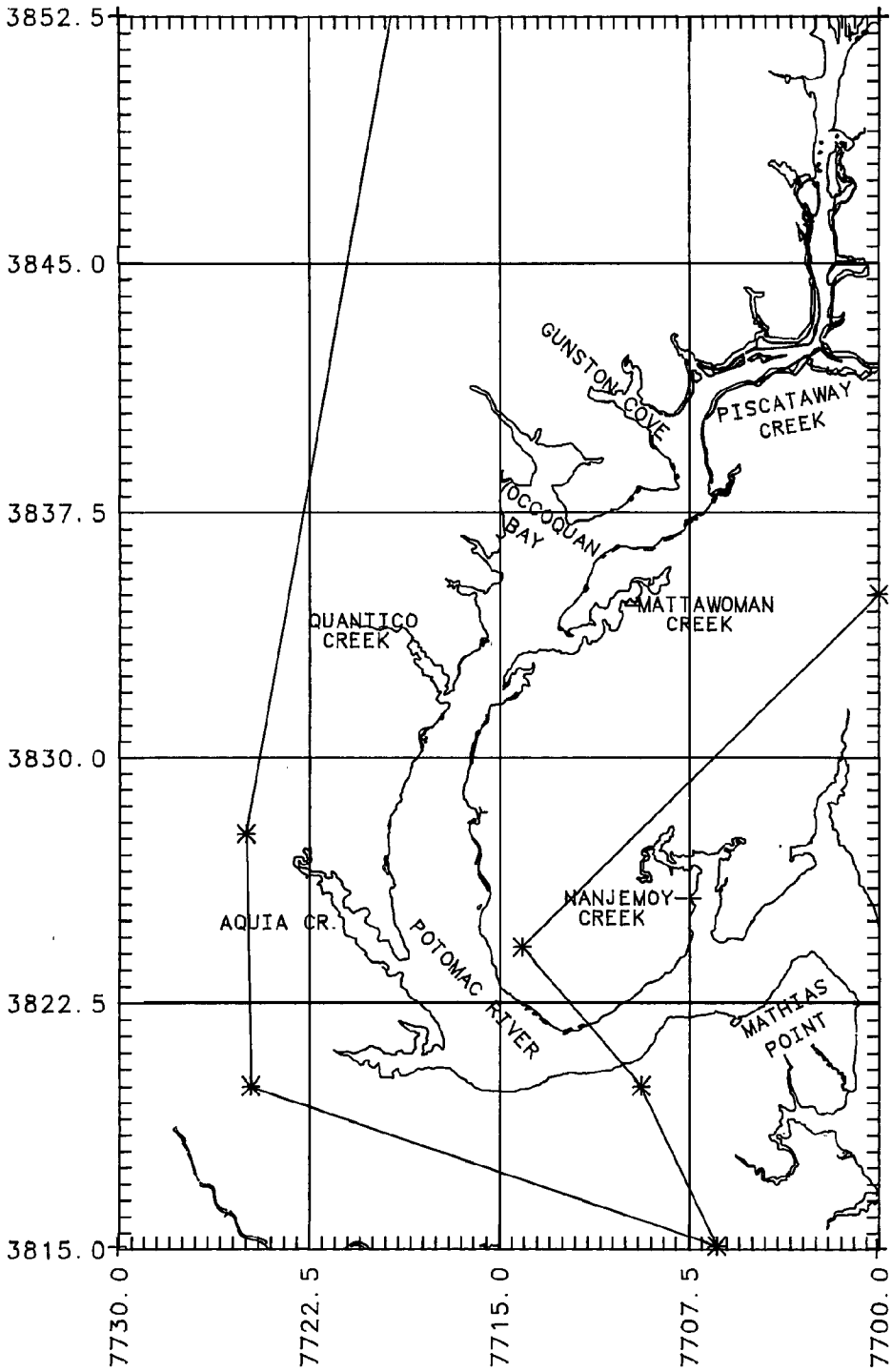

Figure 18. Distribution of SAV in Upper Potomac River (Section 11).

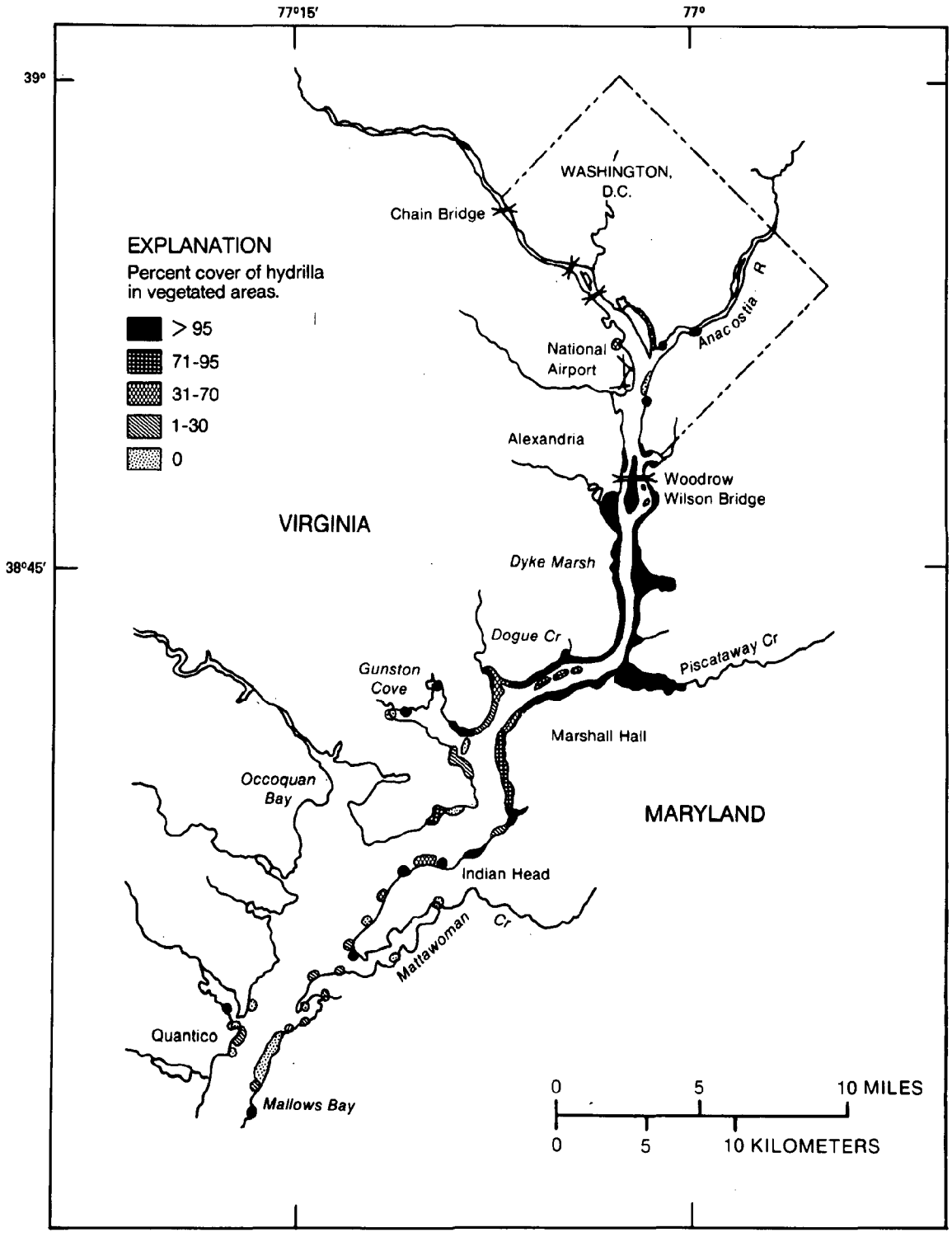

Figure 19. Percent cover of Hydrilla in vegetated areas in the tidal Potomac River in 1987.

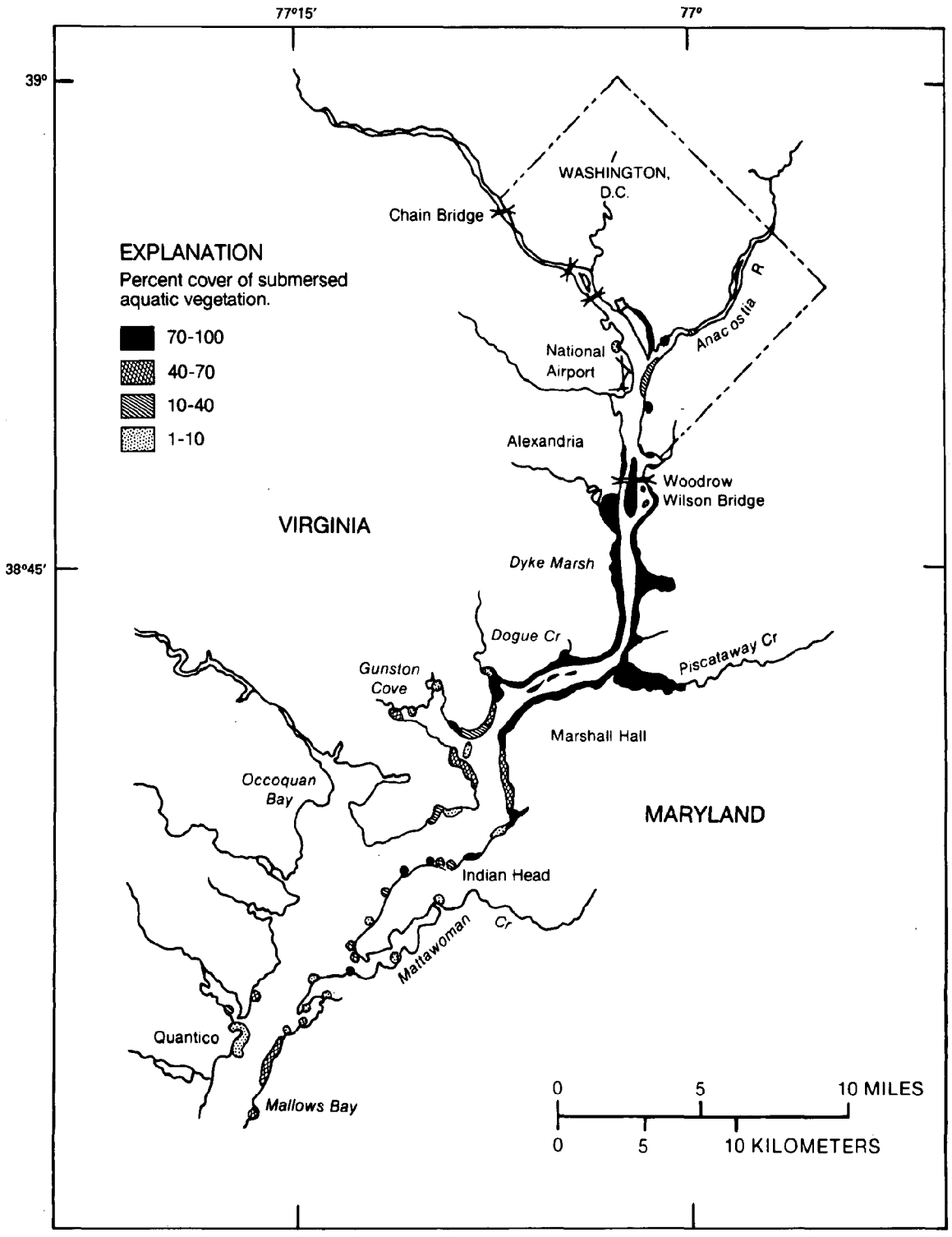

Figure 20. Percent cover of submersed aquatic vegetation in the tidal Potomac River in 1987.

12. MIDDLE EASTERN SHORE

There were 1,527 hectares of SAV identified in the Middle Eastern Shore section (Tables 4-6, Fig. 21). For this report this section has been reorganized as indicated earlier, with boundaries given in Table 3. It now excludes South Marsh and Bloodsworth Islands and includes the Big and Little Annemessex Rivers. SAV beds were very abundant in: 1. the lower Honga River adjacent to Middle Hooper Island, Wroten Island, Parks Neck, and Asquith Island; 2. between Barren Island and Meekins Neck-Upper Hooper Island; and 3. the lower Manokin and the Big and Little Annemessex Rivers. Little SAV was observed in Fishing Bay, the Nanticoke and Wicomico Rivers.

R. maritima was the predominant species found by the citizen and charterboat captain surveys. They included reports from many areas that were not identified in the aerial photography. SAV in this section has undergone a very large increase since first observed in 1984 due to the rapid spread of R. maritima. Z. marina, the only other species found, was reported from one location in the Big Annemessex River.

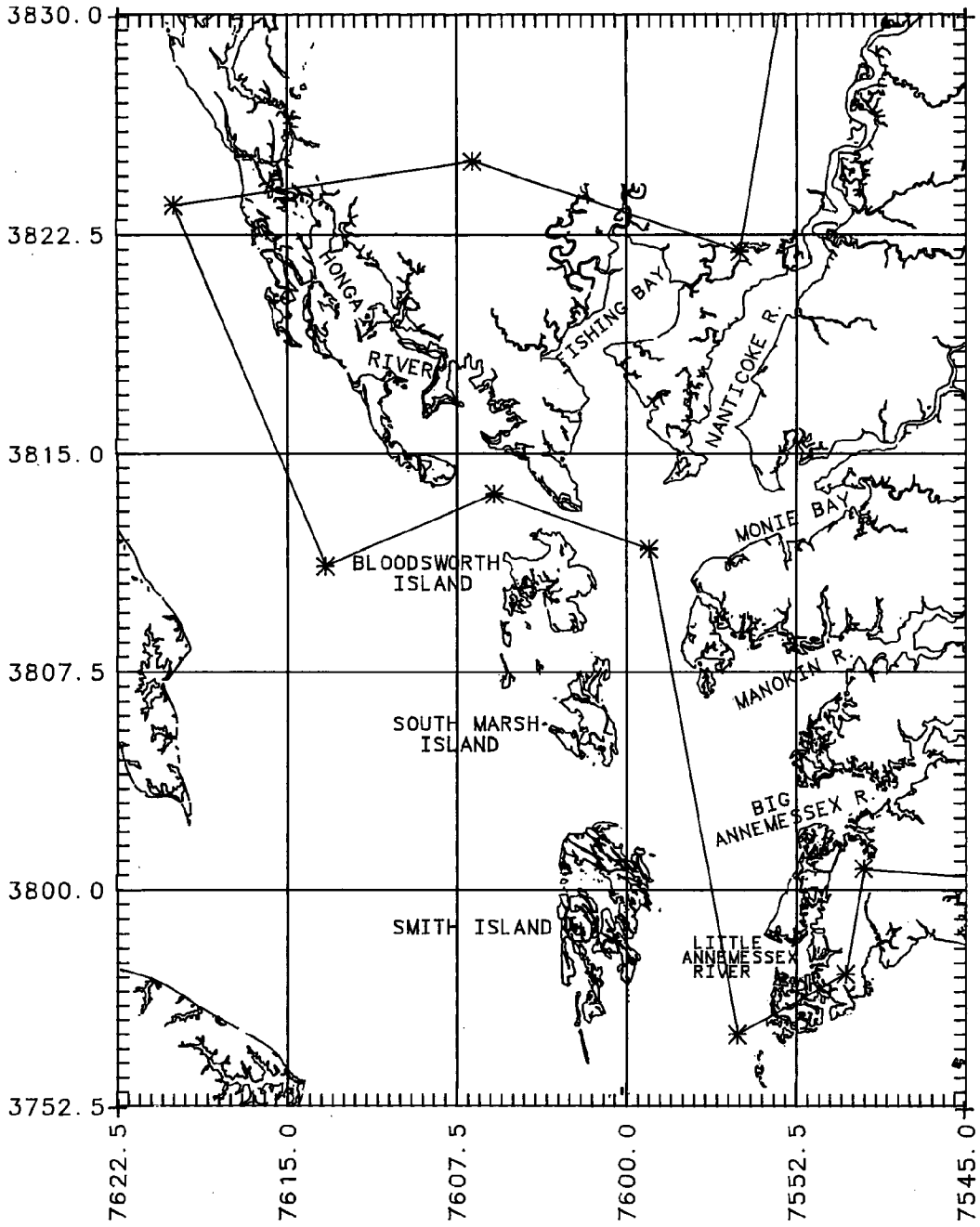

Figure 21. Distribution of SAV in Middle Eastern Shore (Section 12).

13. MID-BAY ISLAND COMPLEX

There were 4,265 hectares of SAV mapped in the Mid-Bay Island Complex in 1987 (Tables 4-6, Fig. 22). This section's boundaries have been revised from the earlier surveys and now include Bloodsworth and South Marsh Islands, but exclude the area from the Big Annemessex River to Chesconessex Creek. 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. Shoal areas inside these two islands also were densely vegetated. SAV continued to increase in abundance around Bloodsworth and South Marsh Islands. Only R. maritima had been reported by the charterboat captain survey around these islands.

14. LOWER EASTERN SHORE

There were 4,036 hectares of SAV observed in the Lower Eastern Shore section in 1987 (Tables 4-6, Fig. 23). This section has been revised for the 1987 report. It now includes the area from just above Great Fox Island to Chesconessex Creek which had been part of Section 13. Large dense beds of Z. marina and R. maritima continue to persist at the mouth of Cherrystone Inlet near Cape Charles, at the mouths of Hungars Creek, Mattawoman Creek, Occahannock Creek, Craddock Creek, Pungoteague Creek, Onancock Creek, and Chesconessex Creek, at the Big Marsh area near Chesconessex Creek, at Webb Island off the mouth of Deep Creek, and on the large shoal area on the eastern side of the Fox Islands. Those areas between the above mentioned creeks were sparsely vegetated. This was due largely to the dynamic and

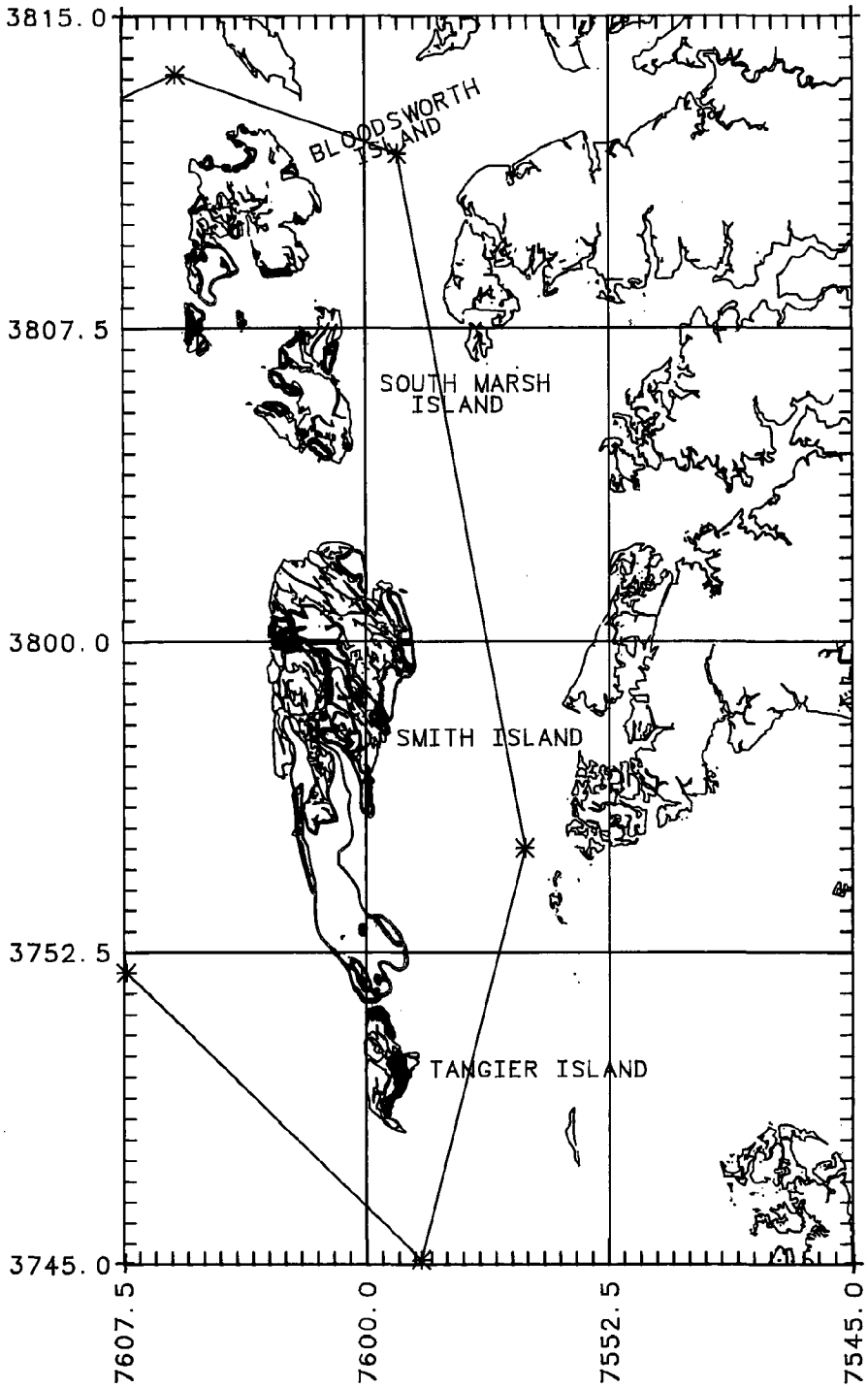

Figure 22. Distribution of SAV in Mid-Bay Island Complex (Section 13).

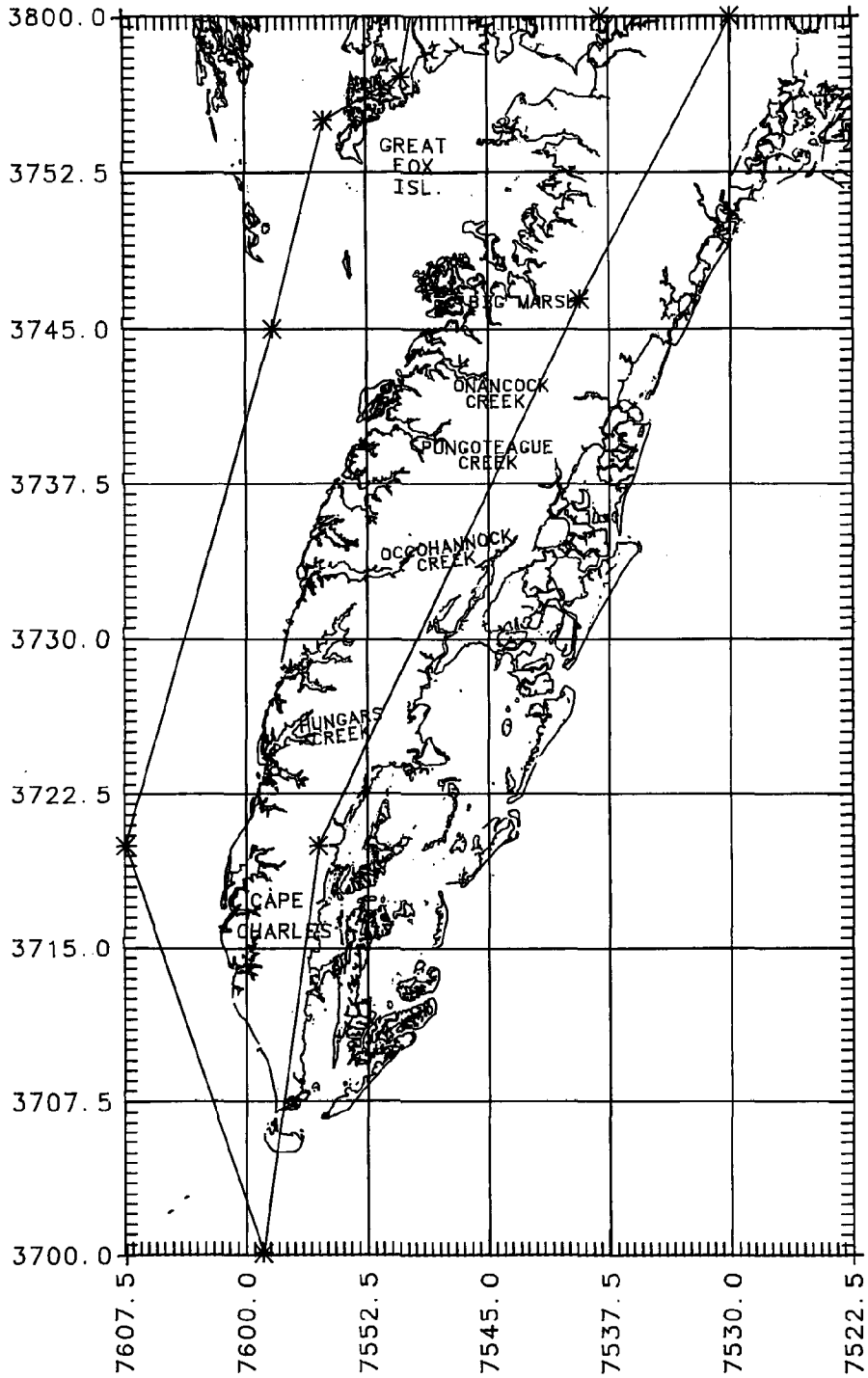

Figure 23. Distribution of SAV in Lower Eastern Shore (Section 14).

exposed nature of these sites. There was very little SAV in the Pocomoke Sound area, and there was no SAV south of Old Plantation Creek just below Cape Charles.

15. REEDVILLE

There were 324 hectares of SAV identified in the Reedville section in 1987 (Tables 4-6, Fig. 24). SAV beds consisted of sparse to moderately dense beds of R. maritima and Z. marina, as noted by the citizens' survey. Most were found in Little Bay, Dymer Creek, Indian Creek, Ball Creek, Dameron Marsh, Fleeton Point and Taskmasker Creek.

16. RAPPAHANNOCK RIVER COMPLEX

There were 208 hectares of SAV observed in the Rappahannock River Complex in 1987 (Tables 4-6, Fig. 25). This was a significant increase from that reported in the last three annual surveys and was a result of the rapid spread of R. maritima into both the Rappahannock and Piankatank Rivers. In particular, dense beds of R. maritima were found in the Corrotoman River where little SAV was found prior to 1987. R. maritima was present in small scattered beds throughout these two systems, many of which did not appear on the aerial photography. A dense SAV bed consisting of R. maritima at the mouth of Carter Creek off the Rappahannock River, and a small dense bed of R. maritima and Z. marina off Willis Wharf, and on both sides of the Hole in the Wall in Milford Haven, continued to persist.

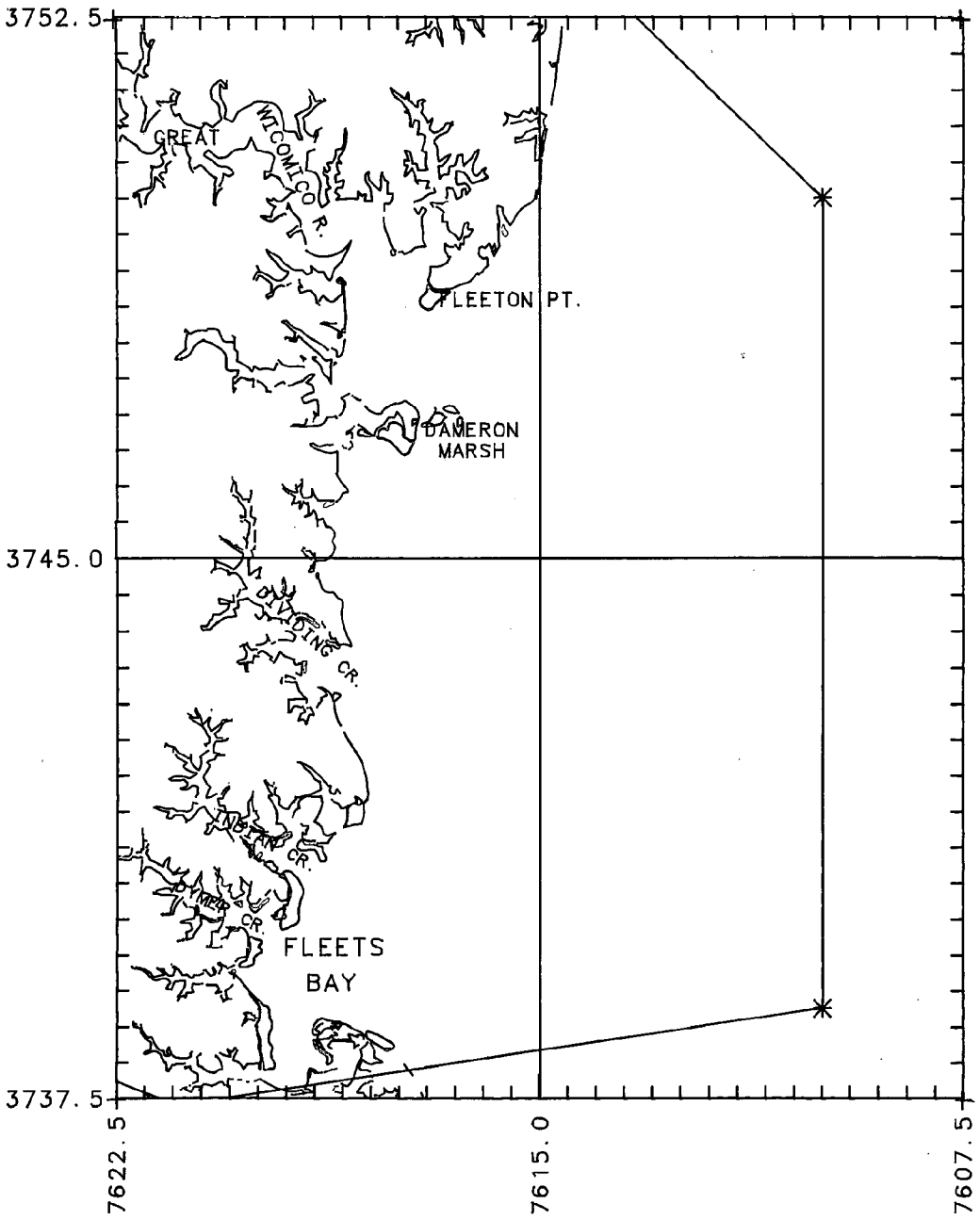

Figure 24. Distribution of SAV in Reedville (Section 15).

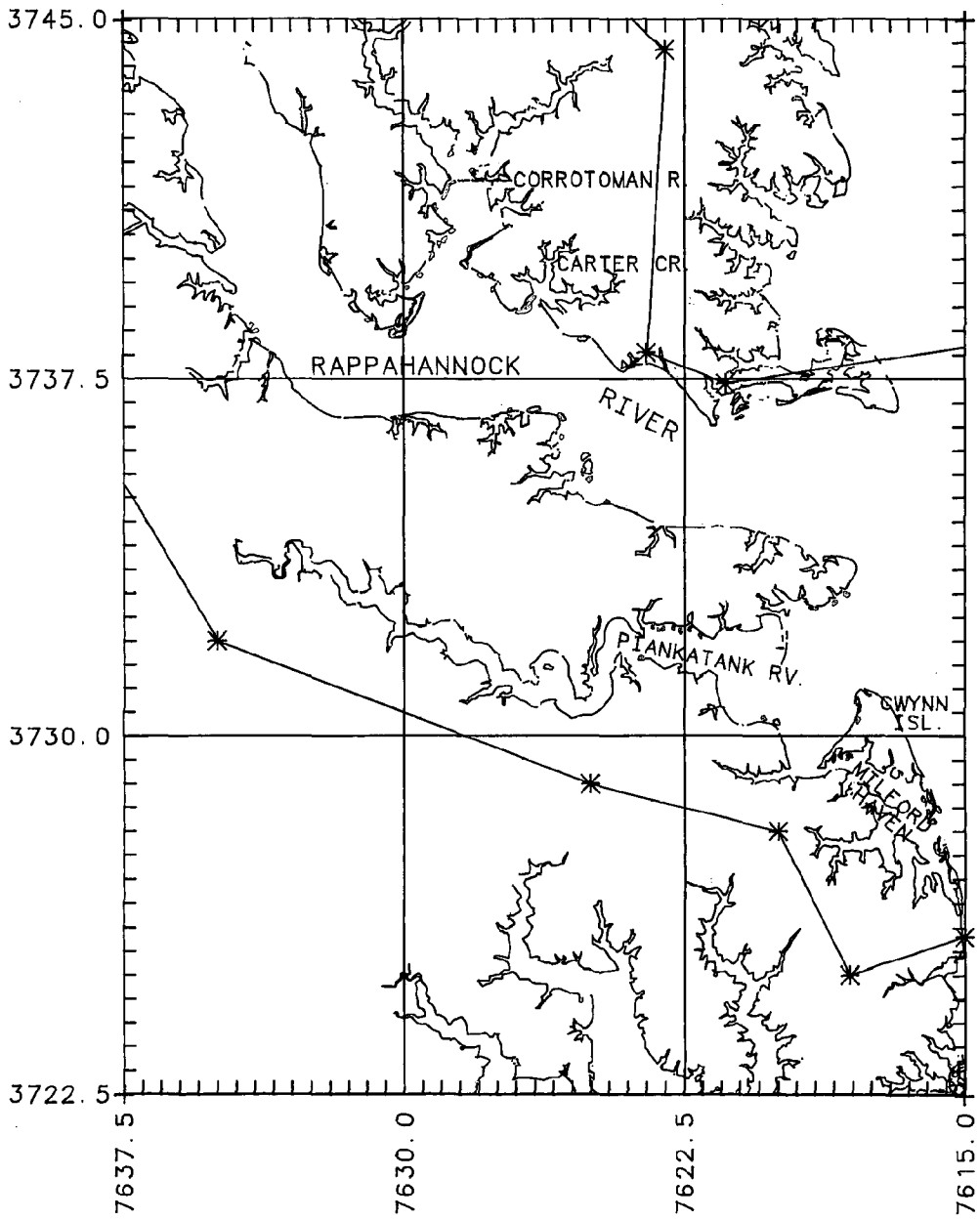

Figure 25. Distribution of SAV in Rappahannock River Complex (Section 16).

16. RAPPAHANNOCK RIVER COMPLEX (continued)

Z. marina was present in very small patches off Parrott Island in the Rappahannock River, Milford Haven and Burton Point in the Piankatank River. This vegetation is the result of successful transplant efforts by VIMS scientists.

17. NEW POINT COMFORT REGION

There were 238 hectares of SAV identified in the New Point Comfort Region in 1987 (Tables 4-6, Fig. 26). SAV consisted of sparse to dense beds of Z. marina and R. maritima between New Point Comfort and just north of Horn Harbor.

18. MOBJACK BAY COMPLEX

The Mobjack Bay Complex contained 1,227 hectares of SAV in 1987 (Tables 4-6, Fig. 27). This section has also been revised from the 1986 report. The boundary between this section and the York River section (19) is now a line bisecting the large shoal off the Guinea Marsh area. Moderate to dense SAV beds, consisting of Z. marina and R. maritima, were most abundant along the entire shoreline of the Mobjack Bay as well as in three of four tributary rivers: Severn, Ware and North. Several small beds of R. maritima were observed within the East River. The Mobjack Bay area continued to harbor some of the more extensive SAV beds on the western shore of the lower Chesapeake Bay.

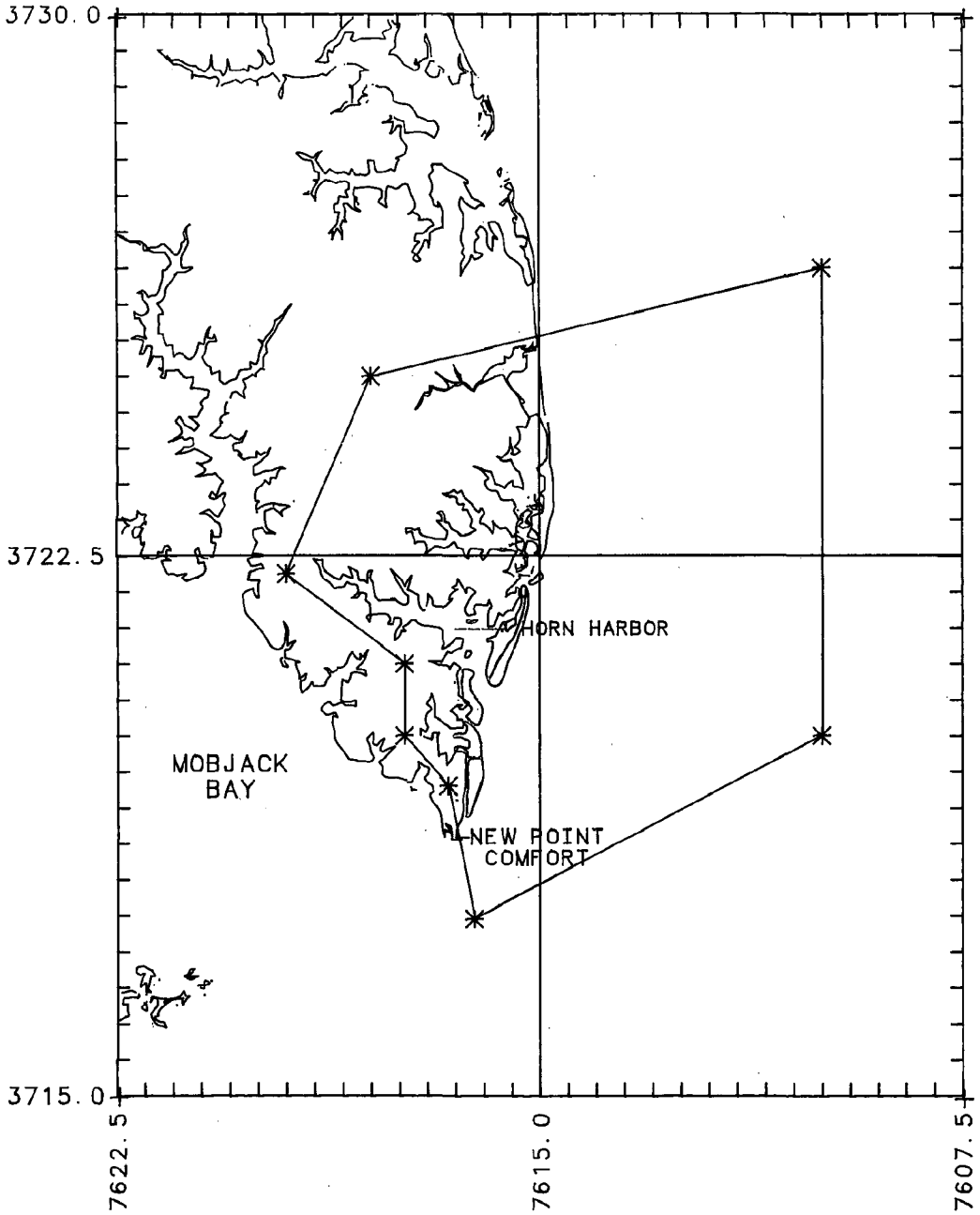

Figure 26. Distribution of SAV in New Point Comfort (Section 17).

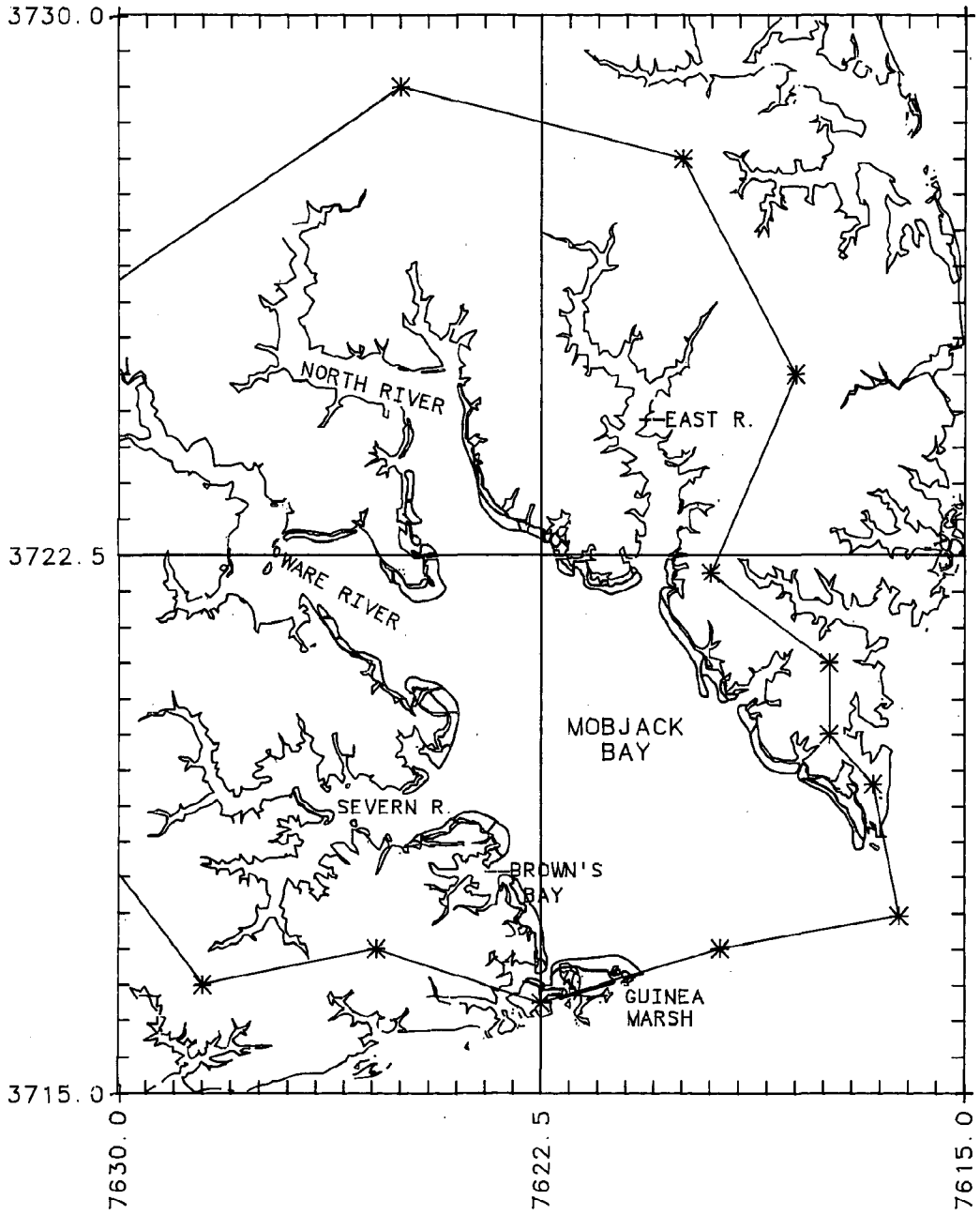

Figure 27. Distribution of SAV in Mobjack Bay Complex (Section 18).

19. YORK RIVER

There were 608 hectares of SAV observed in the York River section in 1987 (Tables 4-6, Fig. 28). This section has also been revised from the 1986 report. The boundary between this section and the Mobjack Bay section (18) is now a line bisecting the large shoal off the Guinea Marsh area. Moderate to 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. The only beds present along the south shore were located on the north side of Goodwin Islands. SAV beds were absent upstream of Gloucester Point except for small (<1 m^2) patches of Z. marina at Little Mumfort Island on the north shore, and just below the Naval Weapons Station on the south shore. These were transplanted in 1985 and 1986 and have persisted through 1987. The SAV beds planted in 1982 and 1983 at Gloucester Point continue to thrive in 1987, similar to many naturally expanding beds along the north shore.

20. LOWER WESTERN SHORE

There were 1,322 hectares of SAV mapped in the Lower Western Shore section in 1987 (Tables 4-6, Fig. 29). SAV beds, consisting of Z. marina and R. maritima, remained as dense beds in Broad Bay, Back River, Drum Island Flats 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.

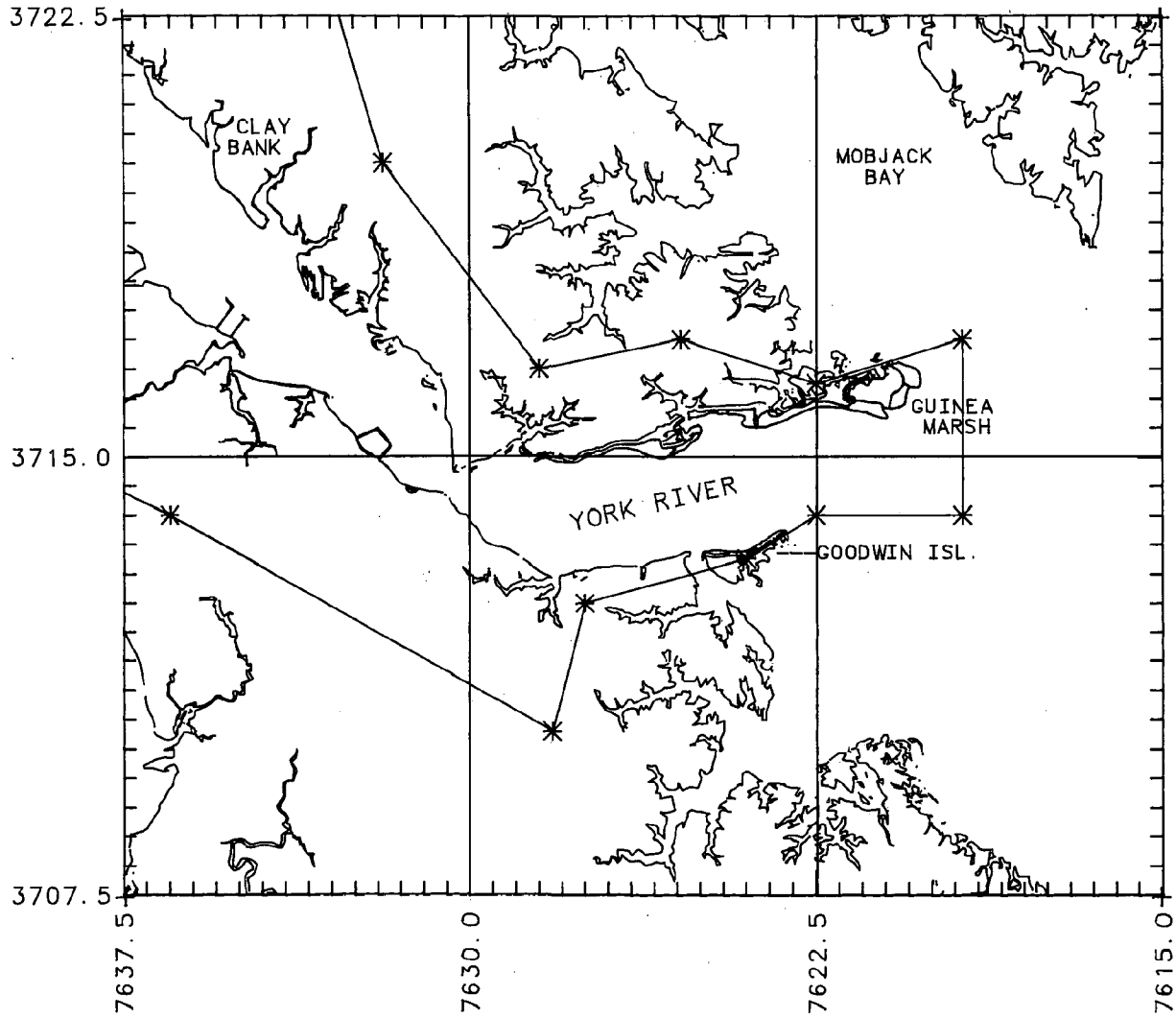

Figure 28. Distribution of SAV in York River (Section 19).

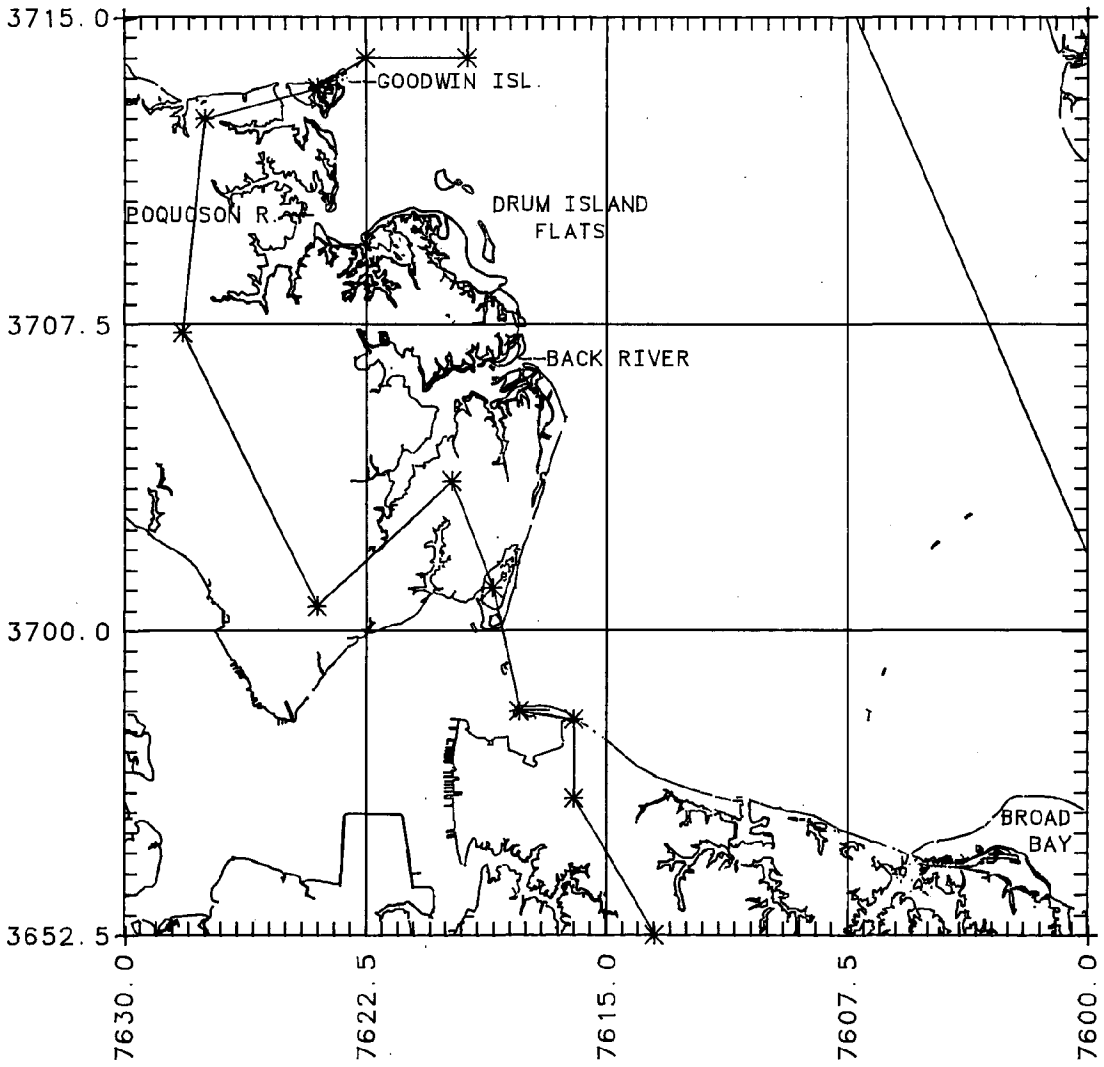

Figure 29. Distribution of SAV in Lower Western Shore (Section 20).

21. JAMES RIVER

The mainstem James River and tributaries emptying into the James remained, for the most part, unvegetated in 1987 (Tables 4-6, Fig. 30). A small section of the Chickahominy that was identified as having SAV in 1987 was photographed. It included Gordon and Nettles Creek, and Nayses Bay. The photography showed SAV beds as occurring in similar locations to previous aerial surveys, indicating that these beds appear to be relatively stable. However, SAV beds were not mapped. Many of the observed beds occurred in small creeks and on a topographic quadrangle were represented by a thin line. Tracing and digitizing a single line rather than a polygon shaped bed would have resulted in large errors, thereby compromising our quality control standards. Ground survey information from a graduate student of the University of Virginia, and from several citizens indicated fringing SAV beds consisting of N. minor, N. quadalupensis, C. demersum and Z. palustris in Sunken Marsh, Morris Creek and the Chickahominy main stem, on the Brandon quadrangle. SAV species are probably distributed throughout the Chickahominy River system, occupying the fringes of many tidal creeks.

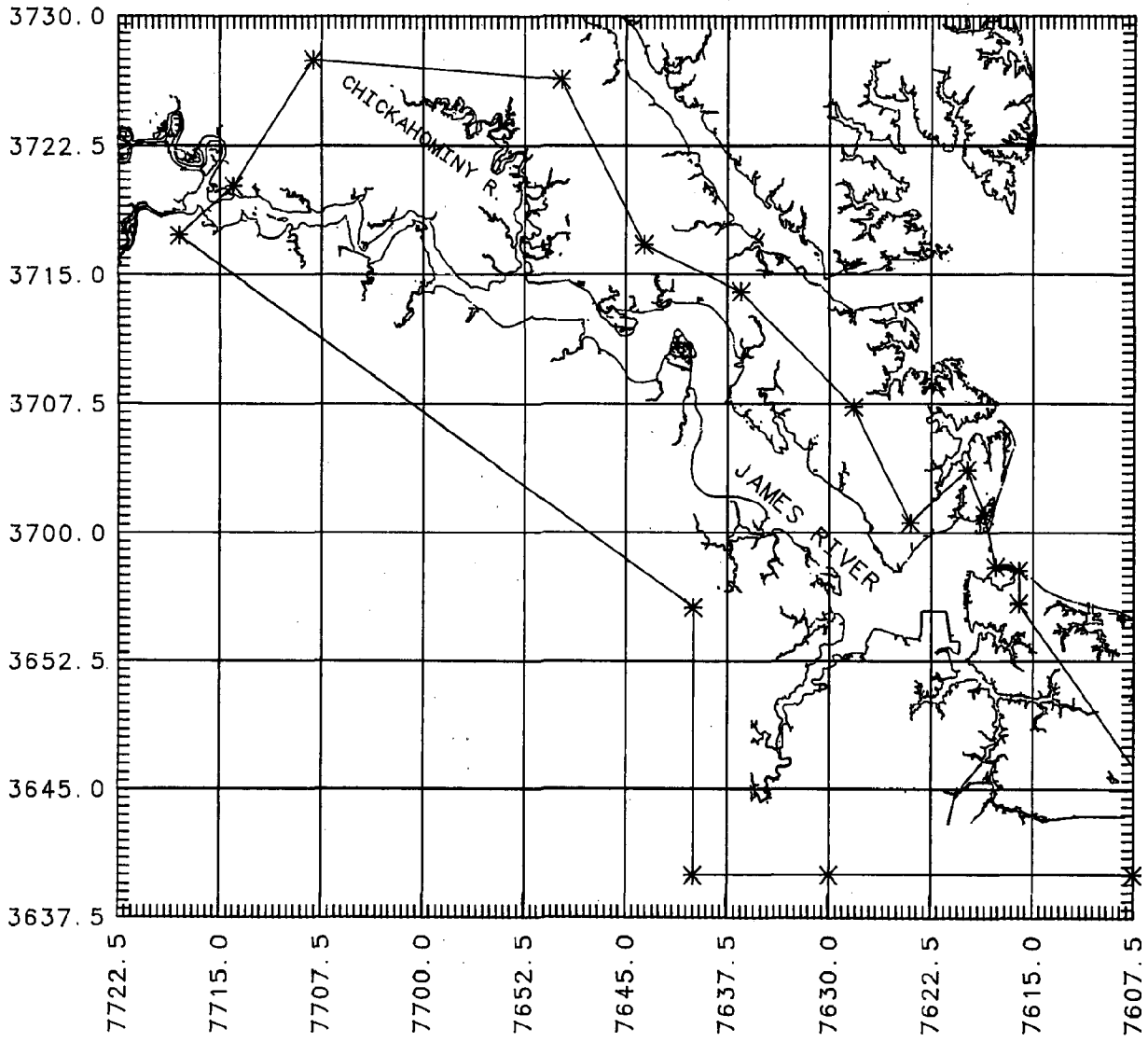

Figure 30. Distribution of SAV in James River (Section 21).

22. CHINCOTEAGUE BAY

There were 2,301 hectares of SAV identified in the Chincoteague Bay section in 1987 (Tables 4-6, Fig. 31). Beds were mostly of moderate to dense coverage with Z. marina predominating in the southern part of the bay and R. maritima in the northern half. All of the SAV was found on the eastern side of the bay west of Assateague Island in water depths of less than 1 meter (MLW). The vegetation was concentrated in four relatively distinct areas identical to that reported in the 1986 survey. They were located west of the northern end of Chincoteague Island, and west of West Bay, Green Run Bay, and the Tingles Island area. The increase in SAV in 1987 from 1986 was a result of additional SAV being mapped in the middle and upper sections of Sinepuxent Bay which were not flown in the 1986 survey. It is likely that these beds were present in 1986. Thus, this region appears to have remained quite stable over the past several years, with little expansion observed in the other southern, oceanside lagoonal systems.

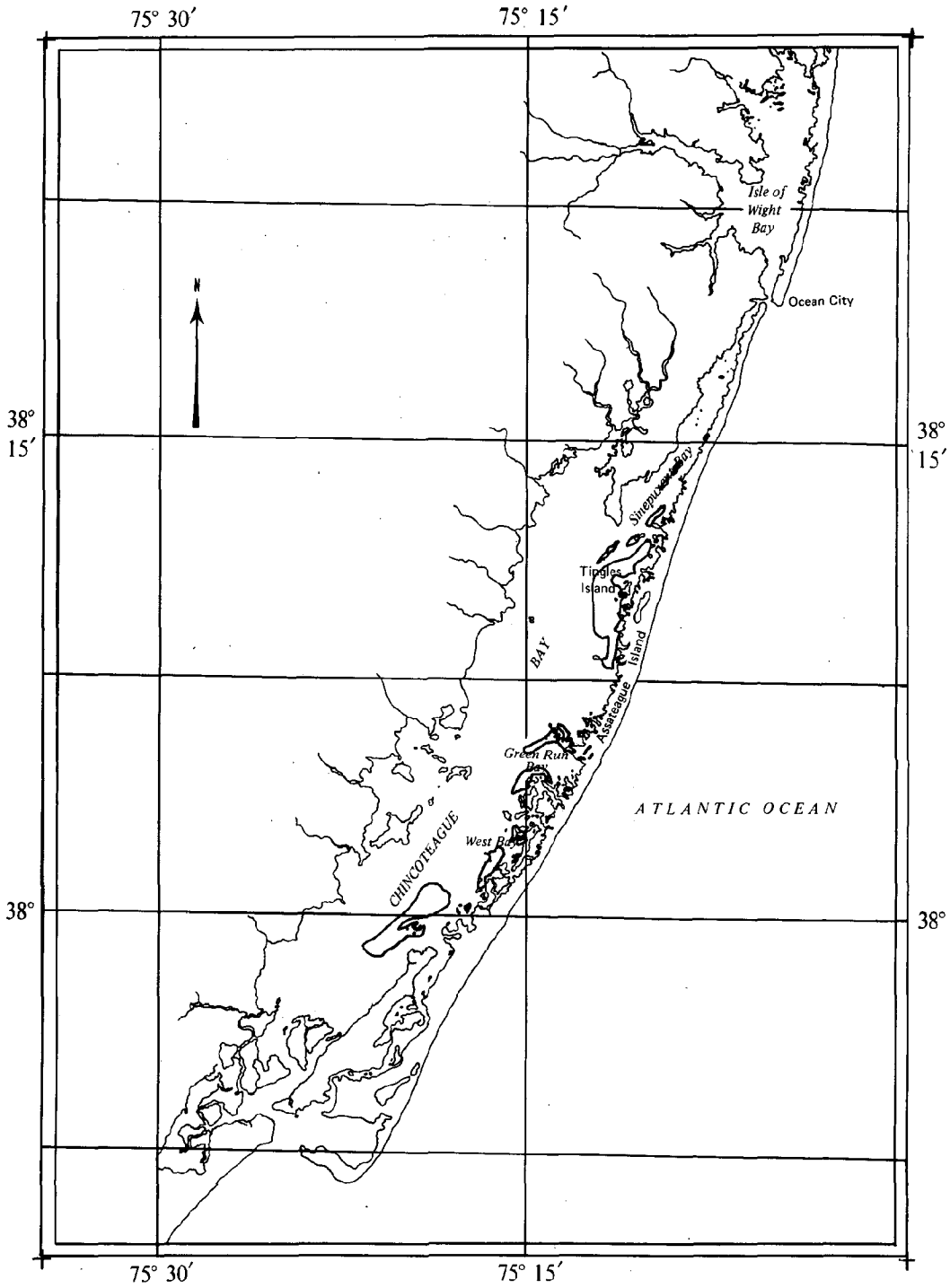

Figure 31. Distribution of SAV in Chincoteague Bay.

SECTION 5

HISTORICAL TRENDS

SAV in the Chesapeake Bay has undergone rapid fluctuations in distribution and abundance in the recent past (Orth and Moore, 1981, 1983, 1984). Although, overall, there is currently much less SAV baywide than in the recent past, patterns of change have varied from region to region within the bay. In order to assess these changes from an historical perspective, it is critical to have long term data on distribution of SAV including species presence or absence and the size of individual SAV beds in specific areas of the bay.

SAV in the Chesapeake Bay has been accurately mapped on a baywide basis for the years 1978, 1984, 1985, 1986 and 1987. In addition, sections of the upper bay were mapped for 1979, and sections of the lower bay were mapped for 1971, 1974, 1980 and 1981 (Orth and Gordon, 1975; Orth, et al., 1979; Anderson and Macomber, 1979; Orth, et al., 1985, 1986, 1987). Three representative areas in the lower bay were chosen to describe changes in the distribution of SAV in this region based on the availability of digitally mapped data (Fig. 32). These areas represent three different scenarios of change that SAV has undergone since the early 1970's. In the lower York River SAV declined in the early 1970's but has slowly returned in the last five years. In the Rappahannock River area SAV almost completely disappeared in the early 1970's and has recently returned to a few sections. The eastern shore area, where SAV had not significantly declined in the 1970's, had some smaller changes in the last decade.

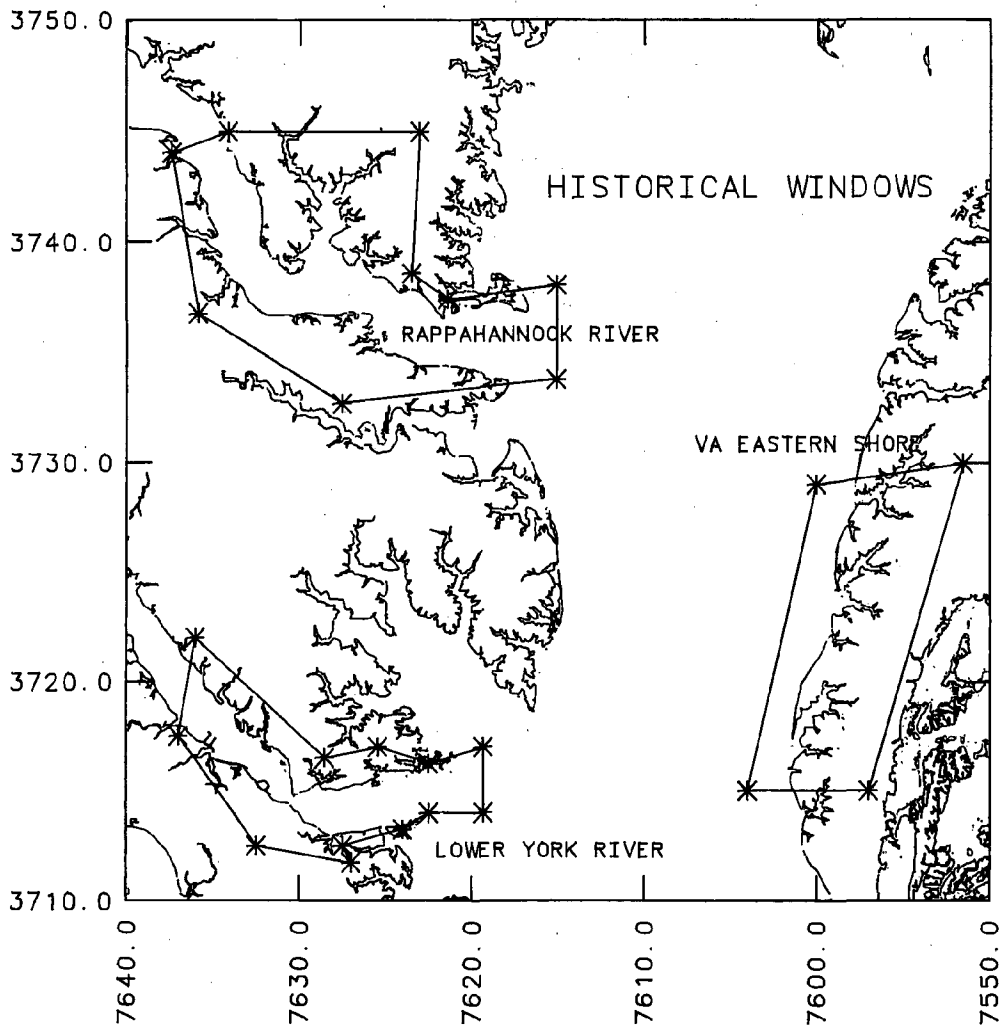

Figure 32. Location of 3 areas used in historical trends analysis.

YORK RIVER

SAV data for this area, which includes all of the area in section 19, were available for 1971, 1974, 1978, 1980, 1981, 1984, 1985, 1986, and 1987 (Fig. 33). The recent changes of SAV in the York River can be characterized by: 1. an abundance of SAV in 1971, primarily along the north shore and extending upriver to Clay Bank, consisting primarily of Z. marina and R. maritima (Fig. 34); 2. a rapid decline between 1971 and 1978, primarily in the upriver sections as well as the deeper portions of the established beds in the downriver areas (Fig. 35), during which approximately 50% of the SAV was lost; 3. a gradual increase in SAV between 1984 and 1987, principally in the downriver portions and in those areas in close proximity to existing beds (Fig. 36). These changes suggest that SAV had been affected by a major perturbation in the early 1970's that caused a shift in the abundance of SAV from upriver to downriver areas. The pattern of change in this river, as well as others along the western shore, has suggested that factors reducing SAV abundance may be related to upland runoff. Many factors known to be associated with SAV declines (i. e. increased turbidity and dissolved nutrients) generally increase with distance upriver, and, also, effects should be more pronounced as water column depth increases. The questions currently being asked by researchers investigating these hypotheses concern whether levels of these factors are sufficient to effect the observed responses. SAV has increased gradually between 1984 and 1987, principally in the downriver sections only, indicating that suitable conditions for SAV growth have returned to these areas. Although this revegetation has

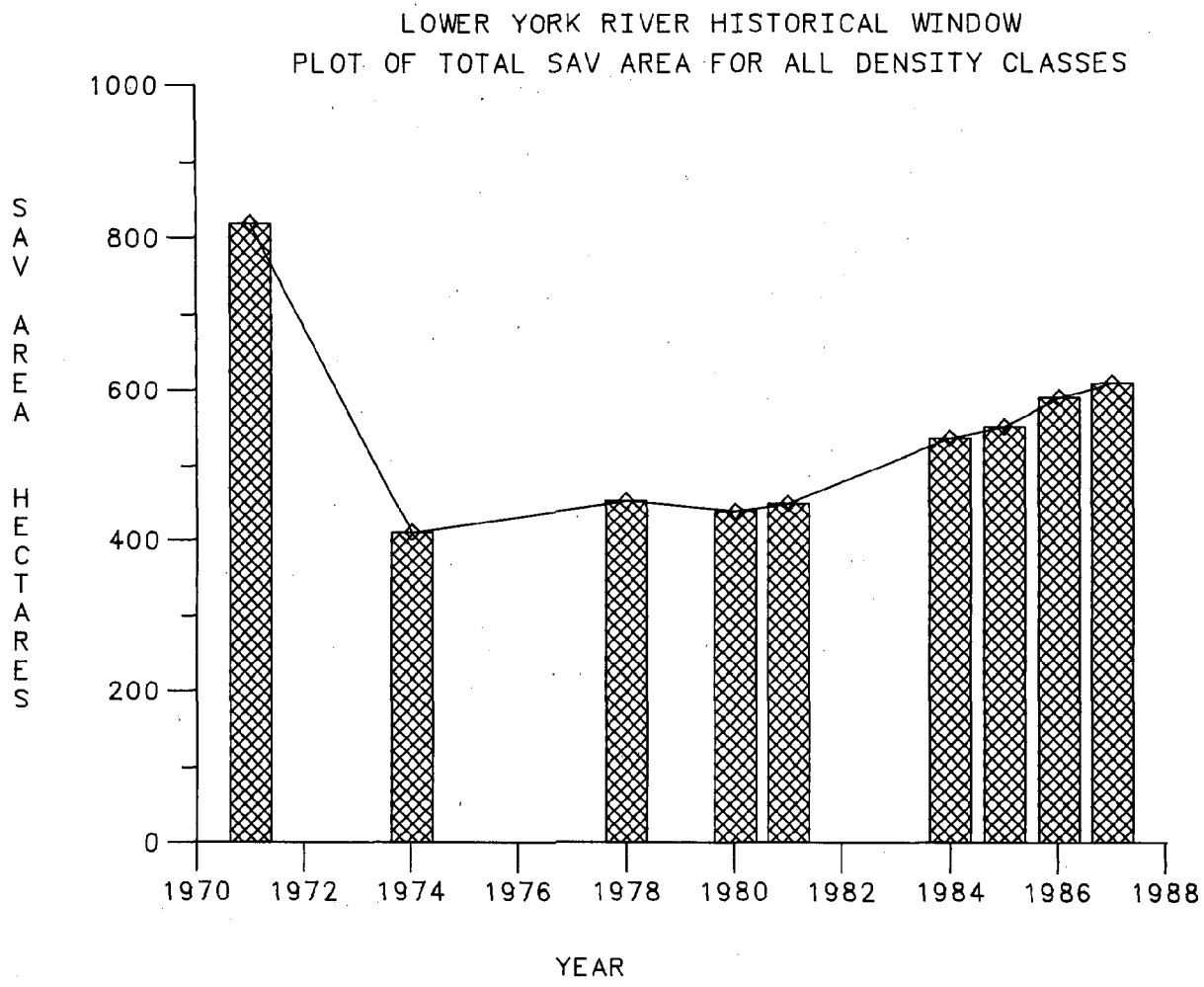

Figure 33. SAV changes in the York River, 1971-1987.

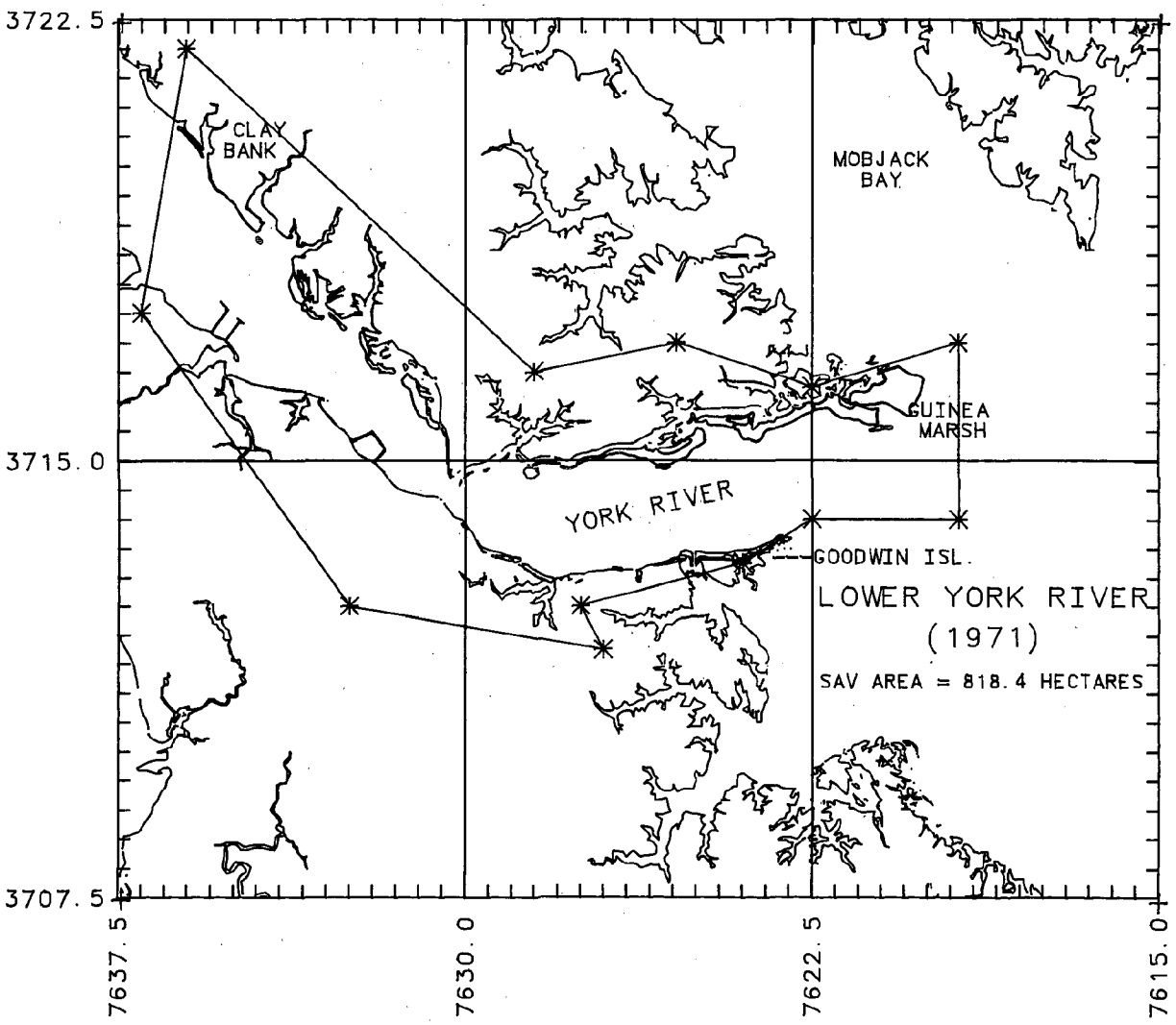

Figure 34. SAV in the York River, 1971.

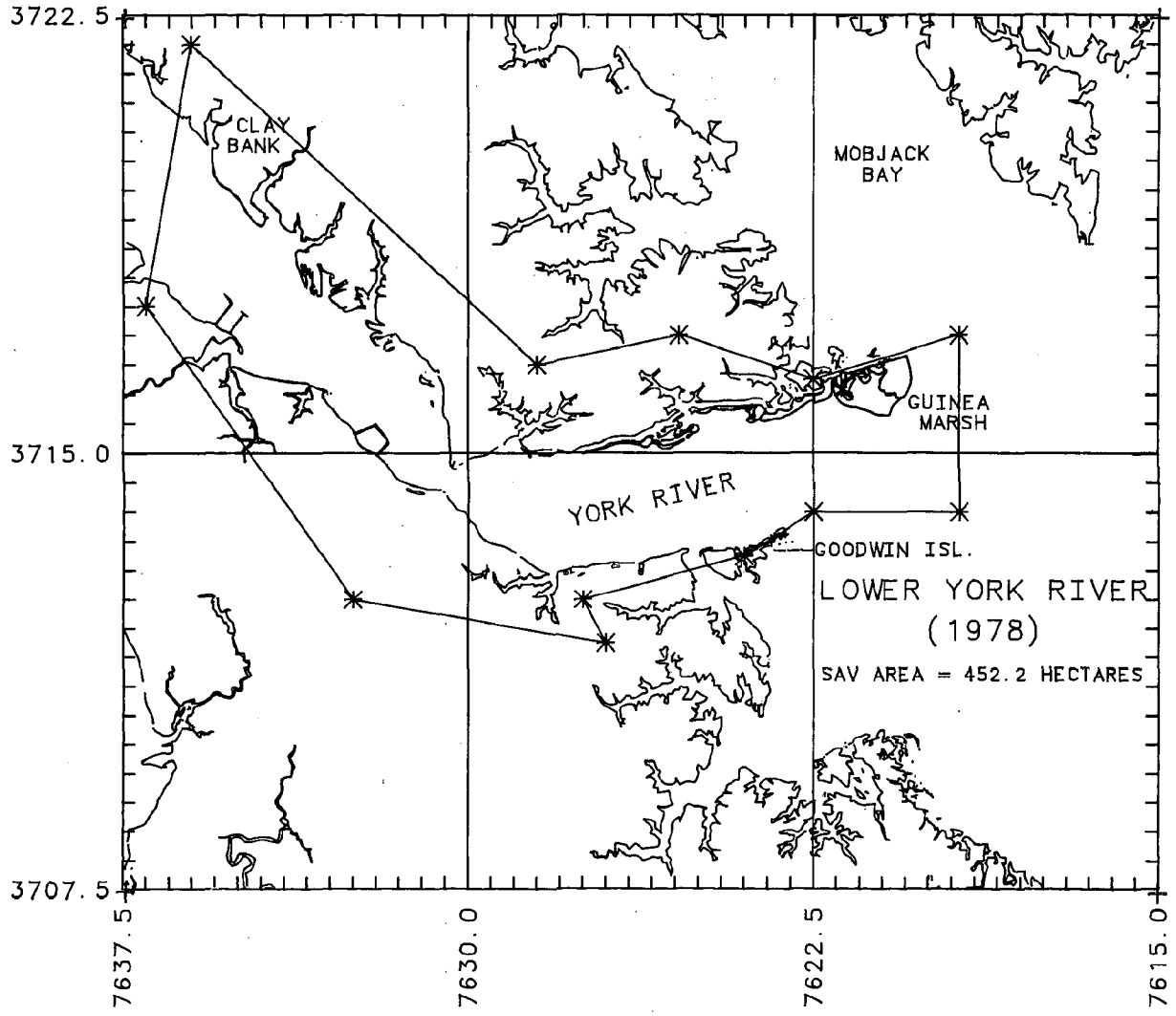

Figure 35. SAV in the York River, 1978.

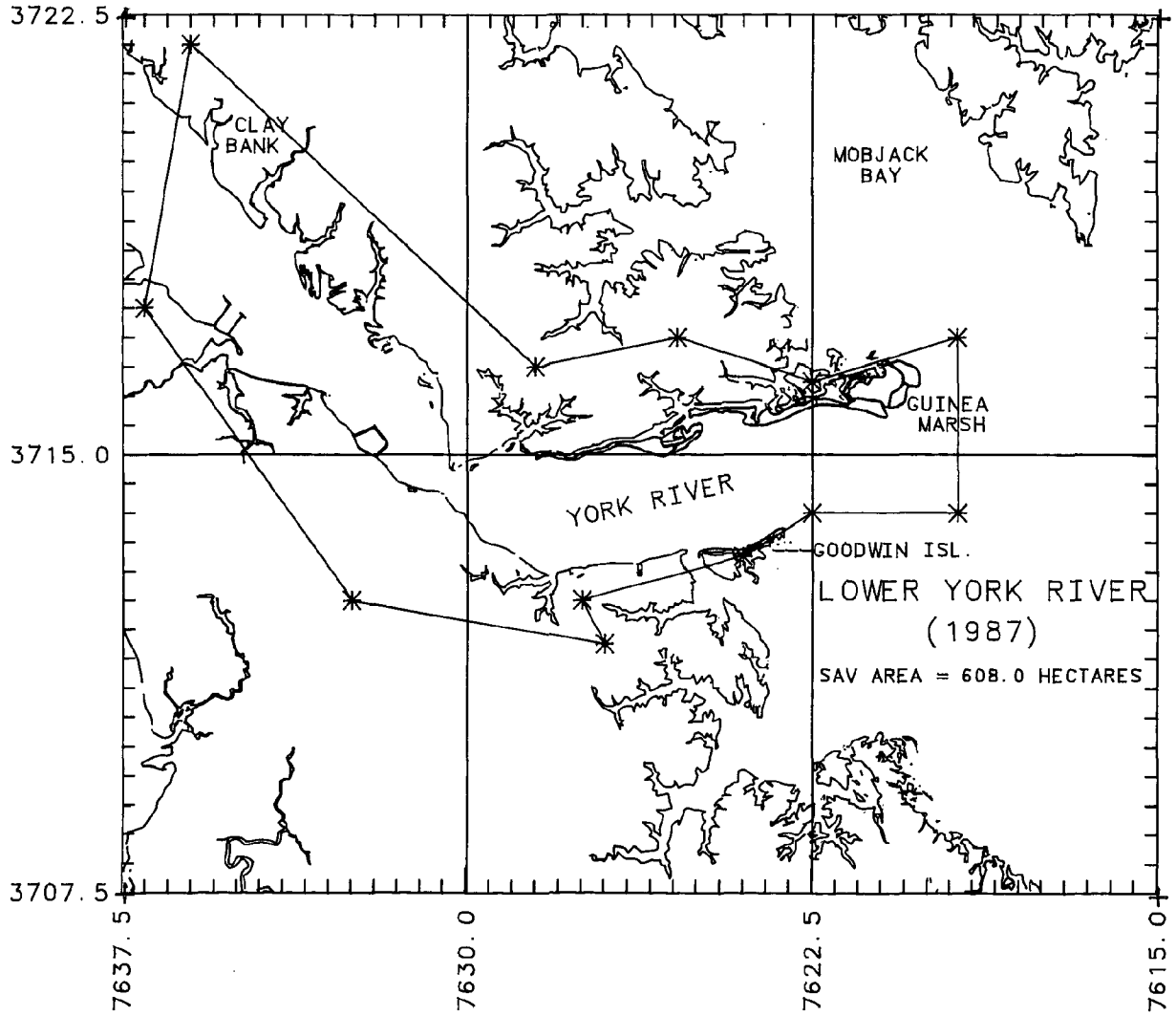

Figure 36. SAV in the York River, 1987.

occurred naturally, success of VIMS transplanting efforts along the gradient of SAV in the York River since 1978 has paralleled the natural recovery (VIMS, unpublished data). Areas upstream of the Gloucester Point - Yorktown constriction in the river are generally still unsuitable for SAV growth.

RAPPAHANNOCK RIVER

SAV data for the Rappahannock River, which represents a portion of Section 16, were available for the same period as the York River data (Fig. 37). Changes in SAV in this river are characterized by: 1. an abundance of SAV, consisting of both Z. marina and R. maritima, in 1971 along both shores (Fig. 38); 2. a rapid decline between 1971 and 1974, with SAV being almost completely eliminated from the entire river by 1974 (Fig. 39); 3. continued absence of SAV through 1986 with a rapid increase in SAV in 1987 in certain downriver areas (Fig. 40). Transplantation efforts in this river in portions that represented the historical distributional limits of SAV, generally paralleled the natural changes. Although, as with the York, both Z. marina and R. maritima occurred in this area prior to 1971, and both subsequently declined, only R. maritima has recolonized sites along the lower half of the former SAV distribution. R. maritima has been described as a colonizer of suitable habitat, and potentially can produce an abundance of seeds more suitable for dispersion than Z. marina. Its recent rapid spread has also been observed in other sections of the bay. However, why it has spread in the Rappahannock and not the York River is as yet unclear.

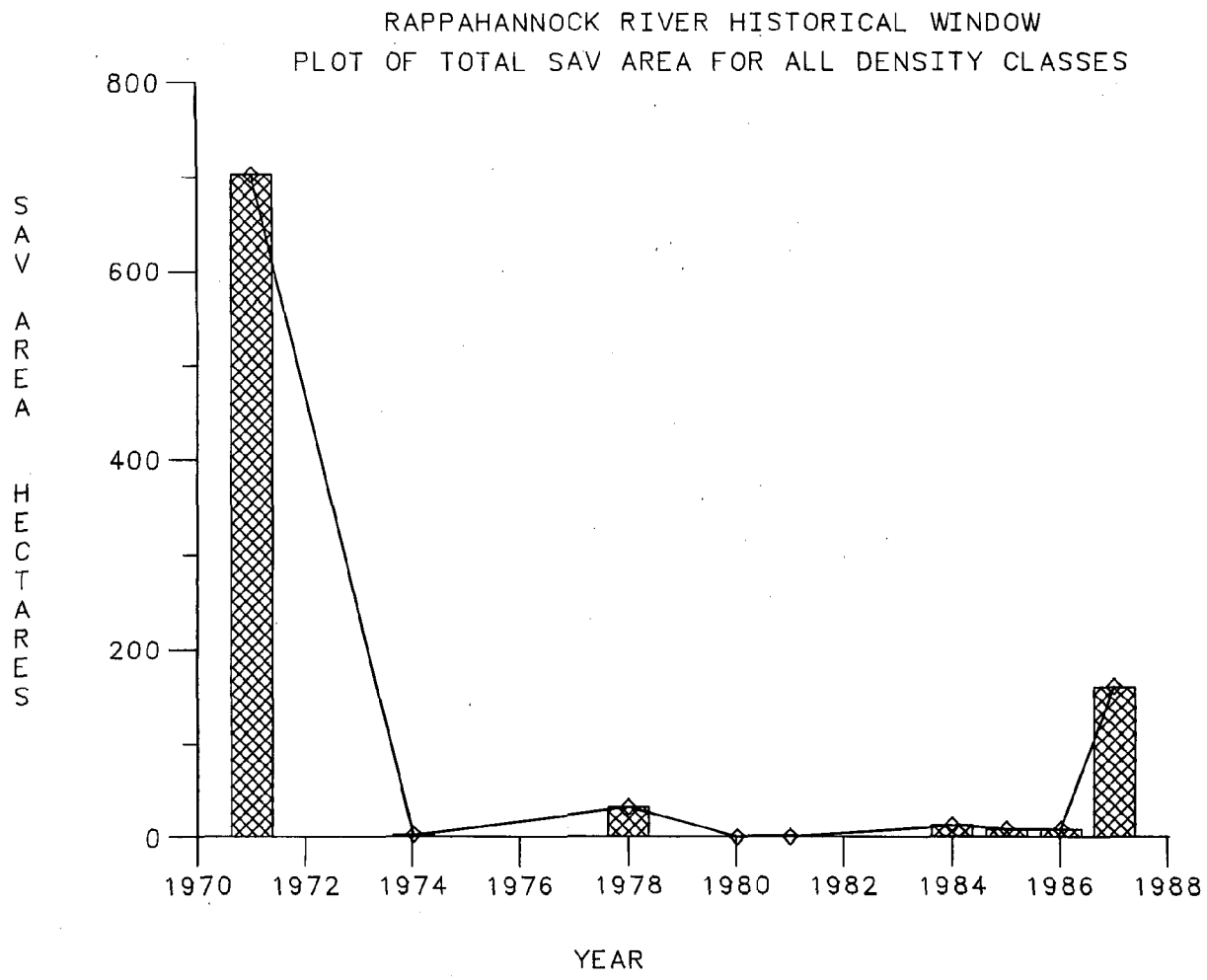

Figure 37. SAV changes in the Rappahannock River, 1971-1987.

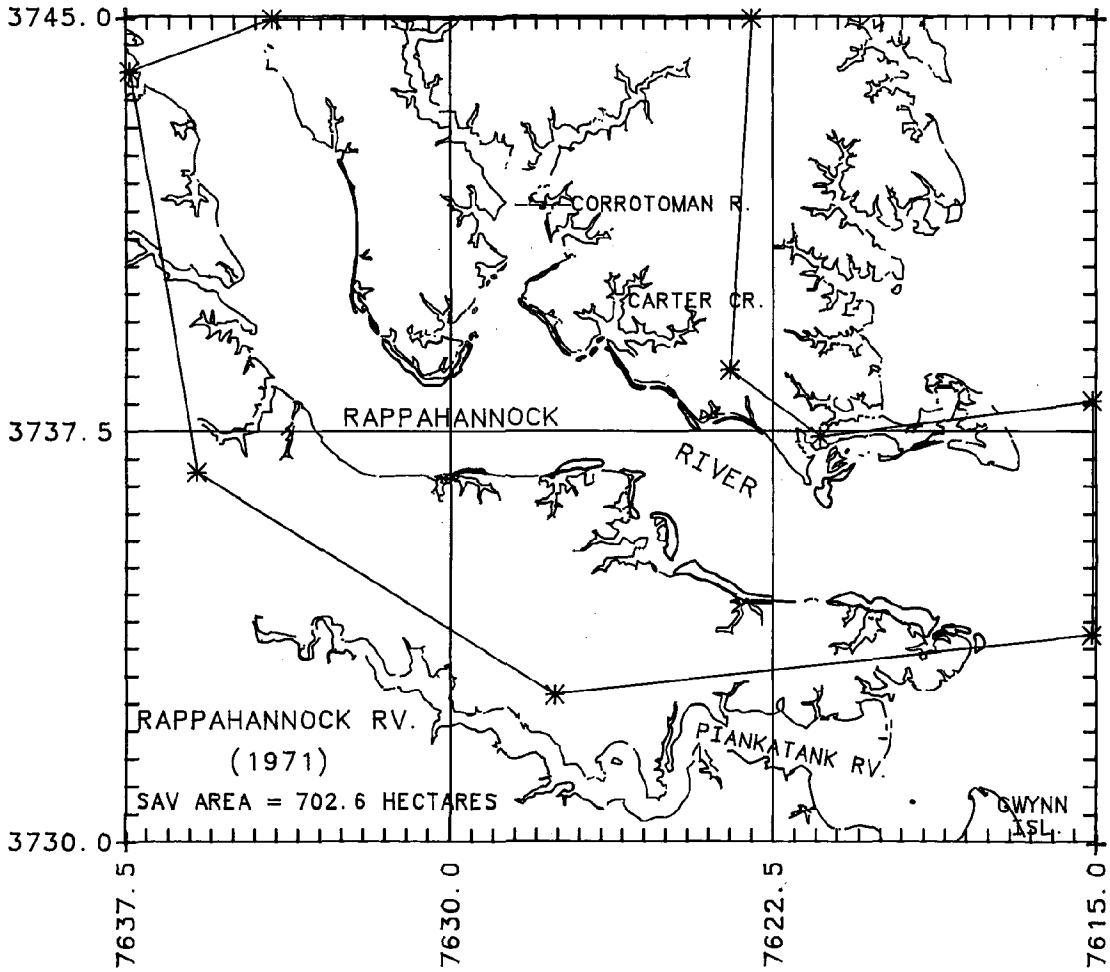

Figure 38. SAV in the Rappahannock River, 1971.

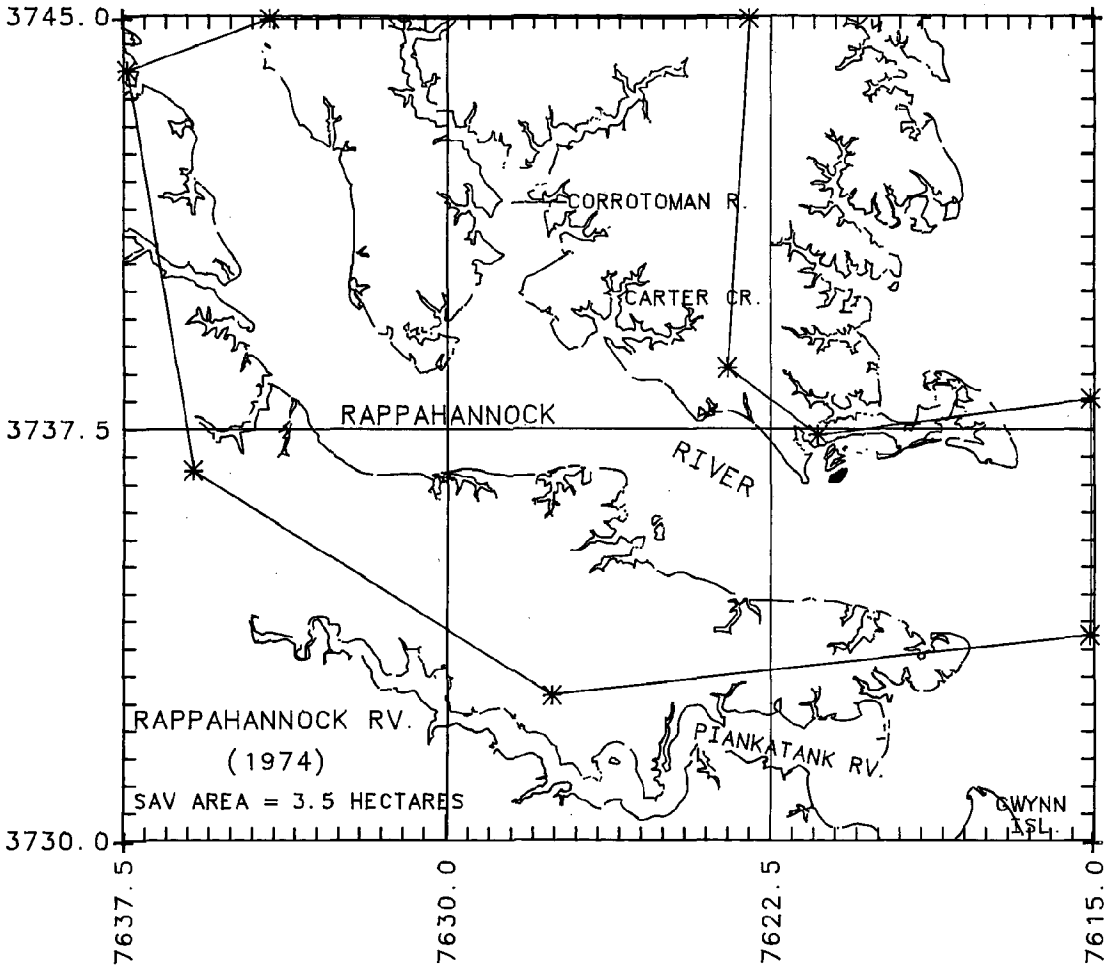

Figure 39. SAV in the Rappahannock River, 1974.

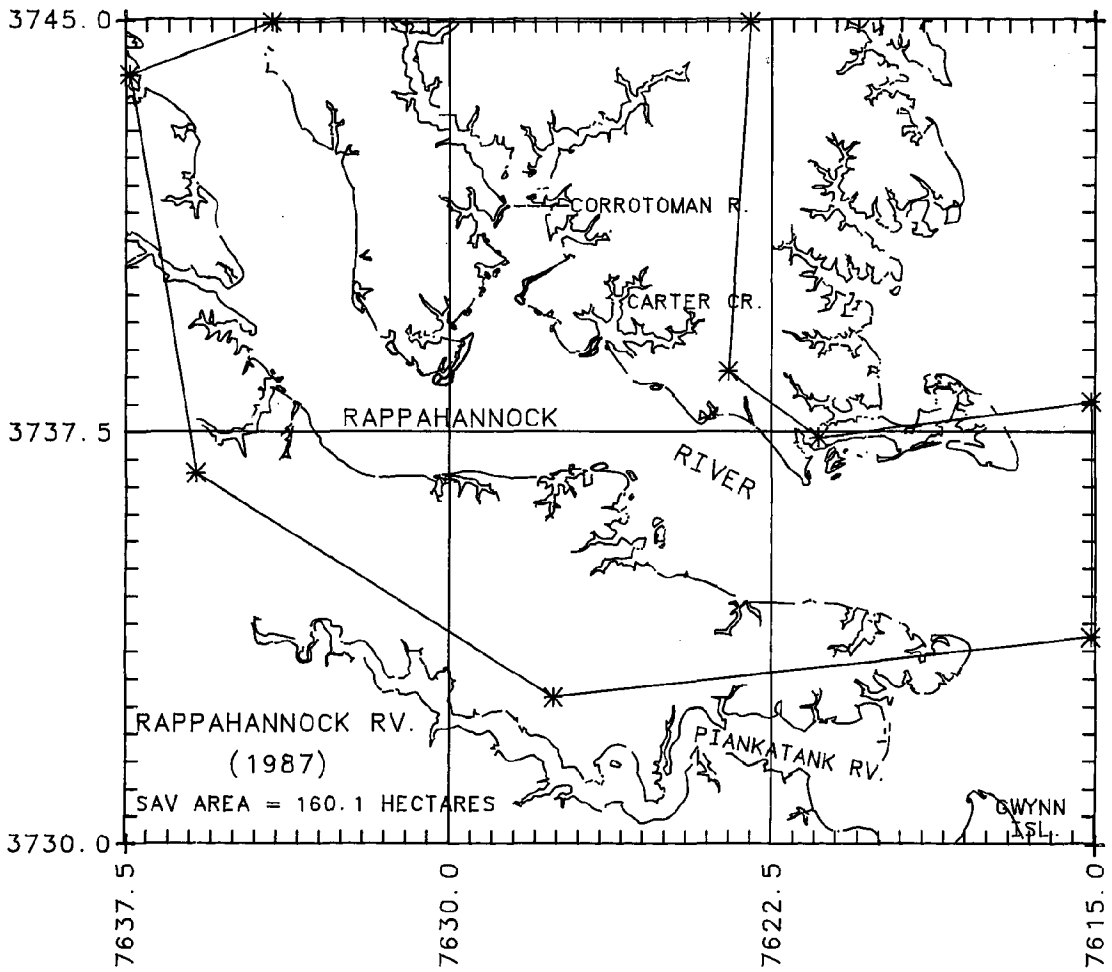

Figure 40. SAV in the Rappahannock River, 1987.

EASTERN SHORE

SAV data for the eastern shore, which represents a portion of Section 14, were available from 1978, 1980, 1981, 1984, 1985, 1986, and 1987 (Fig. 41). Although data were not available for this area prior to 1978, additional data for a smaller subsection of this area were available prior to 1978 (Orth, et al., 1987). Changes in this section can be characterized by: 1. abundant SAV in 1978 which, based on data from the smaller historical area, was most likely not significantly different from 1971 (Fig. 42); 2. some changes between 1978 and 1980, resulting in a decrease of approximately 30% of the SAV in this section (Fig. 43); 3. a gradual increase in SAV abundance from 1980 through 1987 (Fig. 44). This eastern shore region has, to a large degree, different runoff characteristics than many of the western shore tributaries, such as the York and Rappahannock Rivers. The drainage basins of the creeks along this region are small, and circulation patterns promote flushing with clear oceanic water having fewer nutrients. Its location and response therefore support the hypothesis of runoff being an important factor affecting SAV survival in the bay region.

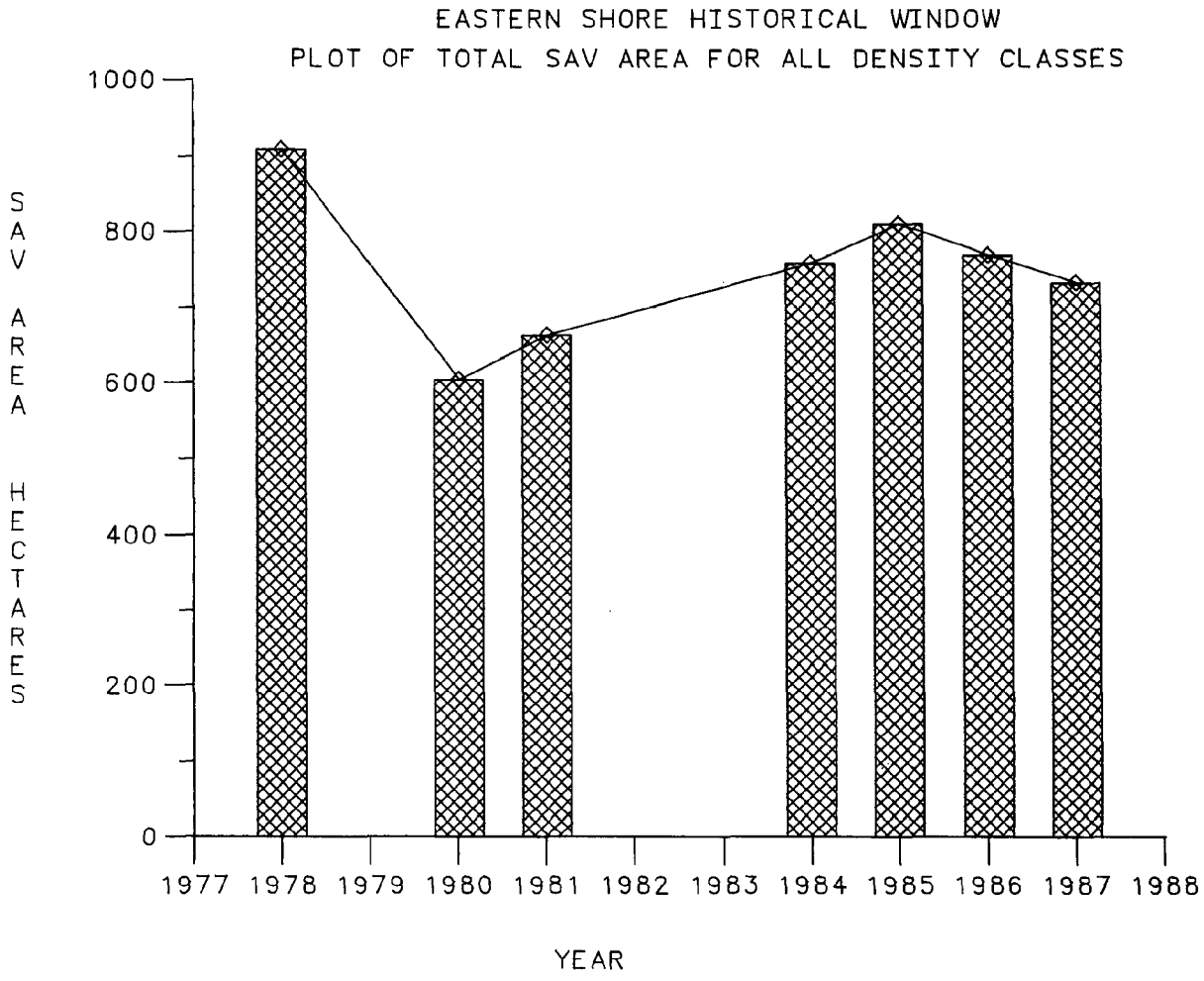

Figure 41. SAV changes along the lower Eastern Shore, 1978-1987.

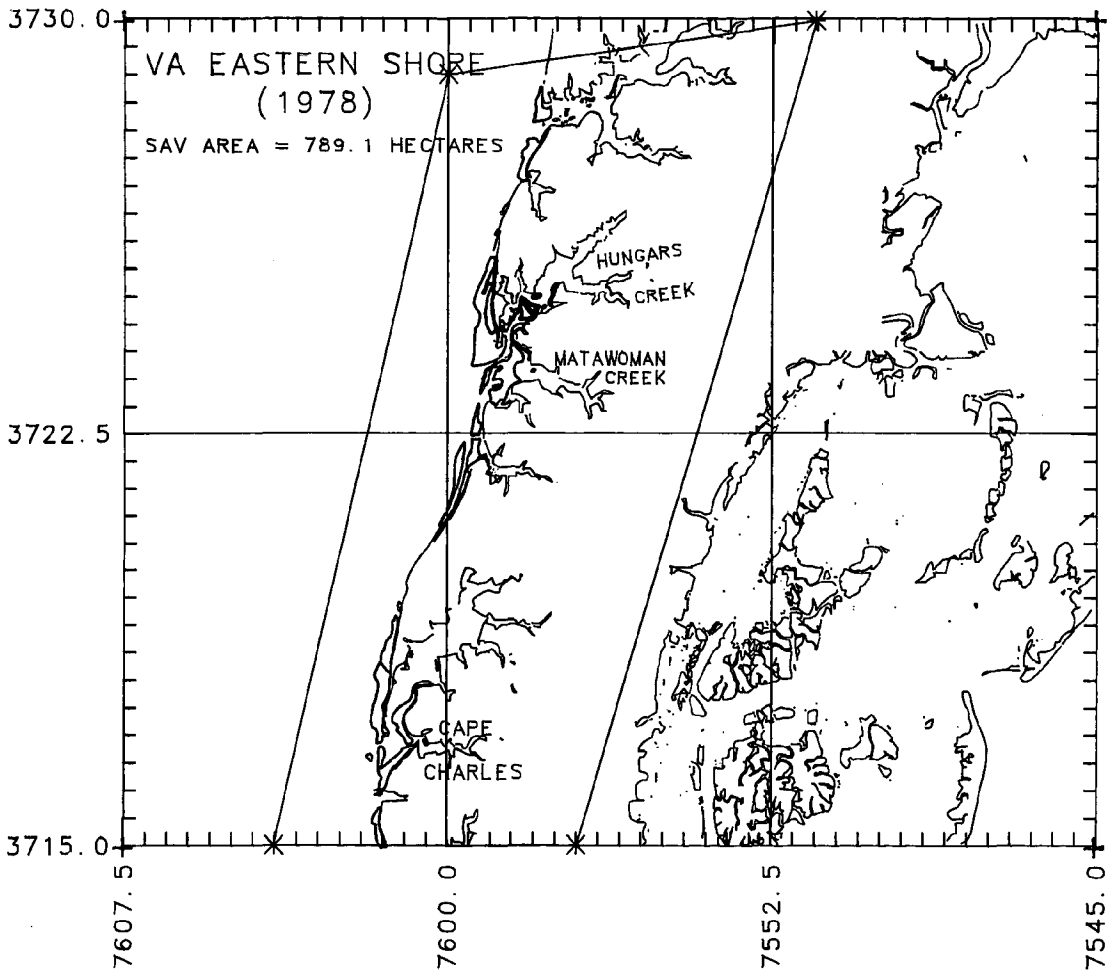

Figure 42. SAV along the lower Eastern Shore, 1978.

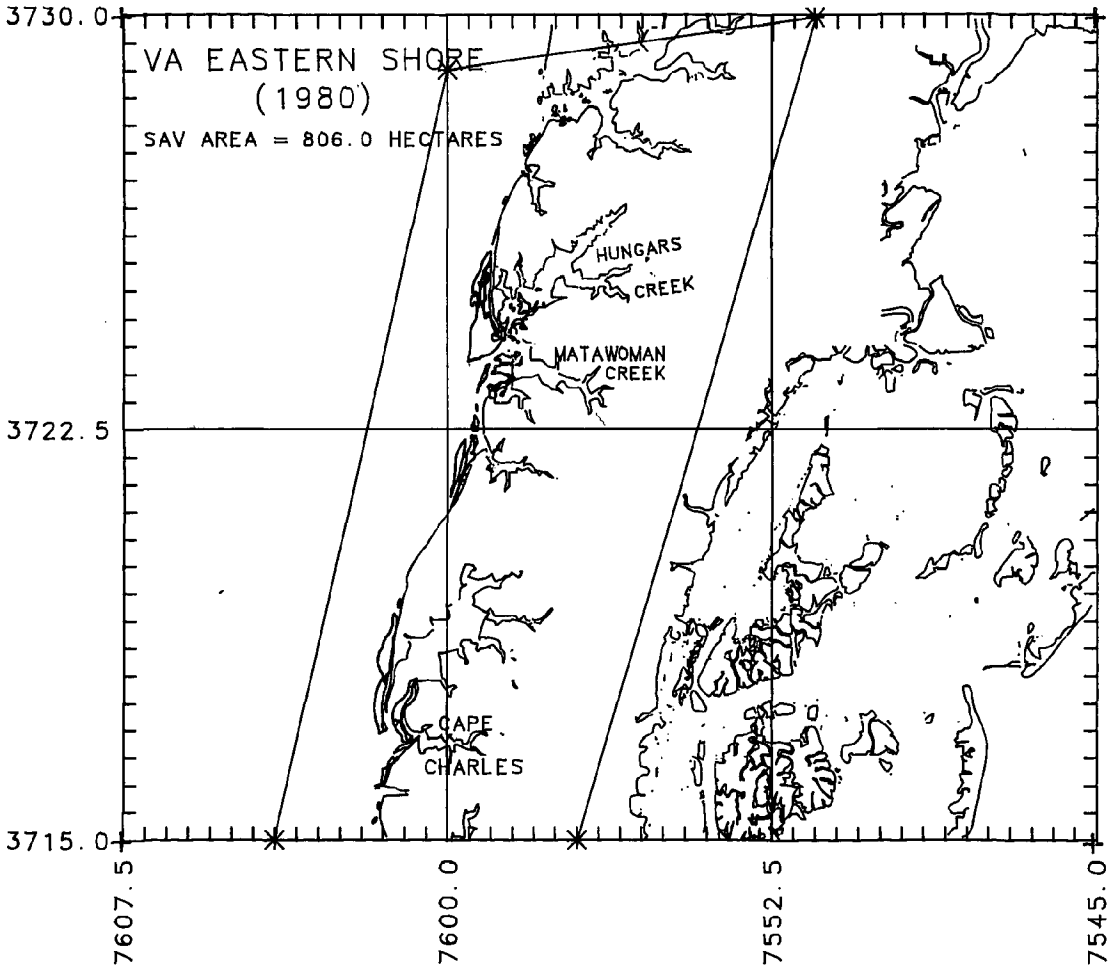

Figure 43. SAV along the lower Eastern Shore, 1980.

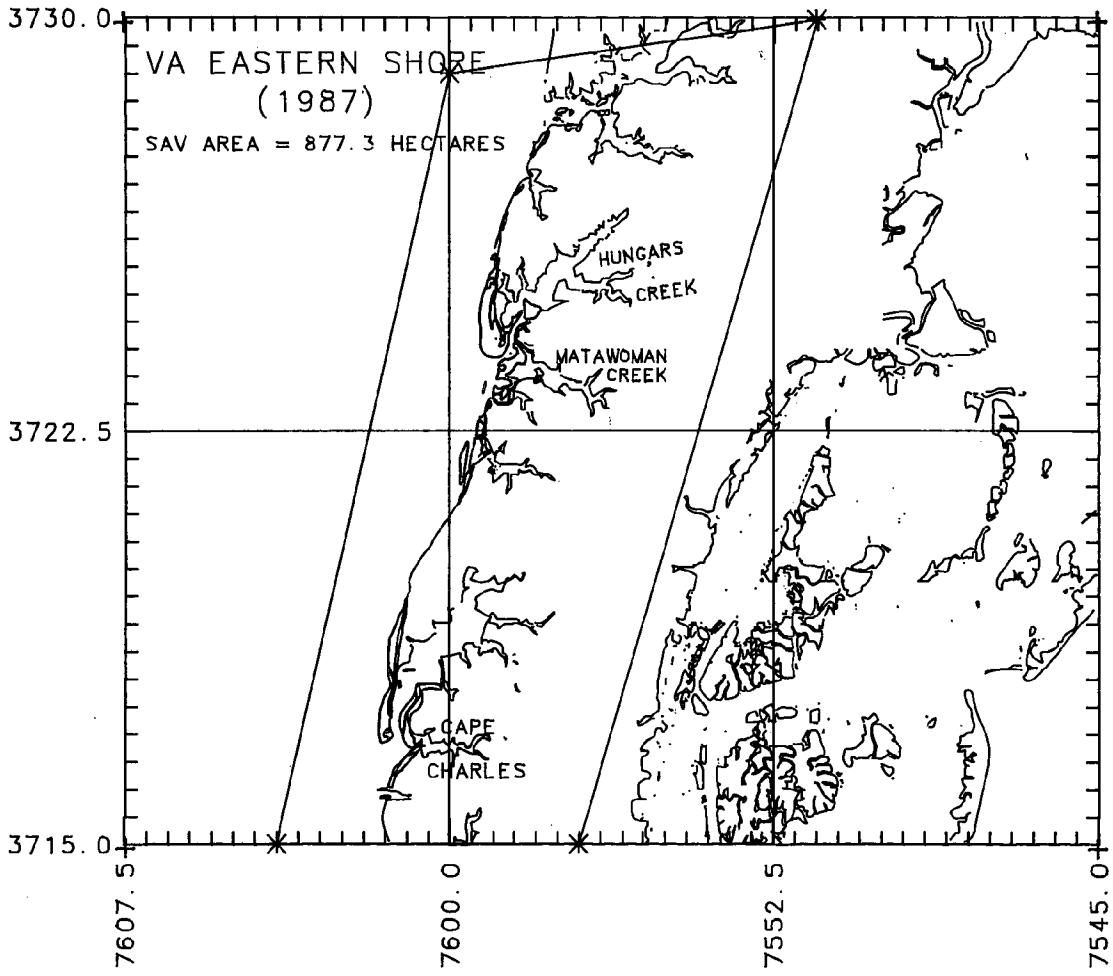

Figure 44. SAV along the lower Eastern Shore, 1987.

SECTION 6

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APPENDICES

APPENDIX A

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

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

APPENDIX B
LATITUDE AND LONGITUDE COORDINATE POINTS DEFINING 21 MAJOR SECTIONS IN THE CHESAPEAKE BAY AND CHINCOTEAGUE BAY

SEC. 1. Susquehanna Flats

LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN
39	27.00	76	10.00
39	39.15	76	10.00
39	39.15	75	51.00
39	27.50	76	00.00
39	26.50	76	01.31

SEC. 2. Upper Eastern Shore

LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN
39	10.00	76	20.00
39	20.00	76	12.50
39	26.50	76	01.31
39	27.50	76	00.00
39	39.15	75	51.00
39	39.15	75	45.00
39	19.50	75	45.00
39	20.00	76	00.00
39	12.55	76	10.40
39	09.25	76	16.00

SEC. 3. Upper Western Shore

LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN
39	12.40	76	49.00
39	30.00	76	20.00
39	27.00	76	10.00
39	26.50	76	01.31
39	20.00	76	12.50
39	10.00	76	20.00
39	00.00	76	20.00
39	03.50	76	32.30
39	06.82	76	35.40
39	11.15	76	40.00

SEC. 4. Chester River

LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN
39	00.00	76	20.00
39	10.00	76	20.00
39	09.25	76	16.00
39	12.55	76	10.40
39	20.00	76	00.00
39	19.50	75	45.00
39	05.00	75	45.00
39	05.00	76	00.00
38	57.10	76	11.85
39	00.00	76	19.10

SEC. 5. Central Western Shore

LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN
38	42.90	76	35.00
38	55.00	76	37.50
39	12.40	76	49.00
39	11.15	76	40.00
39	06.82	76	35.40
39	03.50	76	32.30
39	00.00	76	20.00
38	55.00	76	25.00
38	45.00	76	25.00

SEC. 6. Eastern Bay

LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN
38	45.00	76	25.00
38	55.00	76	25.00
39	00.00	76	20.00
39	00.00	76	19.10
38	57.10	76	11.85
39	05.00	76	00.00
38	50.00	76	01.65
38	44.10	76	10.50
38	50.00	76	16.50
38	45.00	76	20.00
38	42.50	76	20.50

SEC. 7. Choptank River

LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN
38	23.50	76	20.00
38	45.00	76	25.00
38	42.50	76	20.50
38	45.00	76	20.00
38	50.00	76	16.50
38	44.10	76	10.50
38	50.00	76	01.65
39	05 00	76	00.00
39	05.00	75	45.00
38	45.00	75	45 00
38	45.00	75	50 00
38	21.93	75	55 00
38	25.00	76	06 80

LATITUDE DEG	MIN	LONGITUDE DEG	MIN

SEC. 8. Patuxent River

38	15.00	76	25 45
38	35.00	77	00.00
38	58.00	76	45.00
38	55.00	76	37.50
38	42.90	76	35.00
38	30.00	76	32.30
38	21.66	76	23.50
38	18.00	76	22.83

SEC. 9. Middle Western Shore

38	02.85	76	19.40
38	05.00	76	21.54
38	15.00	76	25.45
38	18.00	76	22.83
38	21.66	76	23.50
38	30.00	76	32.30
38	42.90	76	35.00
38	45.00	76	25.00
38	23.50	76	20.00
38	05.00	76	10.00

SEC. 10. Lower Potomac River

37	53.40	76	14.45
37	55.50	76	18.15
37	53.85	76	28.00
38	06.15	76	53.00
38	15.00	77	06.40
38	20.00	77	09.40
38	24.20	77	14.08
38	35.00	77	00.00
38	15.00	76	25.45
38	05.00	76	21.54
38	02.85	76	19.40
38	05.00	76	10.00
37	50.00	76	10.00

LATITUDE DEG	MIN	LONGITUDE DEG	MIN

SEC. 11. Upper Potomac River

38	15.00	77	06.40
38	20.00	77	24.80
38	27.65	77	25.00
39	01.80	77	17.10
38	58.00	76	45.00
38	35.00	77	00.00
38	24.20	77	14.08
38	20.00	77	09.40

SEC. 12. Middle Eastern Shore

38	11.10	76	13.30
38	23.50	76	20.00
38	25.00	76	06.80
38	21.93	75	55.00
38	45.00	75	50.00
38	40.00	75	37.00
38	00.00	75	38.00
38	00.73	75	49.50
37	57.10	75	50.30
37	55.00	75	55.10
38	11.70	75	59.00
38	13.60	76	05.83

SEC. 13. Tangier-Smith Islands

37	45.00	75	58.30
37	50.00	76	10.00
38	05.00	76	10.00
38	11.10	76	13.30
38	13.60	76	05.83
38	11.70	75	59.00
37	55.00	75	55.10

SEC. 14. Lower Eastern Shore

37	00.00	75	58.95
37	20.00	76	10.00
37	38.75	76	10.00
37	50.00	76	10.00
37	45.00	75	58.30
37	55.00	75	55.10
37	57.10	75	50.30
38	00.73	75	49.50
38	00.00	75	38.00
38	00.00	75	30.00
37	46.45	75	39.30
37	20.00	75	55.50

SEC. 15. Reedville

LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN
37	38.75	76	10.00
37	37.40	76	21.40
37	38.05	76	23.50
37	44.35	76	23.00
37	48.00	76	28.00
37	53.85	76	28.00
37	55.50	76	18.15
37	53.40	76	14.45
37	50.00	76	10.00

SEC. 16. Rappahannock River Complex

37	26.50	76	10.00
37	25.00	76	18.08
37	28.00	76	20.00
37	29.00	76	25.00
37	32.00	76	35.00
37	49.15	76	48.00
37	53.73	76	49.65
37	58.00	76	45.45
37	48.00	76	28.00
37	44.35	76	23.00
37	38.05	76	23.50
37	37.40	76	21.40
37	38.75	76	10.00

SEC. 17. New Point Comfort Region

37	17.45	76	16.16
37	19.45	76	16.62
37	20.00	76	17.40
37	21.00	76	17.40
37	22.25	76	19.50
37	25.00	76	18.00
37	26.50	76	10.00
37	20.00	76	10.00

SEC. 18. Mobjack Bay Complex

37	17.00	76	19.33
37	16.25	76	22.50
37	17.00	76	25.42
37	16.50	76	28.50
37	20.00	76	31.88
37	25.75	76	31.00
37	29.00	76	25.00
37	28.00	76	20.00
37	25.00	76	18.00
37	22.25	76	19.50
37	21.00	76	17.40
37	20.00	76	17.40
37	19.30	76	16.62
37	17.45	76	16.16

SEC. 19. York River

37	14.00	76	22.50
37	13.25	76	24.00
37	12.50	76	27.50
37	07.30	76	28.20
37	14.00	76	36.50
37	16.72	76	43.65
37	26.29	76	49.77
37	30.55	76	40.00
37	28.56	76	35.00
37	20.00	76	31.88
37	16.50	76	28.50
37	17.00	76	25.42
37	16.25	76	22.50
37	17.00	76	19.33
37	14.00	76	19.33

LATITUDE DEG	MIN	LONGITUDE DEG	MIN

SEC. 20. Lower Western Shore

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

SEC. 21. James River

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

LATITUDE DEG	MIN	LONGITUDE DEG	MIN

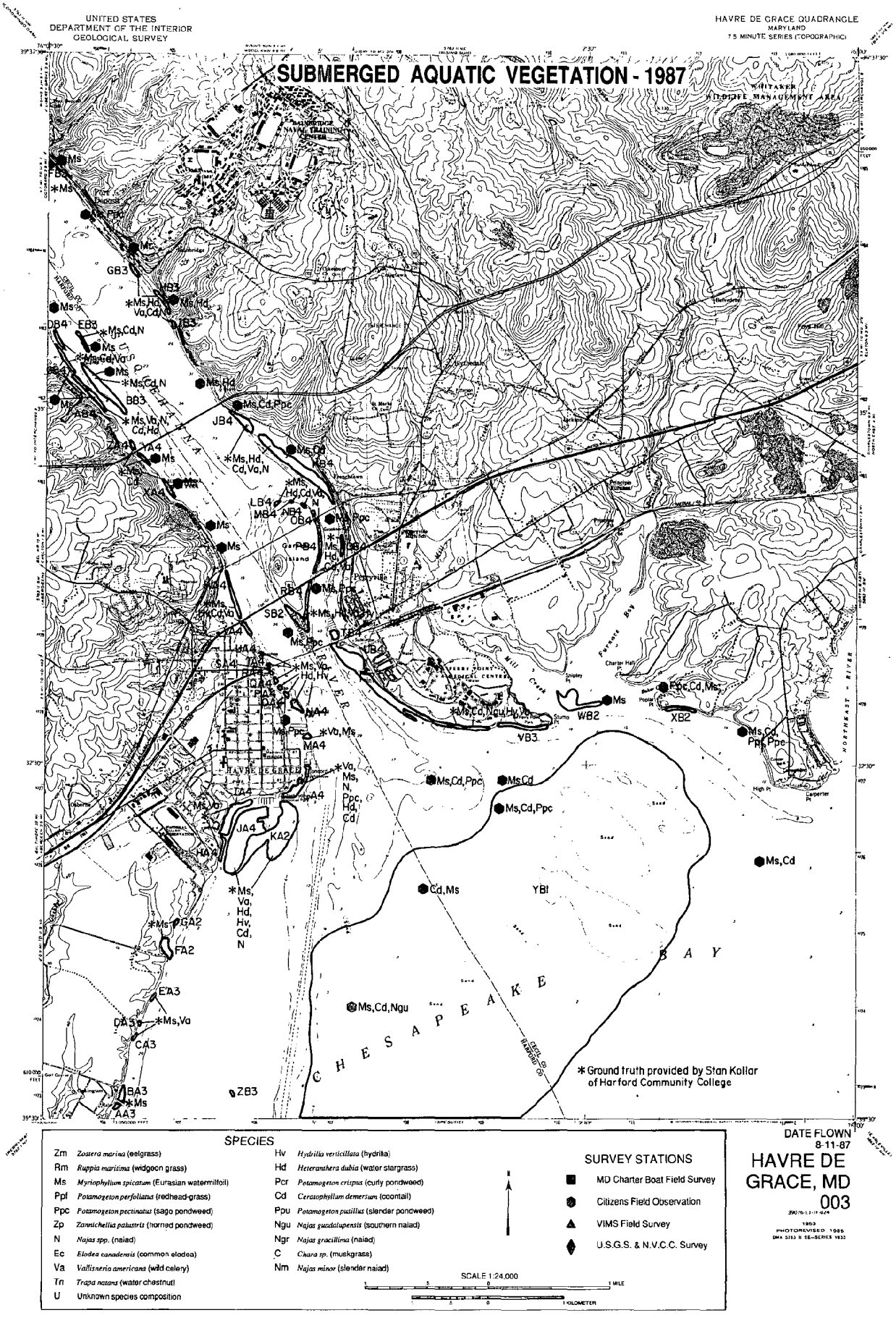
Chincoteague Bay

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

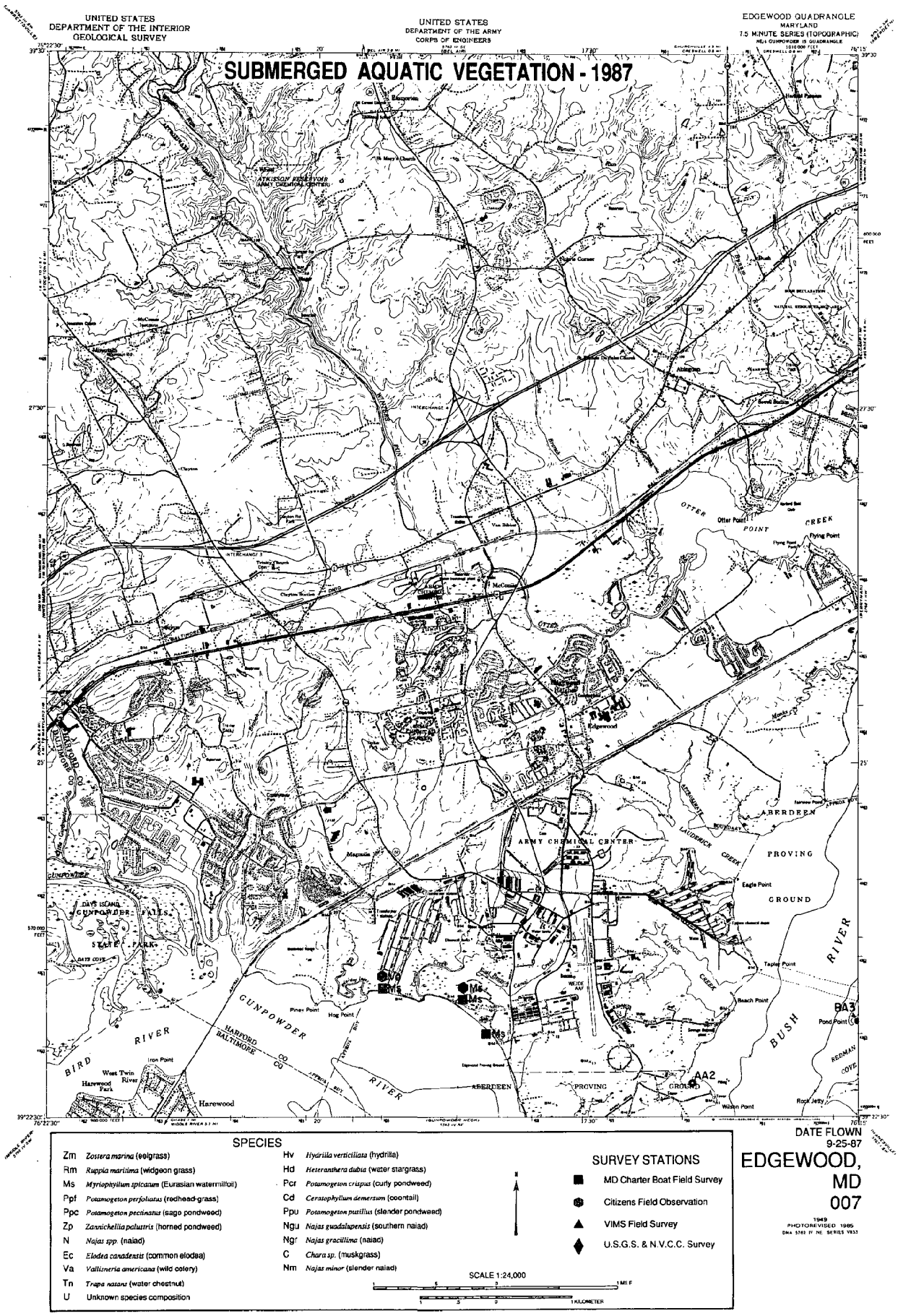
APPENDIX C

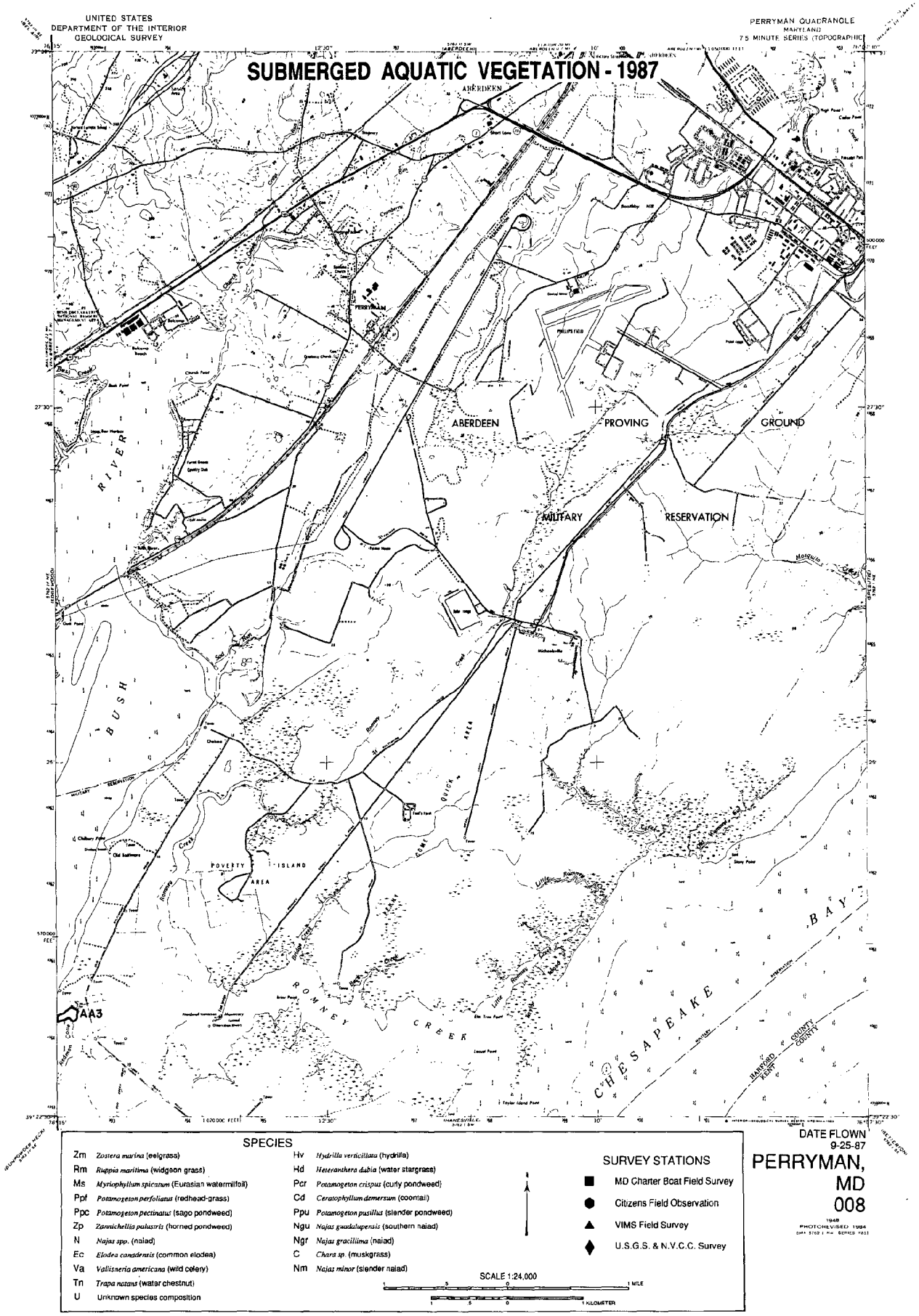
TOPOGRAPHIC QUADRANGLES SHOWING THE 1987 DISTRIBUTION AND ABUNDANCE OF SAV (BOUNDARIES OF INDIVIDUAL SAV BEDS ARE DELINEATED BY SOLID LINES. EACH BED IS IDENTIFIED WITH A LETTER (A-Z) AND A NUMBER (1-4). THESE NUMBERS REPRESENT THE DENSITY CLASSIFICATION DISCUSSED IN THE TEXT AND FIG. 4, I.E., 1 = <10%; 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.)

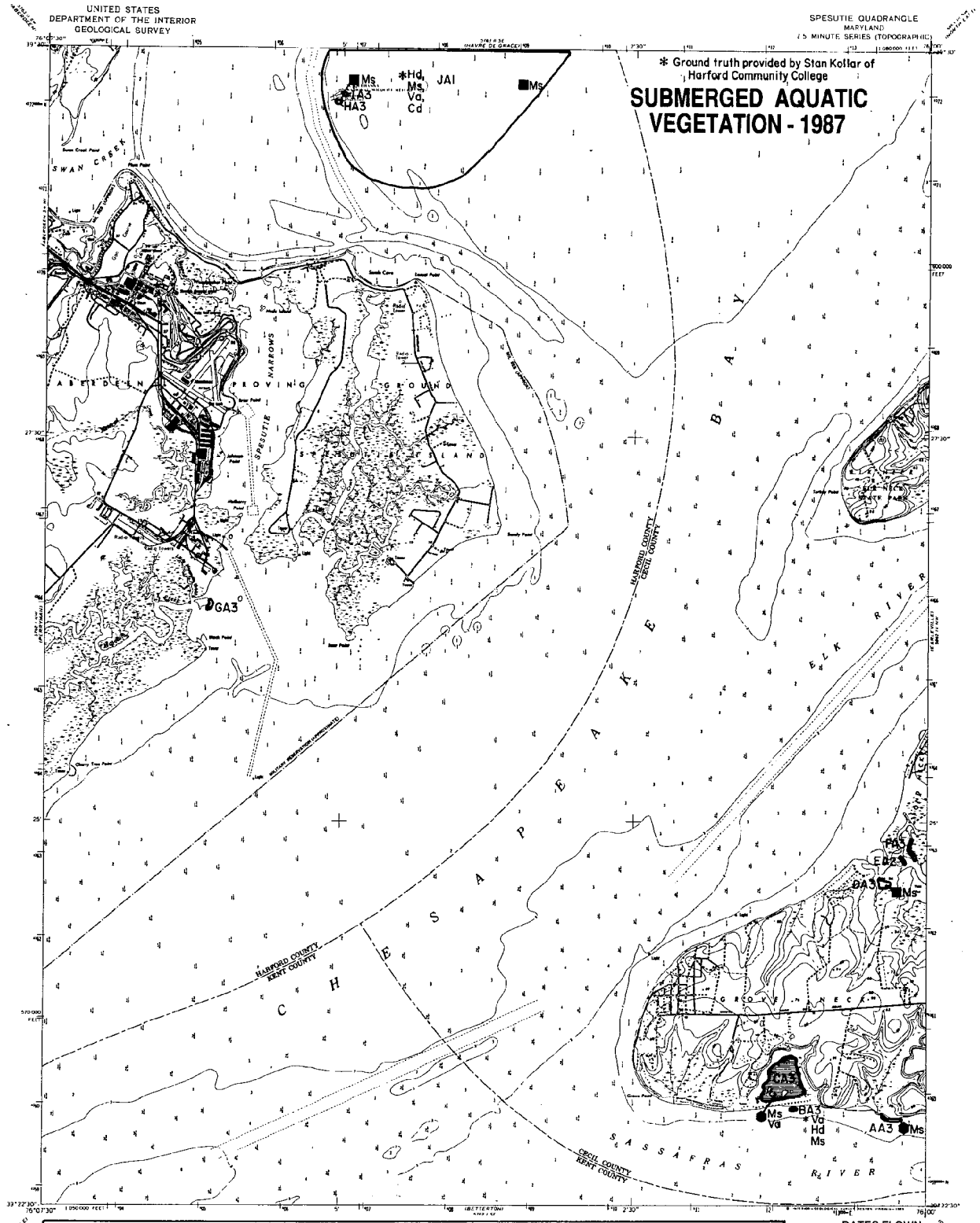
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
ABERDEEN QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)
Ground truth provided by Brian Koller of Harford Community College
SUBMERGED AQUATIC VEGETATION - 1987
SUSQUEHANNA STATE PARK
Aberdeen
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATE FLOWN
8-11-87
ABERDEEN, MD
002
1983
PHOTOREVISED 1985


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
HAVRE DE GRACE QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
WHITAKER
WILDLIFE MANAGEMENT AREA
HAVRE DE GRACE
CHESAPEAKE
BAY
* Ground truth provided by Stan Kollar
of Harford Community College
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 KILOMETER
DATE FLOWN
8-11-87
HAVRE DE GRACE, MD
003
1953
PHOTOREVISED 1985

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
SUBMERGED AQUATIC VEGETATION - 1987
NORTH EAST RIVER
ELK NECK STATE FOREST
CHESAPEAKE BAY
ELK RIVER
Ms
Ms
GA4
Ms FA4
Ms
Ms
Va, Ms
Ms CA3
Ms
Va
Ms
BA2
Va
Ms
Ms, Va
DA3
Ms
EA2
Va, Ms
AA2 Va
Ms
* Ground truth provided by Stan Kollar of Harford Community College
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SCALE 1:24,000
1 MILE
1 KILOMETER
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
DATE FLOWN
8-11-87
NORTH EAST, MD
004


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
EDGEWOOD QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
ATKISSON RESERVOIR
ARMY CHEMICAL CENTER
OTTER POINT CREEK
Otter Point
Flying Point
Edgewood
ABERDEEN PROVING GROUND
LAUDERICK CREEK
Eagle Point
KINGS CREEK
Tapler Point
Beach Point
BUSH RIVER
Pond Point
REDMAN COVE
Rock Jetty
Wilson Point
GUNPOWDER RIVER
Piney Point
Hog Point
BIRD RIVER
Iron Point
West Twin River
Harewood Park
Harewood
HARFORD CO
BALTIMORE CO
DAYS ISLAND
GUNPOWDER FALLS STATE PARK
Magnolia
Clayton
McCormick
Van Bibber
Abingdon
Bush
Vo
Ms
Ms
Ms
Ms
AA2
BA3
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATE FLOWN
9-25-87
EDGEWOOD, MD
007
1949
PHOTOREVISED 1985


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
PERRYMAN QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
ABERDEEN
PROVING
GROUND
MILITARY
RESERVATION
RIVER
BUSH
POVERTY
ISLAND
AREA
ROMNEY
CREEK
CHESAPEAKE
BAY
AA3
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (watar chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
DATE FLOWN
9-25-87
PERRYMAN,
MD
008
1948
PHOTOREVISED 1984



SPECIES

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

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

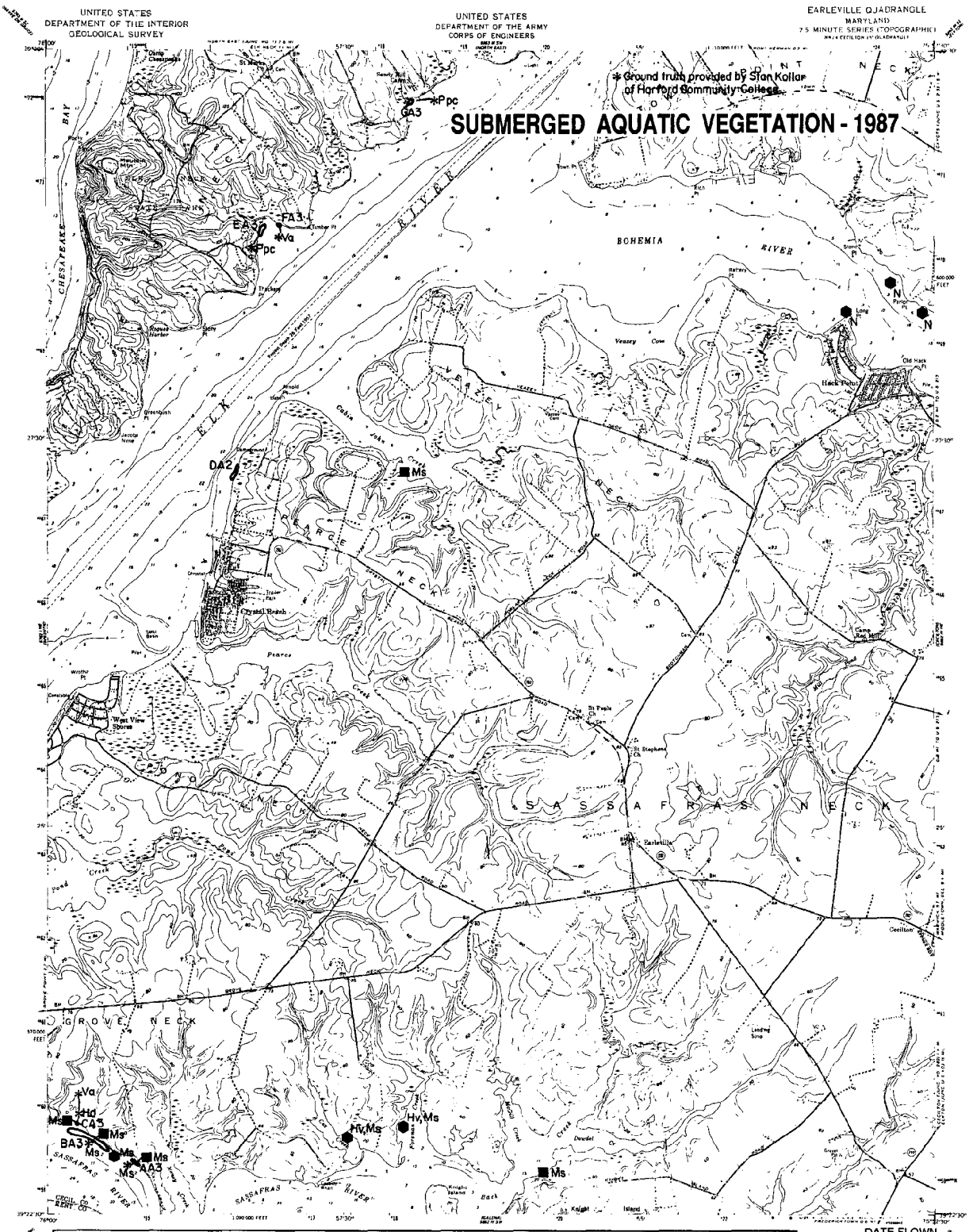
1 MILE

1 KILOMETER

DATES FLOWN
8-11-87
9-25-87

SPESUTIE, MD
009

PHOTOREVISED 1984



SPECIES

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

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

1 0 1 MILE

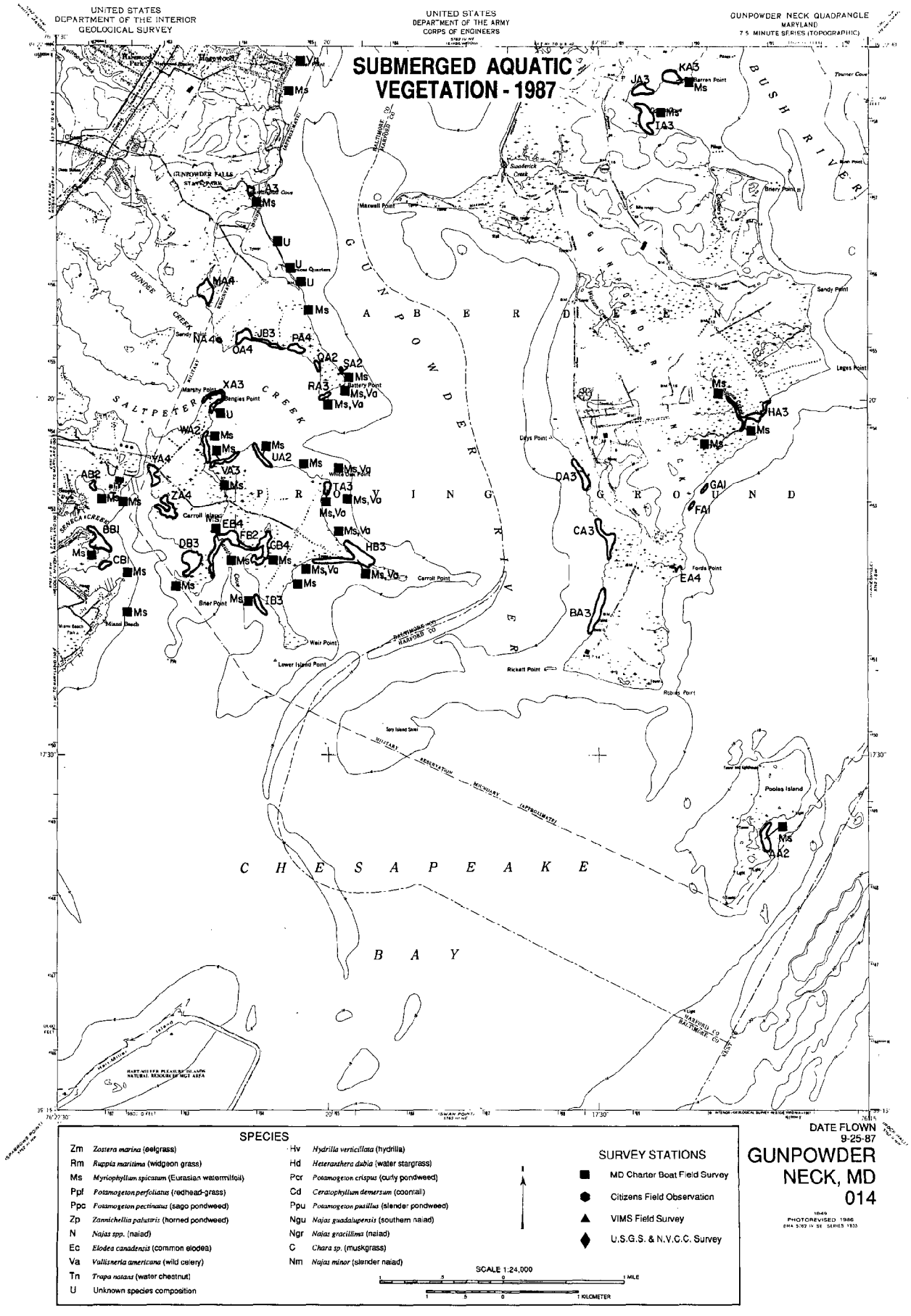
1 0 1 KILOMETER

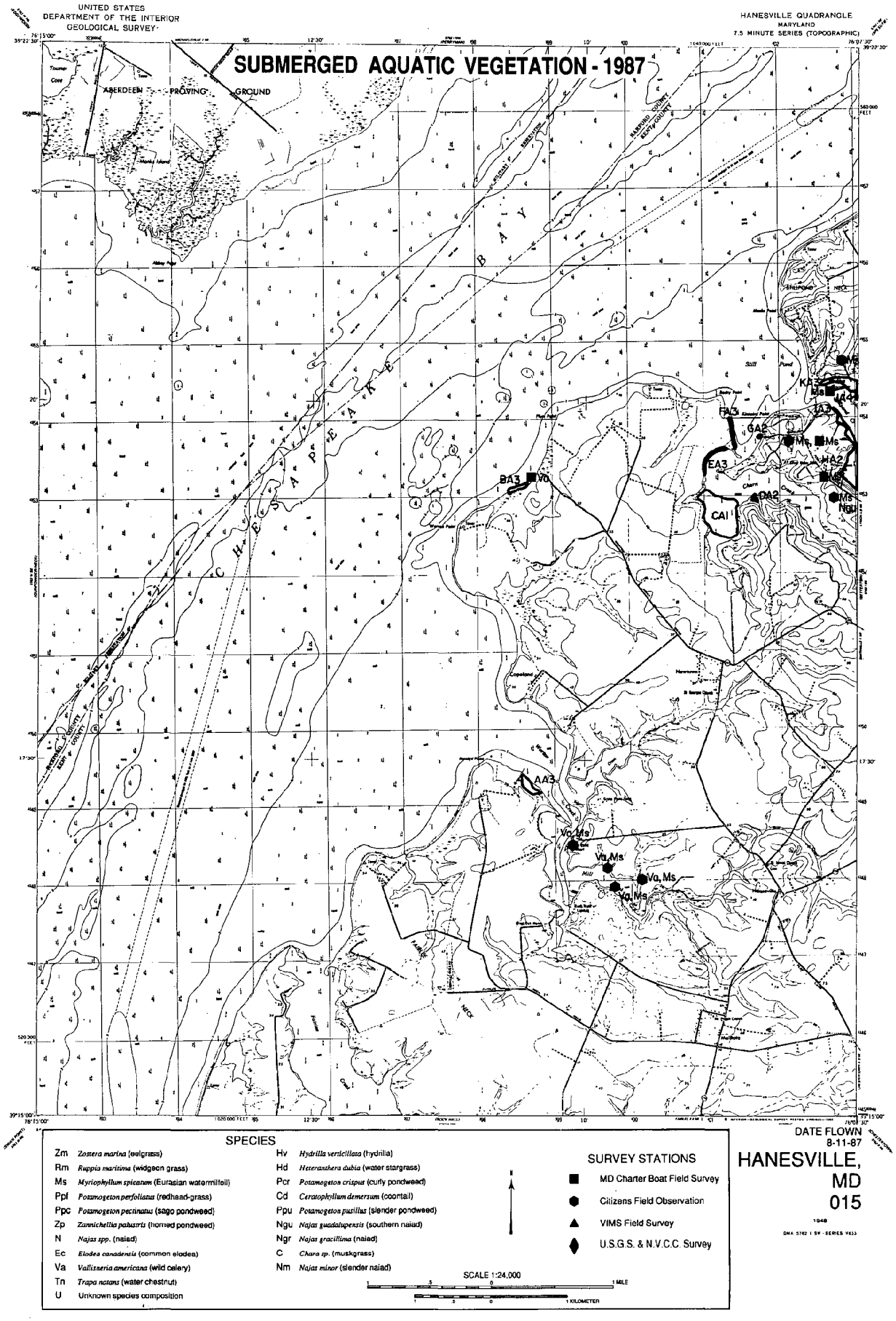
DATE FLOWN
8-11-87

EARLEVILLE,
MD
010

1958
PHOTOREVISED 1975

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MIDDLE RIVER QUADRANGLE
MARYLAND - BALTIMORE CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
MIDDLE RIVER NECK
Middle River
MARTIN STATE AIRPORT
Bowleys Quarters
Stansbury Point
Wetherby Point
Cedar Beach
Witchcoat Point
Evergreen Park
Porters Park
Todds Pt.
Seneca Park
Back River
Gunpowder Neck
CHESAPEAKE BAY
Va,Cd,Ec
Ms,Va,Cd
Ppc,Cd,
Va,Ms,Ec
Ms,Va,Cd
Ms,Va,Cd
Va,Cd,Ec,
Ms,Ppc
U
Va,Ms
Ms,Va
Ms,Va
Ms,Ppc
Va
Ms
Va
Ms
Ms
Ms
Ms,Va
Ms,Va
HA3
HA4
HA2
EA3
EA1
AA2
AA4
BA4
CA3
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATE FLOWN
9-25-87
MIDDLE RIVER,
MD
013
1969
PHOTOREVISED 1985
DMA 5762 IV SW - SERIES 7833

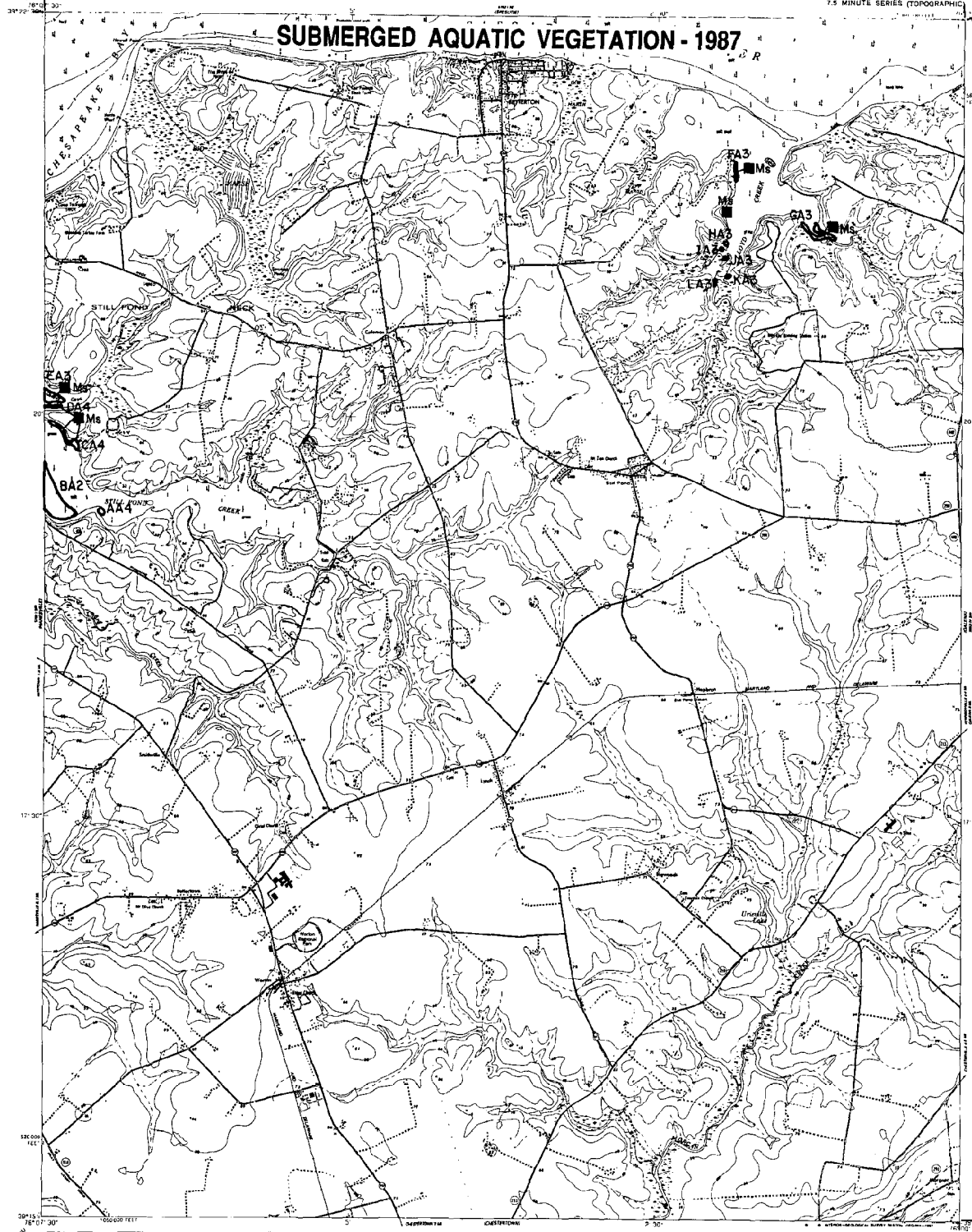

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
GUNPOWDER NECK QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
GUNPOWDER RIVER
BUSH RIVER
CHESAPEAKE BAY
SALTPETER CREEK
DUNNE CREEK
SENECA CREEK
GUNPOWDER FALLS STATE PARK
Carroll Island
Days Point
Pooles Island
Rickett Point
Lower Island Point
Weir Point
Carroll Point
Fords Point
Sandy Point
Labes Point
Turner Cove
Maxwell Point
Battery Point
Bangies Point
Marshy Point
Bnerr Point
Briery Point
Warren Point
Suederick Creek
Mouse Beach
Mixed Beach
Hart-Miller Island
Natural Resource Mgt Area
Tower and lighthouse
Light
Aberdeen Proving Ground
Military Reservation
Boundary - Approximate
Baltimore Harford Co
Baltimore Co
Harford Co
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATE FLOWN
9-25-87
GUNPOWDER NECK, MD
014
PHOTOREVISED 1986


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
HANESVILLE QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
ABERDEEN PROVING GROUND
CHESAPEAKE BAY
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATE FLOWN
8-11-87
HANESVILLE, MD
015

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

BETTERTON QUADRANGLE
MARYLAND - KENT CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION - 1987



SPECIES

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

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

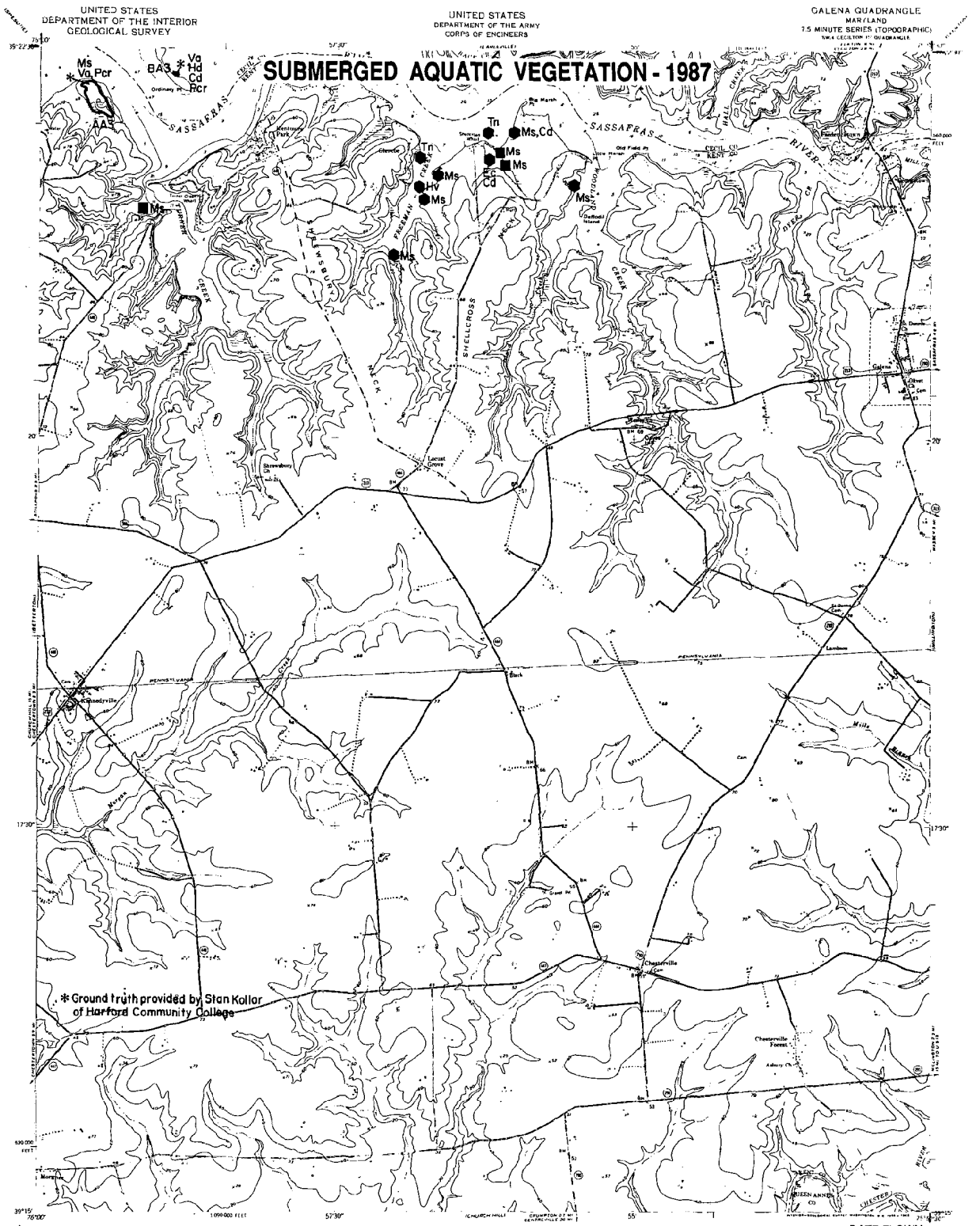
1 0 1 MILE

1 .5 0 1 KILOMETER

DATE FLOWN
8-11-87

BETTERTON, MD
016

1948
PHOTOREVISED 1986
DMA 5762 I SE SERIES V833



SPECIES

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

SURVEY STATIONS

- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

1 MILE

1 KILOMETER

DATE FLOWN
8-11-87

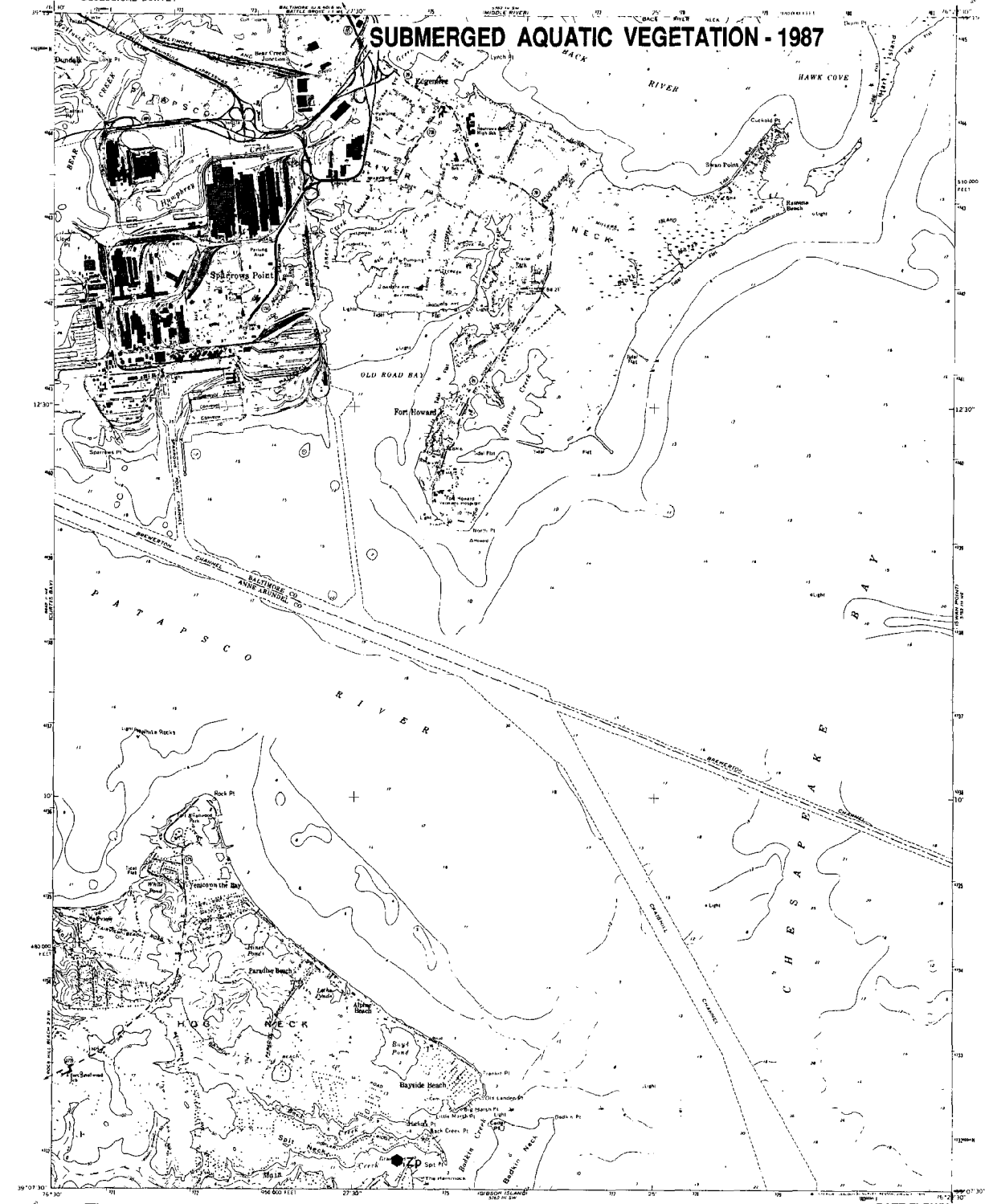
GALENA,
MD
017

PHOTOINSPECTED 1974
1953

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

SPARROWS POINT QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION - 1987



SPECIES

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

SURVEY STATIONS

- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

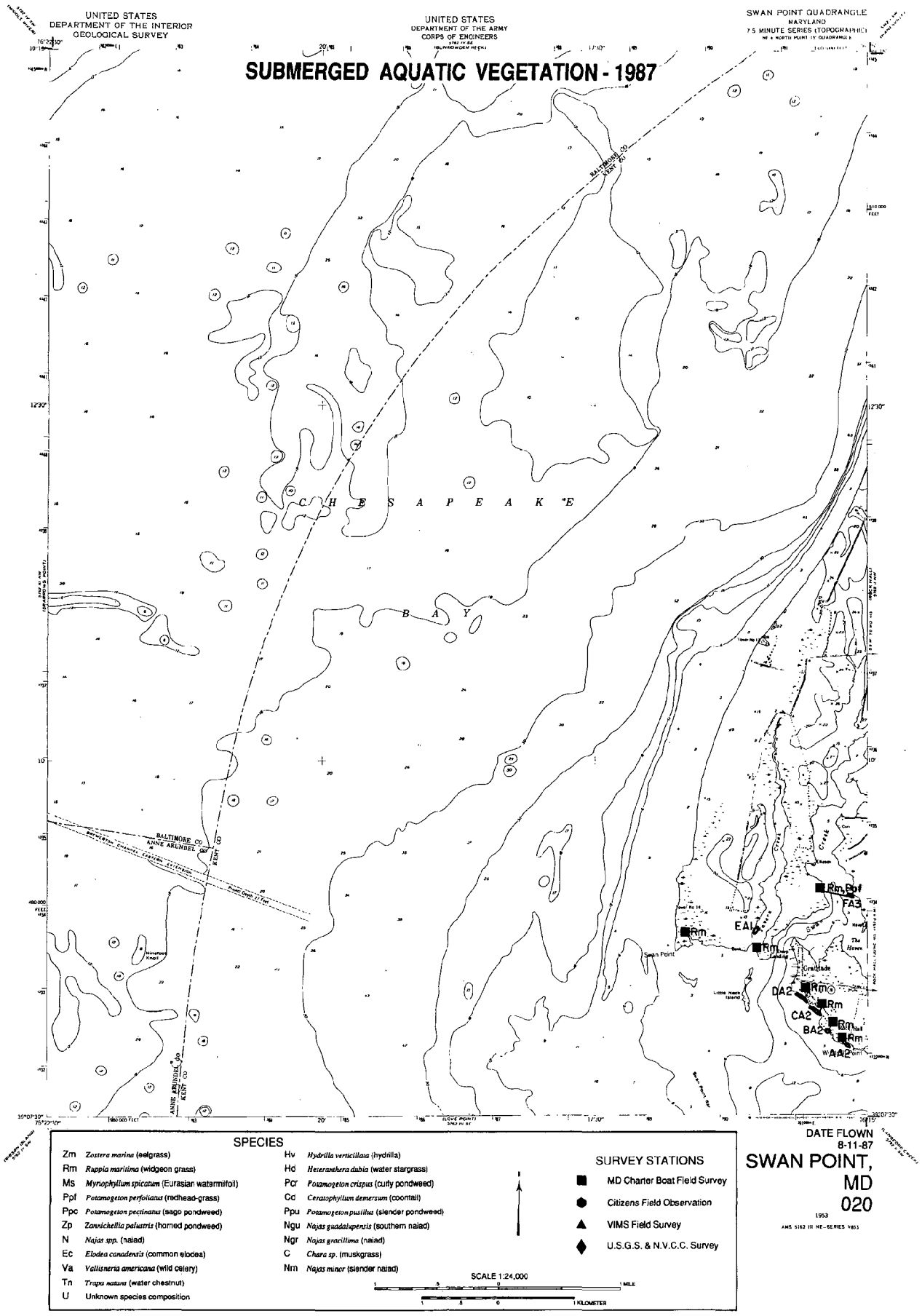
1 MILE

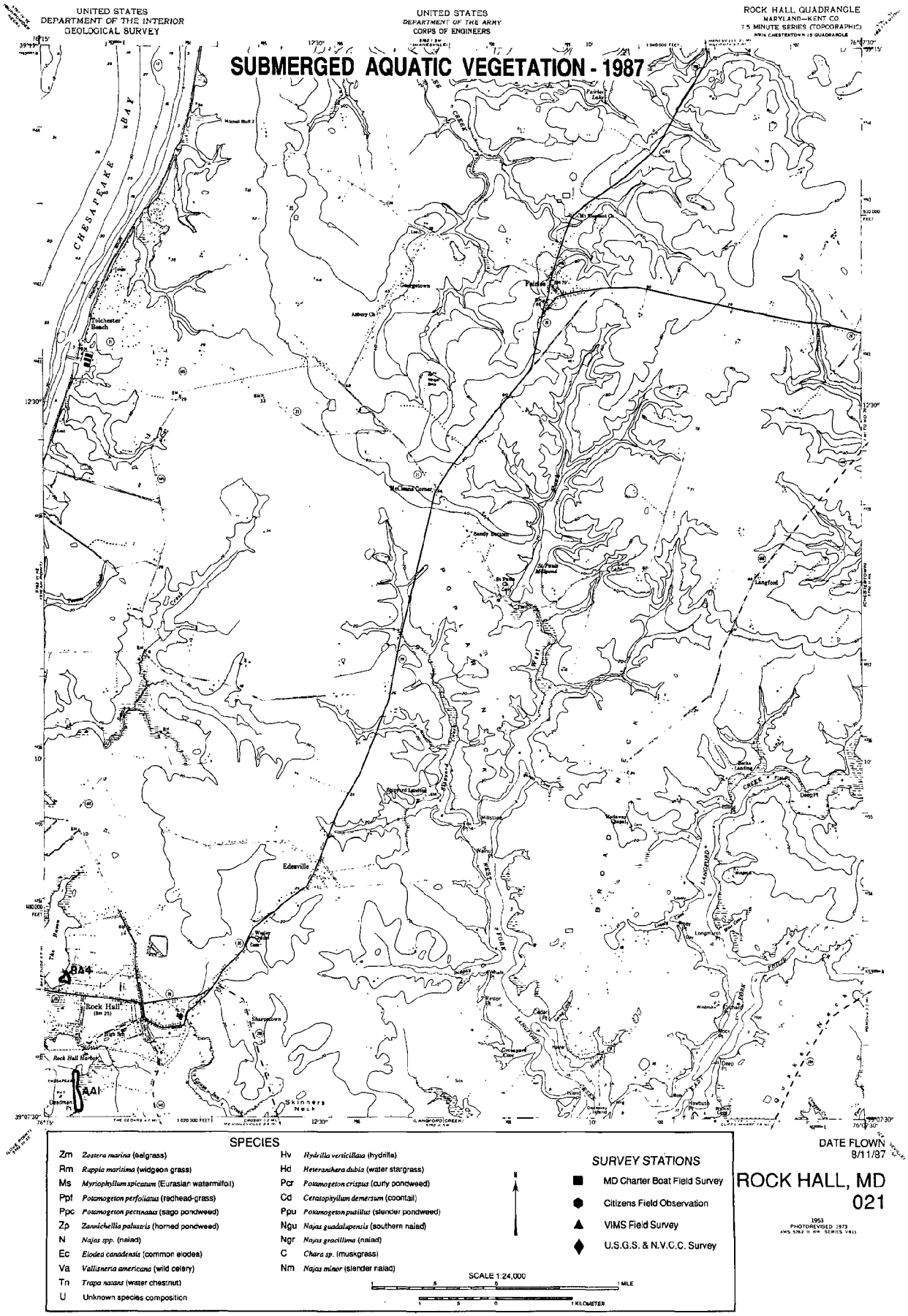
1 KILOMETER

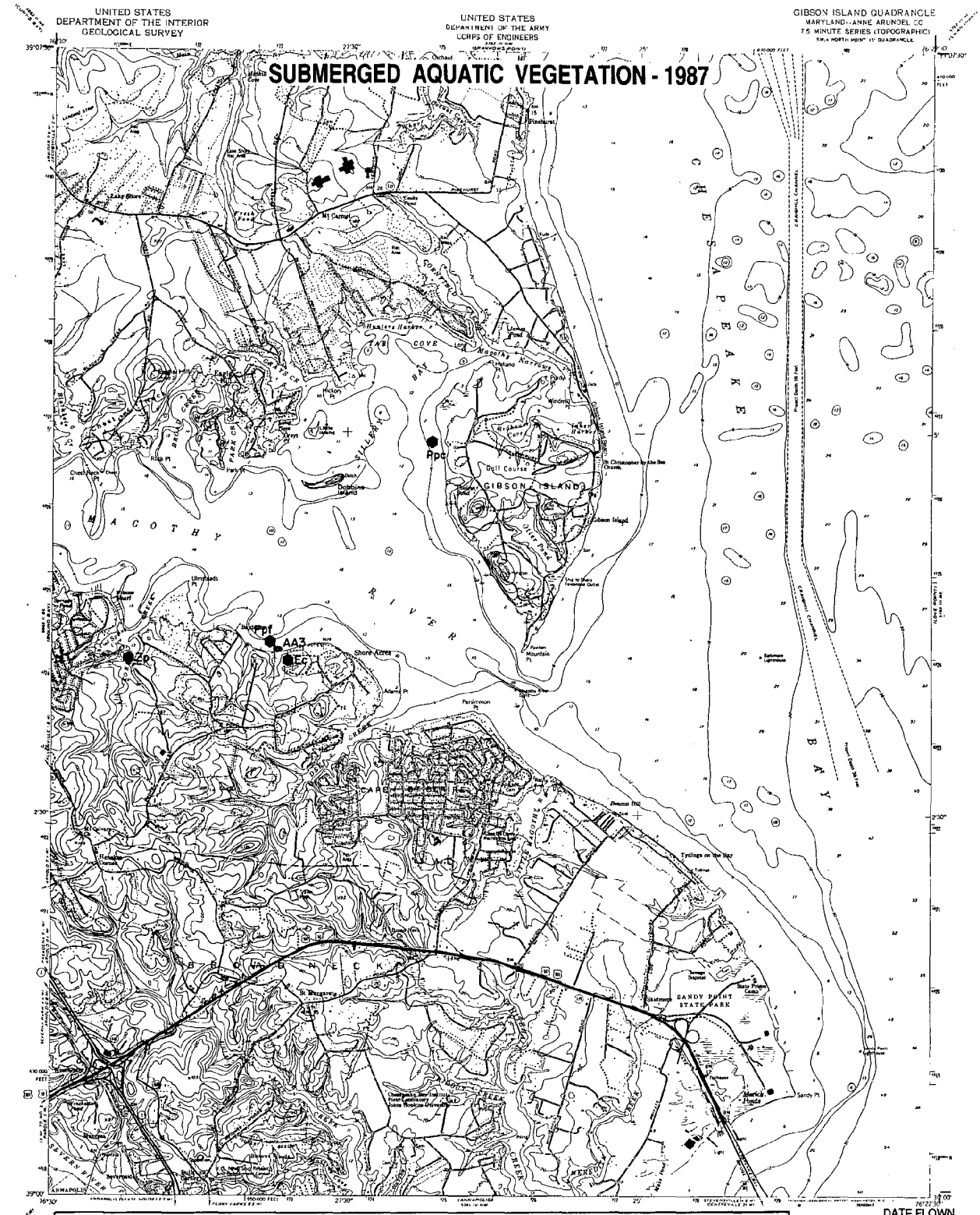
DATE FLOWN
9-25-87

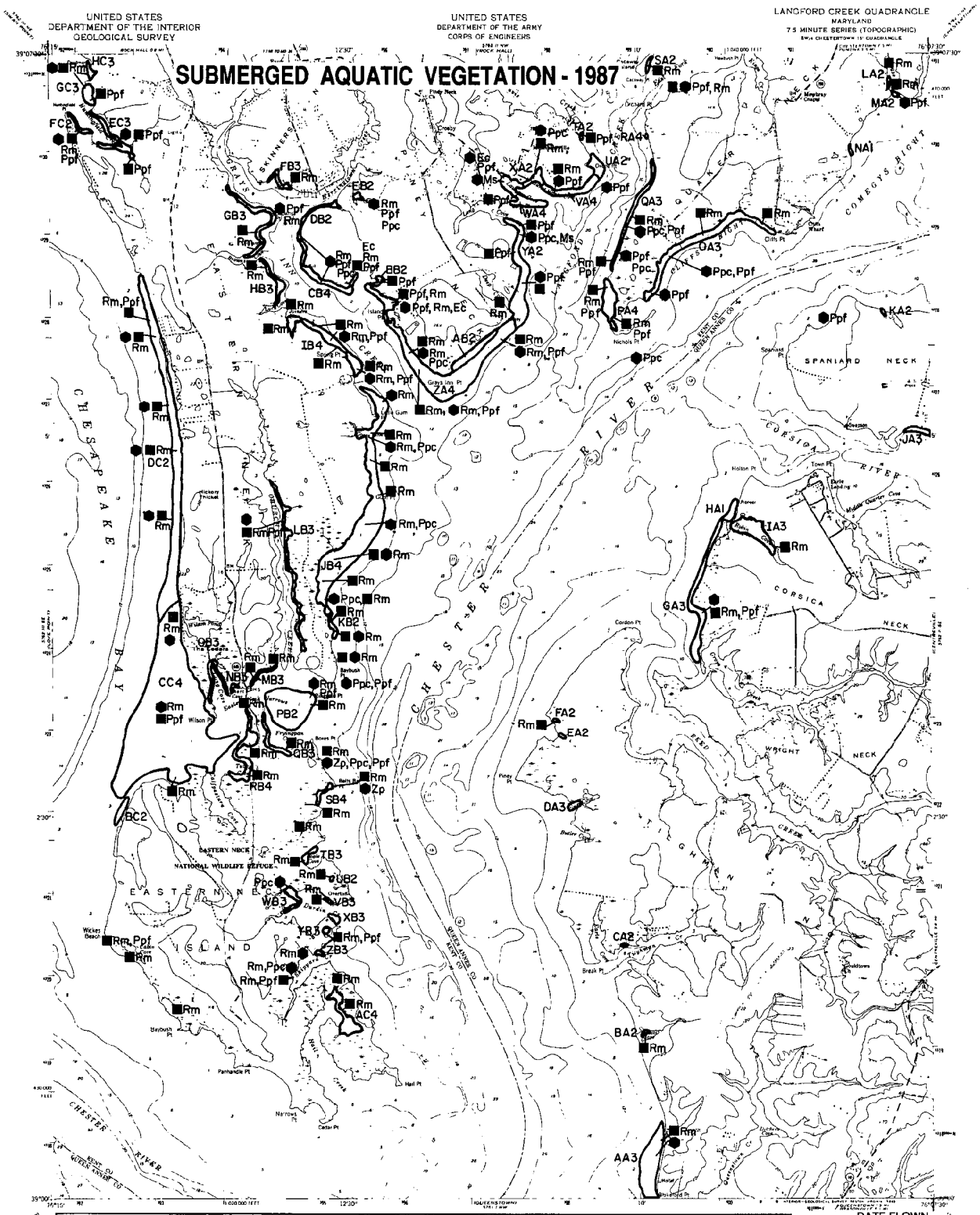
SPARROWS POINT, MD
019

1969
PHOTOREVISED 1974
AMS 5782 III NW - SERIES V815


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
SWAN POINT QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
C H E S A P E A K E
B A Y
BALTIMORE CO.
ANNE ARUNDEL CO.
Swan Point
Rm, Ppf
FA3
EA2
Rm
DA2
CA2
BA2
AA2
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATE FLOWN
8-11-87
SWAN POINT,
MD
020
1953


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
ROCK HALL QUADRANGLE
MARYLAND—KENT CO
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
CHESAPEAKE BAY
Tolchester Beach
Georgetown
Fairlee
McCleans Corner
Sandy Bottom
Langford
Edesville
Rock Hall
Rock Hall Harbor
Skinners Neck
BA4
AA1
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATE FLOWN
8/11/87
ROCK HALL, MD
021
1953
PHOTOREVISED 1973


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
GIBSON ISLAND QUADRANGLE
MARYLAND--ANNE ARUNDEL CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
CHESAPEAKE
BAY
MAGOTHY
RIVER
GIBSON ISLAND
Ppc
Ppf
AA3
Ec
Zp
SANDY POINT
STATE PARK
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 KILOMETER
DATE FLOWN
8-11-87
GIBSON ISLAND,
MD
024
1954
PHOTOREVISED 1979

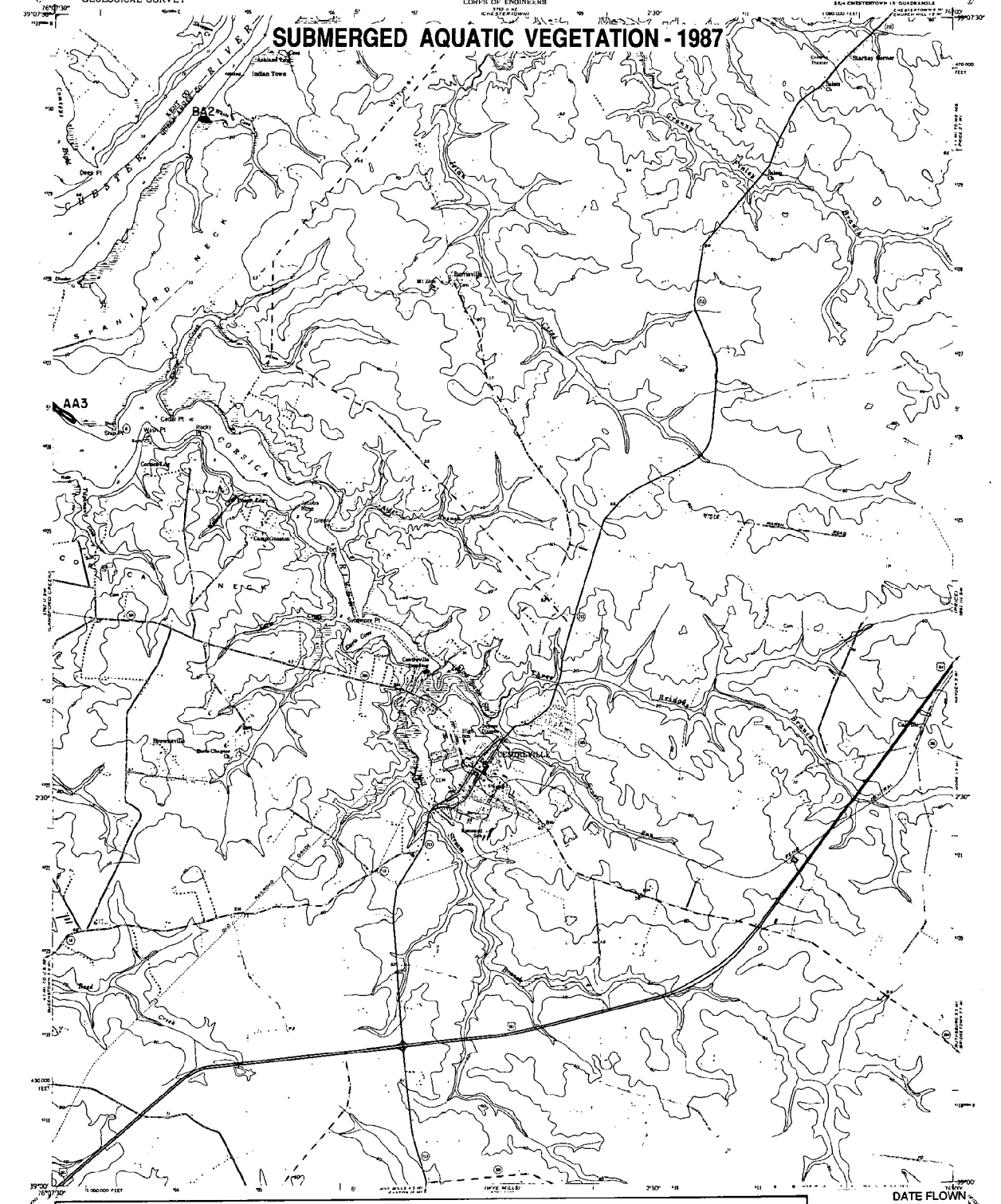

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
LANGFORD CREEK QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
CHESAPEAKE BAY
EASTERN BAY
CHESTER RIVER
CORSICA RIVER
SPANIARD NECK
CORSICA NECK
WRIGHT NECK
EASTERN NECK ISLAND
EASTERN NECK NATIONAL WILDLIFE REFUGE
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppl Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 0 1 MILE
1 5 0 1 KILOMETER
DATE FLOWN
8-11-87
LANGFORD CREEK, MD
026
1994
PHOTOREVISED 1988

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

CENTREVILLE QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION - 1987



SPECIES

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

SURVEY STATIONS

- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

DATE FLOWN
8-11-87

CENTREVILLE, MD 027

1954
PHOTOREVISED 1973
AMS 5762 II SE-SERIES V833

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

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

SUBMERGED AQUATIC VEGETATION - 1987

SPECIES

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

SURVEY STATIONS

- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

1 0 1 MILE

1 0 1 KILOMETER

DATE FLOWN
8-11-87

SOUTH RIVER,
MD
030

1957
PHOTOREVISED 1978
DMA 5661 I NE-SERIES V833

DATE FLOWN
8-11-87

ANNAPOLIS, MD
031

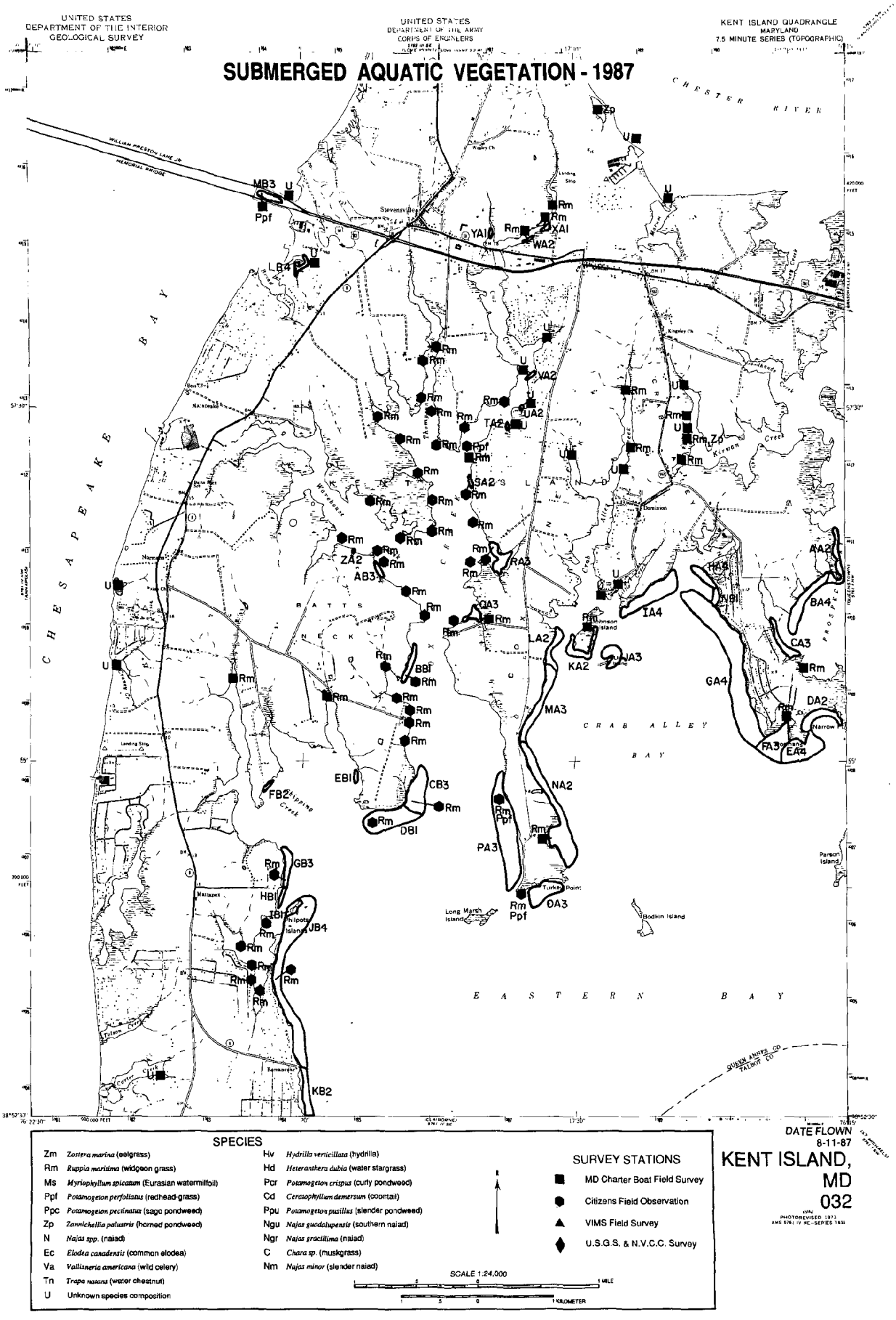
SPECIES

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

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
KENT ISLAND QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
CHESAPEAKE BAY
CHESTER RIVER
EASTERN BAY
CRAB ALLEY BAY
BATTS NECK
Stevensville
Kent Island
Bodkin Island
Long Marsh Island
Parson Island
Turkey Point
Narrow
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
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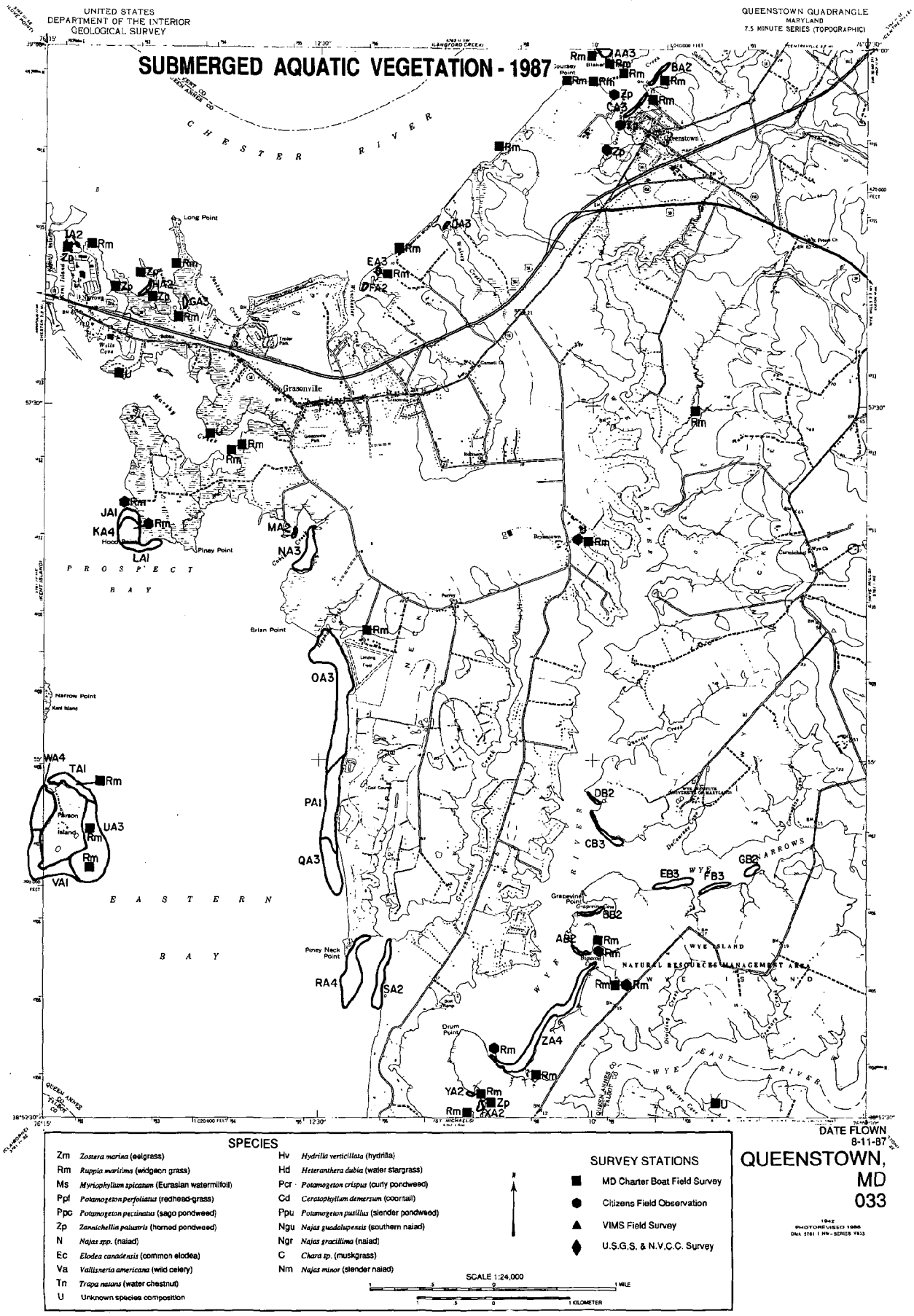
1 KILOMETER
DATE FLOWN
8-11-87
KENT ISLAND,
MD
032
PHOTOREVISED 1973
AMS 5761 IV NE-SERIES V833


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
QUEENSTOWN QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
CHESTER RIVER
PROSPECT BAY
EASTERN BAY
WYE RIVER
WYE NARROWS
WYE ISLAND
NATURAL RESOURCES MANAGEMENT AREA
Grasonville
Long Point
Piney Point
Brian Point
Narrow Point
Piney Neck Point
Drum Point
Grapevine Point
Queenstown
Rm
Zp
U
IA2
HA2
GA3
JA1
KA4
LA1
MA2
NA3
OA3
PA1
QA3
RA4
SA2
WA4
TA1
UA3
VA1
EA3
FA2
AA3
BA2
CA3
DB2
CB3
EB3
FB3
GB2
BB2
AB2
ZA4
YA2
XA2
DATE FLOWN
8-11-87
QUEENSTOWN,
MD
033
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
ALEXANDRIA QUADRANGLE
VIRGINIA - DISTRICT OF COLUMBIA - MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadelupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
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DATE FLOWN
9-2-87
ALEXANDRIA,
VA-DC-MD
034
1965
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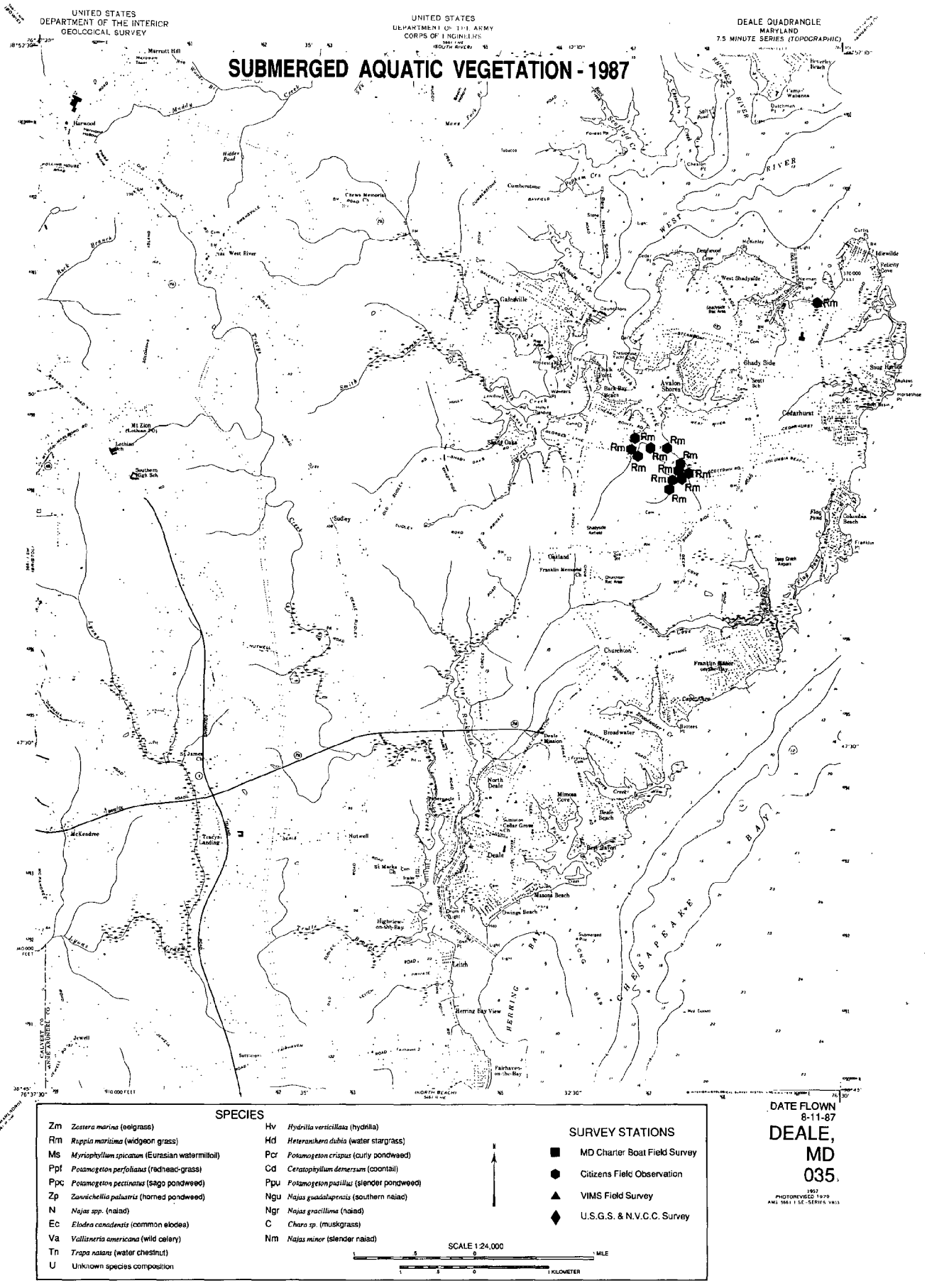
DMA 5561 I SE-SERIES V834


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
DEALE QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
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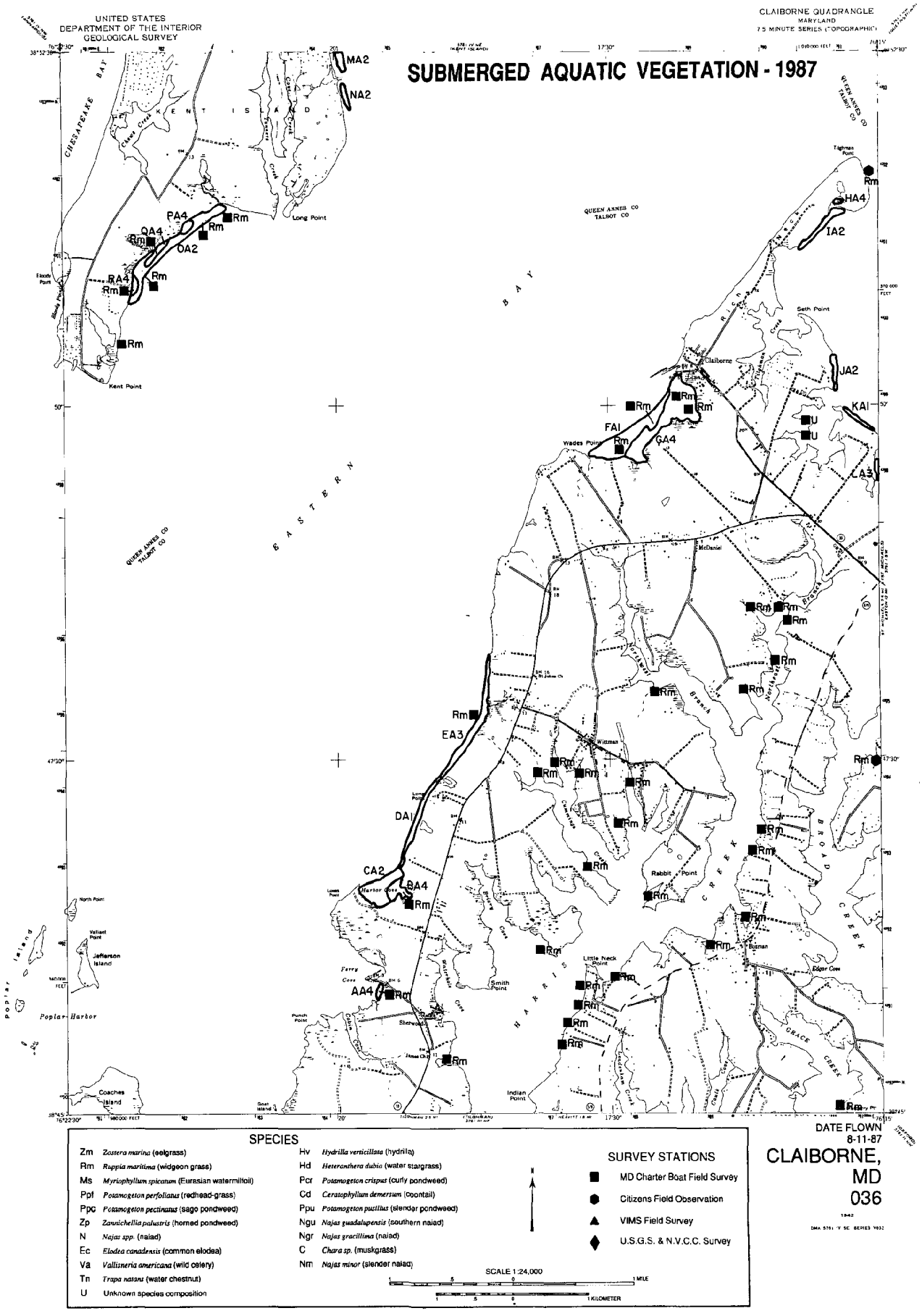
DATE FLOWN
8-11-87
DEALE,
MD
035.
1957
PHOTOREVISED 1979
AMS 5861 I SE-SERIES V833


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
CLAIBORNE QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
CHESAPEAKE BAY
EASTERN BAY
KENT ISLAND
Kent Point
Long Point
Claiborne
Wades Point
Seth Point
Tilghman Point
Rabbit Point
Little Neck Point
Smith Point
Indian Point
Coaches Island
Jefferson Island
Poplar Harbor
Harris Creek
Broad Creek
Grace Creek
QUEEN ANNES CO
TALBOT CO
MA2
NA2
PA4
QA4
OA2
RA4
HA4
IA2
JA2
KA1
FA1
GA4
CA3
EA3
DA1
CA2
BA4
AA4
Rm
U
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
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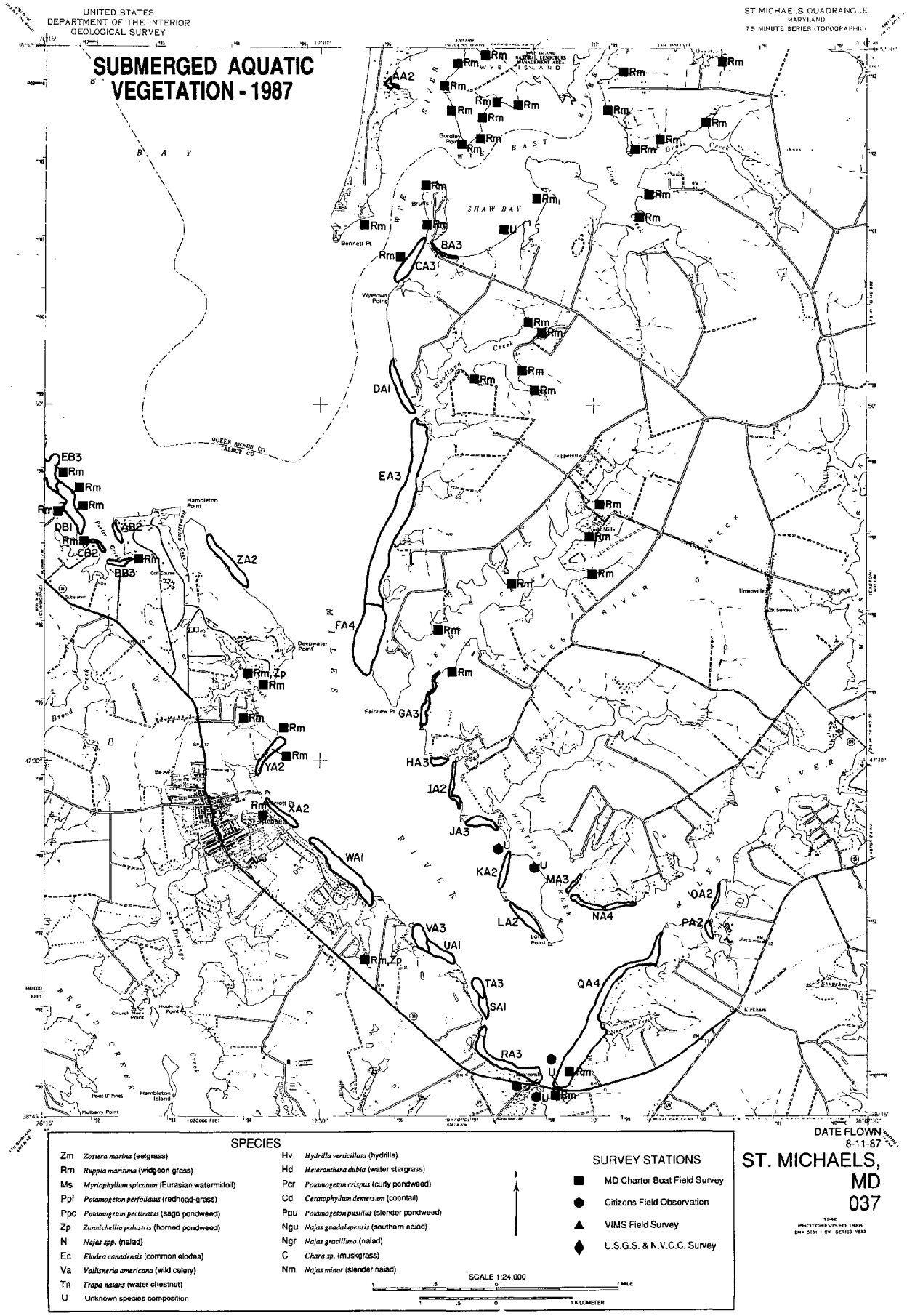
DATE FLOWN
8-11-87
CLAIBORNE,
MD
036


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
ST. MICHAELS QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
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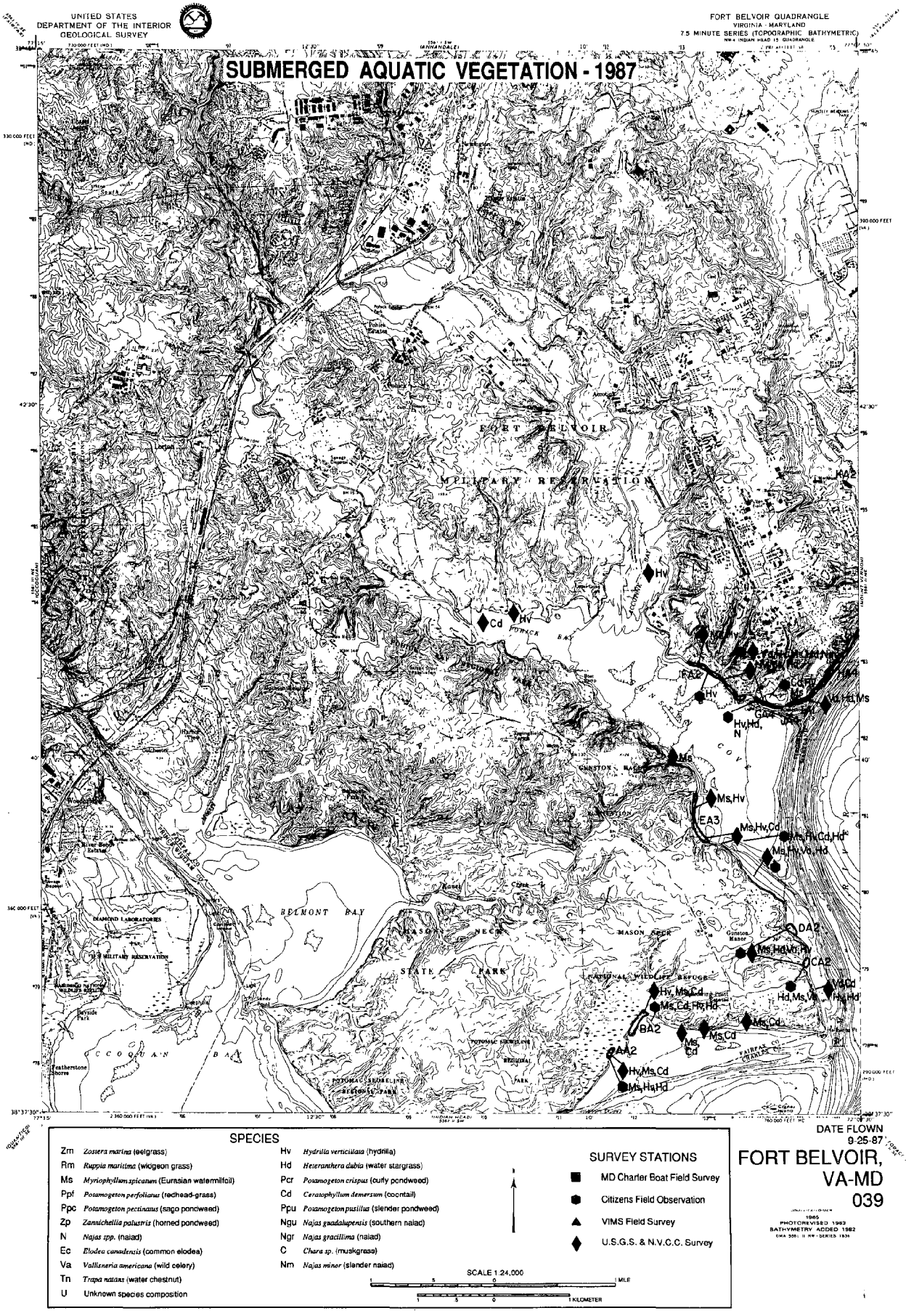
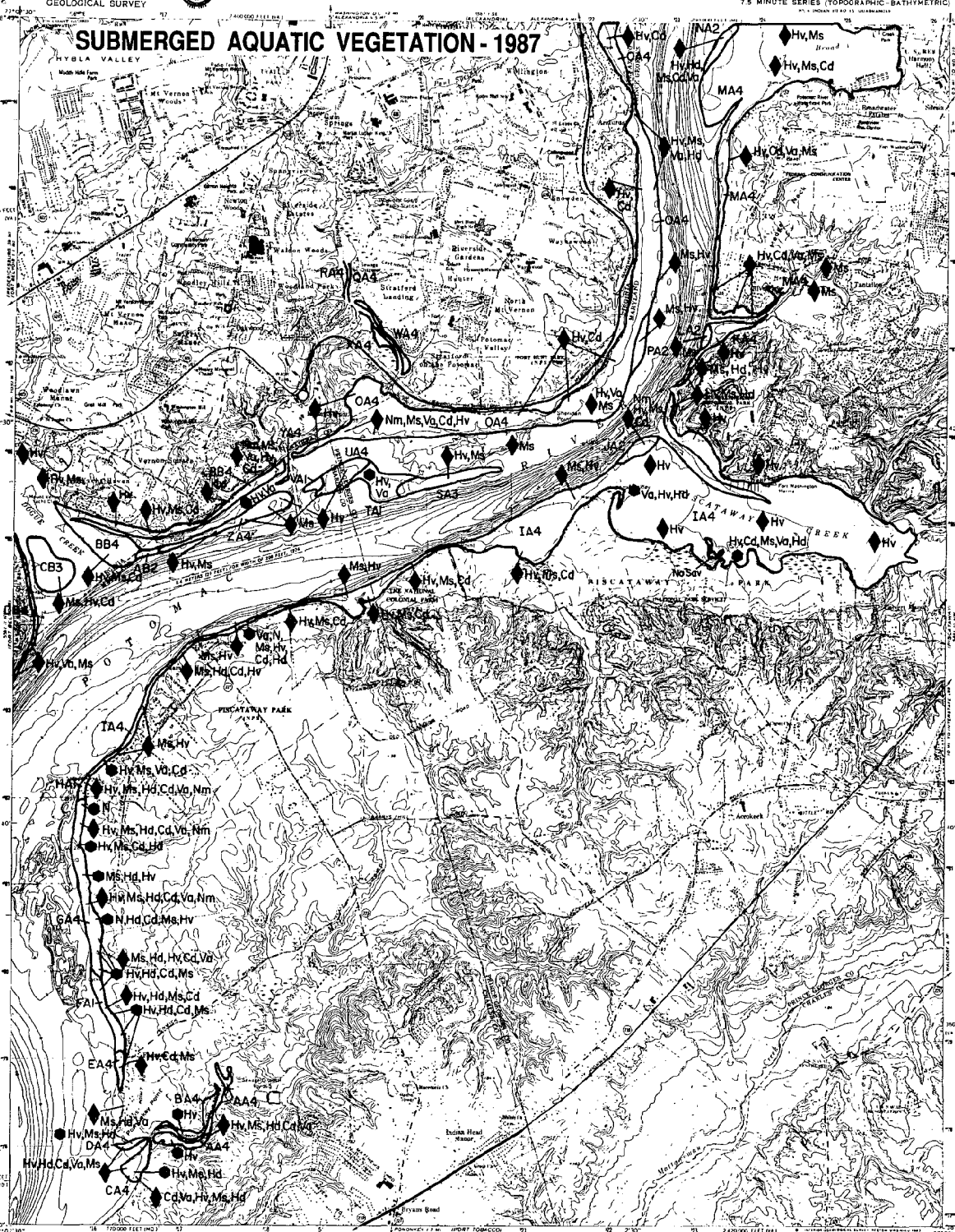
DATE FLOWN
8-11-87
ST. MICHAELS, MD
037
1942
PHOTOREVISED 1966


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
FORT BELVOIR QUADRANGLE
VIRGINIA - MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC BATHYMETRIC)
SUBMERGED AQUATIC VEGETATION - 1987
FORT BELVOIR
MILITARY RESERVATION
POHICK BAY
BELMONT BAY
MASON NECK
STATE PARK
OCCOQUAN BAY
DIAMOND LABORATORIES
U.S. MILITARY RESERVATION
Cd
Hv
Ms
Hv,Hd,N
Ms,Hv
EA3
Ms,Hv,Cd
Ms,Hv,Cd,Hd
Ms,Hv,Vc,Hd
DA2
Ms,Hd,Vc,Hv
CA2
Hd,Ms,Vc
Hv,Ms,Cd
Ms,Cd,Hv,Hd
BA2
Ms,Cd
AA2
Hv,Ms,Cd
Ms,Hv,Hd
KA2
FA2
GA4
Vd,Hd,Ms
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATE FLOWN
9-25-87
FORT BELVOIR,
VA-MD
039
1965
PHOTOREVISED 1983
BATHYMETRY ADDED 1982

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

MOUNT VERNON QUADRANGLE
VIRGINIA-MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC-BATHYMETRIC)

SUBMERGED AQUATIC VEGETATION - 1987



SPECIES

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

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

DATE FLOWN
9-25-87

MT. VERNON, VA-MD 040

1966
PHOTOREVISED 1983
BATHYMETRY ADDED 1983
DMA 3361 II NE-SERIES V833

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
NORTH BEACH QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
CHESAPEAKE BAY
North Beach
West Beach
Chesapeake Beach
Randle Cliff Beach
Holiday Beach
Camp Roosevelt
Rose Haven
Fairhaven
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
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KILOMETER
DATE FLOWN
8-11-87
NORTH BEACH, MD
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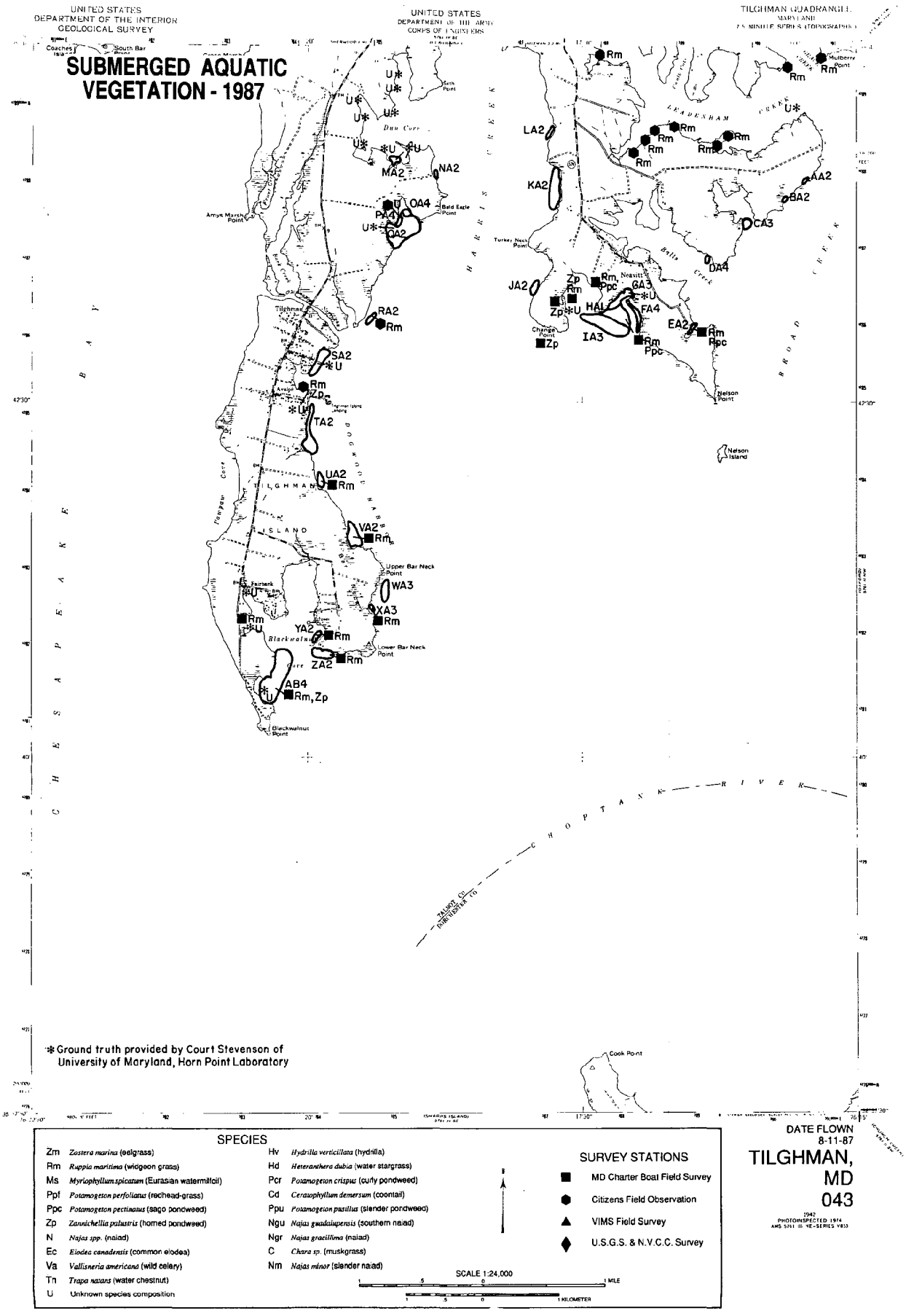
UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
TILGHMAN QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
CHESAPEAKE BAY
HARRIS CREEK
LEADENHAM CREEK
BROAD CREEK
CHOPTANK RIVER
TILGHMAN ISLAND
Dun Cove
Black Walnut Point
Upper Bar Neck Point
Lower Bar Neck Point
Bald Eagle Point
Nelson Point
Nelson Island
Cook Point
Mulberry Point
Turkey Neck Point
Change Point
Neavitt
Ballis Creek
Fairbank
Avalon
Tilghman
Rm
U
Zp
Ppc
HAL
NA2
OA4
PA4
QA2
RA2
SA2
TA2
UA2
VA2
WA3
XA3
YA2
ZA2
AB4
Rm, Zp
LA2
KA2
JA2
IA3
GA3
FA4
EA2
DA4
CA3
BA2
AA2
*Ground truth provided by Court Stevenson of University of Maryland, Horn Point Laboratory
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
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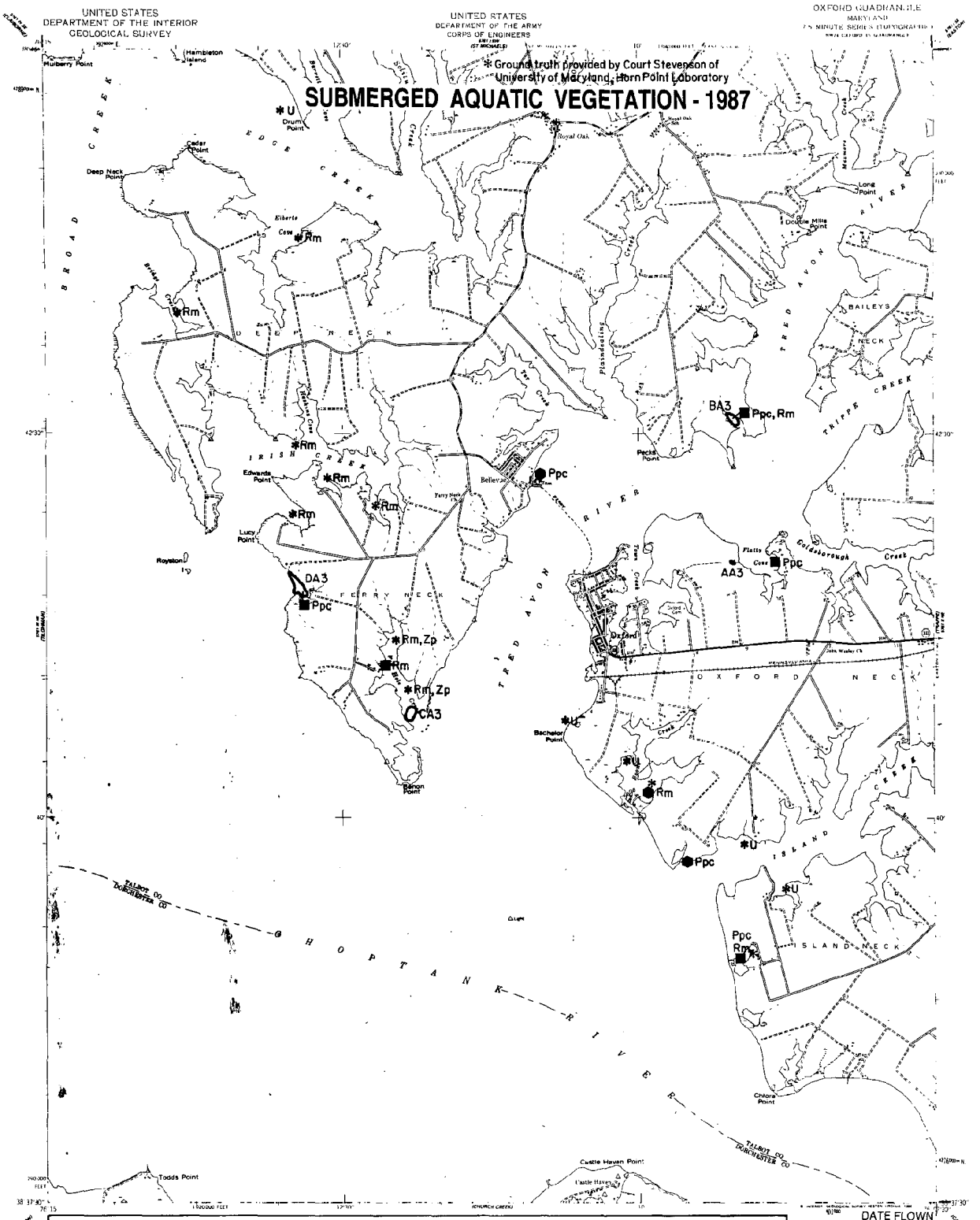
DATE FLOWN
8-11-87
TILGHMAN, MD
043
1942
PHOTOINSPECTED 1974
AMS 5761 II NE-SERIES V833



SPECIES

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

SURVEY STATIONS

- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

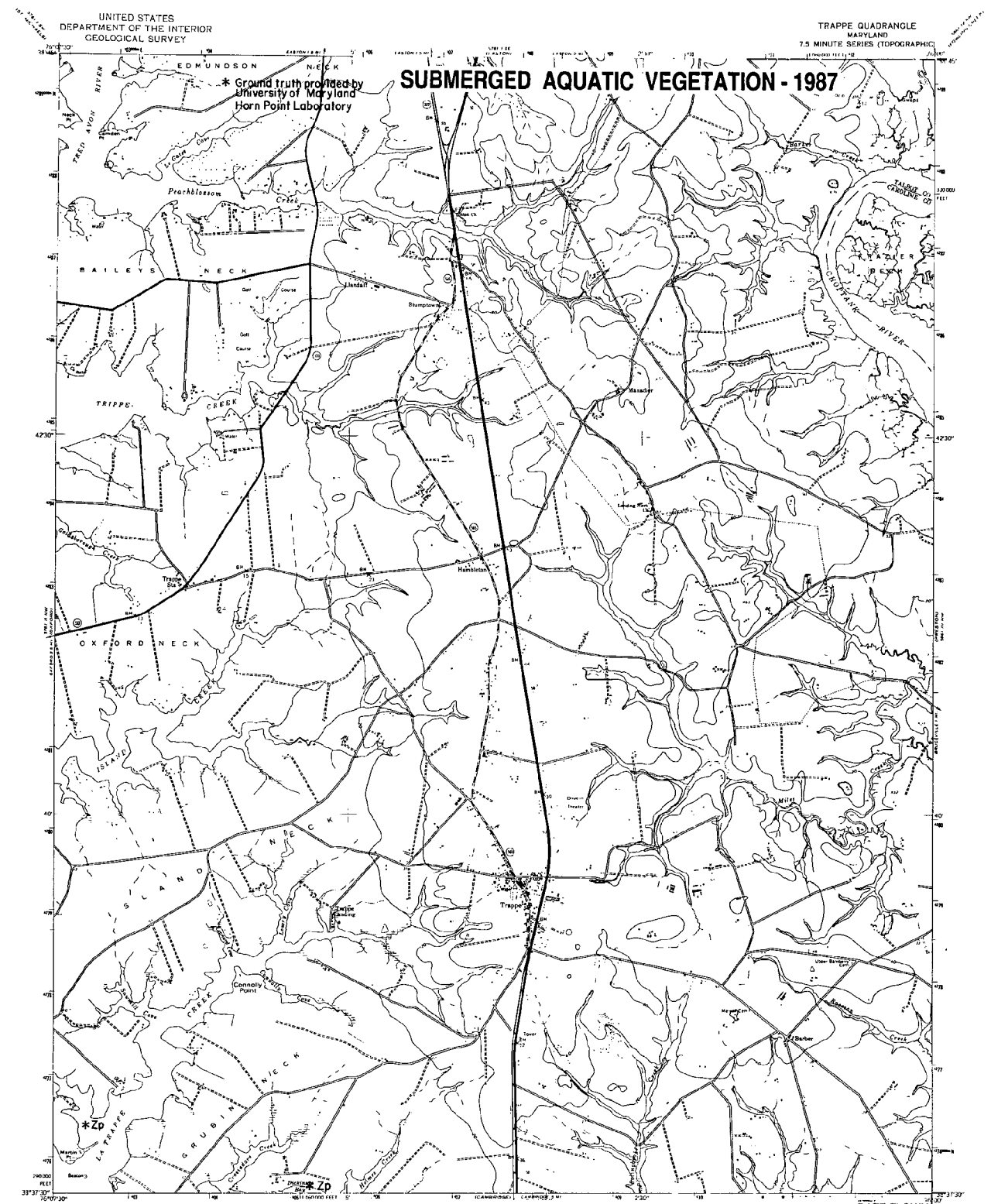
1 MILE

1 KILOMETER

DATE FLOWN
8-11-87

OXFORD, MD
044

1942



SPECIES

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

SURVEY STATIONS

- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

DATE FLOWN
9-1-87

TRAPPE,
MD
045

SPECIES

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

SURVEY STATIONS

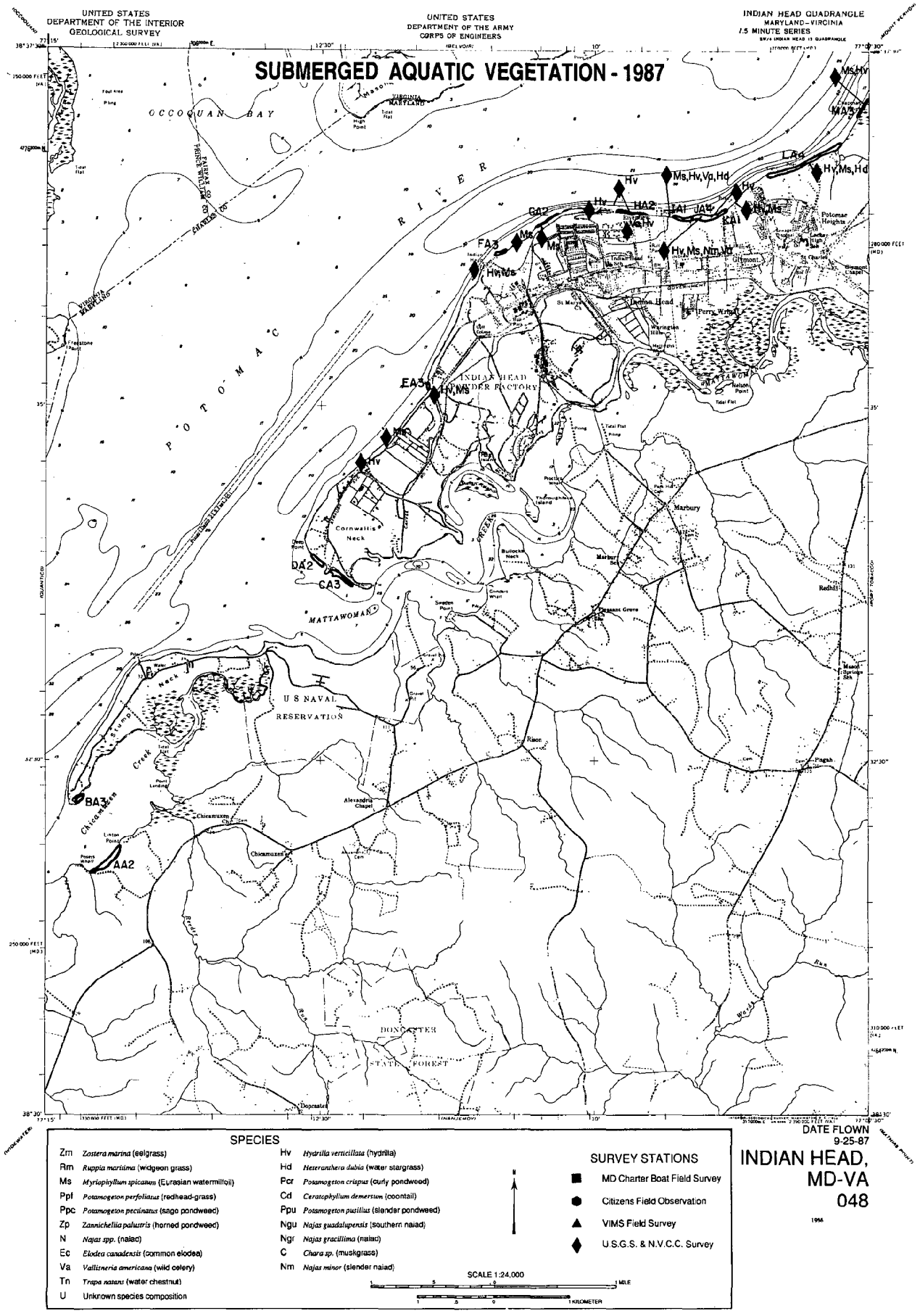
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S. & N.V.C.C. Survey

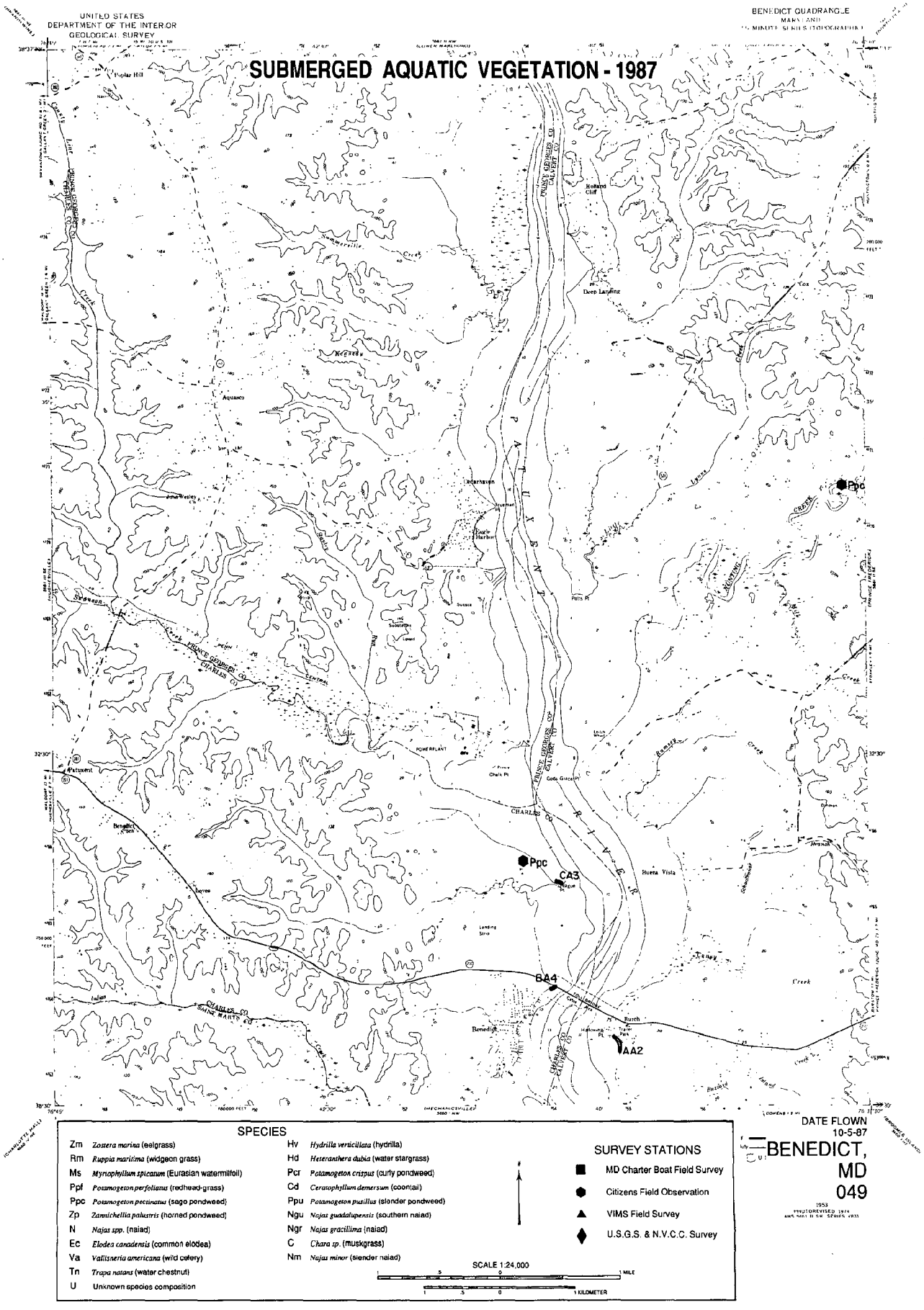
SCALE 1:24,000

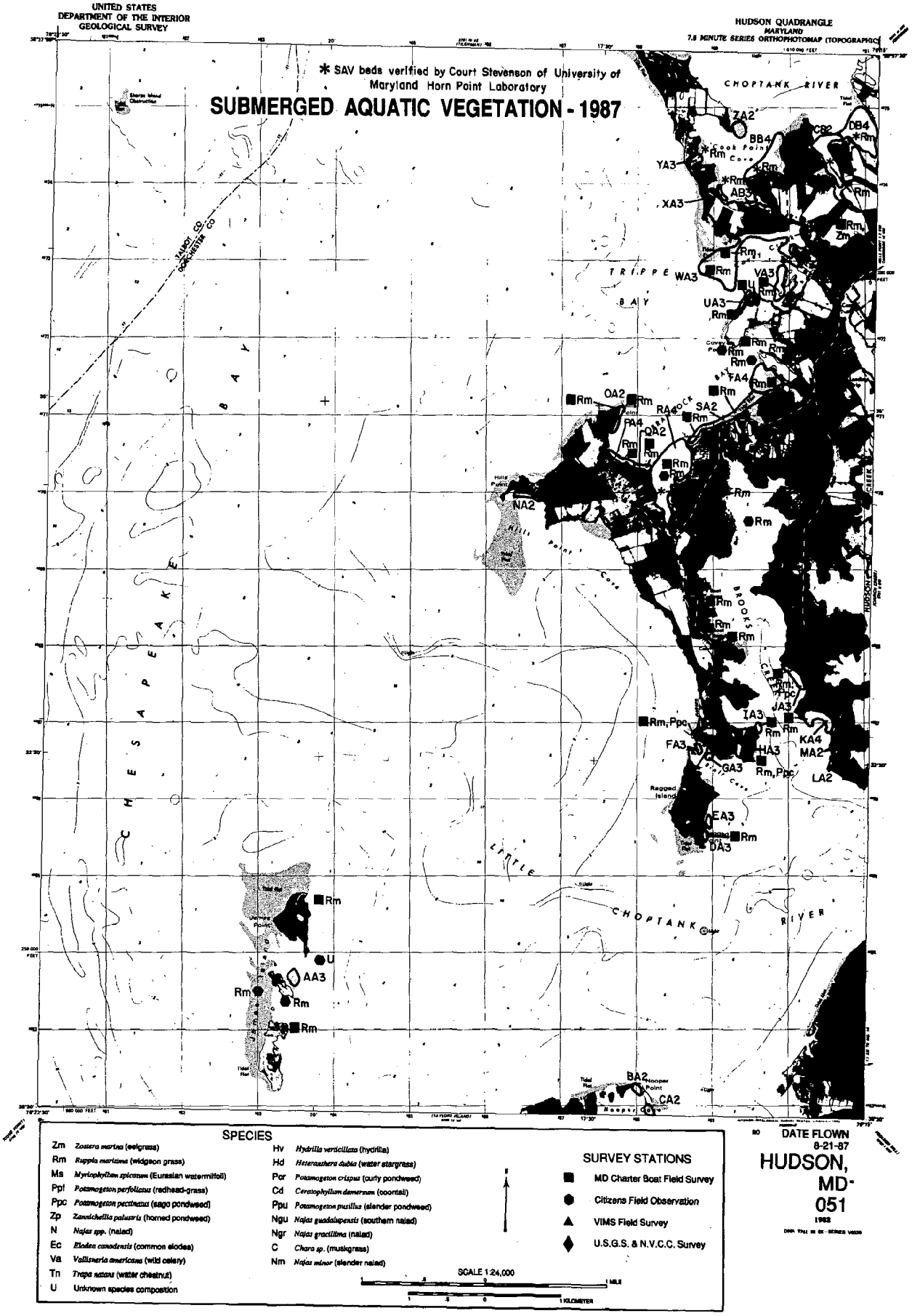
DATE FLOWN
9-25-87

QUANTICO, VA-MD 047

1966
PHOTOREVISED 1982
BATHYMETRY ADDED 1982


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
INDIAN HEAD QUADRANGLE
MARYLAND-VIRGINIA
7.5 MINUTE SERIES
SUBMERGED AQUATIC VEGETATION - 1987
OCCOQUAN BAY
POTOMAC RIVER
INDIAN HEAD POWDER FACTORY
Indian Head
Cornwallis Neck
MATTAWOMAN
U S NAVAL RESERVATION
Chicamuxen Creek
DONCASTER STATE FOREST
Marbury
Potomac Heights
Ms,Hv
MA3
LA4
Hv,Ms,Hd
Ms,Hv,Va,Hd
Hv
HA2
TA1
JA4
KA1
Hv,Ms
GA2
FA3
Ms
Hv,Ms,Nm,Va
Hv,Ms
EA3
Hv,Ms
Hv
DA2
CA3
BA3
AA2
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATE FLOWN
9-25-87
INDIAN HEAD,
MD-VA
048


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
BENEDICT QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
PATUXENT
RIVER
Ppc
CA3
AA4
AA2
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATE FLOWN
10-5-87
BENEDICT, MD
049
1953
PHOTOREVISED 1974


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
HUDSON QUADRANGLE
MARYLAND
7.5 MINUTE SERIES ORTHOPHOTOMAP (TOPOGRAPHIC)
* SAV beds verified by Court Stevenson of University of Maryland Horn Point Laboratory
SUBMERGED AQUATIC VEGETATION - 1987
CHOPTANK RIVER
TRIPPE BAY
HEAD OF CHESAPEAKE BAY
LITTLE CHOPTANK RIVER
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
DATE FLOWN
8-21-87
HUDSON, MD-051
1988

SPECIES

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

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

1 MILE

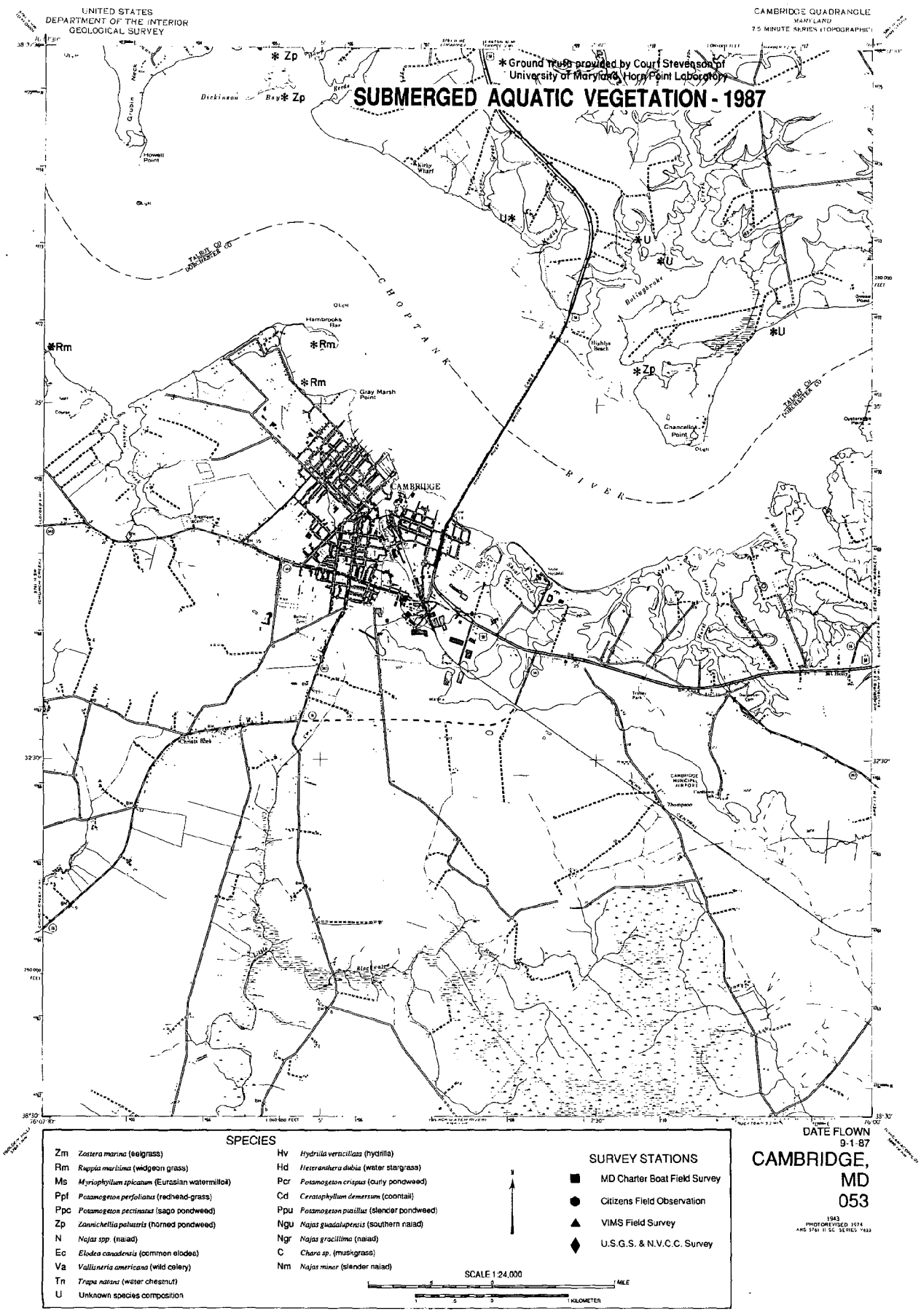
1 KILOMETER

DATES FLOWN
8-21-87
9-1-87

CHURCH CREEK, MD 052

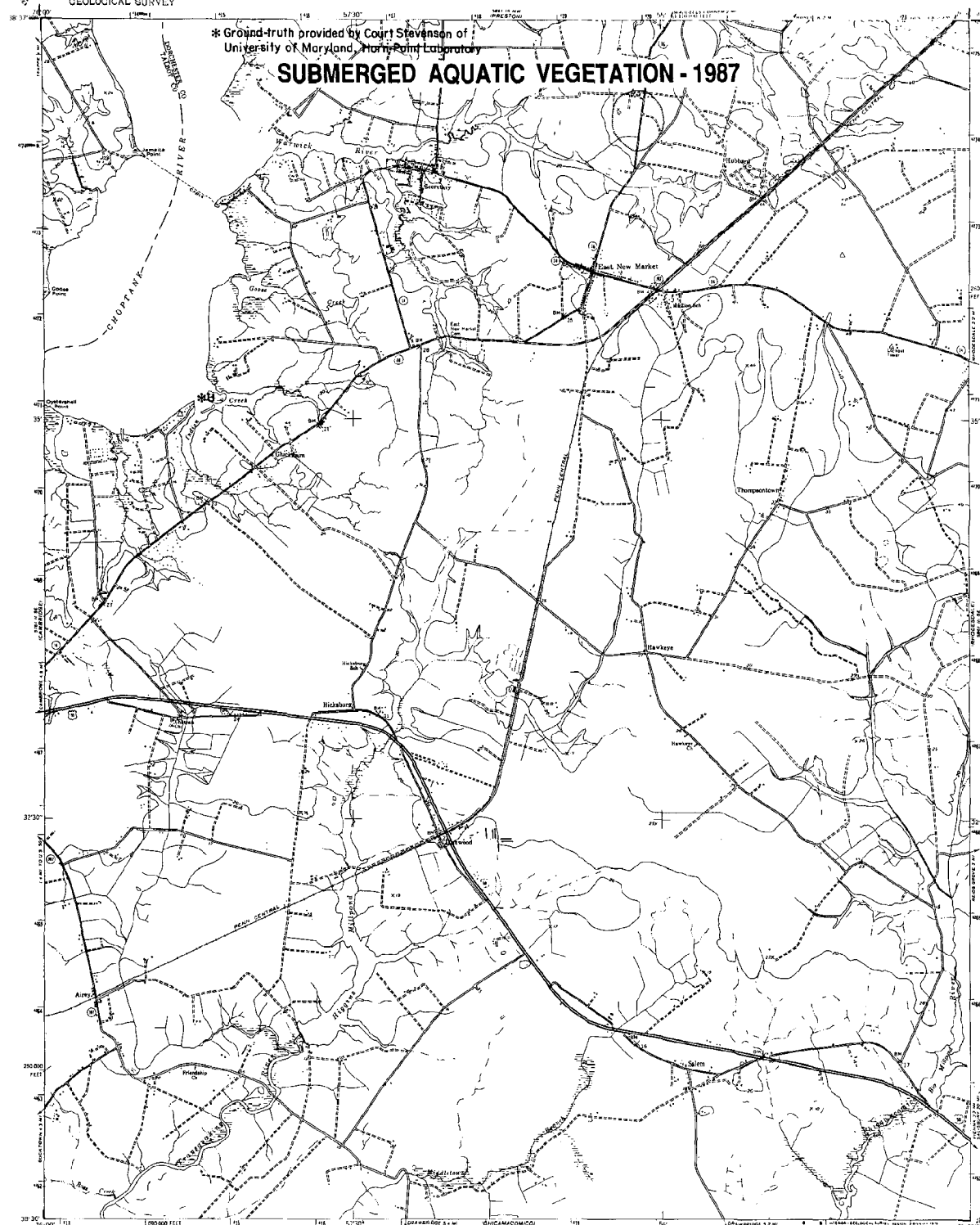
N3830—W7607.5/7.5

1942


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
CAMBRIDGE QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)
* Ground truth provided by Court Stevenson of University of Maryland, Horn Point Laboratory
SUBMERGED AQUATIC VEGETATION - 1987
CHOPTANK RIVER
CAMBRIDGE
Dickinson Bay
Howell Point
Kirby Wharf
Hambrooks Bar
Gray Marsh Point
Highlys Beach
Chancellor Point
Bolingbroke
Cambridge Municipal Airport
Thompson
Blackwater River
TALBOT CO
DORCHESTER CO
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATE FLOWN
9-1-87
CAMBRIDGE,
MD
053
1943
PHOTOREVISED 1974

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

EAST NEW MARKET QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)



SPECIES

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

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

DATE FLOWN
9-1-87
EAST NEW MARKET, MD
054

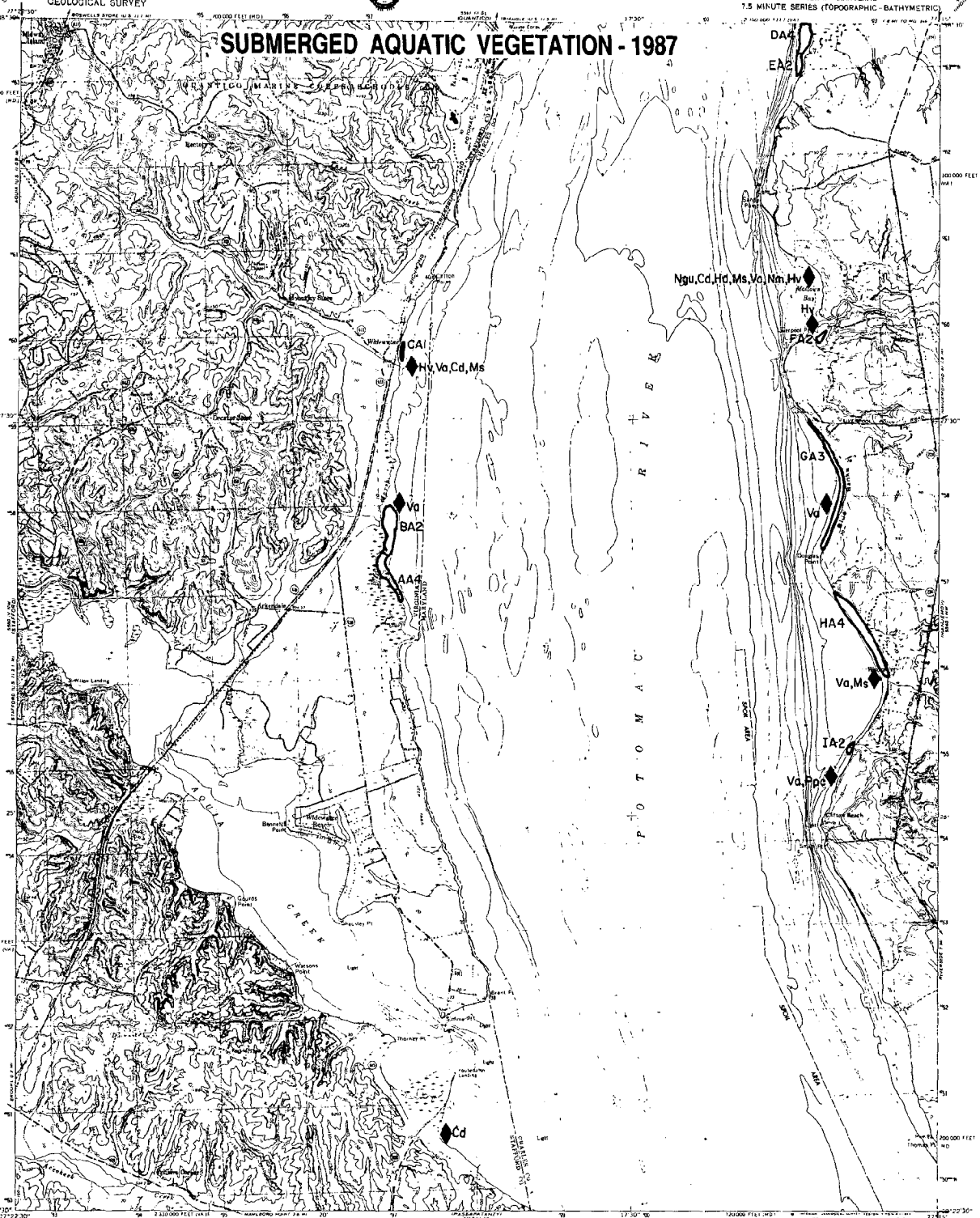
PHOTOREVISED 1974
AMS 5861 III SW SERIES V835

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES

WIDEWATER QUADRANGLE
VIRGINIA - MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC - BATHYMETRIC)

SUBMERGED AQUATIC VEGETATION - 1987



SPECIES

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

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

DATE FLOWN
9-25-87

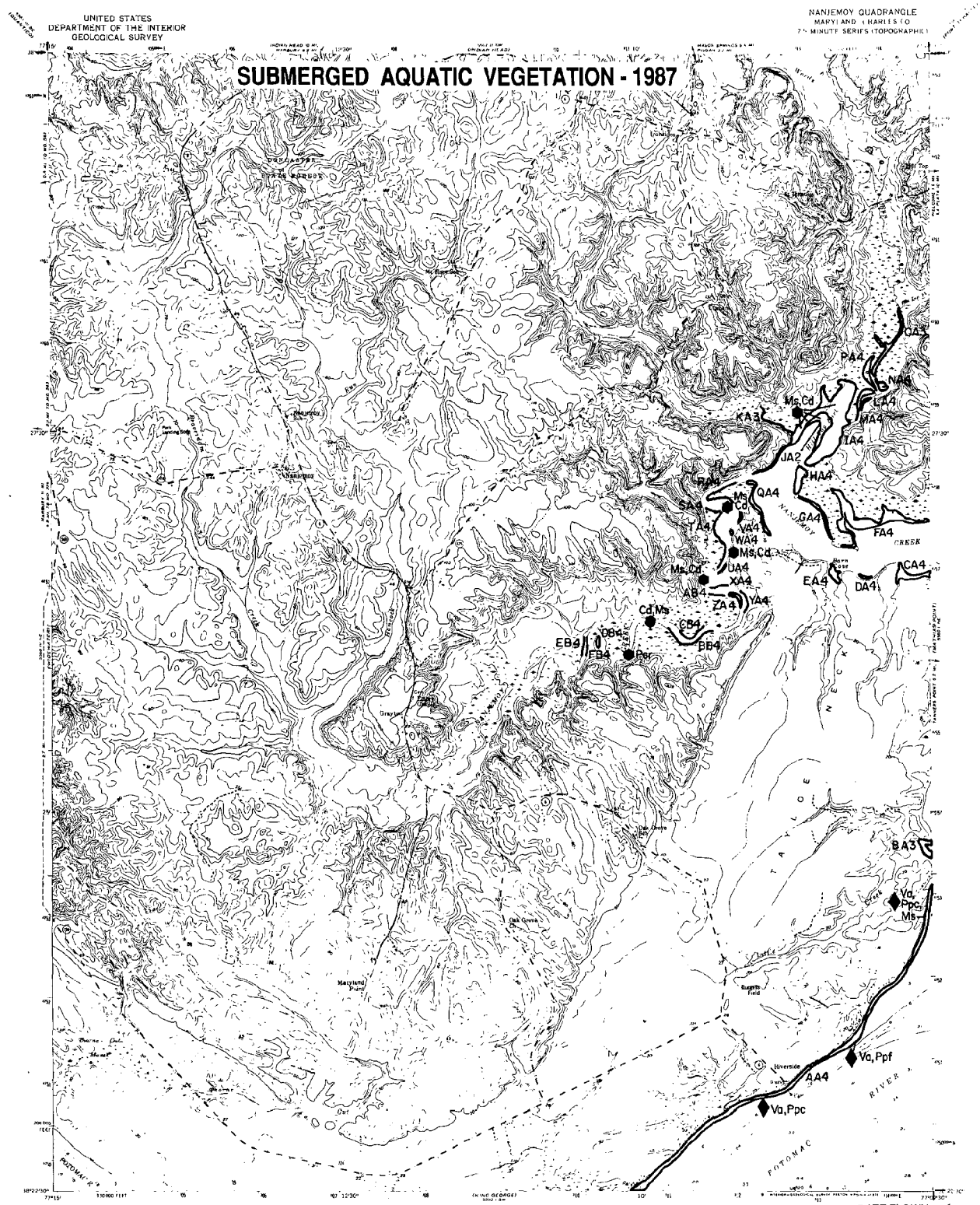
WIDEWATER, VA-MD 055

1966
PHOTOREVISED 1978
BATHYMETRY ADDED 1982
DMA 5680 IV NE SERIES V834

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

NANJEMOY QUADRANGLE
MARYLAND CHARLES CO
7½ MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION - 1987



SPECIES

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

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

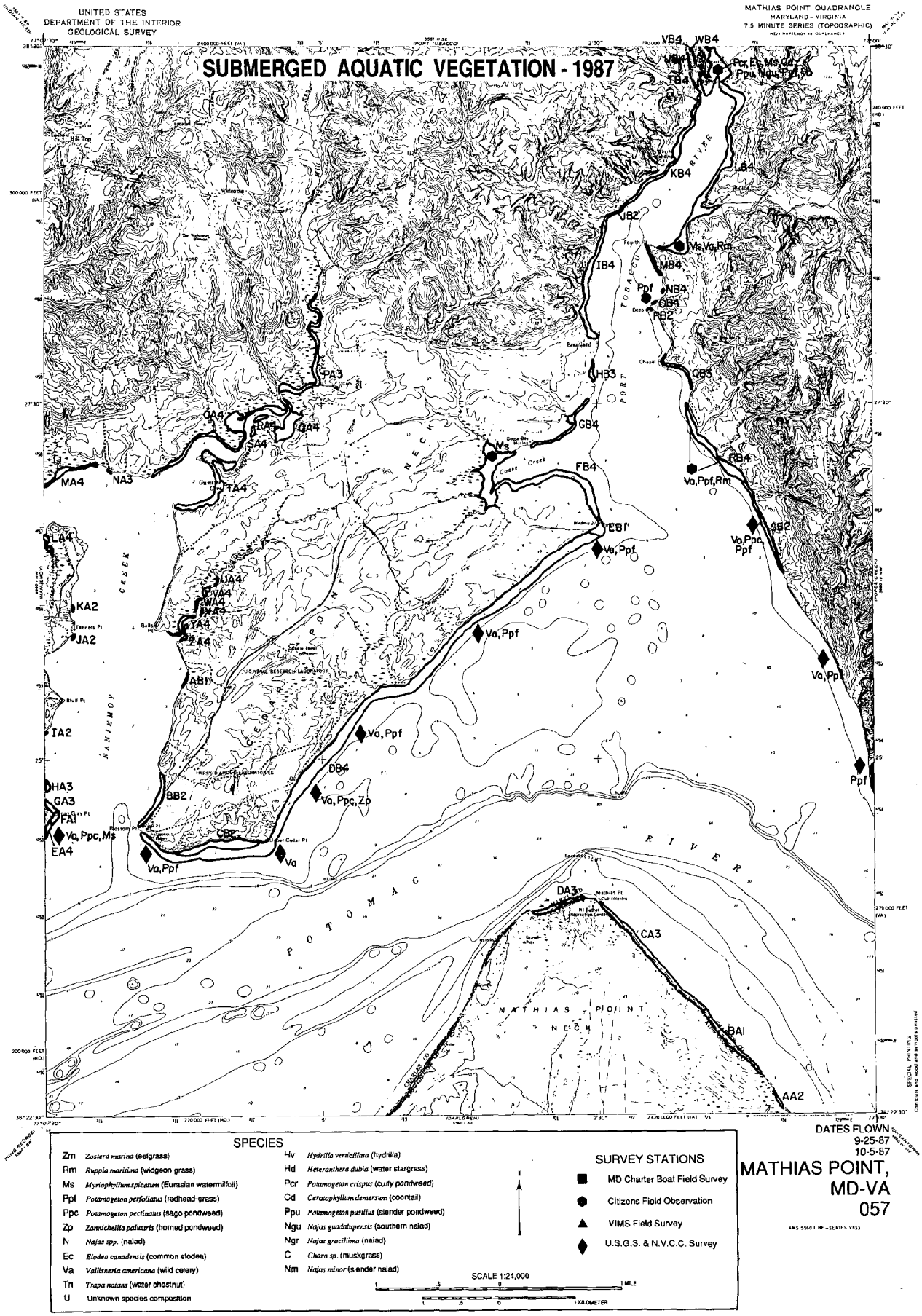
1 .5 0 1 MILE

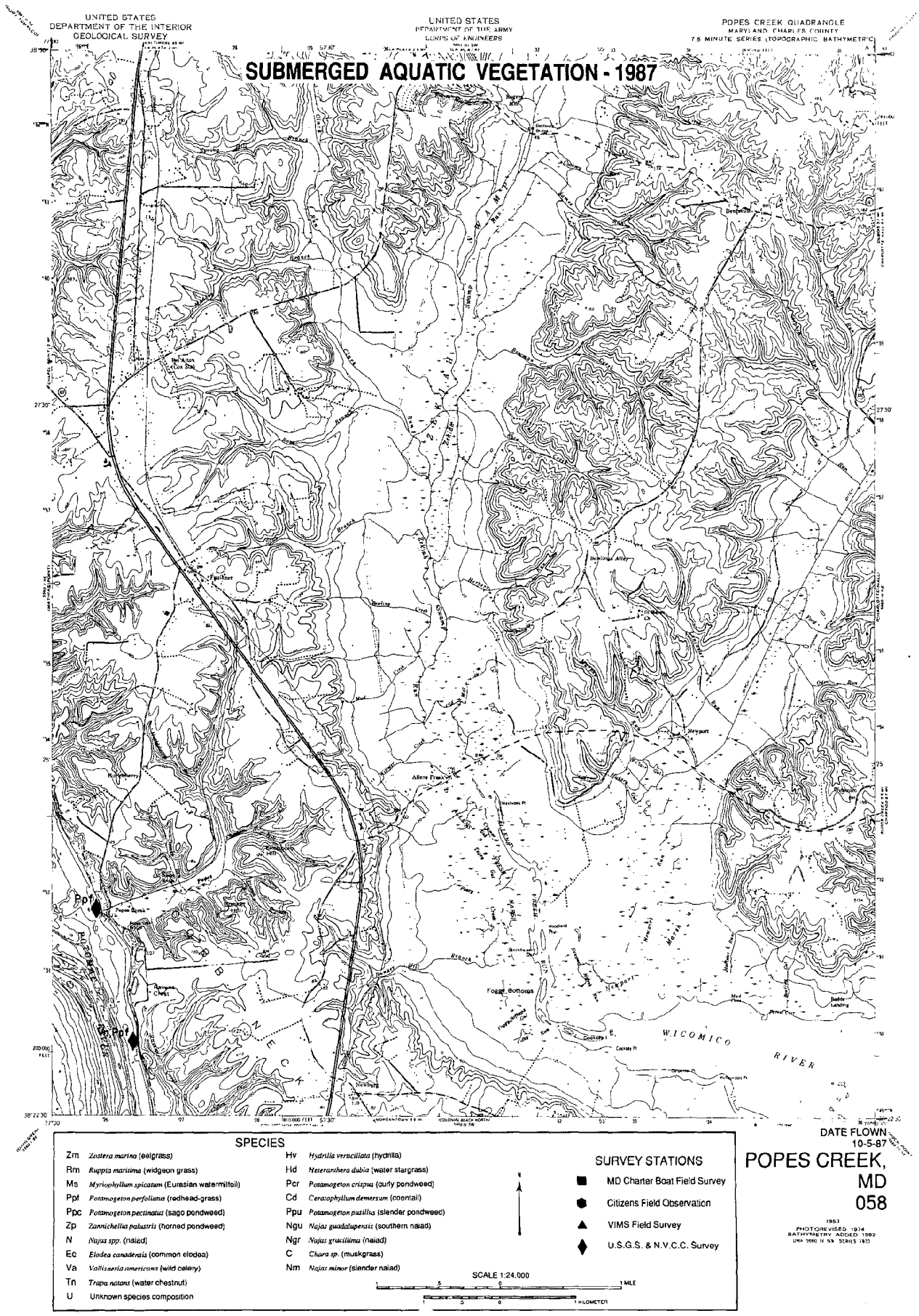
1 .5 0 1 KILOMETER

DATE FLOWN
9-25-87

NANJEMOY,
MD
056

1984
PHOTOREVISED 1978
AMS 5160 I NW SERIES V833

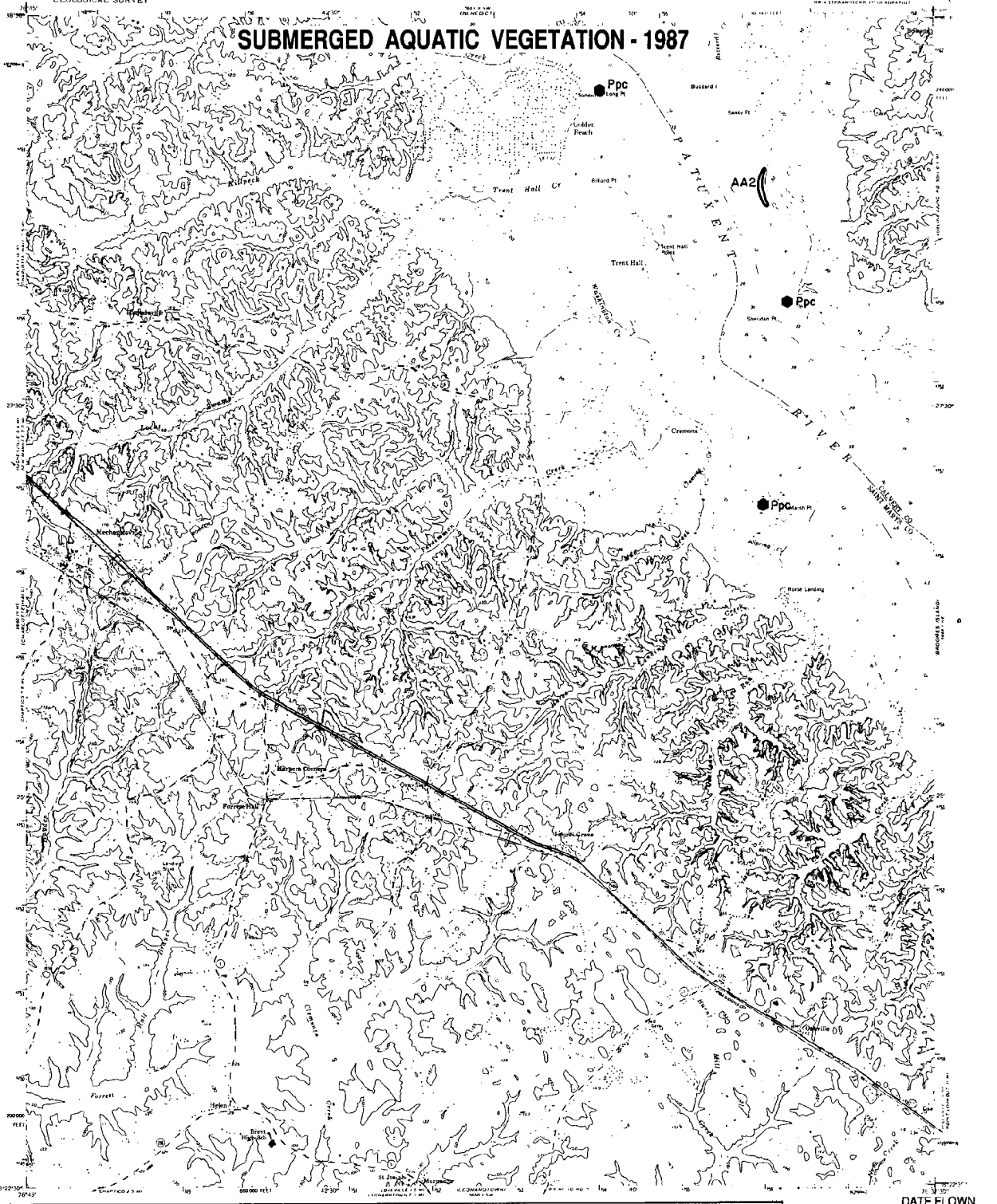

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MATHIAS POINT QUADRANGLE
MARYLAND – VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
POTOMAC RIVER
NANJEMOY CREEK
PORT TOBACCO RIVER
MATHIAS POINT NECK
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppl Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Por Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATES FLOWN
9-25-87
10-5-87
MATHIAS POINT,
MD-VA
057


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
POPES CREEK QUADRANGLE
MARYLAND CHARLES COUNTY
7.5 MINUTE SERIES (TOPOGRAPHIC BATHYMETRIC)
SUBMERGED AQUATIC VEGETATION - 1987
Ppf
Tn,Ppf
Fogg Bottoms
WICOMICO
RIVER
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATE FLOWN
10-5-87
POPES CREEK,
MD
058
1953
PHOTOREVISED 1974
BATHYMETRY ADDED 1982

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

MECHANICSVILLE QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION - 1987



SPECIES

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

SURVEY STATIONS

- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S. & N.V.C.C. Survey

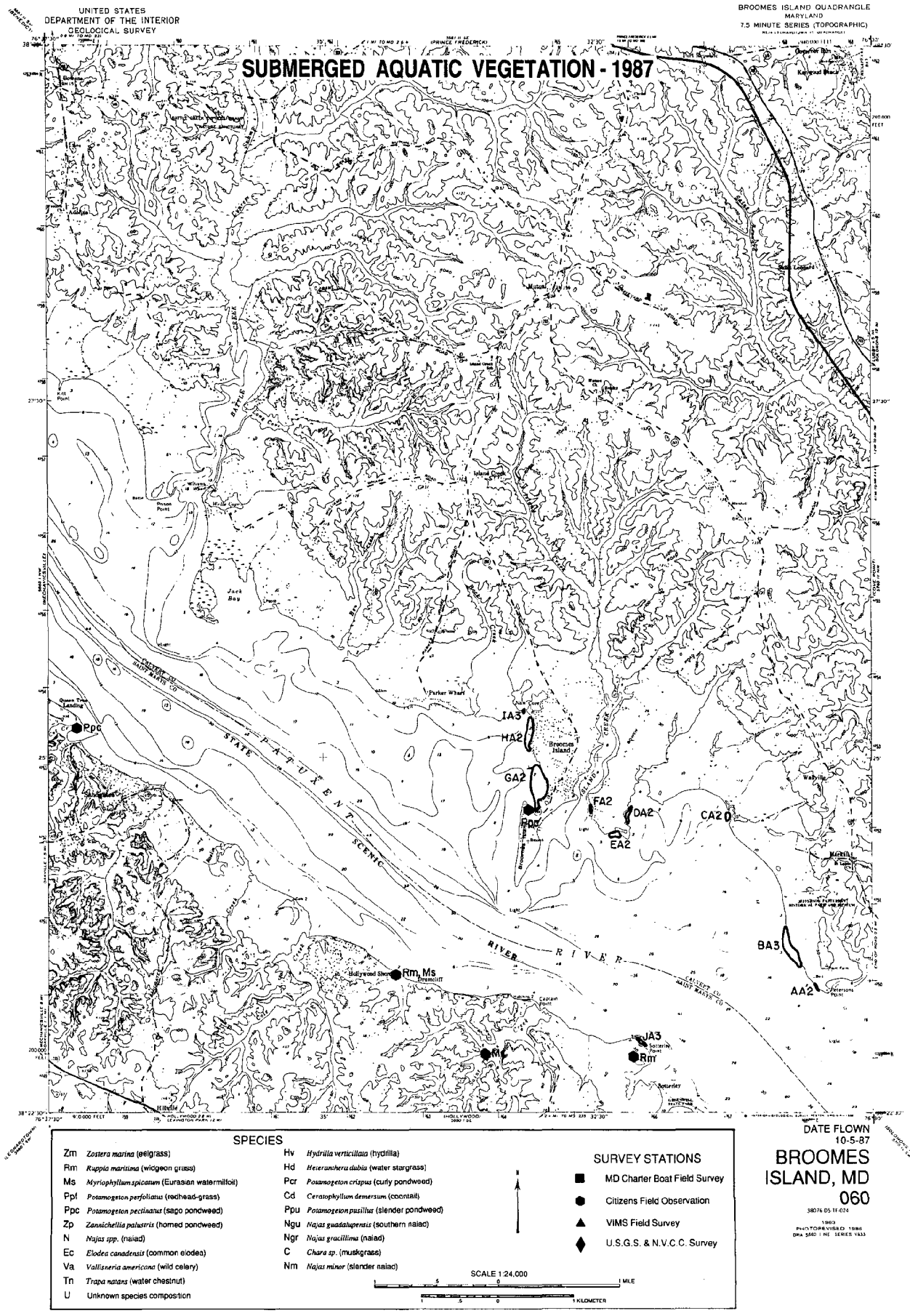
SCALE 1:24,000

1 MILE
1 KILOMETER

DATE FLOWN
10-5-87

MECHANICSVILLE,
MD
059

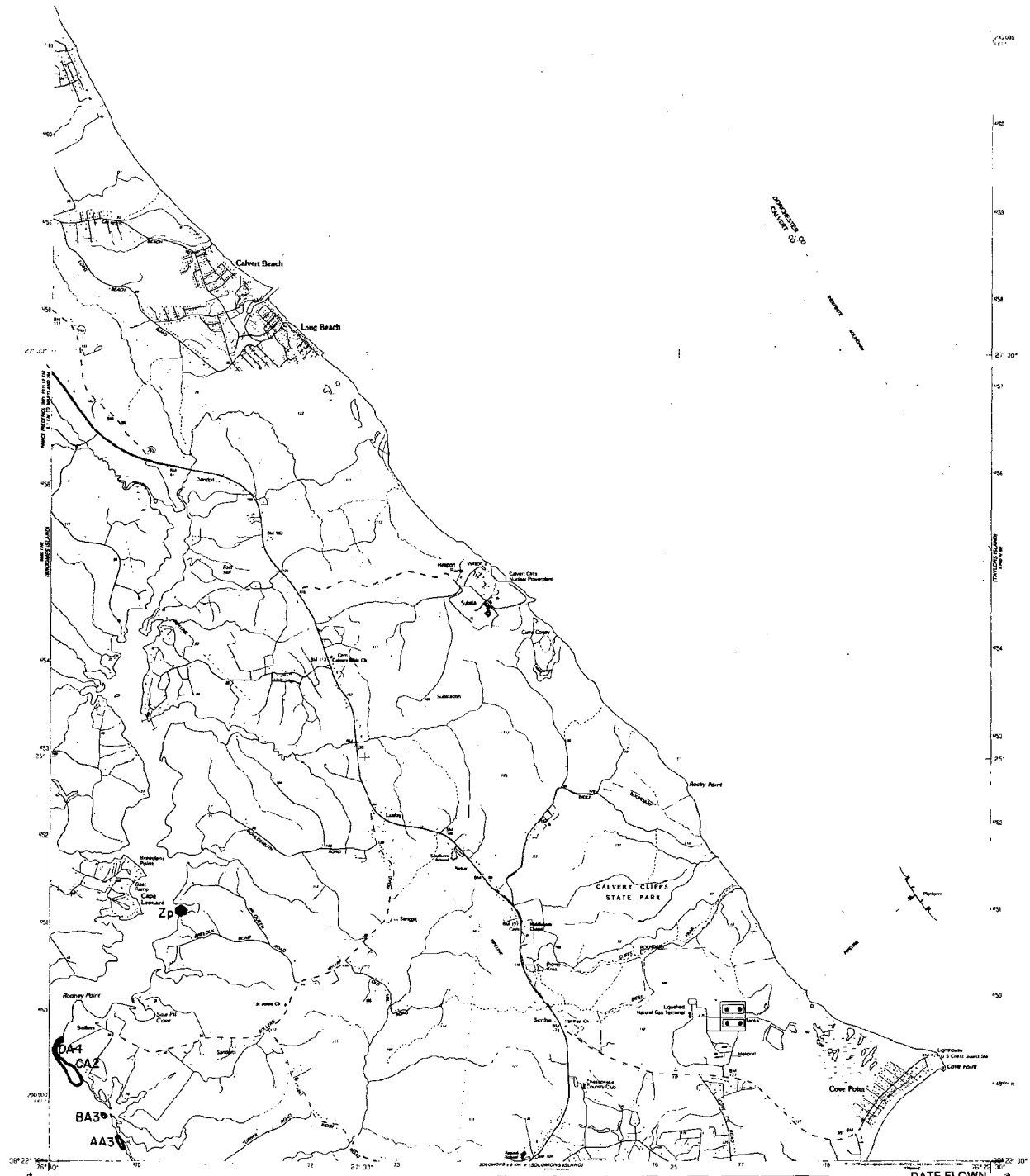
1953
PHOTOREVISED 1974


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
BROOMES ISLAND QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
PATUXENT
RIVER
SCENIC
IA3
HA2
GA2
FA2
DA2
CA2
EA2
BA3
AA2
Ppc
Rm, Ms
Ms
Rm
JA3
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATE FLOWN
10-5-87
BROOMES
ISLAND, MD
060

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COVE POINT QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION - 1987



SPECIES

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

SURVEY STATIONS

- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

1 MILE

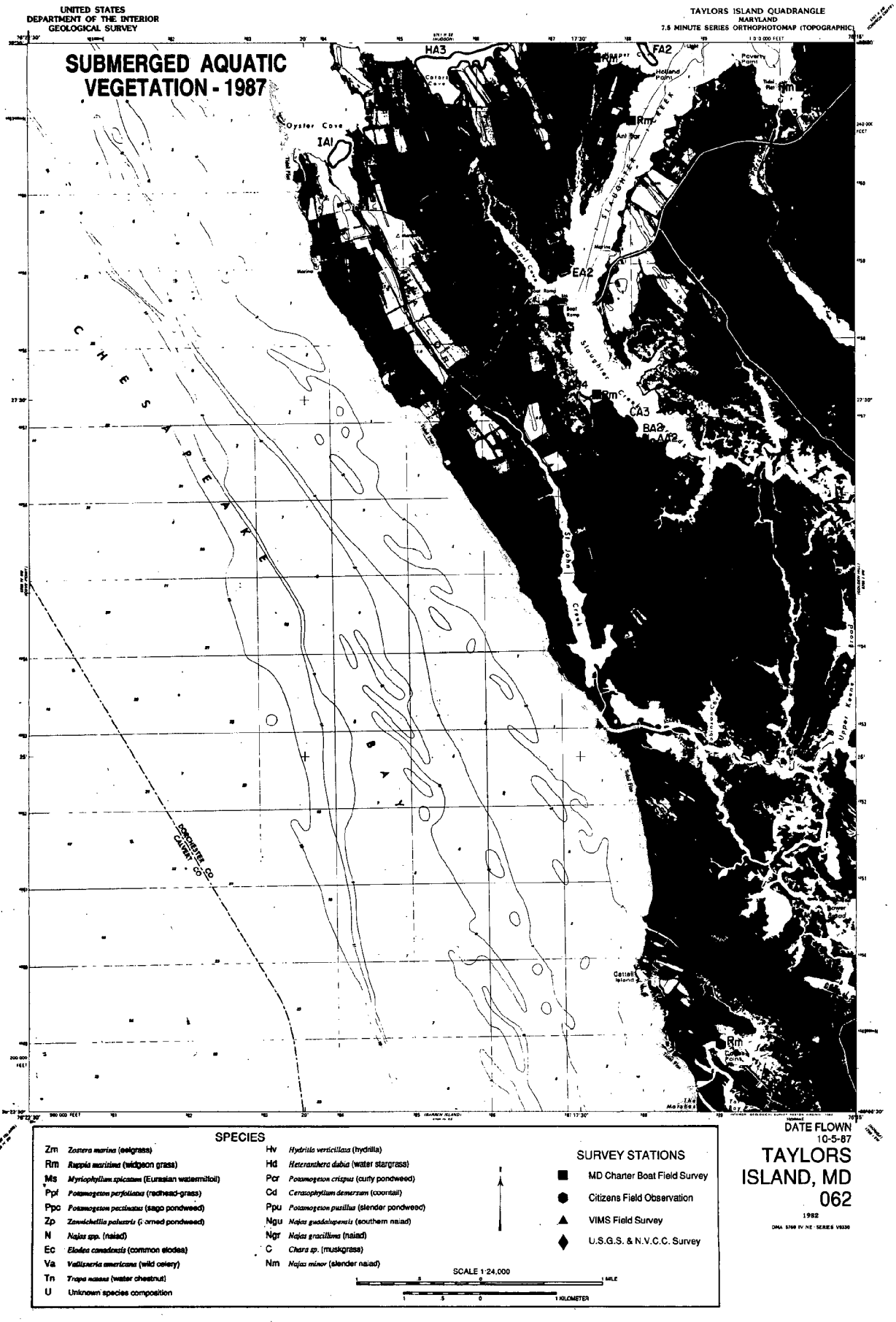
1 KILOMETER

DATE FLOWN
10-5-87

COVE POINT, MD
061

1987

COVE POINT, MD.


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
TAYLORS ISLAND QUADRANGLE
MARYLAND
7.5 MINUTE SERIES ORTHOPHOTOMAP (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
HA3
FA2
Oyster Cove
IA1
Rm
EA2
CA3
BA2
AA2
Slaughter Creek
St John Creek
Upper Keene Brook
Cattail Island
CHESAPEAKE BAY
DORCHESTER CO
CALVERT CO
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATE FLOWN
10-5-87
TAYLORS ISLAND, MD
062
1982

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

GOLDEN HILL QUADRANGLE
MARYLAND-DORCHESTER CO.
7.5 MINUTE SERIES ORTHOPHOTOMAP (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION - 1987

DATE FLOWN
10-5-87

GOLDEN HILL, MD 063

1981

SPECIES

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

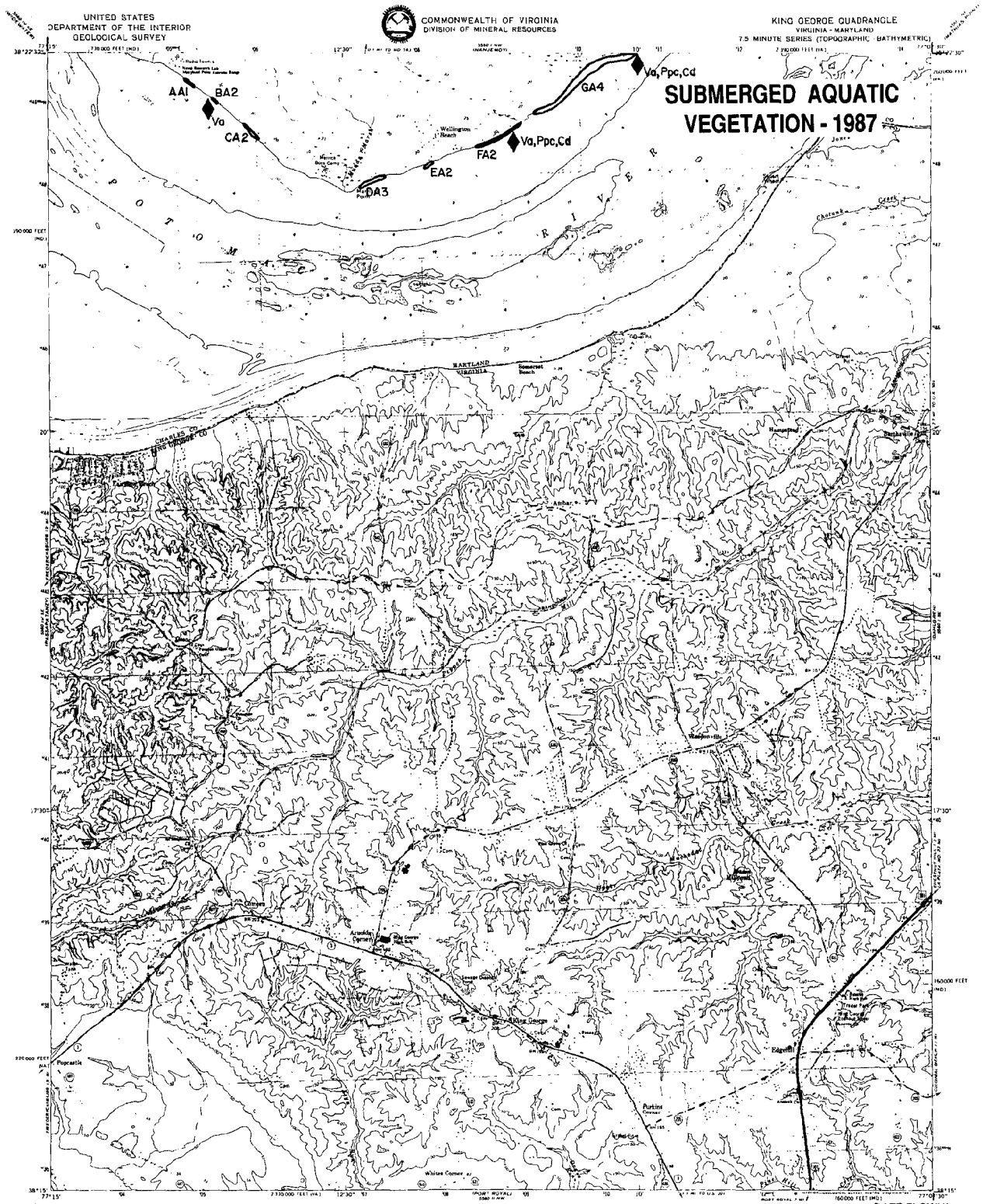
SURVEY STATIONS

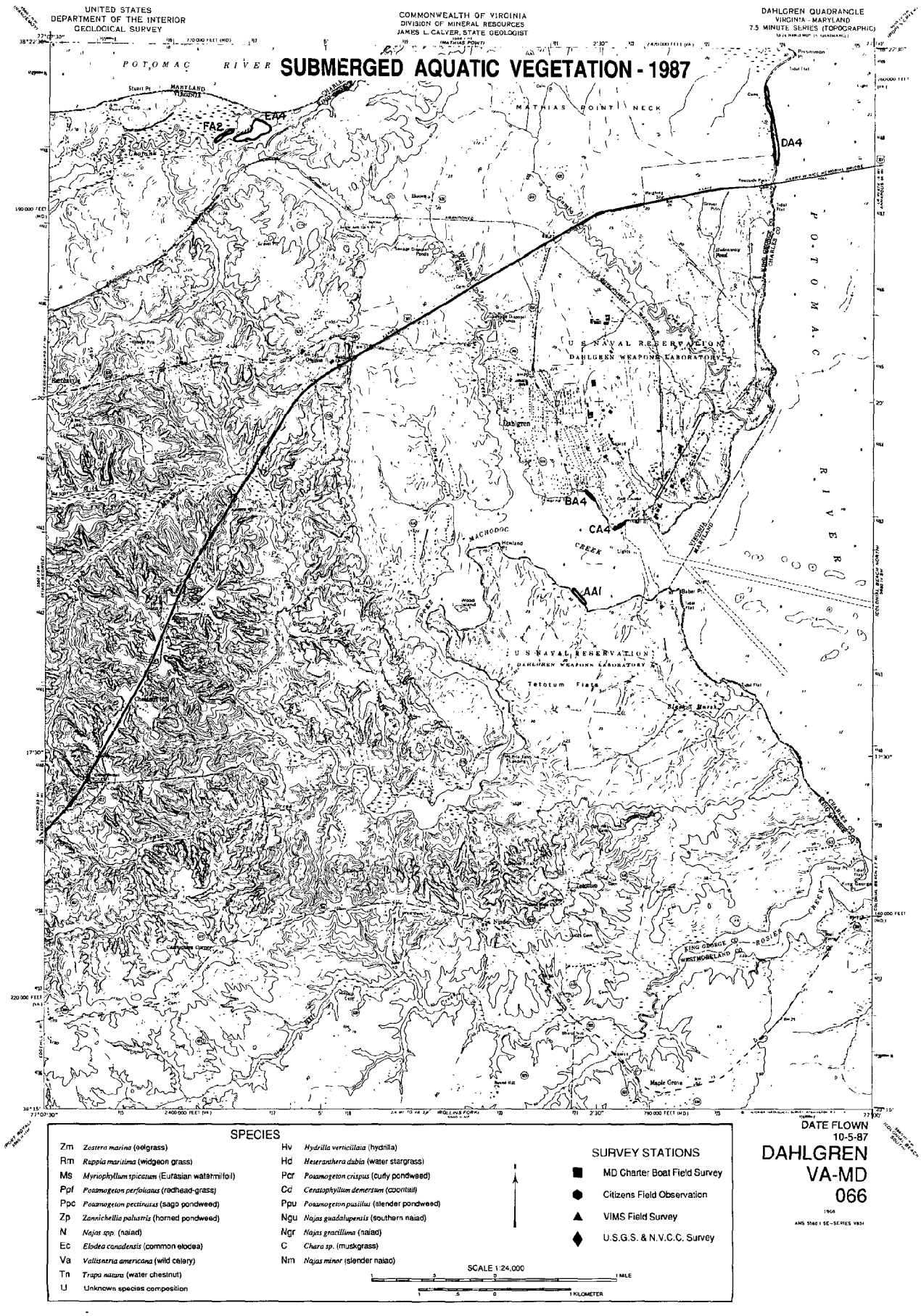
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S. & N.V.C.C. Survey

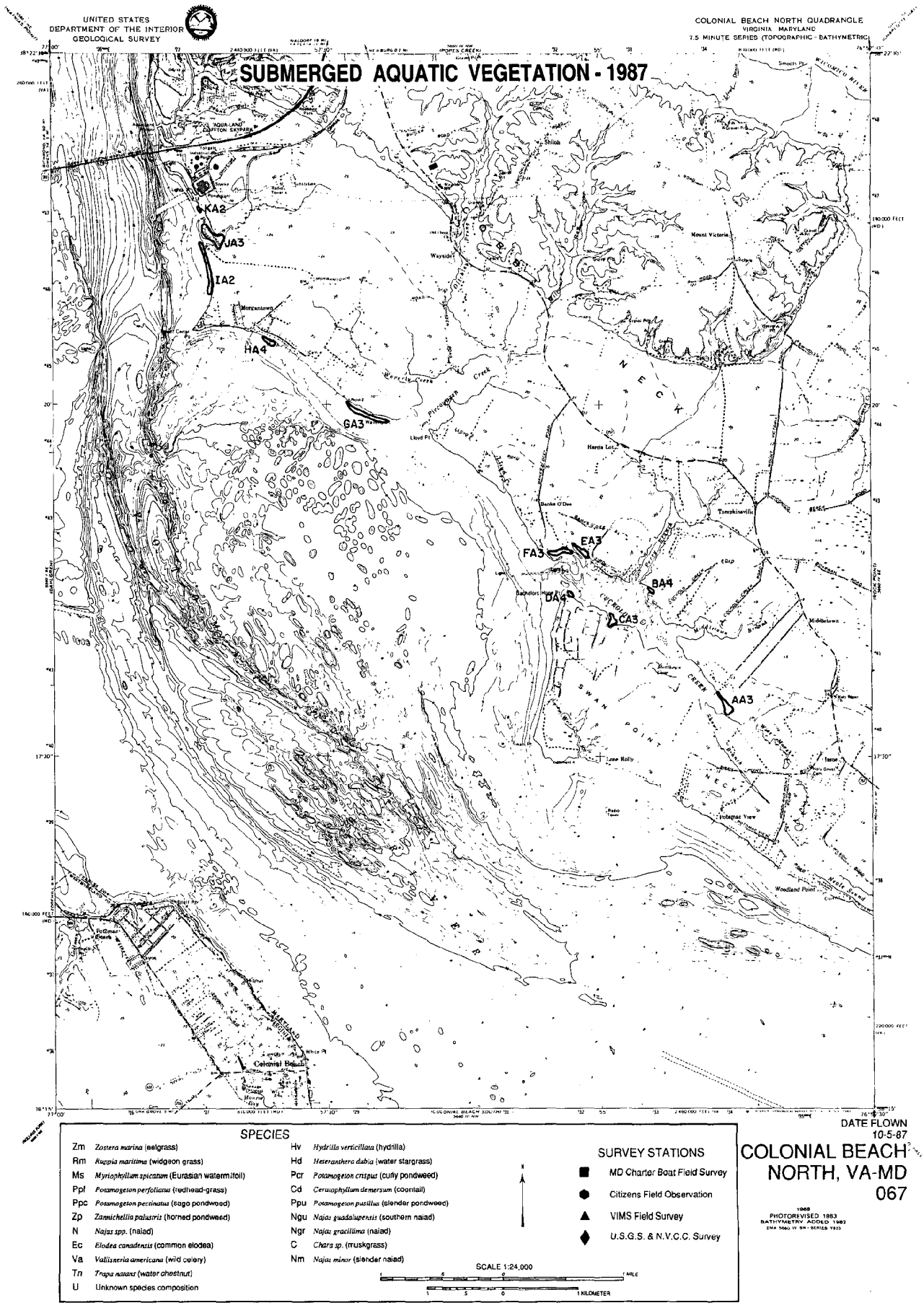
SCALE 1:24,000

1 0 1 MILE

1 0 1 KILOMETER


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES
KING GEORGE QUADRANGLE
VIRGINIA - MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC - BATHYMETRIC)
SUBMERGED AQUATIC VEGETATION - 1987
AA1
BA2
Vo
CA2
DA3
EA2
FA2
GA4
Va,Ppc,Cd
Va,Ppc,Cd
POTOMAC RIVER
MARYLAND
VIRGINIA
CHARLES CO
KING GEORGE CO
Somerset Beach
Wellington Beach
Monroe Bay
Popes Creek
Chotank Creek
Hopyard
Ambar
Oldtown
Arnoldia Corner
King George
Edgehill
Purkins Corner
Whites Corner
Popcastle
Fort Royall
Fort Hill
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 0 1 MILE
1 0 1 KILOMETER
DATE FLOWN
9-25-87
KING GEORGE, VA-MD
065
PHOTOREVISED 1978
PHOTOINSPECTED 1982


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES
JAMES L. CALVER, STATE GEOLOGIST
DAHLGREN QUADRANGLE
VIRGINIA - MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
POTOMAC RIVER
MATTHIAS POINT NECK
FA2
EA4
DA4
BA4
CA4
AA1
U.S. NAVAL RESERVATION
DAHLGREN WEAPONS LABORATORY
MACHODOC CREEK
Dahlgren
Tetotum Flats
Maple Grove
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATE FLOWN
10-5-87
DAHLGREN
VA-MD
066


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
COLONIAL BEACH NORTH QUADRANGLE
VIRGINIA MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC - BATHYMETRIC)
SUBMERGED AQUATIC VEGETATION - 1987
KA2
JA3
IA2
HA4
GA3
FA3
EA3
BA4
DA4
CA3
AA3
Colonial Beach
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATE FLOWN
10-5-87
COLONIAL BEACH
NORTH, VA-MD
067
1968
PHOTOREVISED 1983
BATHYMETRY ADDED 1982

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

HOLLYWOOD QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION - 1987

SPECIES

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

SURVEY STATIONS

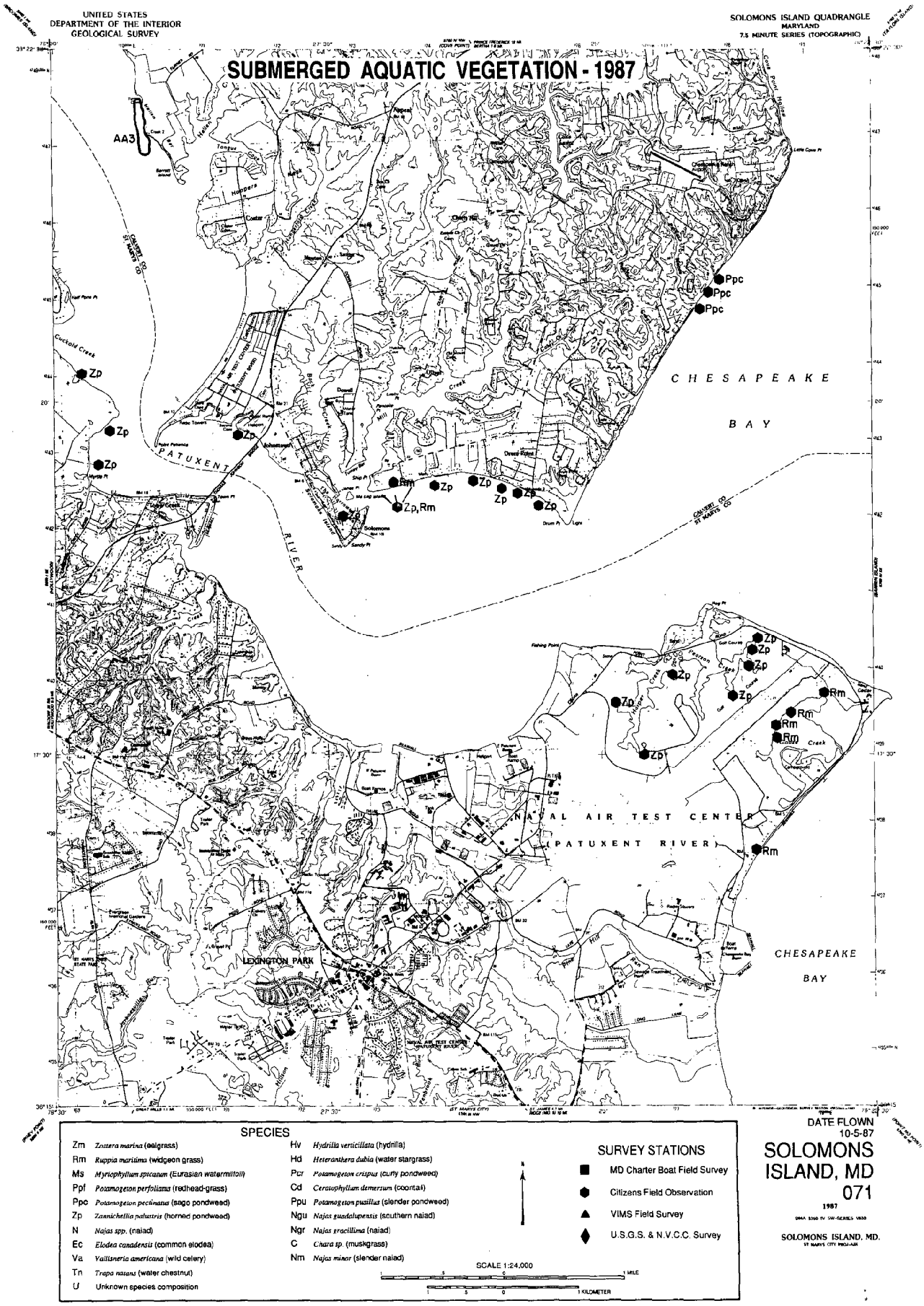
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

DATE FLOWN
10-5-87

HOLLYWOOD, MD
070

1963
AMS 5460 I SE--SERIES V831


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
SOLOMONS ISLAND QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
AA3
CHESAPEAKE
BAY
PATUXENT
RIVER
NAVAL AIR TEST CENTER
(PATUXENT RIVER)
LEXINGTON PARK
CHESAPEAKE
BAY
Zp
Rm
Ppc
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATE FLOWN
10-5-87
SOLOMONS
ISLAND, MD
071
1987
SOLOMONS ISLAND, MD.

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

BARREN ISLAND QUADRANGLE
MARYLAND
7.5 MINUTE SERIES ORTHOPHOTOMAP (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION - 1987

SPECIES

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

SURVEY STATIONS

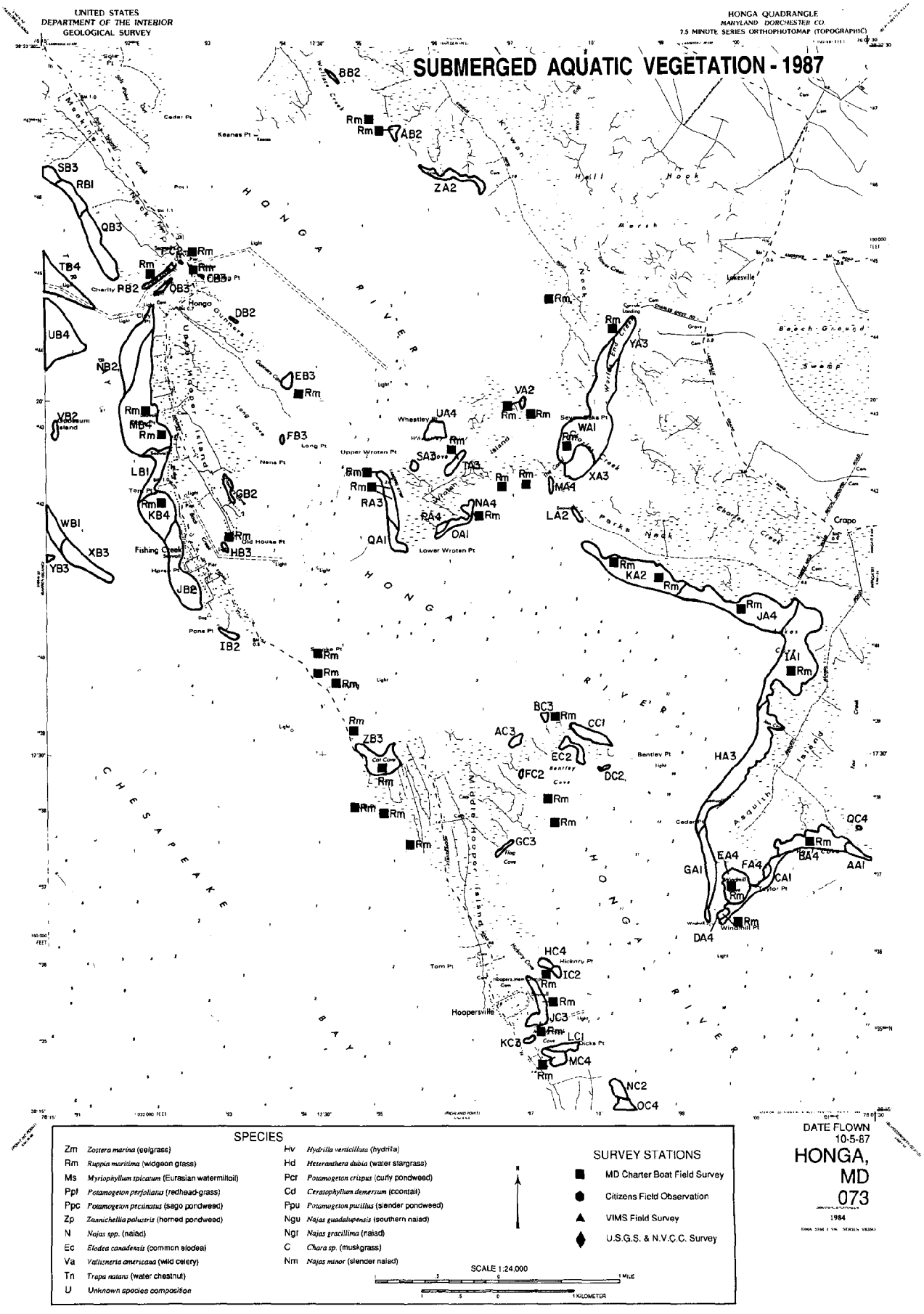
- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

DATE FLOWN
10-5-87

BARREN
ISLAND, MD
072

38076-C3-OM-024
1984
DMA 5760 IV SE - SERIES V833O


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
HONGA QUADRANGLE
MARYLAND DORCHESTER CO.
7.5 MINUTE SERIES ORTHOPHOTOMAP (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
HONGA RIVER
CHESAPEAKE BAY
Hoopersville
Lakesville
Crapo
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (ccontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATE FLOWN
10-5-87
HONGA,
MD
073
1984

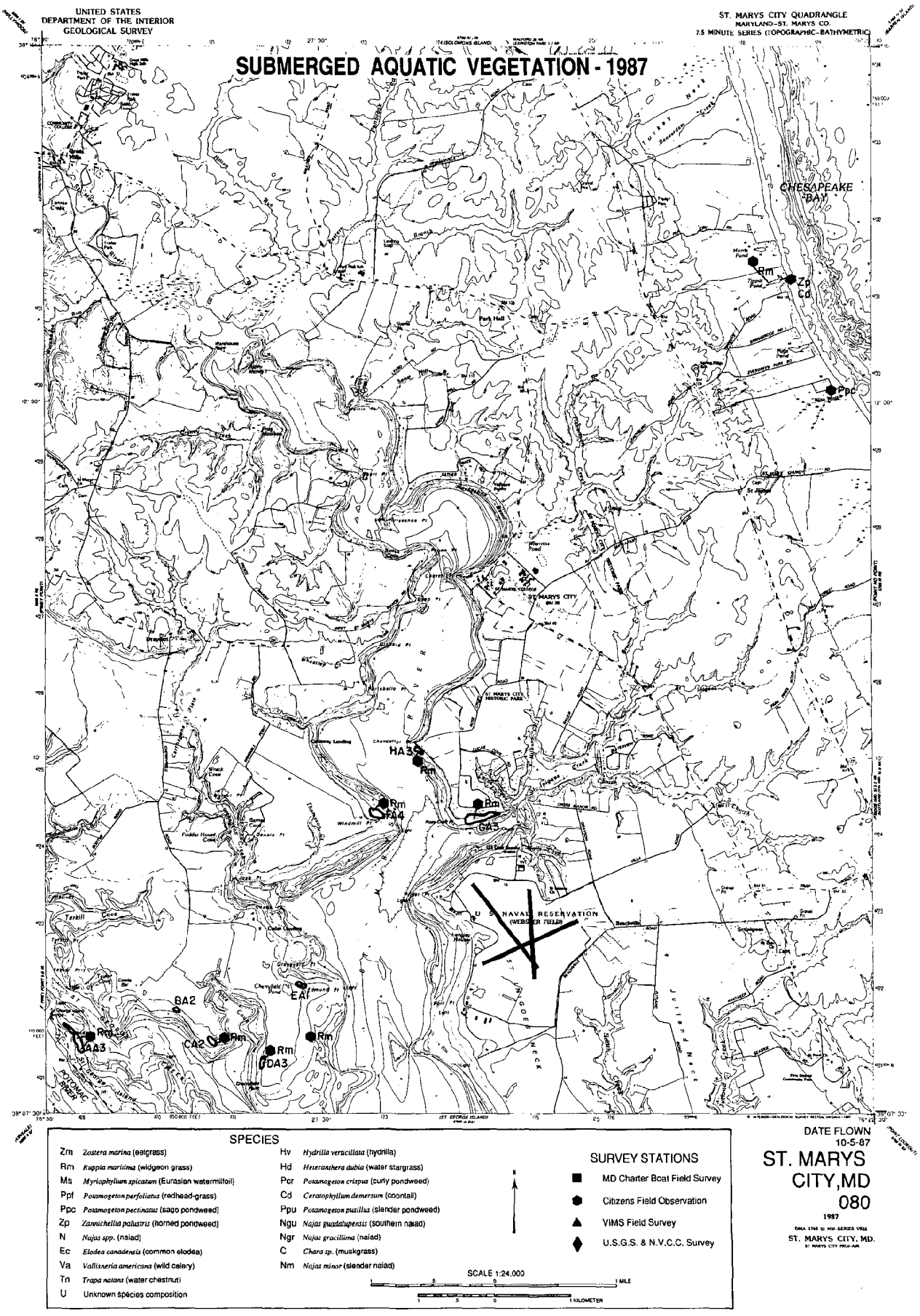
SPECIES

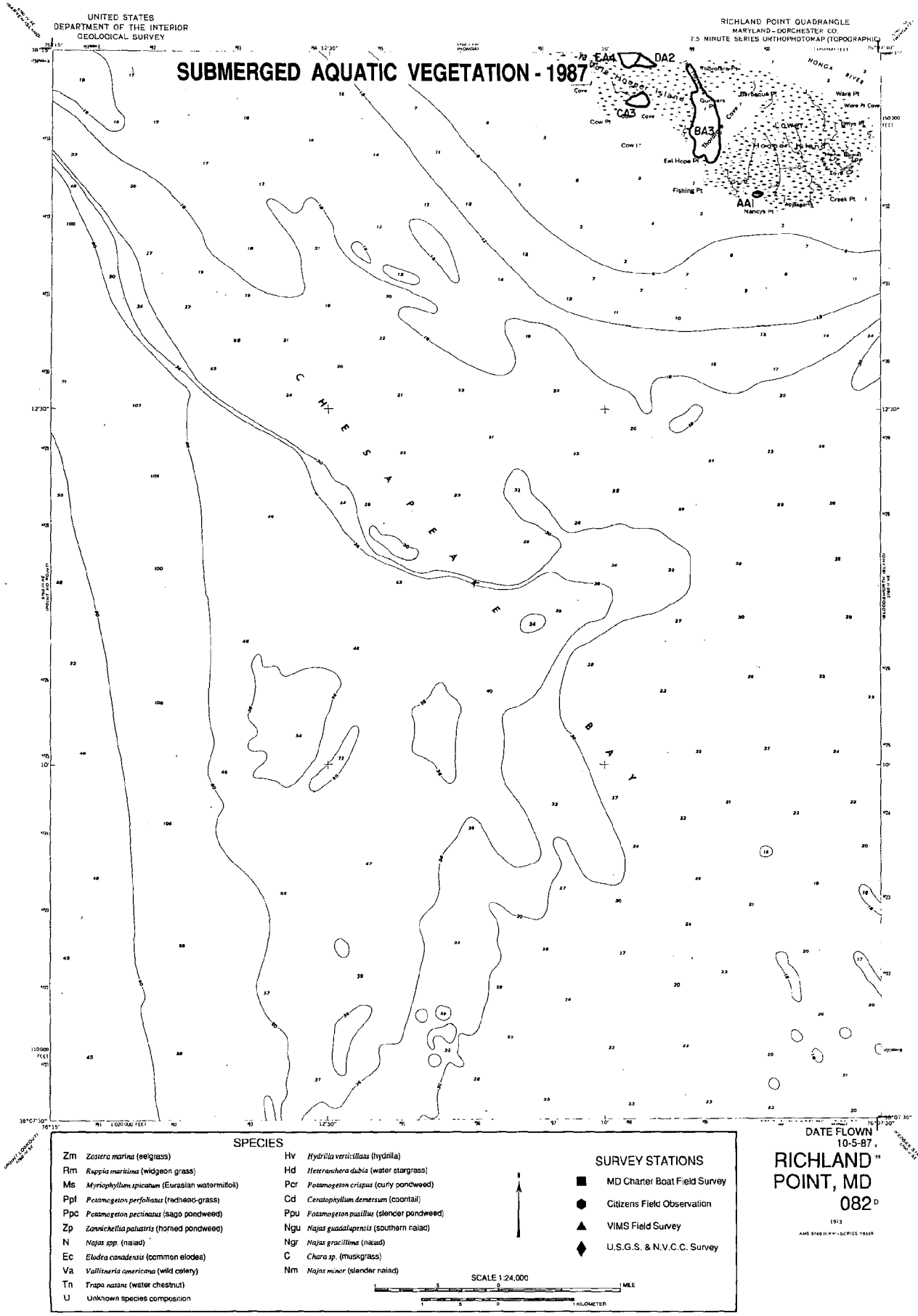
- Zm *Zostera marina* (eelgrass)
- Rm *Ruppia maritima* (widgeon grass)
- Ms *Myriophyllum spicatum* (Eurasian watermilfoil)
- Ppf *Potamogeton perfoliatus* (redhead-grass)
- Ppc *Potamogeton pectinatus* (sago pondweed)
- Zp *Zannichellia palustris* (horned pondweed)
- N *Najas spp.* (naiad)
- Ec *Elodea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

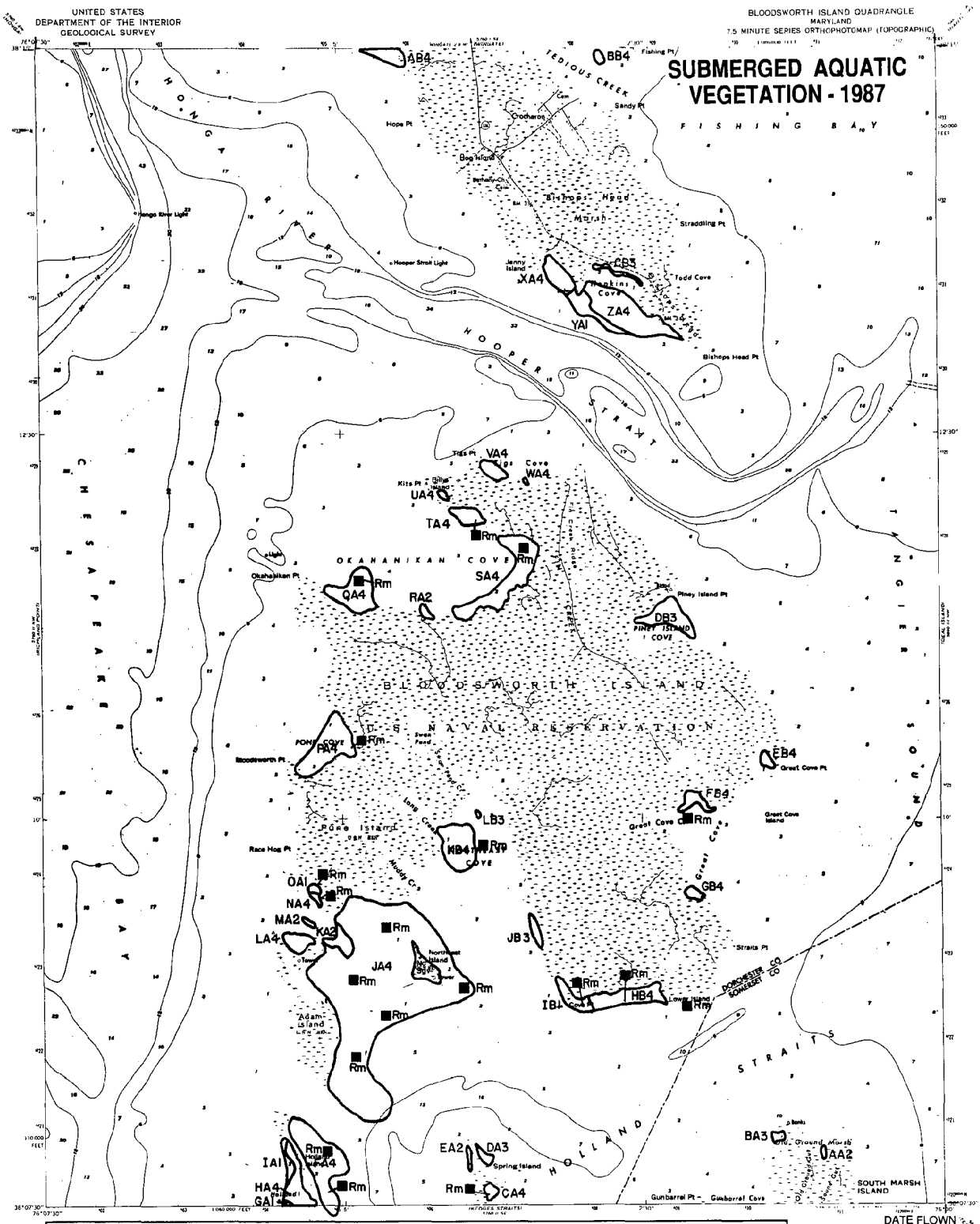
SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
ST. MARYS CITY QUADRANGLE
MARYLAND-ST. MARYS CO.
7.5 MINUTE SERIES (TOPOGRAPHIC-BATHYMETRIC)
SUBMERGED AQUATIC VEGETATION - 1987
CHESAPEAKE BAY
ST. MARYS CITY
U.S. NAVAL RESERVATION (WEBSTER FIELD)
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATE FLOWN
10-5-87
ST. MARYS CITY,MD
080
1987
ST. MARYS CITY, MD.


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
RICHLAND POINT QUADRANGLE
MARYLAND-DORCHESTER CO.
7.5 MINUTE SERIES ORTHOPHOTOMAP (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
EA4
DA2
CA3
BA3
AA1
Goose Island
Cow Pt
Eat Hope Pt
Fishing Pt
Nancys Pt
Ware Pt
Ware Pt Cove
Creek Pt
HONGA RIVER
CHESAPEAKE BAY
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
N
SCALE 1:24,000
1 0 1 MILE
1 0 1 KILOMETER
DATE FLOWN
10-5-87
RICHLAND POINT, MD
082
1973



SPECIES

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

SURVEY STATIONS

- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

1 MILE

1 KILOMETER

DATE FLOWN
10-5-87

BLOODSWORTH ISLAND, MD
083

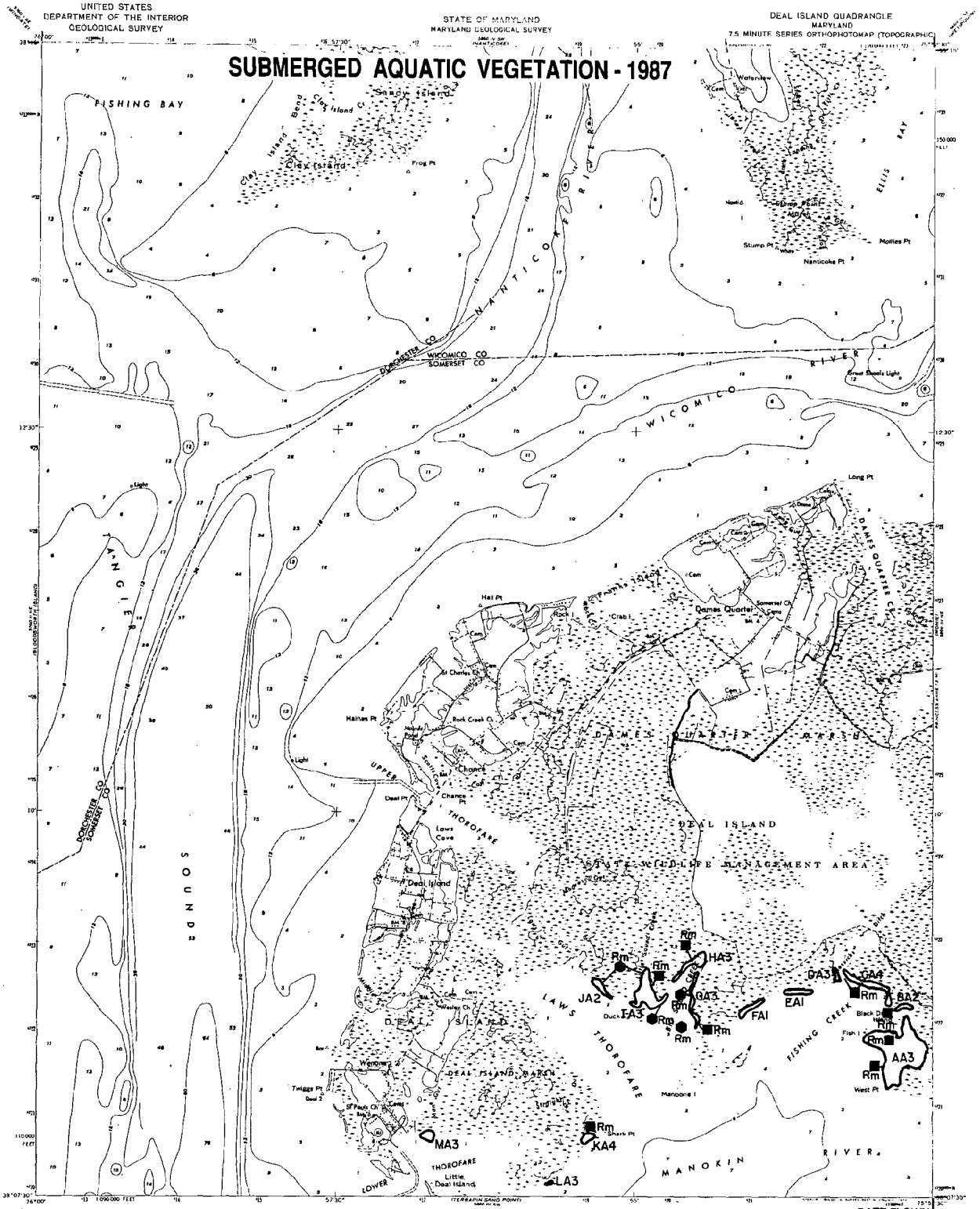
1973

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

STATE OF MARYLAND
MARYLAND GEOLOGICAL SURVEY

DEAL ISLAND QUADRANGLE
MARYLAND
7.5 MINUTE SERIES ORTHOPHOTOMAP (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION - 1987



SPECIES

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

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

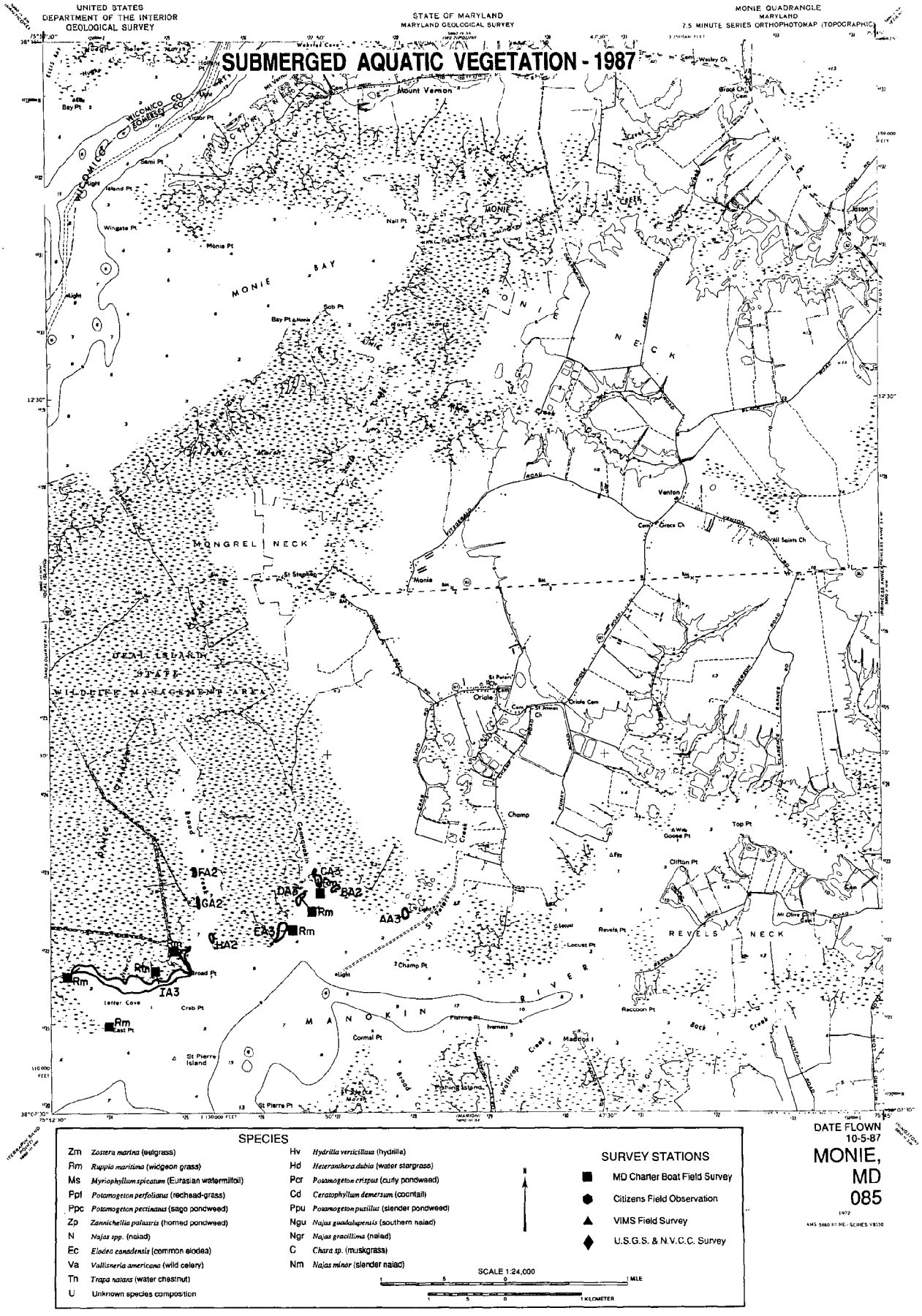
1 MILE

1 KILOMETER

DATE FLOWN
10-5-87

DEAL ISLAND,
MD
084

1972



SPECIES

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

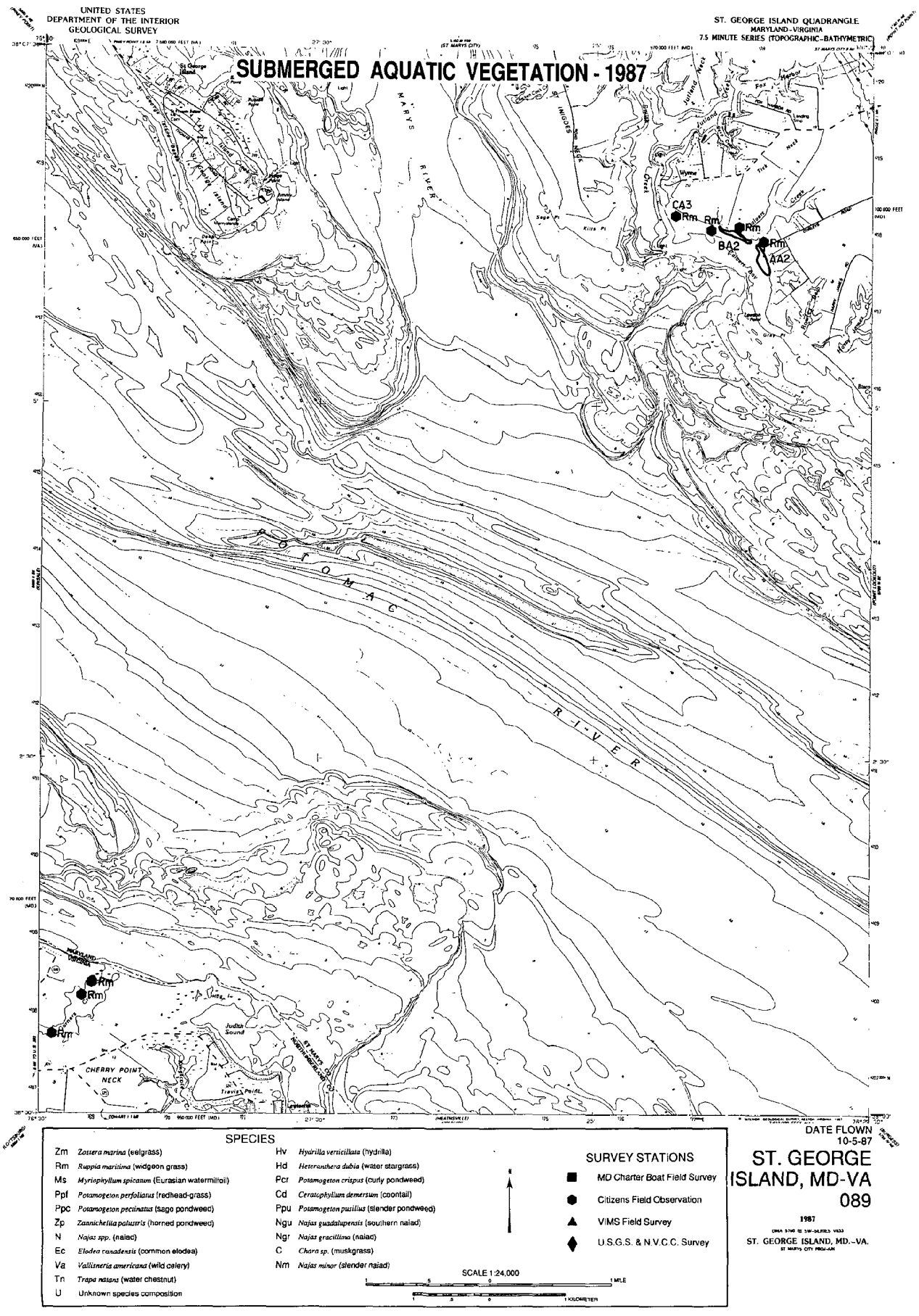
SURVEY STATIONS

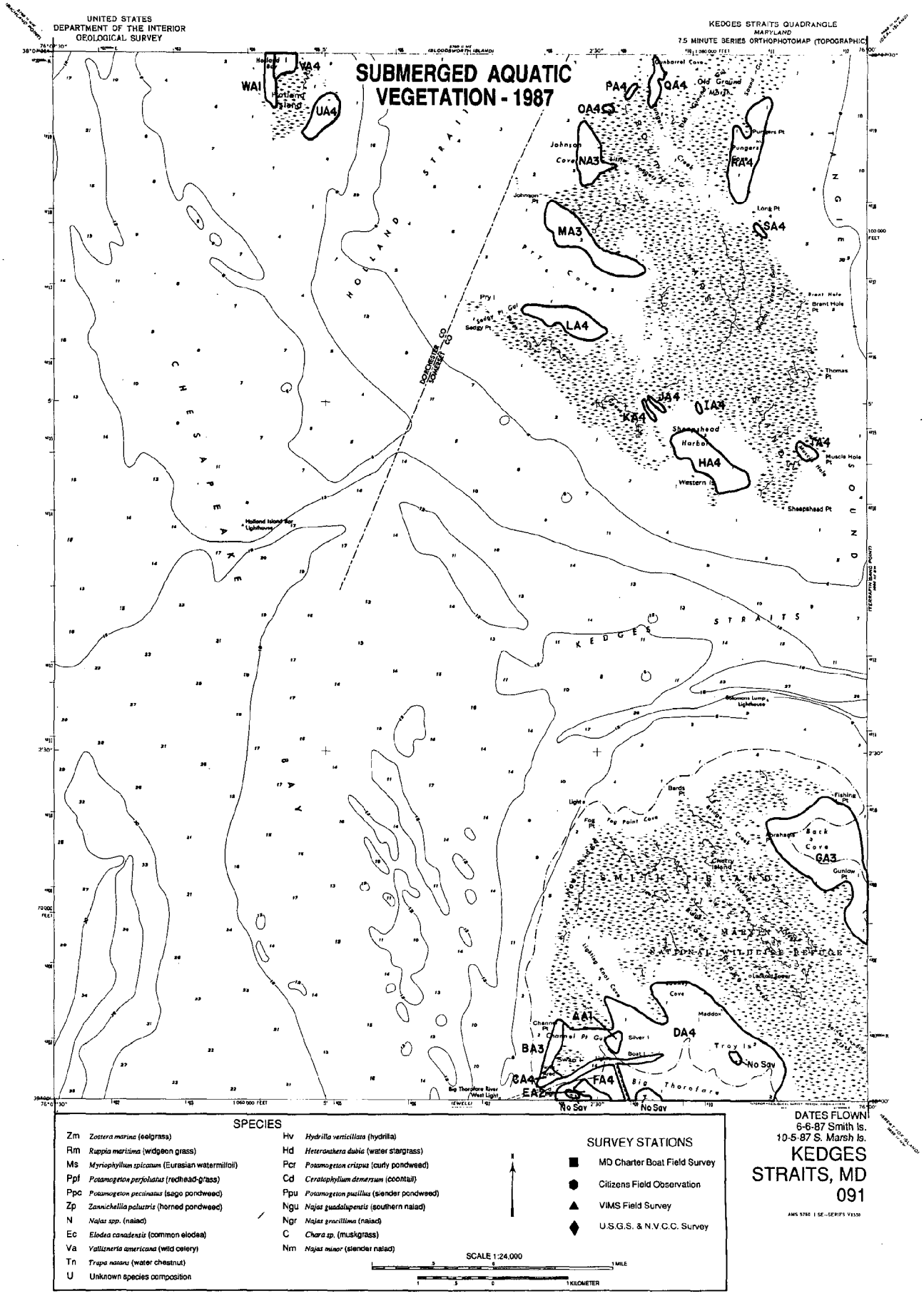
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

DATE FLOWN
10-5-87

MONIE,
MD
085


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
ST. GEORGE ISLAND QUADRANGLE
MARYLAND-VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC-BATHYMETRIC)
SUBMERGED AQUATIC VEGETATION - 1987
POTOMAC
RIVER
ST MARYS
RIVER
CA3
BA2
AA2
Rm
CHERRY POINT
NECK
Judith Sound
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATE FLOWN
10-5-87
ST. GEORGE ISLAND, MD-VA
089
1987
ST. GEORGE ISLAND, MD.-VA.

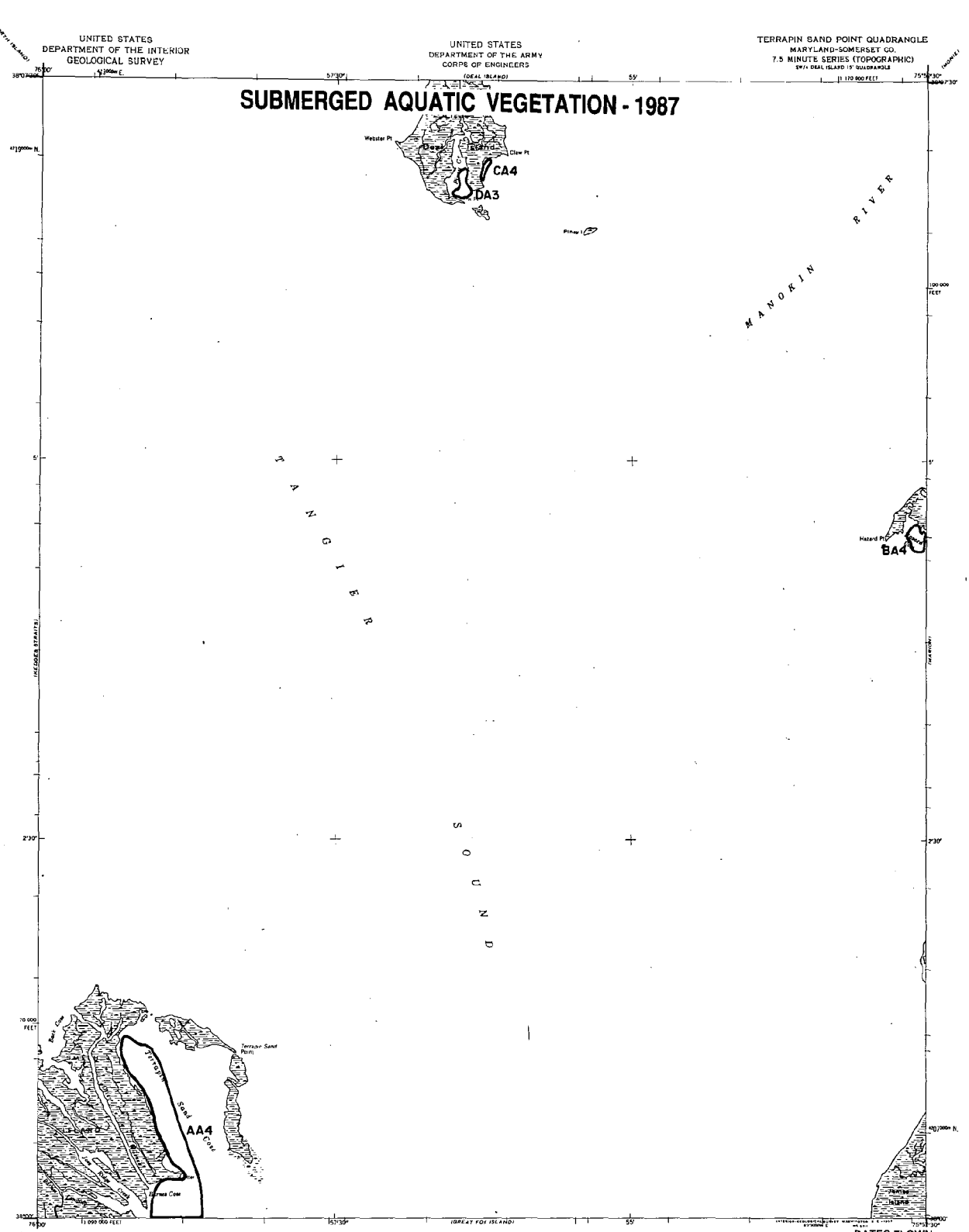

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
KEDGES STRAITS QUADRANGLE
MARYLAND
7.5 MINUTE SERIES ORTHOPHOTOMAP (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
WA1
VA4
UA4
PA4
QA4
OA4
NA3
RA4
MA3
SA4
LA4
JA4
OIA4
KA4
TA4
HA4
AA1
DA4
BA3
CA4
FA4
EA2
GA3
HOLLAND STRAITS
CHESAPEAKE BAY
TANGIER SOUND
KEDGES STRAITS
SMITH ISLAND
MARTIN NATIONAL WILDLIFE REFUGE
DORCHESTER CO
SOMERSET CO
Holland Island
Holland Island Bar Lighthouse
Johnson Cove
Johnson Pt
Pungers Pt
Pungers Creek
Long Pt
Brant Hole
Brant Hole Pt
Thomas Pt
Sheepshead Harbor
Sheepshead Pt
Muscle Hole
Muscle Hole Pt
Western Is
Sedgy Pt
Pry Cove
Pry I
Old Ground
Old Ground Marsh
Gunbarrel Cove
Sound
Bards Pt
Fishing Pt
Fog Point Cove
Fog Pt
Back Cove
Gunlow Pt
Cherry Island
Lighthouse
Channel Pt
Channel Pt Gut
Silver I
Boat I
Troy Is
No Sav
Big Thorofare
Big Thorofare River (West Light)
Maddox
Cove
Lighting Knob Cove
Lighting Knob
Common Lump Lighthouse
Tenmile Creek
Tenmile Point
Ladder Zone
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATES FLOWN
6-6-87 Smith Is.
10-5-87 S. Marsh Is.
KEDGES STRAITS, MD
091

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS

TERRAPIN SAND POINT QUADRANGLE
MARYLAND-SOMERSET CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION - 1987



SPECIES

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

SURVEY STATIONS

- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S. & N.V.C.C. Survey

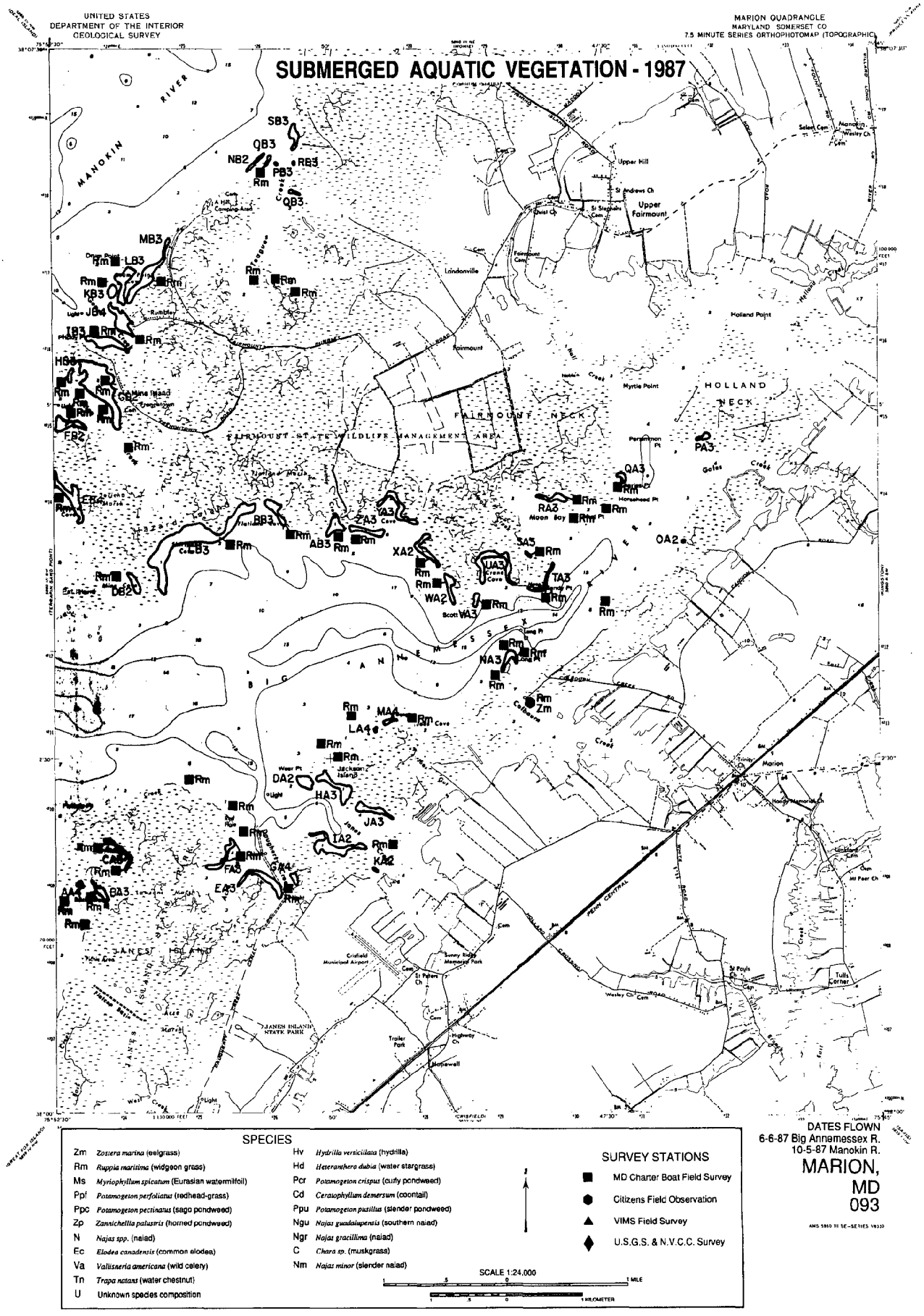
SCALE 1:24,000

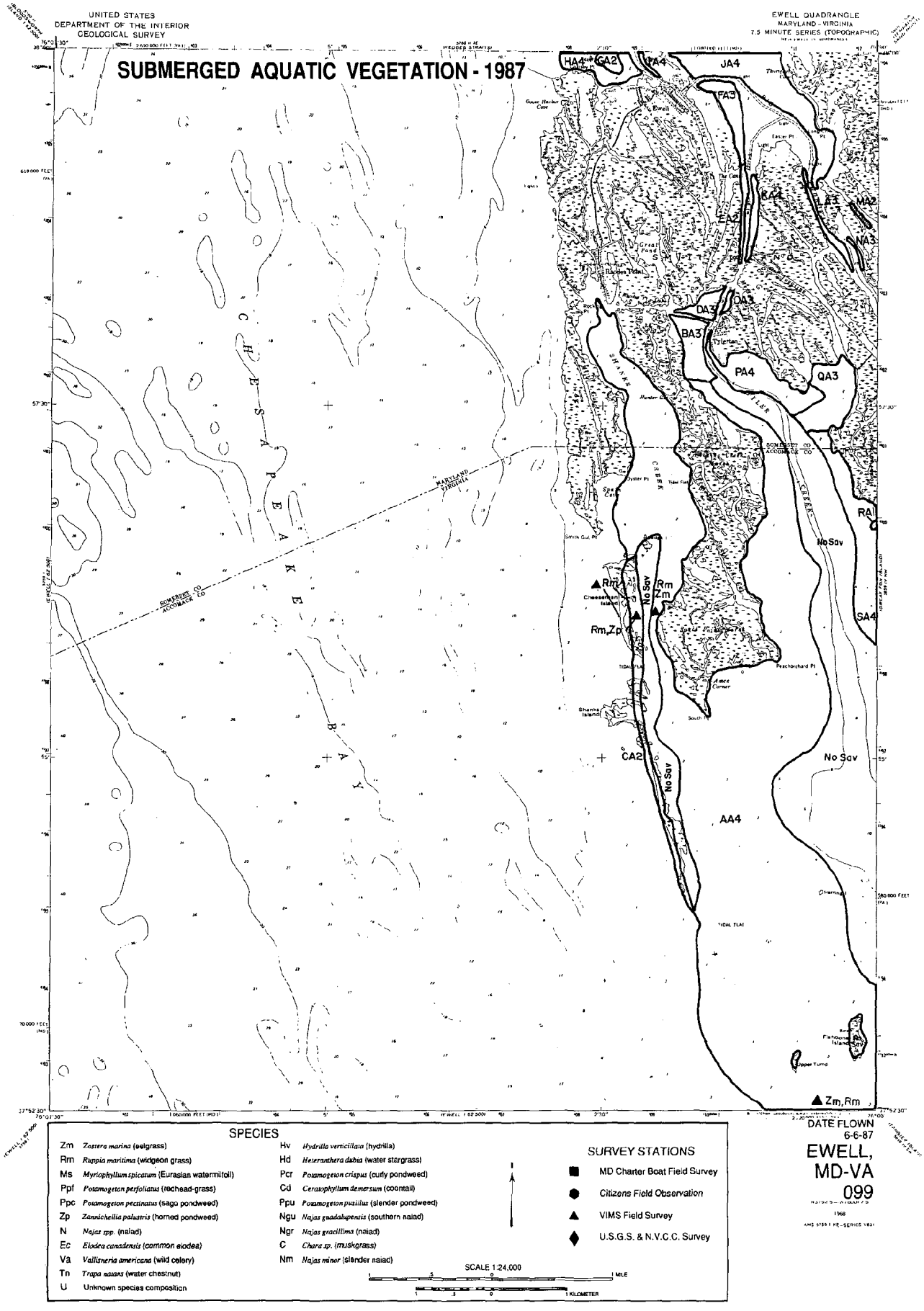
1 0 1 MILE

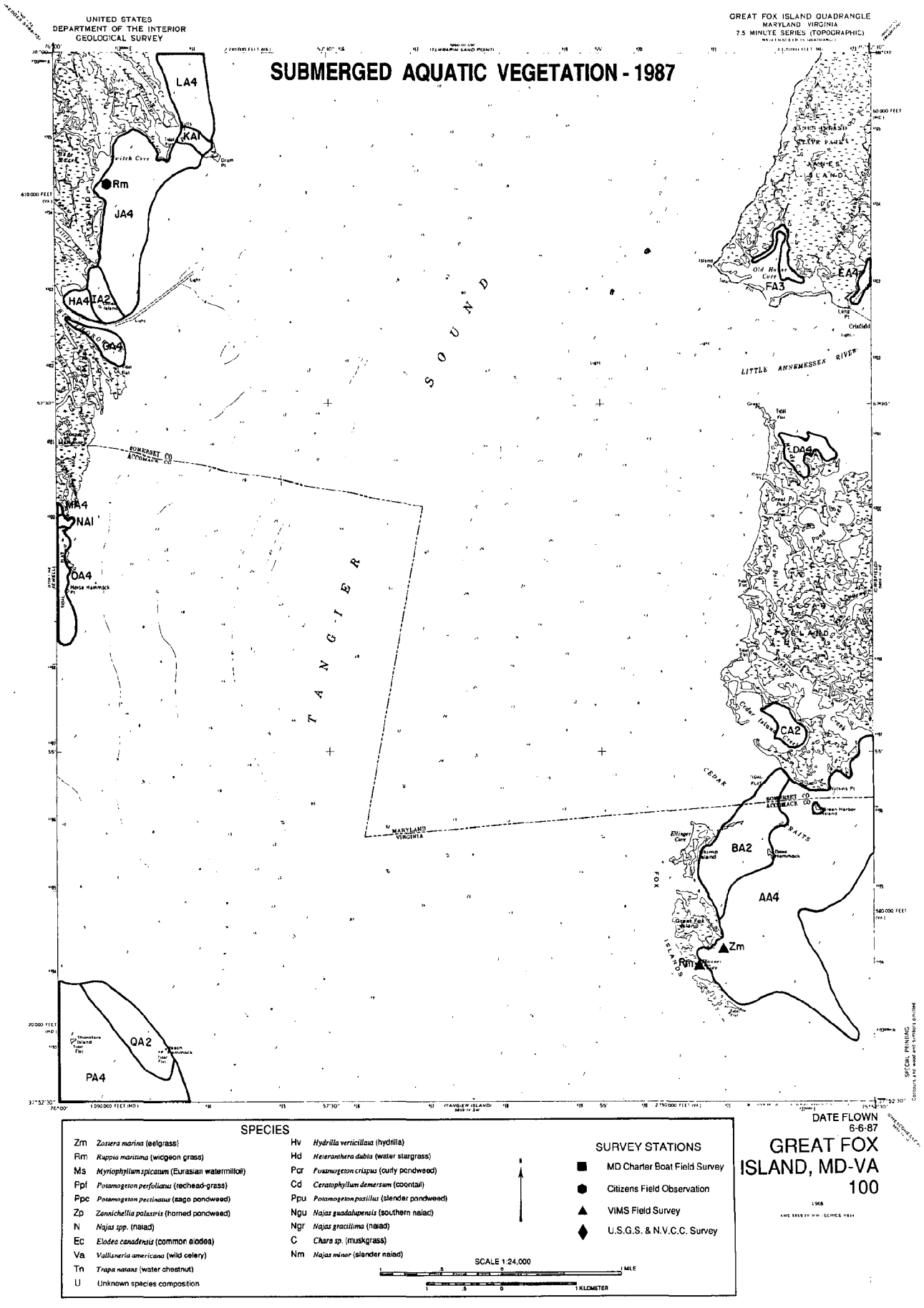
1 0 1 KILOMETER

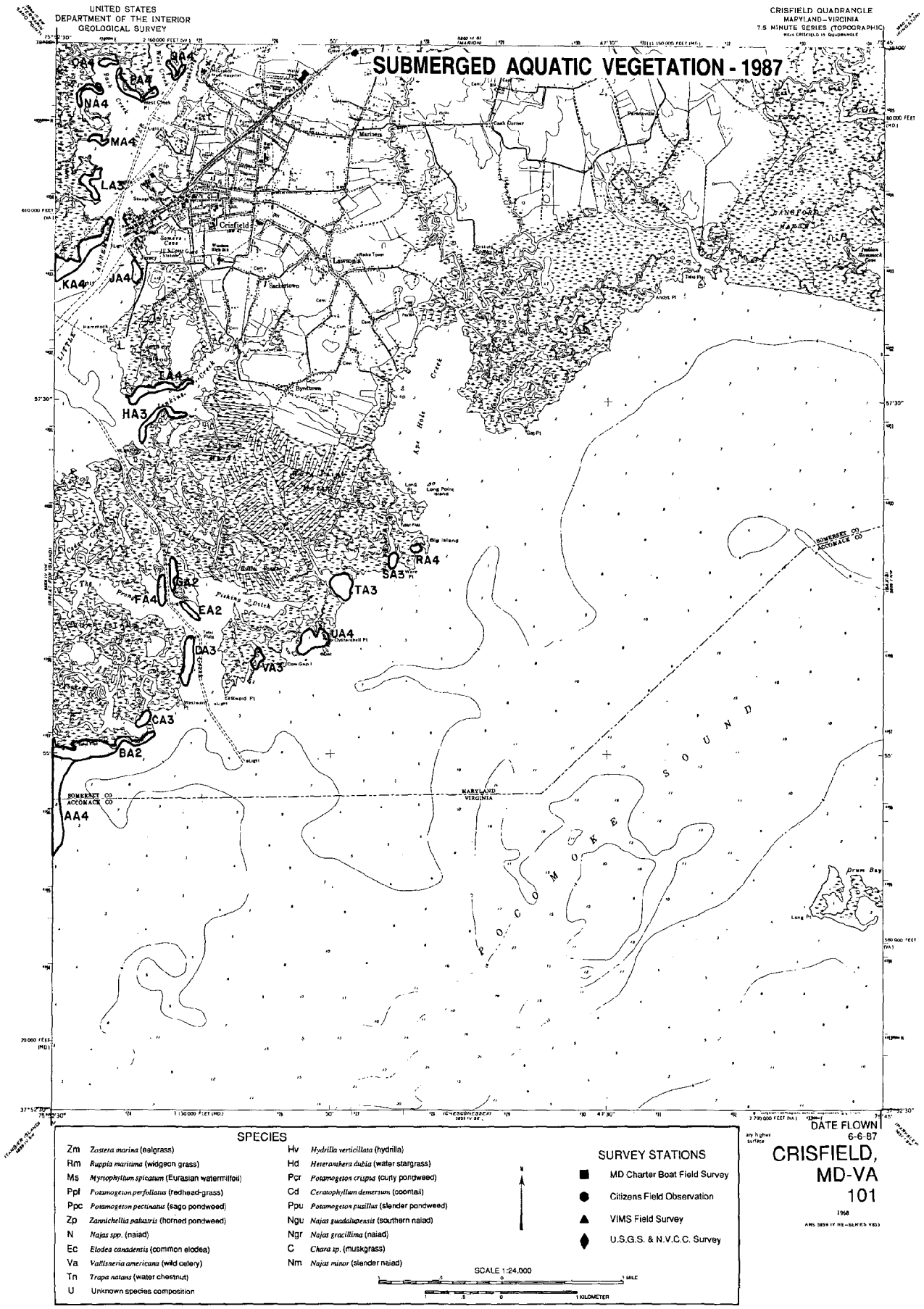
DATES FLOWN
6-6-87 Smith Is.
10-5-87 Deal Is.

TERRAPIN SAND POINT, MD
092


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
MARION QUADRANGLE
MARYLAND SOMERSET CO
7.5 MINUTE SERIES ORTHOPHOTOMAP (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
MANOKIN RIVER
FAIRMOUNT NECK
HOLLAND NECK
FAIRMOUNT STATE WILDLIFE MANAGEMENT AREA
BIG ANNEMESSEX RIVER
JANES ISLAND
JANES ISLAND STATE PARK
Upper Fairmount
Fairmount
Landonville
Holland Point
Myrtle Point
Moon Bay
Marion
Crisfield Municipal Airport
Hopewell
Trailer Park
Tulls Corner
PENN CENTRAL
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATES FLOWN
6-6-87 Big Annemessex R.
10-5-87 Manokin R.
MARION,
MD
093


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
EWELL QUADRANGLE
MARYLAND - VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
CHESAPEAKE BAY
MARYLAND
VIRGINIA
SOMERSET CO
ACCOMACK CO
HA4
GA2
FA4
JA4
FA3
KA4
EA2
LA3
MA2
NA3
DA3
CA3
BA3
PA4
QA3
RA
SA4
AA4
CA2
Rm
Zm
Rm,Zp
No Sav
Zm,Rm
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATE FLOWN
6-6-87
EWELL,
MD-VA
099
1968


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
GREAT FOX ISLAND QUADRANGLE
MARYLAND VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
SOUND
TANGIER
LITTLE ANNEMESSEX RIVER
MARYLAND
VIRGINIA
SOMERSET CO
ACCOMACK CO
LA4
KA1
Rm
JA4
HA4
IA2
GA4
MA4
NA1
OA4
FA3
EA4
DA4
CA2
BA2
AA4
Zm
QA2
PA4
SPECIAL PRINTING
DATE FLOWN
6-6-87
GREAT FOX
ISLAND, MD-VA
100
1968
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER

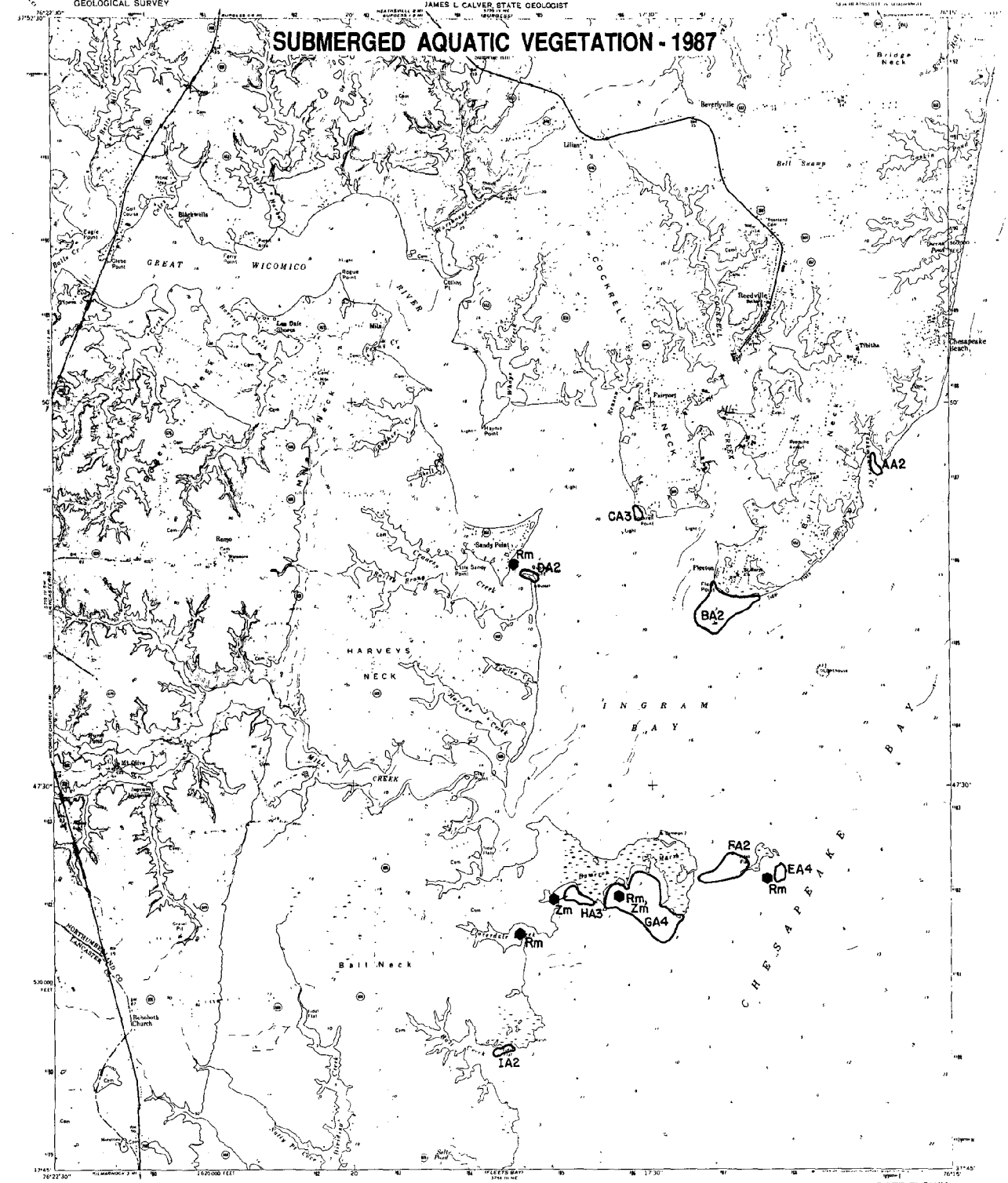

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
CRISFIELD QUADRANGLE
MARYLAND–VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
CA4
PA4
NA4
MA4
LA3
KA4
JA4
IA4
HA3
GA2
FA4
EA2
DA3
CA3
BA2
AA4
VA3
UA4
TA3
SA3
RA4
Crisfield
Lawsonia
Sackertown
Ape Hole Creek
Big Island
Long Point Island
Drum Bay
POCOMOKE SOUND
SOMERSET CO
ACCOMACK CO
MARYLAND
VIRGINIA
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppl Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATE FLOWN
6-6-87
CRISFIELD,
MD-VA
101
1968

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

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

REEDVILLE QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION - 1987



SPECIES

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

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

1 MILE

1 KILOMETER

DATE FLOWN
6-28-87

REEDVILLE, VA

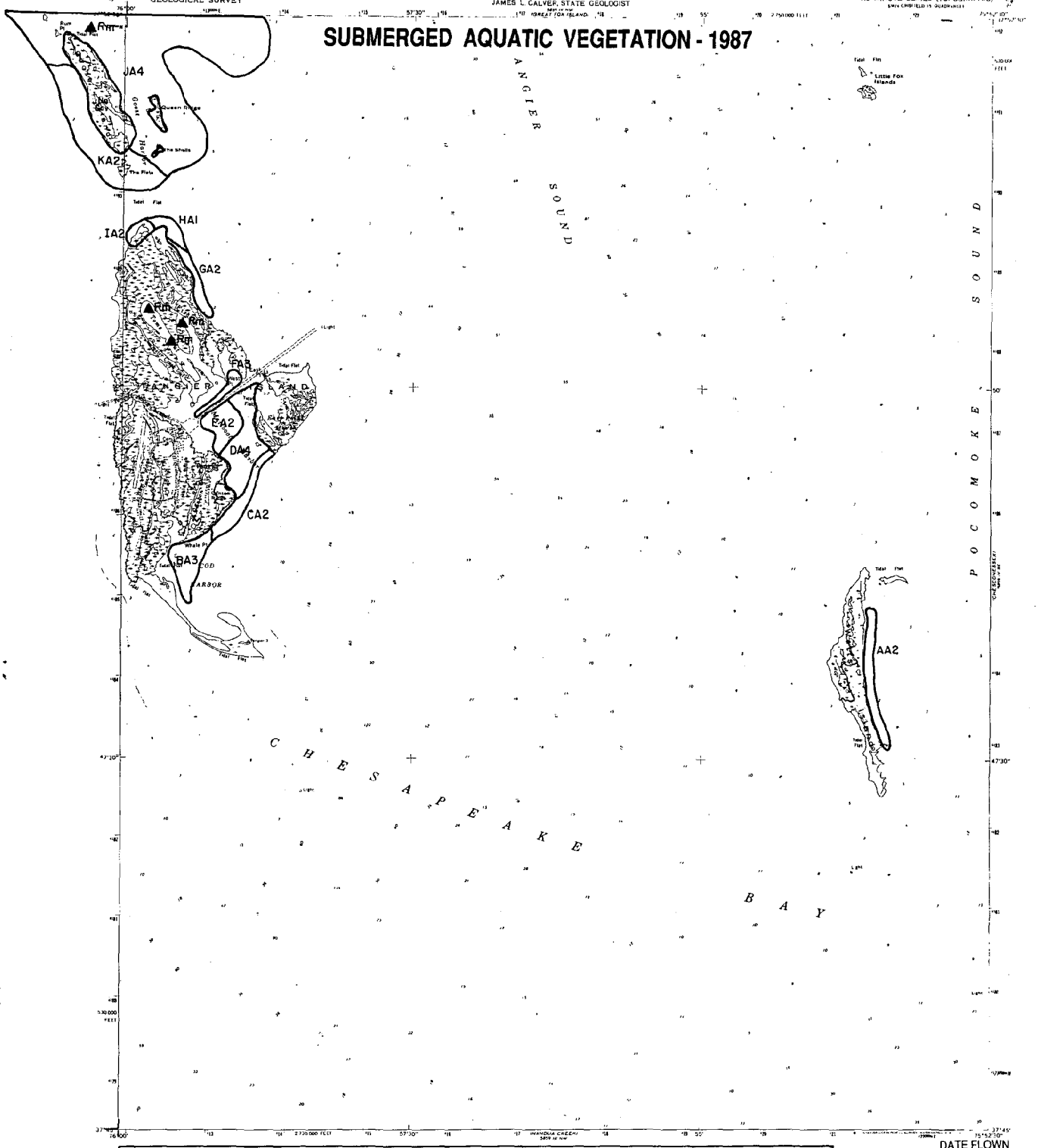
106

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

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

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

SUBMERGED AQUATIC VEGETATION - 1987



SPECIES

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

SURVEY STATIONS

- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

1 MILE

1 KILOMETER

DATE FLOWN
6-6-87

TANGIER ISLAND,
VA
107

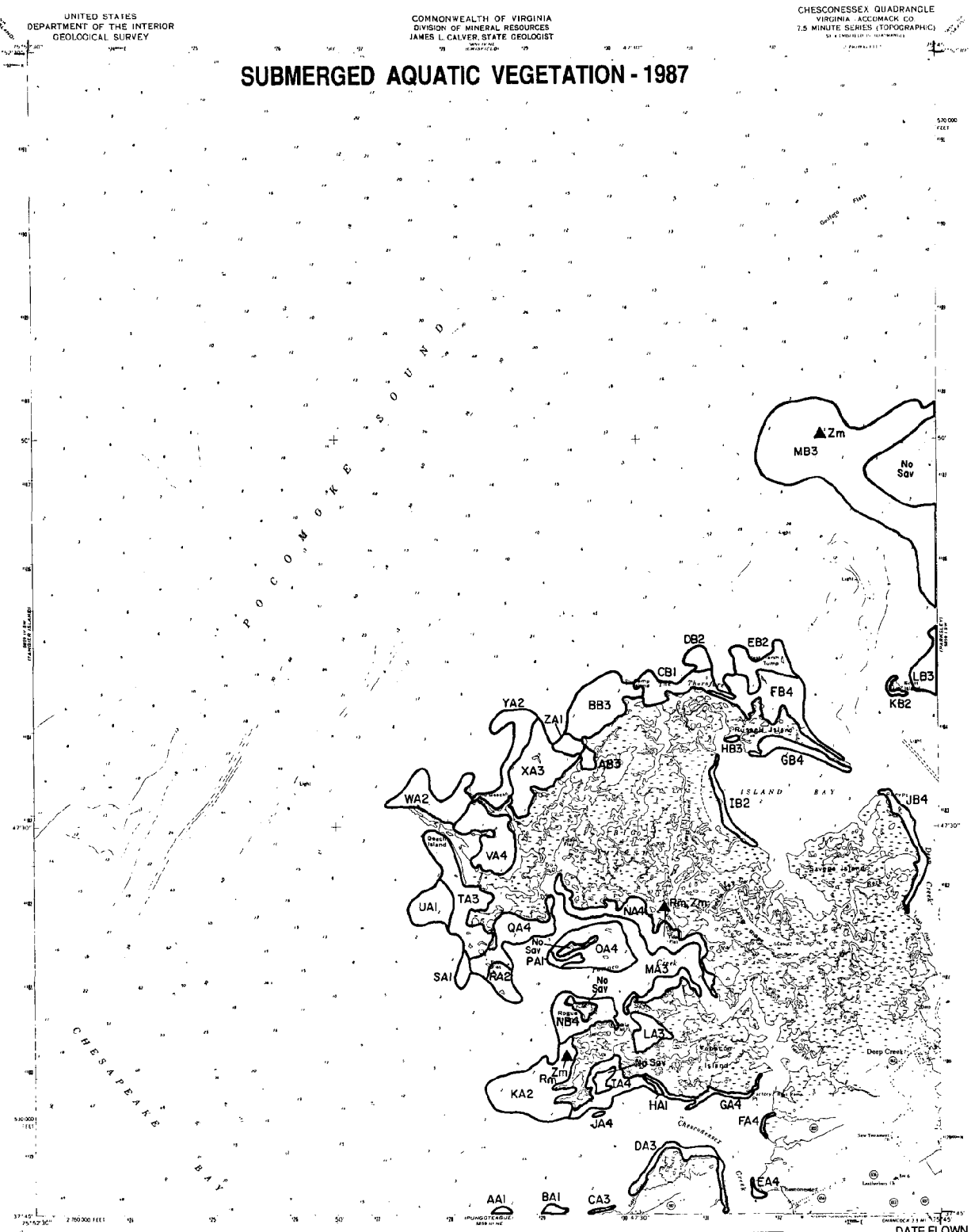
1968

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

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

CHESCONESSEX QUADRANGLE
VIRGINIA - ACCOMACK CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION - 1987



SPECIES

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

SURVEY STATIONS

- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

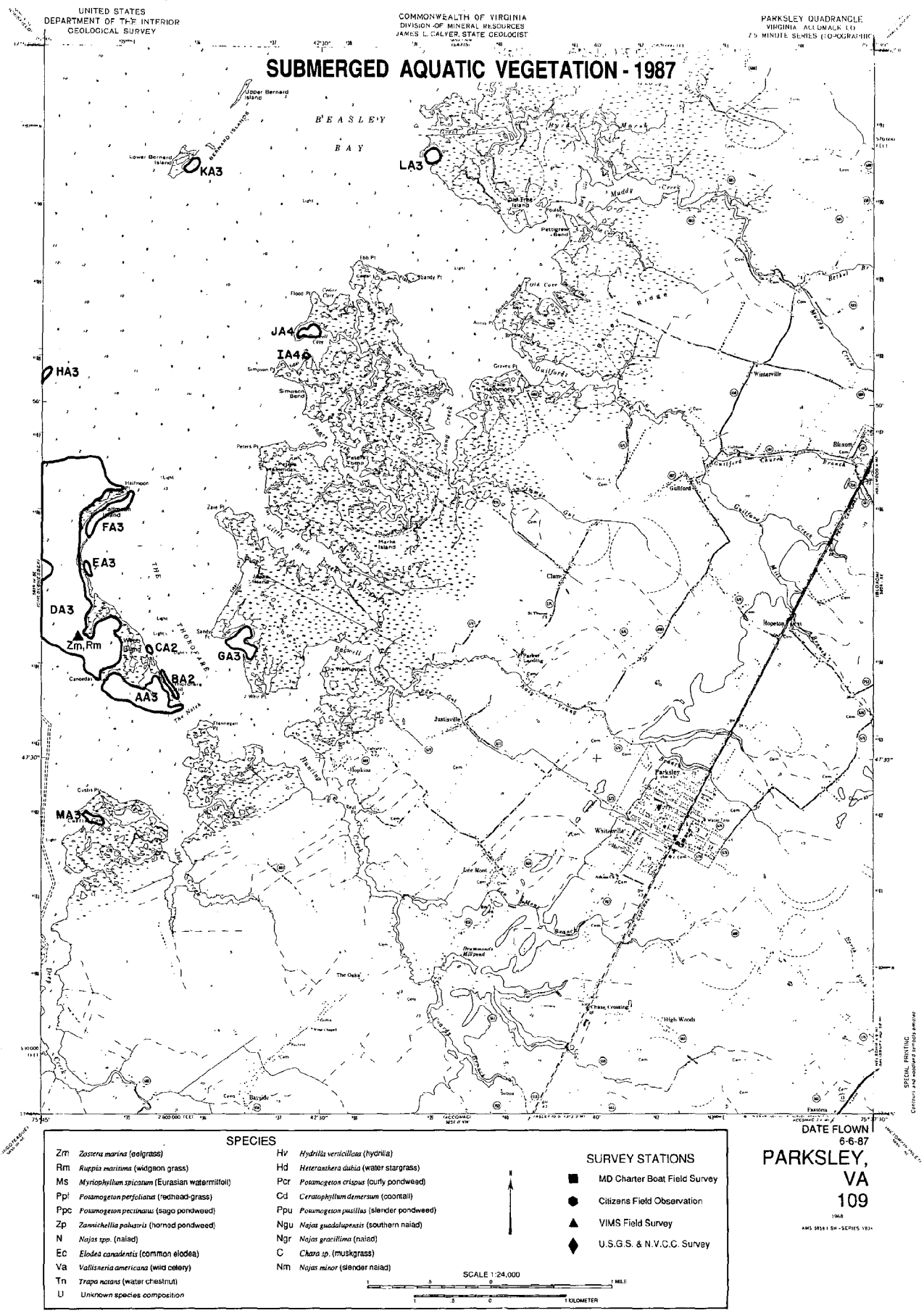
1 MILE

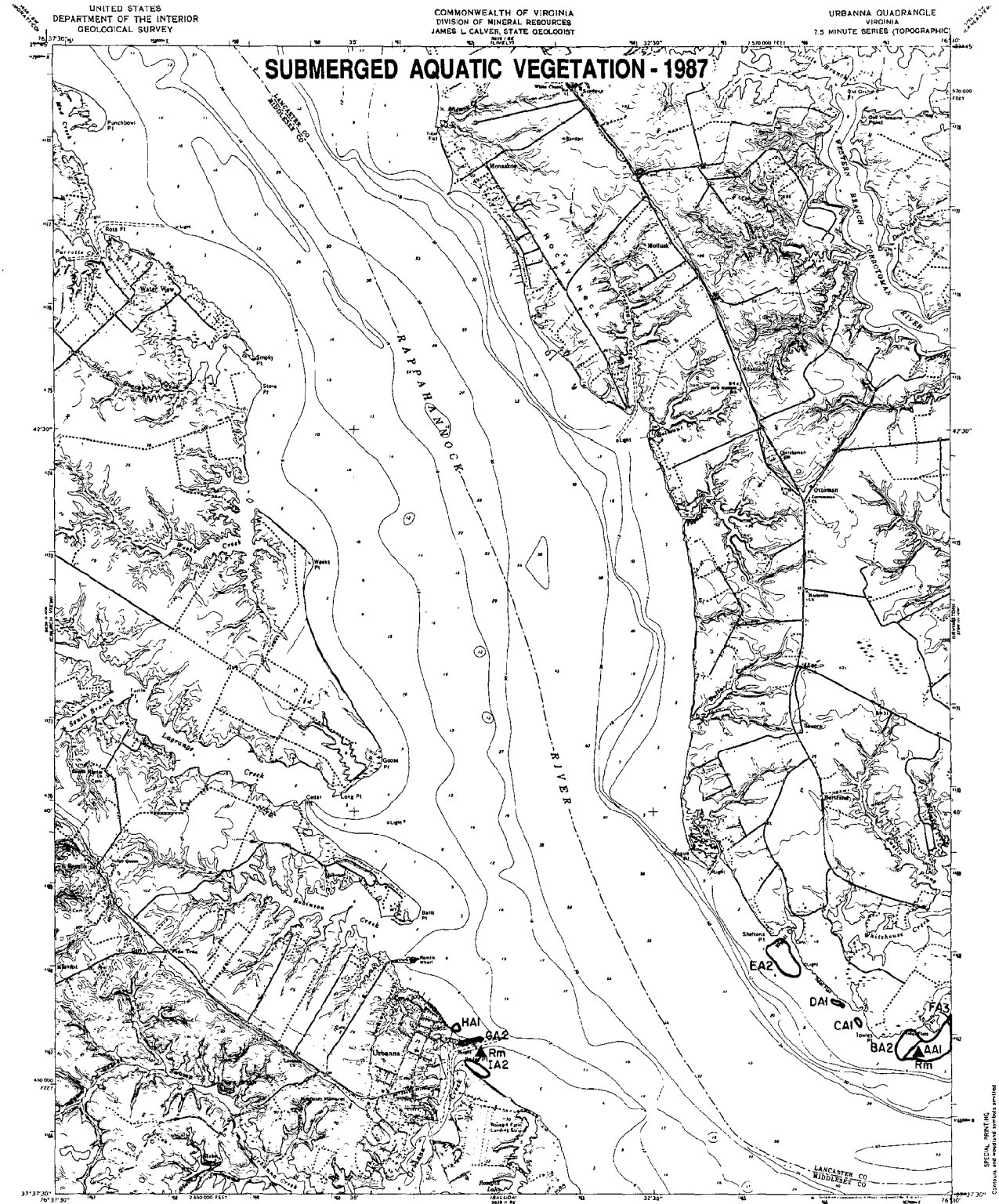
1 KILOMETER

DATE FLOWN
6-6-67

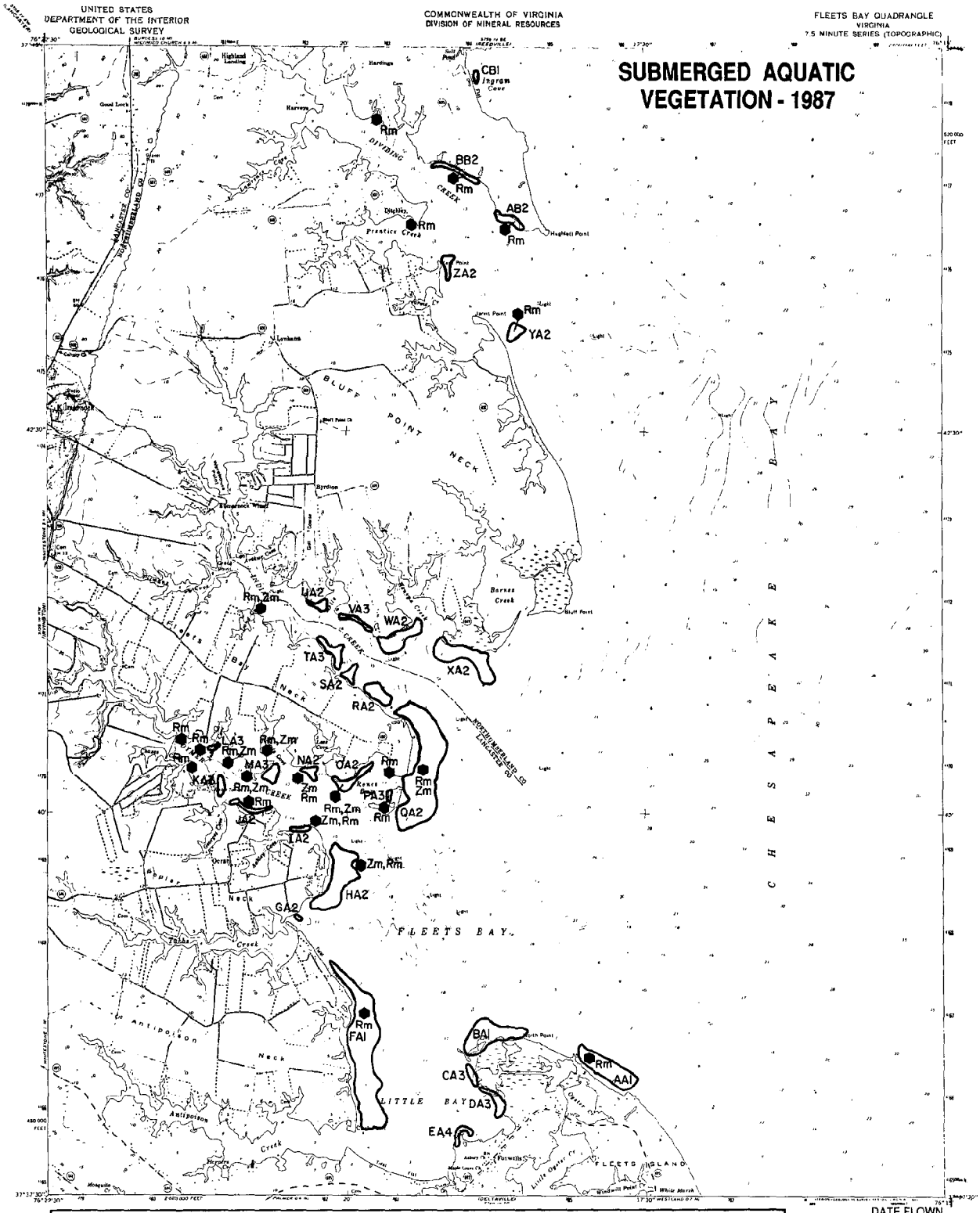
CHESCONESSEX, VA
108

1968

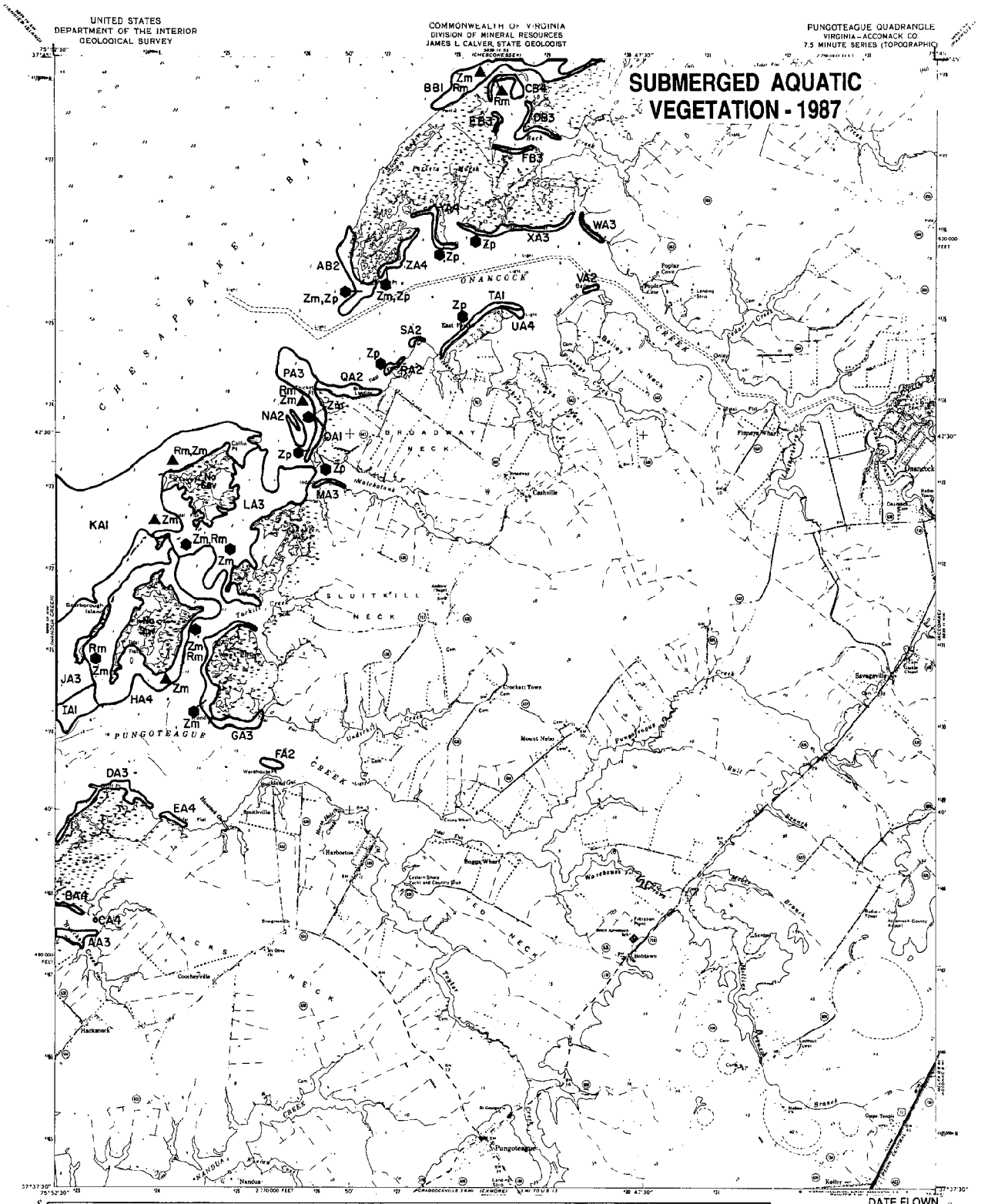

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES
JAMES L. CALVER, STATE GEOLOGIST
PARKSLEY QUADRANGLE
VIRGINIA-ACCOMACK CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
BEASLEY BAY
KA3
LA3
JA4
IA4
HA3
FA3
EA3
DA3
Zm,Rm
CA2
GA3
BA2
AA3
MA3
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATE FLOWN
6-6-87
PARKSLEY, VA
109
1968
SPECIAL PRINTING


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES
JAMES L. CALVER, STATE GEOLOGIST
URBANNA QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
RAPPAHANNOCK
RIVER
EA2
DAI
CAI
FA3
BA2
AAI
Rm
HAI
GA2
Rm
IA2
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATE FLOWN
6-28-87
URBANNA,
VA
110
1968

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES
IRVINGTON QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
JA3
IA3
HA3
KA2
LA3
MA3
NA3
OA4
PA4
QA3
RA2
SA4
GA3
FA1
EA4
TA2
UA3
VA3
WA1
DA4
BA2
CA2
AA3
Rm
Kilmarnock
Pitmans Corner
Irvington
White Stone
RAPPAHANNOCK
RIVER
LANCASTER CO
MIDDLESEX CO
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATE FLOWN
6-28-87
IRVINGTON,
VA
111
1968
PHOTOREVISED 1979


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES
FLEETS BAY QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
CHESAPEAKE BAY
FLEETS BAY
LITTLE BAY
BLUFF POINT NECK
Rm
BB2
AB2
ZA2
YA2
VA3
WA2
XA2
TA3
SA2
RA2
LA3
MA3
NA2
QA2
PA3
KA2
IA2
HA2
GA2
FA1
BA1
AA1
CA3
DA3
EA4
Rm,Zm
Zm,Rm
Zm
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATE FLOWN
6-28-87
FLEETS BAY, VA
112
1968
PHOTOINSPECTED 1978
DMA 5759 III NE-SERIES V834

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES
JAMES L. CALVER, STATE GEOLOGIST
NANDUA CREEK QUADRANGLE
VIRGINIA - ACCOMACK CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
C H E S A P E A K E
B A Y
LA1
KA3
JA3
IA1
HA3
GA3
FA2
EA3
DA4
CA4
AA3
BA1
NANDUA
CREEK
SPECIAL PRINTING
Contours and wood and symbols omitted
DATE FLOWN
6-6-87
NANDUA CREEK,
VA
113
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER



SPECIES

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

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ⬢ Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

DATE FLOWN
6-6-87

PUNGOTEAGUE, VA

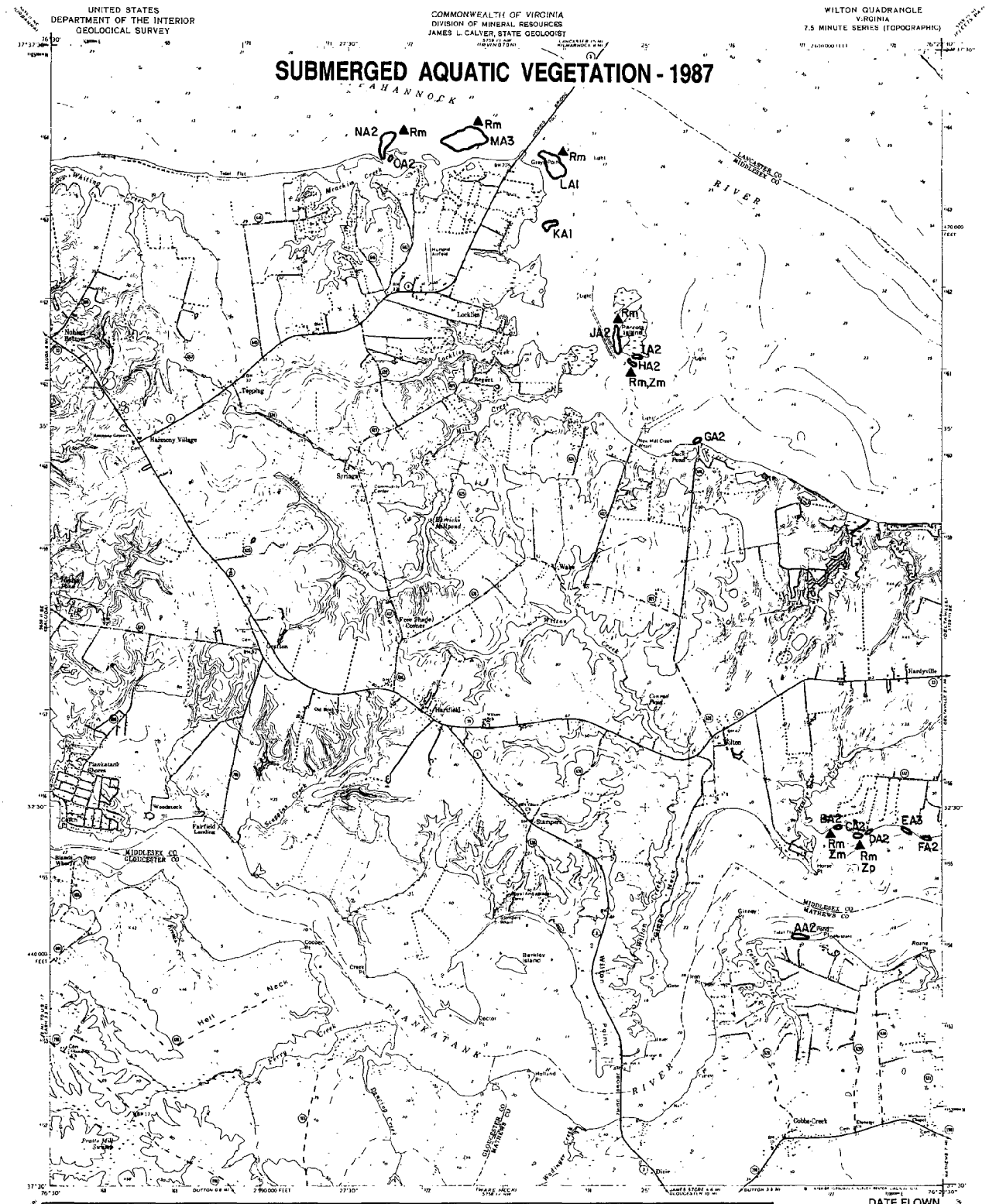
114

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

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

WILTON QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION - 1987



SPECIES

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

SURVEY STATIONS

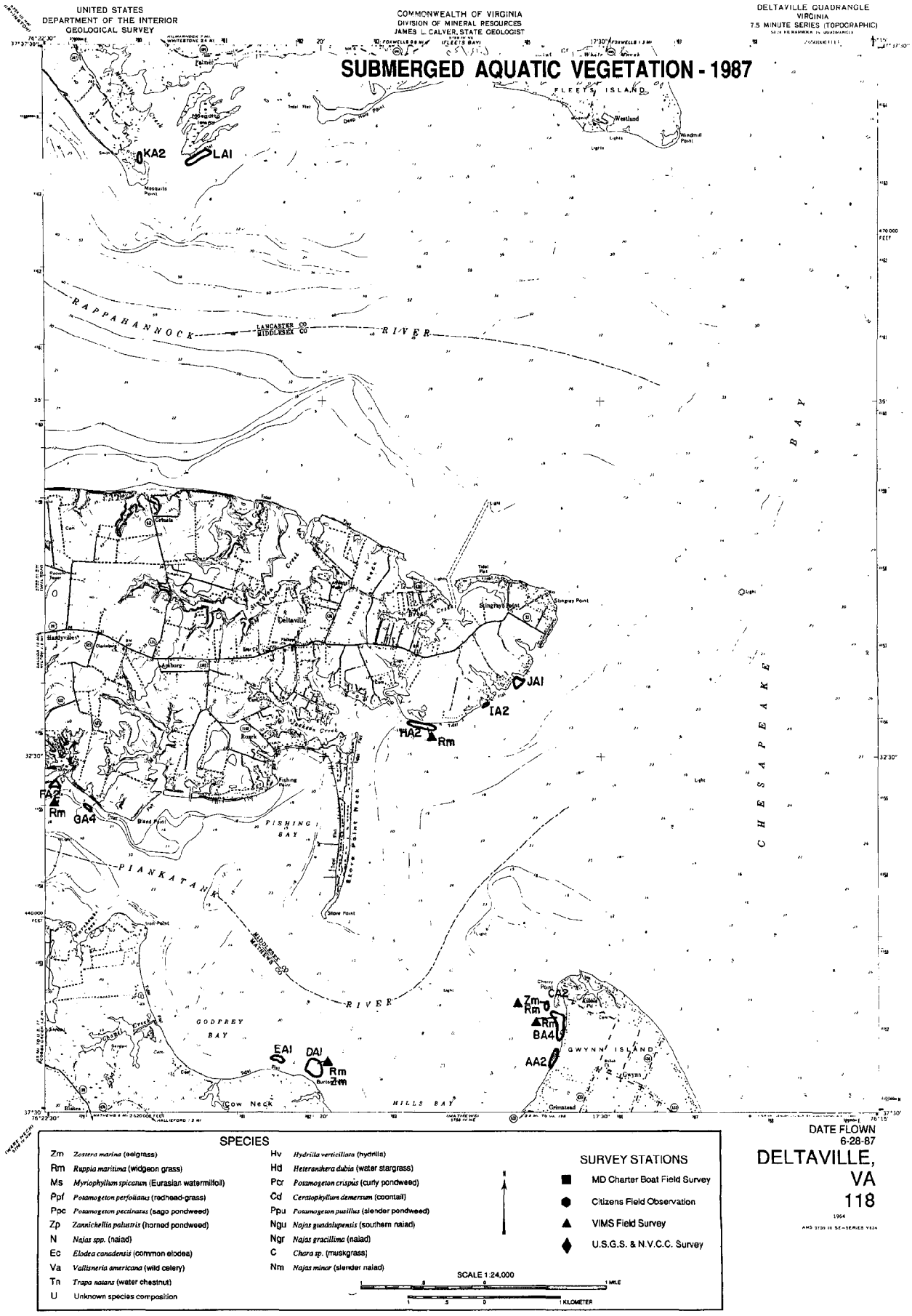
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

DATE FLOWN
6-28-87

WILTON, VA
117

1964
PHOTOREVISED 1973
AMS 5759 III SW-SERIES V834

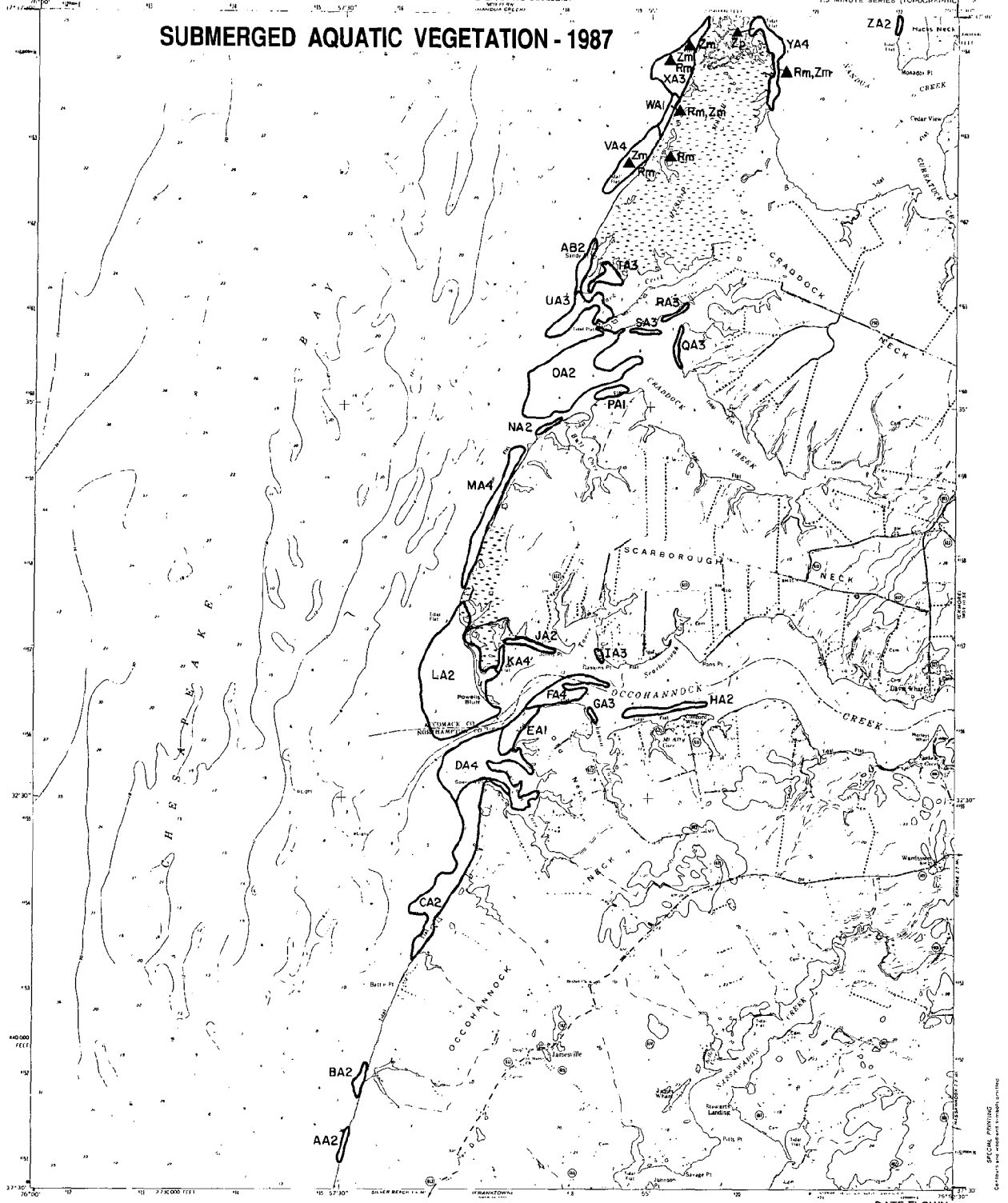

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES
JAMES L. CALVER, STATE GEOLOGIST
DELTAVILLE QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
KA2
LAI
FLEETS ISLAND
Westland
RAPPAHANNOCK
LANCASTER CO
MIDDLESEX CO
RIVER
CHESAPEAKE
BAY
Deltaville
JAI
IA2
HA2
Rm
FA2
GA4
FISHING
BAY
PIANKATANK
RIVER
GODFREY
BAY
EAI
DAI
Zm
CA2
BA4
AA2
GWYNN ISLAND
HILLS BAY
Cow Neck
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATE FLOWN
6-28-87
DELTAVILLE,
VA
118
1954

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

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

JAMESVILLE QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION - 1987



SPECIES

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

SURVEY STATIONS

- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

1 0 1 MILE

1 0 1 KILOMETER

DATE FLOWN
6-28-87

JAMESVILLE,
VA
119

1968

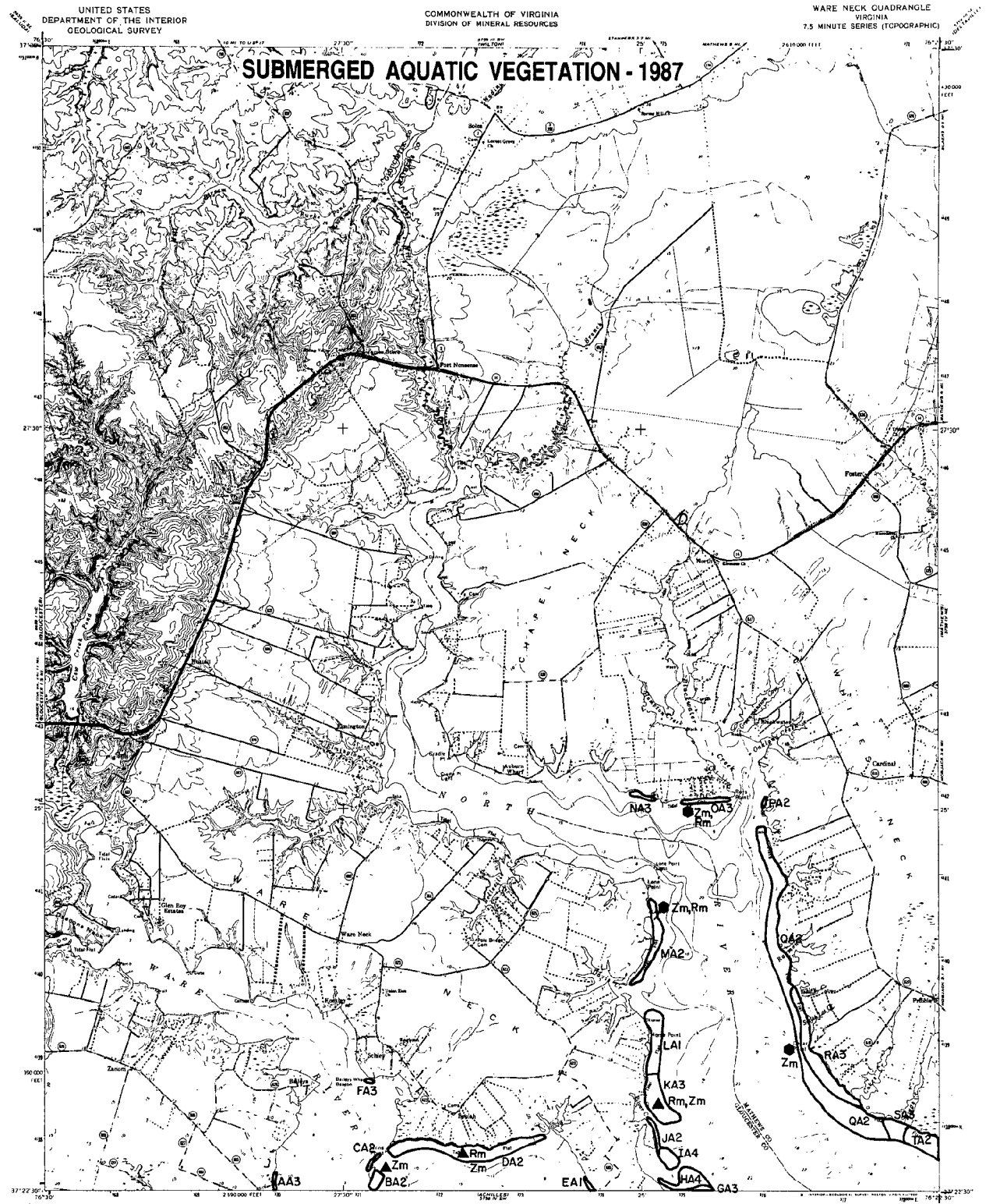
AMS 4854 III SW SERIES V834

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES

WARE NECK QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION - 1987



SPECIES

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

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

1 MILE

1 KILOMETER

DATE FLOWN
6-28-87

WARE NECK,
VA
122

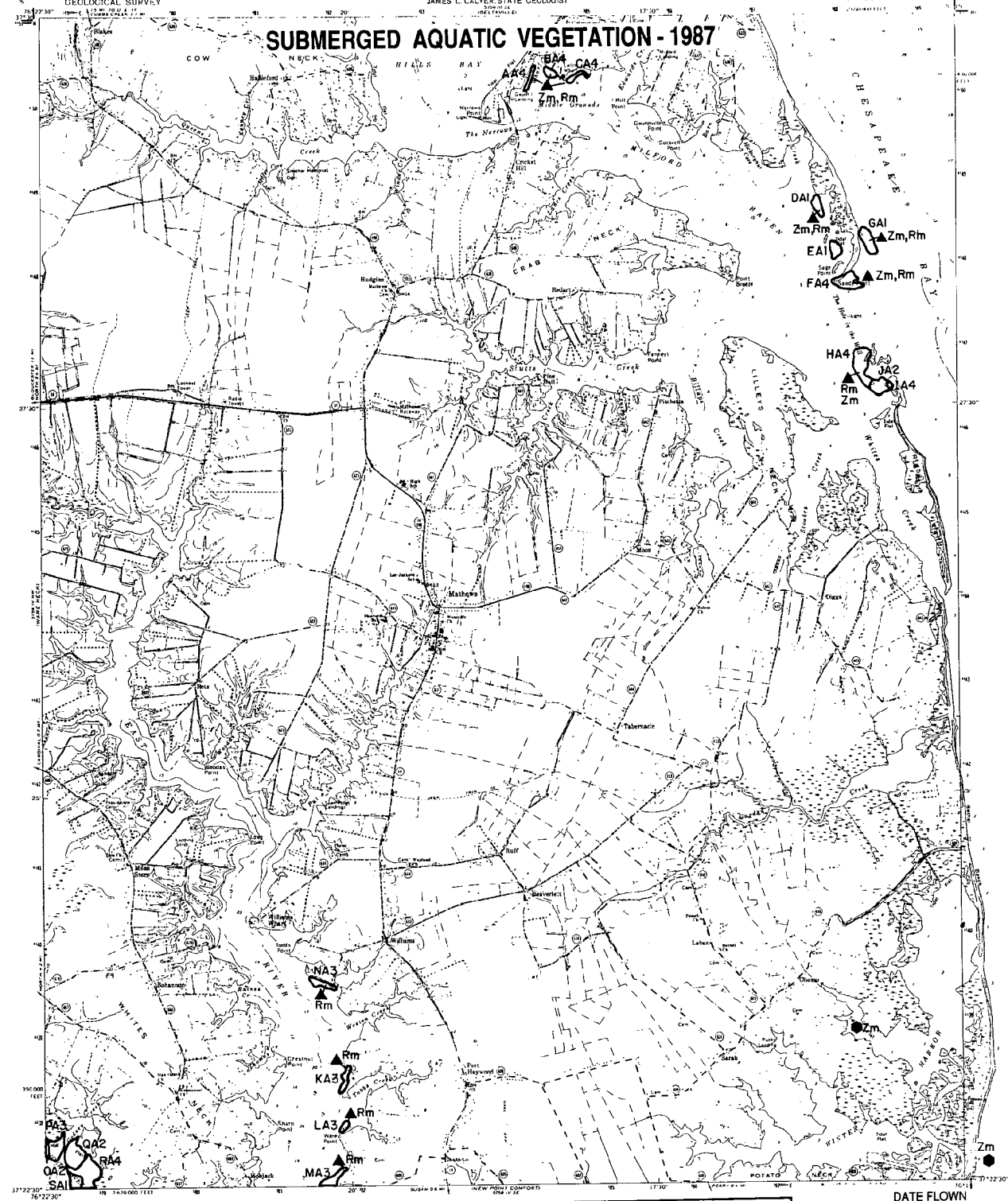
1965
PHOTOREVISED 1980
DMA 5758 IV NW—SERIES V814

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

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

MATHEWS QUADRANGLE
VIRGINIA-MATHEWS CO
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION - 1987



SPECIES

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

SURVEY STATIONS

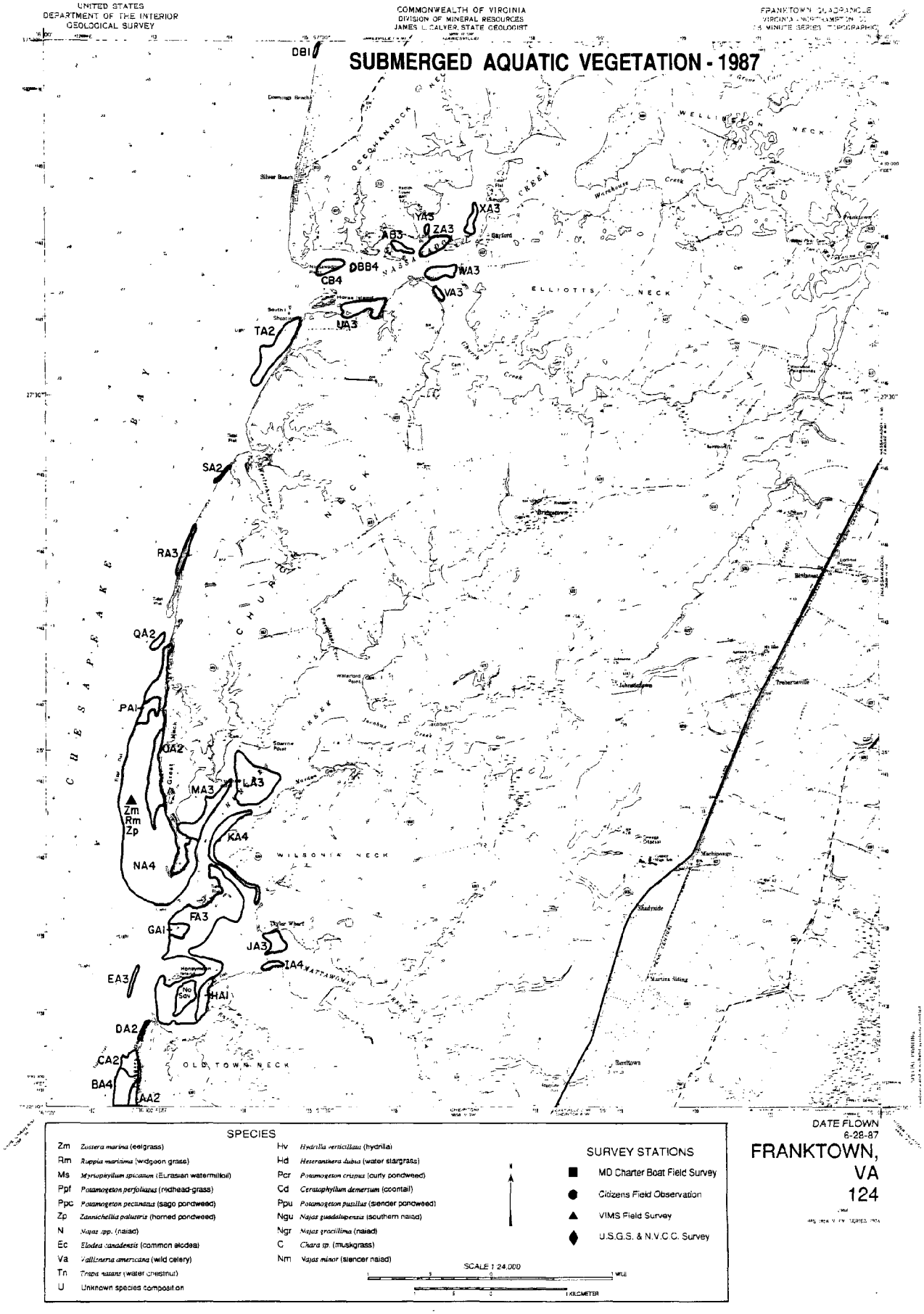
- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S. & N.V.C.C. Survey

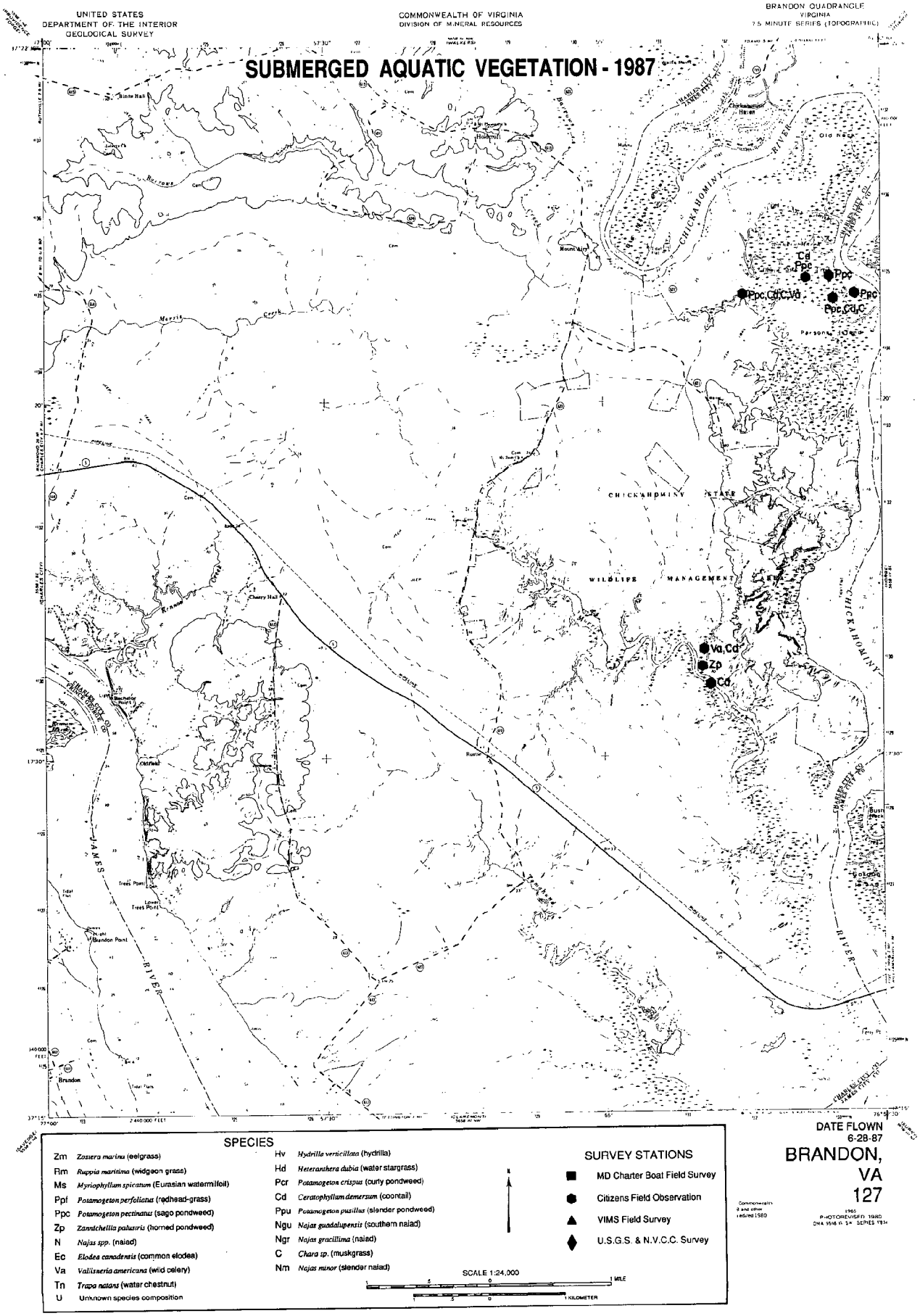
SCALE 1:24,000

DATE FLOWN
6-28-87

MATHEWS,
VA
123

1965


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES
JAMES L. CALVER, STATE GEOLOGIST
FRANKTOWN QUADRANGLE
SUBMERGED AQUATIC VEGETATION - 1987
DB1
XA3
YA3
ZA3
AB3
DB4
CB4
WA3
VA3
UA3
TA2
SA2
RA3
QA2
PA1
OA2
MA3
LA3
KA4
NA4
FA3
GA1
JA3
IA4
EA3
HA1
DA2
CA2
BA4
AA2
Zm
Rm
Zp
No Sav
ELLIOTTS NECK
WILSONIA NECK
OLD TOWN NECK
WELLINGTON NECK
CHESAPEAKE BAY
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
MILE
KILOMETER
DATE FLOWN
6-28-87
FRANKTOWN,
VA
124


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES
BRANDON QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
CHICKAHOMINY RIVER
CHICKAHOMINY WILDLIFE MANAGEMENT AREA
JAMES RIVER
Ppc
Ppc,Cd,C,Va
Ppc,Cd,C
Va,Cd
Zp
Cd
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
DATE FLOWN
6-28-87
BRANDON,
VA
127

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

NORGE QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION - 1987

SPECIES

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

SURVEY STATIONS

- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

DATE FLOWN
6-28-87

NORGE,
VA
128

1984

DATES FLOWN
6-6-87
6-28-87

ACHILLES,
VA
131

SPECIES

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

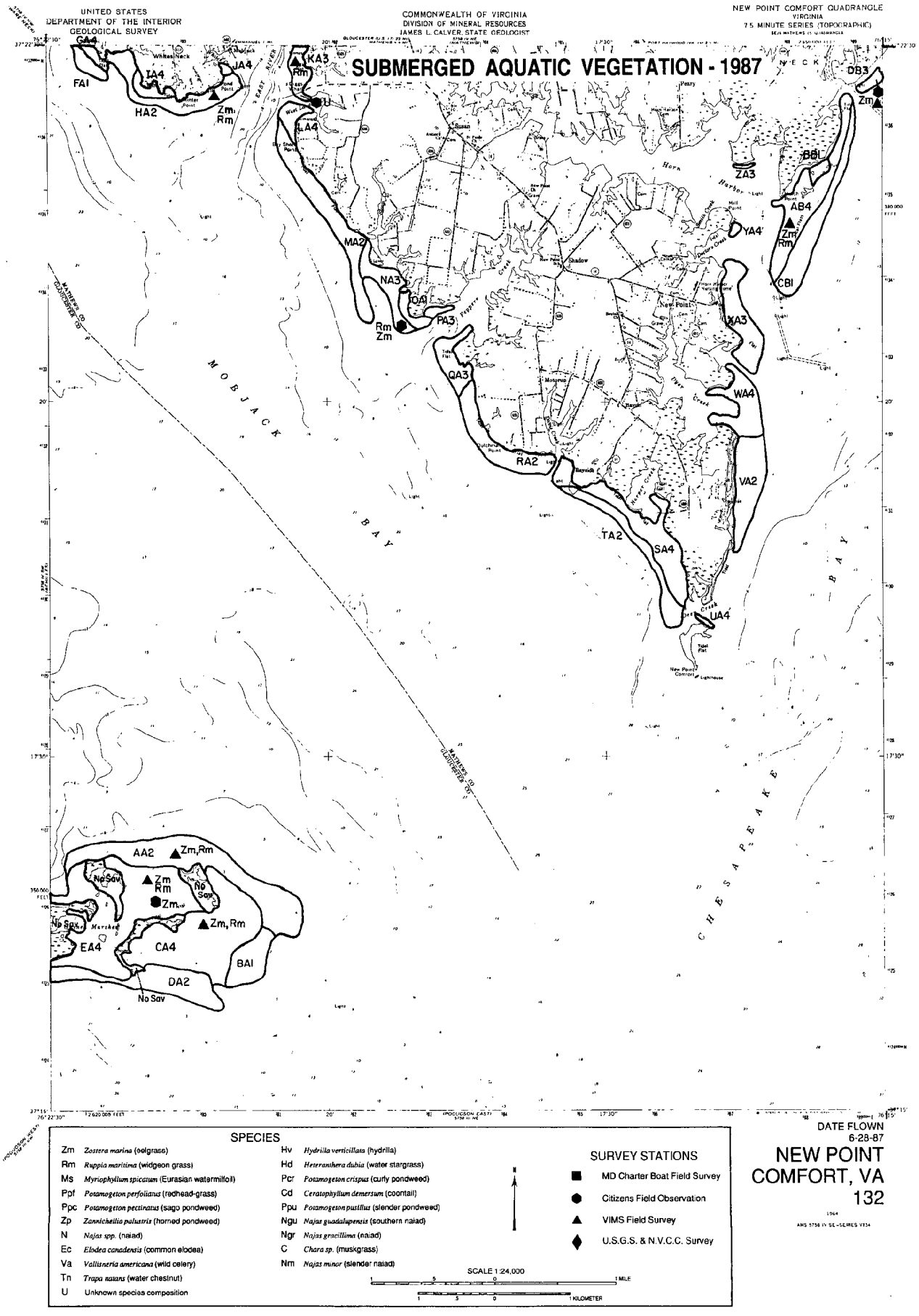
SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ◆ U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

1 MILE

1 KILOMETER


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES
JAMES L. CALVER, STATE GEOLOGIST
NEW POINT COMFORT QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
NECK
MOBJACK BAY
CHESAPEAKE BAY
GA4
FA1
TA4
JA4
HA2
Zm, Rm
KA3
Rm
U
LA4
MA2
NA3
OA1
Rm Zm
PA3
QA3
RA2
TA2
SA4
UA4
VA2
WA4
XA3
YA4
ZA3
BB1
AB4
CB1
DB3
Zm
AA2
Zm,Rm
No Sav
Zm Rm
Zm
EA4
CA4
BA1
DA2
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATE FLOWN
6-28-87
NEW POINT
COMFORT, VA
132

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

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

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

SUBMERGED AQUATIC VEGETATION - 1987

SPECIES

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

SURVEY STATIONS

- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

1 MILE

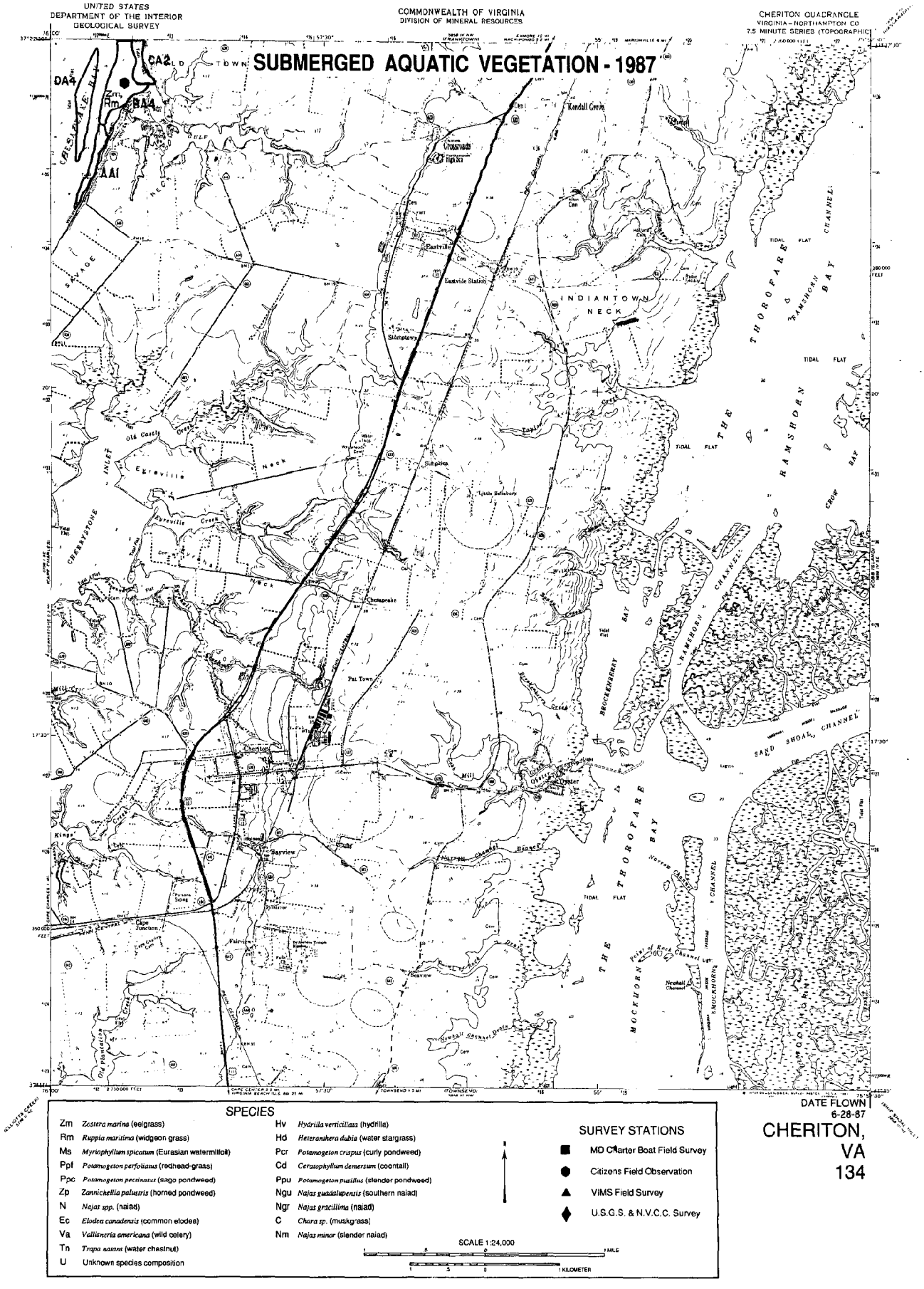
1 KILOMETER

DATE FLOWN
6-28-87

CAPE CHARLES,
VA
133

1968

AMS 5758 I SE-SERIES V814

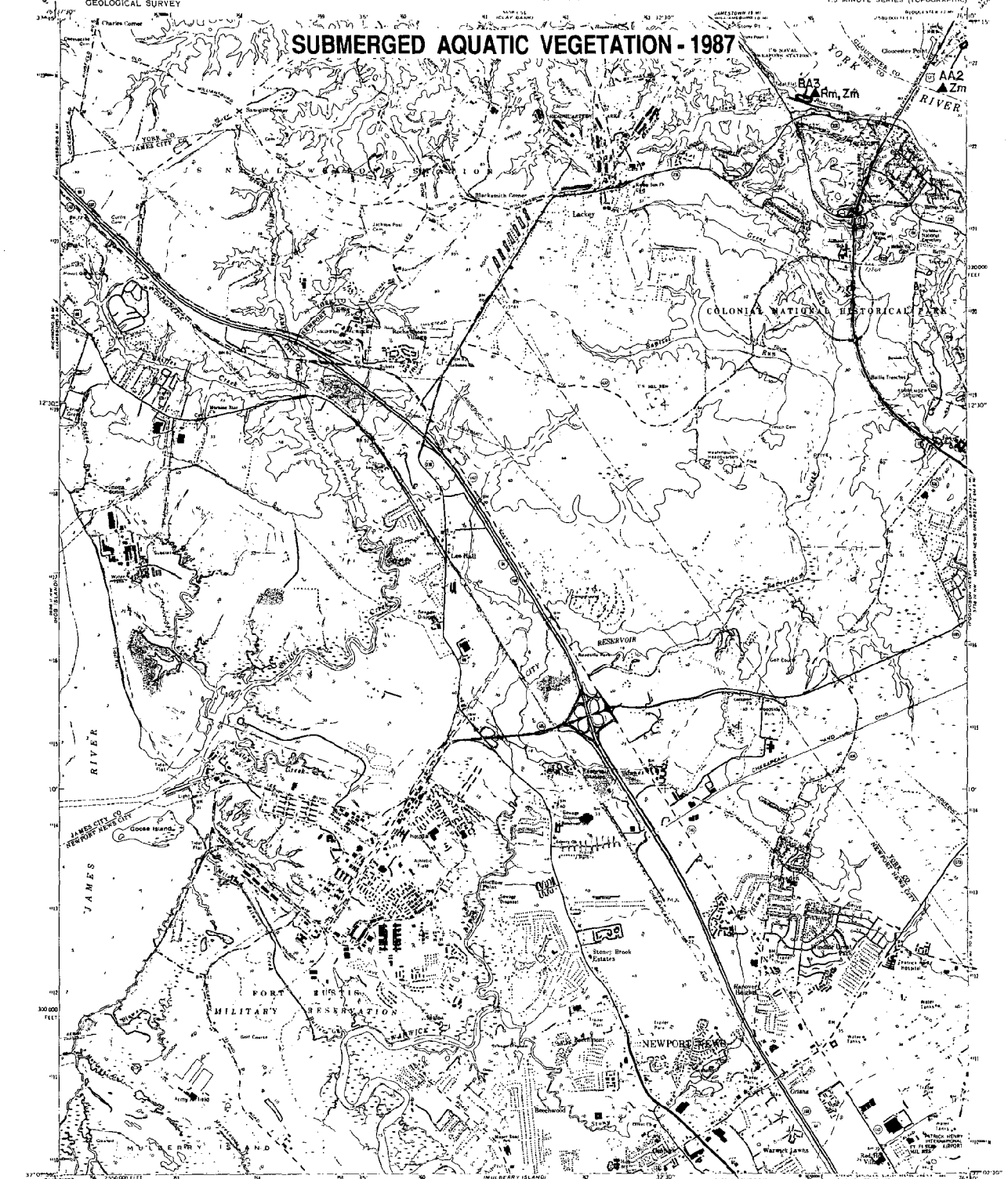

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES
CHERITON QUADRANGLE
VIRGINIA - NORTHAMPTON CO
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
DA4
CA2
BA4
AA1
Zm
Rm
INDIANTOWN NECK
THOROFARE
HAMMOCK BAY
CHANNEL
TIDAL FLAT
Cheriton
Pat Town
Sayview
Eastville
Eastville Station
Kendall Grove
Stumpsburg
Old Castle
Eyreville
Eyreville Creek
Chesapeake
Little Salisbury
Brickhouse Creek
Mill Creek
Nassawadox Creek
Nassawadox
Cape Charles Junction
Fairview
Old Plantation Creek
Newhall Channel
Point of Rock Channel
SAND SHOAL CHANNEL
CHESAPEAKE BAY
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 0 1 MILE
1 0 1 KILOMETER
DATE FLOWN
6-28-87
CHERITON,
VA
134

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES

YORKTOWN QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION - 1987



SPECIES

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

SURVEY STATIONS

- ■ MD Charter Boat Field Survey
- ● Citizens Field Observation
- ▲ VIMS Field Survey
- ♦ U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

1 MILE

1 KILOMETER

DATE FLOWN
6-6-87

YORKTOWN,
VA
139

1965
PHOTOREVISED 1980
DMA 3628 II NE-SERIES V834

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES

POQUOSON WEST QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION - 1987

SPECIES

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

SURVEY STATIONS

- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

1 .5 0 1 MILE

1 .5 0 1 KILOMETER

DATE FLOWN
6-6-87

POQUOSON
WEST, VA
140

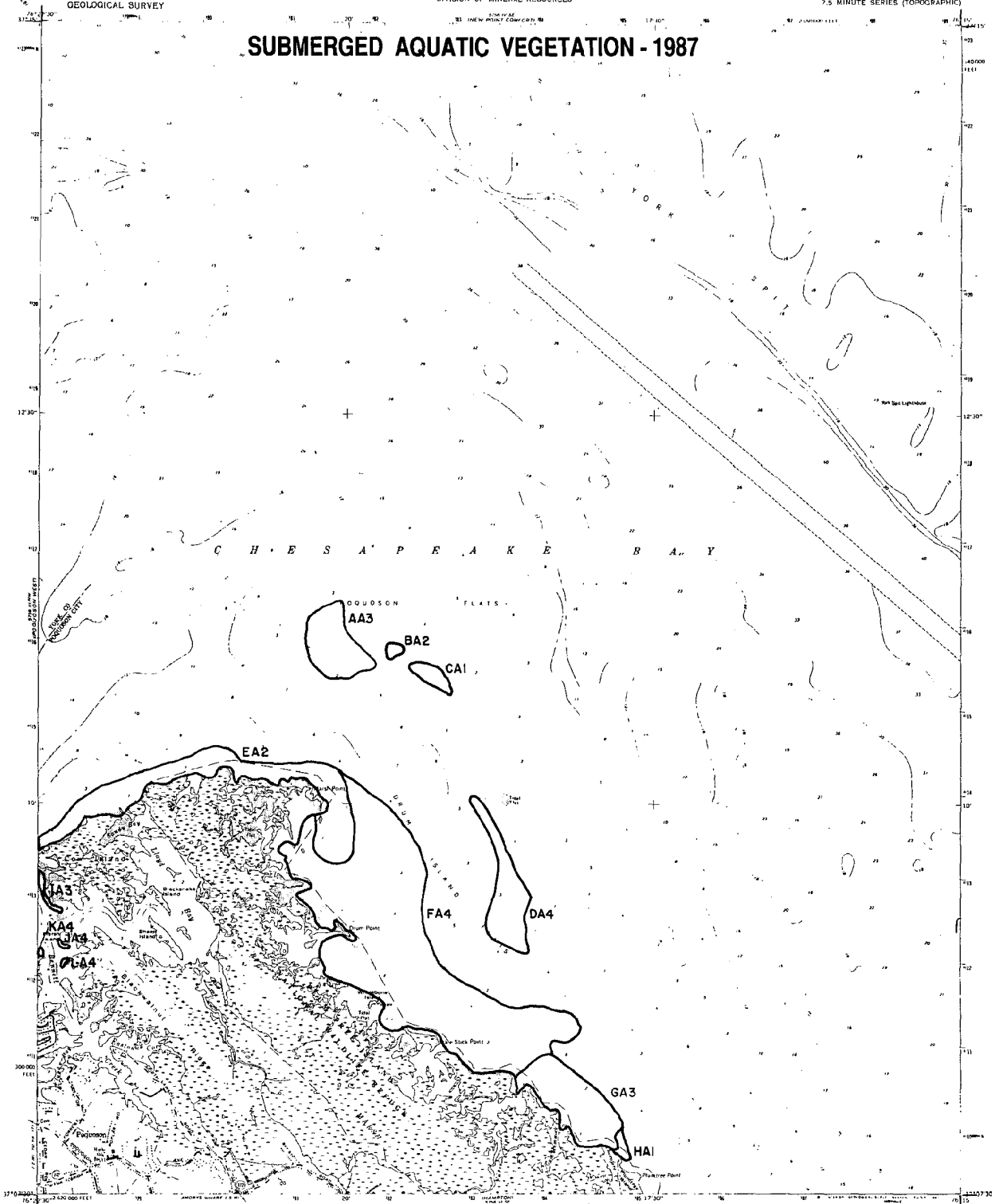
1965
PHOTOREVISED 1979
DMA 5758 III NW—SERIES V834

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES

POQUOSON EAST QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION - 1987



SPECIES

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

SURVEY STATIONS

- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

1 0 1 MILE

1 0 1 KILOMETER

DATE FLOWN
6-6-87

POQUOSON EAST, VA

141

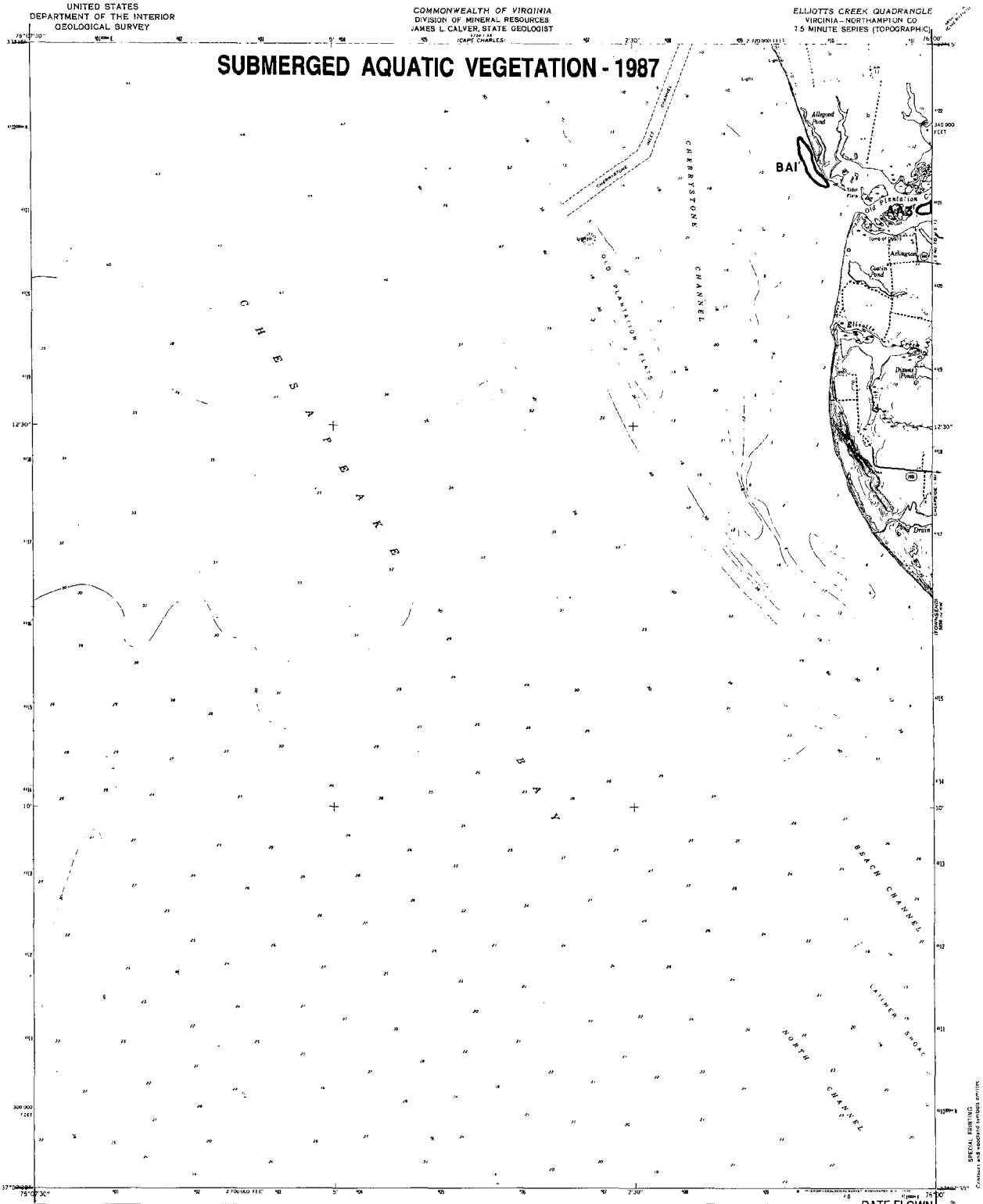
1964
PHOTOREVISED 1979
DMA 5738 III NE-SERIES V834

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

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

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

SUBMERGED AQUATIC VEGETATION - 1987



SPECIES

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

SURVEY STATIONS

- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S. & N.V.C.C. Survey

N

SCALE 1:24,000

1 0 1 MILE

1 0 1 KILOMETER

DATE FLOWN
6-28-87

ELLIOTTS CREEK, VA

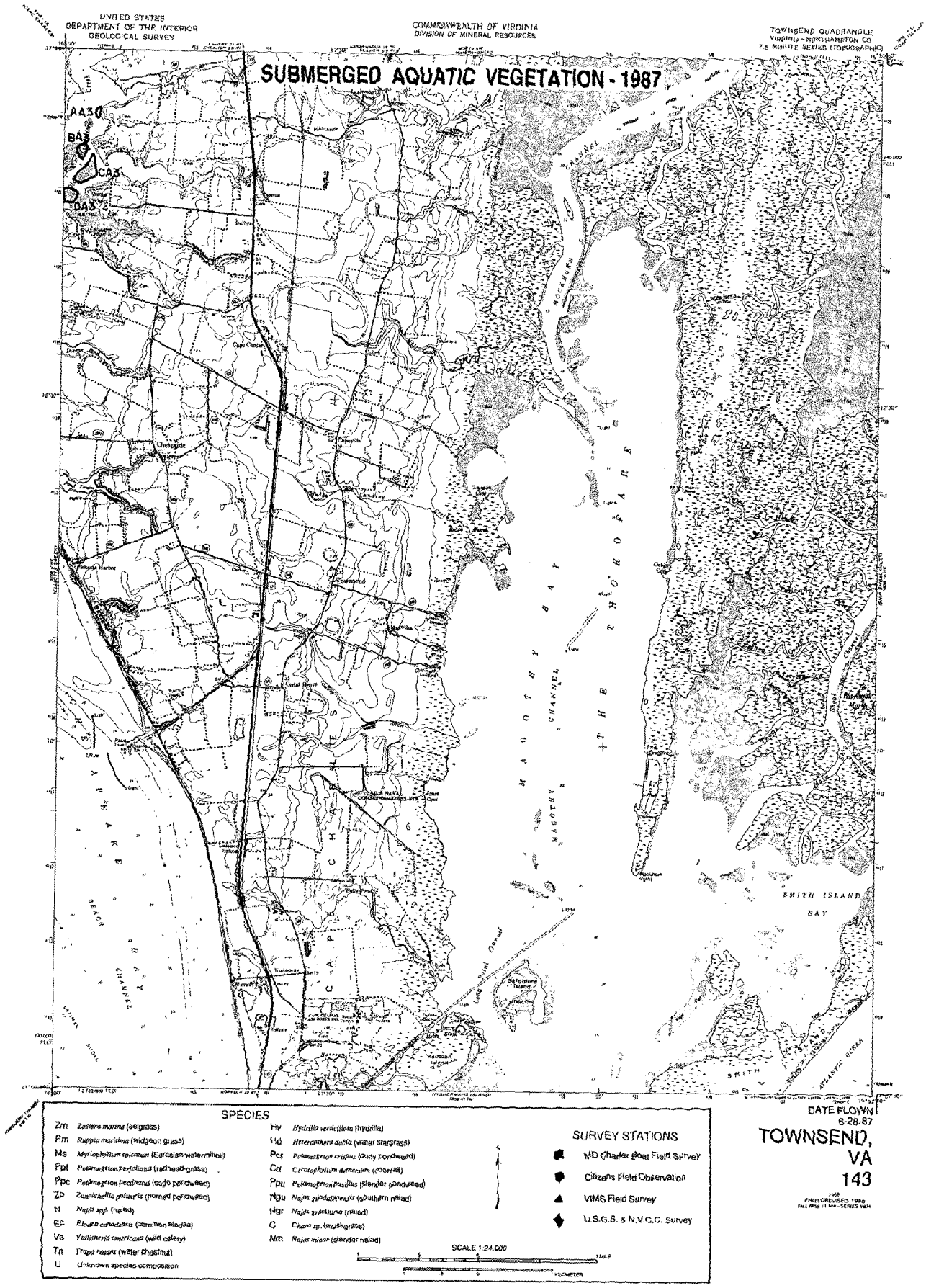
142

N3707.5—W7600/7.5

1968

AMS 5709 II NE—SERIES V834

SPECIAL PRINTING
Contours and woodland symbols omitted


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES
TOWNSEND QUADRANGLE
VIRGINIA-NORTHAMPTON CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
AA30
BA3
CA3
DA3
MOCKHORN CHANNEL
MAGOTHY BAY
THE THOROFARE
MAGOTHY CHANNEL
SMITH ISLAND
BAY
SMITH ISLAND
ATLANTIC OCEAN
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppt Potamogeton perfoliatus (radhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Vs Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Nga Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATE FLOWN
6-28-87
TOWNSEND,
VA
143

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES

HAMPTON QUADRANGLE
VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)

SUBMERGED AQUATIC VEGETATION - 1987

SPECIES

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

SURVEY STATIONS

- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

DATE FLOWN
6-6-87

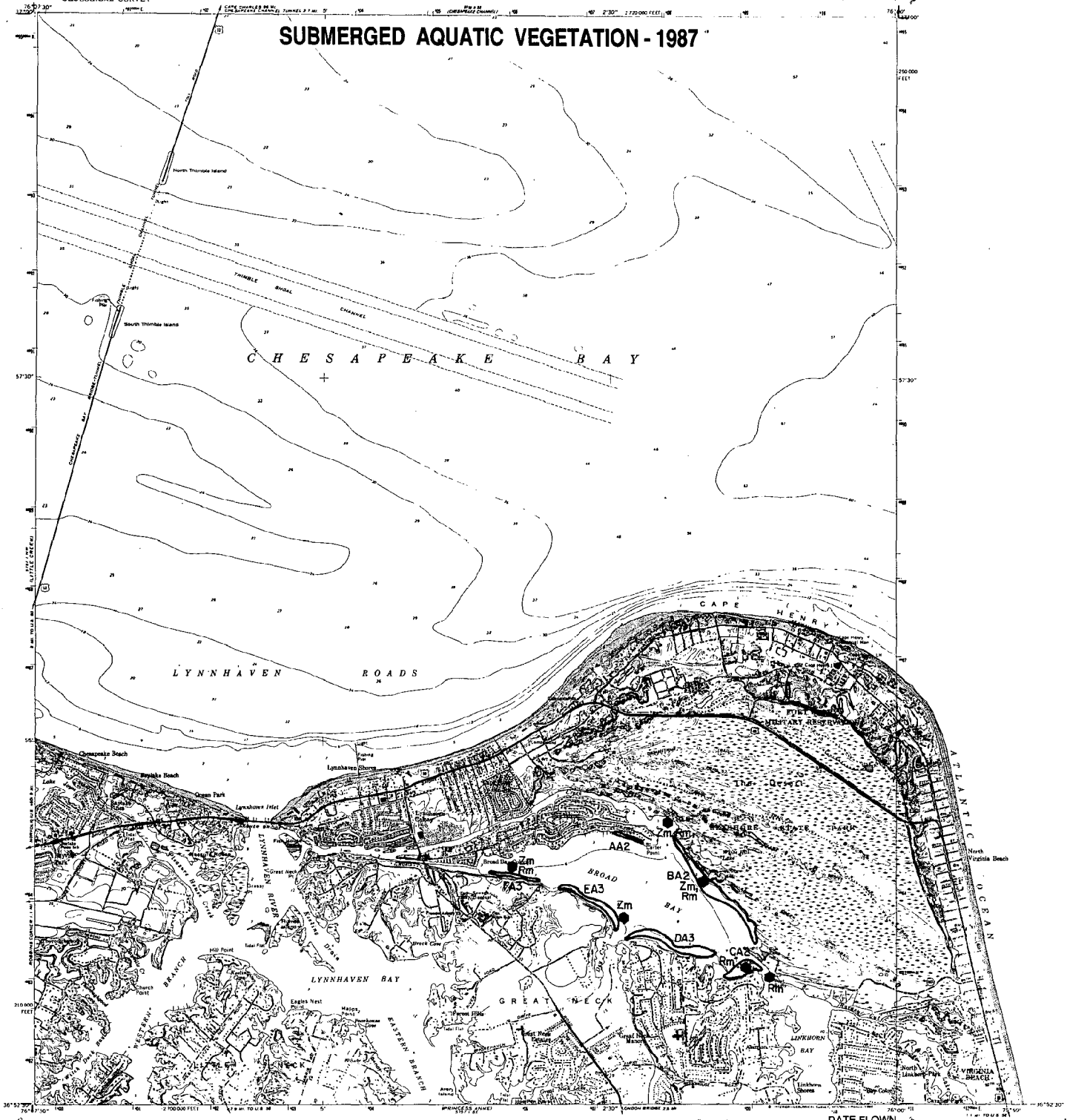
HAMPTON, VA
147

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

COMMONWEALTH OF VIRGINIA
DIVISION OF MINERAL RESOURCES

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

SUBMERGED AQUATIC VEGETATION - 1987



SPECIES

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

SURVEY STATIONS

- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

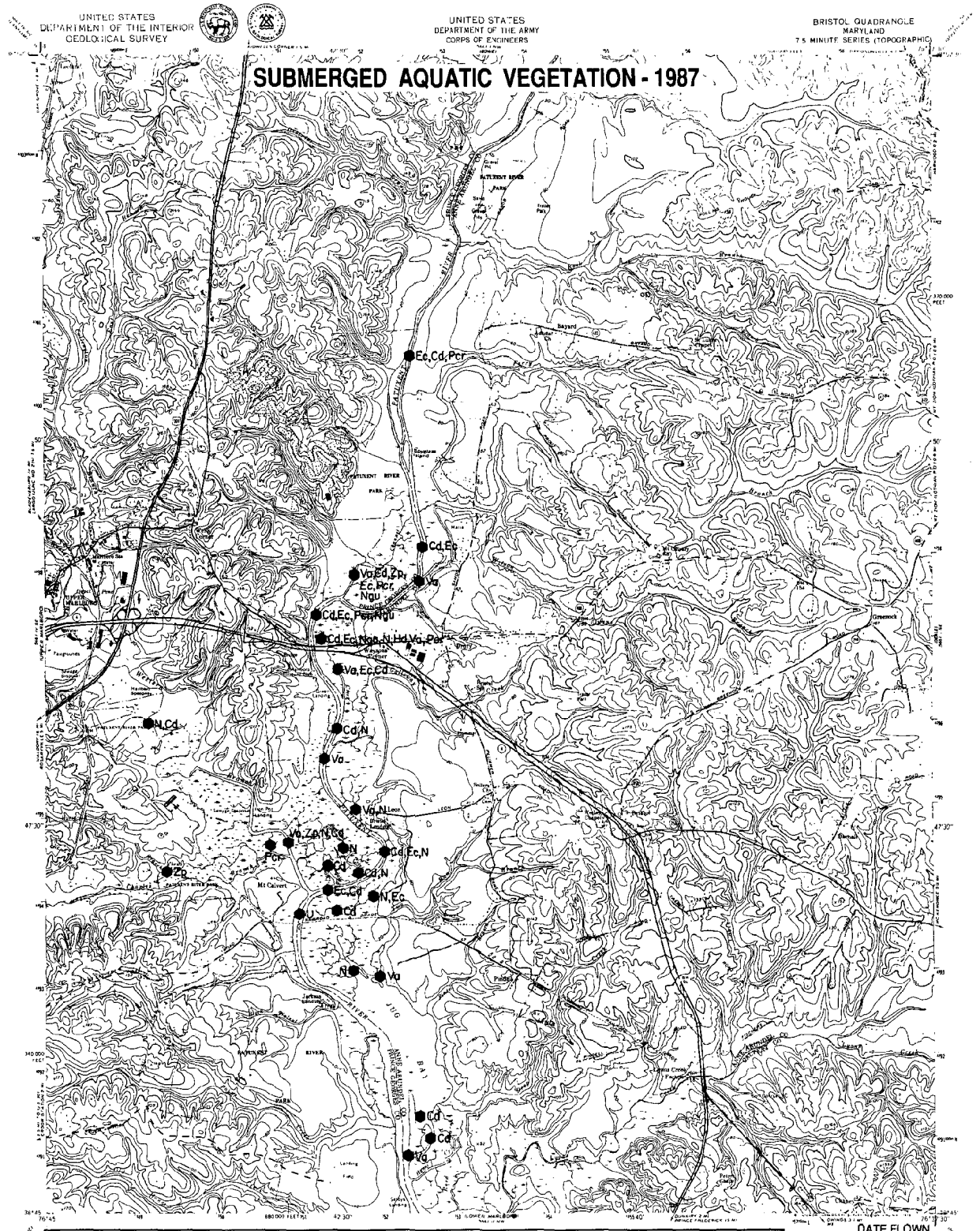
1 MILE

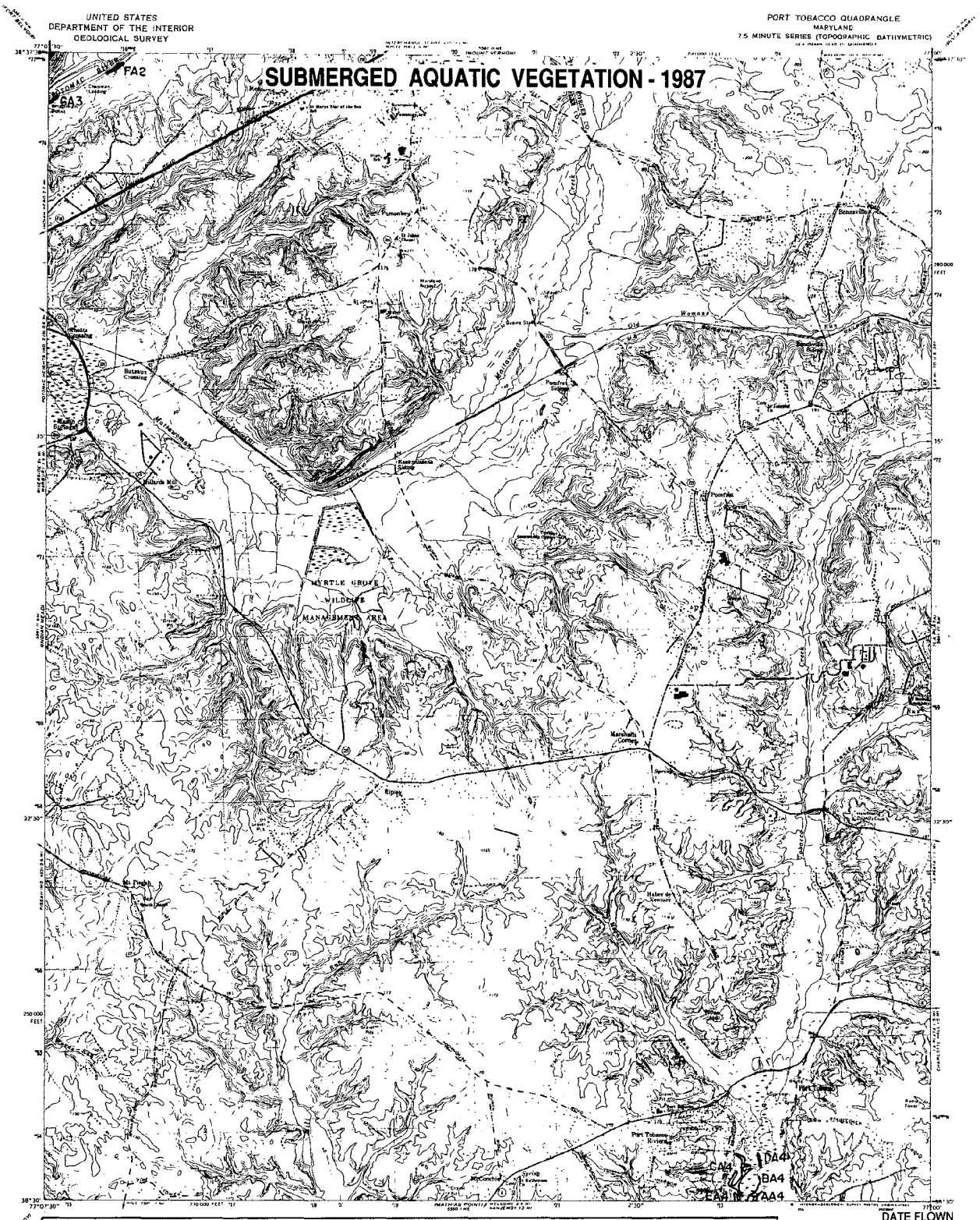
1 KILOMETER

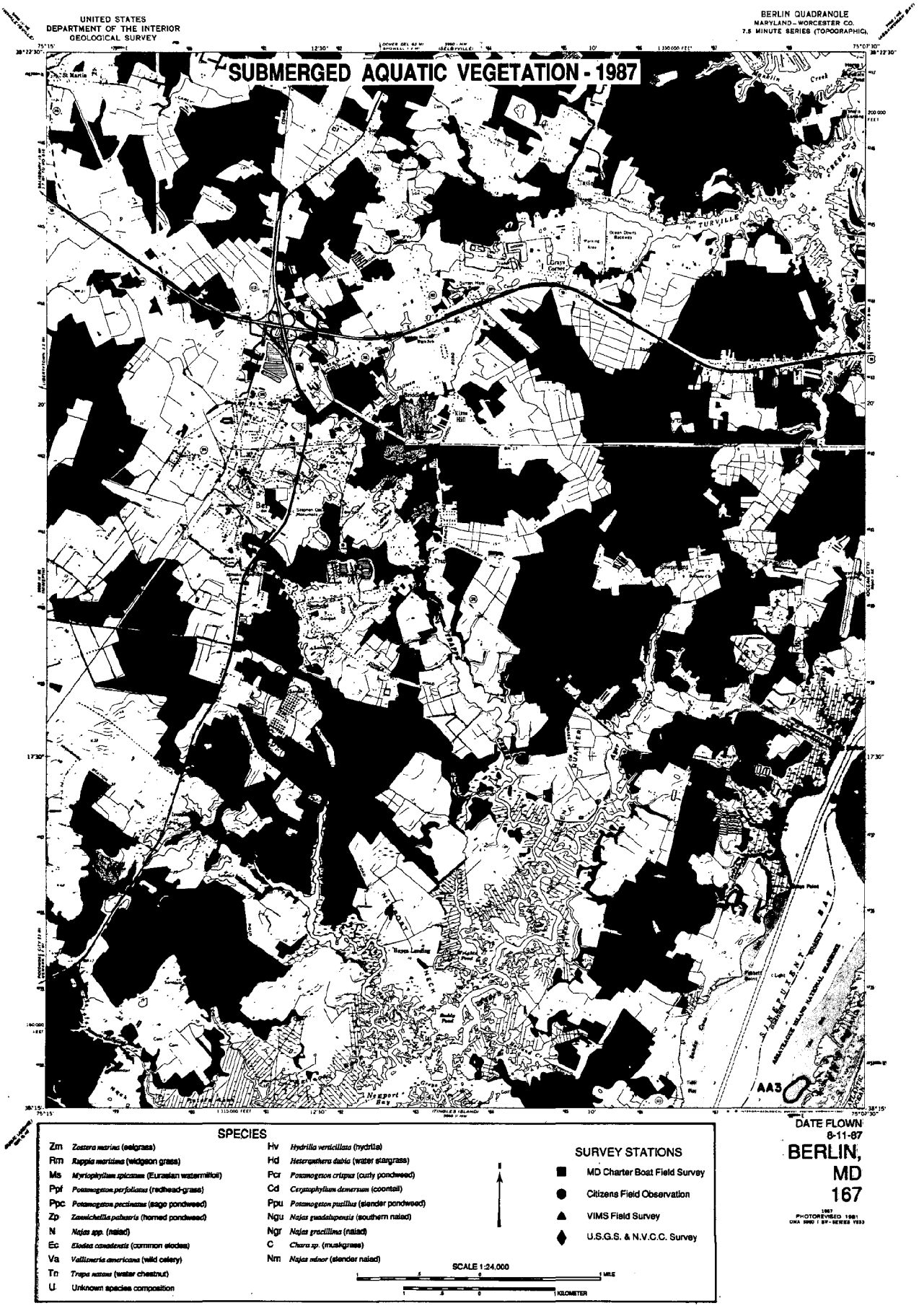
DATE FLOWN
6-6-87

CAPE HENRY, VA
152

1954
PHOTOREVISED 1979
DMA 5757 I NE–SERIES V834

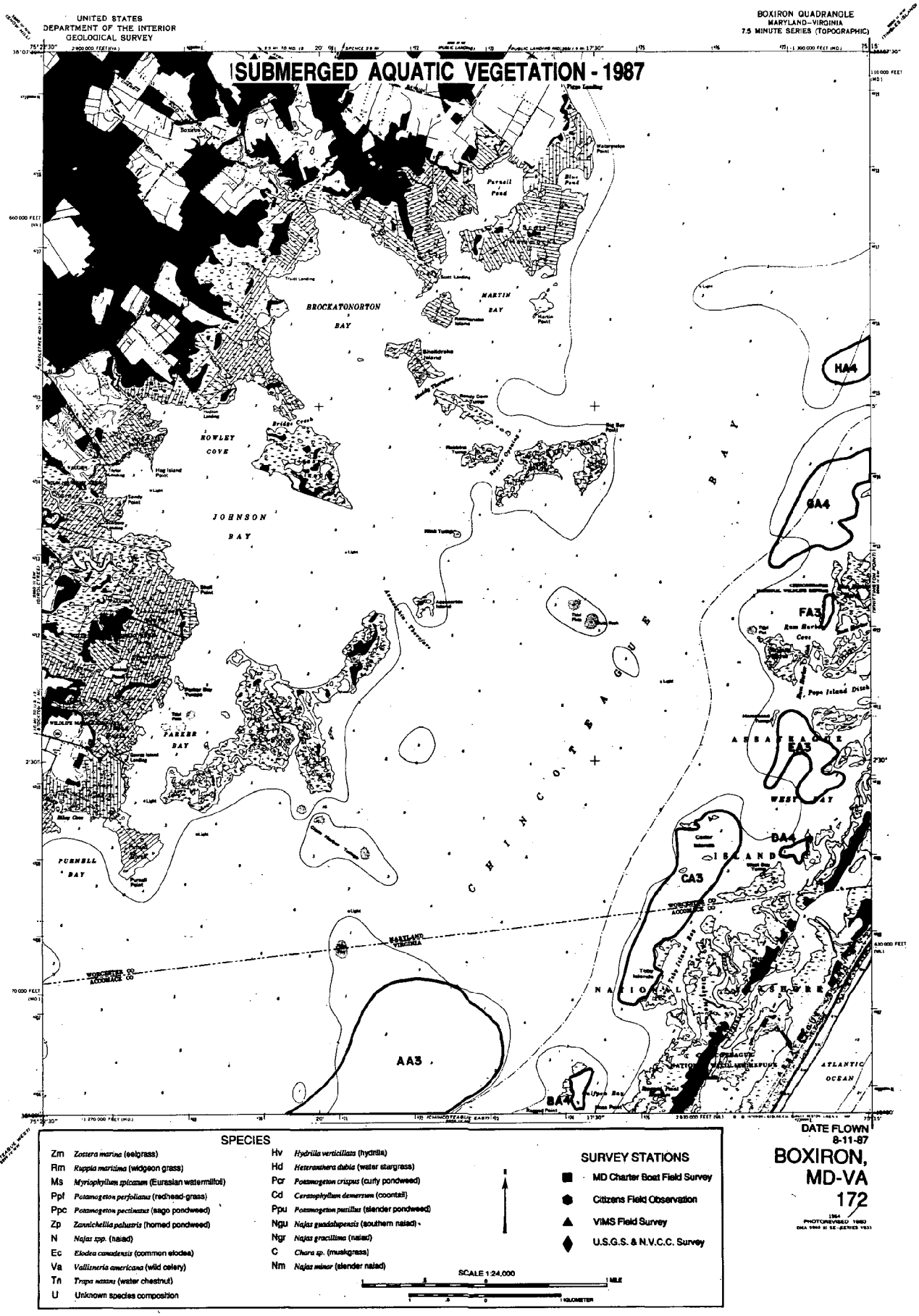

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
UNITED STATES
DEPARTMENT OF THE ARMY
CORPS OF ENGINEERS
BRISTOL QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
Ec,Cd,Pcr
Cd,Ec
Va,Cd,Zp,
Ec,Pcr,
Ngu
Cd,Ec,Pcr,Ngu
Cd,Ec,Nga,N,Hd,Va,Per
Va,Ec,Cd
N,Cd
Cd,N
Va
Va,N
Va,Zp,Cd
N
Cd,Ec,N
Pcr
Cd
Cd,N
Zp
Mt Calvert
Ec,Cd
N,Ec
U
Cd
N
Va
Cd
Cd
Va
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppl Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
N
SCALE 1:24,000
MILE
KILOMETER
DATE FLOWN
9-1-87
BRISTOL,
MD
159

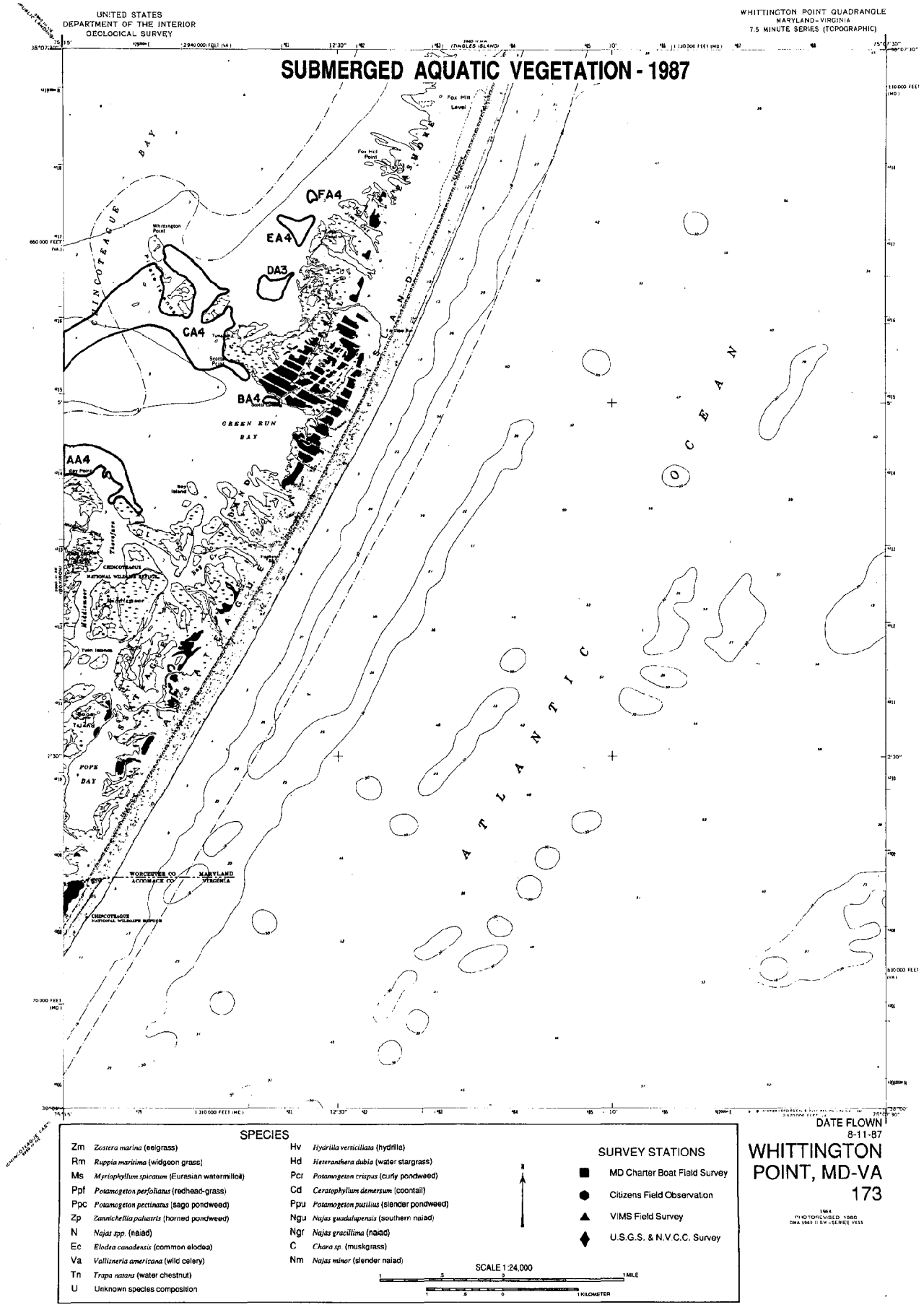

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
PORT TOBACCO QUADRANGLE
MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC, BATHYMETRIC)
SUBMERGED AQUATIC VEGETATION - 1987
FA2
BA3
MYRTLE GROVE
WILDLIFE
MANAGEMENT AREA
DA4
BA4
EA4
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATE FLOWN
9-25-87
PORT TOBACCO,
MD
161
1966
PHOTOREVISED 1978
BATHYMETRY ADDED 1982


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
BERLIN QUADRANGLE
MARYLAND – WORCESTER CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
MILE
KILOMETER
DATE FLOWN
8-11-87
BERLIN,
MD
167
PHOTOREVISED 1981

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
OCEAN CITY QUADRANGLE
MARYLAND - WORCESTER CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
ISLE OF WIGHT
BAY
FENWICK ISLAND
North Ocean City
Ocean City
West Ocean City
OCEAN
ATLANTIC
ASSATEAGUE ISLAND
AA3
BA4
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
MILE
KILOMETER
DATE FLOWN
8-11-87
OCEAN CITY,
MD
168
1964
PHOTOREVISED 1972

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
TINGLES ISLAND QUADRANGLE
MARYLAND - WORCESTER CO
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
NEWPORT BAY
SINEPUXENT BAY
CHINCOTEAGUE BAY
ATLANTIC OCEAN
HA4
GA4
FA4
EA3
DA3
CA4
BA4
AA3
Zm
Rm
Zm,Rm
Rm,Zm
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
DATE FLOWN
8-11-87
TINGLES ISLAND,
MD
170


UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
BOXIRON QUADRANGLE
MARYLAND–VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
BROCKATONORTON BAY
MARTIN BAY
HOWLEY COVE
JOHNSON BAY
FARRER BAY
PURNELL BAY
CHINCOTEAGUE BAY
ASSATEAGUE ISLAND
WEST BAY
Pope Island Ditch
HA4
BA4
FA3
EA3
CA3
AA3
ATLANTIC OCEAN
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
DATE FLOWN
8-11-87
BOXIRON,
MD-VA
172

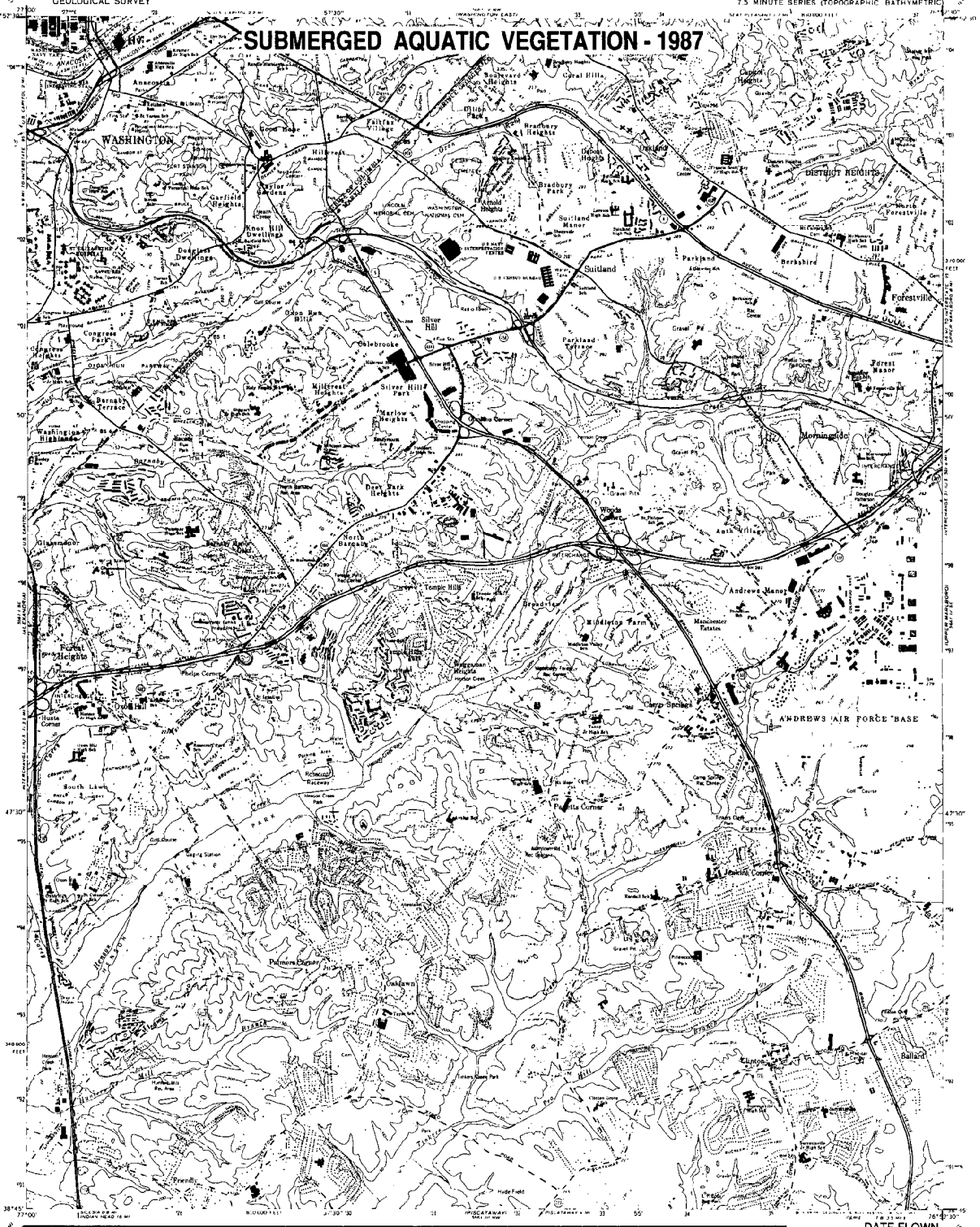

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WHITTINGTON POINT QUADRANGLE
MARYLAND-VIRGINIA
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
CFA4
EA4
DA3
CA4
BA4
AA4
CHINCOTEAGUE BAY
ATLANTIC OCEAN
GREEN RUN BAY
POPS BAY
CHINCOTEAGUE NATIONAL WILDLIFE REFUGE
WORCESTER CO. MARYLAND
ACCOMACK CO. VIRGINIA
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppf Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER
DATE FLOWN
8-11-87
WHITTINGTON POINT, MD-VA
173
1964
PHOTOREVISED 1980
DMA 5960 II SW-SERIES V833

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
CHINCOTEAGUE EAST QUADRANGLE
VIRGINIA-ACCOMACK CO.
7.5 MINUTE SERIES (TOPOGRAPHIC)
SUBMERGED AQUATIC VEGETATION - 1987
AA3
CHINCOTEAGUE BAY
ASSATEAGUE BAY
OYSTER BAY
Little Oyster Bay
ASSATEAGUE CHANNEL
TOMS COVE
Little Toms Cove
ATLANTIC OCEAN
DATE FLOWN
8-11-87
CHINCOTEAGUE
EAST, VA
175
SPECIES
Zm Zostera marina (eelgrass)
Rm Ruppia maritima (widgeon grass)
Ms Myriophyllum spicatum (Eurasian watermilfoil)
Ppl Potamogeton perfoliatus (redhead-grass)
Ppc Potamogeton pectinatus (sago pondweed)
Zp Zannichellia palustris (horned pondweed)
N Najas spp. (naiad)
Ec Elodea canadensis (common elodea)
Va Vallisneria americana (wild celery)
Tn Trapa natans (water chestnut)
U Unknown species composition
Hv Hydrilla verticillata (hydrilla)
Hd Heteranthera dubia (water stargrass)
Pcr Potamogeton crispus (curly pondweed)
Cd Ceratophyllum demersum (coontail)
Ppu Potamogeton pusillus (slender pondweed)
Ngu Najas guadalupensis (southern naiad)
Ngr Najas gracillima (naiad)
C Chara sp. (muskgrass)
Nm Najas minor (slender naiad)
SURVEY STATIONS
MD Charter Boat Field Survey
Citizens Field Observation
VIMS Field Survey
U.S.G.S. & N.V.C.C. Survey
SCALE 1:24,000
1 MILE
1 KILOMETER

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

ANACOSTIA QUADRANGLE
DISTRICT OF COLUMBIA MARYLAND
7.5 MINUTE SERIES (TOPOGRAPHIC BATHYMETRIC)

SUBMERGED AQUATIC VEGETATION - 1987



SPECIES

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

SURVEY STATIONS

- MD Charter Boat Field Survey
- Citizens Field Observation
- VIMS Field Survey
- U.S.G.S. & N.V.C.C. Survey

SCALE 1:24,000

1 5 0 1 MILE

1 5 0 1 KILOMETER

DATE FLOWN
9-2-87

ANACOSTIA,
DC-MD
176

1965

BATHYMETRY ADDED 1982
DMA 566 IV SW SERIES V851

APPENDIX D

1987 SAV BED AREAS FOR EACH TOPOGRAPHIC QUADRANGLE

APPENDIX D

NUMBER OF SQUARE METERS OF SAV FOR INDIVIDUAL BEDS BY TOPOGRAPHIC QUADRANGLE. (SEE MAPS IN APPENDIX C FOR LOCATION OF EACH BED. QUADRANGLES ARE LISTED NUMERICALLY BY VIMS CHART NUMBER.)

ABERDEEN MD.
VIMS CHART # 002

AA3	16620
BA4	4439
DA3	1082
EA3	1720
FA3	9556
GA4	6977
CA3	1409

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	0
DENSITY 3 =	30387
DENSITY 4 =	11416
TOTAL =	41803

HAVRE DE GRACE MD.
VIMS CHART # 003

AA3	5300
BA3	13550
CA3	2254
DA3	1335
EA3	2640
FA2	23980
GA2	3796
HA4	10700
IA4	56080
JA4	238200
KA2	258800
LA4	40060
MA4	6050
NA4	10590
OA4	2708
PA4	2800
QA4	3683
RA4	1766
SA4	577
TA4	1079
UA4	1502
VA4	8608

HAVRE DE GRACE MD. (continued)
VIMS CHART # 003

WA4	22560
XA4	9817
YA4	6738
ZA4	3306
AB4	28580
BB3	72810
CB4	13200
DB4	7240
EB3	9537
FB3	2796
GB3	9458
HB3	12290
IB3	2423
JB4	26040
KB4	132100
LB4	3807
MB4	1000
NB4	1623
OB4	2970
PB4	21690
QB4	6049
RB4	15440
SB2	38960
TB4	10790
UB4	204600
VB3	26220
WB2	66100
XB2	11800
YB1	17110000
ZB3	2922

TOTAL AREA

DENSITY 1 =	17109999
DENSITY 2 =	403436
DENSITY 3 =	163535
DENSITY 4 =	901953
TOTAL =	18578920

NORTH EAST MD.
VIMS CHART # 004

AA2	3135
BA2	9246
CA3	32610
DA3	4680
EA2	6807
FA4	1087
GA4	2327

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	19188
DENSITY 3 =	37290
DENSITY 4 =	3414
TOTAL =	59892

EDGEWOOD MD.
VIMS CHART # 007

AA2	3823
BA3	1352

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	3823
DENSITY 3 =	1352
DENSITY 4 =	0
TOTAL =	5175

PERRYMAN MD.
VIMS CHART # 008

AA3	29280

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	0
DENSITY 3 =	29280
DENSITY 4 =	0
TOTAL =	29280

SPESUTIE MD.
VIMS CHART # 009

AA3	6785
BA3	1676
CA3	189600
DA3	12320
EA2	4459
FA3	10210
GA3	4792
HA3	2919
IA3	1787
JA1	3562000

TOTAL AREA

DENSITY 1 =	3562000
DENSITY 2 =	4459
DENSITY 3 =	230089
DENSITY 4 =	0
TOTAL =	3796548

EARLEVILLE MD.
VIMS CHART # 010

AA3	1974
BA3	28230
CA3	827
DA2	6483
EA3	6032
FA3	1043
GA3	2295

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	6483
DENSITY 3 =	40401
DENSITY 4 =	0
TOTAL =	46884

MIDDLE RIVER MD.
VIMS CHART # 013

AA4	45640
BA4	19480
CA3	4746
DA2	43250
EA1	20030
FA3	14470
HA3	7819
IA2	16140
GA4	25690
JA2	23170

TOTAL AREA

DENSITY 1 =	20030
DENSITY 2 =	82560
DENSITY 3 =	27035
DENSITY 4 =	90810
TOTAL =	220435

GUNPOWER NECK MD.
VIMS CHART # 014

AA2	32400
BA3	49080
CA3	40430
DA3	31940
EA4	3321
FA1	4353
GA1	4624
HA3	41870
IA3	54090
JA3	25860
KA3	30220
LA3	8041
MA4	43550
NA4	1954
OA4	22840
PA4	15170
QA2	5889
RA3	8149
SA2	1228
TA3	11250
UA2	17410
VA3	16880
WA2	24520
XA3	20410
YA4	23300
ZA4	34200

GUNPOWER NECK MD. (continued)
VIMS CHART # 014

AB2	7412
BB1	42230
CB1	11090
DB3	48830
EB4	56580
FB2	9133
GB4	41360
HB3	86280
IB3	17930
JB3	11610

TOTAL AREA

DENSITY 1 =	62297
DENSITY 2 =	97992
DENSITY 3 =	502870
DENSITY 4 =	242275
TOTAL =	905434

HANESVILLE MD.
VIMS CHART # 015

AA3	24970
BA3	10310
CA1	217400
DA2	4795
EA3	13060
FA3	15970
GA2	1855
HA2	70210
IA3	25560
JA4	604
KA3	38770

TOTAL AREA

DENSITY 1 =	217400
DENSITY 2 =	76860
DENSITY 3 =	128640
DENSITY 4 =	604
TOTAL =	423504

BETTERTON MD.
VIMS CHART # 016

AA4	3752
BA2	106300
CA4	17140
DA4	5224
EA3	23220
FA3	8780
GA3	24930
HA3	2525
IA3	1195
JA3	1103
KA3	1700
LA3	2256

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	106300
DENSITY 3 =	65709
DENSITY 4 =	26116
TOTAL =	198125

GALENA MD.
VIMS CHART # 017

AA3	74120
BA3	1569

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	0
DENSITY 3 =	75689
DENSITY 4 =	0
TOTAL =	75689

SWAN POINT MD.
VIMS CHART # 020

AA2	1919
BA2	2151
CA2	3006
DA2	3445
EA1	3171
FA3	2357

TOTAL AREA

DENSITY 1 =	3171
DENSITY 2 =	10521
DENSITY 3 =	2357
DENSITY 4 =	0
TOTAL =	16049

ROCK HALL MD.
VIMS CHART # 021

AA1	42710
BA4	10400

TOTAL AREA

DENSITY 1 =	42710
DENSITY 2 =	0
DENSITY 3 =	0
DENSITY 4 =	10400
TOTAL =	53110

GIBSON ISLAND MD.
VIMS CHART # 024

AA3	2581

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	0
DENSITY 3 =	2581
DENSITY 4 =	0
TOTAL =	2581

LANGFORD CREEK MD.
VIMS CHART # 026

AA3	161400
BA2	2862
CA2	2397
DA3	12440
EA2	4105
FA2	2759
GA3	105500
HA1	24410
IA3	85150
JA3	15860
KA2	2617
LA2	3569
MA2	5085
NA1	5005
OA3	154700
PA4	68910
QA3	38210
RA4	1116
SA2	6031
TA2	3001
UA2	31760
VA4	61780
XA2	21690
WA4	69520
YA2	152000
ZA4	413000
AB2	55810
BB2	9232
CB4	63020
DB2	20400
EB2	7841
FB3	11770
GB3	47240
HB3	25460
IB4	96840
JB4	515900
KB2	15450
LB3	64520
MB3	10250
NB3	3668
OB3	21970
PB2	228900
QB3	24900
RB4	71820
SB4	14270
TB3	13470
UB2	1654
VB3	2987
WB3	20340

LANGFORD CREEK MD. (continued)
VIMS CHART # 026

XB3	9256
YB3	4978
ZB3	3819
AC4	63910
BC2	21330
CC4	1539000
DC2	452400
EC3	43840
FC2	10240
GC3	28140
HC3	12250

TOTAL AREA

DENSITY 1 =	29415
DENSITY 2 =	1061133
DENSITY 3 =	922118
DENSITY 4 =	2979086
TOTAL =	4991752

CENTREVILLE MD.
VIMS CHART # 027

AA3	12180
BA2	2294

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	2294
DENSITY 3 =	12180
DENSITY 4 =	0
TOTAL =	14474

KENT ISLAND MD.
VIMS CHART # 032

AA2	58370
BA4	107200
CA3	45320
DA2	69350
EA4	139400
FA3	118500
IA4	153800
JA3	57540
KA2	56800
LA2	51770

KENT ISLAND MD. (continued)
VIMS CHART # 032

MA3	112000
NA2	253800
OA3	95160
PA3	308900
QA3	24040
RA3	58950
SA2	3778
TA2	3066
UA2	2085
VA2	5969
WA2	5767
XA1	8089
YA1	5877
ZA2	2842
AB3	11780
BB1	34910
CB3	122600
DB1	159200
EB1	10920
FB2	8295
GB3	43370
HB1	12280
IB1	23480
JB4	372100
KB2	55870
LB4	16660
MB3	22270
GA4	526400
HA4	38840
NB1	17690

TOTAL AREA

DENSITY 1 =	272446
DENSITY 2 =	577762
DENSITY 3 =	1020430
DENSITY 4 =	1354400
TOTAL =	3225038

QUEENSTOWN MD.
VIMS CHART # 033

AA3	14470
BA2	14880
CA3	14610
DA3	2545
EA3	4290
FA2	4231
GA3	7229
HA2	10560
IA2	1781
JA1	35730
KA4	76000
LA1	42480
MA2	3716
NA3	72450
OA3	371900
PA1	182200
QA3	119700
RA4	146000
SA2	78880
TA1	69560
UA3	296900
VA1	154700
WA4	121100
YA2	3920
XA2	5665
ZA4	184800
AB2	9462
BB2	11980
CB3	25270
DB2	8248
EB3	33840
FB3	20000
GB2	18330

TOTAL AREA

DENSITY 1 =	484670
DENSITY 2 =	171653
DENSITY 3 =	983204
DENSITY 4 =	527900
TOTAL =	2167427

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

AA4	306400
BA2	24670
CA4	61170
DA4	1779000
EA2	37650
FA4	42970
GA4	18100
HA4	4778
IA2	3285
JA3	14430
KA2	1864
LA2	5367
MA4	3883
NA4	29890
OA2	3796
PA2	4206
QA4	7181
RA4	19590
SA1	14130
TA4	1475000
UA4	43150
VA4	5149
WA4	803900

TOTAL AREA

DENSITY 1 =	14130
DENSITY 2 =	80838
DENSITY 3 =	14430
DENSITY 4 =	4600161
TOTAL =	4709559

CLAIBORNE MD.
VIMS CHART # 036

AA4	11790
BA4	50220
CA2	137100
DA1	70570
EA3	125000
FA1	222800
GA4	330900
HA4	7064
IA2	51590
JA2	29020
KA1	19490
LA3	11750
MA2	27030

CLAIBORNE MD. (continued)
VIMS CHART # 036

NA2	20160
OA2	187800
PA4	19810
QA4	29680
RA4	17180

TOTAL AREA

DENSITY 1 =	312860
DENSITY 2 =	452700
DENSITY 3 =	136750
DENSITY 4 =	466644
TOTAL =	1368954

ST. MICHAELS MD.
VIMS CHART # 037

AA2	10120
BA3	9084
CA3	68560
DA1	63790
EA3	482800
FA4	257400
GA3	36830
HA3	17270
IA2	26280
JA3	36720
KA2	32390
LA2	53500
MA3	11420
NA4	52330
OA2	11220
PA2	12740
QA4	362200
RA3	118000
SA1	23660
TA3	25100
UA1	42110
VA3	45550
WA1	159800
XA2	35720
YA2	46830
ZA2	85500
AB2	14410
BB3	17700
CB2	8843

ST. MICHAELS MD. (continued)
VIMS CHART # 037

DB1	88190
EB3	59890

TOTAL AREA

DENSITY 1 =	377550
DENSITY 2 =	337553
DENSITY 3 =	928924
DENSITY 4 =	671930
TOTAL =	2315957

FORT BELVOIR VA.-MD.
VIMS CHART # 039

AA2	7035
BA2	23470
CA2	5712
DA2	13770
EA3	29270
FA2	35170
GA4	14620
JA4	3643
IA1	8516
HA4	50040
KA2	2264

TOTAL AREA

DENSITY 1 =	8516
DENSITY 2 =	87421
DENSITY 3 =	29270
DENSITY 4 =	68303
TOTAL =	193510

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

BA4	73950
CA4	76880
DA4	23920
EA4	36030
FA1	99950
GA4	254700
HA1	19960
JA2	66620
KA4	103900
LA2	23990

MT. VERNON VA.-MD. (continued)
VIMS CHART # 040

MA4	1970000
NA2	54160
OA4	2056000
PA2	63550
QA4	5832
RA4	7215
SA3	132300
TA1	150500
UA4	119200
VA1	21260
WA4	44100
XA4	35190
YA4	5527
ZA4	170800
AB2	19300
BB4	456700
CB3	216400
DB4	55180
IA4	4123000
AA4	81760

TOTAL AREA

DENSITY 1 =	291670
DENSITY 2 =	227620
DENSITY 3 =	348700
DENSITY 4 =	9699884
TOTAL =	10567873

TILGHMAN MD.
VIMS CHART # 043

AA2	3485
BA2	3605
CA3	14580
DA4	5441
EA2	5694
FA4	17020
GA3	31800
HA1	58330
IA3	103700
JA2	14240
KA2	58610
LA2	7867
MA2	10640
NA2	3670
OA4	6492
PA4	7263

TILGHMAN MD. (continued)
VIMS CHART # 043

QA2	113000
RA2	9702
SA2	38270
TA2	51220
UA2	14680
VA2	39710
WA3	25590
XA3	3553
YA2	10650
ZA2	29950
AB4	165700

TOTAL AREA

DENSITY 1 =	58330
DENSITY 2 =	414993
DENSITY 3 =	179223
DENSITY 4 =	201916
TOTAL =	854462

OXFORD MD.
VIMS CHART # 044

AA3	2399
BA3	12600
CA3	14230
DA3	25910

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	0
DENSITY 3 =	55139
DENSITY 4 =	0
TOTAL =	55139

QUANTICO VA.-MD.
VIMS CHART # 047

AA4	63540
BA2	50800
CA3	33940
DA2	32550
EA1	84330
FA1	17580
GA2	11180
HA4	33810
IA1	45720
JA2	89230

TOTAL AREA

DENSITY 1 =	147630
DENSITY 2 =	183760
DENSITY 3 =	33940
DENSITY 4 =	97350
TOTAL =	462680

INDIAN HEAD MD.-VA.
VIMS CHART # 048

AA2	29610
BA3	8079
CA3	16640
DA2	12050
EA3	3029
FA3	6634
GA2	6594
HA2	9099
IA1	7965
JA4	24640
KA1	4860
LA4	39250
MA3	7452

TOTAL AREA

DENSITY 1 =	12825
DENSITY 2 =	57353
DENSITY 3 =	41834
DENSITY 4 =	63890
TOTAL =	175902

BENEDICT MD.
VIMS CHART # 049

AA2	7567
BA4	2071
CA3	3017

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	7567
DENSITY 3 =	3017
DENSITY 4 =	2071
TOTAL =	12655

HUDSON MD.
VIMS CHART # 051

AA3	23610
BA2	12040
CA2	11710
DA3	9604
EA3	9982
FA3	7149
GA3	6031
HA3	10810
IA3	7779
JA3	28400
KA4	56360
LA2	5157
MA2	1689
NA2	17980
OA2	16730
PA4	18060
QA2	13530
RA4	293700
SA2	82190
TA4	110400
UA3	8847
VA3	46710
WA3	333700
XA3	7949
YA3	18730
ZA2	23510
AB3	23550

HUDSON MD. (continued)
VIMS CHART # 051

BB4	157000
CB2	125600
DB4	188900

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	310136
DENSITY 3 =	542851
DENSITY 4 =	824420
TOTAL =	1677407

CHURCH CREEK MD.
VIMS CHART # 052

AA4	16820
BA4	4355
CA2	7567
DA2	3927
EA2	7621
FA2	4605
GA2	3731
HA3	13930
IA1	282000
JA4	9089
KA3	130400
LA3	10540

TOTAL AREA

DENSITY 1 =	282000
DENSITY 2 =	27451
DENSITY 3 =	154870
DENSITY 4 =	30264
TOTAL =	494585

WIDEWATER VA.-MD.
VIMS CHART # 055

AA4	50040
BA2	72630
CA1	8089
DA4	45250
EA2	13500
FA2	9794
GA3	72390
HA4	112900
IA2	7070

TOTAL AREA

DENSITY 1 =	8089
DENSITY 2 =	102994
DENSITY 3 =	72390
DENSITY 4 =	208190
TOTAL =	391663

NANJEMOY MD.
VIMS CHART # 056

AA4	246600
BA3	22910
CA4	32180
DA4	4839
EA4	14810
FA4	146100
GA4	12800
HA4	33870
IA4	305900
JA2	50230
KA3	11350
LA4	4887
MA4	16880
NA4	12280
OA3	37710
PA4	22210
QA4	24930
RA4	8416
SA4	2658
TA4	11080
UA4	2287
VA4	2393
WA4	1827
XA4	3178
YA4	7112
ZA4	8476
AB4	3634

NANJEMOY MD. (Continued)
VIMS CHART # 056

BB4	10820
CB4	6675
DB4	6390
EB4	4548
FB4	4529

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	50230
DENSITY 3 =	71970
DENSITY 4 =	962309
TOTAL =	1084509

MATHIAS POINT MD.-VA.
VIMS CHART # 057

AA2	7556
BA1	62460
CA3	108300
DA3	36530
EA4	10080
FA1	11110
GA3	12630
HA3	8405
IA2	1696
JA2	1899
KA2	2357
LA4	10560
MA4	28020
NA3	1740
OA4	123200
PA3	92720
QA4	71040
RA4	9783
SA4	5527
TA4	94230
UA4	3113
VA4	7601
WA4	4184
XA4	2765
YA4	16540
ZA4	7460
AB1	4210
BB2	41960
CB2	89950
DB4	886300
EB1	22490

MATHIAS POINT MD.-VA.
VIMS CHART # 057 (Continued)

FB4	289700
GB4	36160
HB3	10660
IB4	99140
JB2	11790
KB4	84580
LB4	346100
MB4	13100
NB4	1624
OB4	1595
PB2	1327
QB3	19360
RB4	86260
SB2	44070
TB4	3279
UB4	3573
VB4	636
WB4	2459

TOTAL AREA

DENSITY 1 =	100270
DENSITY 2 =	202605
DENSITY 3 =	290345
DENSITY 4 =	2248609
TOTAL =	2841829

MECHANICSVILLE MD.
VIMS CHART # 059

AA2	20780

TOTAL AREA

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

BROOMES ISLAND MD.
VIMS CHART # 060

AA2	1831
BA3	50160
CA2	6880
DA2	8444
EA2	11860
FA2	2492
GA2	83000
HA2	31680
IA3	1084
JA3	4609

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	146187
DENSITY 3 =	55853
DENSITY 4 =	0
TOTAL =	202040

COVE POINT MD.
VIMS CHART # 061

AA3	5931
BA3	2061
CA2	31230
DA4	6984

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	31230
DENSITY 3 =	7992
DENSITY 4 =	6984
TOTAL =	46206

TAYLORS ISLAND MD.
VIMS CHART # 062

AA2	2875
BA2	1848
CA3	6207
DA4	32020
EA2	4363
FA2	29300
GA3	10440
HA3	326000
IA1	61650

TOTAL AREA

DENSITY 1 =	61650
DENSITY 2 =	38386
DENSITY 3 =	342647
DENSITY 4 =	32020
TOTAL =	474703

GOLDEN HILL MD.
VIMS CHART # 063

AA2	7431
BA3	995
CA2	1628
DA3	15260

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	9059
DENSITY 3 =	16255
DENSITY 4 =	0
TOTAL =	25314

KING GEORGE VA.-MD.
VIMS CHART # 065

GA4	106200
FA2	18670
EA2	4642
DA3	16170
CA2	9144
BA2	2433
AA1	3694

TOTAL AREA

DENSITY 1 =	3694
DENSITY 2 =	34889
DENSITY 3 =	16170
DENSITY 4 =	106200
TOTAL =	160953

DAHLGREN VA.-MD.
VIMS CHART # 066

AA1	11390
BA4	5929
CA4	4181
DA4	44050
EA4	66020
FA2	11310

TOTAL AREA

DENSITY 1 =	11390
DENSITY 2 =	11310
DENSITY 3 =	0
DENSITY 4 =	120180
TOTAL =	142880

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

AA3	15230
BA4	3312
CA3	11760
DA4	3607
EA3	12400
FA3	15280
GA3	30840
HA4	9738
IA2	29920
JA3	43870
KA2	1904

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	31824
DENSITY 3 =	129380
DENSITY 4 =	16657
TOTAL =	177861

HOLLYWOOD MD.
VIMS CHART # 070

AA3	22230
BA2	11330
CA4	8696
DA2	7484

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	18814
DENSITY 3 =	22230
DENSITY 4 =	8696
TOTAL =	49740

SOLOMONS ISLAND MD.
VIMS CHART # 071

AA3	83330

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	0
DENSITY 3 =	83330
DENSITY 4 =	0
TOTAL =	83330

BARREN ISLAND MD.
VIMS CHART # 072

AA3	7143
BA1	59030
CA4	82410
DA3	2781
EA1	12640
FA4	8295
GA1	8361
HA4	268700
IA1	32010
JA4	42930
KA1	44180
MA2	69600
NA1	137900
OA3	18160
LA4	1904000

TOTAL AREA

DENSITY 1 =	294121
DENSITY 2 =	69600
DENSITY 3 =	28084
DENSITY 4 =	2306335
TOTAL =	2698140

HONGA MD.
VIMS CHART # 073

AA1	29830
BA4	177100
CA1	92820
DA4	15630
EA4	130500
FA4	15950
GA1	106600
HA3	354000
IA1	498400
JA4	417200
KA2	326500
LA2	8984
MA4	8906
NA4	18880
OA1	35930
PA4	14600
QA1	50800
RA3	85340
SA3	10460
TA3	34880
UA4	53490
VA2	9426
WA1	539400
XA3	113000
YA3	98080
ZA2	68690
AB2	18790
BB2	6389
CB3	2363
DB2	4280
EB3	23790
FB3	5152
GB2	25910
HB3	7672
IB2	14680
JB2	254300
KB4	207400
LB1	108000
MB4	547200
NB2	216300
OB3	11550
PB2	27460
QB3	166300
RB1	65780
SB3	34900
TB4	170600
UB4	273400
VB2	14270
WB1	68950

HONGA MD. (continued)
VIMS CHART # 073

XB3	120200
YB3	7575
ZB3	137100
AC3	17980
BC3	12790
GC3	14660
HC4	21600
IC2	14680
JC3	89070
KC3	9429
LC1	43190
MC4	42090
NC2	37670
OC4	35080
PC2	1840
QC4	3660
CC1	74190
DC2	5851
EC2	36610
FC2	4339

TOTAL AREA

DENSITY 1 =	1713890
DENSITY 2 =	1096969
DENSITY 3 =	1356291
DENSITY 4 =	2153286
TOTAL =	6320436

WINGATE MD.
VIMS CHART # 074

AA4	251800
BA3	3381
CA3	4384
DA4	332800
EA2	34260
FA2	27860
GA4	123900
HA3	66220
IA1	39600
JA3	108600
KA3	11090
LA3	2688
MA2	12680
NA4	384300
OA1	6162
PA3	69580

WINGATE MD.
VIMS CHART # 074

QA2	105400
RA4	5403
SA1	51490
TA3	72630
UA2	5477

TOTAL AREA

DENSITY 1 =	97252
DENSITY 2 =	185677
DENSITY 3 =	338573
DENSITY 4 =	1098203
TOTAL =	1719705

ST. MARY'S CITY MD.
VIMS CHART # 080

AA3	23410
BA2	2497
CA2	7834
DA3	8050
EA1	4472
FA4	19260
GA3	34030
HA3	5281

TOTAL AREA

DENSITY 1 =	4472
DENSITY 2 =	10331
DENSITY 3 =	70771
DENSITY 4 =	19260
TOTAL =	104834

RICHLAND POINT MD.
VIMS CHART # 082

AA1	5982
BA3	310900
CA3	39910
DA2	27270
EA4	40520

TOTAL AREA

DENSITY 1 =	5982
DENSITY 2 =	27270
DENSITY 3 =	350810
DENSITY 4 =	40520
TOTAL =	424582

BLOODSWORTH ISLAND MD.
VIMS CHART # 083

AA2	8513
BA3	15190
CA4	23440
DA3	20300
EA2	12220
FA4	358200
GA1	6013
HA4	120800
IA1	35130
JA4	2492000
KA2	64730
LA4	69290
MA2	10740
NA4	11820
OA1	12820
PA4	270200
QA4	185000
RA2	15720
SA4	311000
TA4	67890
VA4	54490
WA4	2428
XA4	96330
YA1	97350
ZA4	338300
AB4	59850
BB4	14920
CB3	25000
DB3	159100
EB4	24730
FB4	53660

BLOODSWORTH ISLAND MD.
VIMS CHART # 083 (continued)

GB4	26310
HB4	165500
IB1	73810
JB3	36950
KB4	201600
LB3	5107
UA4	11110

TOTAL AREA

DENSITY 1 =	225123
DENSITY 2 =	111923
DENSITY 3 =	261647
DENSITY 4 =	4958868
TOTAL =	5557561

DEAL ISLAND MD.
VIMS CHART # 084

AA3	298500
BA2	11820
CA4	43740
DA3	10950
EA1	22310
FA1	20630
GA3	22060
HA3	32950
IA3	86460
JA2	19700
KA4	12760
LA3	3324
MA3	17160

TOTAL AREA

DENSITY 1 =	42940
DENSITY 2 =	31520
DENSITY 3 =	471404
DENSITY 4 =	56500
TOTAL =	602364

MONIE MD.
VIMS CHART # 085

AA3	8057
BA2	6367
CA3	13920
DA3	7543
EA3	21040
FA2	4008
GA2	4571
HA2	4457
IA3	176000

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	19403
DENSITY 3 =	226560
DENSITY 4 =	0
TOTAL =	245963

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

AA2	37050
BA2	19430
CA3	837

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	56480
DENSITY 3 =	837
DENSITY 4 =	0
TOTAL =	57317

KEDGES STRAITS MD.
VIMS CHART # 091

AA1	47580
BA3	94990
CA4	44710
DA4	2870000
EA2	72590
FA4	214200
GA3	1272000
HA4	412600
IA4	8636
JA4	13710
KA4	15440

KEDGES STRAITS MD. (continued)
VIMS CHART # 091

LA4	265300
MA3	433900
NA3	228600
OA4	12230
PA4	16470
QA4	86530
RA4	421800
SA4	12200
TA4	50240
UA4	169900
VA4	87710
WA1	82350

TOTAL AREA

DENSITY 1 =	129930
DENSITY 2 =	72590
DENSITY 3 =	2029490
DENSITY 4 =	4701676
TOTAL =	6933686

TERRAPIN SAND POINT MD.
VIMS CHART # 092

AA4	816200
BA4	57580
CA4	11900
DA3	46960

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	0
DENSITY 3 =	46960
DENSITY 4 =	885680
TOTAL =	932640

MARION MD.
VIMS CHART # 093

AA4	5146
BA3	21570
CA3	24880
DA2	30070
EA3	44220
FA3	26780
GA4	9946

MARION MD. (continued)
VIMS CHART # 093

HA3	51650
IA2	78210
JA3	28570
KA2	2167
LA4	1905
MA4	8495
NA3	20810
OA2	1291
PA3	7144
QA3	7356
RA3	19040
SA3	1806
TA3	21130
UA3	63500
VA3	8383
WA2	28480
XA2	29400
YA3	43390
ZA3	25040
AB3	32760
BB3	32770
CB3	292400
DB2	22150
EB4	65250
FB2	34650
GB2	197100
HB3	8203
IB3	58840
JB4	54830
KB3	16440
LB3	51770
MB3	74310
NB2	9586
OB3	4773
PB3	1634
QB3	6194
RB3	1483
SB3	25880

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	433104
DENSITY 3 =	1022726
DENSITY 4 =	145572
TOTAL =	1601402

EWELL MD.-VA.
VIMS CHART # 099

AA4	15520000
BA3	275300
CA2	523700
DA3	117300
EA2	86730
FA3	241600
GA2	73500
HA4	322300
IA4	18870
JA4	932200
KA4	91690
LA3	93040
MA2	20020
NA3	18480
OA3	20720
PA4	517800
QA3	489500
RA1	9092
SA4	757500

TOTAL AREA

DENSITY 1 =	9092
DENSITY 2 =	703950
DENSITY 3 =	1255940
DENSITY 4 =	18160356
TOTAL =	20129335

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

AA4	4212000
BA2	1029000
CA2	183000
PA4	1499000
QA2	611600
OA4	250700
NA1	27740
MA4	9635
GA4	178300
HA4	124600
IA2	206500
JA4	1516000
KA1	93800
LA4	552200
FA3	132000

GREAT FOX ISLAND MD.-VA.
VIMS CHART # 100 (continued)

EA4	58740
DA4	214700

TOTAL AREA

DENSITY 1 =	121540
DENSITY 2 =	2030100
DENSITY 3 =	132000
DENSITY 4 =	8615874
TOTAL =	10899514

CRISFIELD MD.-VA.
VIMS CHART # 101

AA4	167200
BA2	179600
CA3	24270
DA3	80710
EA2	18310
FA4	32830
GA2	32470
VA3	25110
UA4	92920
TA3	72820
SA3	20790
RA4	10400
HA3	41530
IA4	72690
JA4	27880
KA4	147900
LA3	45290
MA4	18340
NA4	25500
OA4	17840
PA4	57950
QA4	19900

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	230380
DENSITY 3 =	310520
DENSITY 4 =	691350
TOTAL =	1232250

REEDVILLE VA.
VIMS CHART # 106

AA2	19020
BA2	223500
CA3	13230
DA2	19660
EA4	26010
FA2	125800
GA4	393700
HA3	40010
IA2	18930

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	406910
DENSITY 3 =	53240
DENSITY 4 =	419710
TOTAL =	879860

TANGIER ISLAND VA.
VIMS CHART # 107

AA2	215100
BA3	242200
CA2	164300
DA4	383500
EA2	197000
FA3	70140
GA2	114200
HA1	84570
IA2	72580
JA4	2745000
KA2	702900

TOTAL AREA

DENSITY 1 =	84570
DENSITY 2 =	1466080
DENSITY 3 =	312340
DENSITY 4 =	3128500
TOTAL =	4991490

CHESCONESSEX VA.
VIMS CHART # 108

AA1	15180
BA1	23560
CA3	10260
DA3	141700
EA4	14570
FA4	13020
GA4	87300
HA1	16180
IA4	228600
JA4	7645
LA3	130900
MA3	123700
NA4	405800
OA4	389000
PA1	34030
QA4	328500
RA2	121500
SA1	53230
TA3	460200
UA1	213100
VA4	359500
WA2	323000
XA3	438700
YA2	271800
ZA1	75090
AB3	39250
BB3	423300
CB1	224000
DB2	74040
EB2	217500
FB4	441200
GB4	136800
HB3	9972
IB2	87720
JB4	147600
KB2	23180
LB3	141400
MB3	2033000
KA2	571200
NB4	260800

TOTAL AREA

DENSITY 1 =	654370
DENSITY 2 =	1689940
DENSITY 3 =	3952382
DENSITY 4 =	2820335
TOTAL =	9117026

PARKSLEY VA.
VIMS CHART # 109

AA3	270400
BA2	17420
CA2	6127
DA3	1741000
EA3	14320
FA3	90810
GA3	75780
HA3	11880
IA4	4892
JA4	37840
KA3	22870
LA3	37510
MA3	27190

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	23547
DENSITY 3 =	2291760
DENSITY 4 =	42732
TOTAL =	2358039

URBANNA VA.
VIMS CHART # 110

AA1	127000
BA2	66210
CA1	5618
DA1	6293
EA2	105300
FA3	2174
GA2	11570
HA1	7556
IA2	29860

TOTAL AREA

DENSITY 1 =	146467
DENSITY 2 =	212940
DENSITY 3 =	2174
DENSITY 4 =	0
TOTAL =	361581

IRVINGTON VA.
VIMS CHART # 111

AA3	38380
BA2	12580
CA2	47900
DA4	98210
EA4	17090
FA1	16580
GA3	221200
HA3	7241
IA3	3778
JA3	32780
KA2	2616
LA3	53570
MA3	7818
NA3	2302
OA4	16400
PA4	12930
QA3	28190
RA2	4274
SA4	21700
TA2	3957
UA3	4788
VA3	294600
WA1	24570

TOTAL AREA

DENSITY 1 =	41150
DENSITY 2 =	71327
DENSITY 3 =	694647
DENSITY 4 =	166330
TOTAL =	973454

FLEETS BAY VA.
VIMS CHART # 112

AA1	165100
BA1	173700
CA3	21110
DA3	37070
EA4	20060
FA1	518200
GA2	6129
HA2	202600
IA2	8748
JA2	20090
KA3	18180
LA3	7740
MA3	32560

FLEETS BAY VA. (continued)
VIMS CHART # 112

NA2	20260
OA2	41510
PA3	7212
QA2	526600
RA2	51500
SA2	24300
TA3	39560
UA2	20160
VA3	16660
WA2	86850
XA2	166800
YA2	31920
ZA2	26050
AB2	31910
BB2	25650
CB1	8443

TOTAL AREA

DENSITY 1 =	865443
DENSITY 2 =	1291077
DENSITY 3 =	180092
DENSITY 4 =	20060
TOTAL =	2356672

NANDUA CREEK VA.
VIMS CHART # 113

AA3	41240
BA1	14000
CA4	94330
DA4	163600
EA3	133800
FA2	1181000
GA3	145200
HA3	72170
IA1	87480
JA3	23730
KA3	242500
LA1	1588000

TOTAL AREA

DENSITY 1 =	1689480
DENSITY 2 =	1181000
DENSITY 3 =	658640
DENSITY 4 =	257930
TOTAL =	3787050

PUNGOTEAGUE VA.
VIMS CHART # 114

AA3	57210
BA4	14830
CA4	1857
DA3	107000
EA4	20510
FA2	25690
GA3	203600
HA4	992900
IA1	157200
JA3	748500
KA1	2095000
LA3	1225000
MA3	16090
NA2	50390
OA1	34030
PA3	212200
QA2	78320
RA2	16050
SA2	10320
TA1	72590
UA4	18160
VA2	12140
WA3	14470
XA3	72910
YA4	55920
ZA4	60370
AB2	157000
BB1	316100
CB4	49880
DB3	44780
EB3	12270
FB3	14050

TOTAL AREA

DENSITY 1 =	2674920
DENSITY 2 =	349910
DENSITY 3 =	2728080
DENSITY 4 =	1214427
TOTAL =	6967337

WILTON VA.
VIMS CHART # 117

AA2	10810
BA2	3146
CA2	6939
DA2	3457
EA3	5531
FA2	3756
GA2	4502
HA2	4474
IA2	3538
JA2	19110
KA1	11490
LA1	55730
MA3	99760
NA2	32660
OA2	2588

TOTAL AREA

DENSITY 1 =	67220
DENSITY 2 =	94980
DENSITY 3 =	105291
DENSITY 4 =	0
TOTAL =	267491

DELTAVILLE VA.
VIMS CHART # 118

AA2	13780
BA4	34270
CA2	5336
DA1	41590
EA1	10000
FA2	8878
GA4	4893
HA2	20960
IA2	3759
JA1	13130
KA2	5265
LA1	26960

TOTAL AREA

DENSITY 1 =	91680
DENSITY 2 =	57978
DENSITY 3 =	0
DENSITY 4 =	39163
TOTAL =	188821

JAMESVILLE VA.
VIMS CHART # 119

AA2	23510
BA2	30730
CA2	486300
DA4	498000
EA1	104700
FA4	159400
GA3	10550
HA2	73000
IA3	9270
JA2	41830
KA4	18020
LA2	913000
MA4	190300
NA2	18570
OA2	663700
PA1	41150
QA3	23350
RA3	15460
SA3	16610
TA3	55100
UA3	145200
VA4	164800
WA1	35860
XA3	237600
YA4	140300
ZA2	12330
AB2	66670

TOTAL AREA

DENSITY 1 =	181710
DENSITY 2 =	2329640
DENSITY 3 =	513140
DENSITY 4 =	1170820
TOTAL =	4195310

WARE NECK VA.
VIMS CHART # 122

AA3	8409
BA2	32490
CA2	9489
DA2	261500
EA1	7684
FA3	5269
GA3	26920
HA4	90940
IA4	43780

WARE NECK VA. (continued)
VIMS CHART # 122

JA2	20240
KA3	138500
LA1	125900
MA2	87160
NA3	12170
OA3	32690
PA2	4274
QA2	661100
RA3	216200
SA3	57560
TA2	100900

TOTAL AREA

DENSITY 1 =	133584
DENSITY 2 =	1177153
DENSITY 3 =	497718
DENSITY 4 =	134720
TOTAL =	1943175

MATHEWS VA.
VIMS CHART # 123

AA4	15490
BA4	14550
CA4	13430
DA1	25380
EA1	22820
FA4	47150
GA1	42230
HA4	67840
IA4	3752
JA2	32500
KA3	21340
LA3	10590
MA3	28070
NA3	20320
OA2	6691
PA3	43470

MATHEWS VA. (continued)
VIMS CHART # 123

QA2	62200
RA4	79400
SA1	23620

TOTAL AREA

DENSITY 1 =	114050
DENSITY 2 =	101391
DENSITY 3 =	123790
DENSITY 4 =	241612
TOTAL =	580843

FRANKTOWN VA.
VIMS CHART # 124

AA2	30560
BA4	100700
CA2	56350
DA2	8570
EA3	15800
FA3	761100
GA1	41970
HA1	59660
IA4	19560
JA3	57470
KA4	105900
LA3	265600
MA3	126600
NA4	1421000
OA2	175600
PA1	58810
QA2	23890
RA3	42460
SA2	11690
TA2	172900
UA3	94880
VA3	15630
WA3	59000
XA3	36500
YA3	8694

FRANKTOWN VA. (Continued)
VIMS CHART # 124

ZA3	64040
AB3	23610
BB4	5268
CB4	53940
DB1	9253

TOTAL AREA

DENSITY 1 =	169693
DENSITY 2 =	479560
DENSITY 3 =	1571384
DENSITY 4 =	1706368
TOTAL =	3927005

ACHILLES VA.
VIMS CHART # 131

AA3	21060
BA4	34200
CA4	35200
DA2	56520
EA4	706800
FA2	166400
GA4	206900
HA4	36290
IA4	142400
JA2	42380
KA4	264500
LA2	547800
MA4	33370
NA4	109400
OA2	17400
PA4	40900
QA4	79740
RA2	594800
SA4	18130
TA4	41500
UA4	8099
VA4	235700
WA4	121200
XA1	303300
YA2	298100
ZA4	223000
AB2	30570
BB4	48910
CB4	16700
DB4	42690
EB4	20520

ACHILLES VA. (continued)
VIMS CHART # 131

FB3	194400
GB3	28350
HB4	8458
IB3	155500
JB4	233500
KB3	226800
LB1	252500
MB3	238800
NB4	252100
OB3	23330
PB3	40490
QB1	57660
RB4	223300
SB2	88420
TB4	118800
UB2	53490
VB4	8850
WB3	24090
XB2	40300
YB1	76250
ZB3	664200

TOTAL AREA

DENSITY 1 =	689710
DENSITY 2 =	1936180
DENSITY 3 =	1617020
DENSITY 4 =	3311157
TOTAL =	7554067

NEW POINT COMFORT VA.
VIMS CHART # 132

AA2	1113000
BA1	286800
CA4	1263000
DA2	536100
EA4	1437000
FA1	94570
GA4	48840
HA2	387400
IA4	88640
JA4	21010
KA3	142600
LA4	111800
MA2	581600
NA3	257300
OA1	80100

NEW POINT COMFORT VA.
VIMS CHART # 132

PA3	35760
QA3	218200
RA2	435600
SA4	622000
TA2	325200
UA4	17930
VA2	452000
WA4	345100
XA3	413300
YA4	21800
ZA3	13810
AB4	584200
BB1	54340
CB1	442000
DB3	57860

TOTAL AREA

DENSITY 1 =	957810
DENSITY 2 =	3830900
DENSITY 3 =	1138830
DENSITY 4 =	4561320
TOTAL =	10488859

CAPE CHARLES VA.
VIMS CHART # 133

AA4	20030
BA2	209000
CA4	68140
DA4	636400
EA3	240200
FA3	70650
GA3	24930
HA4	9813
IA3	77320
JA1	647000
KA3	660700

TOTAL AREA

DENSITY 1 =	647000
DENSITY 2 =	209000
DENSITY 3 =	1073800
DENSITY 4 =	734383
TOTAL =	2664183

CHERITON VA.
VIMS CHART # 134

AA1	116900
BA4	309800
CA2	92850
DA4	215500

TOTAL AREA

DENSITY 1 =	116900
DENSITY 2 =	92850
DENSITY 3 =	0
DENSITY 4 =	525300
TOTAL =	735050

YORKTOWN VA.
VIMS CHART # 139

AA2	3639
BA3	6137

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	3639
DENSITY 3 =	6137
DENSITY 4 =	0
TOTAL =	9776

POQUOSON WEST VA.
VIMS CHART # 140

AA4	3996
BA4	14600
CA3	104800
DA1	222700
EA4	395300
FA3	24860
GA3	62170
HA2	9127
IA3	12260
JA4	56500
KA2	2694
LA4	78750
MA1	246200
NA1	50580
OA2	346900
PA4	44620
QA3	20170

POQUOSON WEST VA.
VIMS CHART # 140

RA3	41780
SA2	349600
TA4	365000
UA3	438900
VA3	13820

TOTAL AREA

DENSITY 1 =	519480
DENSITY 2 =	708321
DENSITY 3 =	718760
DENSITY 4 =	958766
TOTAL =	2905327

POQUOSON EAST VA.
VIMS CHART # 141

AA3	477400
BA2	32210
CA1	97650
DA4	507000
EA2	1291000
FA4	4313000
GA3	721200
HA1	38980
IA3	28350
JA4	7066
KA4	5187
LA4	5117

TOTAL AREA

DENSITY 1 =	136630
DENSITY 2 =	1323210
DENSITY 3 =	1226950
DENSITY 4 =	4837370
TOTAL =	7524160

ELLIOTTS CREEK VA.
VIMS CHART # 142

AA3	20550
BA1	73750

TOTAL AREA

DENSITY 1 =	73750
DENSITY 2 =	0
DENSITY 3 =	20550
DENSITY 4 =	0
TOTAL =	94300

TOWNSEND VA.
VIMS CHART # 143

AA3	6613
BA3	19620
CA3	58410
DA3	35020

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	0
DENSITY 3 =	119663
DENSITY 4 =	0
TOTAL =	119663

HAMPTON VA.
VIMS CHART # 147

AA4	107000
BA4	134100
CA4	32680
DA4	459200
EA4	102400
FA4	526900
GA3	13200
HA1	86680
IA3	164900
JA2	241700
KA4	593700
LA4	9008
MA4	368400

TOTAL AREA

DENSITY 1 =	86680
DENSITY 2 =	241700
DENSITY 3 =	178100
DENSITY 4 =	2333388
TOTAL =	2839868

CAPE HENRY VA.
VIMS CHART # 152

AA2	15800
BA2	153400
CA2	58530
DA3	106500
EA3	52370
FA3	18440

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	227730
DENSITY 3 =	177310
DENSITY 4 =	0
TOTAL =	405040

PORT TOBACCO MD.
VIMS CHART # 161

AA4	2726
BA4	5650
CA4	31810
DA4	3574
EA4	3753
FA2	5557
GA3	3311

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	5557
DENSITY 3 =	3311
DENSITY 4 =	47513
TOTAL =	56381

BERLIN MD.
VIMS CHART # 167

AA3	63960
BA4	6604

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	0
DENSITY 3 =	63960
DENSITY 4 =	6604
TOTAL =	70564

OCEAN CITY MD.
VIMS CHART # 168

AA3	80540
BA4	3611

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	0
DENSITY 3 =	80540
DENSITY 4 =	3611
TOTAL =	84151

TINGLES ISLAND MD.
VIMS CHART # 170

AA3	8821000
BA4	253200
CA4	37930
DA3	287500
EA3	506300
FA4	164500
GA4	35940
HA4	99630

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	0
DENSITY 3 =	9614800
DENSITY 4 =	591200
TOTAL =	10205999

BOXIRON MD.-VA.
VIMS CHART # 172

AA3	3208000
BA4	93440
CA3	1410000
DA4	60550
EA3	577600
FA3	45390
GA4	1008000
HA4	246400

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	0
DENSITY 3 =	5240990
DENSITY 4 =	1408390
TOTAL =	6649380

WHITTINGTON POINT MD.-VA.
VIMS CHART # 173

AA4	341300
BA4	16480
CA4	1519000
DA3	97730
EA4	93830
FA4	10680

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	0
DENSITY 3 =	97730
DENSITY 4 =	1981290
TOTAL =	2079020

CHINCOTEAGUE EAST VA.
VIMS CHART # 175

AA3	4010000

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	0
DENSITY 3 =	4010000
DENSITY 4 =	0
TOTAL =	4010000

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