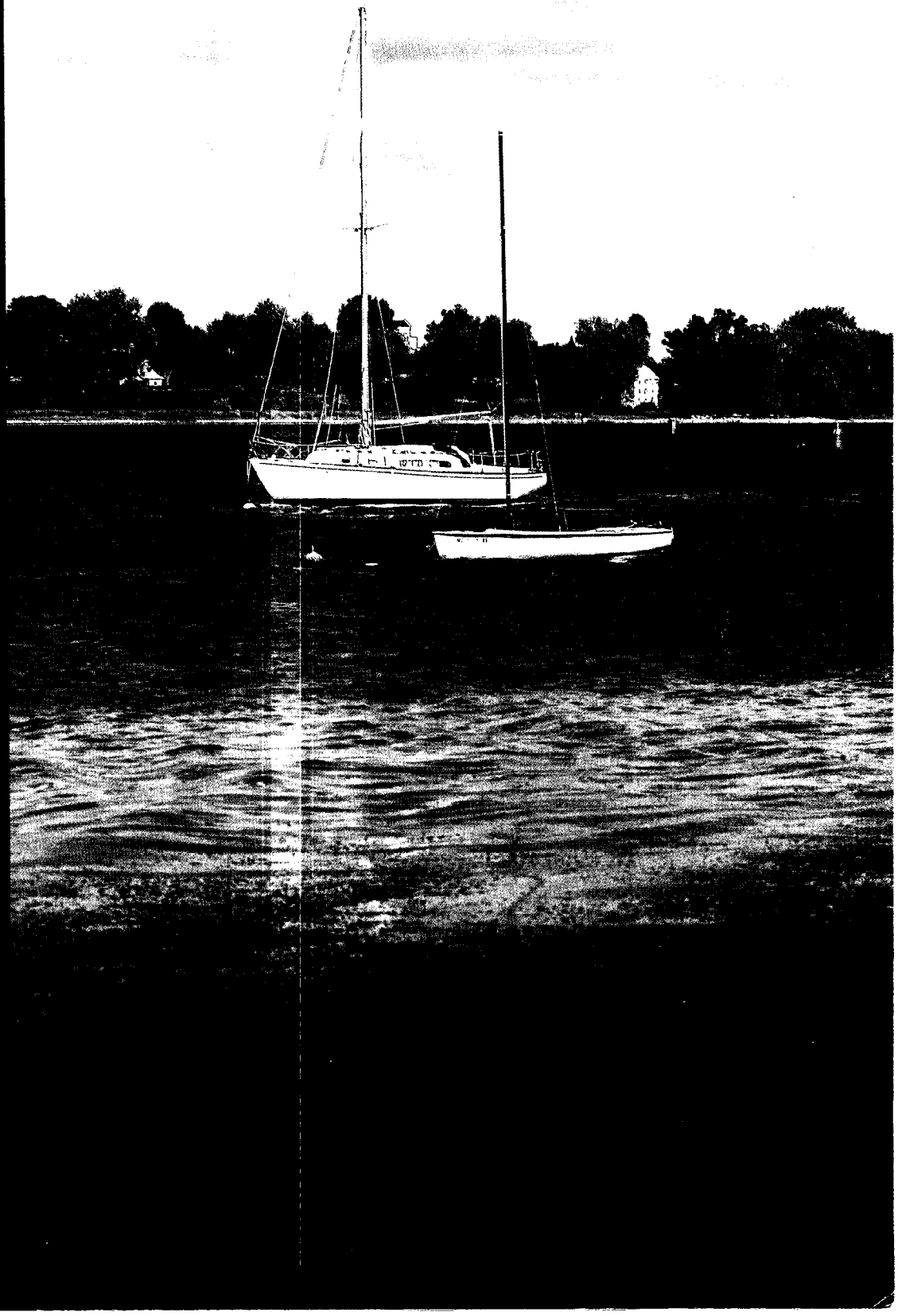
FY 1992 **FINAL PRODUCT** Task 7
SAV Mapping

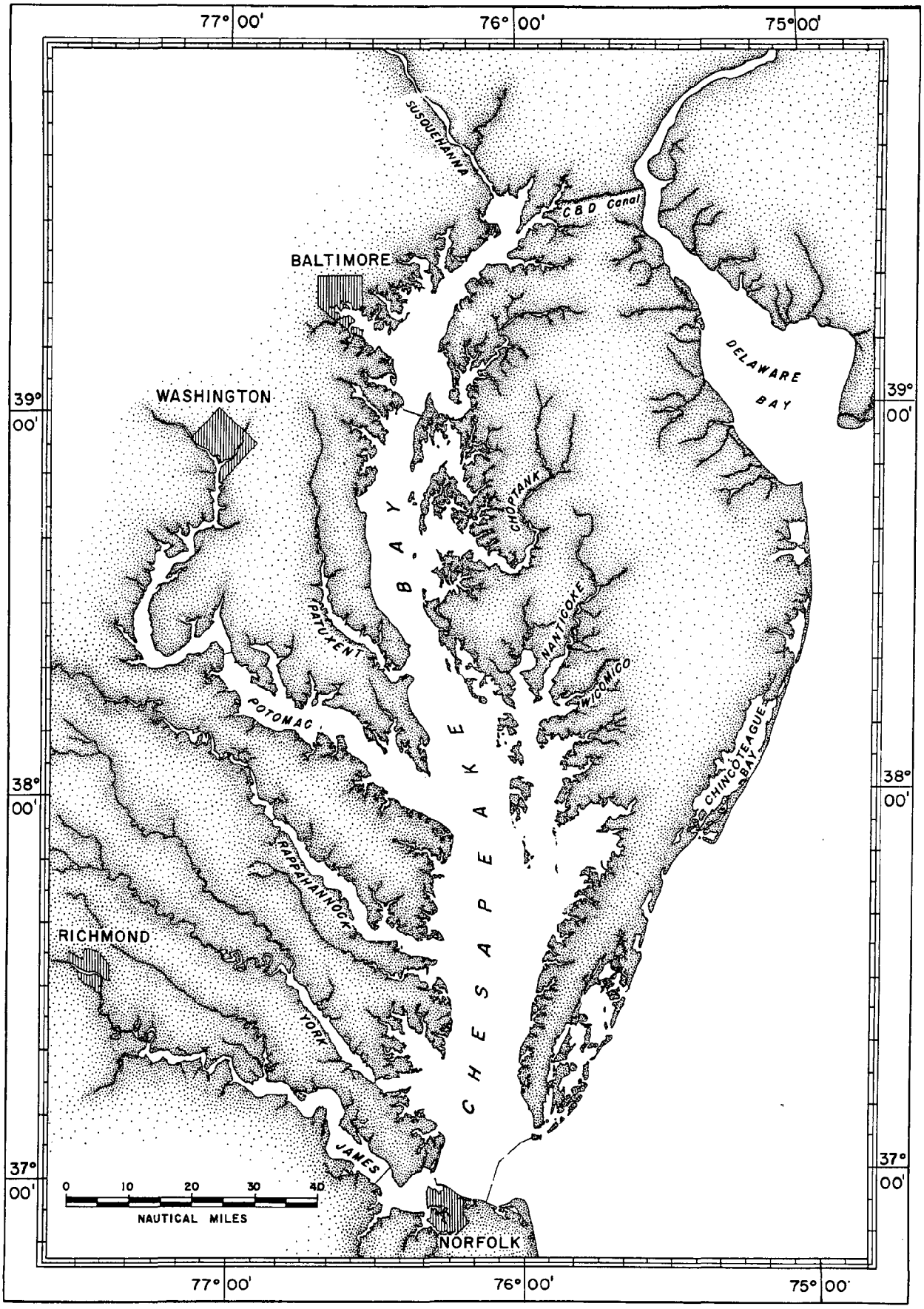
Distribution of Submerged Aquatic Vegetation in the Chesapeake Bay

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

1992



Map of Chesapeake Bay and Tributaries and Chincoteague Bay.



Distribution of Submerged Aquatic Vegetation In The Chesapeake Bay and Tributaries and Chincoteague Bay - 1992

by

Robert J. Orth, Judith F. Nowak, Gary F. Anderson,
and Jennifer R. Whiting

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

Funded by: U.S. Environmental Protection Agency (Grant CB003909-01)

National Oceanographic Atmospheric Administration (Grant No. NA270Z0312-01)

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

Maryland Department of Natural Resources (C324-93-006)

U.S. Fish and Wildlife Service (14-16-0005-92-9031)

Allied-Signal Foundation

Final Report Submitted to: U.S. Environmental Protection Agency
Chesapeake Bay Program Office
Annapolis, MD 21403

December 1993

Cover Photograph: The Susquehanna River, Maryland, 1992: Eurasian watermilfoil (*Myriophyllum spicatum*) bed on the south shore near the mouth. (Photography courtesy of Robert Even Owens of Air Photographics, Inc., Martinsburg, West Virginia.)

Rec'd. by Dept. of Environmental Quality
FEB 24 1994
Public & Inter-governmental Affairs

CONTENTS

	Page
TABLES	v
FIGURES	vi
EXECUTIVE SUMMARY	ix
ACKNOWLEDGEMENTS	xiv
SAV SPECIES	1
METHODS	2
Introduction	2
Aerial photography	2
Mapping process	5
SAV perimeter digitization and area calculation	9
Tests of precision and accuracy	9
Standard operating procedures for QA/QC	10
Choice of representative SAV bed	10
Conversion of SAV perimeter points from X,Y centimeters to Universal Transverse Mercator (UTM) coordinates in ARC/INFO 5.0.1 format	11
Calculation of 1992 SAV areas	11
Organizational procedures for analysis and discussion	12
Ground surveys and other data bases	17
RESULTS	19
Data presentation	19
1992 Summary	19
Upper Bay Zone	19
Middle Bay Zone	37
Lower Bay Zone	38
Chincoteague Bay	38
Discussion of sections arranged within zones	38
Upper Bay Zone	38
Susquehanna Flats (Section 1)	38
Upper Eastern Shore (Section 2)	40
Upper Western Shore (Section 3)	40
Chester River (Section 4)	43
Middle Bay Zone	43
Central Western Shore (Section 5)	43
Eastern Bay (Section 6)	43
Choptank River (Section 7)	47

CONTENTS (continued)

Page

RESULTS (continued)

Patuxent River (Section 8) 49
Middle Western Shore (Section 9) 49
Lower Potomac River (Section 10) 49
Upper Potomac River (Section 11) 53
Middle Eastern Shore (Section 12) 53
Mid-Bay Island Complex (Section 13) 53
Lower Bay Zone 57
Lower Eastern Shore (Section 14) 57
Reedville Region (Section 15) 57
Rappahannock River Complex (Section 16) 60
New Point Comfort Region (Section 17) 60
Mobjack Bay Complex (Section 18) 60
York River (Section 19) 64
Lower Western Shore (Section 20) 64
James River (Section 21) 67
Chincoteague Bay 67

LITERATURE CITED 71

APPENDICES 73

A. Species of submerged aquatic plants found in the Chesapeake Bay and tributaries 75

B. Latitude and longitude coordinate points defining the 21 Chesapeake Bay sections and Chincoteague Bay 89

C. USGS 7.5 minute quadrangles for Chesapeake Bay and Chincoteague Bay showing distribution, abundance, and ground truthing of SAV in 1992 . 95
Map Legend 96

D. Number of square meters of SAV for individual beds and totals for density categories for each USGS 7.5 minute quadrangle in 1992 203

E. 1992 SAV ground survey data listed by USGS 7.5 minute quadrangle quadrangle and by 1992 SAV bed 231
Key to Appendix E 232

F. 1992 Horn Point Environmental Laboratory SAV ground survey of the Choptank River and Eastern Bay with listings by latitude and longitude coordinates 247

TABLES

Number		Page
1	Guidelines followed during acquisition of aerial photographs	4
2	List of USGS 7.5 minute quadrangles for Chesapeake Bay and Chincoteague Bay SAV study areas with corresponding code numbers	7
3	Area descriptions for each of the 21 sections of the Chesapeake Bay SAV study area	15
4	Total area of SAV in hectares by USGS 7.5 minute quadrangles for 1991 and 1992	20
5	Number of hectares of SAV in 1991 and 1992 for the 21 sections and three zones of Chesapeake Bay, and for Chincoteague Bay	24
6	Number of square meters of SAV in 1992 for each USGS 7.5 minute quadrangle of the 21 sections of Chesapeake Bay and of Chincoteague Bay	25
7	Number of square meters of SAV in 1992 by density class for the 21 sections of Chesapeake Bay and for Chincoteague Bay	33

FIGURES

Number		Page
1	Map of Chesapeake Bay and tributaries with Upper, Middle, and Lower zones, and of Chincoteague Bay, with locations of all SAV beds in 1992	x
2	A comparison of the total hectares of SAV for the Upper, Middle, and Lower zones of the Chesapeake Bay in 1991 and 1992	xi
3	Number of hectares SAV per density class in 1992 by section and zone of the Chesapeake Bay.	xii
4	Map of Chesapeake Bay, its tributaries, and of Chincoteague Bay with approximate locations of flight lines for 1992 SAV photography.	3
5	Location of USGS 7.5 minute quadrangles in the Chesapeake Bay, its tributaries, and in Chincoteague Bay with corresponding code numbers.	6
6	Crown density scale used for determining density of SAV beds	13
7	Location of Chincoteague Bay and Chesapeake Bay with Upper, Middle, and Lower zones and 21 sections used for delineation of SAV distribution patterns	14
8	Distribution of SAV in the Susquehanna Flats in 1992 (Section 1)	39
9	Distribution of SAV in the Upper Eastern Shore in 1992 (Section 2)	41
10	Distribution of SAV in the Upper Western Shore in 1992 (Section 3)	42
11	Distribution of SAV in the Chester River in 1992 (Section 4)	44
12	Distribution of SAV in the Central Western Shore in 1992 (Section 5)	45
13	Distribution of SAV in the Eastern Bay in 1992 (Section 6)	46
14	Distribution of SAV in the Choptank River in 1992 (Section 7)	48
15	Distribution of SAV in the Patuxent River in 1992 (Section 8)	50

FIGURES (continued)

Number		Page
16	Distribution of SAV in the Middle Western Shore in 1992 (Section 9)	51
17	Distribution of SAV in the Lower Potomac River in 1992 (Section 10)	52
18	Distribution of SAV in the Upper Potomac River in 1992 (Section 11)	54
19	Distribution of SAV in the Middle Eastern Shore in 1992 (Section 12)	55
20	Distribution of SAV in the Mid-Bay Island Complex in 1992 (Section 13)	56
21	Distribution of SAV in the Lower Eastern Shore (Section 14)	58
22	Distribution of SAV in the Reedville Region in 1992 (Section 15)	59
23	Distribution of SAV in the Rappahannock River Complex in 1992 (Section 16)	61
24	Distribution of SAV in the New Point Comfort Region in 1992 (Section 17)	62
25	Distribution of SAV in the Mobjack Bay Complex in 1992 (Section 18)	63
26	Distribution of SAV in the York River in 1992 (Section 19)	65
27	Distribution of SAV in the Lower Western Shore in 1992 (Section 20)	66
28	Distribution of SAV in the James River in 1992 (Section 21)	68
29	Distribution of SAV in the Chincoteague Bay in 1992	69
30	Illustration of *Chara* spp. (Muskgrass)	78
31	Illustration of *Nitella* spp. (Stonewort)	79
32	Illustration of *Najas guadalupensis* (Southern naiad)	80
33	Illustration of *Vallisneria americana* (Tapegrass)	81
34	Illustration of *Egeria* spp. (Water-weed)	82
35	Illustration of *Hydrilla verticillata* (Hydrilla)	83

FIGURES (continued)

Number		Page
36	A comparison: illustrations of *Hydrilla verticillata*, *Elodea canadensis*, and *Egeria* spp.	84
37	A comparison: illustrations of *Hydrilla verticillata*, *Elodea canadensis*, and *Egeria* spp.	85
38	Illustration of *Ceratophyllum demersum* (Coontail)	86
39	Illustration of *Trapa natans* (Water chestnut)	87
40	Illustration of *Myriophyllum spicatum* (Eurasian watermilfoil)	88

EXECUTIVE SUMMARY

The distribution of submerged aquatic vegetation, principally rooted vascular macrophytes, in the Chesapeake Bay, its tributaries, and Chincoteague Bay, was mapped during May to October 1992 at a scale of 1:24,000 using black and white aerial photography. SAV bed perimeter information was digitized and stored in a computerized data base. Ground truth information was obtained from the U. S. Fish and Wildlife Service; the University of Maryland Horn Point Environmental Laboratories; Harford Community College, Maryland; Essex Community College SAV Research Group of Baltimore County, Maryland; Maryland-National Capital Parks and Planning Commission, Patuxent River Park; and the College of William and Mary, School of Marine Science, Virginia Institute of Marine Science. Citizen support via the U. S. Fish and Wildlife Service and the Chesapeake Bay Foundation provided additional ground truth information.

In 1992, the Chesapeake Bay had 28,591 hectares of SAV, compared to 25,623 hectares in 1991, with 2,516 hectares (8.7%), 13,713 hectares (48.0%), and 12,362 hectares (43.2%) occurring in the Upper, Middle, and Lower Bay zones, respectively (Figs. 1, 2, and 3). SAV increased in most sections in 1992 with the largest increases in SAV abundance occurring in the Eastern Bay and Choptank River sections. SAV declined in only a few sections, notably the Upper Potomac River section.

In 1992 in the Upper Bay zone, 71.2% (1,792 hectares) of SAV was located in the Susquehanna Flats (Section 1). Overall abundance of SAV increased from the 1991 level (1,684 hectares), while the density of the beds in 1992 increased slightly from 1991. In the flats, 88.6% of all SAV beds were classified as very sparse in 1992 (0-10% coverage) (Figure 3), the same as in 1991, but 8.0% of beds were classified as dense in 1992 (70-100% coverage), an increase of 1.0% compared to 1991. *Myriophyllum spicatum, Heteranthera dubia, Vallisneria americana, Hydrilla verticillata,* and *Ceratophyllum demersum* were among the six species reported from many of the SAV beds. In the Upper Eastern Shore (Section 2) there were 283 hectares of SAV in 1992 (43 hectares less than in 1991), located principally in the Elk and lower Sassafras rivers, and in Swan, Stillpond, and Churn creeks with *M. spicatum* and *V. americana* found most frequently, especially in the Elk River. The Upper Western Shore (Section 3) had 186 hectares of SAV concentrated in Saltpeter, Seneca, and Dundee creeks, compared to 91 hectares recorded in 1991. *Myriophyllum spicatum, Elodea canadensis,* and *C. demersum* were frequently cited. In the Chester River (Section 4) SAV abundance (255 hectares) was up 198 hectares from 1991. SAV was most abundant adjacent to Eastern Neck, Eastern Neck Island, and in Gray's Creek in the lower Chester River. *Ruppia maritima* was most commonly cited.

In 1992, 43.7% (5,994 hectares) of the SAV in the Middle Bay zone was found in the Mid-Bay Island Complex (Section 13), which includes the broad shoal area between Smith and Tangier Islands. This is an increase of 287 hectares over 1991. In this zone, 22.2% (3,047 hectares) of SAV was present in the Middle Eastern Shore (Section 12), primarily in the Barren Island-Honga River area, the Big and Little Annemessex rivers, and the lower section of the Manokin River, with *R. maritima* reported most frequently. Little or no SAV was mapped from the Central

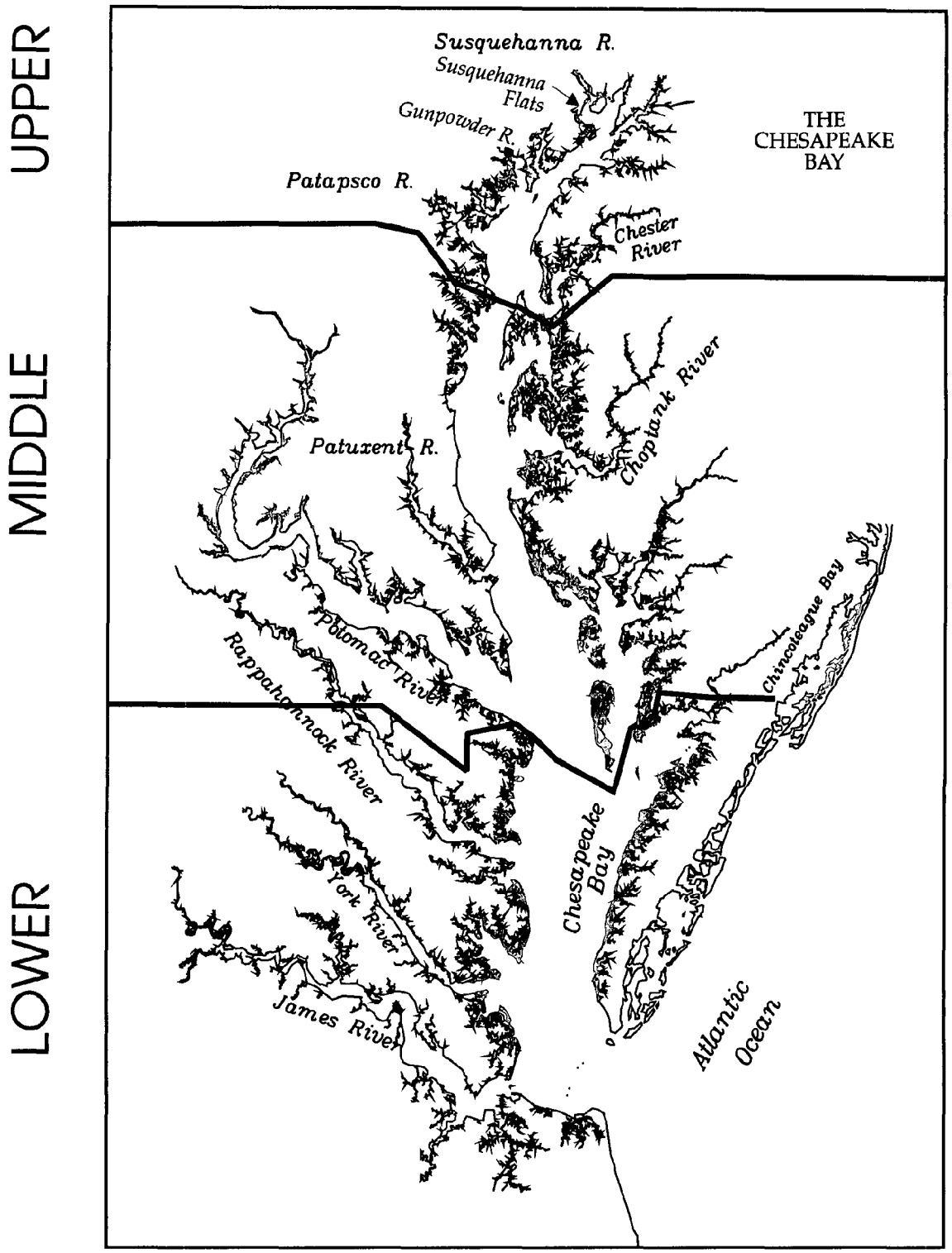


Figure 1. Map of Chesapeake Bay and tributaries with Upper, Middle, and Lower zones, and of Chincoteague Bay, with locations of all SAV beds in 1992 (SAV is shown in red).

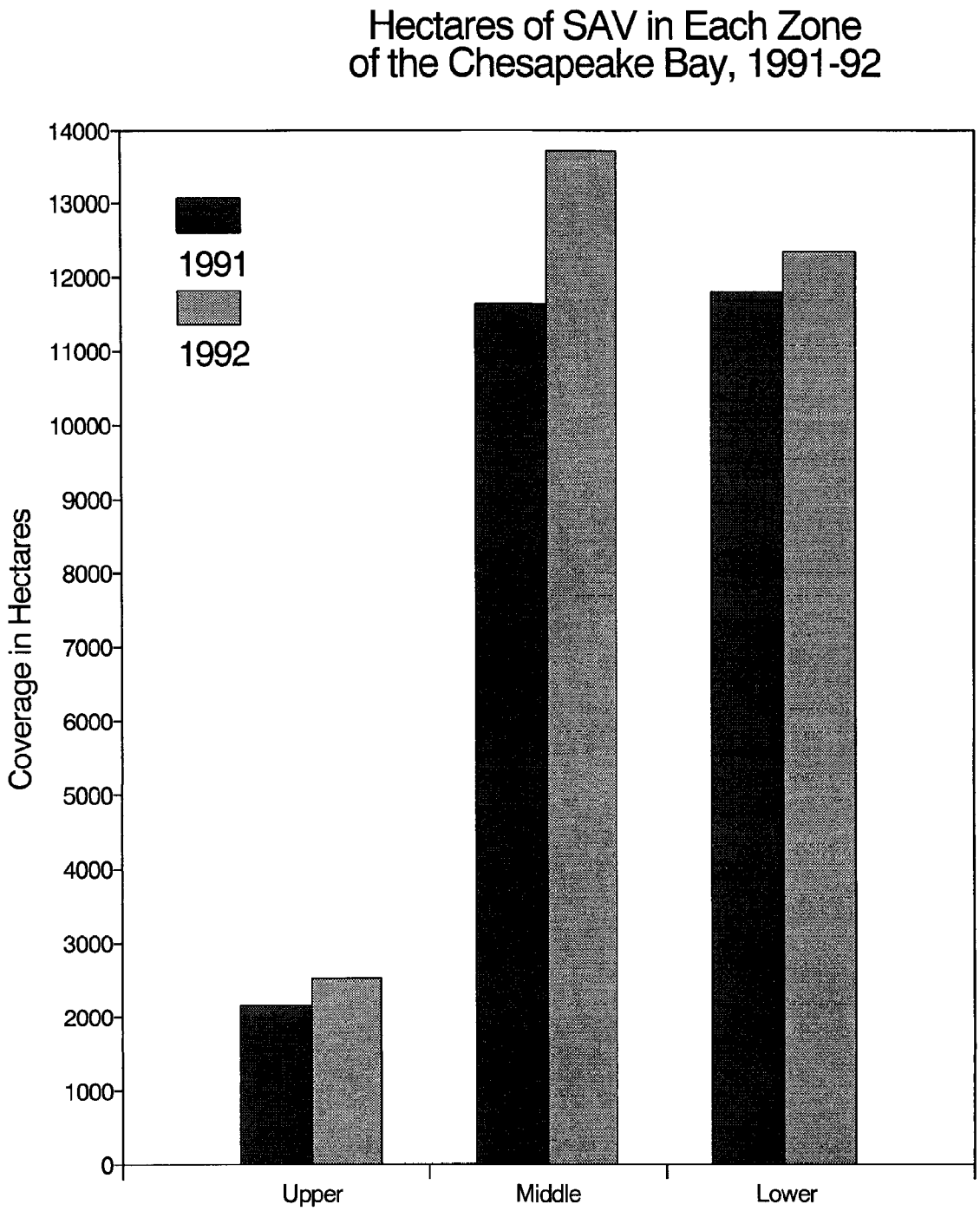


Figure 2. A comparision of the total hectares of SAV for the Upper, Middle, and Lower zones of the Chesapeake Bay in 1991 and 1992. (Refer to Figures 1 and 7 for zone locations.)

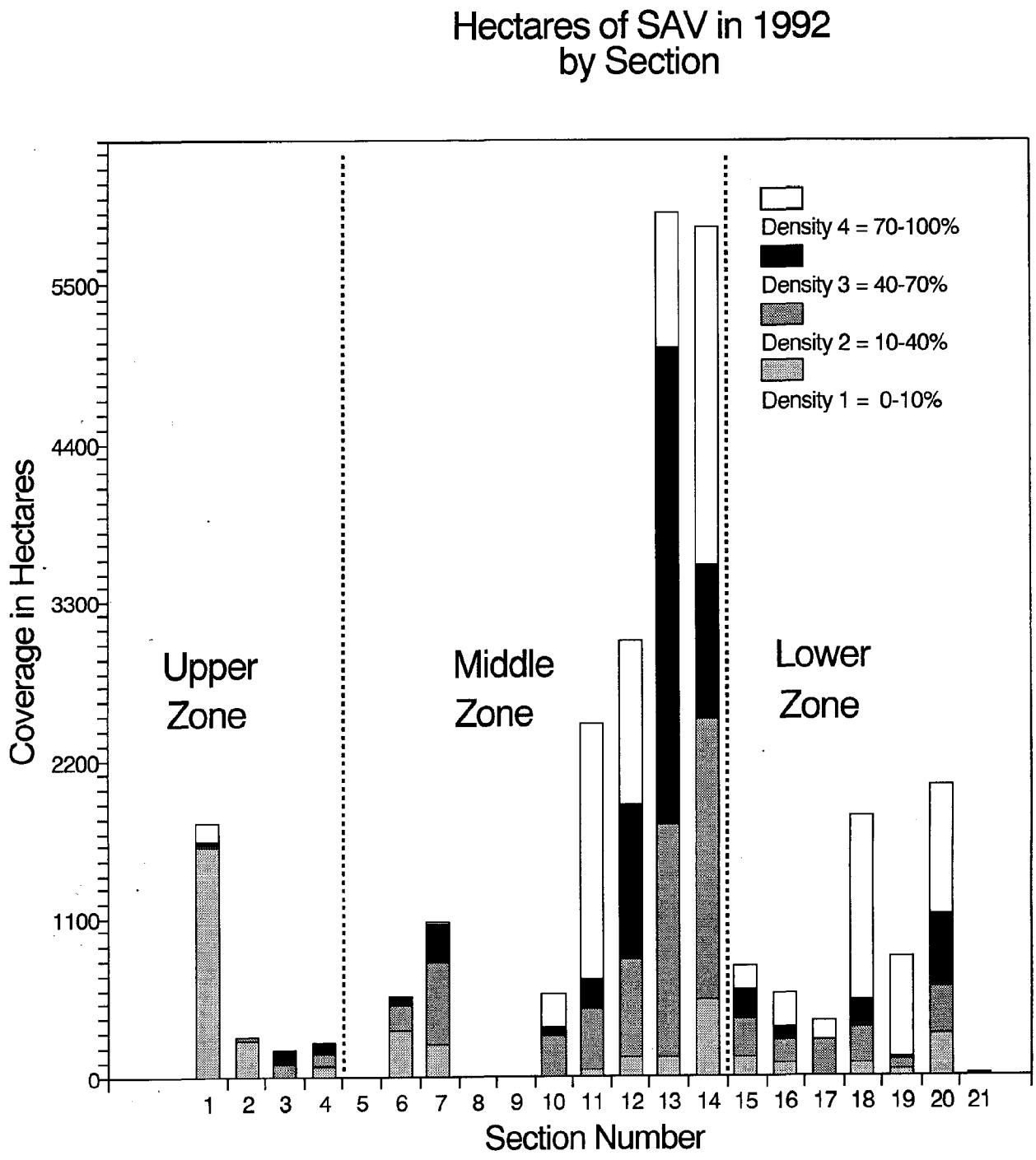


Figure 3. Number of hectares SAV per density class in 1992 by section and zone of the Chesapeake Bay. (Refer to Figure 7, Table 3, and Appendix B for section locations and boundaries.)

Western Shore (Section 5), Patuxent River (Section 8), and Middle Western Shore (Section 9). Citizens' surveys reported *Zannichellia palustris* at numerous locations in the South and Severn rivers, while 12 species were reported from the small marsh creeks in the upper Patuxent River.

The Middle Bay zone also includes the entire Potomac River, where 3,033 hectares of SAV were present in 1992. SAV was concentrated in two distinct regions: 1) the Upper Potomac River (Section 11) with 2,462 hectares; and 2) the upper portion of the Lower Potomac River (Section 10) with 571 hectares, including Nanjemoy Creek and Port Tobacco River. The total abundance of SAV in the Upper Potomac section decreased by 554 hectares from 1991. Declines in SAV were most notable in the Alexandria, Mt. Vernon, and Fort Belvoir quadrangles, primarily in the mainstem river, the southern edge of the large bed at the Woodrow Wilson Bridge, and in Piscataway Creek. Ground survey data were limited in this section in 1992 to only Citizens' surveys with five species reported: *M. spicatum, V. americana, H. verticillata, Najas guadalupensis* and *C. demersum*. SAV increased in the Eastern Bay and Choptank River sections for the first time since the late 1980's. SAV in the Eastern Bay (Section 6) increased 486 hectares from 1991 to a total of 554 hectares in 1992. In the Choptank River (Section 7) it increased 971 hectares from 1991 to a total of 1,085 hectares in 1992. Most of the increase in the Eastern Bay occurred in the Miles River, while in the Choptank River section SAV beds were most abundant in Harris and Broad creeks and in Trippe Bay. Three species were reported from Sections 6 and 7, with *R. maritima* most commonly cited.

In 1992, distribution and abundance of SAV in the Lower Bay zone were similar to 1991. In this zone, 47.9% (5,920 hectares) of the SAV was found in the Lower Eastern Shore (Section 14) around the Fox Islands and the mouths of major creeks (i.e. Cherrystone Inlet and Hungars, Mattawoman, Occahannock, Craddock, Pungoteague, and Onancock creeks). Along the western shore of the Chesapeake Bay, SAV was abundant in Mobjack Bay (Section 18) (14.7% of SAV in the Lower Bay zone), in the lower York River (Section 19) (6.7% of SAV in the Lower Bay zone), and in the Lower Western Shore (Section 20), specifically Back River and the Drum Island Flats area adjacent to Plum Tree Island (16.4% of SAV in the Lower Bay zone). There were 778 hectares of SAV mapped in the Reedville Region (Section 15) in 1992, a 22.5% increase over 1991. There were 396 hectares of SAV identified in 1992 in the New Point Comfort Region (Section 17) compared to 339 hectares in 1991. SAV abundance was up 15.3% from 1991 in both the Piankatank and Rappahannock rivers (Section 16). The James River (Section 21) had less than 4 hectares of SAV in 1992. *Zostera marina* and *R. maritima* were the abundant species in this zone.

SAV in the Chincoteague Bay section increased in distribution with 3,324 hectares mapped in 1992 compared to 2,746 hectares in 1991. Most of the SAV in Chincoteague and Sinepuxent bays, which consisted of *Z. marina* and *R. maritima*, was located along the eastern side of the bay behind Assateague Island. Some small beds, consisting of *R. maritima*, were located along the western side of Isle of Wight and Assawoman bays.

ACKNOWLEDGEMENTS

We would like to gratefully acknowledge all federal and state agencies who financially supported this project: the U. S. Environmental Protection Agency (USEPA); the U. S. Fish and Wildlife Service (USFWS); the Virginia Council on the Environment's and MD-DNR's Coastal Resources Management Program of the National Oceanographic and Atmospheric Administration (NOAA), under the Coastal Zone Management Act of 1972 as amended by the Office of Ocean Coastal Resource Management (OCRM); the Maryland Department of Natural Resources (MD-DNR); and the Virginia Institute of Marine Science, School of Marine Science, College of William and Mary (VIMS). Also, we thank Allied - Signal, Inc. for providing supplemental funding for this work. Additionally, the Virginia Department of Environmental Equality, Division of Intergovernmental Coordination, EcoMAPS Office, under the direction of Dr. Adam A. Frisch, provided GIS support.

Acknowledgement would not be complete without commendation for the groups which provided ground truthing of SAV beds which was used in conjunction with interpretation of the 1992 photography. USFWS with the Chesapeake Bay Foundation (CBF) organized citizens to report locations and species composition of grassbeds around the bay. J. Court Stevenson and Kellie Splain of the University of Maryland Horn Point Environmental Laboratories (HPEL), Stan Kollar of Harford Community College (HCC), and the Essex Community College SAV Research Group of Baltimore County, Maryland provided ground truth information for certain specific regions of the Maryland portion of the Bay. Patuxent River Park staff provided ground truth data for the Patuxent River. Ken Moore, Curtis Harper, Jill Goodman, and James Fishman of VIMS provided ground truth information for the lower bay.

The production of this report required the dedication of numerous scientists, technicians, artists, photographers, and others. The following people deserve a note of thanks: Rich Batiuk and Carin Bisland, USEPA-Chesapeake Bay Program Office; Ed Pendleton and Kathyrn Reshetiloff, USFWS; Vincent Pito, MD-DNR; and Christina Pompa, CBF.

We are especially grateful to the dedicated VIMS personnel who contributed greatly to the production of this report: Leah Nagey, Martin Cavaluzzi, and Jennise Knight for their tremendous assistance and perservation in digitizing the SAV maps, editing the digital data files, mapping ground truth information, and for their constant, careful efforts to maintain high quality control; Melanie Rippon for assistance in designing the map products with ARC/INFO; Wanda Cohen, Harold Burrell, Kay Stubblefield, Sylvia Motley, Billy Jenkins, and Ruth Hershner of the VIMS Publications Center for report production services; and Pat Hall for computer services.

Michael Upchurch, Virginia Division of Mineral Resources; Randy Karin, Maryland Geological Survey, and Claud Summers, USGS, National Cartographic Information Center (NCIC), and the Mid-Continent Mapping Center were helpful in the procurement of high quality topo maps. Craig Breen, Professional Blueprinters, Inc., Newport News, VA, provided high quality reprographic services. Air Photographics, Inc. conducted the aerial photographic missions and was responsible for the high quality aerial photographs.

Aquatic plant illustrations were provided by the Information Office of the University of Florida, Institute of Food and Agricultural Sciences, Center for Aquatic Plants (Gainesville) and were drawn by Laura Line Reep, biological illustrator.

SAV SPECIES

The term "submerged aquatic vegetation" for the purpose of this report encompasses 19 taxa from 10 vascular macrophyte families and 3 taxa from 1 freshwater macrophytic algal family, the Characeae, but excludes all other algae, both benthic and planktonic, which occur in the Chesapeake Bay and its tributaries (Appendix A). Although these other algae do constitute a portion of the SAV biomass in the Chesapeake Bay and tributaries (Humm, 1979), this study has not attempted to identify, delineate, or discuss the algal component of the vegetation nor its relative importance in the flora, except for the Characeae. This is the case, for example, with the benthic marine algae, including many macrophytes, which sometimes co-occur in the same beds as vascular plants, even as epiphytes on vascular plants.

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* (Eurasian watermilfoil), *Potamogeton pectinatus* (sago pondweed), *Potamogeton perfoliatus* (redhead grass), *Zannichellia palustris* (horned pondweed), *Vallisneria americana* (wild celery), *Elodea canadensis* (common elodea), *Ceratophyllum demersum* (coontail), and *Najas guadalupensis* (southern naiad) are less tolerant of high salinities and are found in the middle and upper reaches of the bay (Stevenson and Confer, 1978; Orth et al., 1979; Orth and Moore, 1981, 1983). *Ruppia maritima* (widgeon grass) is tolerant of a wide range of salinities and is found from the bay mouth to the Susquehanna Flats. Approximately twelve other species are only occasionally found and, when present, occur primarily in the middle and upper reaches of the bay and the tidal rivers (Appendix A). *Hydrilla verticillata* (hydrilla), a recently introduced species, presently dominates SAV beds in the tidal freshwater reaches of the Potomac River. It has also been reported again in 1992 in the Susquehanna Flats where its growth has not been as widespread as in the Potomac River (Kollar, pers. comm.).

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

METHODS

INTRODUCTION

Black and white aerial photography at a scale of 1:24,000 was the principal source of information used to assess distribution and abundance of SAV in the Chesapeake Bay, its tributaries, and Chincoteague Bay in 1992. There were 1,514 photographs from 141 flight lines which were carefully examined to identify all SAV beds. Outlines of SAV beds were subsequently drawn onto USGS 7.5 minute quadrangles and then digitized, which provided a digital data base for analysis of bed areas and locations. Ground survey information collected in 1992 was tabulated, placed onto the same 7.5 minute quadrangles, and entered into the SAV digital data base.

AERIAL PHOTOGRAPHY

The 1992 SAV aerial photography was obtained by Air Photographics (Martinsburg, West Virginia) using a Wild RC-20 camera with a 153 mm (6 inch) focal length Aviogon lens and Agfa Pan 200 film. The camera was mounted in the bottom fuselage of Air Photographics' Piper Aztec, a twin engine reconnaissance aircraft. Photography was acquired at an altitude of approximately 12,000 feet, which yielded 1:24,000 scale photographics.

Flight lines to obtain the photography were predetermined by Air Photographics to include all areas known to have SAV, as well as those areas which could potentially have SAV (i.e. all areas where water depths were less than 2 m at mean low water). There were 141 flight lines covering 1,785 miles of shoreline and yielding 1,514 exposures. Flight lines included land features that were necessary to establish control points for accurate mapping (Figure 4). Sections of the upper Rappahannock, upper York, and most of the James rivers were not photographed for analysis because of prior determination of the continued absence of SAV in these areas.

Flight lines were prioritized by sections. Flights were timed to occur during the peak growing season of species known to occur in the sections. In addition, specific areas with significant SAV coverage were given priority. Dates of photography for each quadrangle are noted on each map in Appendix C.

General guidelines followed during acquisition of aerial photography (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 photointerpretation. Deviation from any of these guidelines required prior approval by VIMS staff.

Quality assurance and calibration procedures were consistently followed. The altimeter was calibrated annually by the Federal Aviation Administration. Camera settings were selected by automatic exposure control. Sun angle

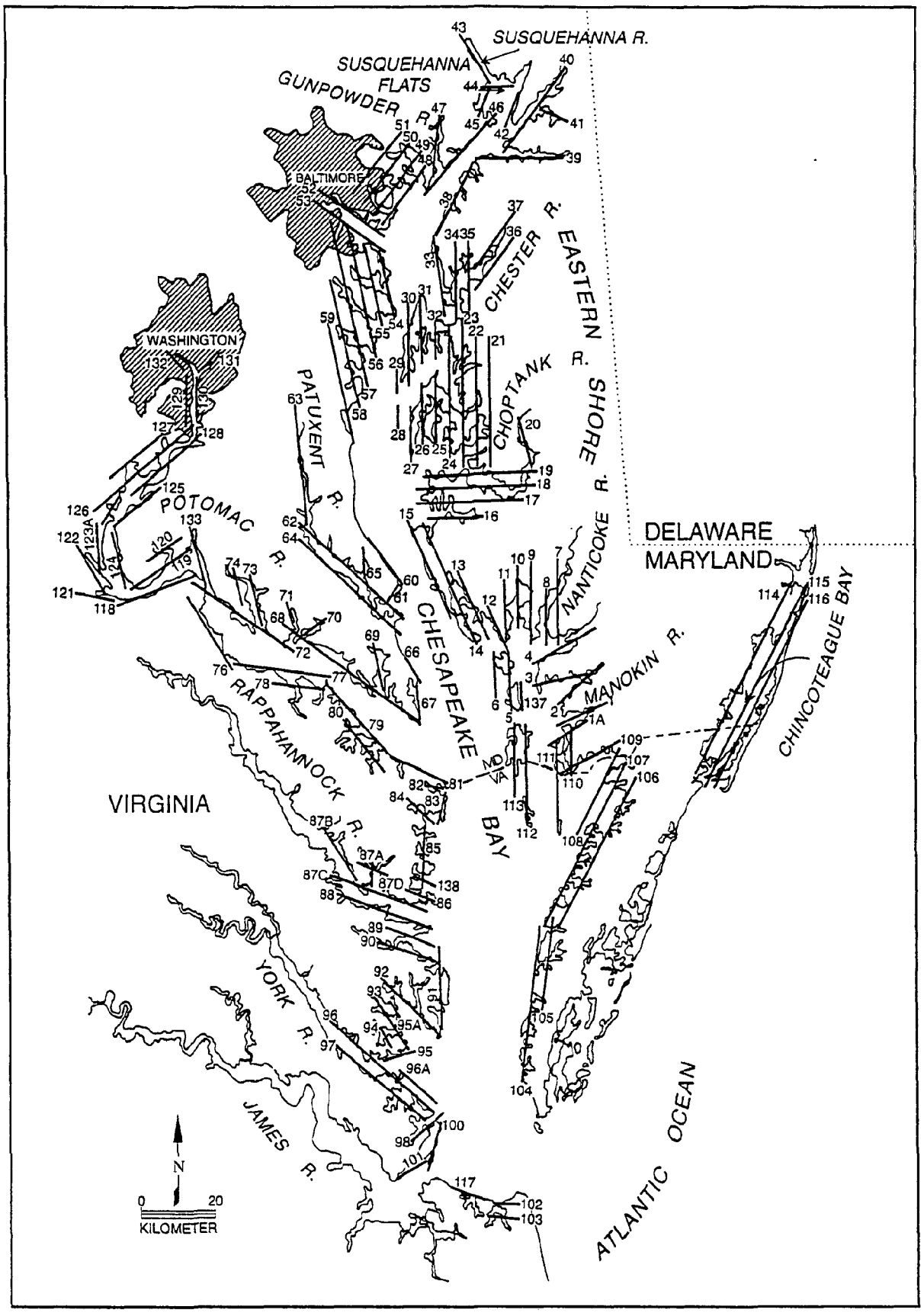


Figure 4. Map of Chesapeake Bay, its tributaries, and of Chincoteague Bay with approximate locations of flight lines for 1992 SAV photography.

TABLE 1

Guidelines Followed During Acquisition of Aerial Photographs.

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

was measured with a sensor 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 tilt. The scale/altitude/film/focal length combination was coordinated so that SAV patches of one square meter could be resolved. Wind speed was monitored hourly. Under normal operating conditions, flights were usually conducted under wind speeds less than 10 mph. (Above this speed, wind-generated waves stir bottom sediments which can easily obscure SAV beds in less than one hour). The pilot used experiential knowledge to determine what acceptable level of turbidity would allow complete delineation of SAV beds. During optimum flight conditions the pilot was able to distinguish bottom features such as SAV or algae at low tide. Excessively turbid conditions precluded photography. Determination of optimum cloud cover level was based on pilot experience. Records of this parameter were kept in a flight notebook. Every attempt was made to acquire photographs when there was no cloud cover below 12,000 feet. Cloud cover did not exceed 5% of the area covered by the camera frame. A thin haze layer above 12,000 feet was generally acceptable. Experience with the Chesapeake Bay has shown that optimal atmospheric conditions generally occur two to three days following passage of a cold front, when winds have shifted from north-northwest to south and have moderated to less than 10 mph. Within the guidelines given for prioritizing and executing the photography, the flights were planned to coincide with these atmospheric conditions where possible.

All film was processed by Air Photographics. A 9 inch x 9 inch black and white contact print was produced for each exposed frame. Each photograph was labeled with the date of acquisition as well as flight line number. Film and photographs were stored under appropriate environmental conditions to prevent degradation.

MAPPING PROCESS

For this analysis USGS 7.5 minute quadrangle maps were utilized for mapping SAV beds from aerial photography, for digitizing the SAV beds, and for compiling SAV bed area measurements. Figure 5 gives locations of 179 quadrangles in the study area which includes all regions with potential for SAV growth. Most quadrangles are sequentially numbered for efficient access to data. The name corresponding to each quadrangle in Figure 5 is listed in Table 2. Identification and delineation of SAV beds by photointerpretation utilized all available information including: knowledge of aquatic grass signatures on film, distribution of SAV in 1992 from aerial photography, 1992 ground truth information, and aerial site surveys. USGS 7.5 minute quadrangle maps (1:24,000 scale) printed by the Mid-Continent Mapping Center of the National Cartographic Information Center on stable transparent mylar were used as base maps. Distortion-free, identical copies of these base maps were made at the same scale on stable transparent mylar using a contact diazo process.

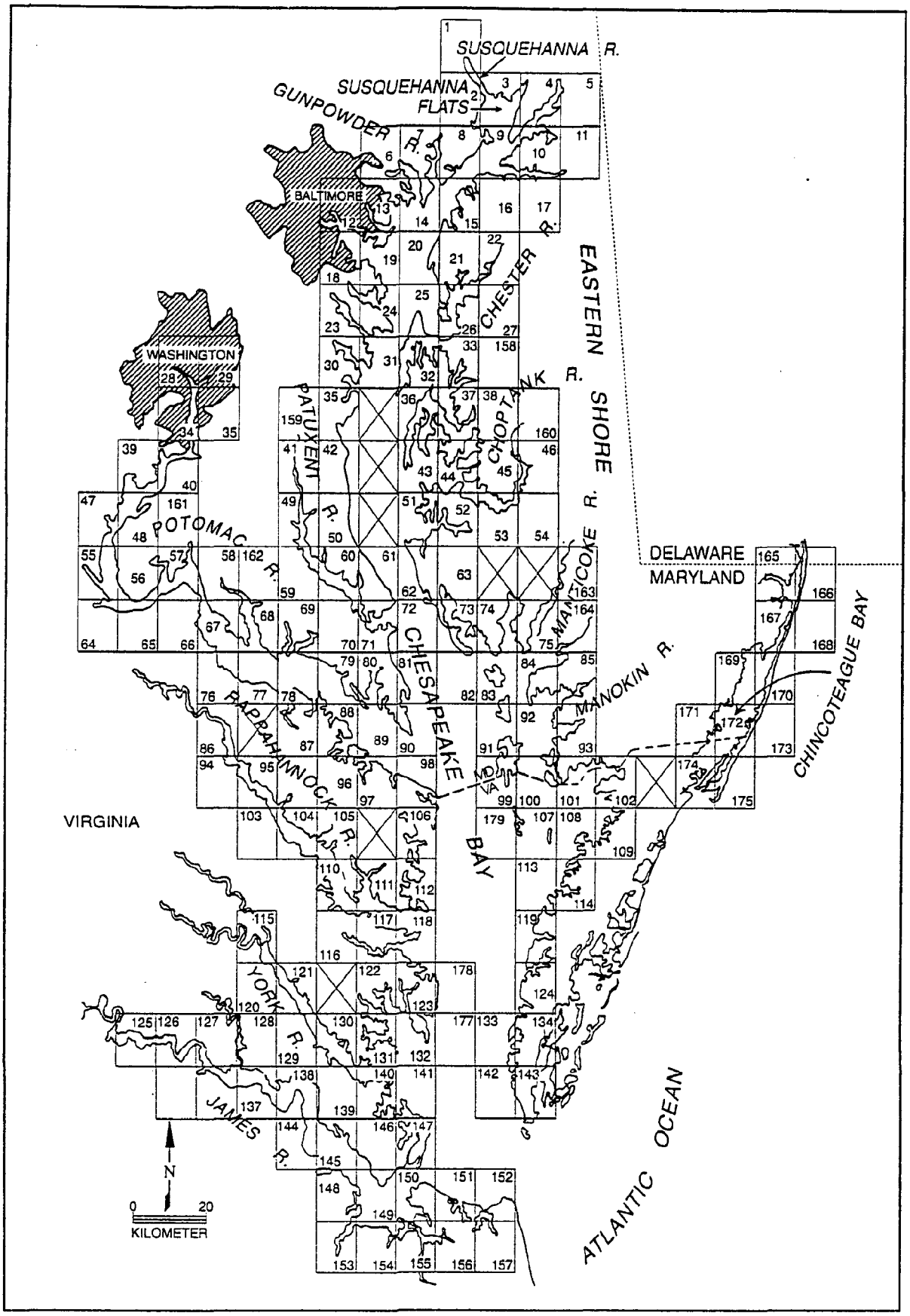


Figure 5. Location of USGS 7.5 minute quadrangles in the Chesapeake Bay, its tributaries, and in Chincoteague Bay with corresponding code numbers . (See Table 2 for quad names.)

TABLE 2

List of USGS 7.5 Minute Quadrangles for Chesapeake Bay and Chincoteague Bay SAV Study Areas with Corresponding Code Numbers. (See Figure 5 for Location of Quadrangles. ARC/INFO Generated 7.5 Minute Quadrangles with SAV Beds and Groundtruthing Are Reproduced in Appendix C.)

001. Conowingo Dam, Md.-Pa.
002. Aberdeen, Md.
003. Havre de Grace, Md.
004. North East, Md.
005. Elkton, Md.-Del.
006. White Marsh, Md.
007. Edgewood, Md.
008. Perryman, Md.
009. Spesutie, Md.
010. Earleville, Md.
011. Cecilton, Md.
012. Baltimore East, Md.
013. Middle River, Md.
014. Gunpowder Neck, Md.
015. Hanesville, Md.
016. Betterton, Md.
017. Galena, Md.
018. Curtis Bay, Md.
019. Sparrows Point, Md.
020. Swan Point, Md.
021. Rock Hall, Md.
022. Chestertown, Md.
023. Round Bay, Md.
024. Gibson Island, Md.
025. Love Point, Md.
026. Langford Creek, Md.
027. Centreville, Md.
028. Washington West, Md.-D.C.-Va.
029. Washington East, D.C.-Md.
030. South River, Md.
031. Annapolis, Md.
032. Kent Island, Md.
033. Queenstown, Md.
034. Alexandria, Va.-D.C.-Md.
035. Deale, Md.
036. Claiborne, Md.
037. St. Michaels, Md.
038. Easton, Md.
039. Fort Belvoir, Va.-Md.
040. Mt. Vernon, Md.-Va.
041. Lower Marlboro, Md.
042. North Beach, Md.
043. Tilghman, Md.
044. Oxford, Md.
045. Trappe, Md.
046. Preston, Md.
047. Quantico, Va.-Md.
048. Indian Head, Va.-Md.
049. Benedict, Md.
050. Prince Frederick, Md.
051. Hudson, Md.
052. Church Creek, Md.
053. Cambridge, Md.
054. East New Market, Md.
055. Widewater, Va.-Md.
056. Nanjemoy, Md.
057. Mathias Point, Md.-Va.
058. Popes Creek, Md.
059. Mechanicsville, Md.
060. Broomes Island, Md.
061. Cove Point, Md.
062. Taylors Island, Md.
063. Golden Hill, Md.
064. Passapatanzy, Md.-Va.
065. King George, Va.-Md.
066. Dahlgren, Va.-Md.
067. Colonial Beach North, Md.-Va.
068. Rock Point, Md.
069. Leonardtown, Md.
070. Hollywood, Md.
071. Solomons Island, Md.
072. Barren Island, Md.
073. Honga, Md.
074. Wingate, Md.
075. Nanticoke, Md.
076. Colonial Beach South, Va.-Md.
077. Stratford Hall, Va.-Md.
078. St. Clements Island, Va.-Md.
079. Piney Point, Md.-Va.
080. St. Marys City, Md.
081. Point No Point, Md.
082. Richland Point, Md.
083. Bloodsworth Island, Md.
084. Deal Island, Md.
085. Monie, Md.
086. Champlain, Va.
087. Machodoc, Va.
088. Kinsale, Va.-Md.
089. St. George Island, Va.-Md.
090. Point Lookout, Md.

(continue on next page)

TABLE 2 (concluded)

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

SAV beds from the 1992 aerial photographs were then mapped onto these diazo mylar copies of USGS 7.5 minute quadrangles. Delineation of each SAV bed was facilitated by superimposing the photographic print with the appropriate diazo mylar quadrangle on a light table. SAV bed boundaries were then traced directly onto the diazo mylar quadrangle with a pencil. Where minor scale differences were evident between a photograph and a quadrangle, or where significant shoreline erosion or accretion had occurred since USGS publication of a map, either a best fit was obtained or shoreline changes were noted on the quadrangle.

In addition to delineating SAV bed boundaries, an estimate of SAV density within each bed was made by visually comparing each bed to an enlarged Crown Density Scale similar to those developed for estimating forest tree crown cover from aerial photography (Fig. 6, p. 13). Bed density was categorized into one of four classes based on a subjective comparison with the density scale. These were: 1, very sparse (<10% coverage); 2, sparse (10-40%); 3, moderate (40-70%); or 4, dense (70-100%). Either the entire bed or subsections within the bed were assigned a bed density number (1 to 4) corresponding to the above density classes. Some beds were subsectioned to delineate where variations in SAV density occurred. Additionally, each distinct SAV unit (bed or bed subsection) was assigned an identifying two letter designation unique to its map. Subsections were futher identified as contiguous beds by the addition of two letters unique to that sequence. These contiguous bed identifications aid the tracking and analysis of single natural bed units that were subsectioned due to variation in SAV density. Coupled with the appropriate SAV map number and year of photography, these two letter designations uniquely identify each SAV bed in the data base.

SAV PERIMETER DIGITIZATION

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

TESTS OF PRECISION AND ACCURACY

Prior and subsequent to each digitization session, the NUMONICS instrument was checked manually against a digitizing standard. This was accomplished by securing a diazo mylar quadrangle with SAV polygons to the digitizing tablet. Then the mylar standard was secured to the same quadrangle and digitized four times. The information from digitizing the standard was transmitted to the

beginning of the SAV bed perimeter file on the computer. This same procedure was followed at the end of each digitizing session. When this file was processed by the computer, the digitized area of each standard was compared to the known area of the standard. If a variation between the known and the mean of the observed areas exceeded 1.0%, a warning was printed advising the operator to check the digitizing system. In addition, checks were made with respect to the absolute location of the digitizing standard as secured to the map. A comparison was made between the location of the standard before and after the digitizing session. If the absolute location differed by more than 0.10 cm another warning 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 quadrangles and standards rather than paper ones which can change scale as a function of changes in air temperature and humidity in the digitizer room.

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

STANDARD OPERATING PROCEDURES FOR QUALITY ASSURANCE/ QUALITY CONTROL

Standard operating procedures (SOPs) were developed to facilitate orderly and efficient processing of the 1992 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, which was used to guide and record editing operations; and a flow chart used to track progress of all operations including all changes in file names. Examples of these SOPs are in Orth et al., 1988.

CHOICE OF REPRESENTATIVE SAV BED

Part of the quality assurance/quality control program was designed to isolate and remove anomolous data and to obtain accurate and representative SAV bed polygons. Every SAV bed mean area was the result of at least four independent digitizations of the perimeter of each SAV bed. The computer calculated area for each replication, and the three bed perimeters most similar in terms of area were then used for the calculation of a mean area. The three replicate areas used in the mean area calculation were required to be within 5% or less from that of the mean area. All replicates whose areal differences were in excess of 5% of the mean bed area were flagged by the VIMS quality assurance/quality control computer program for additional error assesment. The VIMS error rate was normally less than 1%. The replicate bed perimeter whose area was most similar

to the mean area was identified as the "best bed" and was chosen as representative of that SAV bed. The "best bed" perimeter coordinate points were then saved by the computer program and transferred to the ARC/INFO GIS system for area calculations and inclusion in the SAV data base.

CONVERSION OF SAV PERIMETER POINTS FROM X,Y CENTIMETERS TO UNIVERSAL TRANSVERSE MERCATOR (UTM) COORDINATES IN ARC/INFO 5.0.1 FORMAT

The EPA Chesapeake Bay Program Computer Center manages its geographic data base using Environmental Systems Research Institute (ESRI) ARC/INFO Geographic Information System (GIS) (ESRI, 1989). During 1991, the VIMS SAV program began converting its operation from the Prime to ARC/INFO based on a SUN Sparc 2 Unix workstation. With the assistance of the Virginia Department of Environmental Equality, EcoMAPS Office, procedures were developed in 1991 to convert/transform the best bed perimeter points from X,Y centimeters to UTM based coordinates in ARC/INFO 5.0.1 format. This involved construction of data transfer files in an ARC/INFO standard format ("generate"). This was done on the VIMS PRIME for each 7.5 minute quadrangle with SAV beds present. Four files per quadrangle were produced:

1. Polygon file containing SAV bed coordinates in digitizer-based centimeters.
2. Attribute file containing SAV bed labels, density, species composition, and dates.
3. Tic file containing map corner locations in digitizer-based coordinates (cm).
4. Geo file containing corresponding latitude and longitude positions for map corners.

The "generate" files were then transferred to the workstation and imported into the ARC/INFO system.

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

CALCULATION OF 1992 SAV AREAS

The SAV coverages in UTM ARC/INFO Zone 18 format were used to calculate area in square meters for all SAV beds. These areas are reported as USGS 7.5

minute quadrangle totals in Table 4, and section and zone totals in Tables 5 and 6. Section and zone totals were calculated by using an overlay operation of the polygons on the SAV beds in ARC/INFO. The definition of the sections used in this analysis are provided in Table 3.

ORGANIZATIONAL PROCEDURES FOR ANALYSIS AND DISCUSSION

Discussion of the distribution of SAV in the Chesapeake Bay and tributaries has been organized into three zones as established by Orth and Moore (1982) and modified by Orth et al., (1989) (Fig. 7). The Lower Bay zone is the area from the entrance of the bay to a line originating from Smith Point at the mouth of the Potomac River, to approximately 3 nautical miles south of Tangier Island, then extending to just below the Little Annemessex River mouth. From this line north to the Chesapeake Bay Bridge at Kent Island is the area 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 ^{o}/oo), Upper zone. Although the major rivers and smaller tributaries of Chesapeake Bay have their own salinity regimes, the distribution of SAV in each river is discussed within the zone where it connects to the bay.

In addition, 21 sections of the bay are identified for a more detailed discussion of SAV distribution (Fig. 7, Table 3). These sections, which were first delineated for the 1984 SAV survey (Orth et al., 1985) and slightly modified for the 1987 SAV survey (Orth et al., 1989), denote relatively distinct parts of Chesapeake Bay and its tributaries that are readily identifiable. The section boundaries used for analysis and discussion of the 1992 SAV distribution and abundance data were used for the 1987, 1989, 1990, and 1991 reports (Orth et al., 1989; Orth and Nowak, 1990, Orth et al., 1991, Orth et al., 1992). Sections 1 through 4 are located in the Upper Bay zone, sections 5 through 13 in the Middle Bay zone, and sections 14 through 21 in the Lower Bay zone. SAV distribution in Chincoteague Bay is presented and discussed separately from the Chesapeake Bay. Appendix B gives the latitude and longitude of the boundary points of each Chesapeake Bay section and of Chincoteague Bay in decimal degrees.

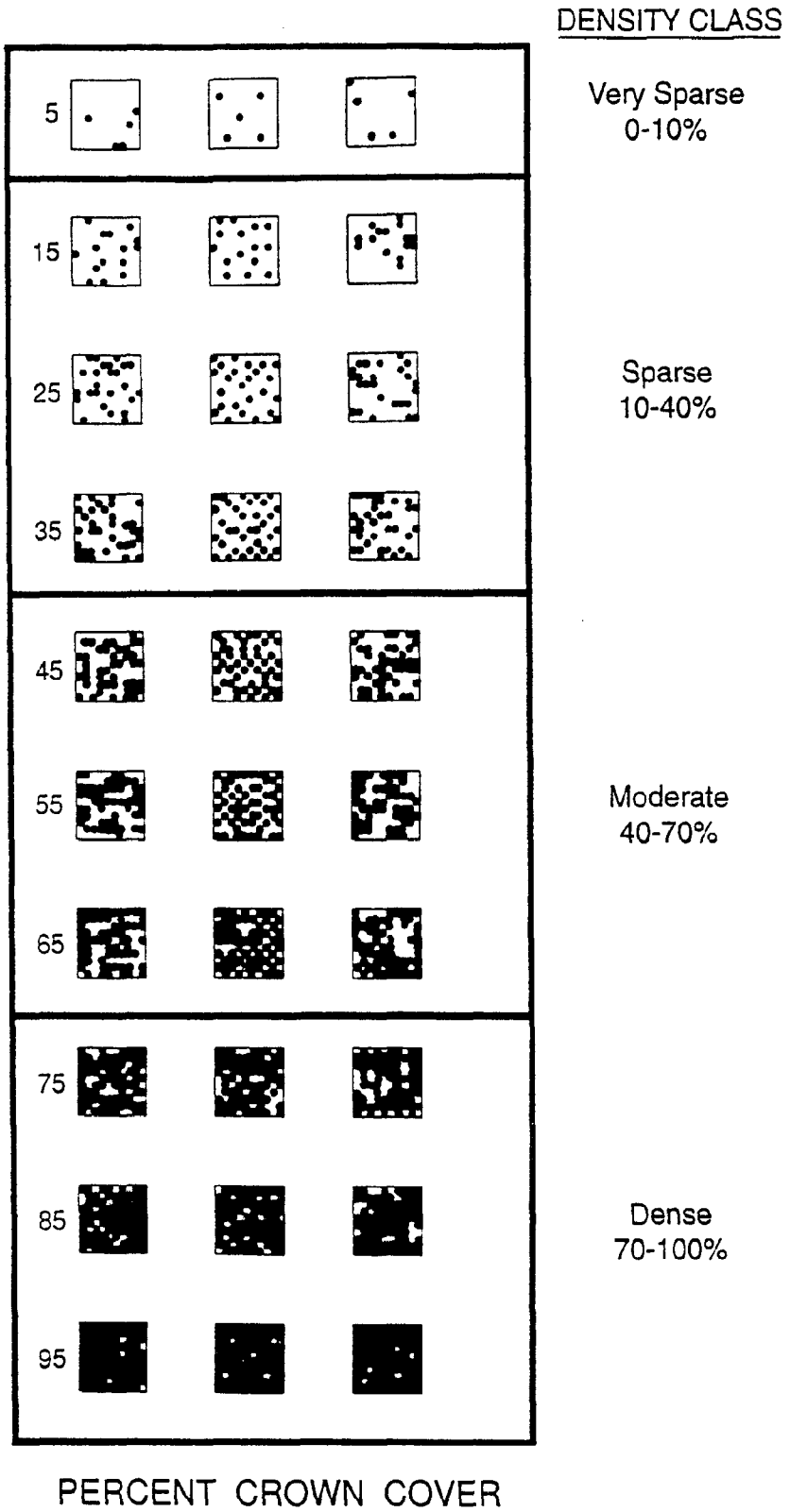


Figure 6. Crown density scale used for determining density of SAV beds. (Numbers on left represent three different arrangements of SAV that make up that category.)

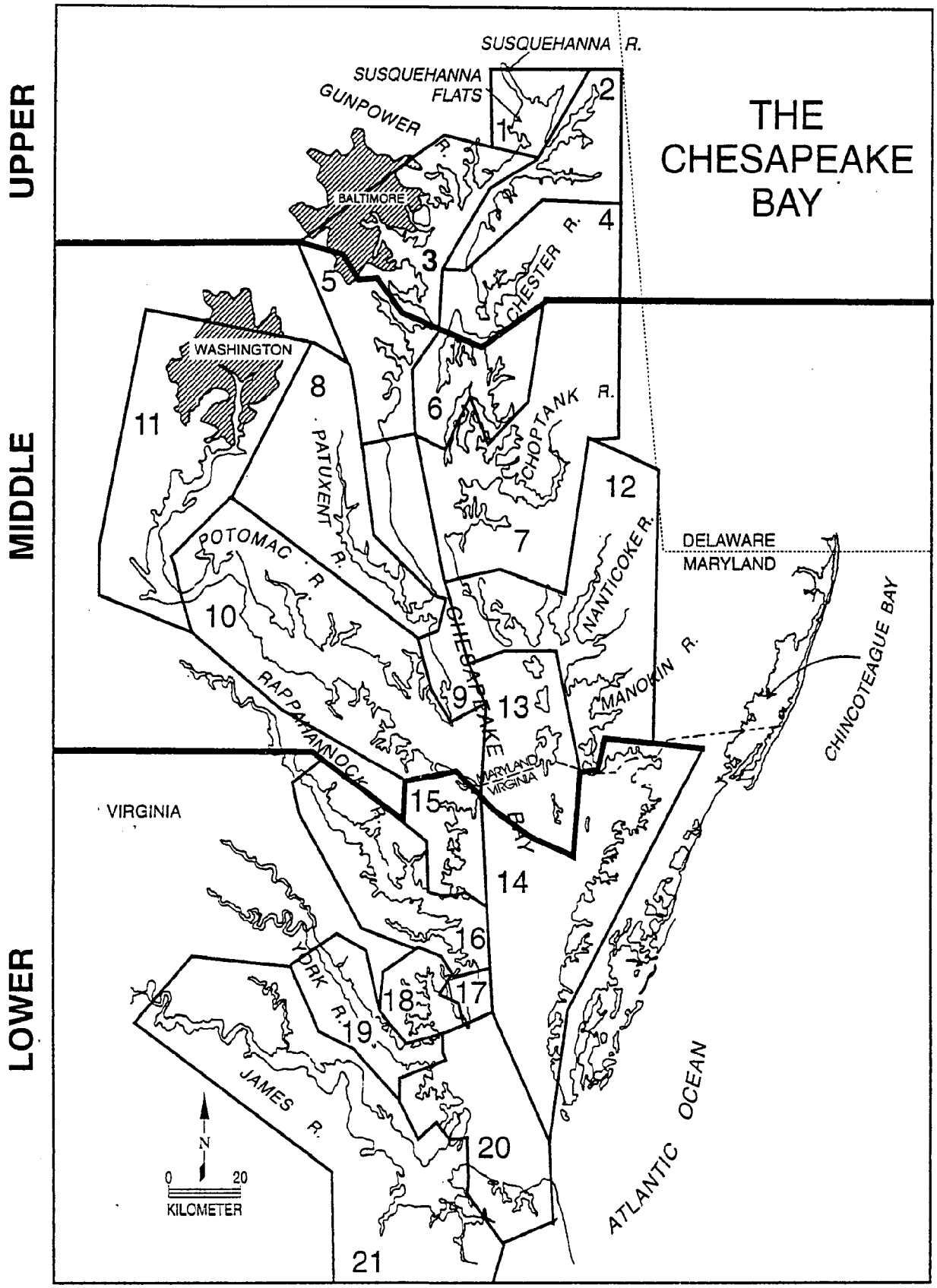


Figure 7. Location of Chincoteague Bay and Chesapeake Bay with Upper, Middle, and Lower zones and 21 sections used for delineation of SAV distribution patterns. (See Table 3 and Appendix B for exact boundary positions.)

TABLE 3

Area Descriptions for Each of the 21 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 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 Chesapeake Bay Bridge to include the Bush, Gunpowder, Middle, Patapsco, and Magothy rivers.
Section 4.	Chester River - includes all of the Chester River, Eastern Neck, and areas north of the Chesapeake Bay Bridge on Kent Island extending to north of Swan Point.
Section 5.	Central Western Shore - all areas south of the Chesapeake 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 Chesapeake Bay Bridge on Kent Island and north of Tilghman Island from Green Marsh Point to include the Wye, East, and Miles rivers, Crab Alley and Prospect bays, 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 not including 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 upstream of the Lower Potomac River Section to Chain Bridge at Washington D.C.
Section 12.**	Middle Eastern Shore - all areas south of Taylor Island and north of a line bisecting Cedar Island to include the Big and Little Annemessex, Honga, Nanticoke, Wicomico, and Manokin rivers, and Fishing Bay.
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 border to Fisherman's Island.

(continue on next page)

TABLE 3 (concluded)

Section 15.	Reedville Region - includes the area between Windmill Point on the Rappahannock River and Smith Point at the mouth of the Potomac River.
Section 16.	Rappahannock River Complex - includes the entire Rappahannock and Piankatank rivers, and the Milford Haven area.
Section 17.	New Point Comfort Region - includes the area from New Point Comfort Lighthouse north to Garden Creek just south of Milford Haven.
Section 18.**	Mobjack Bay Complex - includes the East, North, Ware, and Severn rivers, the north shore of Mobjack Bay from New Point Comfort Lighthouse to the North River, and north of a line bisecting the large shoal area around the Guinea Marshes.
Section 19.**	York River - all areas of the York River from north of the Porpotank River to the mouth, including south of a line bisecting the large shoal area around the Guinea Marshes and the north shore of Goodwin Island.
Section 20.**	Lower Western Shore - includes all areas south of Goodwin Island to Lynnhaven Inlet, including Broad Bay but not including the James River.
Section 21.	James River - all areas in the James River including the Chickahominy River.

** Sections 12, 13, 14, 18, 19, and 20 were given new boundaries for the 1987 report (Orth et al., 1989) which also changed the delineation of the three zones. These new boundaries were retained for the 1989, 1990, and 1991 reports (Orth and Nowak, 1990; Orth et al., 1991; Orth et al., 1992) and for this report. (Refer to Figure 7 and Appendix B for boundary locations.)

GROUND SURVEYS AND OTHER DATA BASES

Ground surveys were accomplished by cooperative efforts from a number of agencies and individuals. Although not all areas of the bay were surveyed, the data did provide valuable supplemental information. The surveys confirmed the existence of some SAV beds mapped from the 1992 aerial photography, as well as SAV beds not visible from the photography. The surveys also provided species data for many of the SAV beds. Ground survey information supplied to VIMS researchers was included on the SAV distribution and abundance maps reproduced in Appendix C. Each survey was designated by a unique symbol to identify the different methods of sampling. In most cases, the symbols on the SAV maps (Appendix C) have been enlarged and offset from the actual sampling point to avoid confusion with the mapped SAV bed. Where species information was available, it was included on the map. Because of space limitations on the maps reproduced in Appendix C, occasionally one or more survey points were combined where the information was duplicated. All ground survey data supplied to VIMS are tabulated in either Appendix E or F.

In Maryland, ground survey data were obtained in 1992 by the Patuxent River Park staff, through three SAV research projects, and by the Citizens' volunteer survey. Data from the following three surveys were compiled by the USFWS. Patuxent River ground survey data were obtained by the Maryland-National Capital Parks and Planning Commission Patuxent River Park staff. The Essex Community College SAV Research Group of Baltimore County, Maryland, contributed ground survey data for quadrangle 14. The Citizens' volunteer survey, under the guidance of the USFWS and the Chesapeake Bay Foundation (CBF), identified SAV locations and SAV species when possible throughout various areas of the Chesapeake and Chincoteague bays. Volunteers, who were recruited through press releases, newsletters, and personal letters, were provided with a SAV identification guide, reduced 1990 SAV maps to aid in the location of SAV beds, and data sheets for reporting visits to numerous sites around the bays. USFWS staff compiled data from the three surveys and mapped the data on copies of 1990 SAV distribution maps (USGS 7.5 minute quads with 1990 SAV beds). These maps were supplied to VIMS SAV researchers and transferred to the 1992 SAV distribution maps reproduced in Appendix C. Data from the three surveys were also tabulated by USFWS. This table became the basis of the much expanded table published in Appendix E.

One 1992 SAV project being conducted on the Susquehanna Flats by Stan Kollar of Harford Community College, Maryland, provided data in the form of species presence by percentage.

A SAV research group at the University of Maryland Horn Point Environmental Laboratories (HPEL) also provided 1992 ground survey data in collaboration with the VIMS research team. Shorelines of the Choptank, Miles, Wye, and Chester rivers, as well as Eastern Bay and Trippe Bay, were sampled from June 26 through August 27. Samples of the bottom were taken every 20-50 m using a rake dragged along the bottom. This survey concentrated on the lower half of the Choptank River from the Horn Point Laboratory to the mouth of the river. In addition, 12 transects were run perpendicular to the shoreline where SAV

abundance was estimated every 10 m for a distance of 200 m. Choptank River and Eastern Bay ground survey data are presented in Appendix F.

For those areas in Virginia waters where aerial photographic evidence of SAV beds was inconclusive, photoverification was accomplished by ground truth surveys. Observations were principally made from small boats and by divers snorkeling over areas indicated from the photographs. In the York, Piankatank, and Rappahannock rivers, where VIMS researchers had transplanted SAV (principally eelgrass), transplant sites were also examined carefully by divers for any extant SAV. VIMS scientists also surveyed a number of sites in the Chesapeake Bay as part of an intensive quantitative SAV study (VIMS, unpublished data). Data for Virginia waters were also collected by the Citizens' volunteer survey (compiled by the USFWS). In addition, a great deal of ground survey information could be extrapolated from earlier studies (Orth et al., 1979; Orth and Moore, 1982). SAV beds in the lower bay contain primarily one or two species and most areas have not undergone wide fluctuations in distribution and abundance since the first bay-wide survey in 1978.

Ground survey data from all sources reported here were added to the USFWS table and each SAV siting was cross-referenced with its associated 1992 SAV bed location. This expanded ground survey table is presented in Appendix E.

RESULTS

DATA PRESENTATION

SAV distribution data are presented by quadrangle (Table 4), by section and zone (Table 5), by quadrangles within a section (Table 6), and by density class (1, 2, 3, 4) for each section (Table 7). Quadrangle maps annotated with all SAV beds are presented in Appendix C, while individual bed areas for each quadrangle are given in Appendix D. Appendix E tabulates all ground truth data for 1992. Appendix F lists latitude and longitude coordinates of the ground survey of the Choptank River and Eastern Bay area by HPEL staff. The 1992 SAV distribution data and species occurrences are first discussed relative to the Upper, Middle, and Lower Bay zones, respectively. The 21 sections of the Chesapeake Bay and Chincoteague Bay are then discussed individually, and the data compared to results from the 1991 survey of SAV distribution and abundance (Orth, et al., 1992). SAV is plotted for each section and for Chincoteague Bay in Figures 8 through 29. SAV beds are plotted in red, and bold, black lines represent section boundaries. USGS 7.5 minute quadrangles are represented by a grid of numbered rectangles (refer to Table 2 for quadrangle names listed by map number). Specific names of rivers, creeks, or points of land which are not found on the section plots, are on the quadrangle maps for that section.

1992 SUMMARY

In 1992, the Chesapeake Bay had 28,591 hectares of SAV, compared to 25,623 hectares in 1991, with 2,516 hectares (8.7%), 13,713 hectares (48.0%), and 12,362 hectares (43.2%) occurring in the Upper, Middle, and Lower Bay zones, respectively (Figs. 1, 2, and 3). SAV increased in most sections in 1992 with the largest increases in SAV abundance occurring in the Eastern Bay and Choptank River sections. SAV declined in only a few sections, notably the Upper Potomac River section.

Upper Bay Zone

In 1992 in the Upper Bay zone, 71.2% (1,792 hectares) of the SAV was located in the Susquehanna Flats (Section 1). Overall abundance of SAV increased from the 1991 level (1,684 hectares), while the density of the beds in 1992 increased slightly from 1991. In the flats, 88.6% of all SAV beds were classified as very sparse in 1992 (0-10% coverage) (Table 7; Figure 3), the same as in 1991, but 8.0% of beds were classified as dense in 1992 (70-100% coverage), an increase of 1.0% compared to 1991. *Myriophyllum spicatum, H. dubia, V. americana, H. verticillata,* and *C. demersum* were among the six species reported from many of the SAV beds. In the Upper Eastern Shore (Section 2) there were 283 hectares of SAV in 1992 (43 hectares less than in 1991) located principally in the Elk and lower

TABLE 4

Total Area of SAV in Hectares by USGS 7.5 Minute Quadrangles for 1991 and 1992.

QUADRANGLE	1991	1992
001. Conowingo Dam, Md. - Pa.	0	0
002. Aberdeen, Md.	8.79	14.98
003. Havre de Grace, Md.	1,652.84	1,745.68
004. North East, Md.	75.36	126.21
005. Elkton, Md.-Del.	24.97	0
006. White Marsh, Md.	#	0
007. Edgewood, Md.	0	.43
008. Perryman, Md.	0	8.78
009. Spesutie, Md.	87.15	45.08
010. Earleville, Md.	155.01	116.16
011. Cecilton, Md.	0	0
012. Baltimore East, Md.	0	0
013. Middle River, Md.	4.40	16.07
014. Gunpowder Neck, Md.	84.24	155.87
015. Hanesville, Md.	4.02	26.19
016. Betterton, Md.	.60	2.47
017. Galena, Md.	3.89	2.98
018. Curtis Bay, Md.	#	0
019. Sparrows Point, Md.	#	#
020. Swan Point, Md.	3.81	5.39
021. Rock Hall, Md.	9.74	12.34
022. Chestertown, Md.	0	0
023. Round Bay, Md.	#	#
024. Gibson Island, Md.	#	#
025. Love Point, Md.	0	0
026. Langford Creek, Md.	42.04	220.66
027. Centreville, Md.	0	0
028. Washington West, Md. - D.C.	3.96	9.92
029. Washington East, D.C. - Md.	#	0
030. South River, Md.	#	#
031. Annapolis, Md.	#	0
032. Kent Island, Md.	1.58	69.59
033. Queenstown, Md.	4.24	87.40
034. Alexandria, Va. - D.C. - Md.	453.72	318.29
035. Deale, Md.	#	#
036. Claiborne, Md.	59.47	231.64
037. St. Michaels, Md.	3.68	243.63
038. Easton, Md.	#	0
039. Fort Belvoir, Va. - Md.	160.27	133.72
040. Mt. Vernon, Va. - Md.	526.17	254.57
041. Lower Marlboro, Md.	#	#
042. North Beach, Md.	-	0
043. Tilghman, Md.	12.54	222.47
044. Oxford, Md.	6.28	115.79
045. Trappe, Md.	0	0

(continue on next page)

Table 4 (continued)

QUADRANGLE	1991	1992
046. Preston, Md.	0	#
047. Quantico, Va. - Md.	805.93	594.92
048. Indian Head, Md. - Va.	355.27	336.04
049. Benedict, Md.	#	0
050. Prince Frederick, Md.	-	-
051. Hudson, Md.	62.85	515.96
052. Church Creek, Md.	2.24	105.79
053. Cambridge, Md.	0	5.66
054. East New Market, Md.	0	0
055. Widewater, Va. - Md.	648.13	730.95
056. Nanjemoy, Md.	140.79	168.32
057. Mathias Point, Md. - Va.	290.27	292.05
058. Popes Creek, Md.	20.13	1.30
059. Mechanicsville, Md.	0	0
060. Broomes Island, Md.	#	#
061. Cove Point, Md.	#	#
062. Taylors Island, Md.	30.01	62.39
063. Golden Hill, Md.	8.92	29.23
064. Passapatanzy, Md. - Va.	#	12.24
065. King George, Va. - Md.	64.17	74.45
066. Dahlgren, Va. - Md.	58.33	33.98
067. Colonial Beach North, Va.	46.62	47.76
068. Rock Point, Md.	#	0
069. Leonardtown, Md.	0	0
070. Hollywood, Md.	#	0
071. Solomons Island, Md.	#	#
072. Barren Island, Md.	121.72	433.61
073. Honga, Md.	861.83	1,326.88
074. Wingate, Md.	460.31	480.81
075. Nanticoke, Md.	0	0
076. Colonial Beach South, Va.	0	0
077. Stratford Hall, Va.-Md.	0	0
078. St. Clements Island, Va. - Md.	#	#
079. Piney Point, Md. - Va.	0	0
080. St. Mary's City, Md.	0	8.81
081. Point No Point, Md.	-	-
082. Richland Point, Md.	20.91	45.90
083. Bloodsworth Island, Md.	801.70	1,024.10
084. Deal Island, Md.	24.35	68.75
085. Monie, Md.	7.28	0
086. Champlain, Va.	0	0
087. Machodoc, Va.	0	0
088. Kinsale, Va.-Md.	0	0
089. St. George Island, Md. - VA	1.74	3.08
090. Point Lookout, Md.	0	0
091. Kedges Straits, Md.	884.83	971.21
092. Terrapin Sand Point, Md.	261.07	267.81
093. Marion, Md.	305.93	278.43

(continue on next page)

TABLE 4 (continued)

QUADRANGLE	1991	1992
094. Mount Landing, Va.	-	-
095. Tappahannock, Va.	-	-
096. Lottsburg, Va.	0	0
097. Heathsville, Va.-Md.	0	0
098. Burgess, Va.-Md.	0	#
099. Ewell, Md.-Va.	2,605.93	2,543.16
100. Great Fox Island, Md. - Va.	1,421.02	1,504.94
101. Crisfield, Md.-Va.	318.73	321.69
102. Saxis, Va.-Md.	1.26	2.86
103. Dunnsville, Va.	-	-
104. Morattico, Va.	0	0
105. Lively, Va.	0	0
106. Reedville, Va.	242.79	302.51
107. Tangier Island, Va.	782.21	601.73
108. Chesconessex, Va.	1,052.51	1,042.80
109. Parksley, Va.	483.10	461.99
110. Urbanna, Va.	5.39	11.25
111. Irvington, Va.	165.03	165.60
112. Fleets Bay, Va.	391.85	475.89
113. Nandua Creek, Va.	441.55	473.91
114. Pungoteague, Va.	976.18	949.27
115. West Point, Va.	-	-
116. Saluda, Va.	0	0
117. Wilton, Va.	16.00	18.18
118. Deltaville, Va.	107.54	142.86
119. Jamesville, Va.	621.64	634.02
120. Toano, Va.	-	-
121. Gressitt, Va.	-	-
122. Ware Neck, Va.	321.73	318.37
123. Mathews, Va.	260.64	326.70
124. Franktown, Va.	627.61	718.67
125. Westover, Va.	#	-
126. Charles City, Va.	-	-
127. Brandon, Va.	#	-
128. Norge, Va.	-	-
129. Williamsburg, Va.	-	-
130. Clay Bank, Va.	0	#
131. Achilles, Va.	1,010.88	1,040.46
132. New Point Comfort, Va.	1,448.69	1,486.00
133. Cape Charles, Va.	362.17	361.03
134. Cheriton, Va.	82.73	87.25
135. Savedge, Va.	-	-
136. Claremont, Va.	-	-
137. Surry, Va.	#	-
138. Hog Island, Va.	-	-
139. Yorktown, Va.	.71	1.16
140. Poquoson West, Va.	554.65	582.94
141. Poquoson East, Va.	1,151.41	1,161.06

(continue on next page)

TABLE 4 (concluded)

QUADRANGLE	1991	1992
142. Elliotts Creek, Va.	68.17	111.96
143. Townsend, Va.	.72	0
144. Bacons Castle, Va.	-	-
145. Mulberry Island, Va.	-	-
146. Newport News North, Va.	-	-
147. Hampton, Va.	381.24	380.63
148. Benns Church, Va.	-	-
149. Newport News South, Va.	-	0
150. Norfolk North, Va.	-	-
151. Little Creek, Va.	0	0
152. Cape Henry, Va.	23.66	19.55
153. Chuckatuck, Va.	-	-
154. Bowers Hill, Va.	-	-
155. Norfolk South, Va.	-	-
156. Kempsville, Va.	-	-
157. Princess Anne, Va.	0	0
158. Wye Mills, Md.	0	0
159. Bristol, Md.	#	#
160. Fowling Creek, Md.	0	0
161. Port Tobacco, Md.	12.65	12.60
162. Charlotte Hall, Md.	8.97	0
163. Mardela Springs, Md.	0	0
164. Wetipquin, Md.	0	0
165. Selbyville, Md.	0	0
166. Assawoman Bay, Md.	1.23	7.94
167. Berlin, Md.	11.13	10.69
168. Ocean City, Md.	17.67	23.57
169. Public Landing, Md.	0	0
170. Tingles Island, Md.	1,066.44	1,180.30
171. Girdle Tree, Md. - Va.	0	0
172. Boxiron, Md.-Va.	672.52	771.61
173. Whittington Point, Md. - VA	363.68	399.10
174. Chincoteague West, Va.	.63	6.27
175. Chincoteague East, Va.	612.86	924.70
176. Anacostia, D.C. - Md.	0	0
177. East of New Point Comfort, Va.	0	8.67
178. Bethel Beach, Va.	0	0*
179. Goose Island, Va.	0*	214.79
TOTAL SAV - Chesapeake Bay	25,623.47	28,591.23
TOTAL SAV - Chincoteague Bay	2,746.17	3,324.18

NOTES:

- = Indicates quadrangle not photographed and assumed to have no SAV.
0 = Indicates quadrangle photographed and no SAV noted.
0* = This quadrangle was newly published and was not available for this years mapping. SAV beds located on this quadrangle were mapped on the overlapping portion of the adjoining quadrangle.
= SAV detected by ground truthing only.

TABLE 5

Number of Hectares of SAV in 1991 and 1992 for the 21 Sections and Three Zones of Chesapeake Bay and for Chincoteague Bay.

ZONE	SECTION	AREA (HECTARES) 1991	1992
	1. Susquehanna Flats	1,684.06	1,791.97
Upper	2. Upper Eastern Shore	326.19	282.96
	3. Upper Western Shore	91.00	185.97
	4. Chester River	56.68	255.16
	Zone Total	2,157.93	2,516.06
	5. Central Western Shore	0.00	0.00
	6. Eastern Bay	67.89	553.93
	7. Choptank River	113.92	1,085.39
	8. Patuxent River	0.00	0.00
Middle	9. Middle Western Shore	0.00	0.00
	10. Lower Potomac River	581.10	571.03
	11. Upper Potomac River	3,016.04	2,461.96
	12. Middle Eastern Shore	2,177.51	3,046.93
	13. Mid-Bay Island Complex	5,707.36	5,993.93
	Zone Total	11,663.82	13,713.17
	14. Lower Eastern Shore	5,719.50	5,920.17
	15. Reedville	634.64	778.40
	16. Rappahannock Rvr. Complex	508.93	586.84
Lower	17. New Point Comfort Region	338.87	395.91
	18. Mobjack Bay Complex	1,787.76	1,818.03
	19. York River	803.53	830.08
	20. Lower Western Shore	2,005.75	2,029.07
	21. James River	2.74	3.50
	Zone Total	11,801.72	12,362.00
Total SAV for Chesapeake Bay		25,623.47	28,591.23
Total SAV for Chincoteague Bay		2,746.17	3,324.18

TABLE 6

Number of Square Meters of SAV in 1992 for Each USGS 7.5 Minute Quadrangle of the 21 Sections of Chesapeake Bay and of Chincoteague Bay. (Map Code Numbers from Table 2 in Parentheses.)

SECTION	QUADRANGLE	AREA
Susquehanna Flats - 1	Conowingo Dam (1)	0.00
	Aberdeen (2)	149,831.16
	Havre de Grace (3)	17,456,826.60
	North East (4)	0.00
	Elkton (5)	0.00
	Perryman (8)	0.00
	Spesutie (9)	313,027.03
	Earleville (10)	0.00
		17,919,685 sq.m
		1,791.97 hectares
		4,427.96 acres
Upper Eastern Shore - 2	North East (4)	1,262,108.63
	Elkton (5)	0.00
	Perryman (8)	0.00
	Spesutie (9)	89,549.87
	Earleville (10)	1,161,552.26
	Cecilton (11)	0.00
	Gunpowder Neck (14)	0.00
	Hanesville (15)	261,890.44
	Betterton (16)	24,691.62
	Galena (17)	29,768.69
	Swan Point (20)	0.00
	Rock Hall (21)	0.00
	Chestertown (22)	0.00
		2,829,562 sq.m
		282.96 hectares
		699.19 acres
Upper Western Shore - 3	White Marsh (6)	0.00
	Edgewood (7)	4,258.22
	Perryman (8)	87,846.40
	Spesutie (9)	48,190.13
	Baltimore East (12)	0.00
	Middle River (13)	160,704.66
	Gunpowder Neck (14)	1,558,671.17
	Hanesville (15)	0.00
	Curtis Bay (18)	0.00
	Sparrows Point (19)	0.00
	Swan Point (20)	0.00
	Round Bay (23)	0.00
	Gibson Island (24)	0.00
	Love Point (25)	0.00
		1,859,671 sq.m
		185.97 hectares
		459.53 acres

(continue on next page)

TABLE 6 (continued)

SECTION	QUADRANGLE	AREA
Chester River - 4	Betterton (16)	0.00
	Galena (17)	0.00
	Swan Point (20)	53,924.98
	Rock Hall (21)	123,377.38
	Chestertown (22)	0.00
	Love Point (25)	0.00
	Langford Creek (26)	2,206,641.97
	Centreville (27)	0.00
	Kent Island (32)	0.00
	Queenstown (33)	167,661.62
		2,551,606 sq.m
		255.16 hectares
		630.50 acres
Central Western Shore - 5	Curtis Bay (18)	0.00
	Round Bay (23)	0.00
	Gibson Island (24)	0.00
	Love Point (25)	0.00
	South River (30)	0.00
	Annapolis (31)	0.00
	Kent Island (32)	0.00
	Deale (35)	0.00
	North Beach (42)	0.00
		0.00 sq.m
		0.00 hectares
		0.00 acres
Eastern Bay - 6	Centreville (27)	0.00
	Annapolis (31)	0.00
	Kent Island (32)	695,903.29
	Queenstown (33)	706,355.76
	Claiborne (36)	2,043,062.67
	St. Michaels (37)	2,093,988.72
	Easton (38)	0.00
	Tilghman (43)	0.00
	Oxford (44)	0.00
	Wye Mills (158)	0.00
		5,539,310 sq.m
		553.93 hectares
		1,368.76 acres
Choptank River - 7	Centreville (27)	0.00
	Claiborne (36)	273,318.02
	St. Michaels (37)	342,314.36
	Easton (38)	0.00
	Tilghman (43)	2,224,675.28
	Oxford (44)	1,157,879.37
	Trappe (45)	0.00
	Preston (46)	0.00
	Hudson (51)	5,159,589.99

(continue on next page)

TABLE 6 (continued)

SECTION	QUADRANGLE	AREA
Choptank River 7 (continued)	Church Creek (52)	1,057,899.07
	Cambridge (53)	56,570.84
	East New Market (54)	0.00
	Taylors Island (62)	581,667.35
	Golden Hill (63)	0.00
	Nanticoke (75)	0.00
	Wye Mills (158)	0.00
	Fowling Creek (160)	0.00
		10,853,914 sq.m
		1,085.39 hectares
		2,682.00 acres
Patuxent River - 8	Deale (35)	0.00
	Lower Marlboro (41)	0.00
	North Beach (42)	0.00
	Benedict (49)	0.00
	Prince Frederick (50)	0.00
	Mechanicsville (59)	0.00
	Broomes Island (60)	0.00
	Cove Point (61)	0.00
	Leonardtown (69)	0.00
	Hollywood (70)	0.00
	Solomons Island (71)	0.00
	Bristol (159)	0.00
	Charlotte Hall (162)	0.00
		0.00 sq. m
		0.00 hectares
		0.00 acres
Middle Western Shore - 9	North Beach (42)	0.00
	Prince Frederick (50)	0.00
	Hudson (51)	0.00
	Broomes Island (60)	0.00
	Cove Point (61)	0.00
	Taylors Island (62)	0.00
	Solomons Island (71)	0.00
	Barren Island (72)	0.00
	St. Marys City (80)	0.00
	Point No Point (81)	0.00
	Richland Point (82)	0.00
	Point Lookout (90)	0.00
		0.00 sq.m
		0.00 hectares
		0.00 acres

(continue on next page)

TABLE 6 (continued)

SECTION	QUADRANGLE	AREA
Lower Potomac River - 10	Nanjemoy (56)	1,683,182.02
	Mathias Point (57)	2,920,495.95
	Popes Creek (58)	12,960.03
	Mechanicsville (59)	0.00
	King George (65)	157,381.36
	Dahlgren (66)	339,814.89
	Colonial Beach North (67)	477,579.75
	Rock Point (68)	0.00
	Leonardtown (69)	0.00
	Hollywood (70)	0.00
	Solomons Island (71)	0.00
	Colonial Beach South (76)	0.00
	Stratford Hall (77)	0.00
	St. Clements Island (78)	0.00
	Piney Point (79)	0.00
	St. Marys City (80)	88,068.03
	Champlain (86)	0.00
	Machodoc (87)	0.00
	Kinsale (88)	0.00
	St. George Island (89)	30,843.04
	Point Lookout (90)	0.00
	Lottsburg (96)	0.00
	Heathsville (97)	0.00
	Burgess (98)	0.00
	Port Tobacco (161)	0.00
	Charlotte Hall (162)	0.00
		5,710,325 sq.m
		571.03 hectares
		1,411.02 acres
Upper Potomac River - 11	Washington West (28)	99,168.04
	Washington East (29)	0.00
	Alexandria (34)	3,182,946.35
	Fort Belvoir (39)	1,337,177.45
	Mt. Vernon (40)	2,545,660.49
	Quantico (47)	5,949,240.79
	Indian Head (48)	3,360,444.49
	Widewater (55)	7,309,476.61
	Nanjemoy (56)	0.00
	Mathias Point (57)	0.00
	Passapatanzy (64)	122,388.84
	King George (65)	587,149.44
	Dahlgren (66)	0.00
	Port Tobacco (161)	125,953.20
	Anacostia (176)	0.00
		24,619,606 sq.m
		2,461.96 hectares
		6,083.50 acres

(continue on next page)

TABLE 6 (continued)

SECTION	QUADRANGLE	AREA
Middle Eastern Shore - 12	Taylors Island (62)	42,191.44
	Golden Hill (63)	292,336.70
	Barren Island (72)	4,336,058.85
	Honga (73)	13,268,758.99
	Wingate (74)	4,808,052.24
	Nanticoke (75)	0.00
	Point No Point (81)	0.00
	Richland Point (82)	458,963.19
	Bloodsworth Island (83)	1,166,053.46
	Deal Island (84)	687,463.11
	Monie (85)	0.00
	Terrapin Sand Point (92)	256,564.14
	Marion (93)	2,784,284.28
	Great Fox Island (100)	1,407,520.43
	Crisfield (101)	961,030.42
	Mardela Springs (163)	0.00
	Wetipquin (164)	0.00
		30,469,277 sq.m
		3,046.93 hectares
		7,528.96 acres
Mid-Bay Island Complex - 13	Richland Point (82)	0.00
	Bloodsworth Island (83)	9,074,956.39
	Deal Island (84)	0.00
	Kedges Straits (91)	9,712,057.35
	Terrapin Sand Point (92)	2,421,497.55
	Ewell (99)	25,431,589.65
	Great Fox Island (100)	5,737,818.70
	Tangier Island (107)	5,413,491.08
	Goose Island (179)	2,147,915.90
		59,939,327 sq.m
		5,993.93 hectares
		14,811.00 acres
Lower Eastern Shore - 14	Marion (93)	0.00
	Great Fox Island(100)	7,904,094.78
	Crisfield (101)	2,255,894.78
	Saxis (102)	28,636.86
	Tangier Island (107)	603,820.00
	Chesconessex (108)	10,427,992.06
	Parksley (109)	4,619,932.11
	Nandua Creek (113)	4,739,141.63
	Pungoteague (114)	9,492,697.56
	Jamesville (119)	6,340,243.26
	Franktown (124)	7,186,743.83
	Cape Charles (133)	3,610,336.86
	Cheriton (134)	872,515.82
	Elliotts Creek (142)	1,119,605.90

(continue on next page)

TABLE 6 (continued)

SECTION	QUADRANGLE	AREA
Lower Eastern Shore - 14 (continued)	Townsend (143)	0.00
	Goose Island (179)	0.00
		59,201,655 sq.m
		5,920.17 hectares
		14,628.74 acres
Reedville Region - 15	Heathsville (97)	0.00
	Burgess (98)	0.00
	Reedville (106)	3,025,141.41
	Irvington (111)	0.00
	Fleets Bay (112)	4,758,904.96
		7,784,046 sq.m
		778.40 hectares
		1,923.43 acres
Rappahannock River Complex - 16	Tappahannock (95)	0.00
	Lottsburg (96)	0.00
	Dunnsville (103)	0.00
	Morattico (104)	0.00
	Lively (105)	0.00
	Urbanna (110)	112,508.52
	Irvington (111)	1,655,982.70
	Fleets Bay (112)	0.00
	Saluda (116)	0.00
	Wilton (117)	181,838.41
	Deltaville (118)	1,428,551.72
	Ware Neck (122)	0.00
	Mathews (123)	2,489,521.80
		5,868,403 sq.m
		586.84 hectares
		1,450.08 acres
New Point Comfort Region - 17	Mathews (123)	325,729.38
	New Point Comfort (132)	3,546,698.89
	East of New Point Comfort (177)	86,705.86
		3,959,134 sq.m
		395.91 hectares
		978.29 acres
Mobjack Bay Complex - 18	Ware Neck (122)	3,183,667.36
	Mathews (123)	451,751.51
	Claybank (130)	0.00
	Achilles (131)	7,119,986.87
	New Point Comfort (132)	7,424,901.79
	East of New Point Comfort (177)	0.00
		18,180,308 sq.m
		1,818.03 hectares
		4,492.35 acres

(continue on next page)

TABLE 6 (continued)

SECTION	QUADRANGLE	AREA
York River - 19	Toano (120)	0.00
	Gressitt (121)	0.00
	Norge (128)	0.00
	Williamsburg (129)	0.00
	Clay Bank (130)	0.00
	Achilles (131)	3,284,615.58
	New Point Comfort (132)	3,888,417.76
	Hog Island (138)	0.00
	Yorktown (139)	11,558.29
	Poquoson West (140)	1,116,197.49
	Poquoson East (141)	0.00
	East of New Point Comfort (177)	0.00
		8,300,789 sq.m
		830.08 hectares
		2,051.13 acres
Lower Western Shore - 20	New Point Comfort (132)	0.00
	Poquoson West (140)	4,713,203.69
	Poquoson East (141)	11,610,619.39
	Elliotts Creek (142)	0.00
	Newport News North (146)	0.00
	Hampton (147)	3,771,344.00
	Norfolk North (150)	0.00
	Little Creek (151)	0.00
	Cape Henry (152)	195,521.37
	Kempsville (156)	0.00
	Princess Anne (157)	0.00
		20,290,688 sq.m
		2,029.07 hectares
		5,013.83 acres
James River - 21	Toano (120)	0.00
	Westover (125)	0.00
	Charles City (126)	0.00
	Brandon (127)	0.00
	Norge (128)	0.00
	Williamsburg (129)	0.00
	Savedge (135)	0.00
	Claremont (136)	0.00
	Surry (137)	0.00
	Hog Island (138)	0.00
	Yorktown (139)	0.00
	Bacons Castle (144)	0.00
	Mulberry Island (145)	0.00
	Newport News North (146)	0.00
	Hampton (147)	34,956.06
	Benns Church (148)	0.00
	Newport News South (149)	0.00

(continue on next page)

TABLE 6 (concluded)

SECTION	QUADRANGLE	AREA
James River - 21 (continued)	Norfolk North (150)	0.00
	Little Creek (151)	0.00
	Chuckatuck (153)	0.00
	Bowers Hill (154)	0.00
	Norfolk South (155)	0.00
	Kempsville (156)	0.00
	Princess Anne (157)	0.00
		34,956 sq.m
		3.50 hectares
		8.65 acres
Chincoteague Bay	Selbyville (165)	0.00
	Assawoman Bay (166)	79,364.98
	Berlin (167)	106,890.61
	Ocean City (168)	235,723.28
	Public Landing (169)	0.00
	Tingles Island (170)	11,802,958.86
	Girdle Tree (171)	0.00
	Boxiron (172)	7,716,100.35
	Whittington Point (173)	3,991,047.98
	Chincoteague West (174)	62,688.86
	Chinoteague East (175)	9,246,987.32
		33,241,762 sq.m
		3,324.18 hectares
		8,214.05 acres

TABLE 7

Number of Square Meters of SAV in 1992 by Density Class for the 21 Sections of Chesapeake Bay and for Chincoteague Bay.

SECTION	DENSITY	AREA
Susquehanna Flats - 1		
	Density 1 =	15,878,168
	Density 2 =	326,612
	Density 3 =	290,209
	Density 4 =	1,424,696
	Total =	17,919,685
Upper Eastern Shore - 2		
	Density 1 =	2,441,091
	Density 2 =	312,214
	Density 3 =	46,488
	Density 4 =	29,769
	Total =	2,829,562
Upper Western Shore - 3		
	Density 1 =	0
	Density 2 =	699,030
	Density 3 =	1,025,417
	Density 4 =	135,224
	Total =	1,859,671
Chester River - 4		
	Density 1 =	677,674
	Density 2 =	1,018,659
	Density 3 =	809,262
	Density 4 =	46,011
	Total =	2,551,606
Central Western Shore - 5		
	Density 1 =	0
	Density 2 =	0
	Density 3 =	0
	Density 4 =	0
	Total =	0
Eastern Bay - 6		
	Density 1 =	3,090,711
	Density 2 =	1,872,309
	Density 3 =	576,291
	Density 4 =	0
	Total =	5,539,310

(continue on next page)

TABLE 7 (continued)

SECTION	DENSITY	AREA
Choptank River - 7		
	Density 1 =	2,047,594
	Density 2 =	5,882,511
	Density 3 =	2,781,556
	Density 4 =	142,253
	Total =	10,853,914
Patuxent River - 8		
	Density 1 =	0
	Density 2 =	0
	Density 3 =	0
	Density 4 =	0
	Total =	0
Middle Western Shore - 9		
	Density 1 =	0
	Density 2 =	0
	Density 3 =	0
	Density 4 =	0
	Total =	0
Lower Potomac River - 10		
	Density 1 =	0
	Density 2 =	2,638,734
	Density 3 =	610,418
	Density 4 =	2,461,174
	Total =	5,710,325
Upper Potomac River - 11		
	Density 1 =	364,474
	Density 2 =	4,262,209
	Density 3 =	2,199,869
	Density 4 =	17,793,053
	Total =	24,619,606

(continue on next page)

TABLE 7 (continued)

SECTION	DENSITY	AREA
Middle Eastern Shore - 12		
	Density 1 =	1,213,627
	Density 2 =	6,899,970
	Density 3 =	10,857,986
	Density 4 =	11,497,694
	Total =	30,469,277
Mid-Bay Island Complex - 13		
	Density 1 =	1,253,294
	Density 2 =	16,248,980
	Density 3 =	33,195,645
	Density 4 =	9,241,408
	Total =	59,939,327
Lower Eastern Shore - 14		
	Density 1 =	5,136,823
	Density 2 =	19,700,721
	Density 3 =	10,773,838
	Density 4 =	23,590,273
	Total =	59,201,655
Reedville - 15		
	Density 1 =	1,138,942
	Density 2 =	2,759,775
	Density 3 =	2,129,396
	Density 4 =	1,755,933
	Total =	7,784,046
Rappahannock River Complex - 16		
	Density 1 =	771,169
	Density 2 =	1,777,444
	Density 3 =	928,837
	Density 4 =	2,390,952
	Total =	5,868,403
New Point Comfort Region - 17		
	Density 1 =	4,698
	Density 2 =	2,487,138
	Density 3 =	95,231
	Density 4 =	1,372,067
	Total =	3,959,134

(continue on next page)

TABLE 7 (concluded)

SECTION	DENSITY	AREA
Mobjack Bay Complex - 18		
	Density 1 =	840,022
	Density 2 =	2,539,918
	Density 3 =	1,968,326
	Density 4 =	12,832,041
	Total =	18,180,308
York River - 19		
	Density 1 =	288,695
	Density 2 =	891,328
	Density 3 =	251,039
	Density 4 =	6,869,727
	Total =	8,300,789
Lower Western Shore - 20		
	Density 1 =	2,866,109
	Density 2 =	3,223,007
	Density 3 =	5,045,001
	Density 4 =	9,156,572
	Total =	20,290,688
James River - 21		
	Density 1 =	0
	Density 2 =	0
	Density 3 =	34,956
	Density 4 =	0
	Total =	34,956
Chincoteague Bay		
	Density 1 =	587,629
	Density 2 =	1,795,307
	Density 3 =	11,550,219
	Density 4 =	19,308,607
	Total =	33,241,762
Chesapeake Bay Total		
	Density 1 =	38,013,093
	Density 2 =	73,540,558
	Density 3 =	73,619,765
	Density 4 =	100,738,846
	Total =	285,912,262

Sassafras rivers, and Swan, Stillpond, and Churn creeks with *M. spicatum* and *V. americana* found most frequently, especially in the Elk River. The Upper Western Shore (Section 3) had 186 hectares of SAV concentrated in Saltpeter, Seneca, and Dundee creeks, compared to 91 hectares recorded in 1991. *Myriophyllum spicatum, E. canadensis,* and *C. demersum* were frequently cited. In the Chester River (Section 4) SAV abundance (255 hectares) was up 198 hectares from 1991. SAV was most abundant adjacent to Eastern Neck, Eastern Neck Island, and in Gray's Creek in the lower Chester River. *Ruppia maritima* was most commonly cited.

Middle Bay Zone

In 1992, 43.7% (5,994 hectares) of the SAV in the Middle Bay zone was found in the Mid-Bay Island Complex (Section 13) which includes the broad shoal area between Smith and Tangier Islands. This is an increase of 287 hectares over 1991. In this zone, 22.2% (3,047 hectares) of the SAV was present in the Middle Eastern Shore (Section 12), primarily in the Barren Island-Honga River area, the Big and Little Annemessex rivers, and the lower section of the Manokin River, with *R. maritima* reported most frequently. Little or no SAV was mapped from the Central Western Shore (Section 5), Patuxent River (Section 8), and Middle Western Shore (Section 9). Citizens' surveys reported *Z. palustris* at numerous locations in the South and Severn rivers while 12 species were reported from the small marsh creeks in the upper Patuxent River.

The Middle Bay zone also includes the entire Potomac River, where 3,033 hectares of SAV were present in 1992. SAV was concentrated in two distinct regions: 1) the Upper Potomac River (Section 11) with 2,462 hectares; and 2) the upper portion of the Lower Potomac River (Section 10) with 571 hectares, including Nanjemoy Creek and Port Tobacco River. The total abundance of SAV in the Upper Potomac section decreased from 1991 by 554 hectares. Declines in SAV were most notable in the Alexandria, Mt. Vernon, and Fort Belvoir quadrangles, primarily in the mainstem river, the southern edge of the large bed at the Woodrow Wilson Bridge, and in Piscataway Creek. Ground survey data were limited in this section in 1992 to only Citizens' surveys with five species reported: *M. spicatum, V. americana, H. verticillata, N. guadalupensis* and *C. demersum.* SAV increased in the Eastern Bay and Choptank River sections for the first time since the late 1980's. SAV in the Eastern Bay (Section 6) increased 486 hectares from 1991 to a total of 554 hectares in 1992, while in the Choptank River (Section 7) it increased 971 hectares from 1991 to a total of 1,085 hectares in 1992. Most of the increase in the Eastern Bay occurred in the Miles River, while in the Choptank River section, SAV beds were most abundant in Harris and Broad creeks and in Trippe Bay. Three species were reported from Sections 6 and 7, with *R. maritima* most commonly cited.

Lower Bay Zone

Distribution and abundance of SAV in 1992, in the Lower Bay zone, were similar to 1991. In this zone, 47.9% (5,920 hectares) of the SAV was found in the Lower Eastern Shore (Section 14) around the Fox Islands and the mouths of major creeks (i.e. Cherrystone Inlet and Hungars, Mattawoman, Occahannock, Craddock, Pungoteague, and Onancock creeks). Along the western shore of the Chesapeake Bay, SAV was abundant in Mobjack Bay (Section 18) (14.7% of SAV in the Lower Bay zone), in the lower York River (Section 19) (6.7% of SAV in the Lower Bay zone), and in the Lower Western Shore (Section 20), specifically Back River and the Drum Island Flats area adjacent to Plum Tree Island (16.4% of SAV in the Lower Bay zone). There were 778 hectares of SAV mapped in the Reedville Region (Section 15) in 1992, a 22.5% increase over 1991. There were 396 hectares of SAV identified in 1992 in the New Point Comfort Region (Section 17) compared to 339 hectares in 1991. SAV abundance was up 15.3% from 1991 in both the Piankatank and Rappahannock rivers (Section 16). The James River (Section 21) had less than 4 hectares of SAV in 1992. *Zostera marina* and *R. maritima* were the abundant species in this zone.

Chincoteague Bay

SAV in the Chincoteague Bay section increased in distribution with 3,324 hectares mapped in 1992 compared to 2,746 hectares in 1991. Most of the SAV in Chincoteague and Sinepuxent bays, which consisted of *Z. marina* and *R. maritima*, was located along the eastern side of the bay behind Assateague Island. Some small beds, consisting of *R. maritima*, were located along the western side of Isle of Wight and Assawoman bays.

DISCUSSION OF SECTIONS ARRANGED WITHIN ZONES

Upper Bay Zone

1. Susquehanna Flats

There were 1,792 hectares of SAV in the Susquehanna Flats section in 1992 (Tables 4-7; Figure 8; Appendix C, Maps 2, 3, and 9) compared to 1,684 hectares mapped in 1991. Eight percent of the total coverage of SAV in this section was dense (class 4), 1.6% was moderate (class 3), 1.8% was sparse (class 2), and 88.6% was very sparse (class 1) (Table 7; Figure 3). SAV beds were located principally in two main areas: 1) sparse to dense fringing beds in the Susquehanna River consisting primarily of *M. spicatum*, with *H. dubia*, *V. americana*, *H. verticillata*, and *C. demersum* from Robert Island to the river mouth at Havre de Grace on the west side, to Stump Point at the mouth of Mill Creek on the east side, and in Mill Creek, Furnace Bay, and Baker Cove; and 2) a large area of very sparse SAV

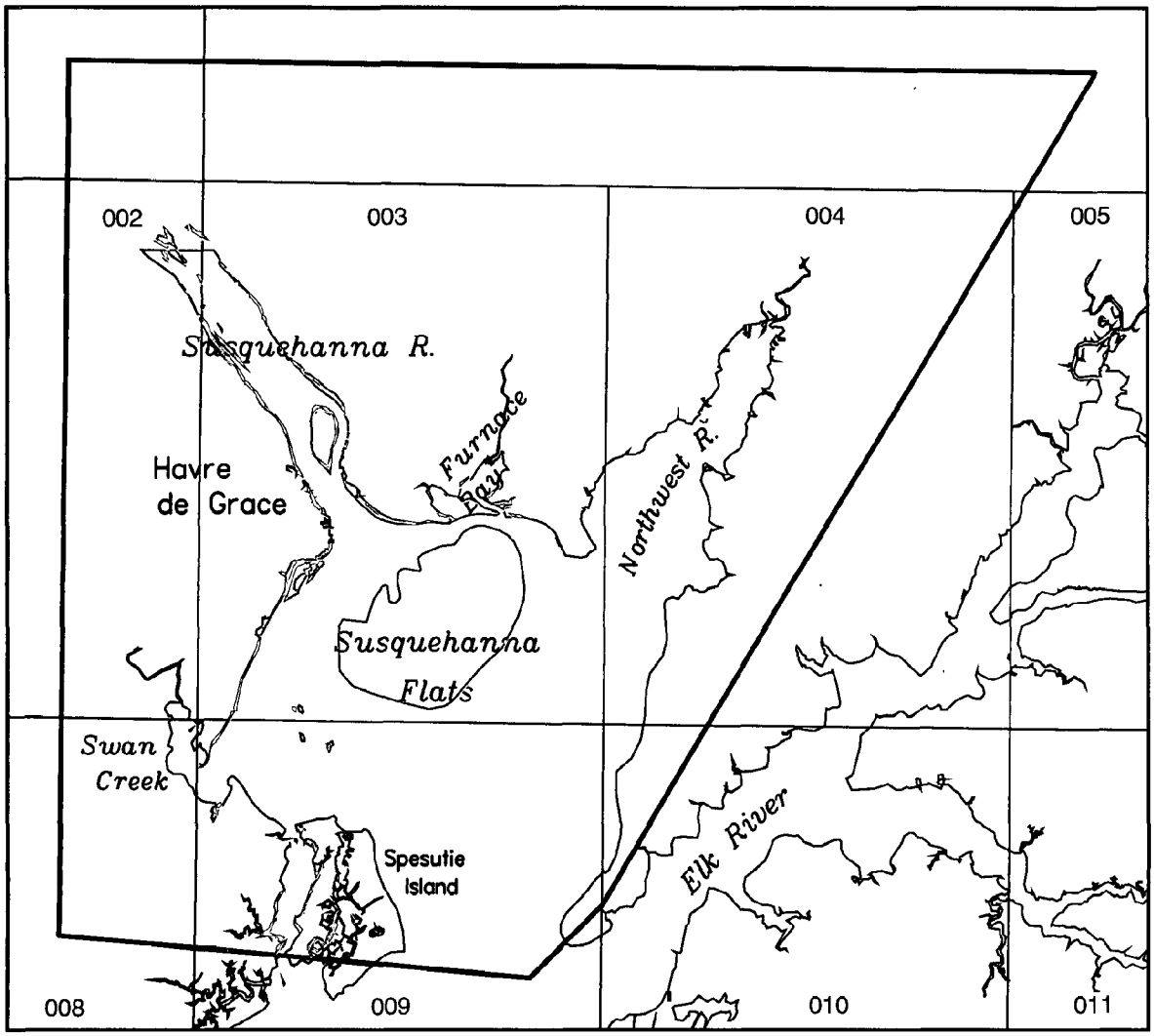


Figure 8. Distribution of SAV in the Susquehanna Flats in 1992 (Section 1).

located in the broad shoal area at the river mouth. This broad shoal area consisted primarily of small patches of *M. spicatum*. In addition, SAV beds were again mapped in Spesutie Narrows where most SAV is found as small, fringing beds of *M. spicatum* and *H. verticillata*. The Citizens' Survey reported *M. spicatum* and *Potamogeton crispus* in the Northeast River.

A total of six species (*M. spicatum, H. dubia, V. americana, H. verticillata, C. demersum, P. crispus*) have been reported either by Stan Kollar of Harford Community College or the Citizens' Survey.

2. Upper Eastern Shore

There were 283 hectares of SAV mapped for the Upper Eastern Shore section in 1992 (Tables 4-7; Figure 9; Appendix C, Maps 4, 5, 9, 10, 15, 16, and 17) compared to 326 hectares mapped for 1991. In this section 1.1% of the total coverage of SAV was dense (class 4), 1.6% was moderate (class 3), 11.0% was sparse (class 2), and 86.3% was very sparse (class 1) (Table 7; Figure 3). Principal locations of beds were in the Elk River, Swan Creek, lower Sassafras River, Still Pond, and the mouth of Churn Creek. Very little or no SAV was mapped in the Bohemia River or along the mainstem of the bay from Still Pond to Swan Point.

Ground survey data from Stan Kollar and the Citizens' survey reported 5 species in this section (Maps 4, 9, 10, 15, 16, and 17) with *M. spicatum* and *V. americana* found most frequently, especially in the Elk River. *Potamogeton perfoliatus, P. crispus,* and *Potamogeton pectinatus* were also reported.

3. Upper Western Shore

There were 186 hectares of SAV mapped from the aerial photographs in 1992 for the Upper Western Shore section (Tables 4-7; Figure 10; Appendix C, Maps 7, 8, 9, 13 and 14) compared to 91 hectares in 1991. Of the total coverage of SAV in this section 7.3% was dense (class 4), 55.1% was moderate (class 3), and 37.6% was sparse (class 2) (Table 7; Figure 3). SAV beds were concentrated in Saltpeter, Dundee, Seneca, and Romney creeks, and Middle River, in and adjacent to Galloway Creek. SAV was mapped in the lower Spesutie Narrows in 1992, the first time SAV was mapped in this part of section 3. Very little or no SAV was again reported in the Back, Patapsco, Bush, Gunpowder, and Magothy rivers.

Ground survey data from the Citizen's survey and Essex Community College reported 6 species in this section (Maps 7, 13, 14, 19, 23, and 24) with *M. spicatum, E. canadensis,* and *C. demersum* were found most frequently in Saltpeter, Dundee, and Seneca creeks, where SAV has been most abundant. *Vallisneria americana* and *Z. palustris* were also reported in these same areas but less frequently. *Zannichellia palustris* and *R. maritima* were reported from other creeks and rivers with *Z. palustris* most numerous at locations in the Magothy River.

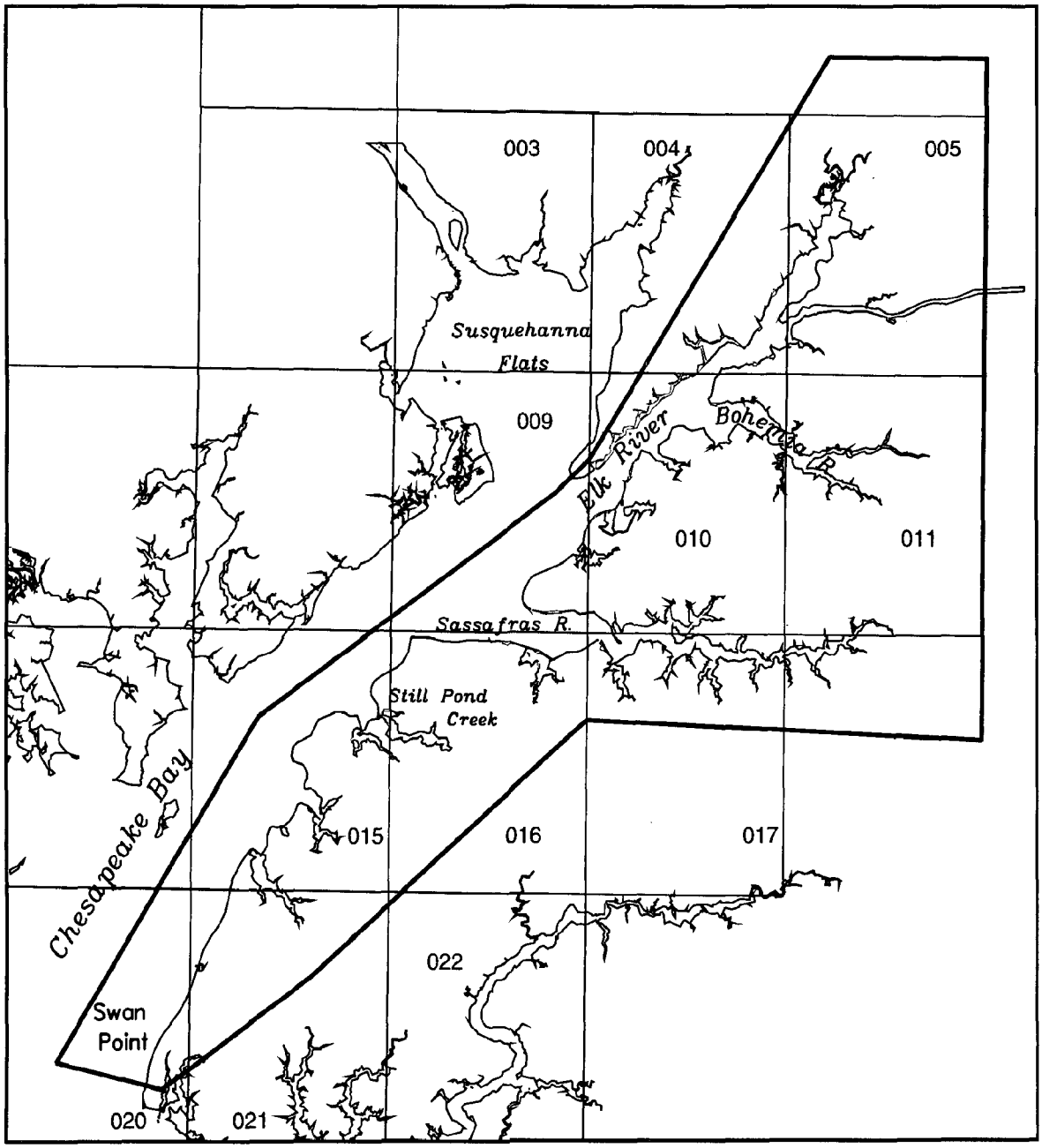


Figure 9. Distribution of SAV in the Upper Eastern Shore in 1992 (Section 2).

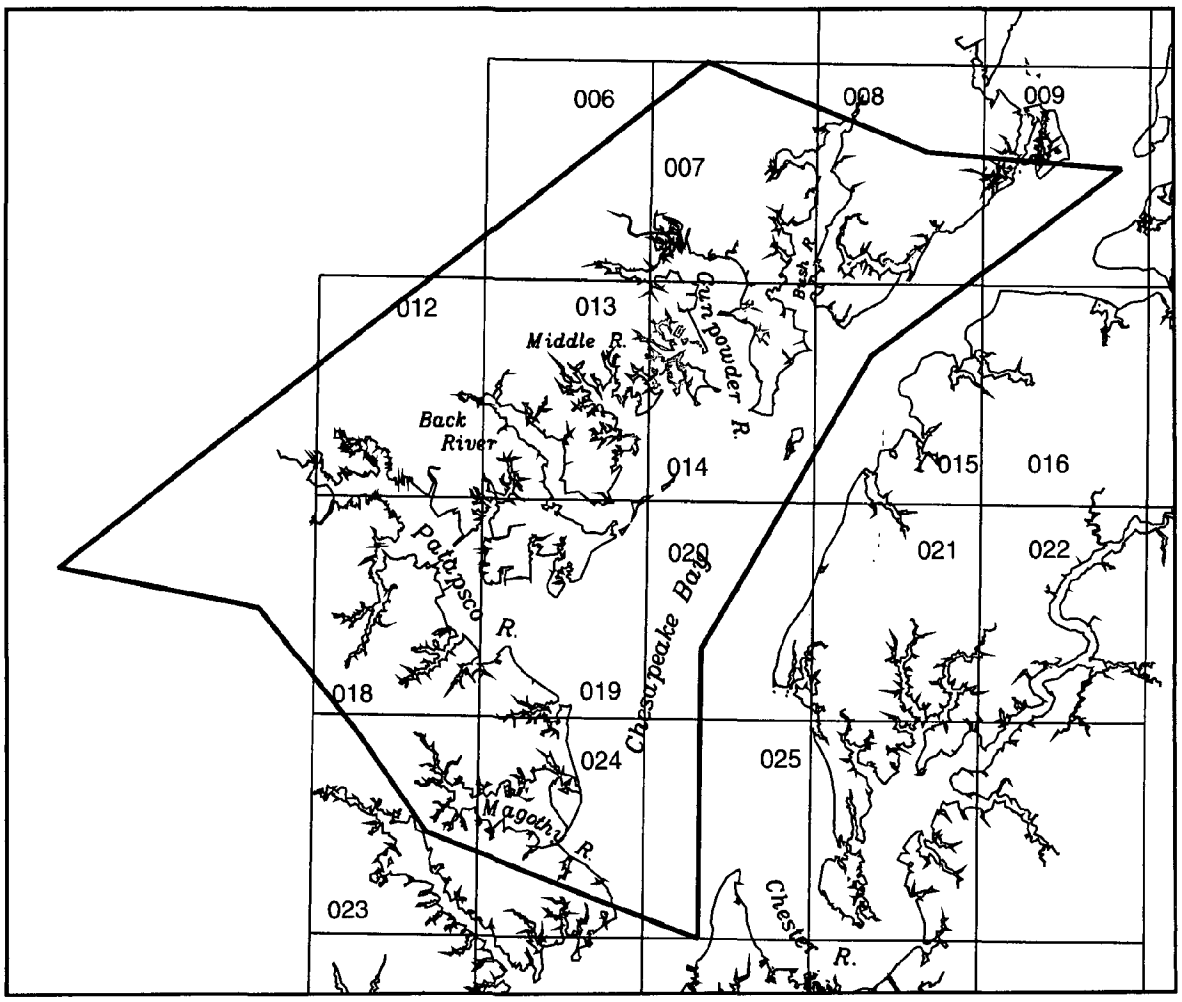


Figure 10. Distribution of SAV in the Upper Western Shore in 1992 (Section 3).

4. Chester River

There were 255 hectares of SAV in the Chester River section in 1992 (Tables 4-7; Figure 11; Appendix C, Maps 20, 21, 26, and 33) compared to 57 hectares in 1991. In this section, 1.8% of the total coverage of SAV was dense (class 4), 31.7% was moderate (class 3), 39.9% was sparse (class 2), and 26.6% was very sparse (class 1) (Table 7; Figure 3). This is the first year in which SAV has increased in this section. SAV has continually declined in this section since 1987 when 515 hectares of SAV were mapped, and large, dense beds of *R. maritima* dominated this section. Most of the SAV, and where the greatest increase occurred, was located adjacent to Eastern Neck and Eastern Neck Island, especially near Eastern Neck Narrows, and in Grays Creek, a tributary entering the Chester River. Additional SAV beds in the Chester River were located in Robin Cove and adjacent to Quaker Neck. Rock Hall Harbor, and Haven, Swan, and Huntingfield creeks, located above Eastern Neck on the Chesapeake Bay, supported the remaining SAV beds in this section.

Three species of SAV were reported from this section by Citizens' and HPEL surveys in 1992: *Potamogeton perfoliatus*, *Z. palustris*, and *R. maritima* (Maps 20, 21, and 26). *Ruppia maritima* was most commonly cited, especially in the Chester River. HPEL staff ran a 200 m transect in Fryingpan Cove in Eastern Neck Narrows. They found *P. perfoliatus* occurring along 5 points of the transect and *R. maritima* occurring at only 1 point. Plants were very patchy, with 2% or less of the sample being SAV. No plants were found beyond 100 m. A second transect conducted along the eastern shore of the lower Chester River adjacent to Robin Cove found no SAV.

Middle Bay Zone

5. Central Western Shore

There was no SAV observed from the aerial photography in the Central Western Shore section in 1992 (Tables 4-7; Figure 12). This was similar to 1991. Citizens' surveys found *Z. palustris* at numerous locations in the Severn and South rivers (Maps 23 and 30) and at one location at the mouth of the Rhode River (Map 35). *Ruppia maritima* was reported at a few locations in the South and Rhode rivers.

6. Eastern Bay

There were 554 hectares of SAV identified from the Eastern Bay section in 1992 (Tables 4-7; Figure 13; Appendix C, Maps 32, 33, 36, and 37) compared to 68 hectares reported in 1991, a 714.7% increase. In this section, 10.4% of the total coverage of SAV in this section was moderate (class 3), 33.8% was sparse (class 2), and 55.8% was very sparse (class 1) (Table 7; Figure 3). Most of the SAV was

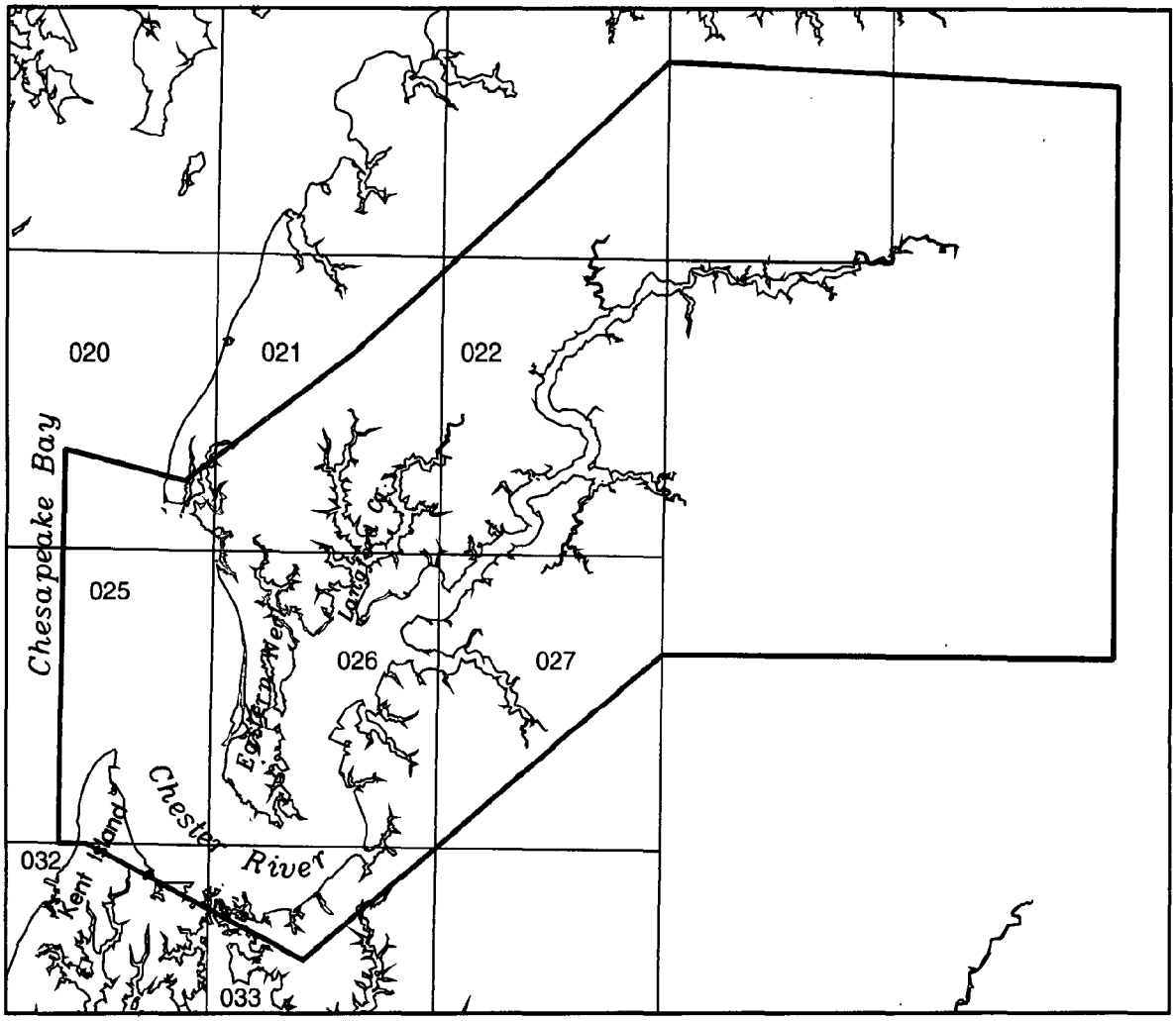


Figure 11. Distribution of SAV in the Chester River 1n 1992 (Section 4).

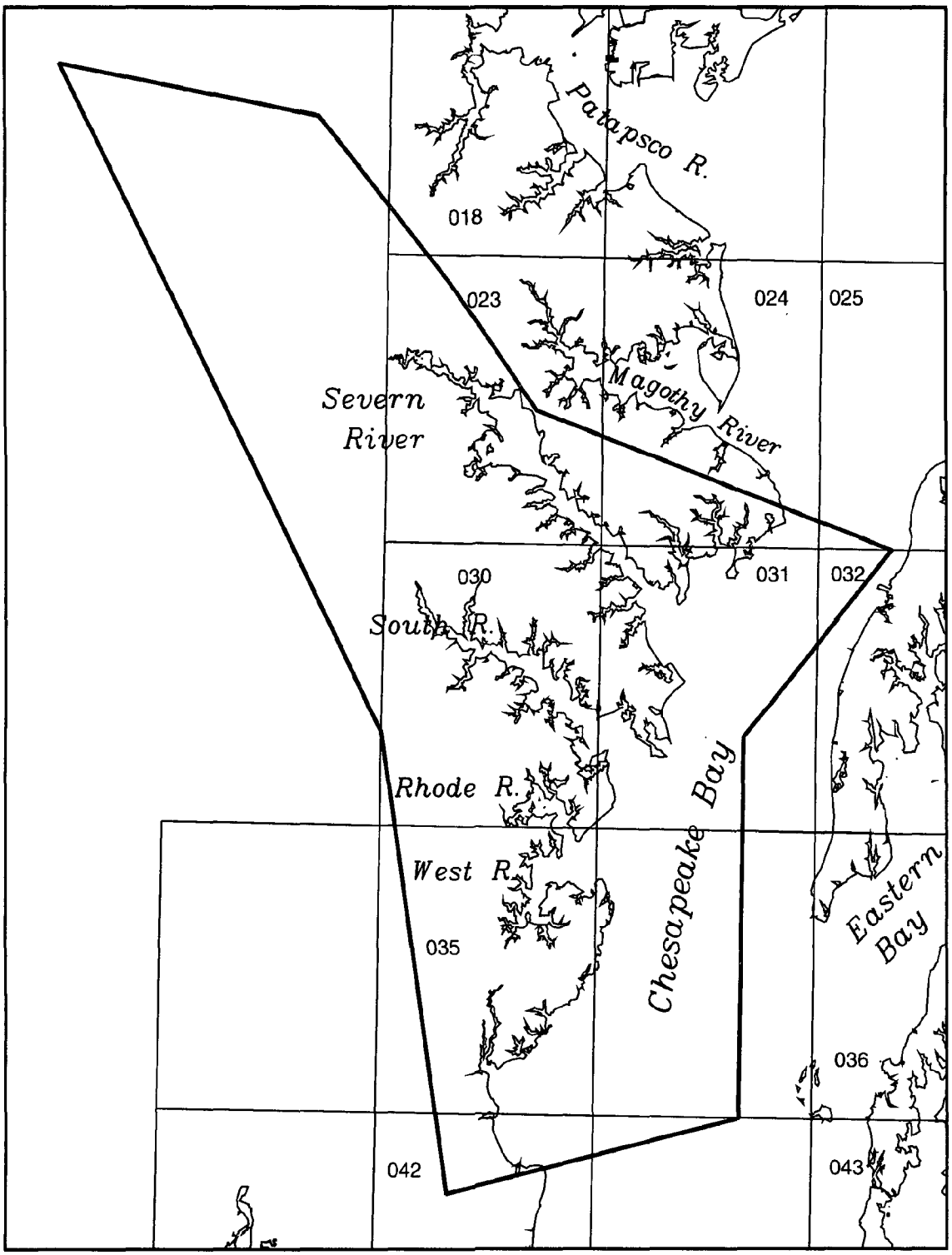


Figure 12. Distribution of SAV in the Central Western Shore in 1992 (Sect6ion 5).

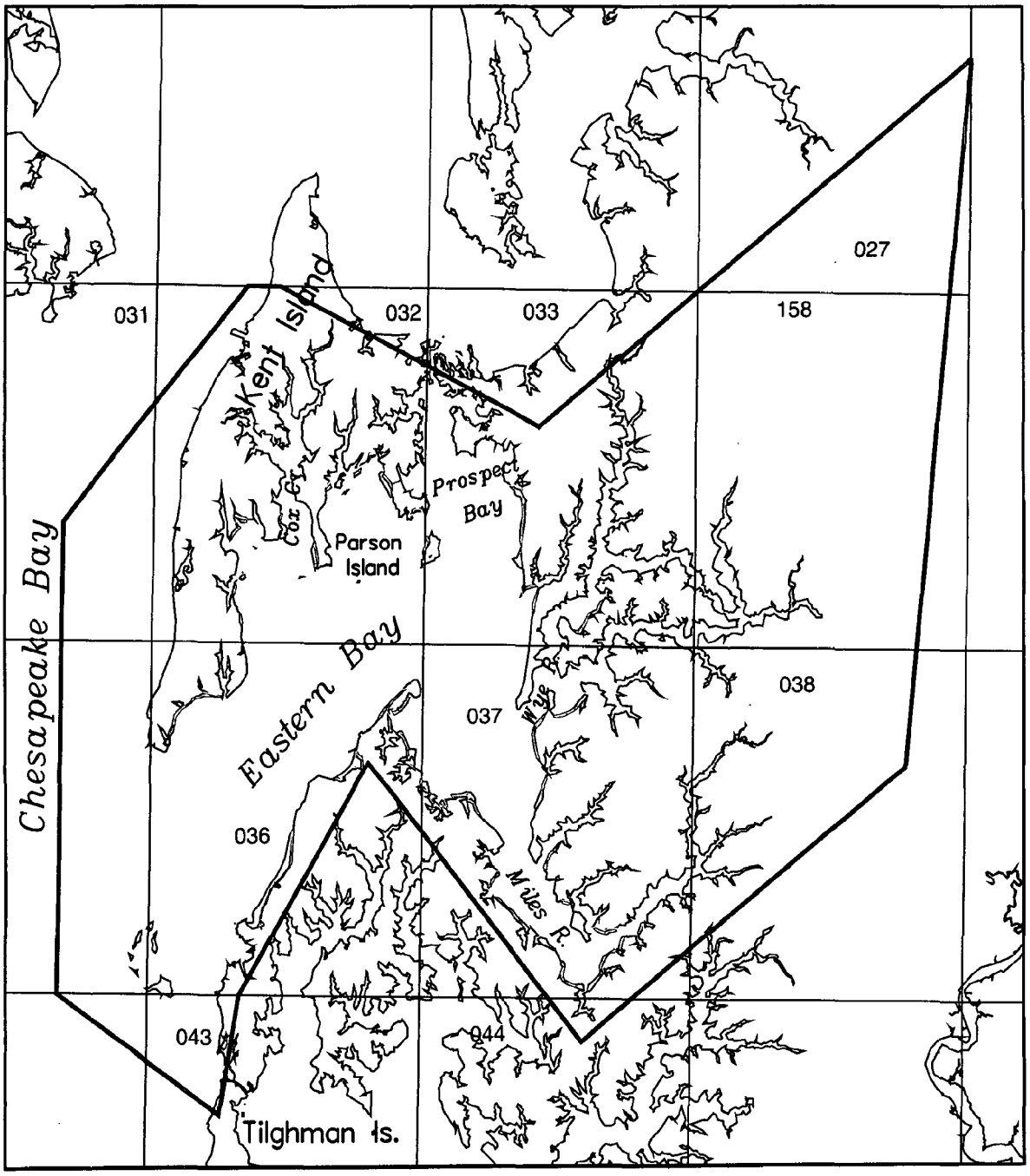


Figure 13. Distribution of SAV in the Eastern Bay in 1992 (Section 6).

found in the lower Miles River, where little SAV was reported in 1991. Other SAV beds were located in the lower Cox Creek, Wye River, the eastern shore of lower Kent Island, Parson Island, Harbor Cove on Eastern Bay, Piney Neck, Crab Alley Bay, and between Wades Point and Claiborne on Eastern Bay.

Only two species of SAV were reported from this section by Citizens' and HPEL surveys: *Z. palustris, R. maritima* (Maps 32, 33, 36, and 37; Appendix F) with *R. maritima* most commonly cited. HPEL staff conducted three transects in the Eastern Bay area.

Ruppia maritima accounted for less than 2% cover at 7 points along a transect run from the western side of Parsons Island. No SAV was found beyond 170 m. *Ruppia maritima* was more abundant along a transect run from the southern tip of Kent Island between Kent and Long Point. This species was found at 7 points out to 150 m from the shoreline accounting for up to 90% of the coverage at the inshore stations (30 m from shore). At the third transect between Claiborne and Wades Point *R. maritima* was abundant at only two points in the first 30 m and was absent from the remainder of the transect.

7. Choptank River

There were 1,085 hectares of SAV observed in the Choptank River section in 1992 (Tables 4-7; Figure 14; Appendix C, Maps 43, 44, 51, 52, 53, and 62) compared to 114 hectares in 1991, an increase (851.8%) that is greater than any other section in 1992. In this section, 1.3% of the total coverage of SAV was dense (class 4), 25.6% was moderate (class 3), 54.2% was sparse (class 2), and 18.9% was very sparse (class 1) (Table 7; Figure 3). SAV was found in moderate to sparse beds in Blackwalnut Cove at the southern tip of Tilghman Island; Cators, Oyster, Point, and Cook Point coves; James Island; Brannock Bay; Tred Avon River; Harris, Broad, Chapel, Island, Irish, and Covey creeks; and off the Little Choptank River in Hudson and Brook creeks.

Three species of SAV were reported from this section by Citizens' and HPEL surveys: *Z. palustris, R. maritima,* and *P. pectinatus* (Maps 43, 44, 46, 51, 52, and 53; Appendix F) with *R. maritima* most commonly cited. HPEL staff conducted seven transects in the Choptank River area. *Ruppia maritima* accounted for less than 20% cover at 6 points along a transect run in Brannock Bay with no SAV reported beyond 150 m. No SAV was found along a second transect just north of the Brannock Bay transect although the aerial survey mapped SAV in the area. No SAV was found along a transect run from the western side of Ragged Island at the mouth of the Little Choptank River. *Ruppia maritima* was more abundant along a transect run from the southern tip of Tilghman Island at Blackwalnut Point. SAV was present at all points out to 200 m and was present beyond the transect. A transect run from Cooks Point Cove found no SAV although the aerial survey reported abundant SAV. However, the transect was run off a point from which no SAV was reported in the aerial survey. The Chapel Creek transect had *R. maritima* occurring along the entire 200 m transect, with 14 points have greater than 50% coverage of SAV. The aerial survey has consistently reported SAV in this area. The transect between Change and Nelson Point on the

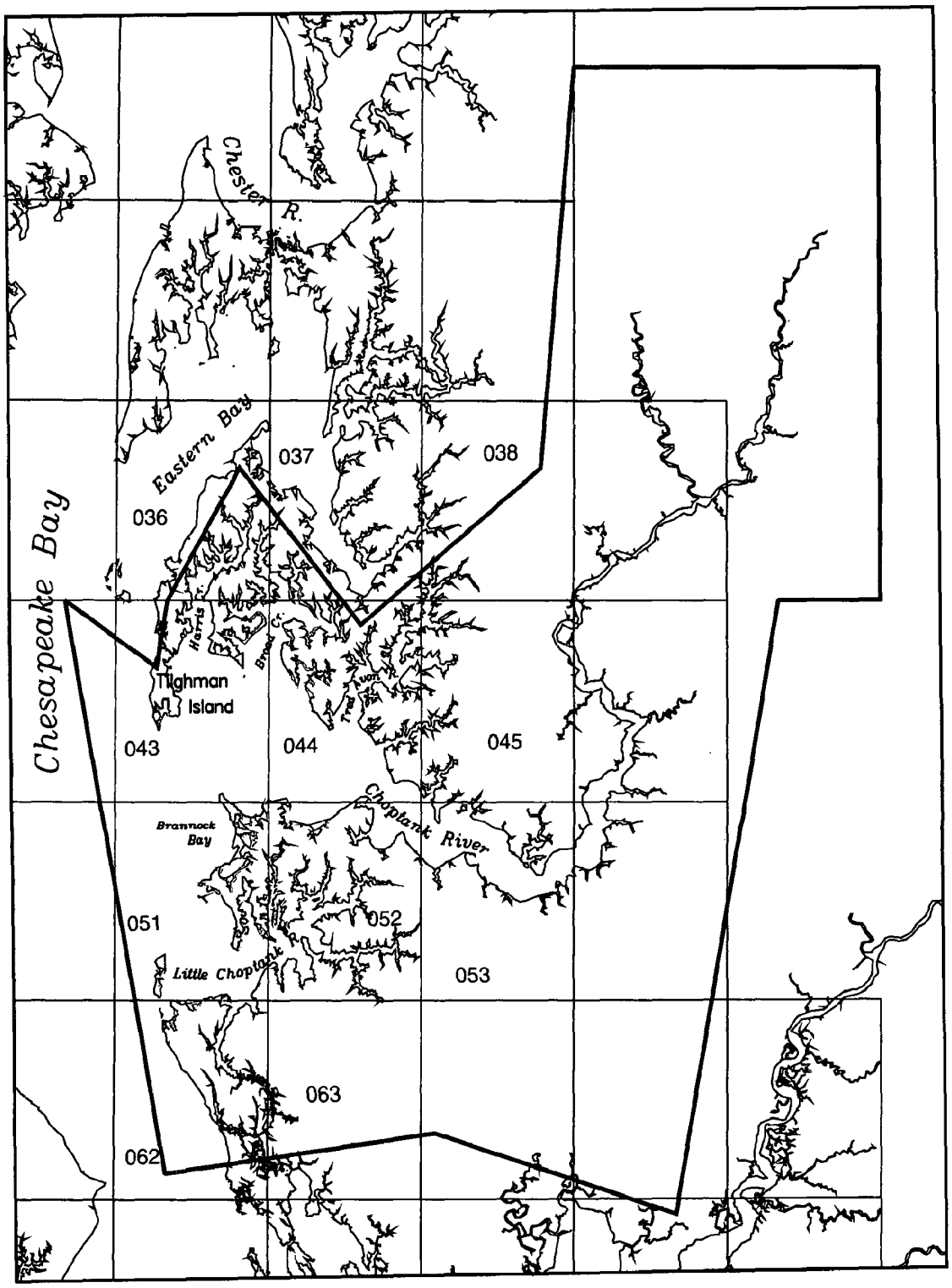


Figure 14. Distribution of SAV in the Choptank River in 1992 (Section 7).

Choptank River had a very patchy distribution of *R. maritima*, although it was abundant (greater than 20% coverage) at five points along the 200 m transect.

8. Patuxent River

There was no SAV observed from the aerial photography in the Patuxent River section in 1992 (Tables 4-7; Figure 15) similar to 1991. The Patuxent River Park and Citizens' surveys reported 12 species occurring in this section primarily in the marsh creeks in the upper portions of the Patuxent River (Maps 41, 60, and 159): *E. canadensis, C. demersum, V. americana, Z. palustris, N. guadalupensis, Najas gracillus, Najas minor, P. crispus, Potamogeton pusillus, P. pectinatus,* and *Potamogeton epihydrus. Zannichellia palustris* and *R. maritima* were reported from the lower portion of the Patuxent River in Saint Leonard, Pearson and Harper creeks (Maps 61 and 71).

9. Middle Western Shore

There were no SAV beds identified in the Middle Western Shore section in 1992 (Tables 4-7; Figure 16) similar to 1991. *Zannichellia palustris* and *R. maritima* were reported by Citizens' surveys from Goose Creek just south of the Patuxent River mouth (Map 71).

10. Lower Potomac River

There were 571 hectares of SAV identified in the Lower Potomac River section as indicated on the 1992 aerial photography (Tables 4-7; Figure 17; Appendix C, Maps 56, 57, 58, 65, 66, 67, 80, and 89) compared to 581 hectares reported in 1991. In this section, 43.1% of the total coverage of SAV was dense (class 4), 10.7% was moderate (class 3), and 46.2% was sparse (class 2) (Table 7; Figure 3). Most of the SAV occurred in the region near the Route 301 bridge, and along Nanjemoy Creek and Port Tobacco River, as well as along the shoreline adjacent to these two creeks. SAV beds were found fringing the eastern side of Mathias Point Neck to an area just below the Route 301 bridge. Several small beds were observed in Machodoc, Rosier, and Cuckhold creeks, the St. Marys River, and in Calvert Bay at the mouth of Smith Creek.

Ground survey data was available only from Citizens' surveys for Maps 66, 78, 80, and 98. *Zannichellia palustris* was reported from two creeks off the Lower Machodoc Creek (Map 78) and in the St. Marys River (Map 80). *Ruppia maritima* was reported from the St. Marys River and Cubitt Creek in the lower Potomac River. Three species were reported from off Mathias Point Neck: *V. americana, E. canadensis,* and *P. perfoliatus.*

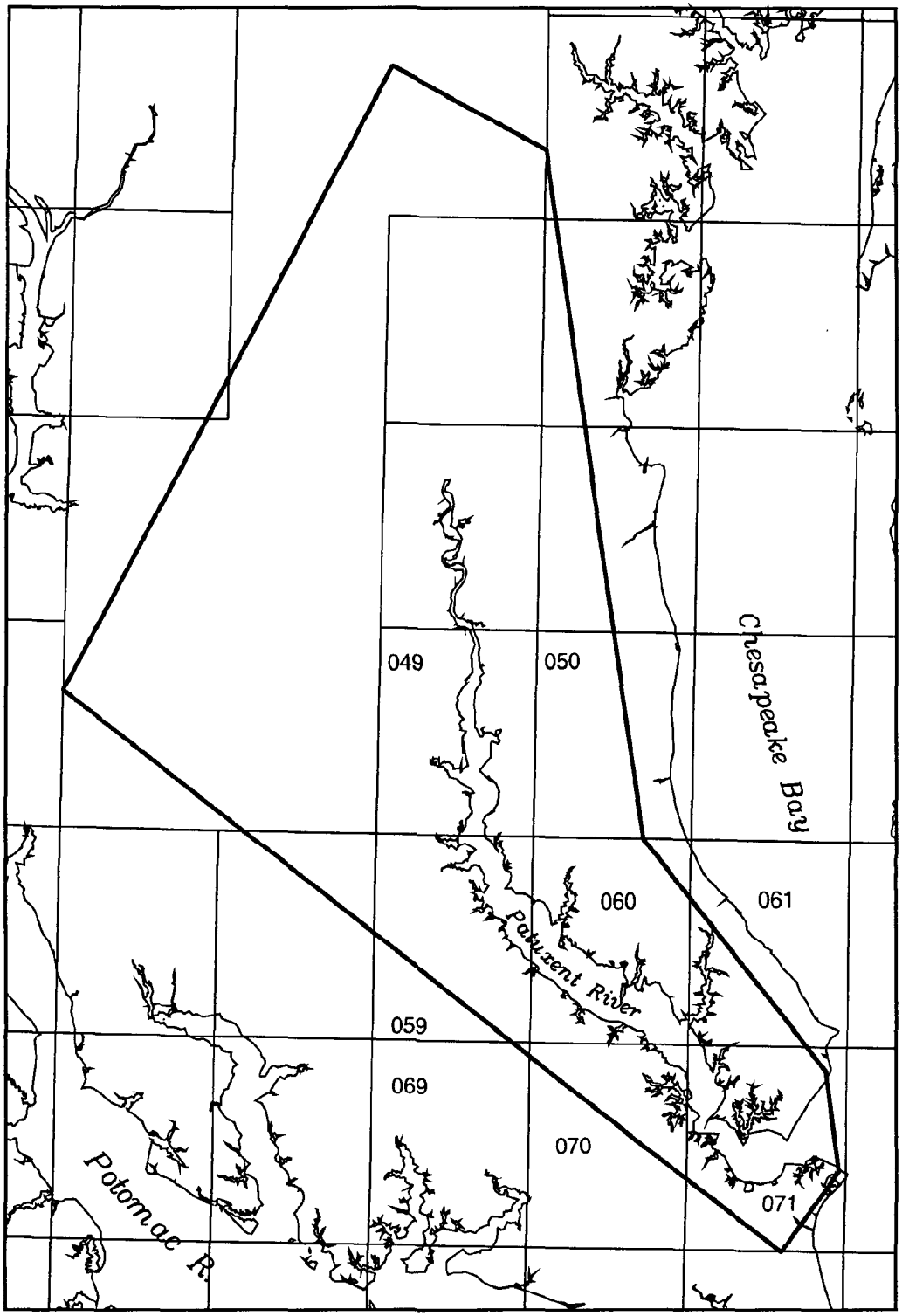


Figure 15. Distribution of SAV in the Patuxent River in 1992 (Section 8).

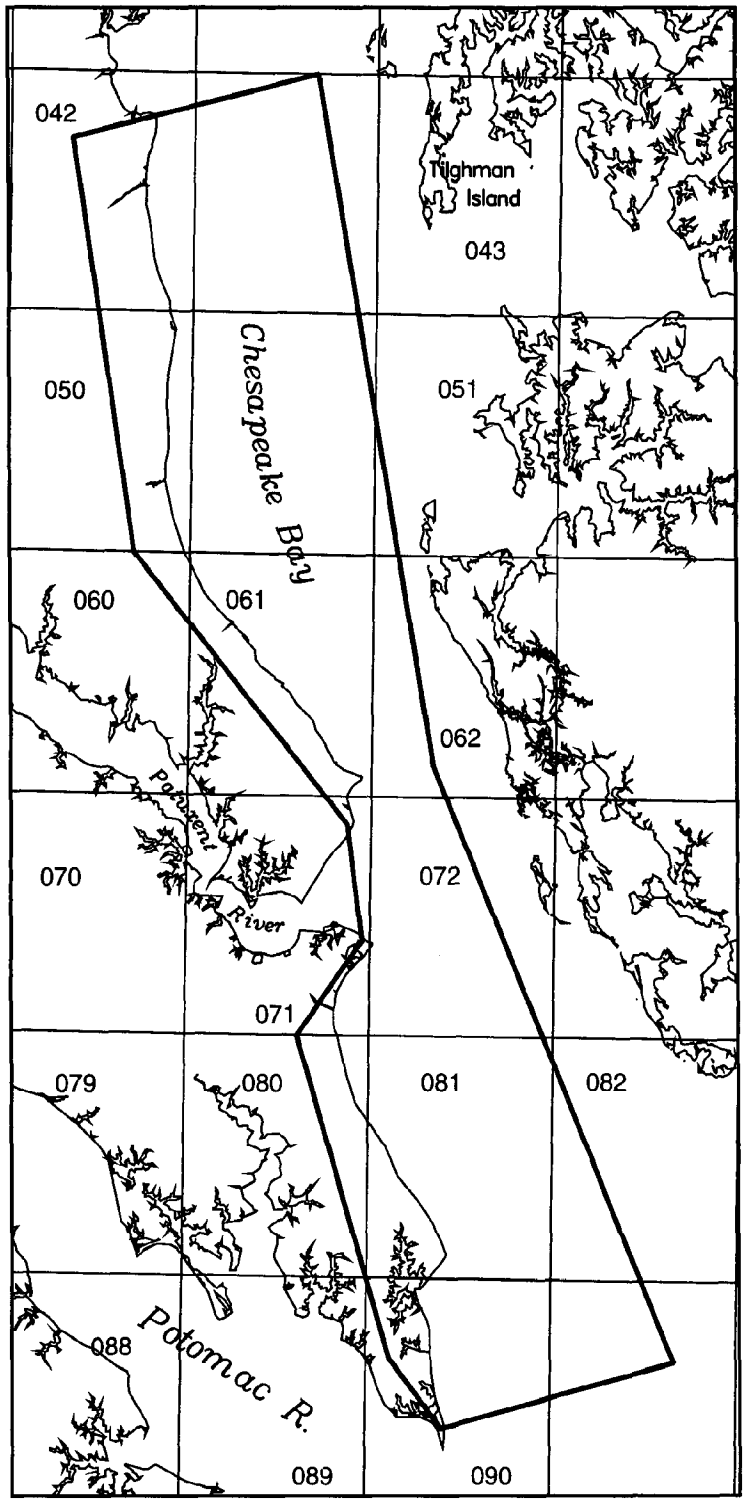


Figure 16. Distribution of SAV in the Middle Western Shore in 1992 (Section 9).

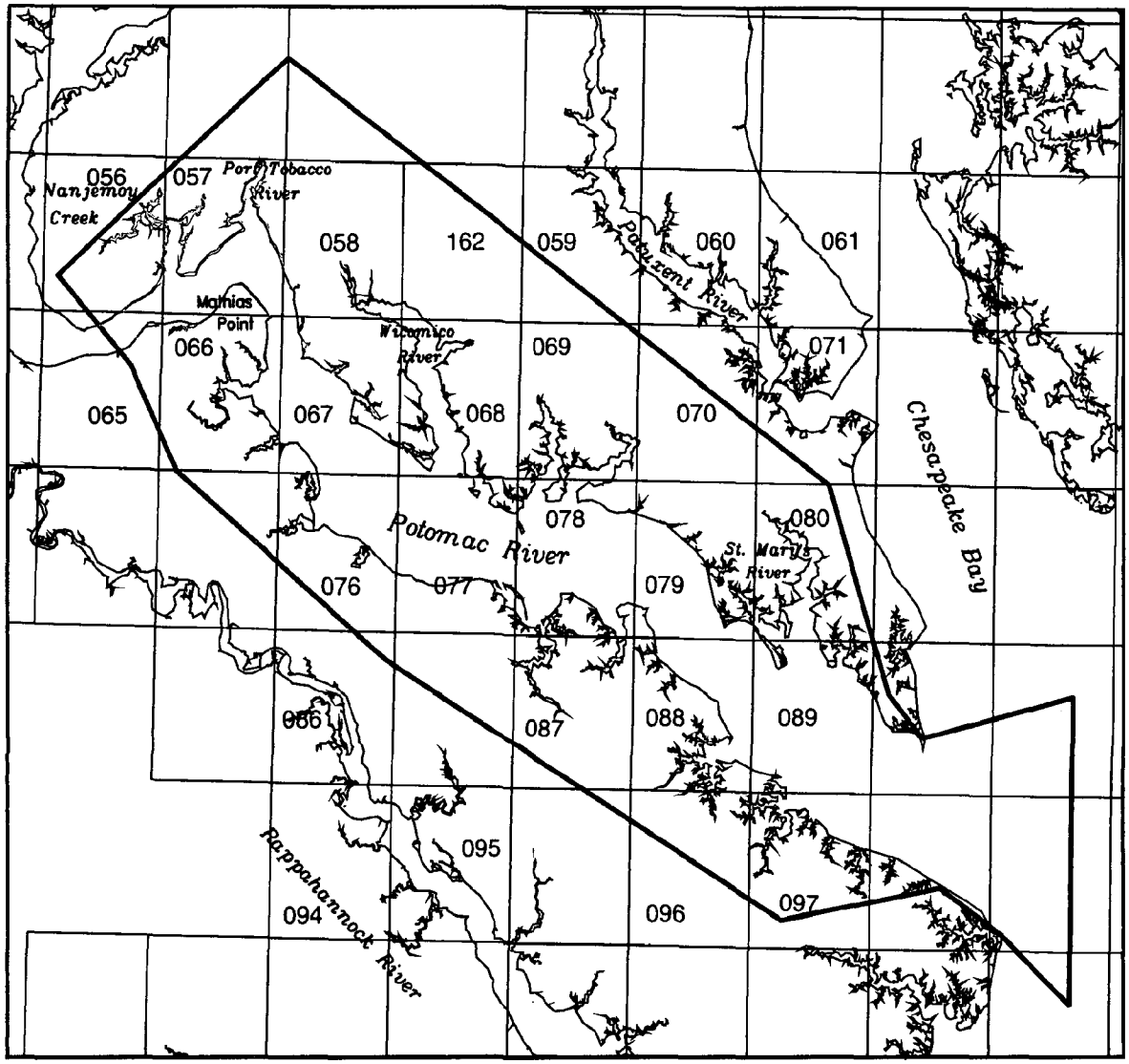


Figure 17. Distribution of SAV in the Lower Potomac River in 1992 (Section 10).

11. Upper Potomac River

There were 2,462 hectares of SAV mapped in the Upper Potomac River section (Tables 4-7; Figure 18; Appendix C, Maps 28, 34, 39, 40, 47, 48, 55, 64, 65, and 161) in 1992 compared to 3,016 hectares reported in 1991, a decrease of 18.4%. A total of 72.3% of the SAV beds were densely vegetated (class 4), 8.9% was moderate (class 3), 17.3% was sparse (class 2), and 1.5% was very sparse (class 1) (Table 7; Figure 3). Declines in SAV were most notable in the Alexandria (Map 34), Mt. Vernon (Map 40), and Fort Belvoir (Map 39) quadrangles, in particular in the mainstem of the Potomac River, the southern edge of the large bed at the Woodrow Wilson Bridge, and in Piscataway Creek. SAV beds increased in size in Aquia Creek. SAV beds were first noted in Potomac Creek although COG reported *H. verticillata* at one location in 1991. SAV is still absent from Occoquan and Belmont bays (although COG reported some SAV in 1991 in Belmont Bay) but some SAV beds were located and mapped at the mouth of the Occoquan River in 1992.

Ground survey data was available only from Citizens' surveys for Map 40. Five species were reported: *M. spicatum, V. americana, H. verticillata, N. guadalupensis* and *C. demersum.*

12. Middle Eastern Shore

There were 3,047 hectares of SAV identified in the Middle Eastern Shore section (Tables 4-7; Figure 19; Appendix C, Maps 62, 63, 72, 73, 74, 82, 83, 84, 92, 93, 100, and 101) in 1992 compared to 2,178 hectares reported in 1991. In this section, 37.7% of the SAV was dense (class 4), 35.6% moderate (class 3), 22.6% sparse (class 2), and 4.0% very sparse (class 1) (Table 7; Figure 3). SAV beds were very abundant in: 1) the Honga River, 2) between Barren Island and Meekins Neck-Upper Hooper Island, and 3) the lower Manokin and the Big and Little Annemessex rivers. No SAV beds were observed in Fishing and Monie bays, and in the Nanticoke and Wicomico rivers. Ground survey data were available for this section in 1992 from Citizens' surveys (Maps 72, 74, 82, 84, 100, 101). *Ruppia maritima* was reported most frequently, while *Z. palustris* was present in only one area (Map 74).

13. Mid-Bay Island Complex

There were 5,994 hectares of SAV mapped in the Mid-Bay Island Complex in 1992 (Tables 4-7; Figure 20; Appendix C, Maps 83, 91, 92, 99, 100, 107, and 179) compared to 5,707 hectares reported in 1991, a 5.0% increase. This section contains 20.9% of the SAV in the entire Chesapeake Bay, slightly less than the 22.3% in 1991. However, the density of SAV has decreased since 1991. In 1992 15.4% percent of the SAV within this section was in dense beds (class 4) compared to 59.0% in 1991. In the rest of the classes 55.4% was moderately dense

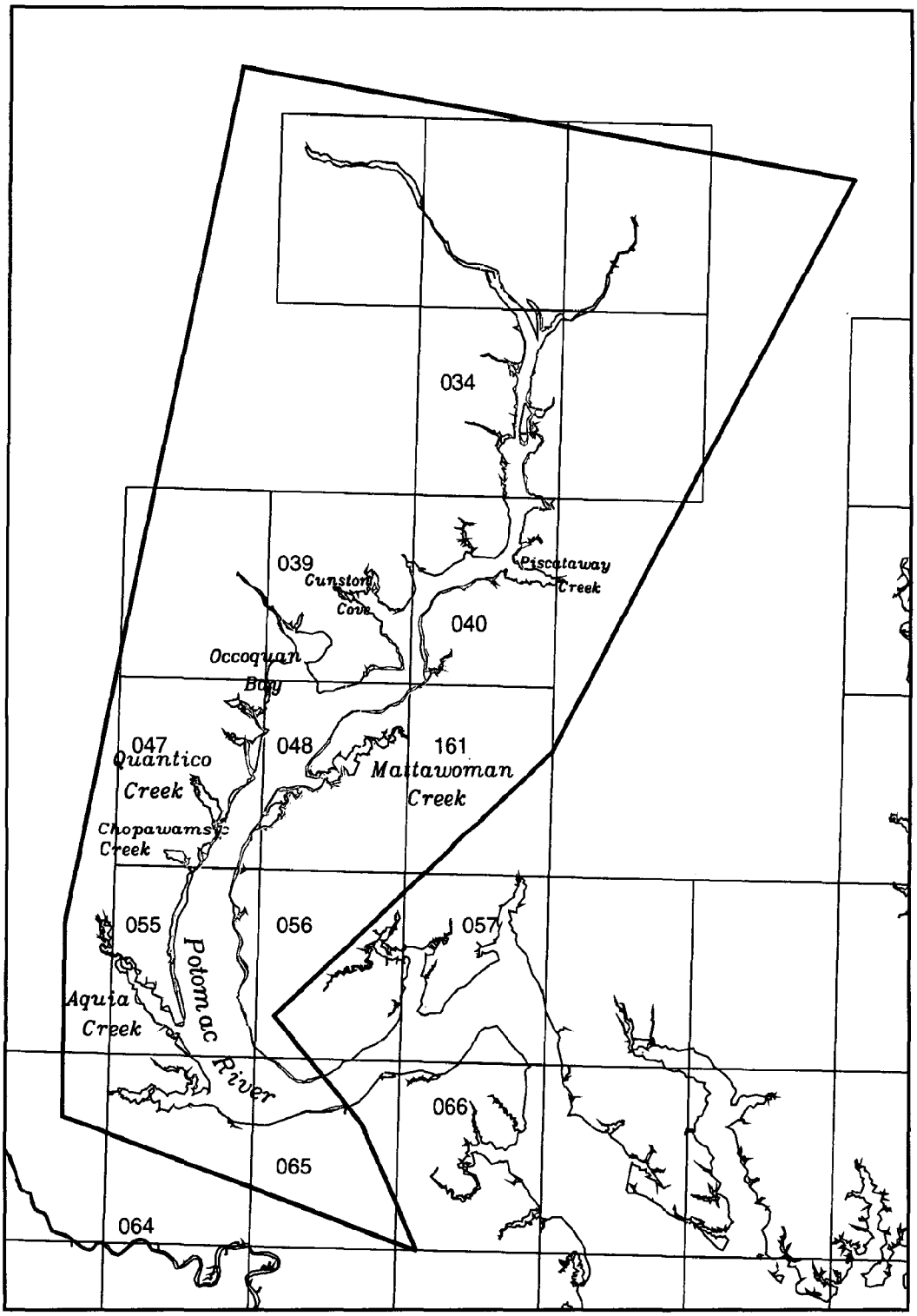


Figure 18. Distribution of SAV in the Upper Potomac River in 1992 (Section 11).

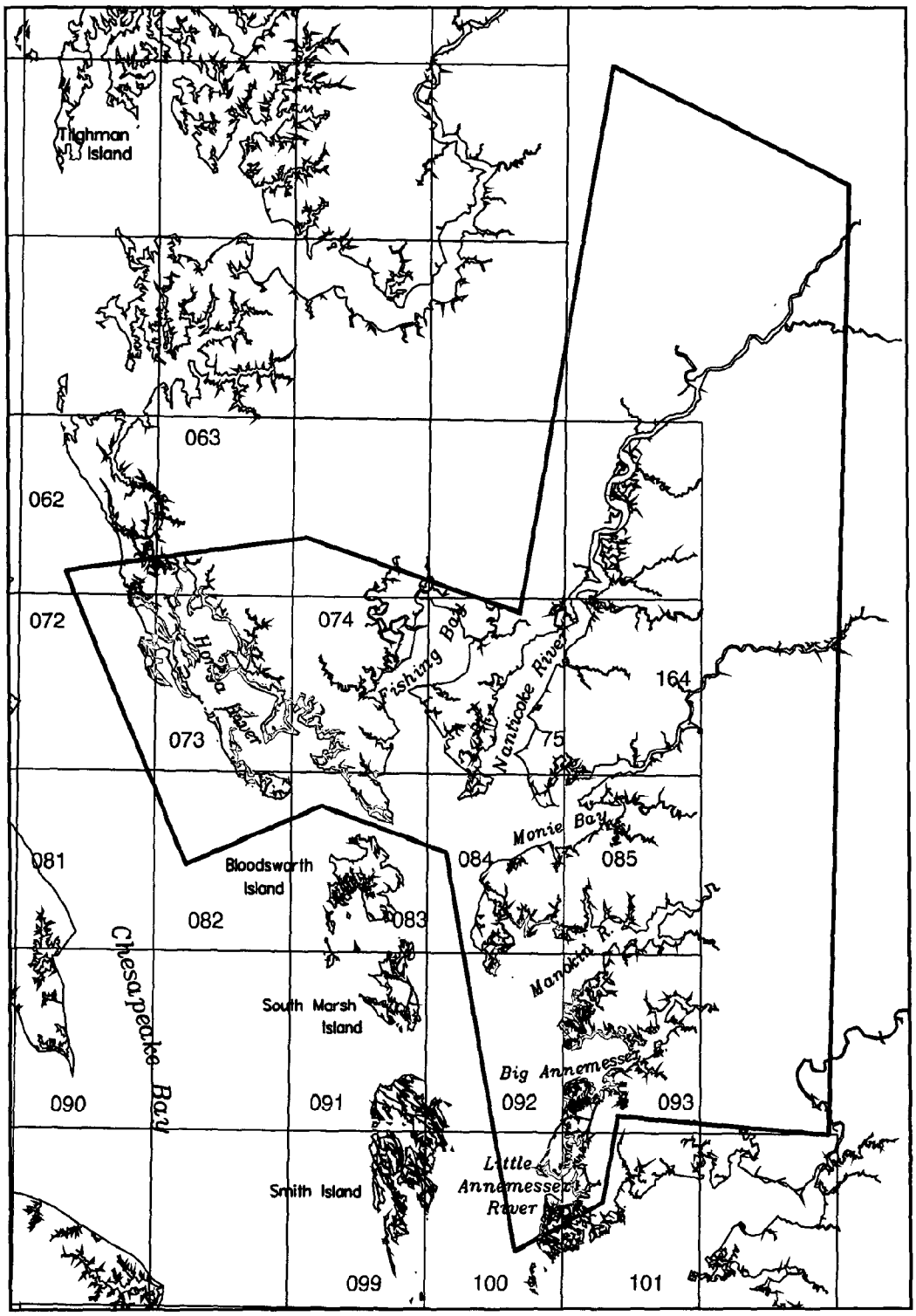


Figure 19. Distribution of SAV in the Middle Eastern Shore in 1992 (Section 12).

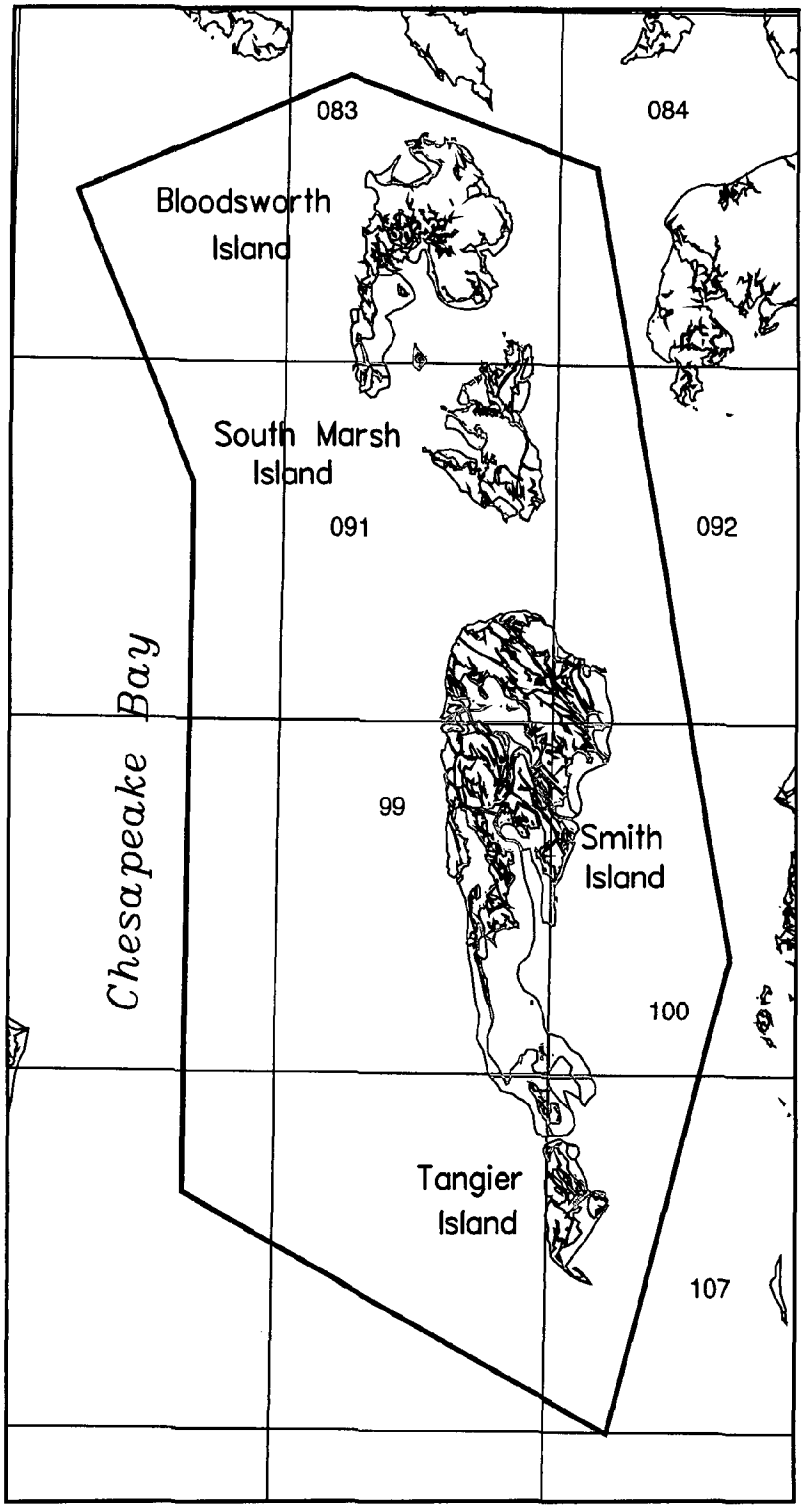


Figure 20. Distribution of SAV in the Mid-Bay Island Complex in 1992 (Section 13).

(class 3), 27.1% was sparse (class 2), and 2.1% was very sparse (class 1) (Table 7; Figure 3).

SAV is present in dense to moderate beds along the broad, expansive shoal area between Tangier Island and Smith Island; the eastern side of Tangier Island; Mailboat Harbor; and on the shoals and in the coves adjacent to Bloodsworth, South Marsh, Holland, Adam, and Spring islands. There was no ground survey data available for this section in 1992, although both *Z. marina* and *R. maritima* have been reported previously throughout this section.

Lower Bay Zone

14. Lower Eastern Shore

There were 5,920 hectares of SAV observed in the Lower Eastern Shore section in 1992 (Tables 4-7; Figure 21; Appendix C, Maps 100, 101, 102, 107, 108, 109, 113, 114, 119, 124, 133, 134, and 142) compared to 5,720 hectares reported in 1991. In this section 39.8% of the total SAV was dense (class 4), 18.2% was moderate (class 3), 33.3% was sparse (class 2), and 8.7% was very sparse (class 1) (Table 7; Figure 3). Large, dense beds continue to persist at the mouth of Cherrystone Inlet near Cape Charles, and at the mouths of Hungars, Mattawoman, Occohannock, Craddock, Pungoteague, Onancock, and Chesconessex creeks. Large, dense beds also occur at the Big Marsh area near Chesconessex Creek, at Webb Island off the mouth of Deep Creek, and on the large shoal area on the eastern side of the Fox and Cedar Islands. There was no SAV from Elliots Creek just below Cape Charles to Fishermans Island at the mouth of Chesapeake Bay. Ground survey data were limited in this section. Although both *Z. marina* and *R. maritima* have been reported previously throughout this section, the Citizens' surveys reported *Z. marina* and *R. maritima* in Nassawadox Creek (Map 124) and *R. maritima* in Beasley Bay (Map 109) while VIMS staff reported *Z. marina* at the mouth of Kings Creek near Cape Charles (Map 133).

15. Reedville Region

There were 778 hectares of SAV identified in the Reedville Region in 1992 (Tables 4-7; Figure 22; Appendix C, Maps 106 and 112) compared to 635 hectares reported in 1991. In this section, 22.5% of the total coverage of SAV was dense (class 4), 27.4% was moderate (class 3), 35.5% was sparse (class 2), and 14.6% was very sparse (class 1) (Table 7; Figure 3). *Zostera marina* and *R. maritima* were the two species identified by VIMS and Citizens' surveys (Maps 106 and 112). Most beds were found in Little, Fleets, and Ingram bays; Dymer, Indian, Dividing, Ball, and Cloverdale creeks; Dameron Marsh; and adjacent to Fleeton Point.

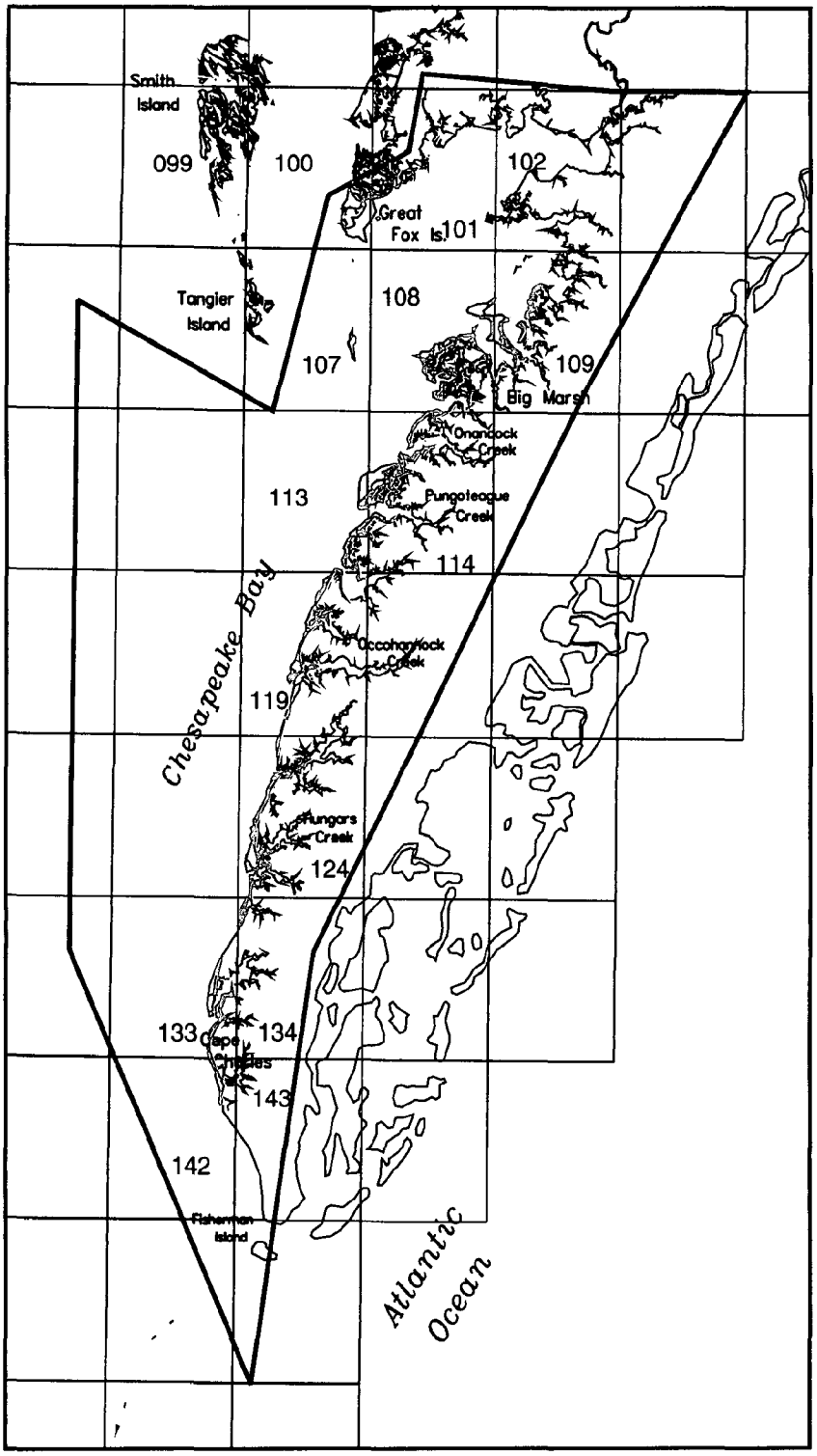


Figure 21. Distribution of SAV in the Lower Eastern Shore in 1992 (Section 14).

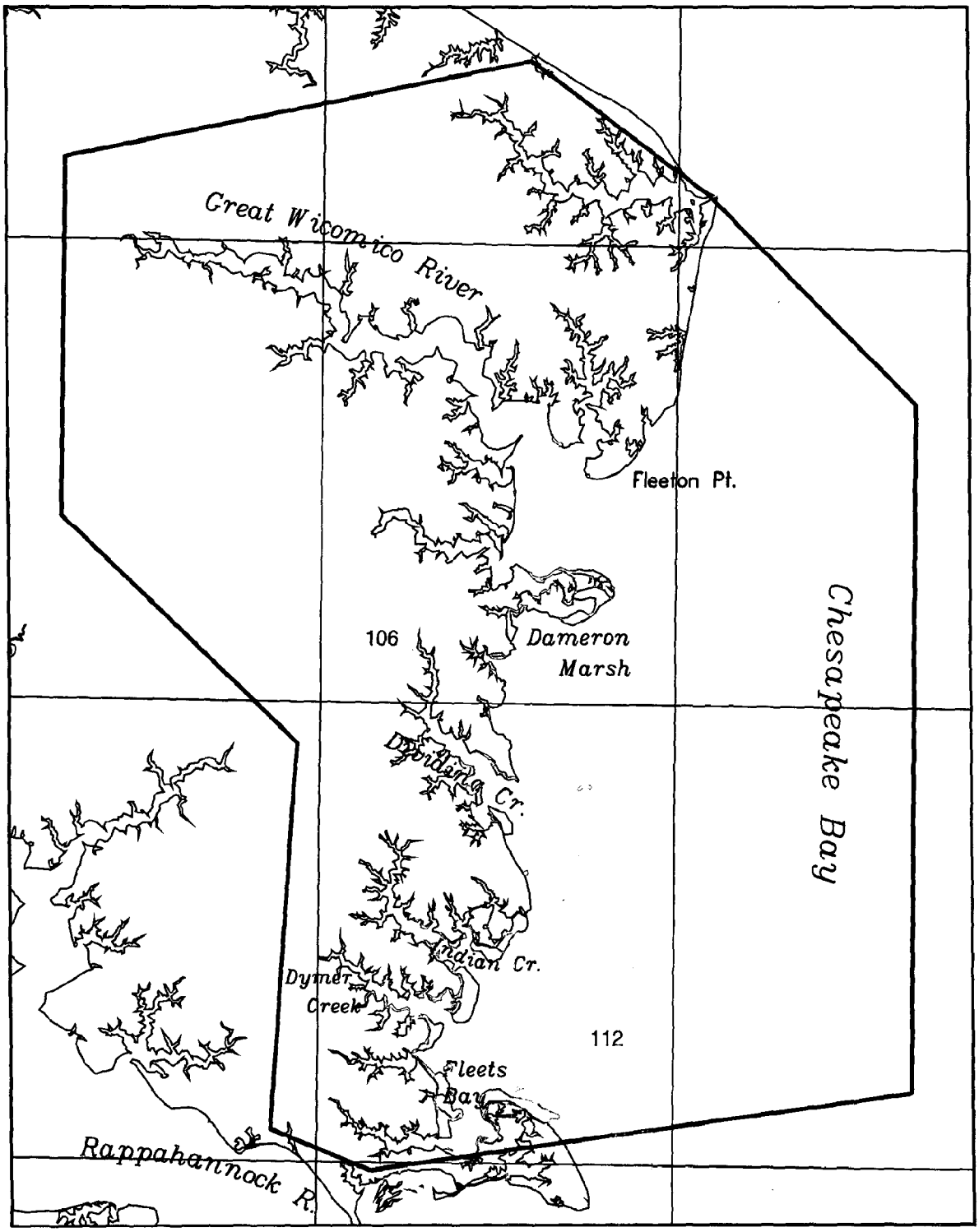


Figure 22. Distribution of SAV in the Reedville Region in 1992 (Section 15).

16. Rappahannock River Complex

There were 587 hectares of SAV observed in the Rappahannock River Complex in 1992 (Tables 4-7; Figure 23; Appendix C, Maps 110, 111, 117, 118, and 123) compared to 509 hectares reported in 1991. In this section 40.7% of the total coverage of SAV was dense (class 4), 15.8% was moderate (class 3), 30.3% was sparse (class 2), and 13.1% was very sparse (class 1) (Table 7; Figure 3). Dense, moderate, and sparse beds were present in the Corrotoman River; along the north shore of the Rappahannock River between Carters Creek and the Corrotoman River; Milford Haven; the lower Piankatank River; and the mouth of the north shore of the Rappahannock River between Mosquito Point and Deep Hole Point. *Ruppia maritima* is the dominant species in both the Rappahannock and Piankatank rivers while *Z. marina* is found in only isolated beds (from ground surveys by VIMS staff of SAV in Maps 110, 111, 117, 118, and 123) e.g. Burtons Point in the Piankatank River. One Citizens' survey observation reported *R. maritima* in Map 110 off Towles Point in the Rappahannock River. The large SAV bed adjacent to Windmill Point that has been slowly expanding naturally since 1989, with both *Z. marina* and *R. maritima* present now covers an area of 28.4 hectares, up from 13.3 hectares in 1991. SAV beds are abundant in Milford Haven but are principally located along the north shore with both *Z. marina* and *R. maritima* present.

17. New Point Comfort Region

There were 396 hectares of SAV identified in the New Point Comfort Region in 1992 (Tables 4-7; Figure 24; Appendix C, Map 123, 132, and 177) compared to 339 hectares reported in 1991. In this section 34.7% of the total coverage of SAV was dense (class 4), 2.4% was moderate (class 3), 62.8% was sparse (class 2), and 0.1% was very sparse (class 1) (Table 7; Figure 3). SAV beds were present from New Point Comfort to just north of Horn Harbor. SAV beds were visible in the northern end of Winter Harbor for the first time since 1978. VIMS staff confirmed the presence of SAV at this location which consisted of both *Z. marina* and *R. maritima* (Map 123), the same species present in other beds in this section. Because reproductive shoots of *Z. marina* were observed (this species flowers in the second year of its life cycle), it is likely that these beds were previously present.

18. Mobjack Bay Complex

The Mobjack Bay Complex contained 1,818 hectares of SAV in 1992 (Tables 4-7; Figure 25; Appendix C, Maps 122, 123, 131, 132 and 177) compared to 1,788 hectares reported in 1991. SAV beds consisting of both *Z. marina* and *R. maritima* (ground surveys were made by VIMS staff and citizens of SAV in Maps 131 and 132) were abundant along the entire shoreline of Mobjack Bay, as well as in the

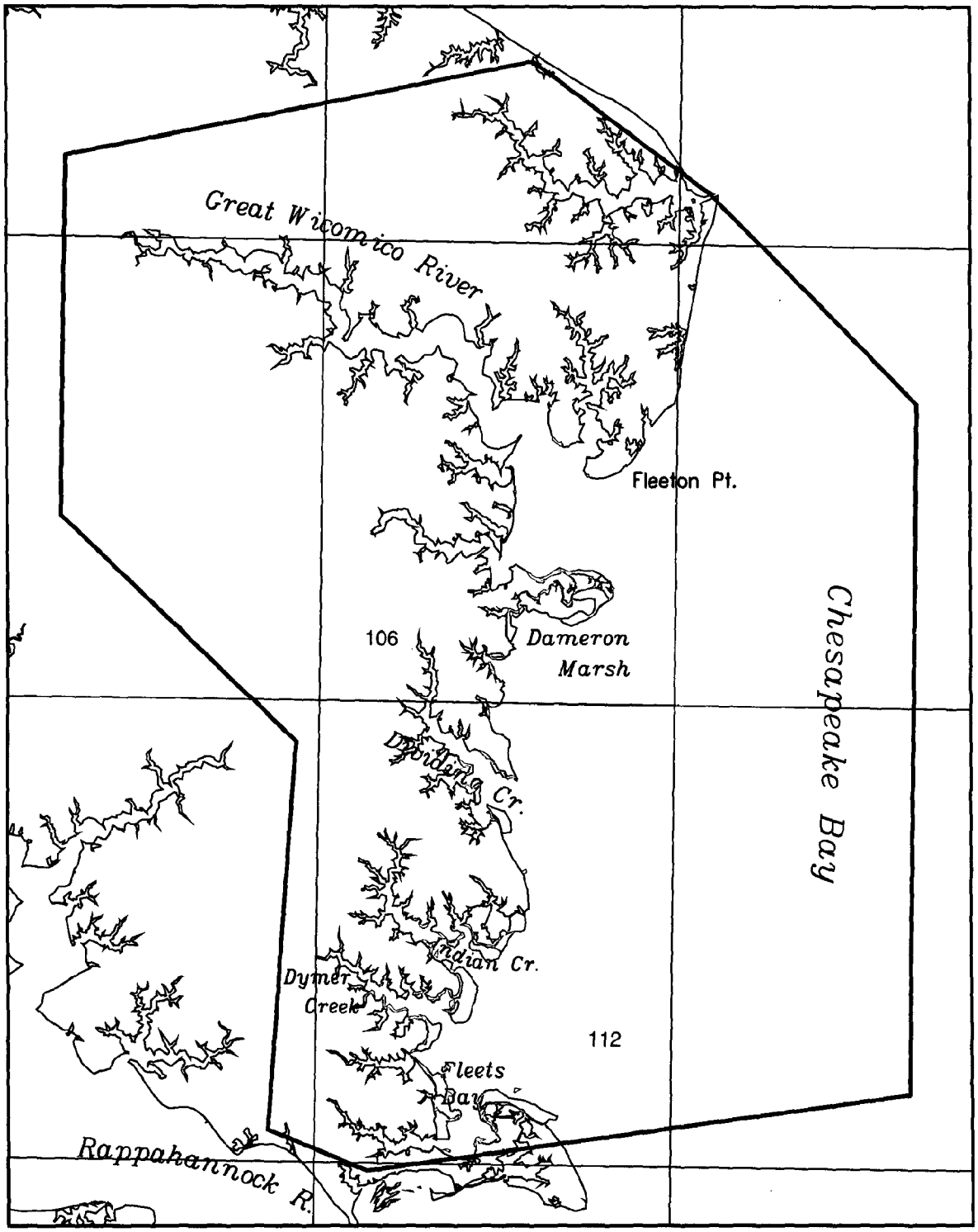


Figure 22. Distribution of SAV in the Reedville Region in 1992 (Section 15).

16. Rappahannock River Complex

There were 587 hectares of SAV observed in the Rappahannock River Complex in 1992 (Tables 4-7; Figure 23; Appendix C, Maps 110, 111, 117, 118, and 123) compared to 509 hectares reported in 1991. In this section 40.7% of the total coverage of SAV was dense (class 4), 15.8% was moderate (class 3), 30.3% was sparse (class 2), and 13.1% was very sparse (class 1) (Table 7; Figure 3). Dense, moderate, and sparse beds were present in the Corrotoman River; along the north shore of the Rappahannock River between Carters Creek and the Corrotoman River; Milford Haven; the lower Piankatank River; and the mouth of the north shore of the Rappahannock River between Mosquito Point and Deep Hole Point. *Ruppia maritima* is the dominant species in both the Rappahannock and Piankatank rivers while *Z. marina* is found in only isolated beds (from ground surveys by VIMS staff of SAV in Maps 110, 111, 117, 118, and 123) e.g. Burtons Point in the Piankatank River. One Citizens' survey observation reported *R. maritima* in Map 110 off Towles Point in the Rappahannock River. The large SAV bed adjacent to Windmill Point that has been slowly expanding naturally since 1989, with both *Z. marina* and *R. maritima* present now covers an area of 28.4 hectares, up from 13.3 hectares in 1991. SAV beds are abundant in Milford Haven but are principally located along the north shore with both *Z. marina* and *R. maritima* present.

17. New Point Comfort Region

There were 396 hectares of SAV identified in the New Point Comfort Region in 1992 (Tables 4-7; Figure 24; Appendix C, Map 123, 132, and 177) compared to 339 hectares reported in 1991. In this section 34.7% of the total coverage of SAV was dense (class 4), 2.4% was moderate (class 3), 62.8% was sparse (class 2), and 0.1% was very sparse (class 1) (Table 7; Figure 3). SAV beds were present from New Point Comfort to just north of Horn Harbor. SAV beds were visible in the northern end of Winter Harbor for the first time since 1978. VIMS staff confirmed the presence of SAV at this location which consisted of both *Z. marina* and *R. maritima* (Map 123), the same species present in other beds in this section. Because reproductive shoots of *Z. marina* were observed (this species flowers in the second year of its life cycle), it is likely that these beds were previously present.

18. Mobjack Bay Complex

The Mobjack Bay Complex contained 1,818 hectares of SAV in 1992 (Tables 4-7; Figure 25; Appendix C, Maps 122, 123, 131, 132 and 177) compared to 1,788 hectares reported in 1991. SAV beds consisting of both *Z. marina* and *R. maritima* (ground surveys were made by VIMS staff and citizens of SAV in Maps 131 and 132) were abundant along the entire shoreline of Mobjack Bay, as well as in the

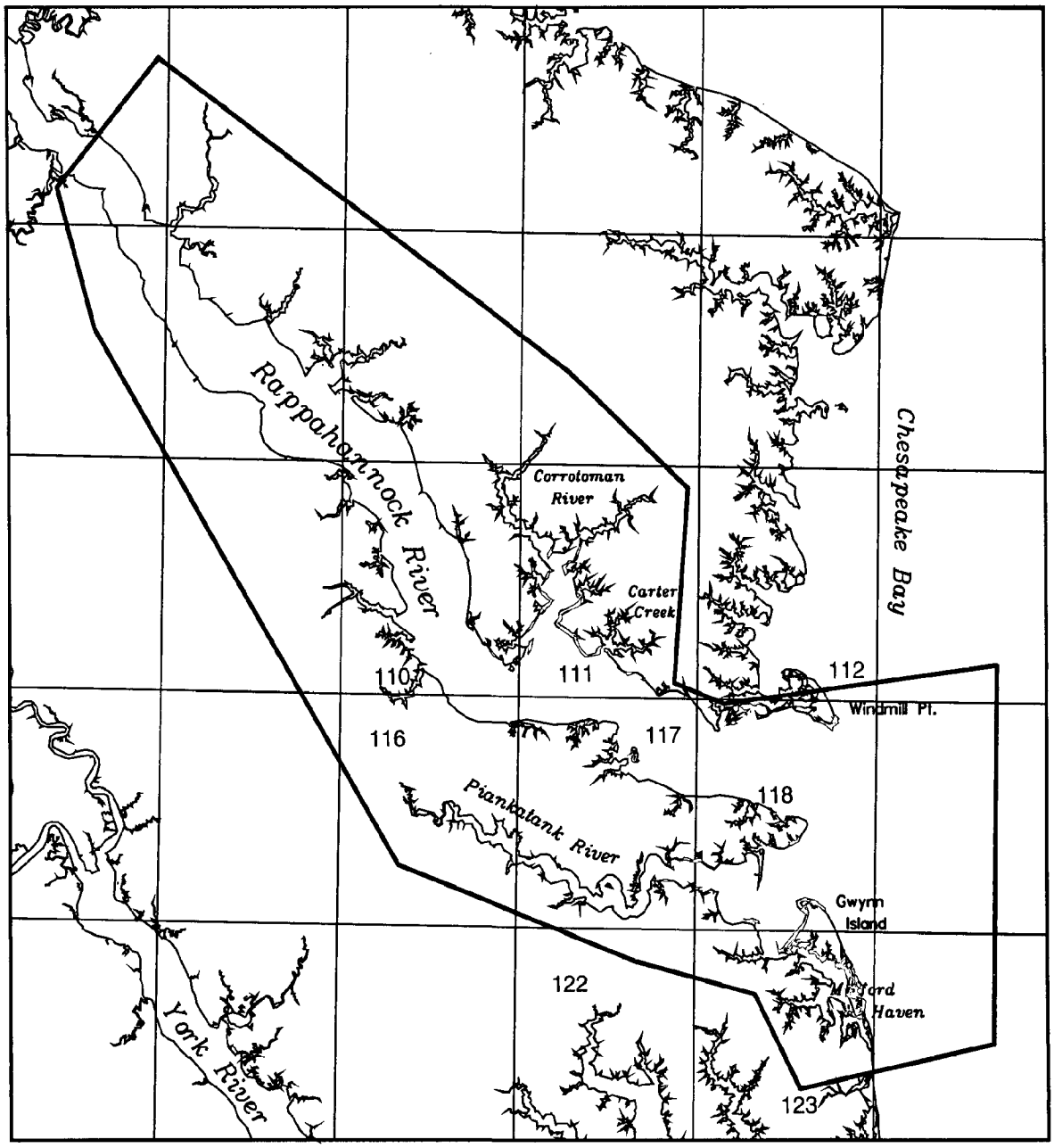


Figure 23. Distribution of SAV in the Rappahannock River Complex in 1992 (Section 16).

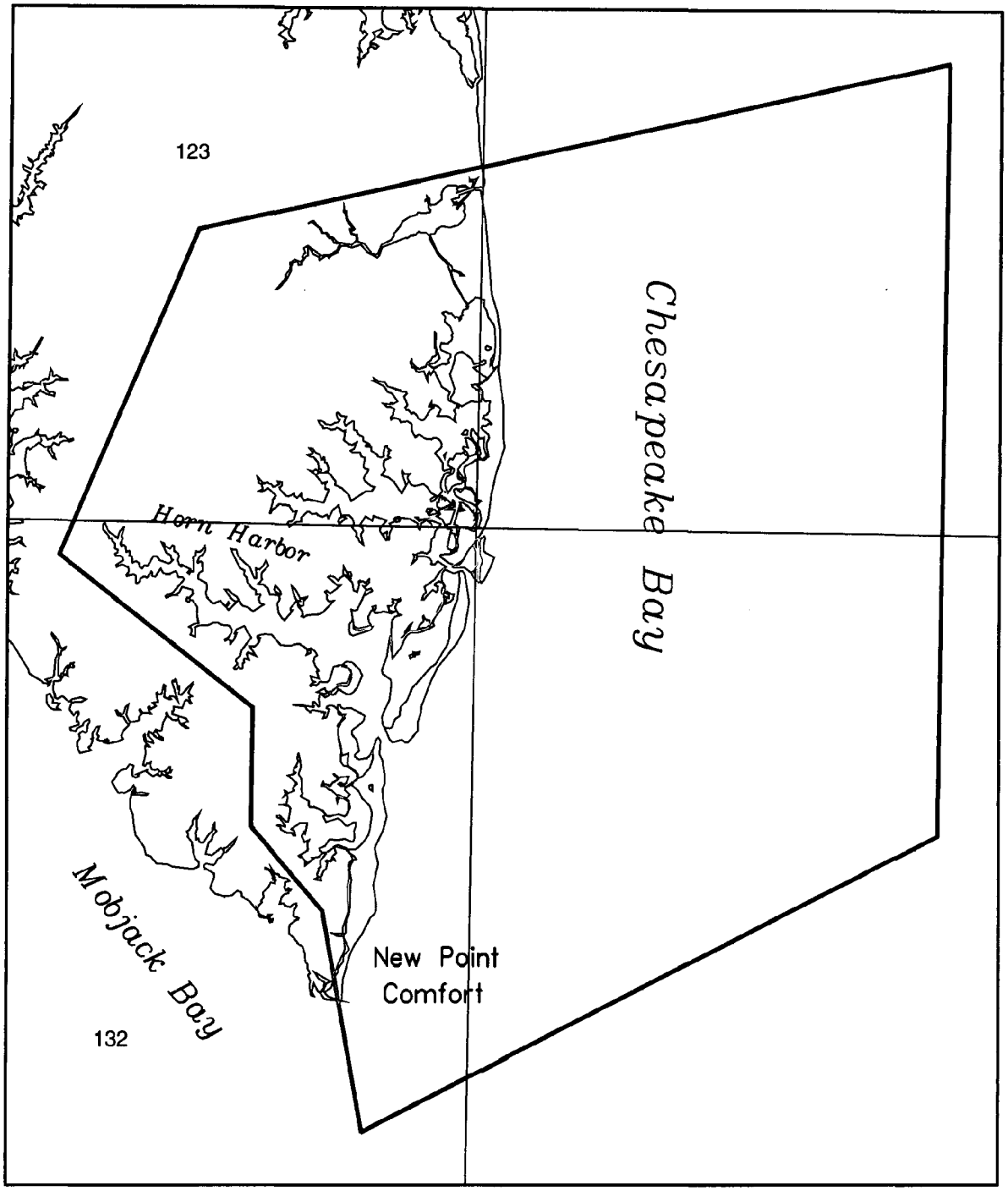


Figure 24. Distribution of SAV in the New Point Comfort Region in 1992 (Section 17).

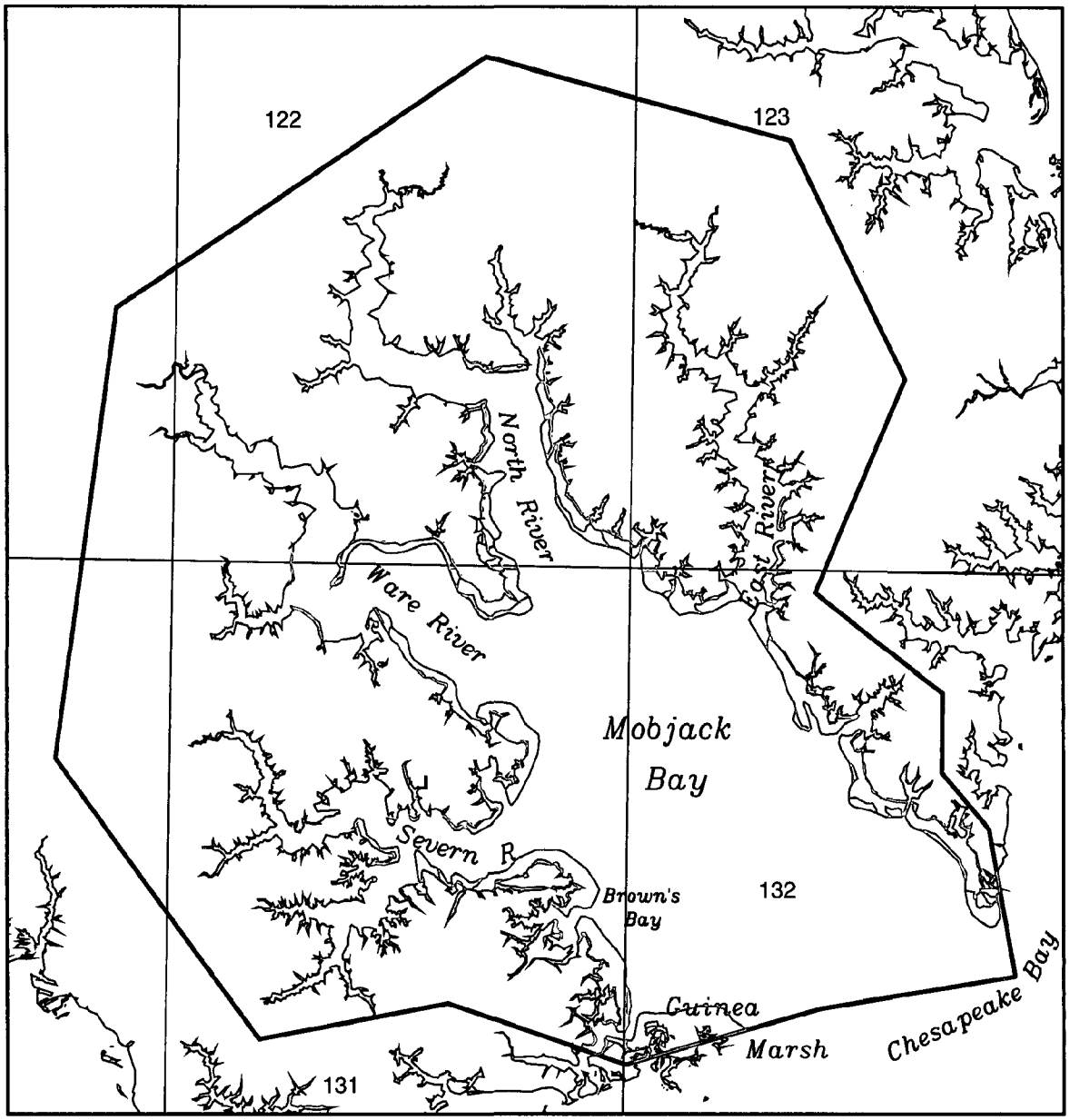


Figure 25. Distribution of SAV in the Mobjack Bay Complex in 1992 (Section 18).

lower reaches of the four tributaries: Severn, Ware, North, and East rivers. The Mobjack Bay area continued to harbor some of the more extensive SAV beds on the western shore of the lower Chesapeake Bay. In this section 70.6% of the total coverage of SAV was dense (class 4), 10.8% was moderate (class 3), 14.0% was sparse (class 2), and 4.6% was very sparse (class 1) (Table 7; Figure 3).

19. York River

There were 830 hectares of SAV observed in the York River section in 1992 (Tables 4-7; Figure 26; Appendix C, Maps 131, 132, 139, and 140) compared to 804 hectares reported in 1991. In this section 82.8% of the total coverage is classified as dense (class 4), while 3.0% was moderately dense (class 3), 10.7% was sparse (class 2), and 3.5% was very sparse (class 1) (Table 7; Figure 3). Ground survey information was available for Maps 131, 132, 139, and 140 from VIMS surveys. 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. SAV beds were absent upstream of Gloucester Point along the north shore except for one small bed of *Z. marina* near Gloucester Point, a result of a VIMS transplanting project using seeds in 1989, 1990, and 1991.

Zostera marina was transplanted using whole plants to Mumfort Island, Catlett Island and Clay Bank along the north shore and Yorktown along the south shore in the fall of 1991 by VIMS staff and was present through the spring and summer, 1992. Plants did not survive at Catlett Island and Clay Bank by late summer 1992 but survived at Mumfort Island and Yorktown. The south shore from Yorktown to Goodwin Island remained unvegetated except for one bed adjacent to the Coast Guard Station consisting of *R. maritima* and a second bed east of the refinery pier. Dense beds were present adjacent to Goodwin Island.

20. Lower Western Shore

There were 2,029 hectares of SAV mapped in the Lower Western Shore section in 1992 (Tables 4-7; Figure 27; Appendix C, Maps 140, 141, 147, and 152) compared to 2,006 hectares reported in 1991. Ground surveys by citizens and VIMS (Maps 140, 141, 147, and 152) reported both *Z. marina* and *R. maritima*. In this section 45.1% of the total coverage was mapped as dense (class 4), 24.9% as moderate (class 3), 15.9% as sparse (class 2), and 14.1% as very sparse (class 1) (Table 7; Figure 3). SAV was mapped in Broad Bay; Back River; the mouth of the Poquoson River off Pasture and Hunts Neck; Drum Island Flats; Poquoson Flats; adjacent to Crab Neck just south of Goodwin Island; and on the south side of Goodwin Island. No SAV was present in the southwest and northwest branches of Back River, or in the Poquoson River, Chisman Creek, and Back Creek.

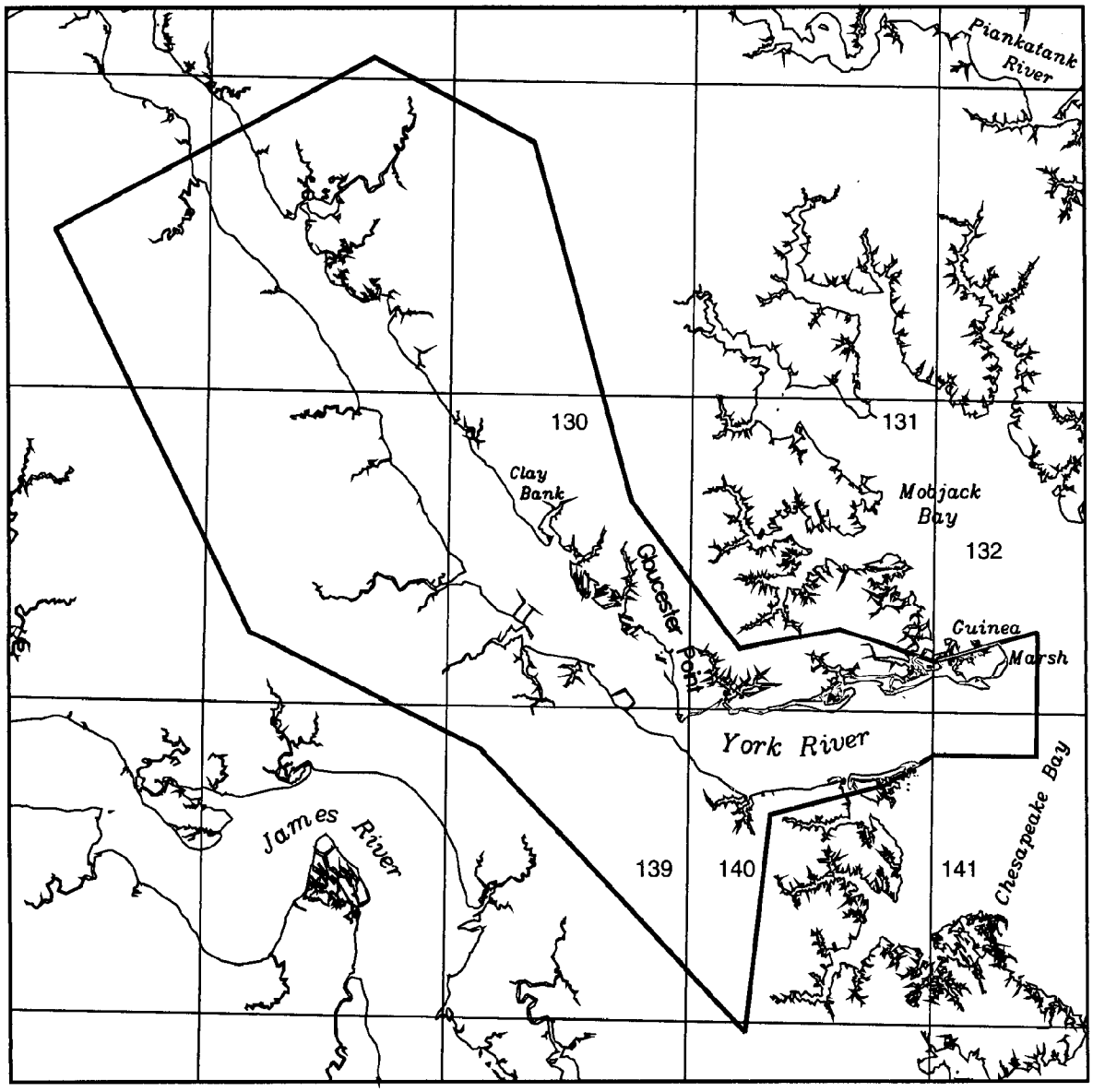


Figure 26. Distribution of SAV in the York River in 1992 (Section 19).

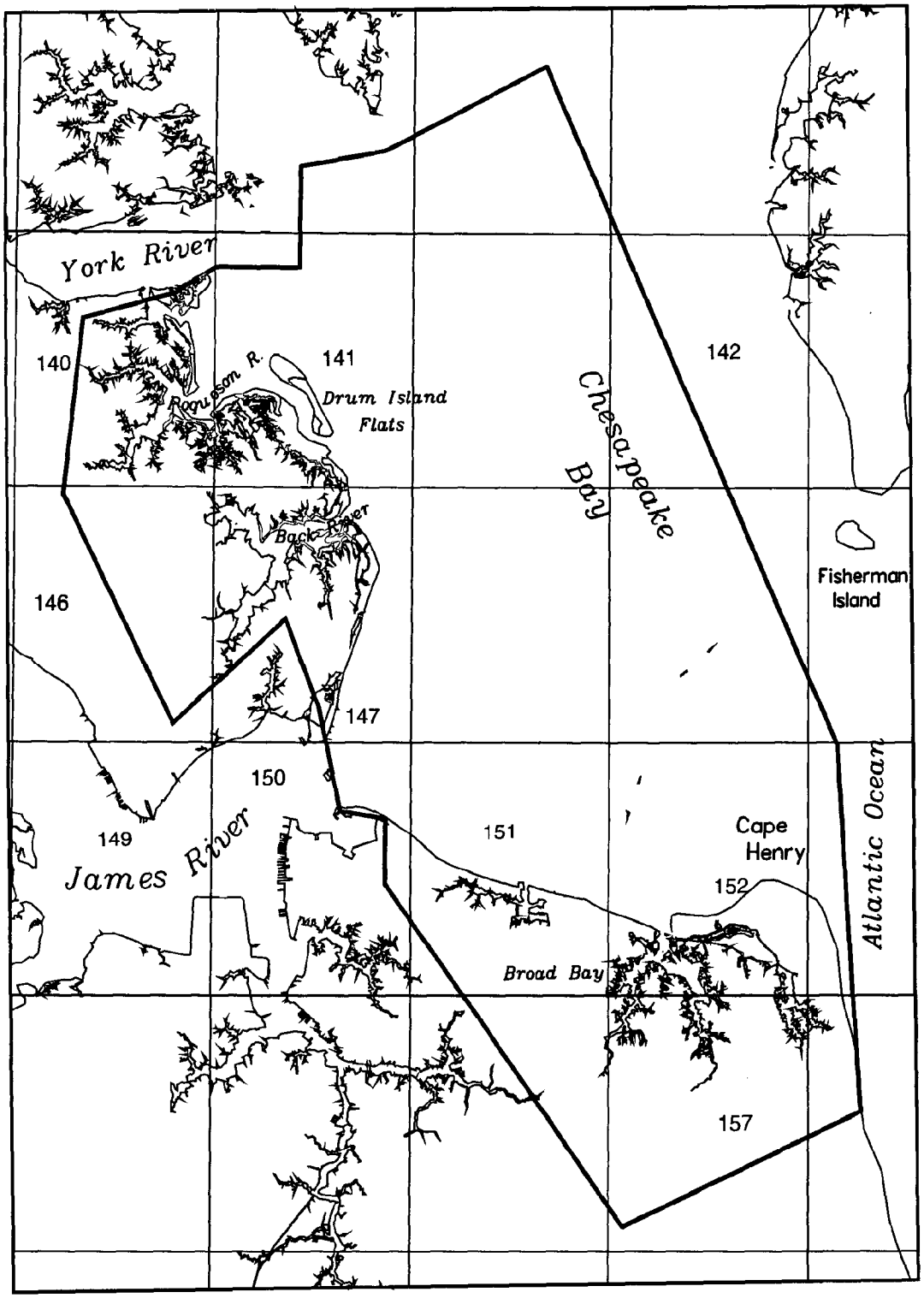


Figure 27. Distribution of SAV in the Lower Western Shore in 1992 (Section 20).

21. James River

There were 3.50 hectares of SAV in the mainstem of the James River in 1992 (Tables 4-7; Figure 28; Appendix C, Map 147), compared to 2.74 hectares in 1991. This single, moderately dense bed, (class 3) (Table 7; Figure 3) located at the mouth of Hampton Creek adjacent to the Veteran's Hospital, consists of *Z. marina*, the species reported in previous ground surveys.

Chincoteague Bay

There were 3,324 hectares of SAV identified in Chincoteague and Sinepuxent bays in 1992 with a small amount present in Isle of Wight and Assawoman bays (Tables 4-7; Figure 29; Appendix C, Maps 166, 167, 168, 170, 172, 173, 174, and 175) compared to 2,746 hectares reported in 1991. In this section 58.1% of the total coverage was mapped as dense (class 4), 34.7% as moderate (class 3), 5.4% as sparse (class 2), and 1.8% as very sparse (class 1) (Table 7; Figure 3). The Citizens' survey found both *Z. marina* and *R. maritima* throughout Chincoteague and Sinepuxent bays (Maps 168, 170, 172, 173 and 175) but only reported *R. maritima* in Isle of Wight and Assawoman bays (Maps 166 and 168). All of the SAV in Chincoteague Bay continues to be present on the eastern side of the bay adjacent to Assateague Island. The vegetation remains concentrated in four relatively distinct areas identical to that reported in the earlier surveys from 1986 through 1991. 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 bed west of Chincoteague Island, the largest in this area, has expanded and is now almost continuous from the island to the offshore areas. SAV in Isle of Wight and Assawoman bays is also present on the eastern side adjacent to Ocean City.

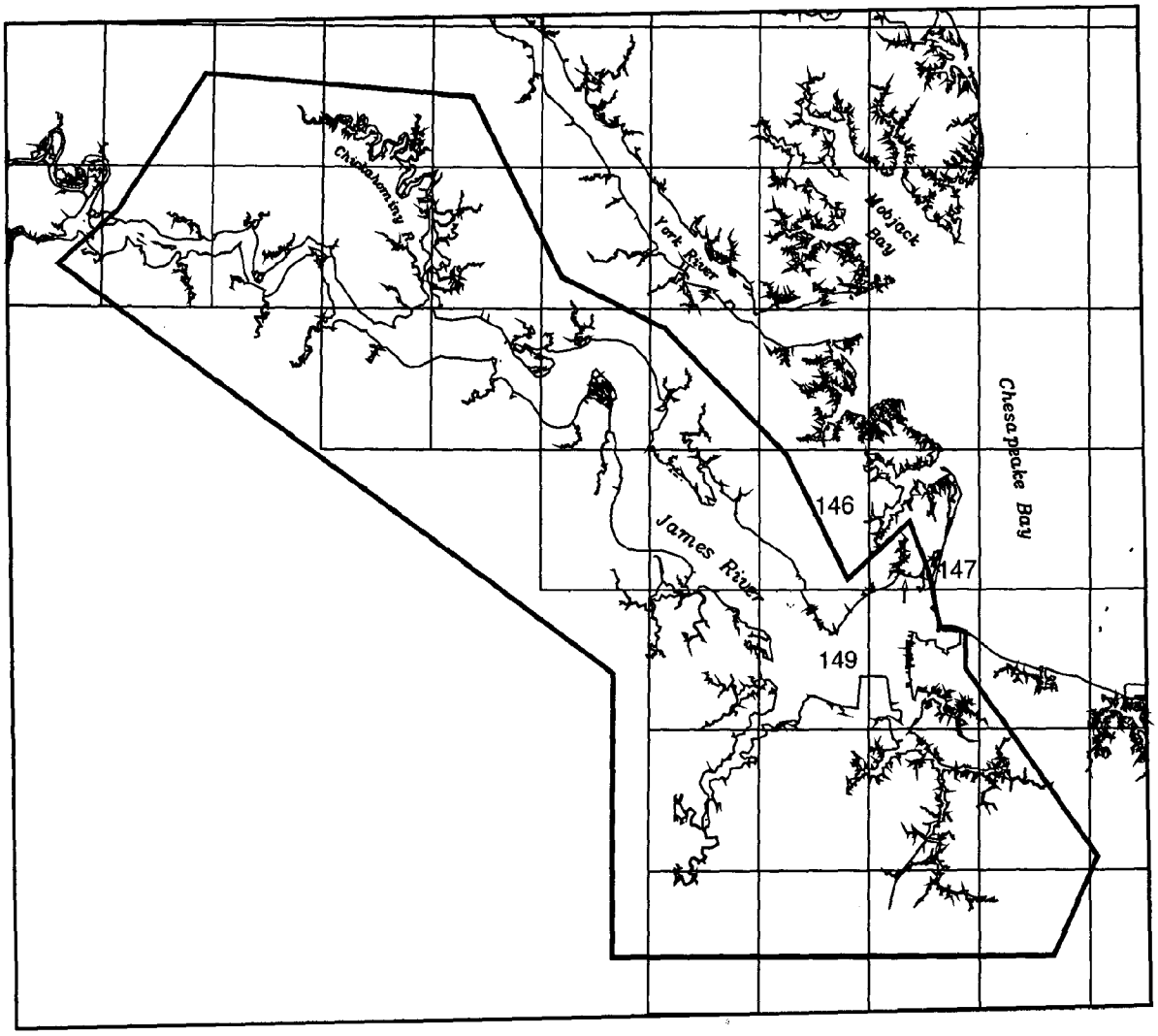


Figure 28. Distribution of SAV in the James River in 1992 (Section 21).

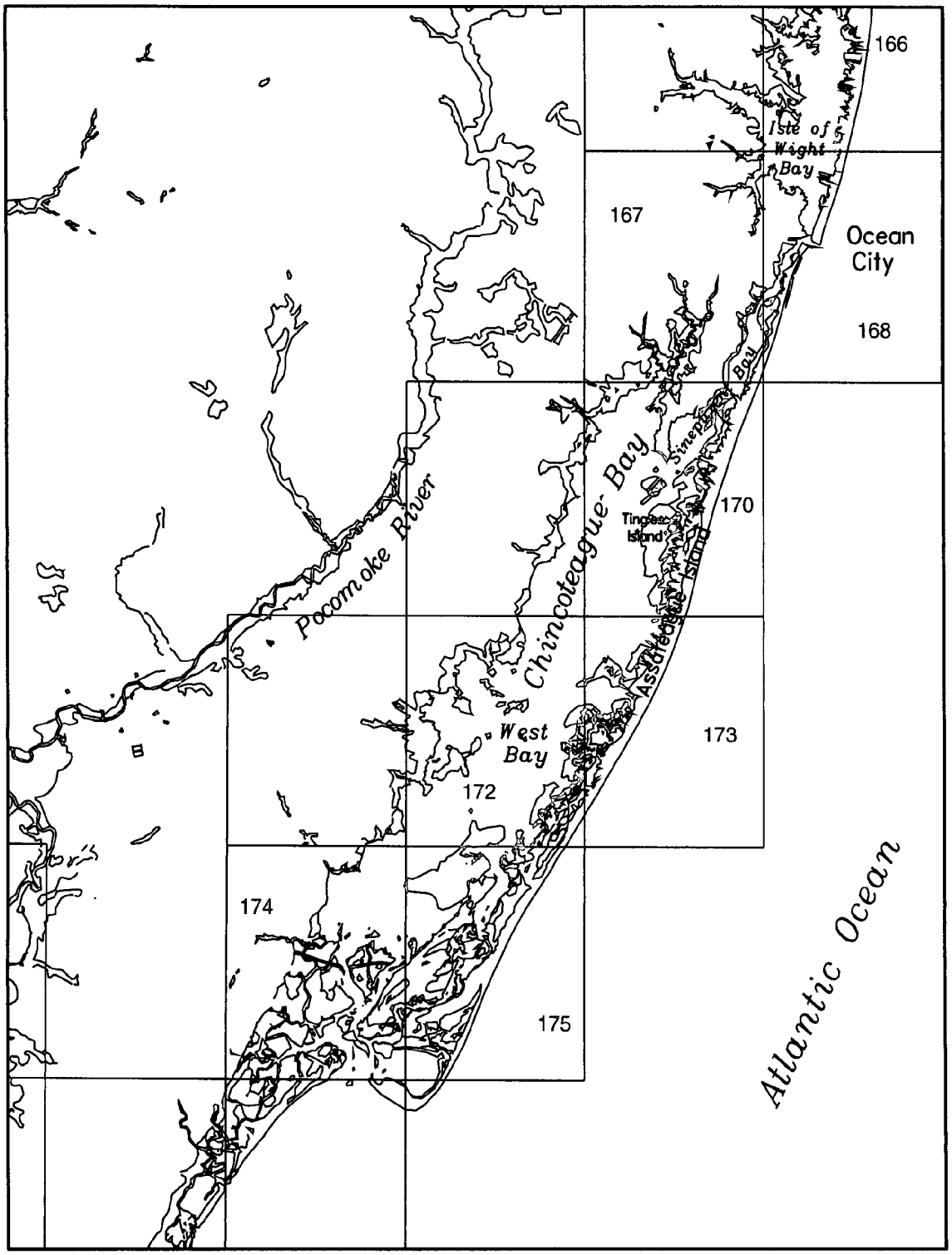


Figure 29. Distribution of SAV in the Chincoteague Bay in 1992.

LITERATURE CITED

Anderson, R. R. and R. T. Macomber. 1980. Distribution of submersed vascular plants, Chesapeake Bay, Maryland. Final Report to U.S. EPA, Chesapeake Bay Program. Grant No. R805970. 126 pp.

Chesapeake Executive Council. 1989. Submerged Aquatic Vegetation Policy for the Chesapeake Bay and Tidal Tributaries. Annapolis, MD. July.

Chesapeake Executive Council. 1990. Implementation Plan for the Submerged Aquatic Vegetation Policy. Annapolis, MD. July.

Environmental Systems Research Institute, Inc. 1989. Volume I & II, User Guide. ESRI, Redlands, CA.

Godfrey, R. K. and J. W. Wooten. 1981. Aquatic and Wetland Plants of Southeastern United States: Dicotyledons. The University of Georgia Press, Athens. 933 pp.

Godfrey, R. K. and J. W. Wooten. 1979. Aquatic and Wetland Plants of Southeastern United States: Monocotyledons. The University of Georgia Press, Athens. 712 pp.

Harvill, A. M. Jr., C. E. Stevens and D. M. E. Ware. 1977. Atlas of the Virginia Flora: Part I, Pteridophytes through Monocotyledons. Virginia Botanical Associates, Farmville. 59 pp.

Harvill, A. M. Jr., T. R. Bradley and C. E. Stevens. 1981. Atlas of the Virginia Flora: Part II, Dicotyledons. Virginia Botanical Associates, Farmville. 148 pp.

Humm, Harold J. 1979. The Marine Algae of Virginia. Special Papers in Marine Science, Number 3, Virginia Institute of Marine Science. The University Press of Virginia, Charlottesville. 263 pp.

Kartesz, J. T. and R. Kartesz. 1980. A Synonymized Checklist of the Vascular Flora of the United States, Canada and Greenland: Volume II, The Biota of North America. The University of North Carolina Press, Chapel Hill. 498 pp.

Orth, R. J. and K. A. Moore. 1981. Submerged aquatic vegetation in the Chesapeake Bay: past, present and future. pp. 271-283. In: Proc. 46th North American Wildlife and Natural Resources Conf., Wildlife Manage. Inst., Wash., D.C.

Orth, R. J. and K. A. Moore. 1982. The biology and propagation of *Zostera marina*, eelgrass, in the Chesapeake Bay, Virginia. Final Report to U.S. EPA, Chesapeake Bay Program. Grant No. R805953. 187 pp.

Orth, R. J. and K. A. Moore. 1983. Chesapeake Bay: an unprecedented decline in submerged aquatic vegetation. Sci. 222:51-53.

Orth, R. J. and K. A. Moore. 1984. Distribution and abundance of submerged aquatic vegetation in Chesapeake Bay: an historical perspective. Est. 7:531-540.

Orth, R. J. and K. A. Moore. 1988. Submerged aquatic vegetation in the Chesapeake Bay: A barometer of Bay health. pp. 619-629. In: M. Lynch (Ed.), Understanding the Estuary: Advances in Chesapeake Bay Res. Chesapeake Res. Consort. Pub. No. 129. CBP/TRS/24/88.

Orth, R. J., K. A. Moore and H. H. Gordon. 1979. Distribution and abundance of submerged aquatic vegetation in the lower Chesapeake Bay, Virginia. Final Report to U.S. EPA, Chesapeake Bay Program. EPA-600/8-79-029/SAV1.

Orth, R. J. and J. F. Nowak. 1990. Distribution of submerged aquatic vegetation in the Chesapeake Bay and tributaries and Chincoteague Bay - 1989. Final Report to U.S. EPA. 247pp.

Orth, R. J., J. F. Nowak, A. A. Frisch, K. P. Kiley, and J. R. Whiting. 1991. Distribution of submerged aquatic vegetation in the Chesapeake Bay and tributaries and Chincoteague Bay - 1990. Final Report to U.S. EPA. 261pp.

Orth, R. J., J. F. Nowak, G. F. Anderson, K. P. Kiley, and J. R. Whiting. 1992. Distribution of submerged aquatic vegetation in the Chesapeake Bay and tributaries and Chincoteague Bay - 1991. Final Report to U.S. EPA. 268pp.

Orth, R. J., J. Simons, R. Allaire, V. Carter, L. Hindman, K. Moore and N. Rybicki. 1985. Distribution of submerged aquatic vegetation in the Cheapeake Bay and tributaries - 1984. Final Report to U.S. EPA, Coop. Agreement X-003301-01. 155 pp.

Orth, R. J., J. Simons, J. Capelli, V. Carter, L. Hindman, S. Hodges, K. Moore and N. Rybicki. 1986. Distribution of submerged vegetation in the Chesapeake Bay and tributaries - 1985. Final Report to U.S. EPA. 296 pp.

Orth, R. J., J. Simons, J. Capelli, V. Carter, A. Frisch, L. Hindman, S. Hodges, K. Moore and N. Rybicki. 1987. Distribution of submerged aquatic vegetation in the Chesapeake Bay and tributaries and Chincoteague Bay - 1986. Final Report to U.S. EPA. 180 pp.

Orth, R. J., A. A. Frisch, and J. F. Nowak. 1988. Quality assurance project plan for the 1987 submerged aquatic vegetation distribution and abundance survey of the Chesapeake and Chincoteague Bays. Plan submitted to U.S. EPA, Chesapeake Bay Liason Office, Annapolis, MD. 47 pp.

Orth, R. J., A. A. Frisch, J. F. Nowak, and K. A. Moore. 1989. Distribution of submerged aquatic vegetation in the Chesapeake Bay and tributaries and Chincoteague Bay - 1987. Final Report to U.S. EPA. 247pp.

Radford, A. E., H. E. Ahles and C. R. Bell. 1968. Manual of the Vascular Flora of the Carolinas. The University of North Carolina Press, Chapel Hill. 1183 pp.

Stevenson, J. C. and N. Confer. 1978. Summary of Available Information on Chesapeake Bay Submerged Vegetation. U.S. Dept. of Interior, Fish and Wildlife Serv. FWS/OBS-78/66. 335 p.

Wood, R. D. and K. Imahori. 1965. A Revision of the Characeae: Volume I, Monograph of the Characeae. Verlag Von J. Cramer, Weinheim. 904 pp.

Wood, R. D. and K. Imarhori. 1964. A Revision of the Characeae: Volume II, Iconograph of the Characeae. Verlag Von J. Cramer, Weinheim. 395 icones with Index.

APPENDICES

APPENDIX A

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

Family	Species	Common name
Characeae (muskgrass)	*Chara braunii* Gm.	Muskgrass
	Chara zeylanica Klein. ex Willd., em.	
	Nitella flexilis (L). Ag., em.	Stonewort
Potamogetonaceae (pondweed)	*Potamogeton perfoliatus* L. var. *bupleuroides* (Fernald) Farwell	Redhead grass
	Potamogeton epihydrus	Leafy pondweed
	Potamogeton pectinatus L.	Sago pondweed
	Potamogeton crispus L.	Curly pondweed
	Potamogeton pusillus L.	Slender pondweed
Ruppiaceae	*Ruppia maritima* L.	Widgeon grass
Zannichelliaceae	*Zannichellia palustris* L.	Horned pondweed
Najadaceae	*Najas guadalupensis* (Sprengel) Magnus	Southern naiad
	Najas gracillima (A. Braun) Magnus	Naiad
	Najas minor Allioni	
Hydrocharitaceae (frogbit)	*Vallisneria americana* Michaux	Wild celery, tapegrass
	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 (watermilfoil)	*Myriophyllum spicatum* L.	Eurasian watermilfoil
Zosteraceae	*Zostera marina* (L.)	Eelgrass

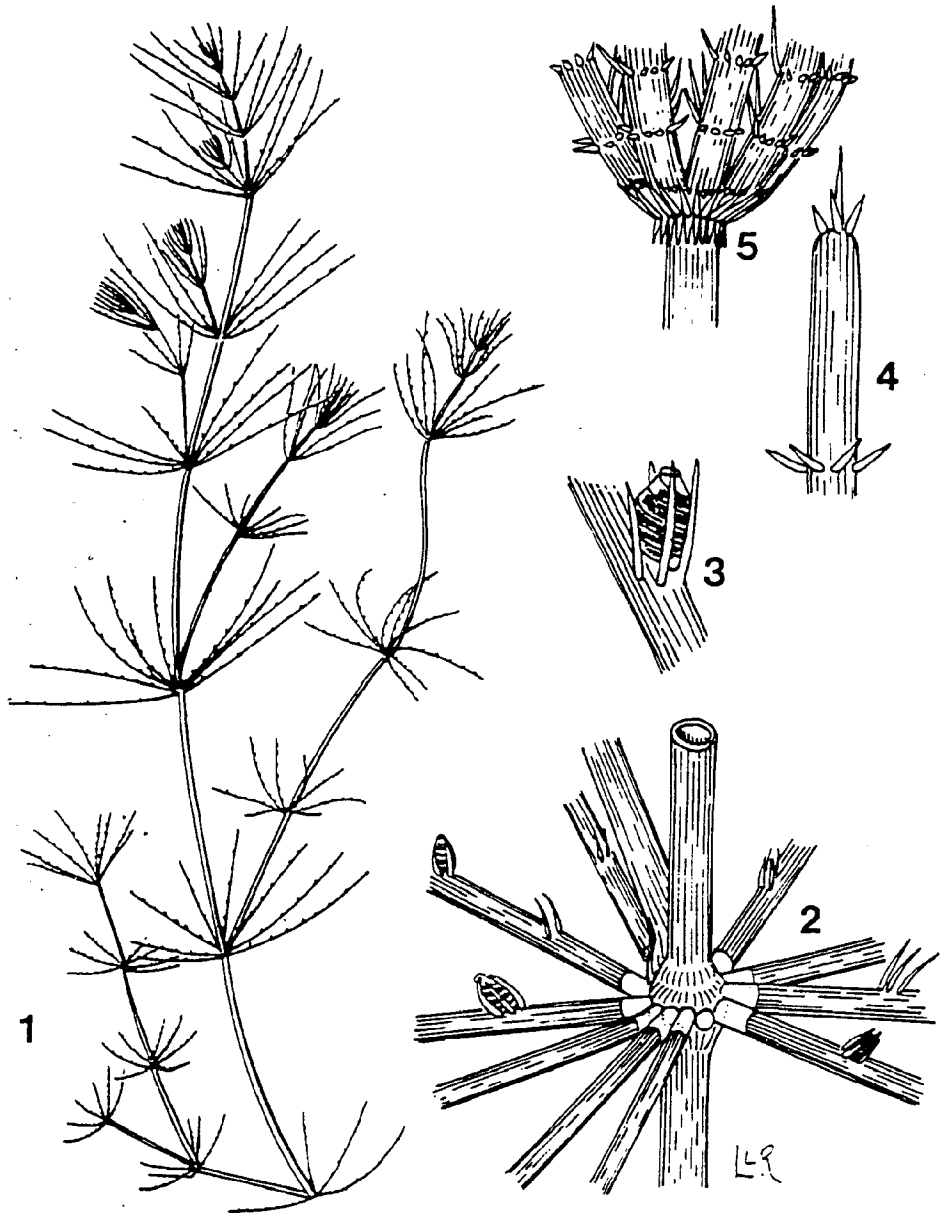


Figure 30. Illustration of *Chara* spp. (Muskgrass): 1. habit, upper portion of plant with branchlet whorls; 2. axial node and fertile branchlets with oogonia; 3. oogonium; 4. branchlet end segment; 5. axial node with 2 tier stipulodes.

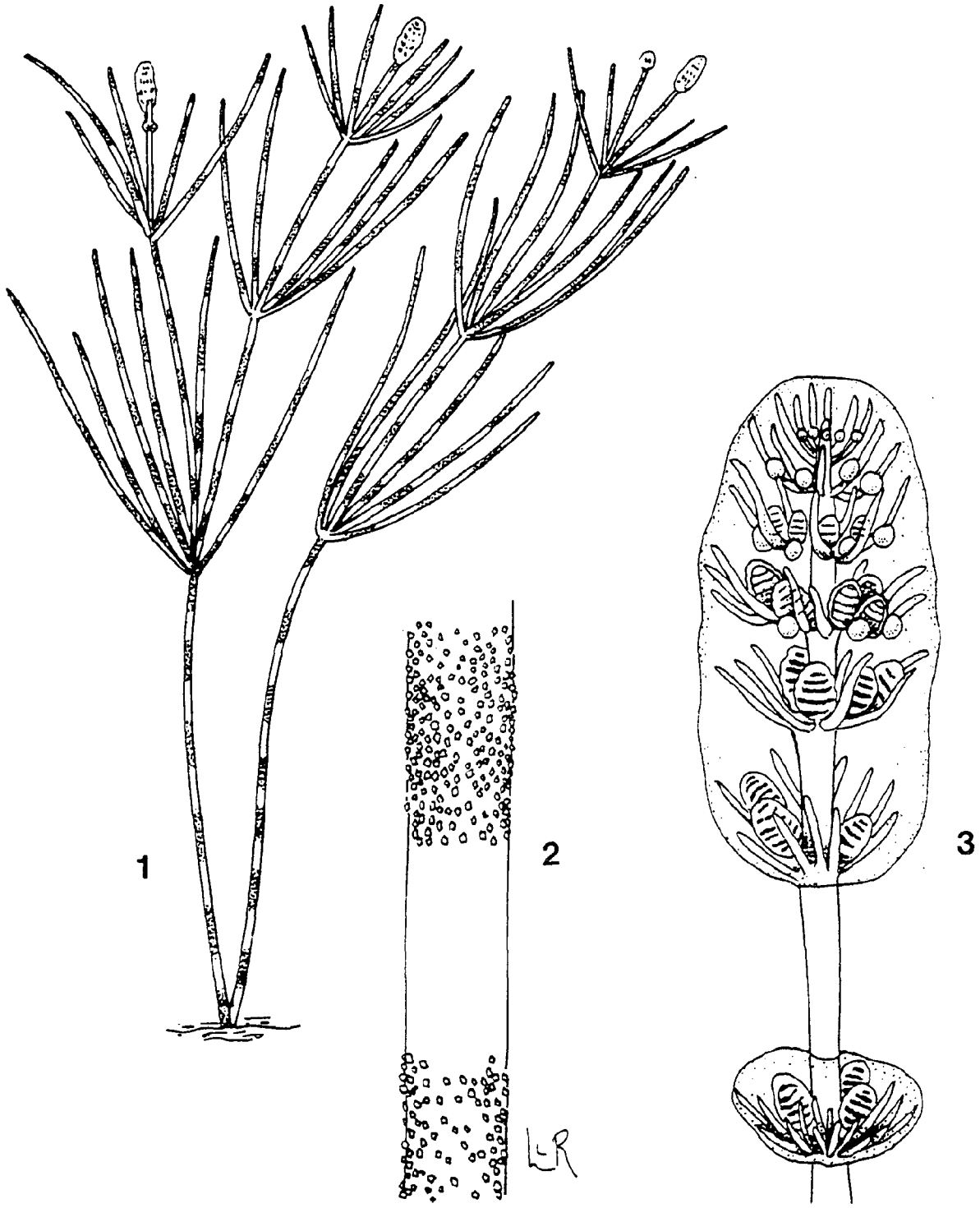


Figure 31. Illustration of *Nitella* spp. (Stonewort): 1. habit, entire plant; 2. portion of ecorticate branchlet; 3. mucus cloud surrounding compacted upper whorls with gametangia.

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

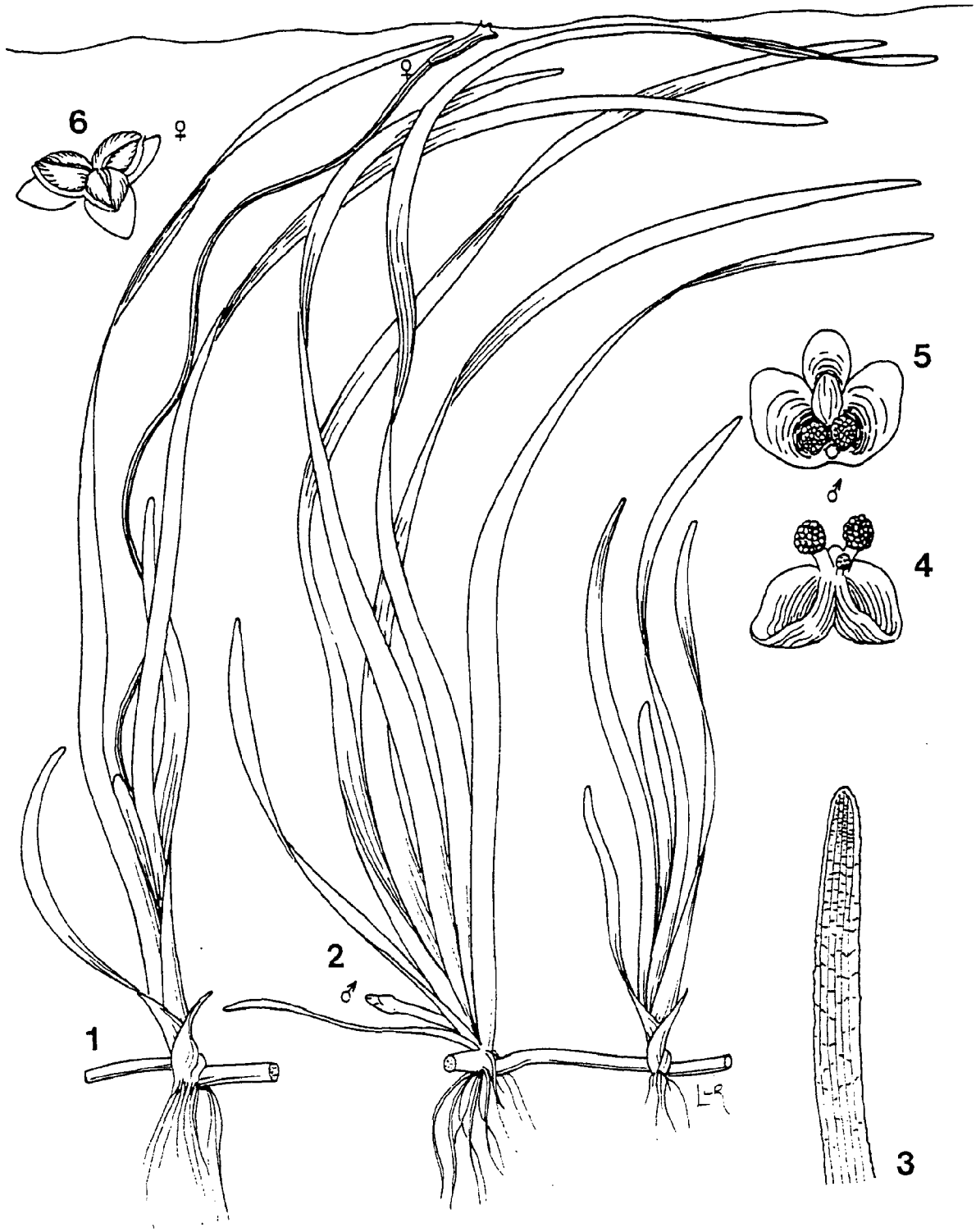


Figure 33. Illustration of *Vallisneria americana* (Tapegrass): 1. female plant; 2. male plant; 3. leaf tip with longitudinal air channels; 4-5. male flower (two views); 6. female flower.

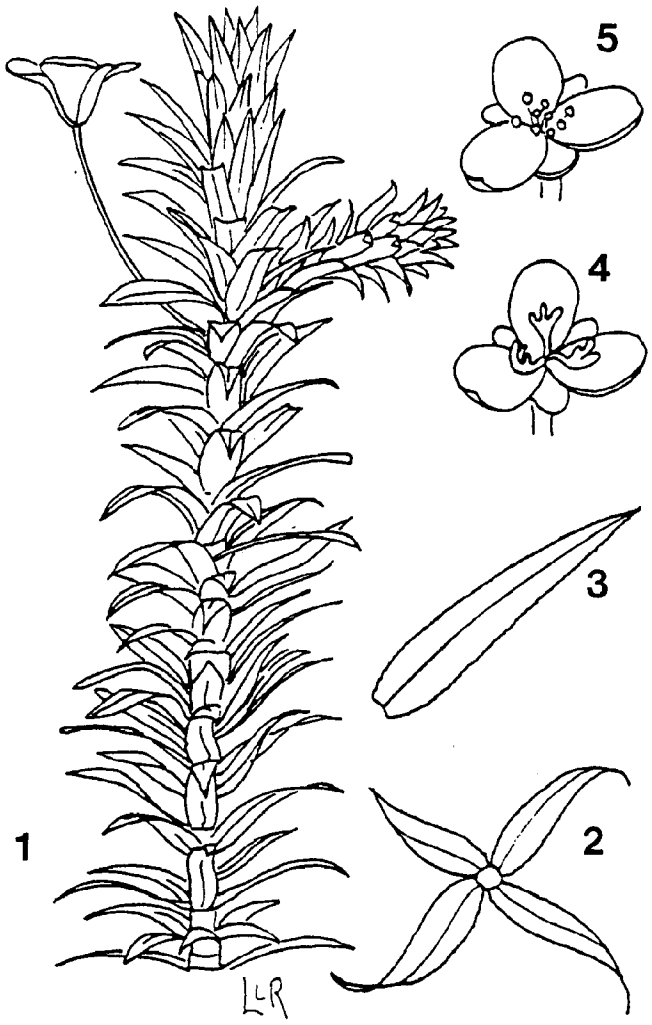


Figure 34. Illustration of *Egeria* spp. (Water-weed): 1. habit, end of branched stem with flower; 2. leaf whorl; 3. leaf; 4. female flower; 5. male flower.

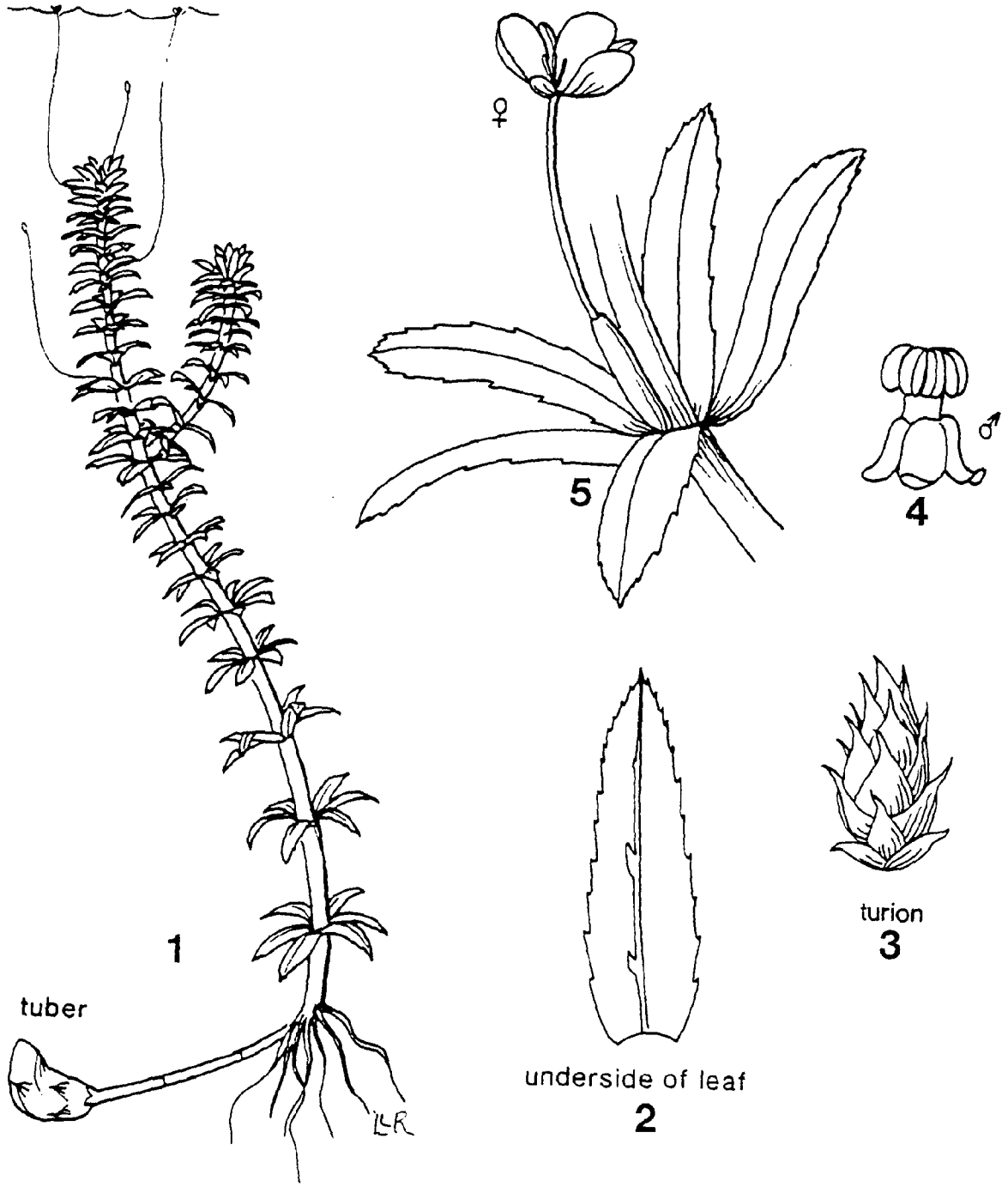


Figure 35. Illustration of *Hydrilla verticillata* (Hydrilla): 1. habit, entire plant; 2. leaf; 3. turion; 4. male flower; 5. female flower and leaf whorl.

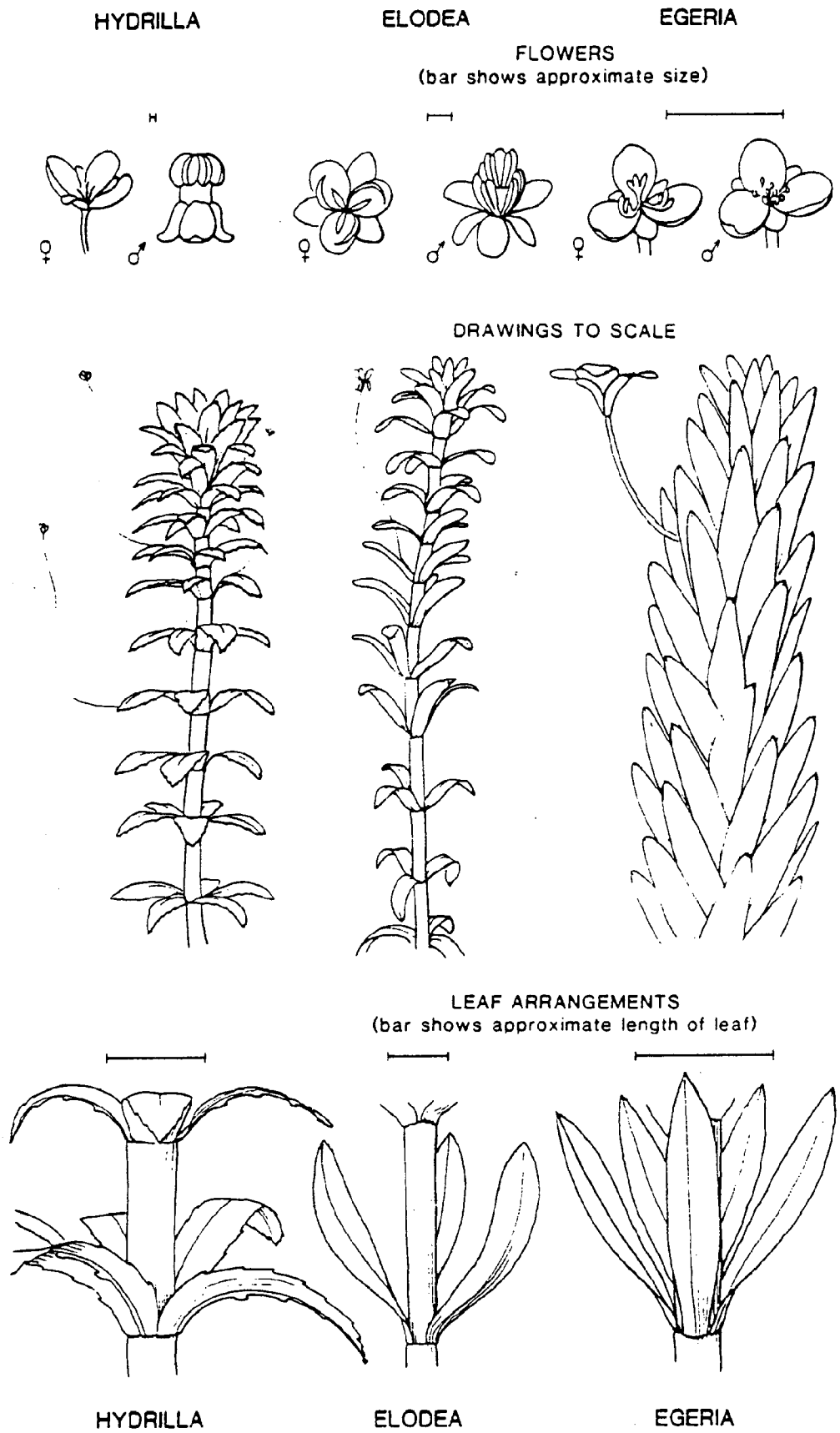


Figure 36. A comparison: illustrations of *Hydrilla verticillata*, *Elodea canadensis*, and *Egeria* spp.

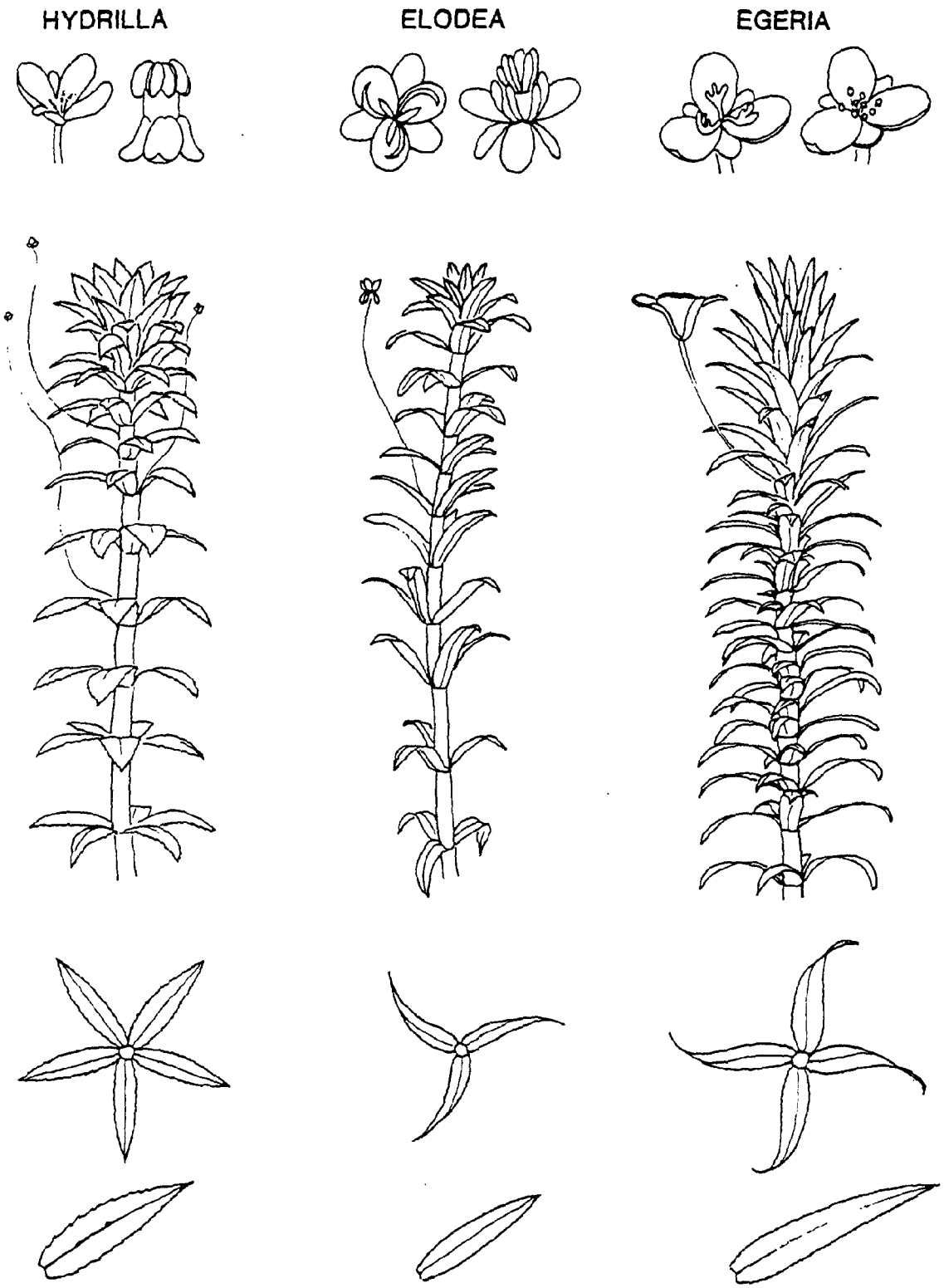


Figure 37. A comparison: illustrations of *Hydrilla verticillata*, *Elodea canadensis*, and *Egeria* spp. showing ends of stems with flowers; leaf whorls; single leaves.

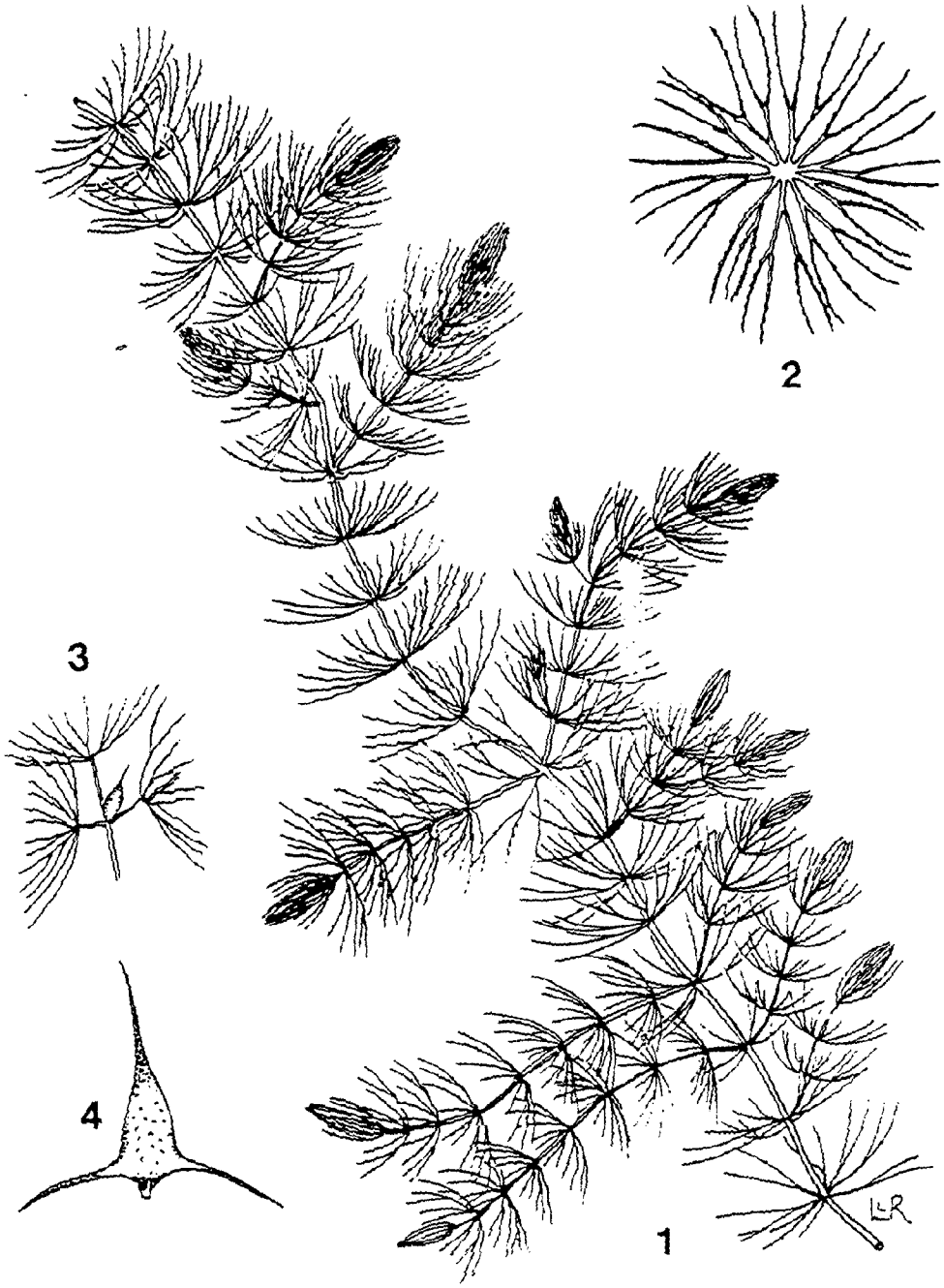


Figure 38. Illustration of *Ceratophyllum demersum* (Coontail): 1. habit, portion of plant; 2. leaf whorl; 3. flower in axil of whorl with branches; 4. fruit.

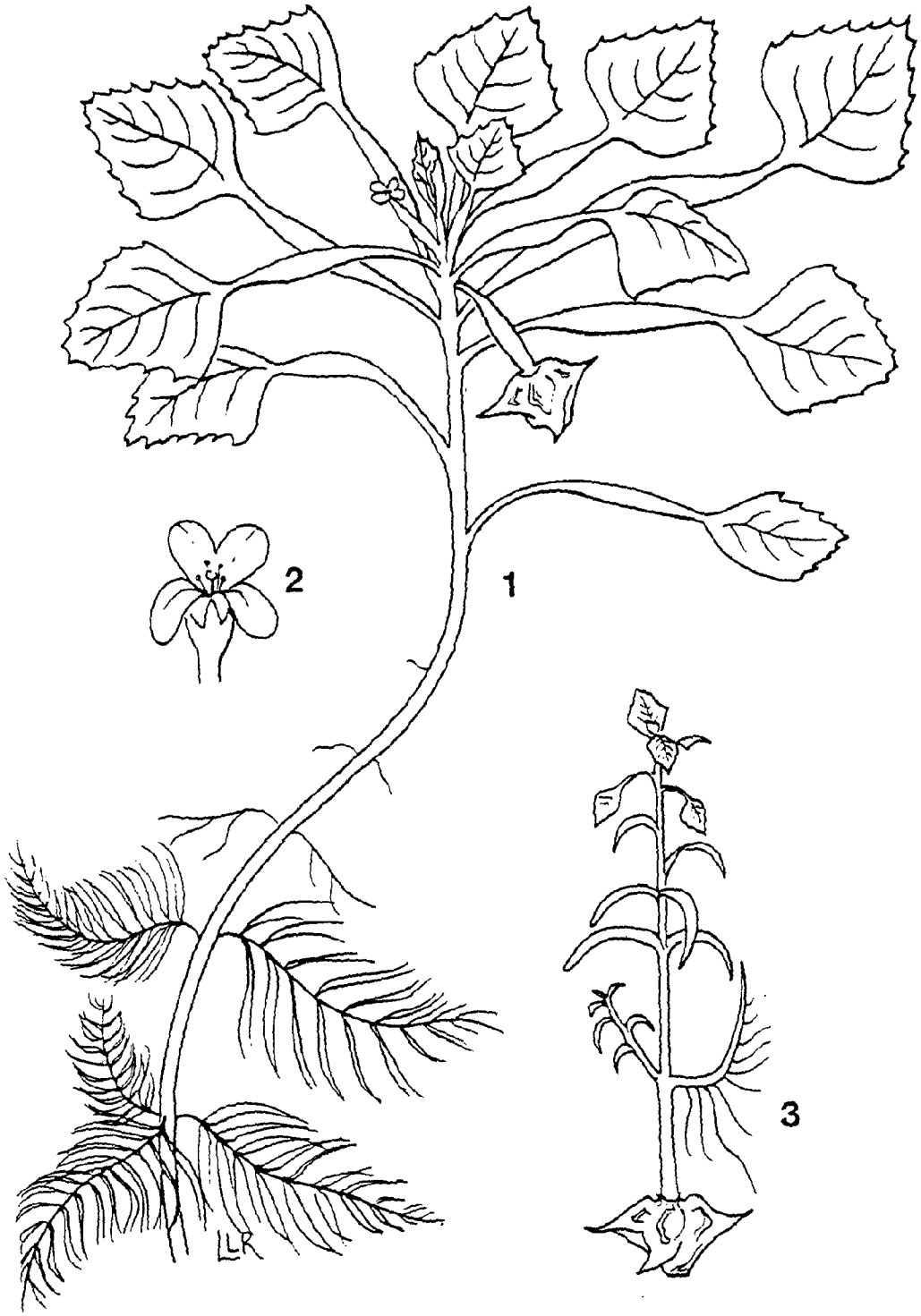


Figure 39. Illustration of *Trapa natans* (Water chestnut): 1. habit, portion of mature plant; 2. flower; 3. seedling.

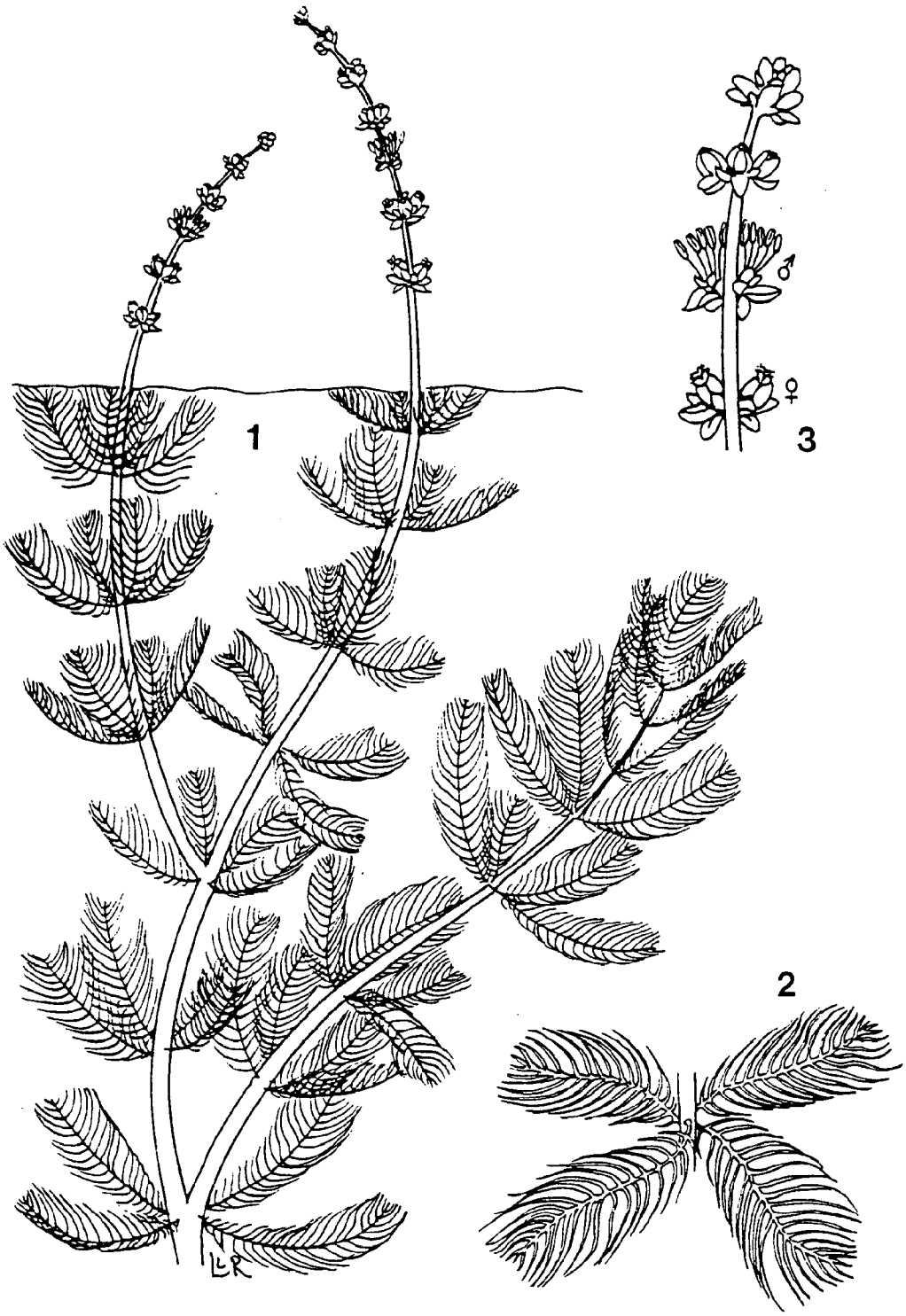


Figure 40. Illustration of *Myriophyllum spicatum* (Eurasian watermilfoil): 1. habit, upper portion of plant with flower spike borne above water; 2. leaf whorl; 3. female and male flowers on spike.

APPENDIX B

APPENDIX B

Latitude and Longitude Coordinate Points Defining the 21 Chesapeake Bay Sections and Chincoteague Bay. (For Section Locations and Descriptions See Fig. 7 and Table 3.)

SEC. 1. Susquehanna Flats

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

SEC. 2. Upper Eastern Shore

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

SEC. 3. Upper Western Shore

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

SEC. 4. Chester River

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

SEC. 5. Central Western Shore

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

SEC. 6. Eastern Bay

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

SEC. 7. Choptank River

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

Latitude Deg Min	Longitude Deg Min

SEC. 8. Patuxent River

38 15.00	76 25.45
38 35.00	77 00.00
38 58.00	76 45.00
38 55.00	76 37.50
38 42.90	76 35.00
38 30.00	76 32.30
38 21.66	76 23.50
38 18.00	76 22.83

SEC. 9. Middle Western Shore

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

SEC. 10. Lower Potomac River

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

SEC. 11. Upper Potomac River

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

SEC. 12. Middle Eastern Shore

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

SEC. 13. Mid-Bay Island Complex

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

SEC. 14. Lower Eastern Shore

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

Latitude Deg Min	Longitude Deg Min

SEC. 15. Reedville

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

SEC. 16. Rappahannock River Complex

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

SEC. 17. New Point Comfort Region

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

Latitude Deg Min	Longitude Deg Min

SEC. 18. Mobjack Bay Complex

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

SEC. 19. York River

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

Latitude Deg Min	Longitude Deg Min	Latitude Deg Min	Longitude Deg Min
SEC. 20. Lower Western Shore		Chincoteague Bay	
36 49.11	75 58.05	37 52.50	75 30.00
36 45.75	76 07.00	38 00.00	75 30.00
36 55.85	76 16.00	38 07.50	75 22.50
36 57.79	76 16.00	38 15.00	75 17.50
36 58.00	76 17.70	38 15.00	75 15.00
37 01.05	76 18.52	38 22.50	75 15.00
37 03.68	76 19.80	38 30.00	75 10.00
37 00.60	76 24.00	38 30.00	75 02.50
37 07.30	76 28.20	38 22.50	75 02.50
37 12.50	76 27.50	38 15.00	75 07.50
37 13.25	76 24.00	38 07.50	75 10.00
37 14.00	76 22.50	38 00.00	75 15.00
37 14.00	76 19.33	37 52.50	75 20.00
37 17.00	76 19.33	37 51.00	75 22.30
37 17.45	76 16.16	37 51.00	75 30.00
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		

APPENDIX C

USGS 7.5 Minute Quadrangles for Chesapeake Bay and Chincoteague Bay Showing Distribution, Abundance, and Ground Truthing of SAV in 1992. [Boundaries of Individual SAV Beds Are Delineated by Solid Lines. Each Bed Is Identified with an Unique Two Letter (AA-ZA, AB-ZB, etc.) and One Number (1-4) Designation. These Numbers Represent the Density Classification Discussed in the Text and Fig. 6, i.e. 1 = <10%; 2 = 10-40%; 3 = 40-70%; 4 = 70-100%. Ground Truthing is Represented by Symbols and Species Codes which Are Explained in the Legend.]

KEY FOR 1992 SAV MAPS

SPECIES

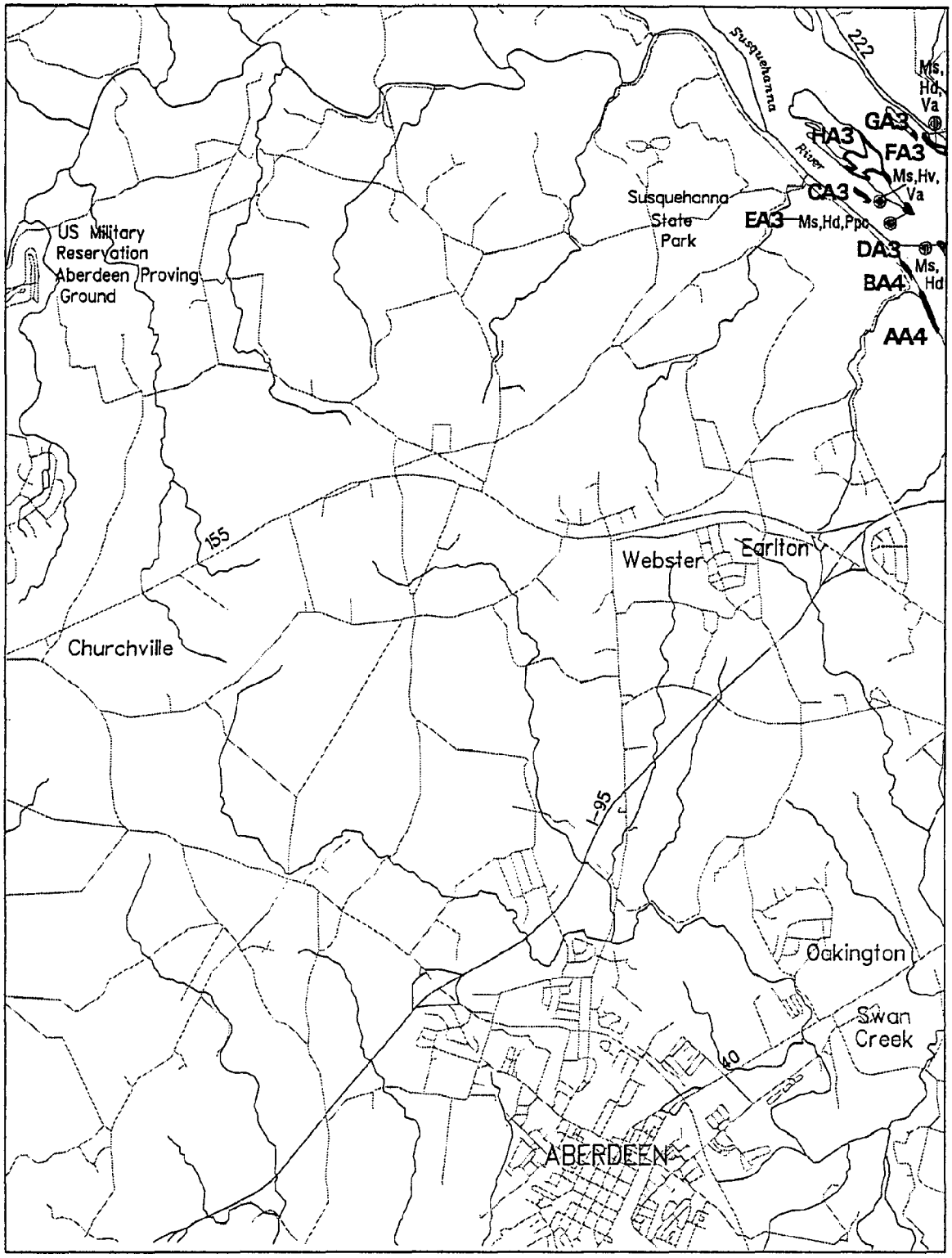
Zm	*Zostera marina* (eelgrass)
Rm	*Ruppia maritima* (widgeon grass)
Ms	*Myriophyllum spicatum* (Eurasian watermilfoil)
Ppf	*Potamogeton perfoliatus* (redhead-grass)
Ppc	*Potamogeton pectinatus* (sago pondweed)
Zp	*Zannichellia palustris* (horned pondweed)
N	*Najas spp.* (naiad)
Ec	*Elodea canadensis*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

SURVEY STATIONS

- ▲ VIMS Field Survey
- ✳ Harford Community College
- ▼ University MD-HPEL
- ● Citizens Field Observation
- ⊠ Essex Community College

Indicates 'NO SAV' polygon

SUBMERGED AQUATIC VEGETATION 1992
Aberdeen, MD. (002)



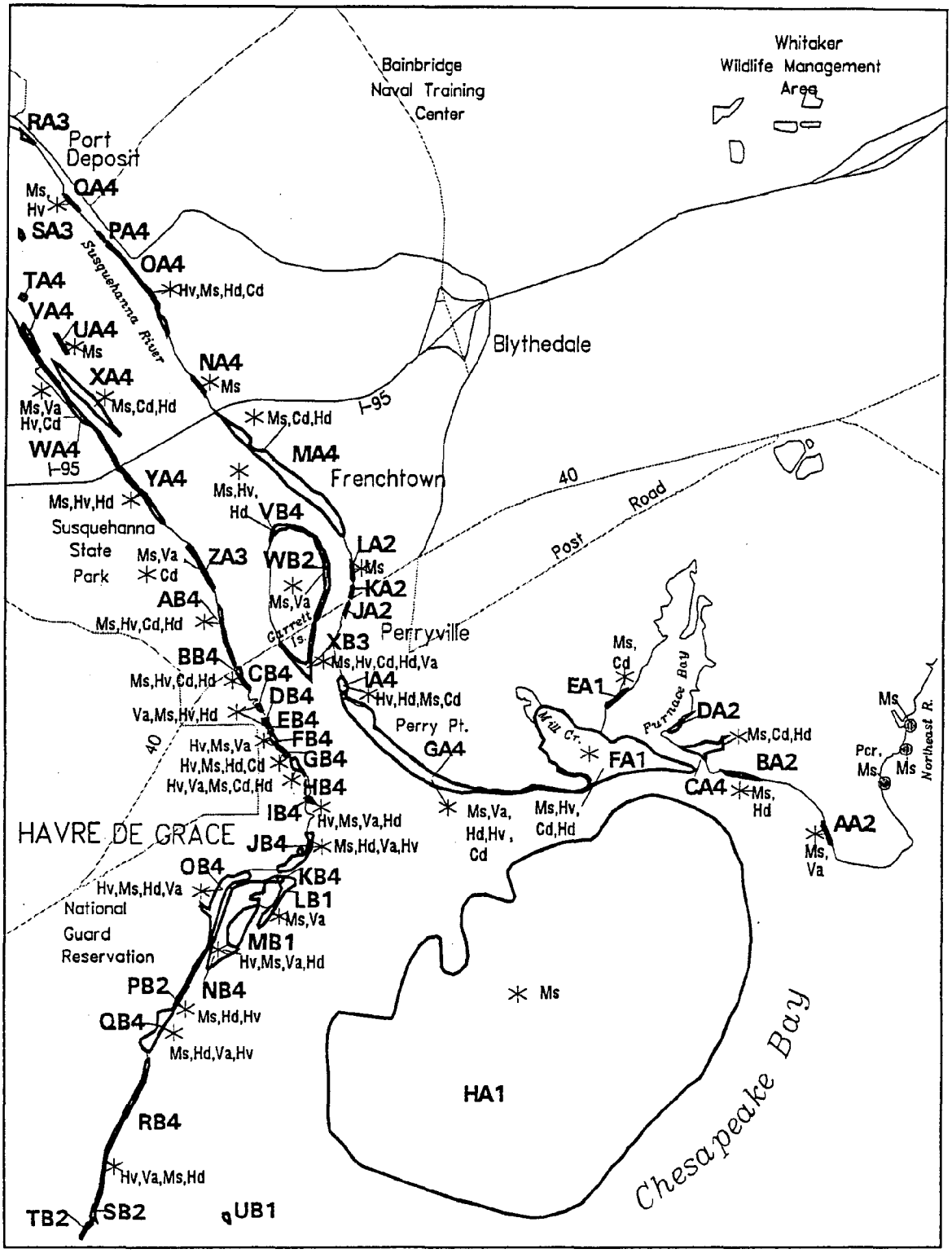
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 08-21-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Havre de Grace, MD. (003)



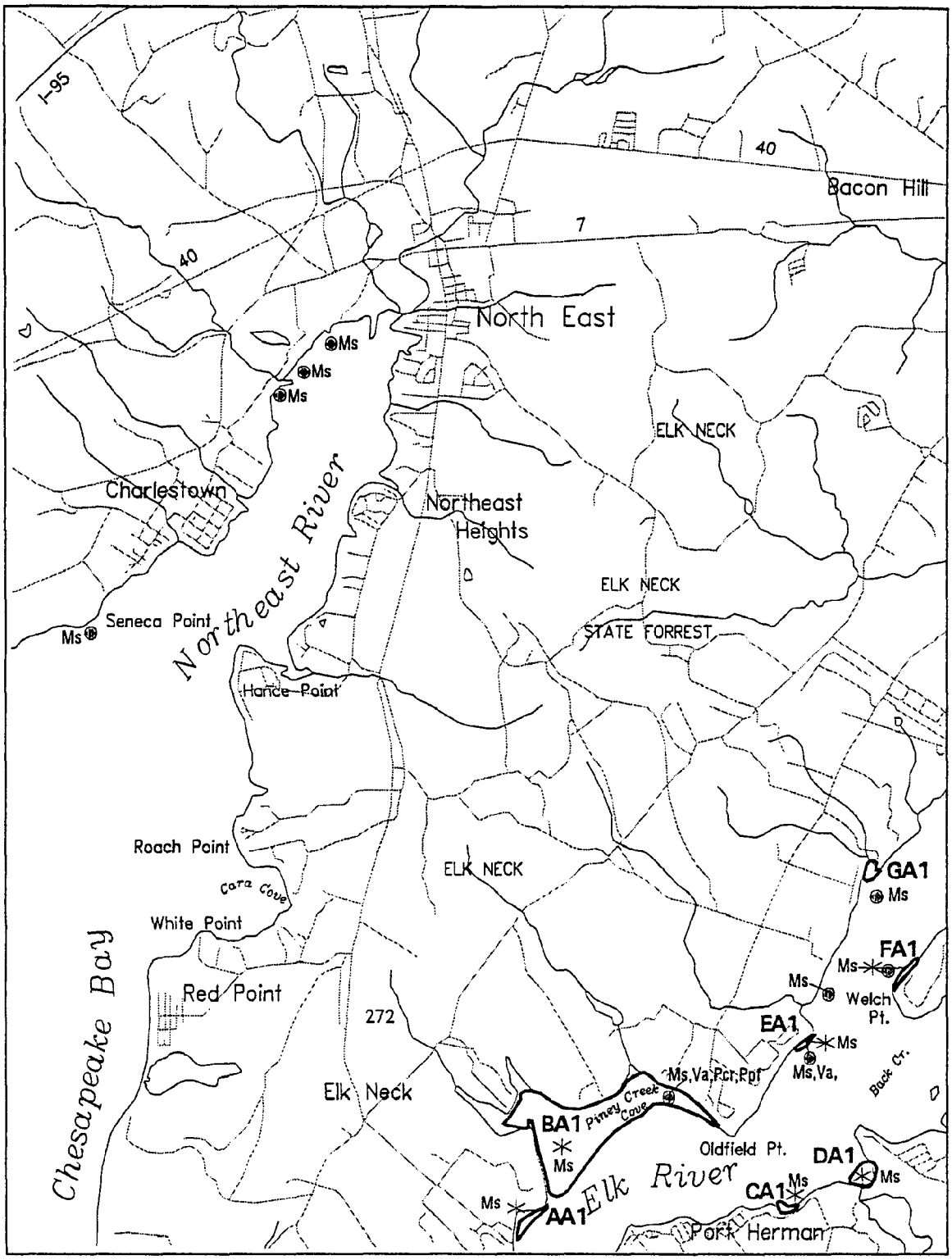
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 09-15-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
North East, MD. (004)



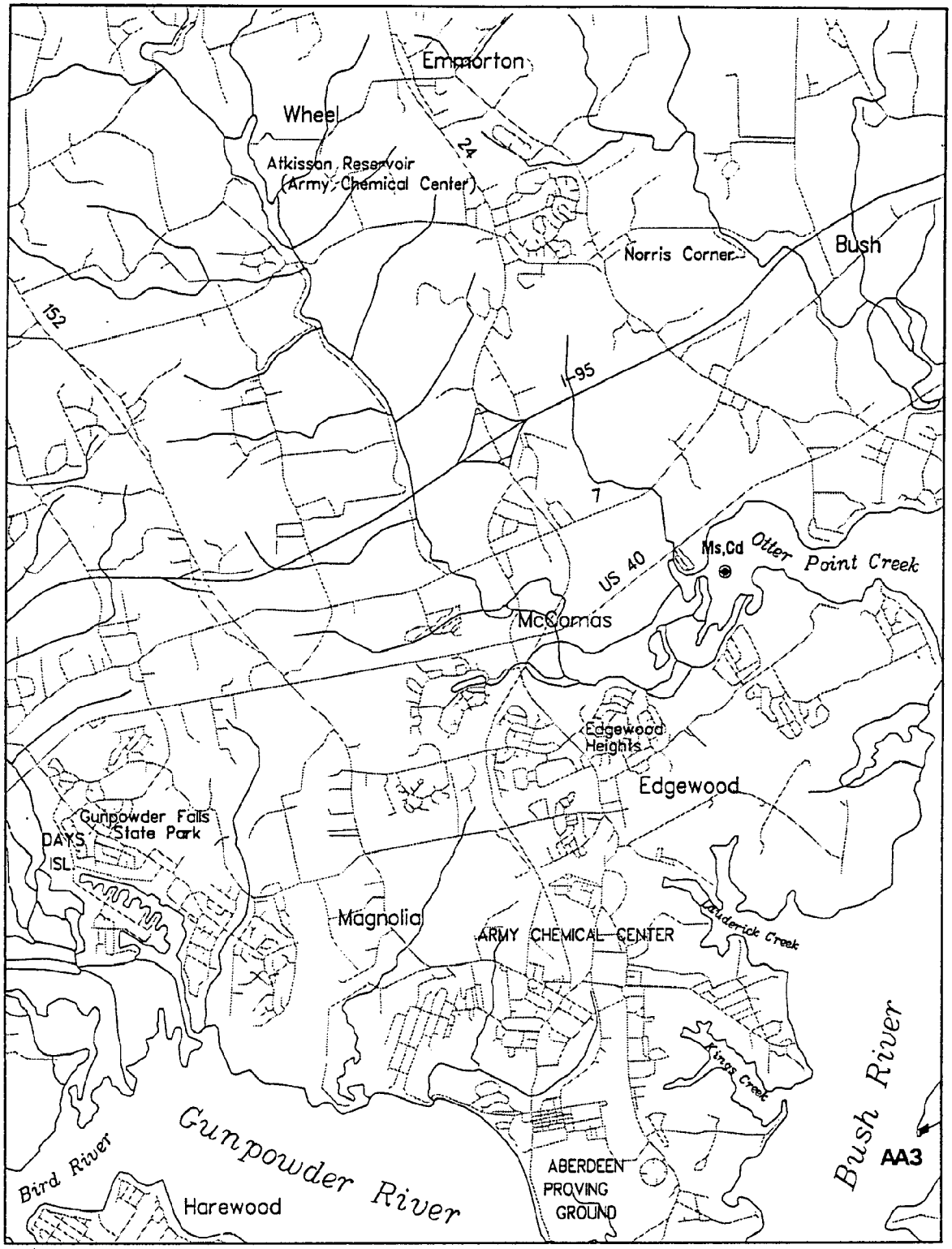
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 08-21-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Edgewood, MD. (007)



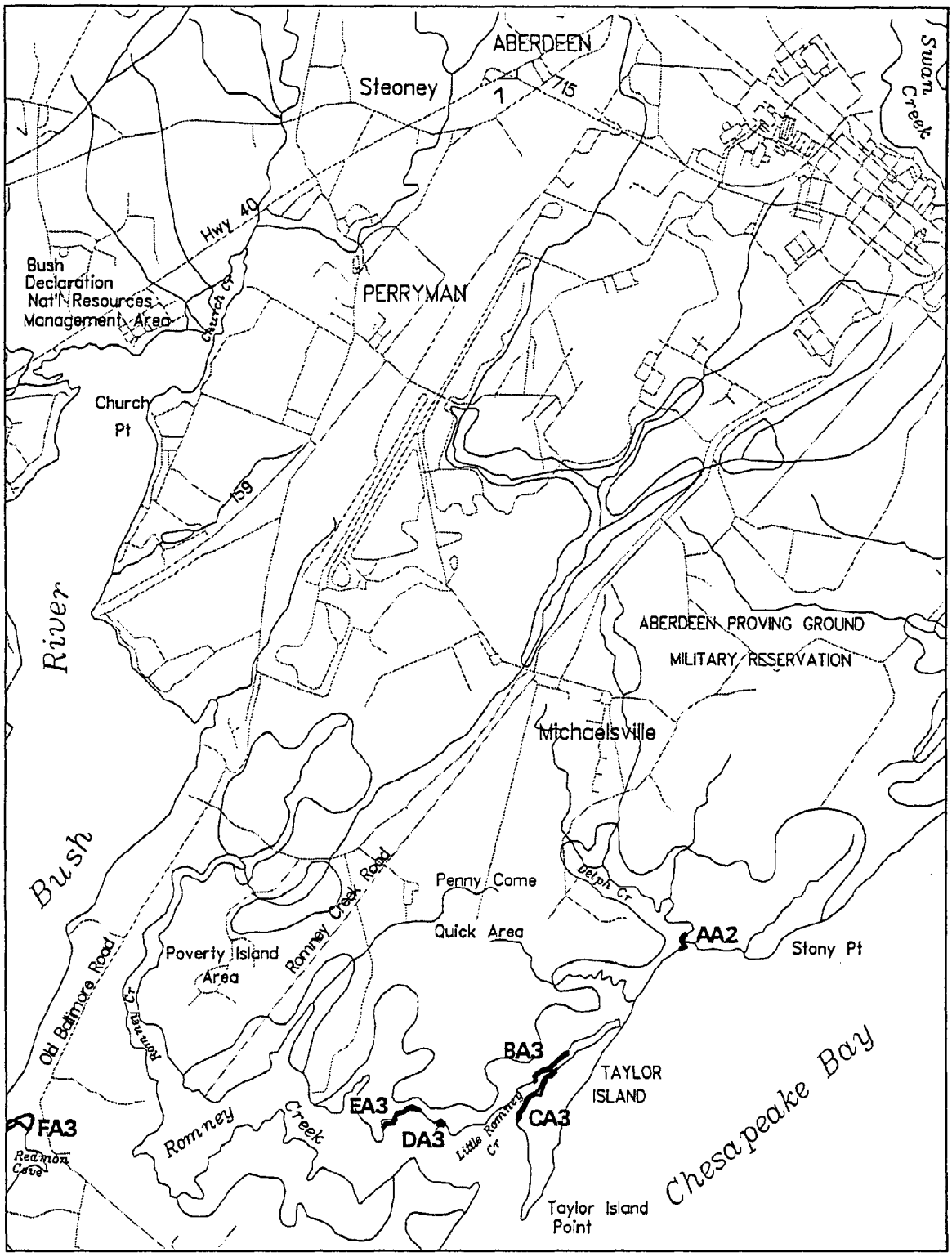
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 09-15-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Perryman, MD. (008)



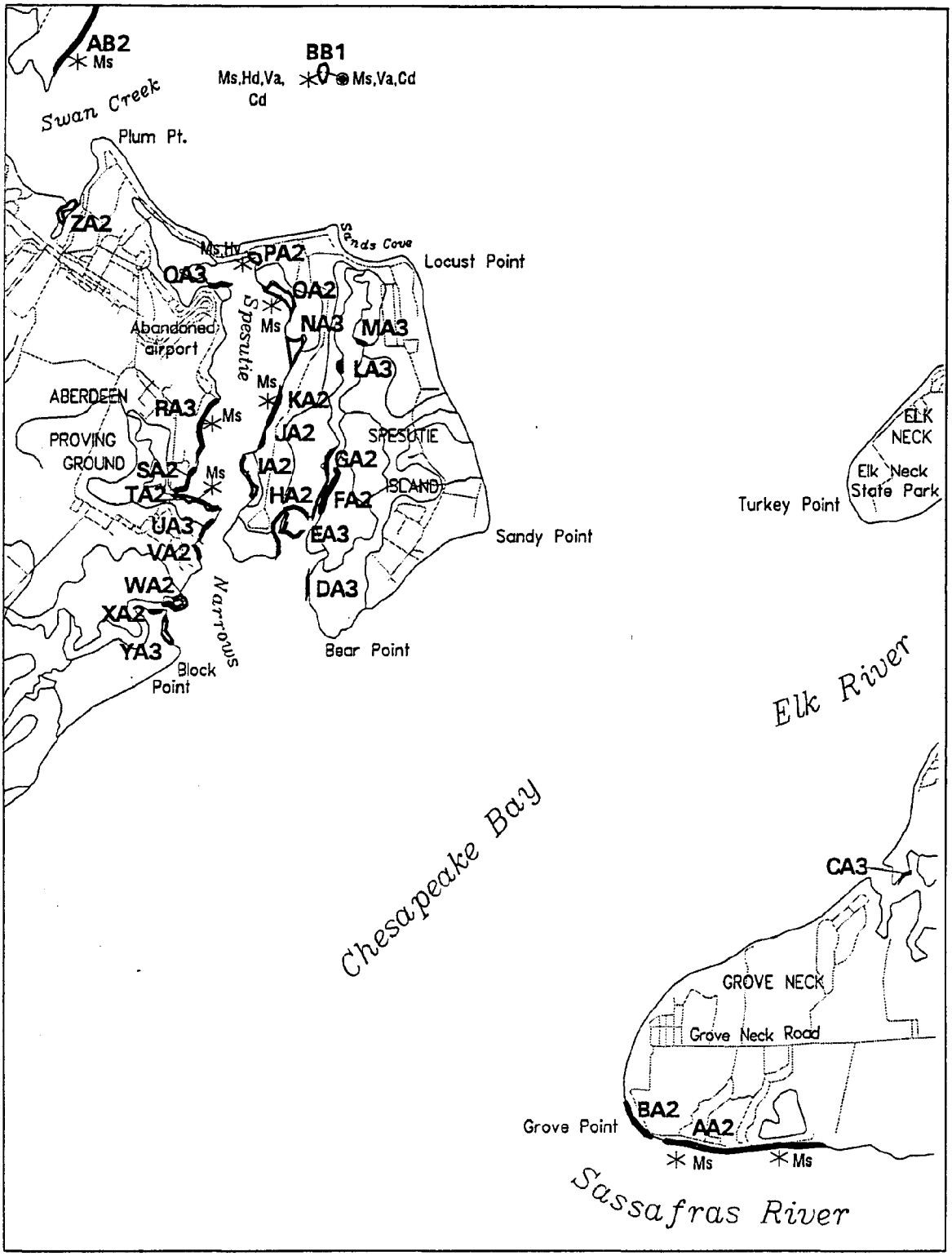
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 09-15-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Spesutie, MD. (009)



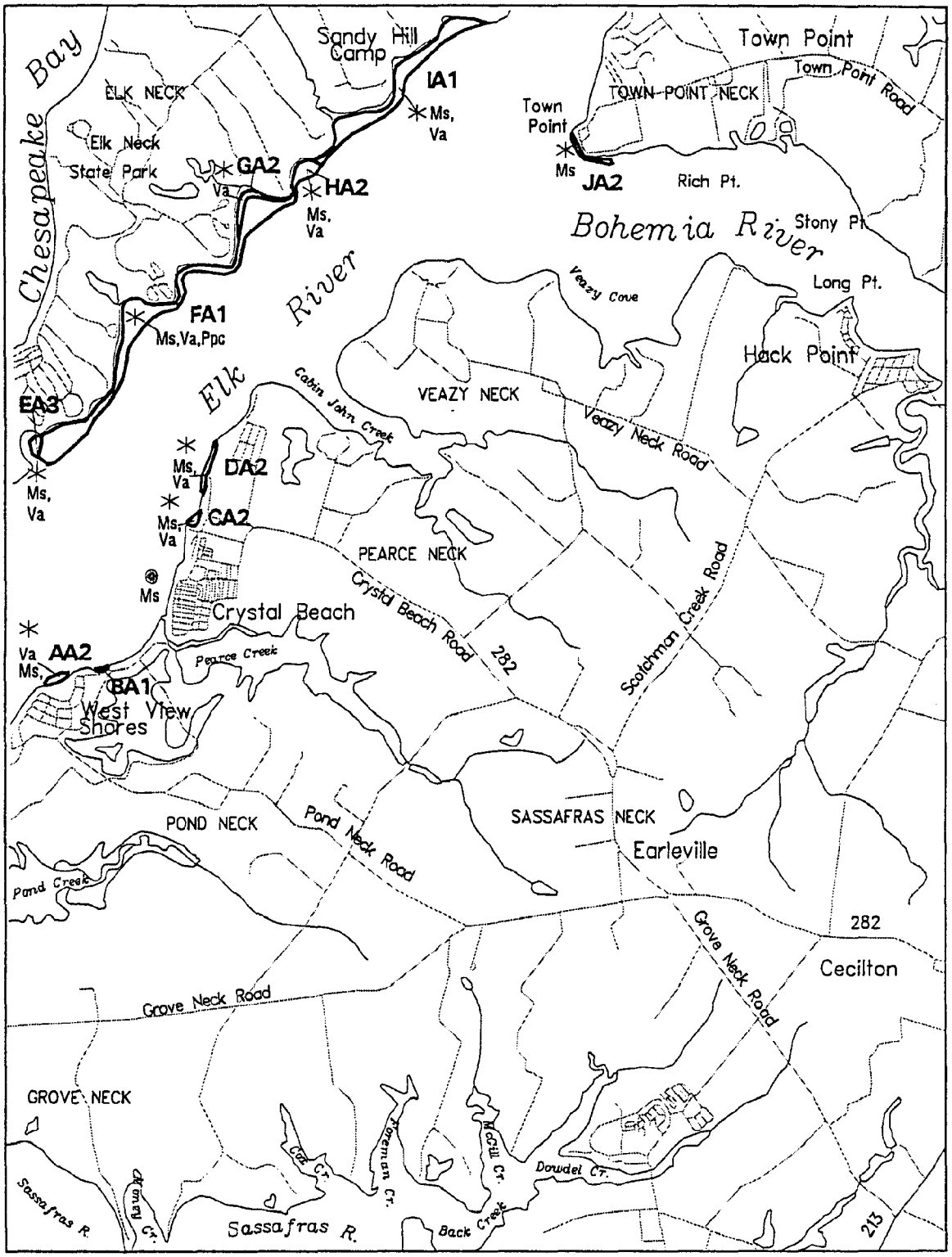
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 09-15-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Earleville, MD. (010)



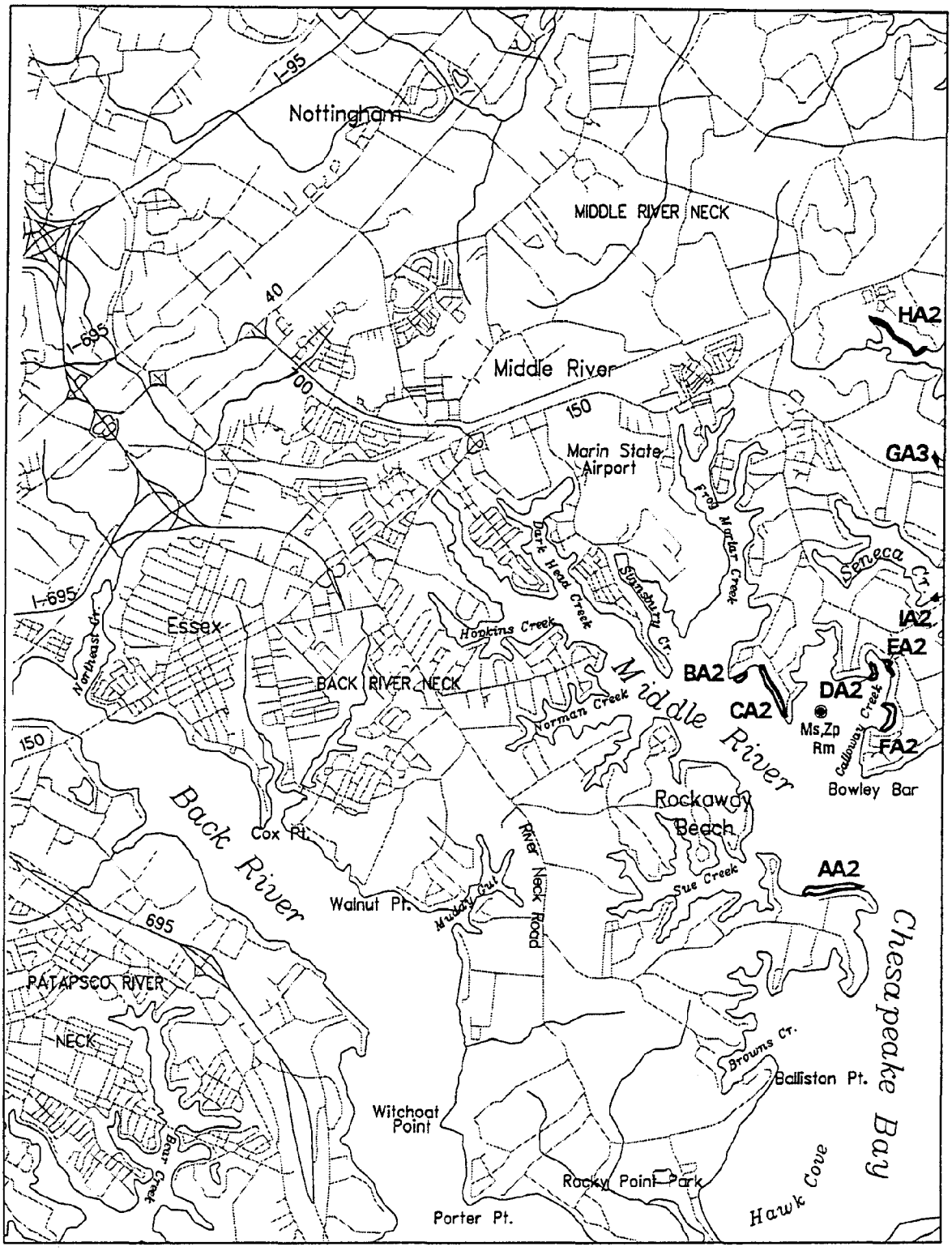
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 09-15-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Middle River, MD. (013)



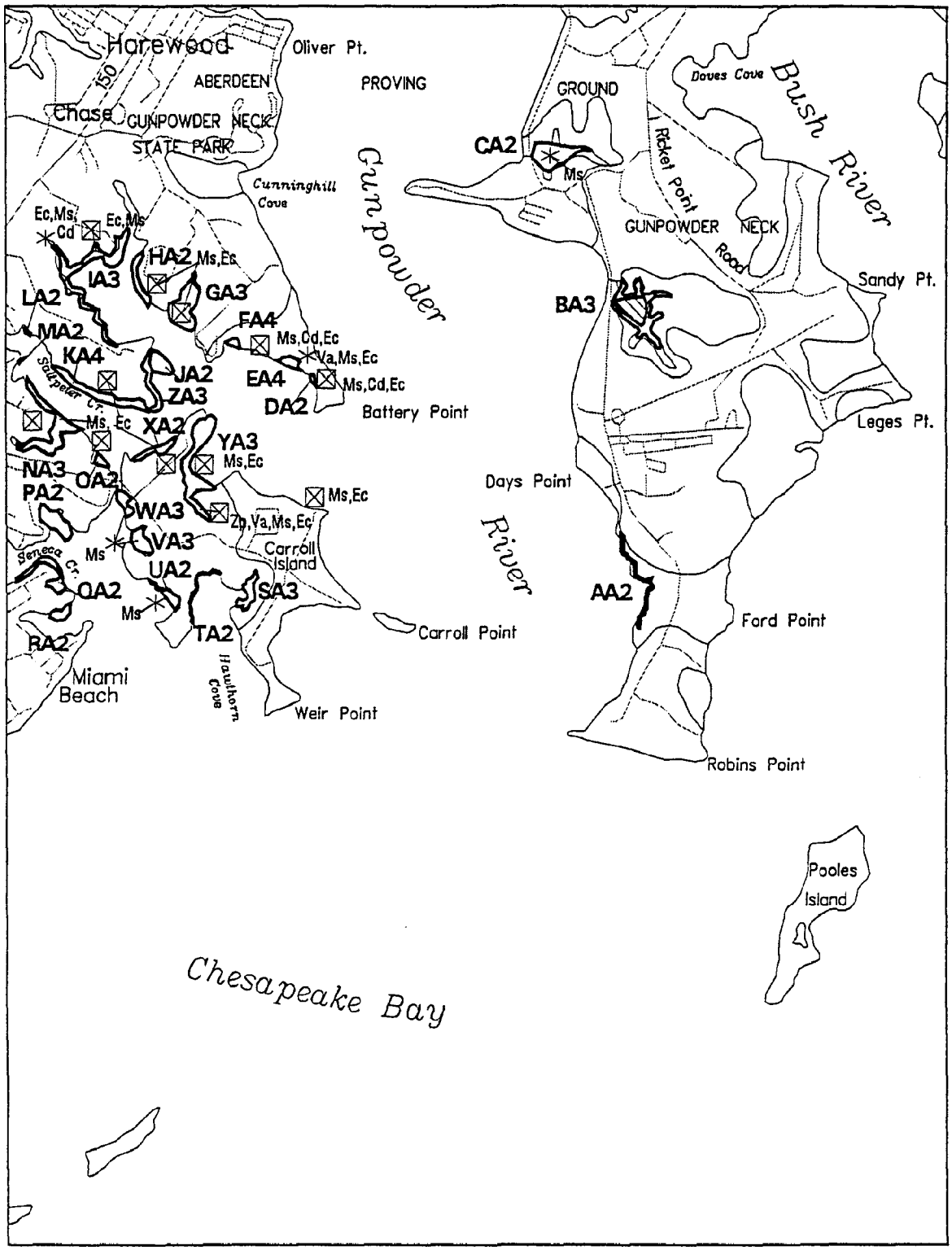
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 09-15-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Gunpowder Neck, MD. (014)



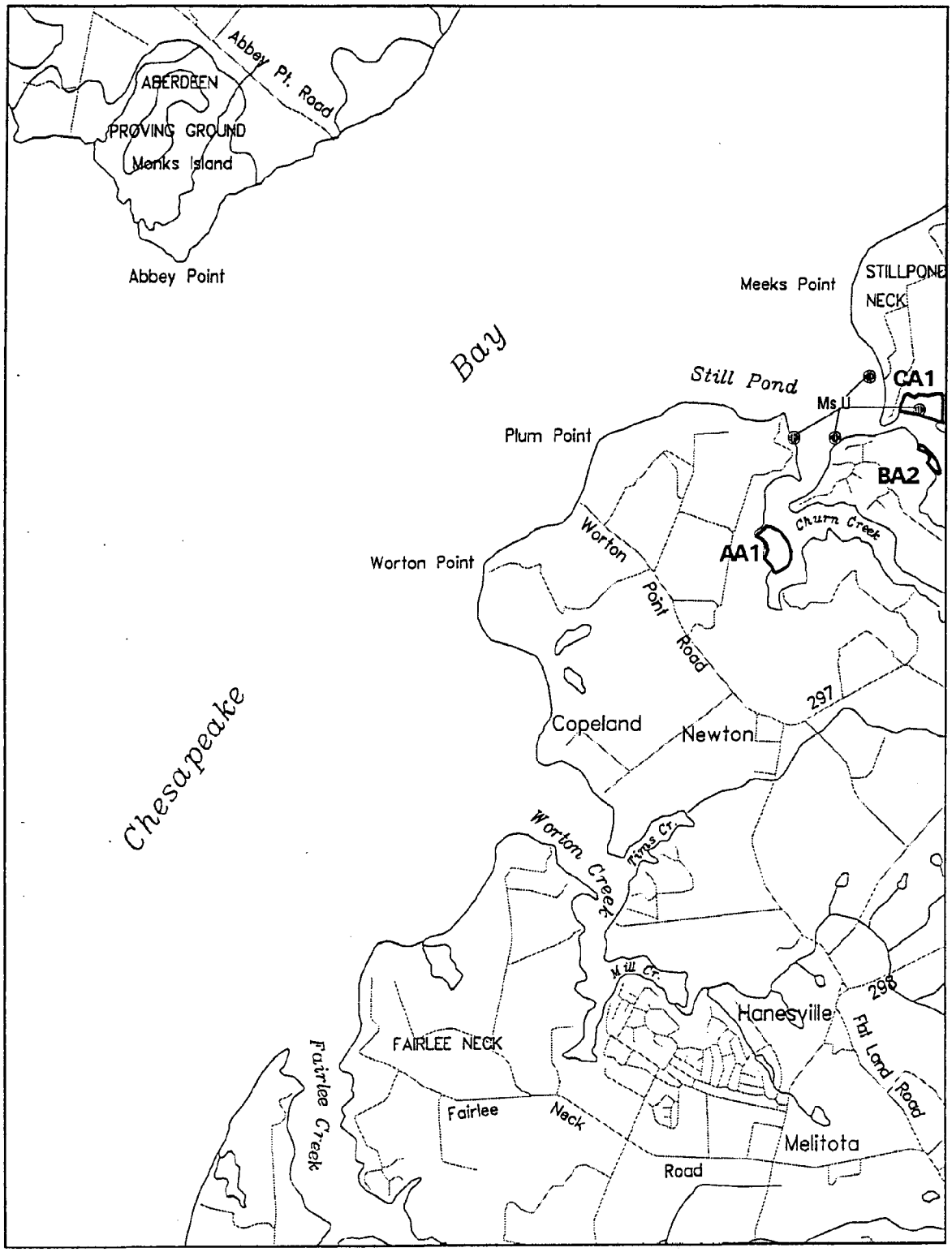
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 08-07-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Hanesville, MD. (015)



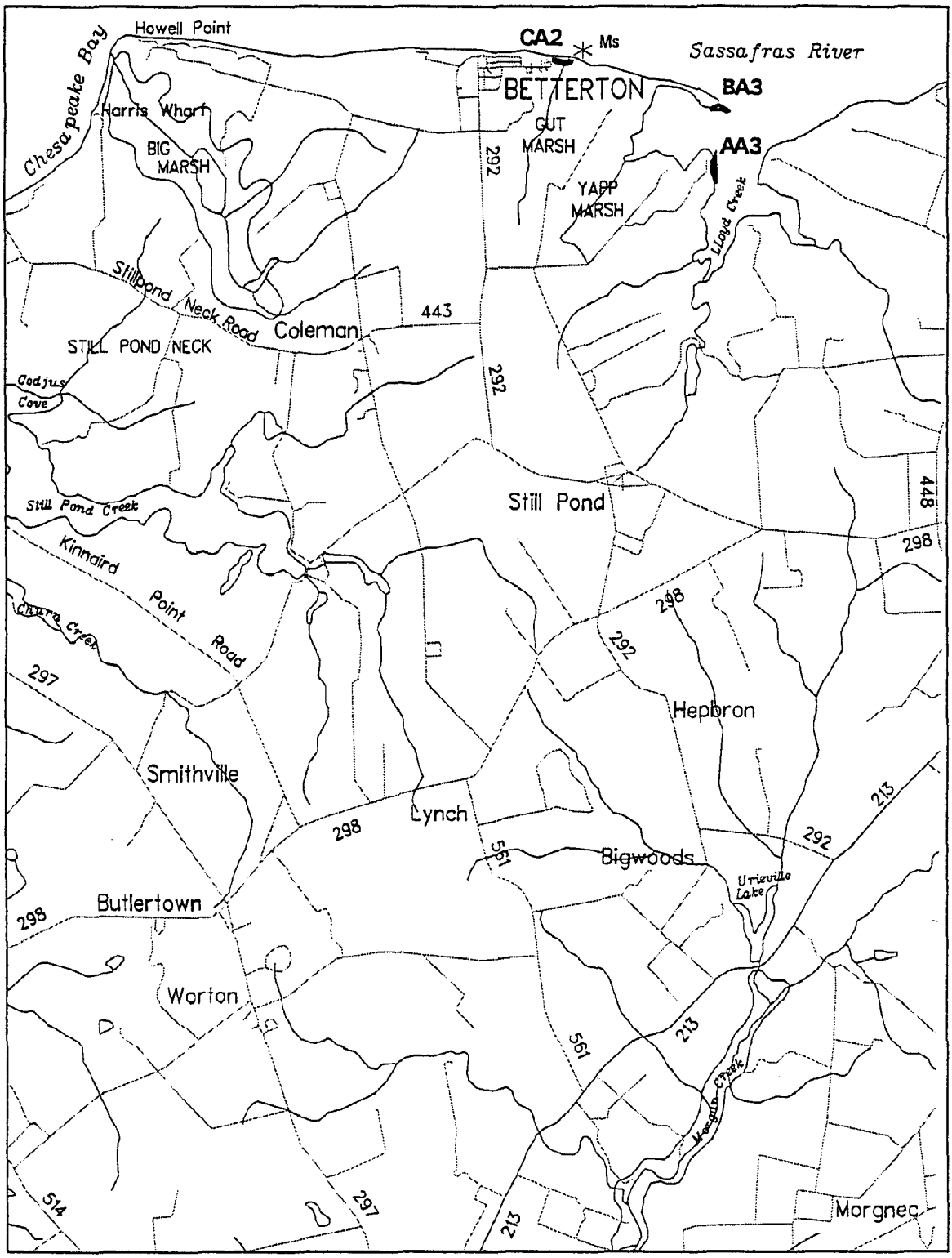
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 08-06-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Betterton, MD. (016)



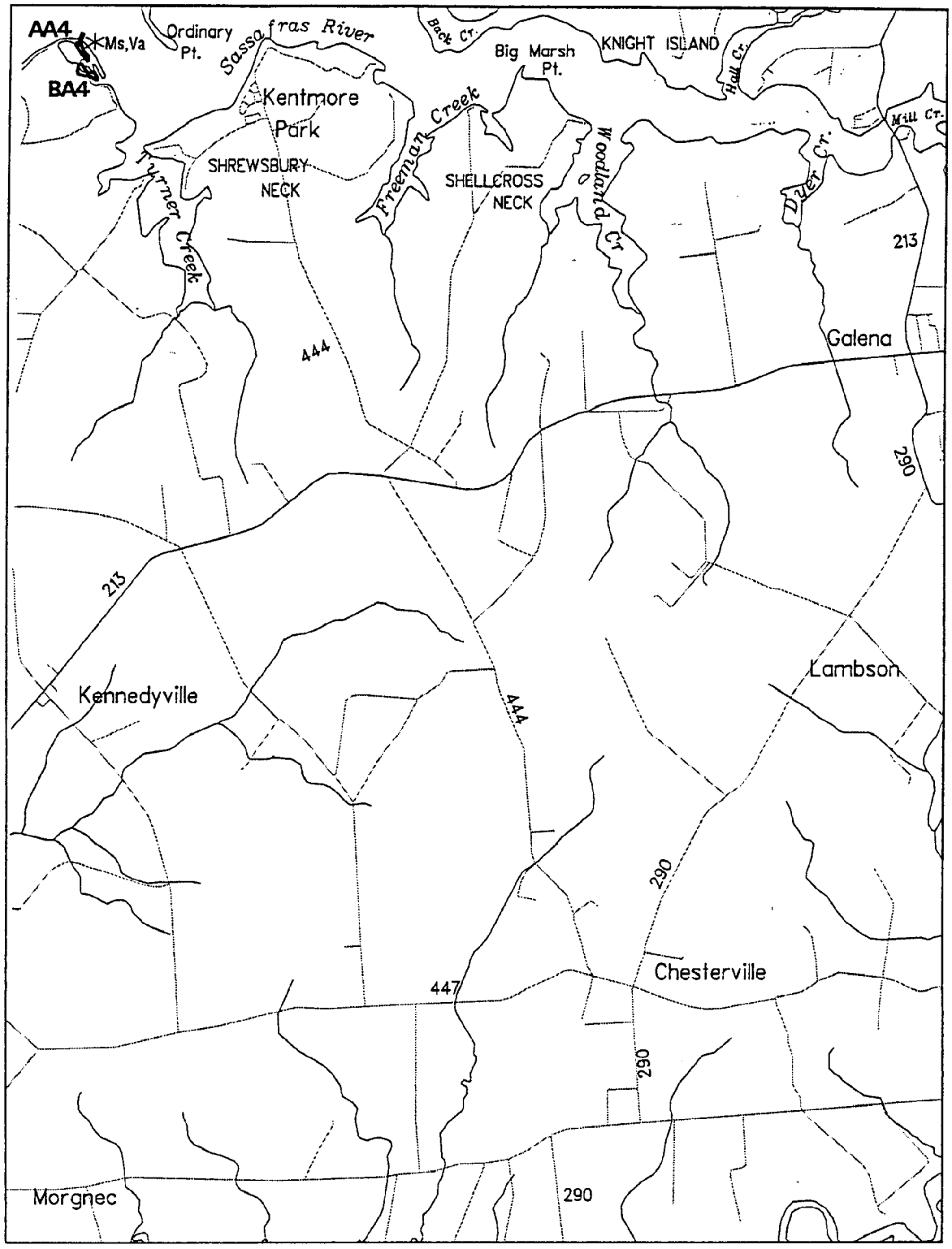
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 08-06-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Galena, MD. (017)



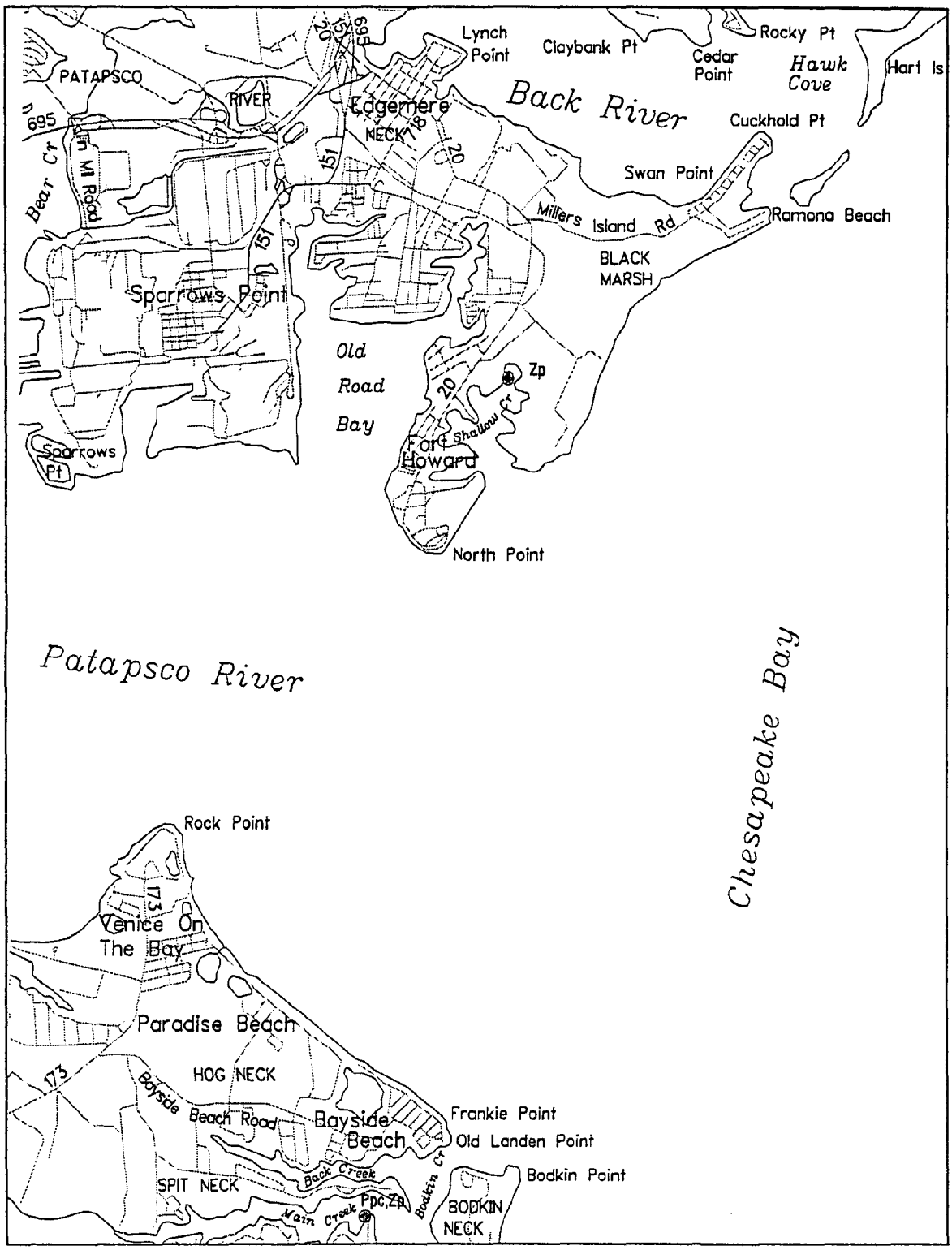
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 08-06-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Sparrows Point, MD. (019)



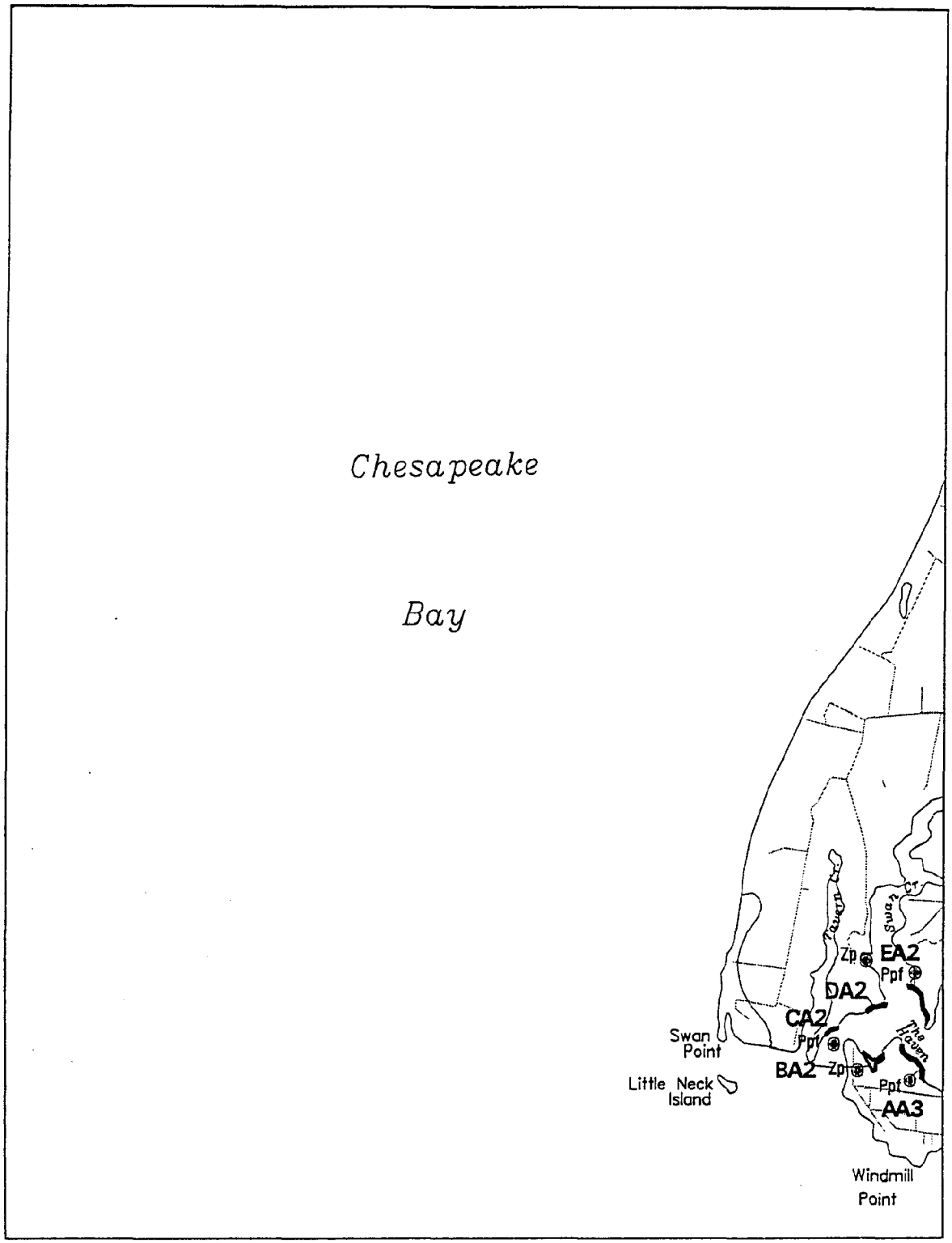
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 08-06-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Swan Point, MD. (020)



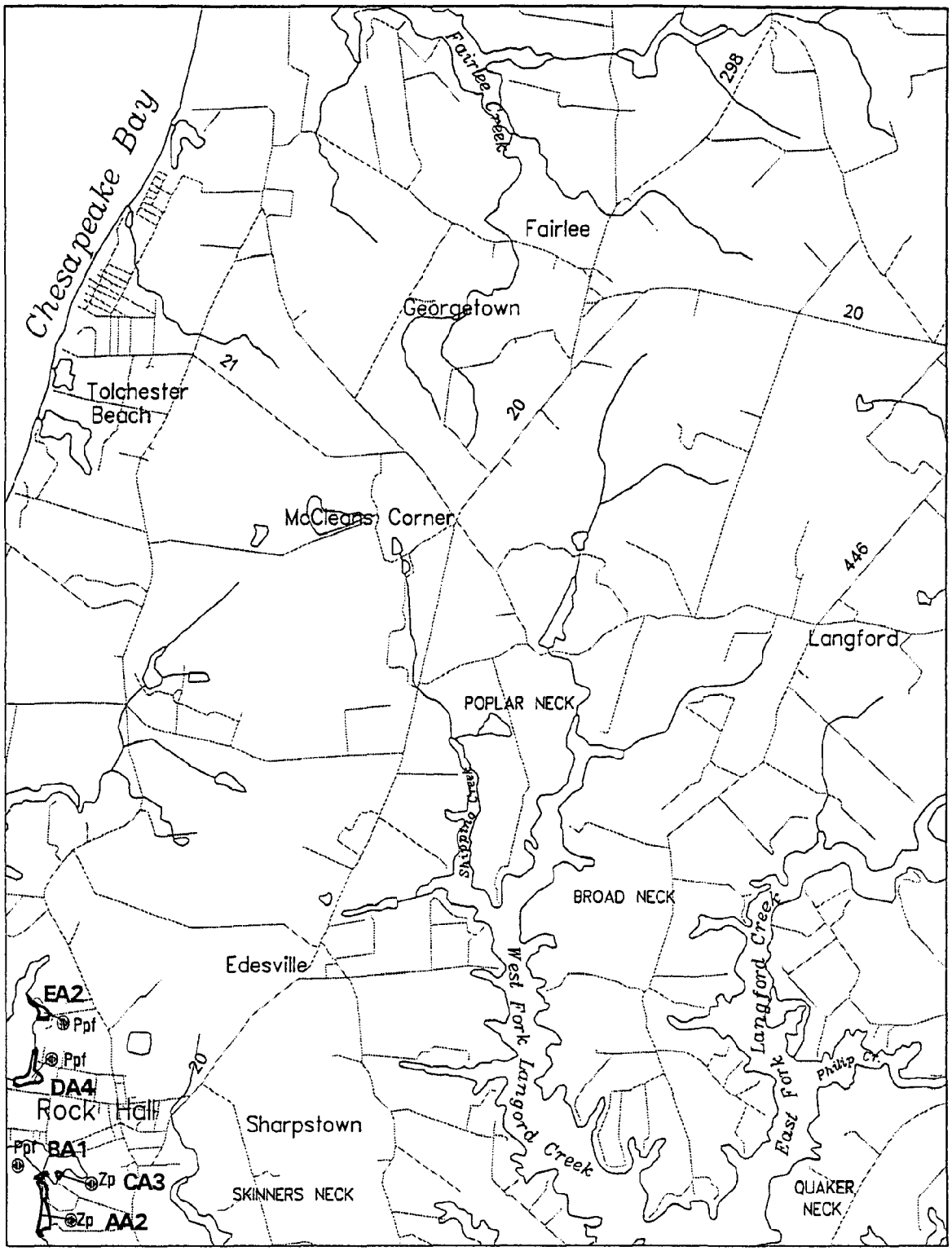
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 08-07-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Rock Hall, MD. (021)



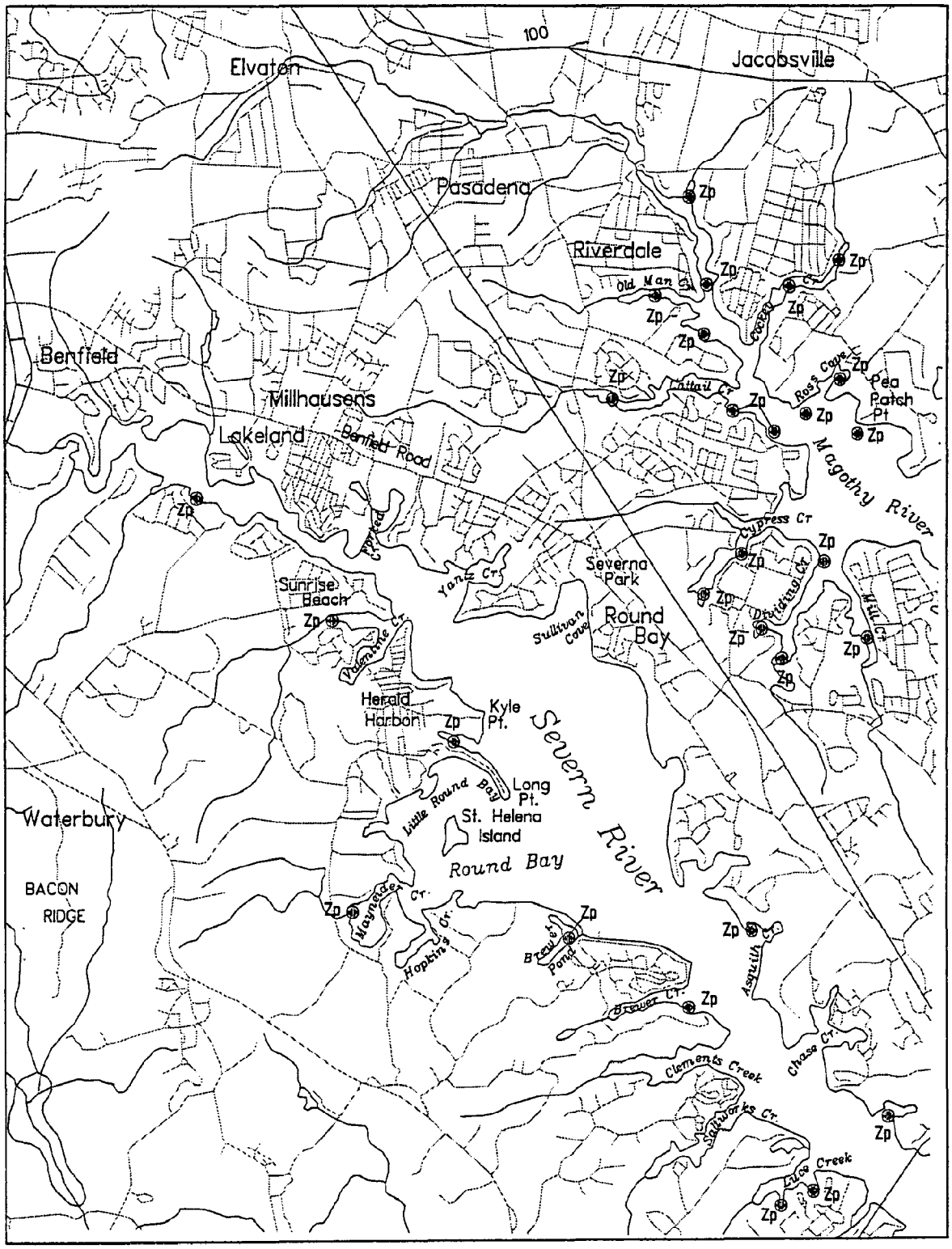
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 08-07-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Round Bay, MD. (023)



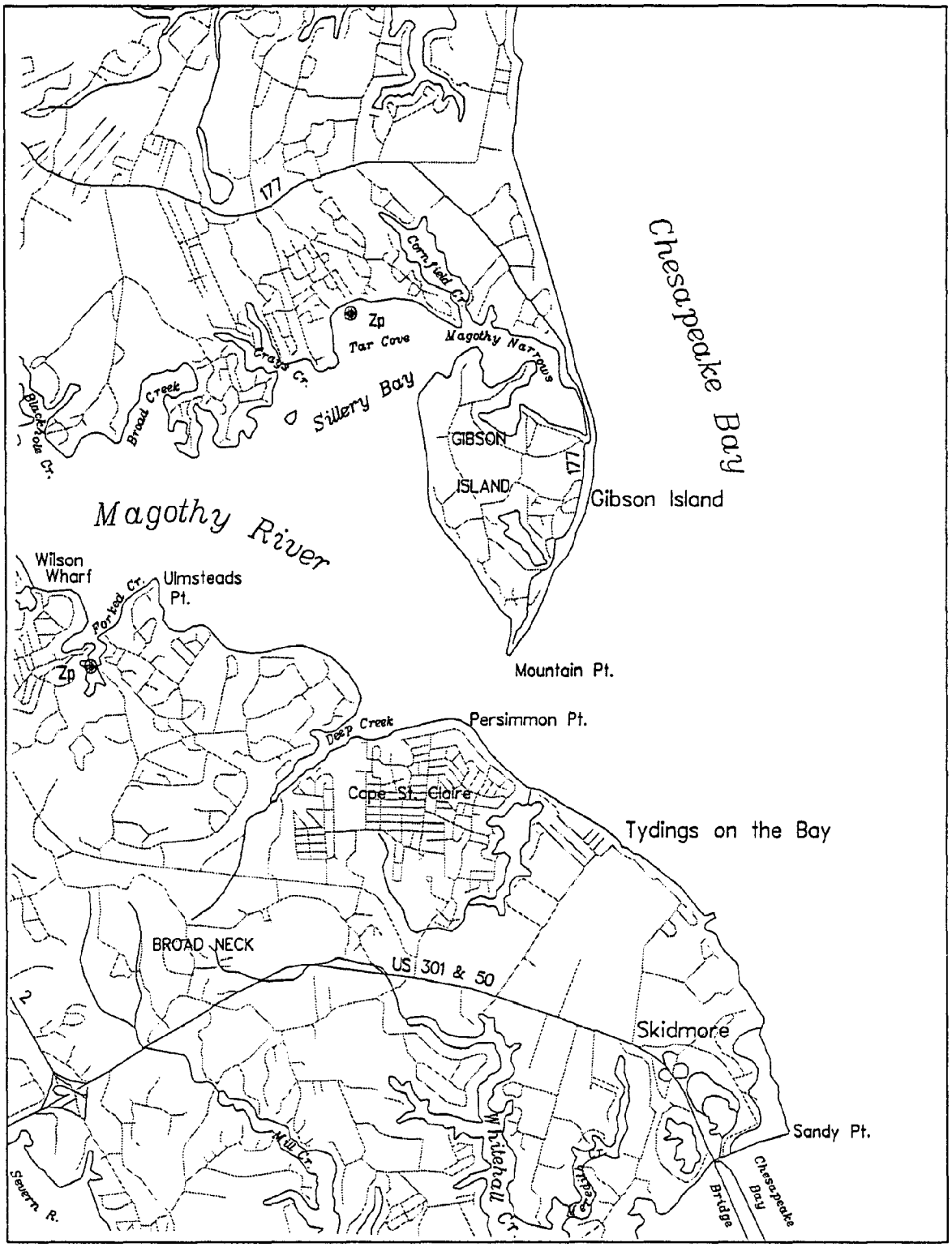
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 08-06-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Gibson Island, MD. (024)



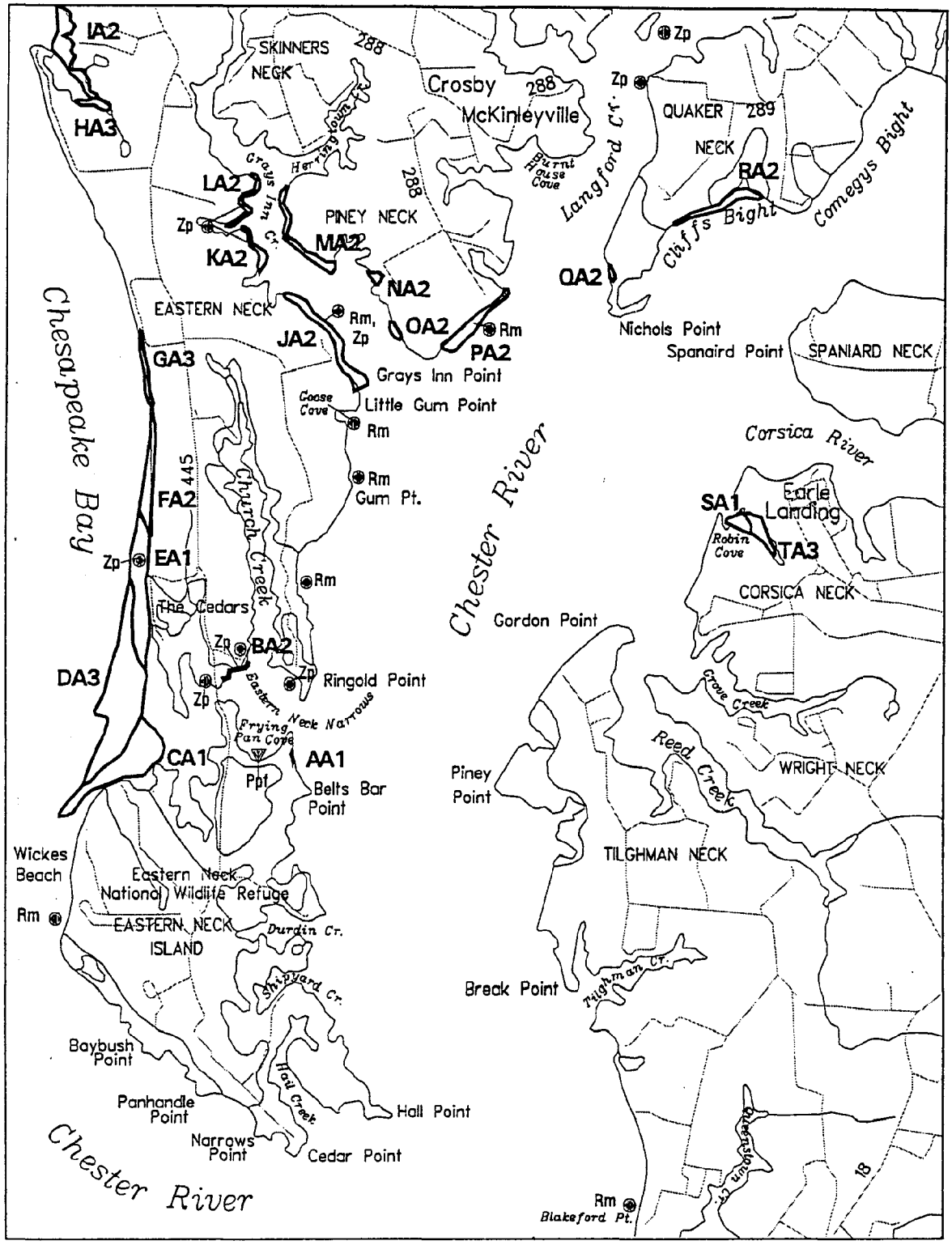
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 08-06-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Langford Creek, MD. (026)



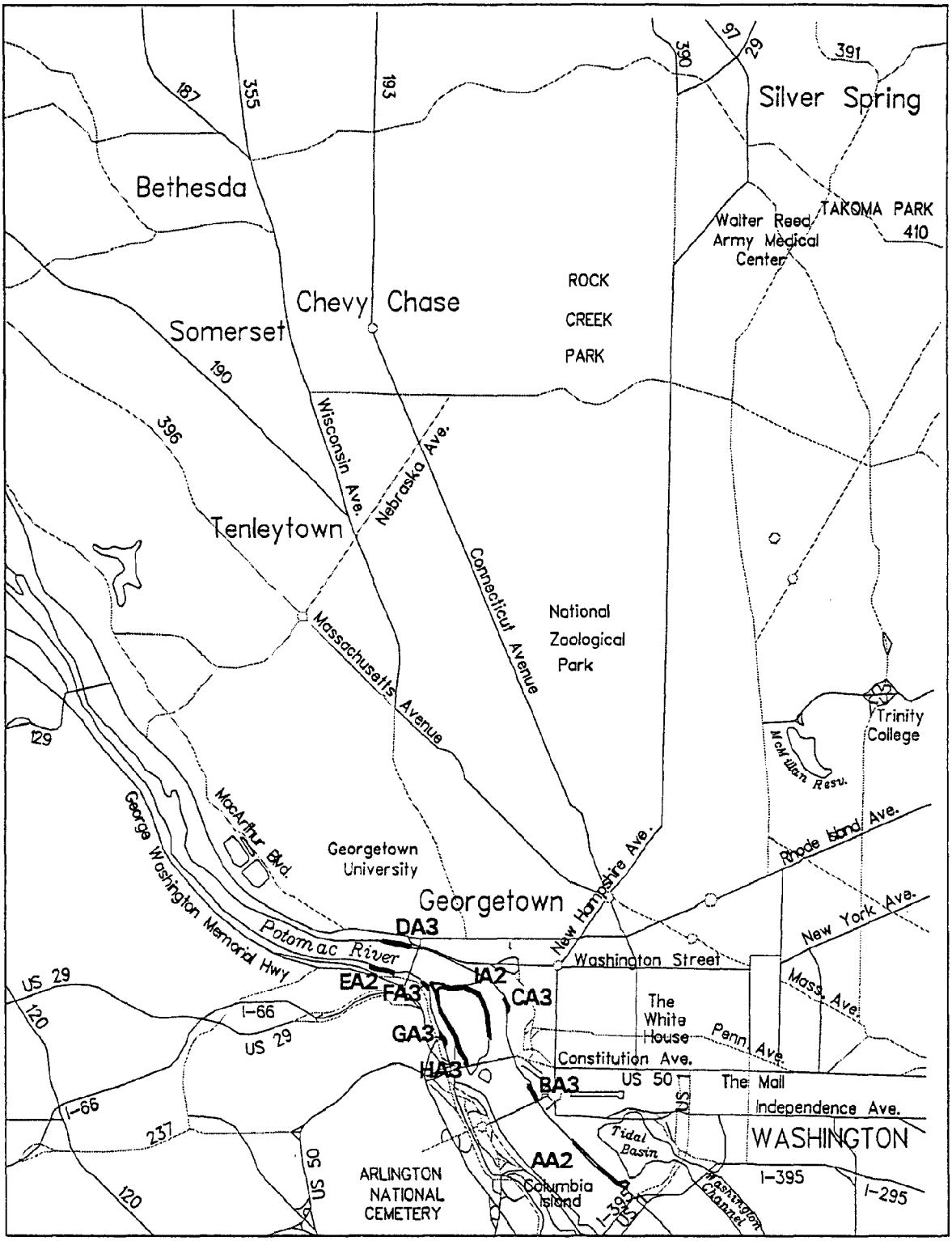
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 08-07-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Washington West, MD.-D.C.-VA. (028)



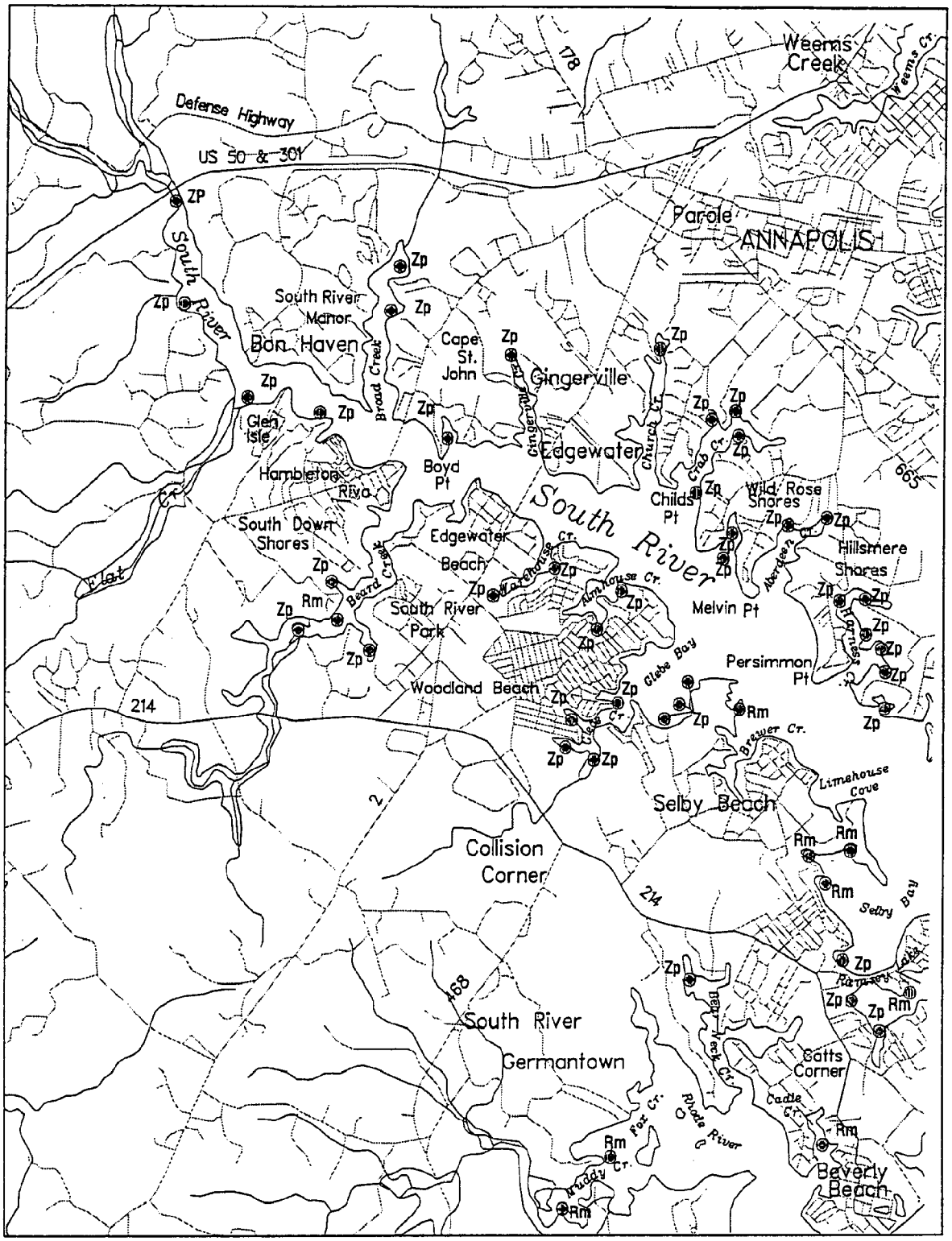
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 08-21-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
South River, MD. (030)



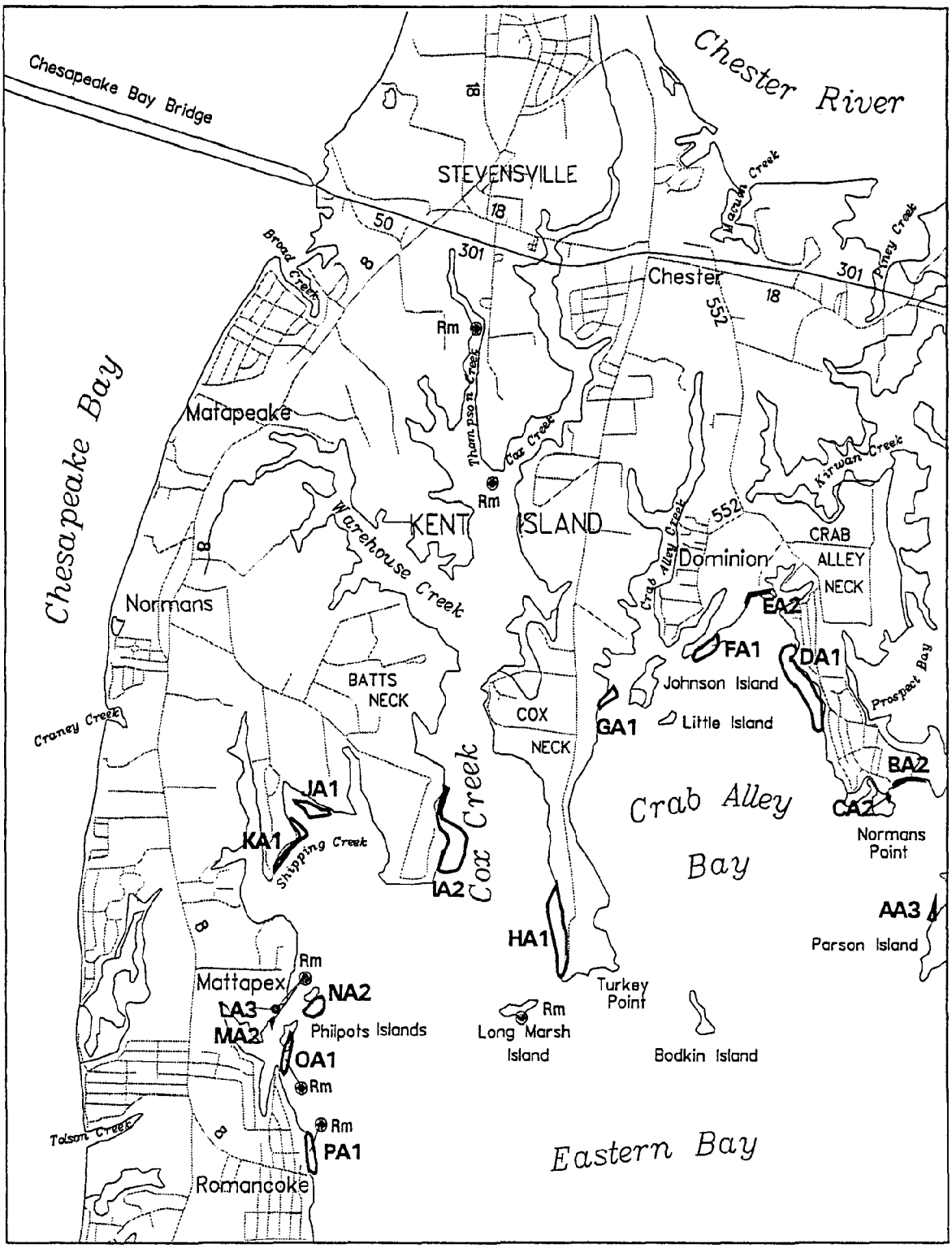
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 08-06-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Kent Island, MD. (032)



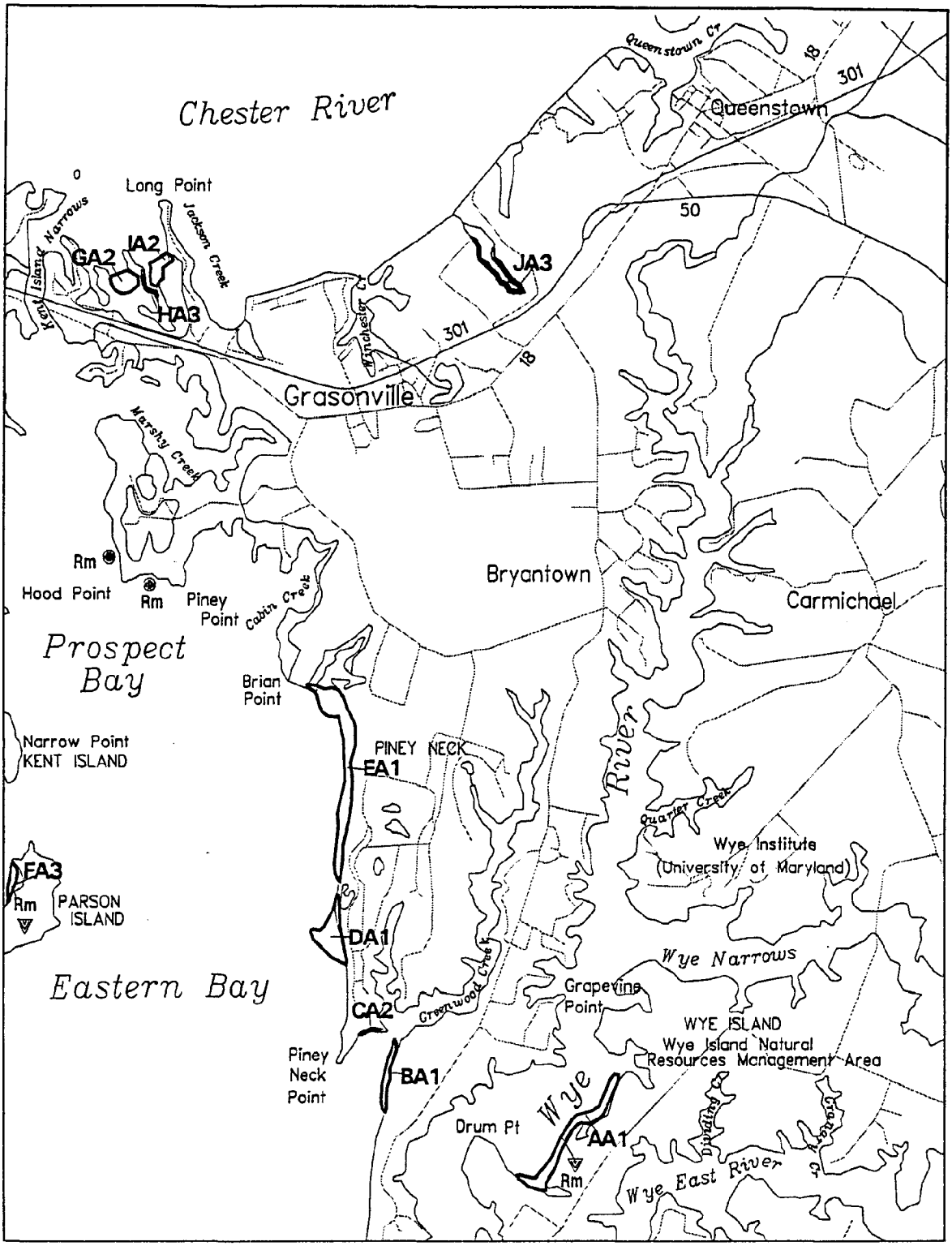
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 08-07-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Queenstown, MD. (033)



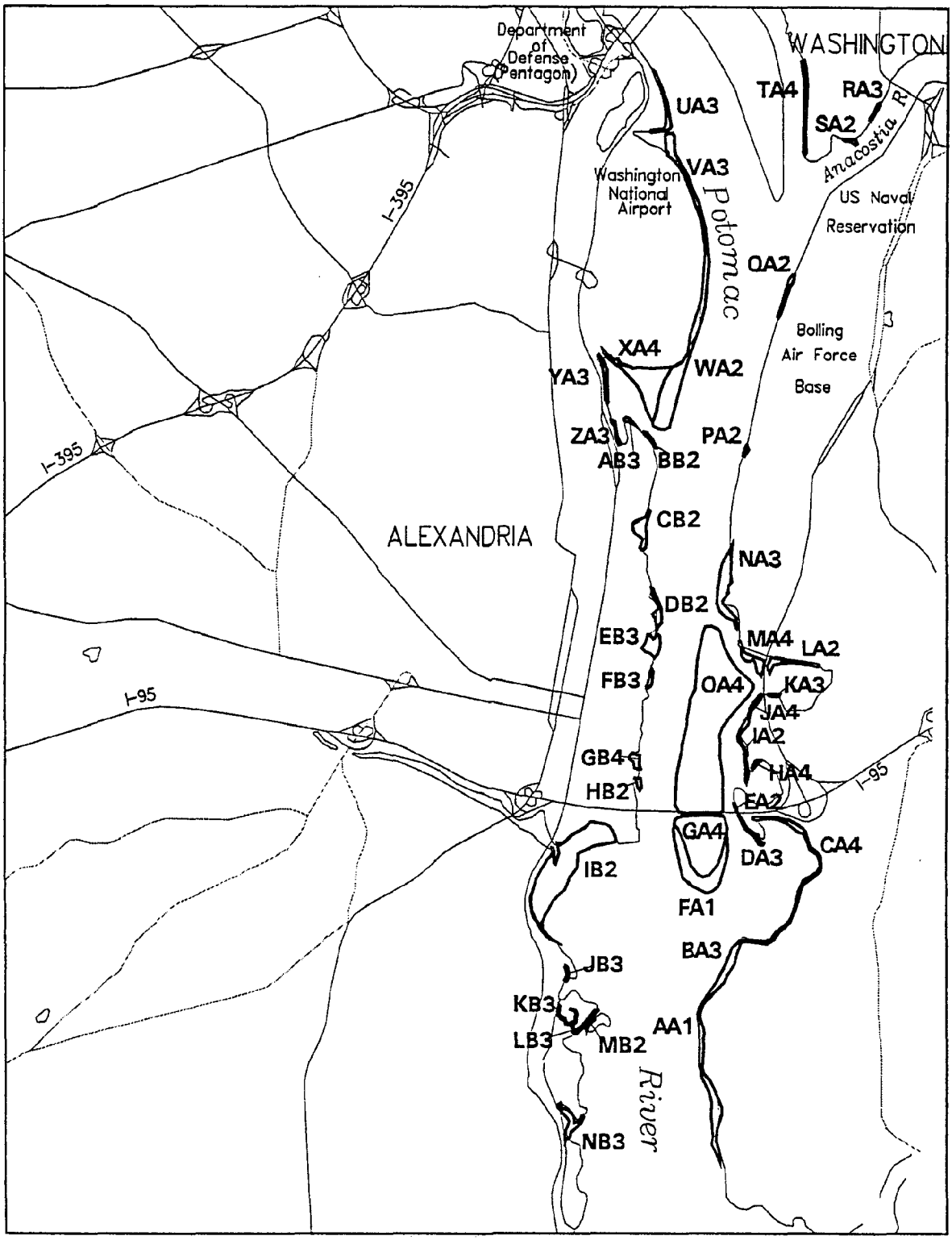
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 08-07-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Alexandria, VA.-D.C.-MD. (034)



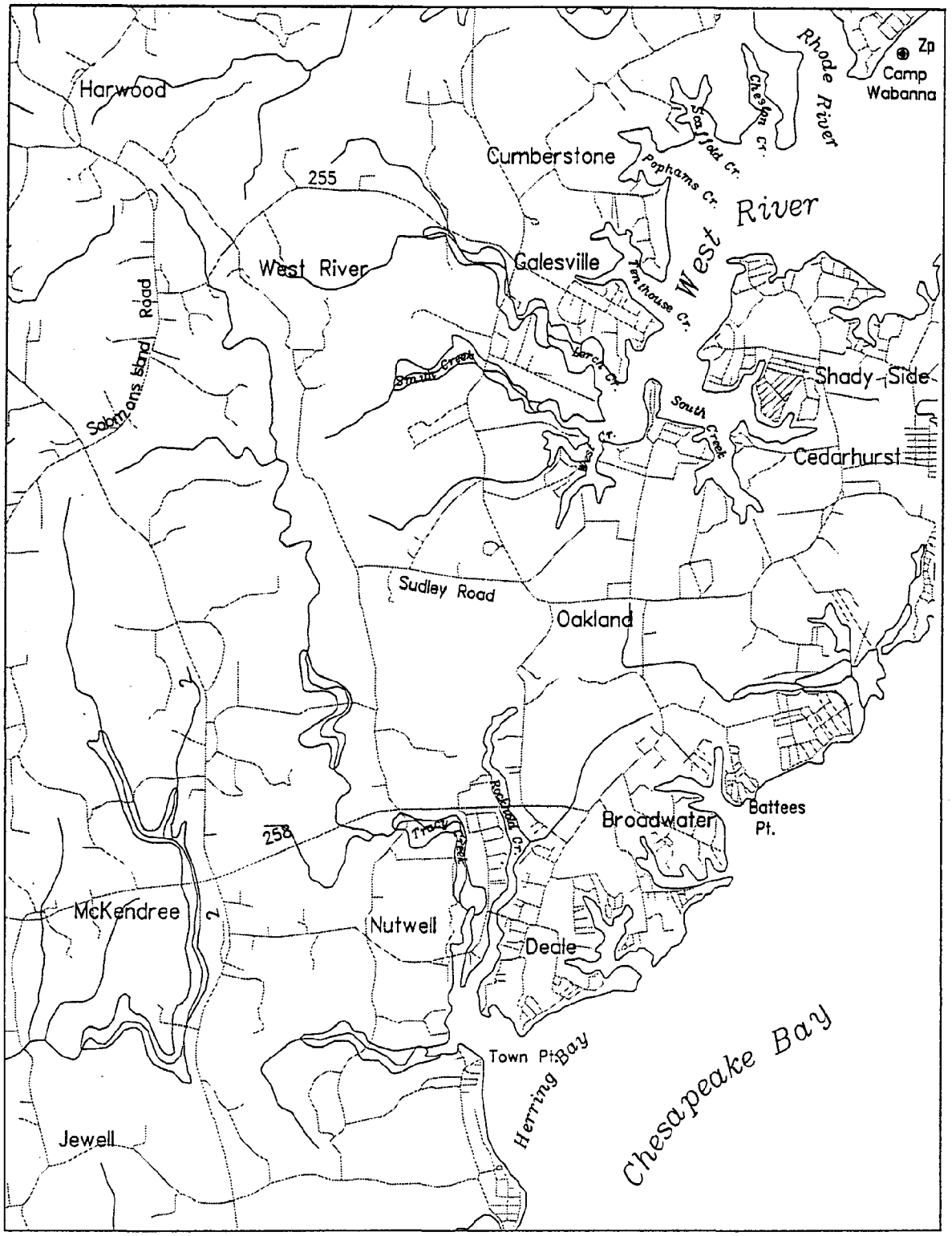
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 08-21-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Deale, MD. (035)



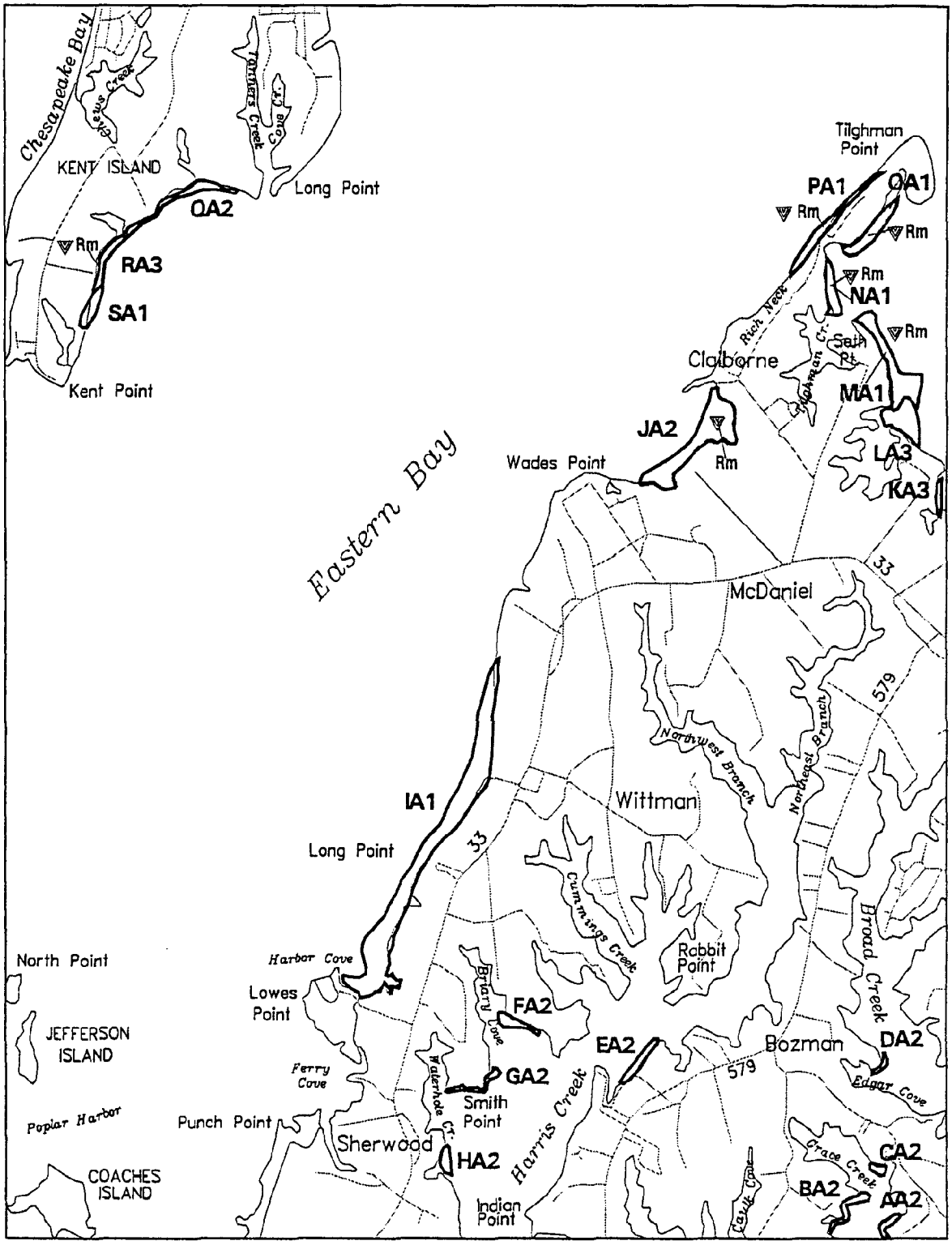
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 07-28-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Claiborne, MD. (036)



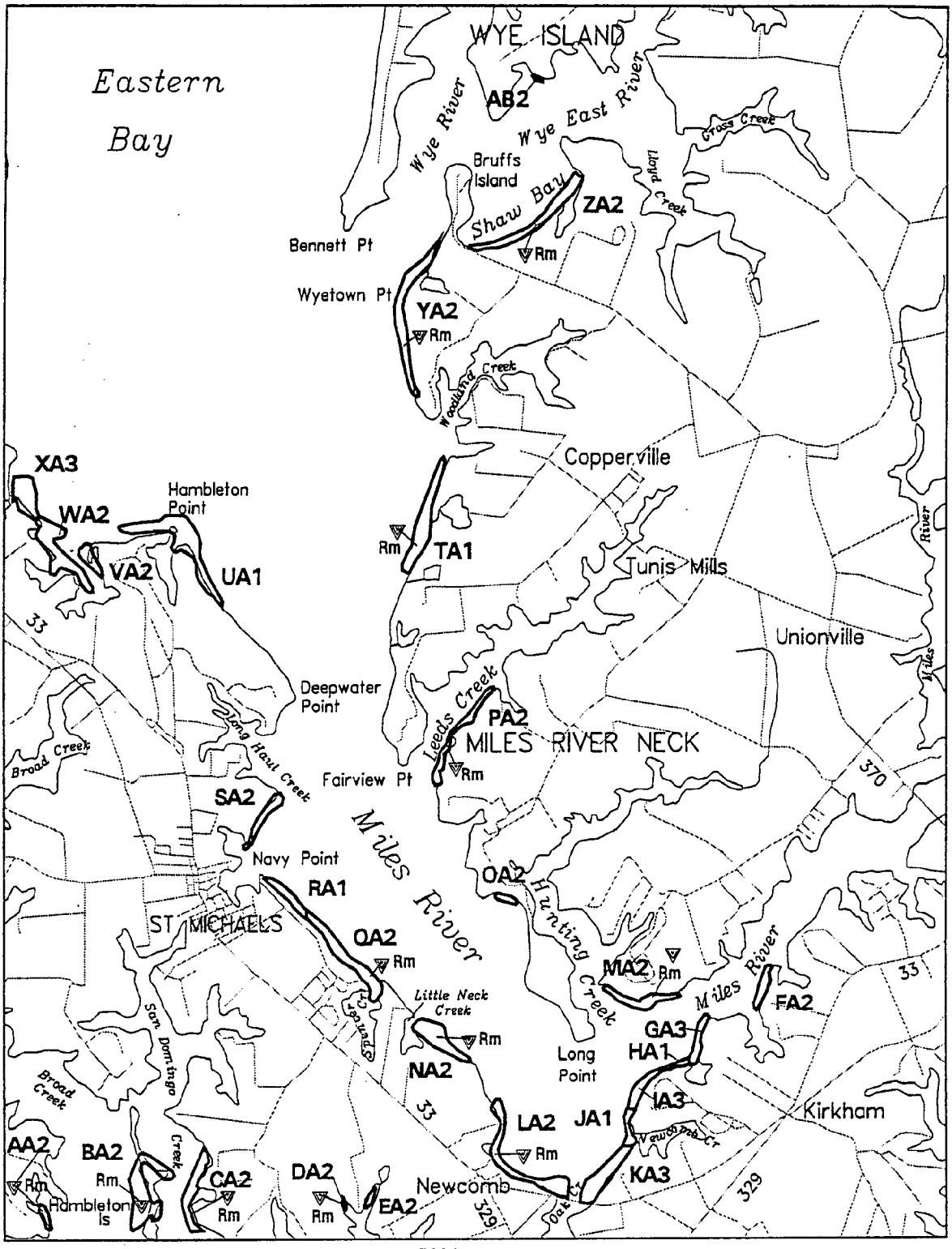
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 08-07-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
St. Michaels, MD. (037)



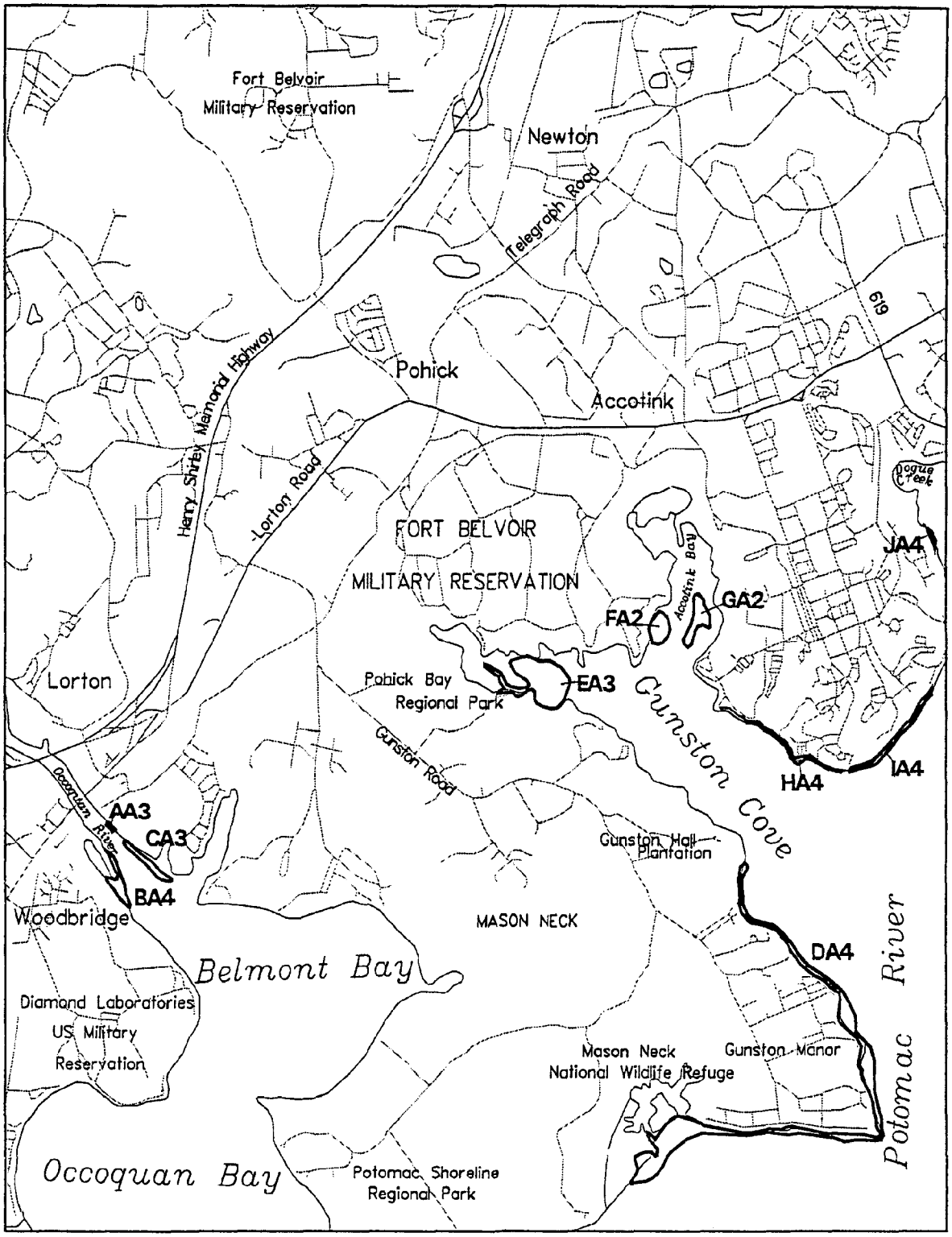
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 08-07-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Fort Belvoir, VA.-MD. (039)



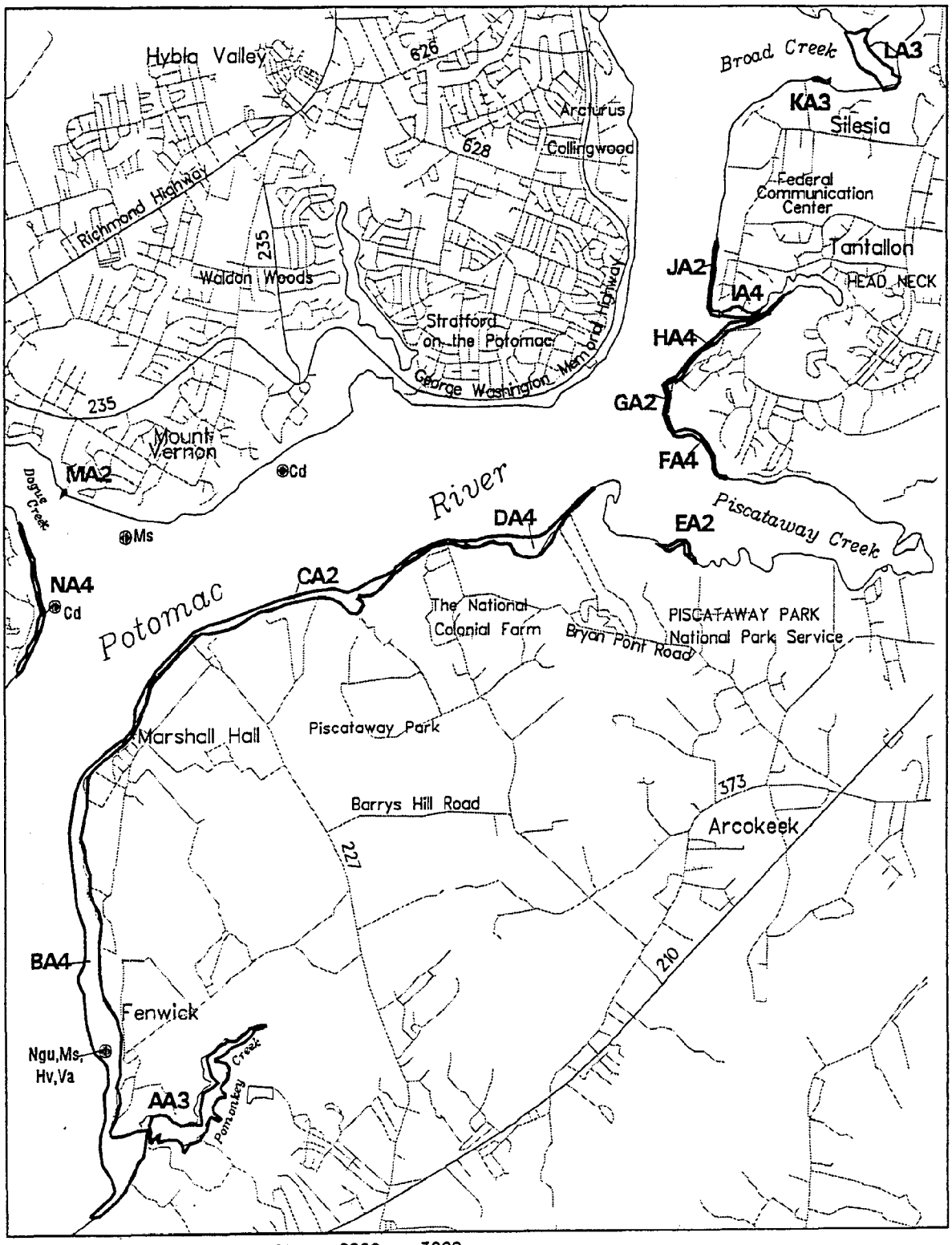
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 08-21-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Mt. Vernon, VA.-MD. (040)



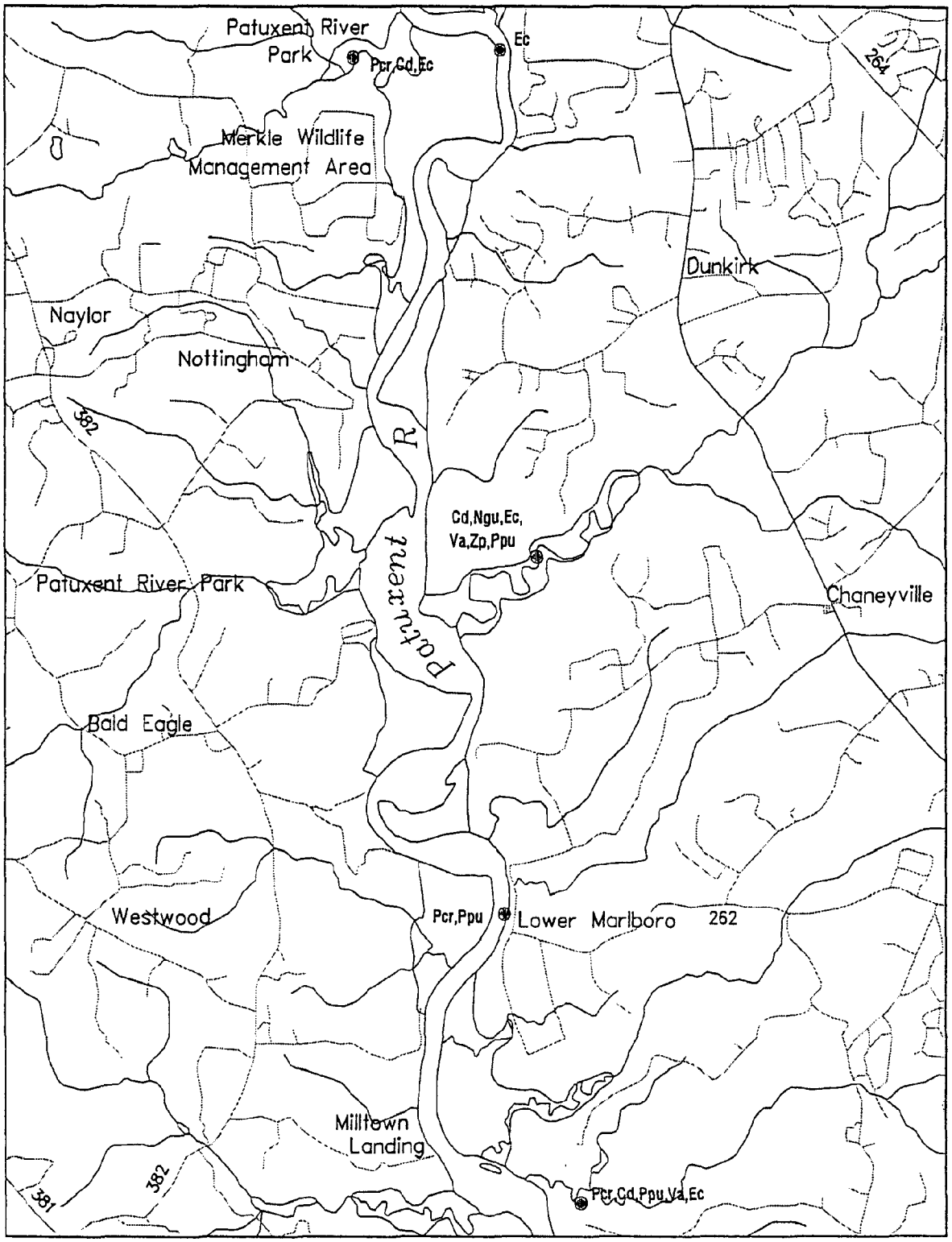
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 08-21-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Lower Marlboro, MD. (041)



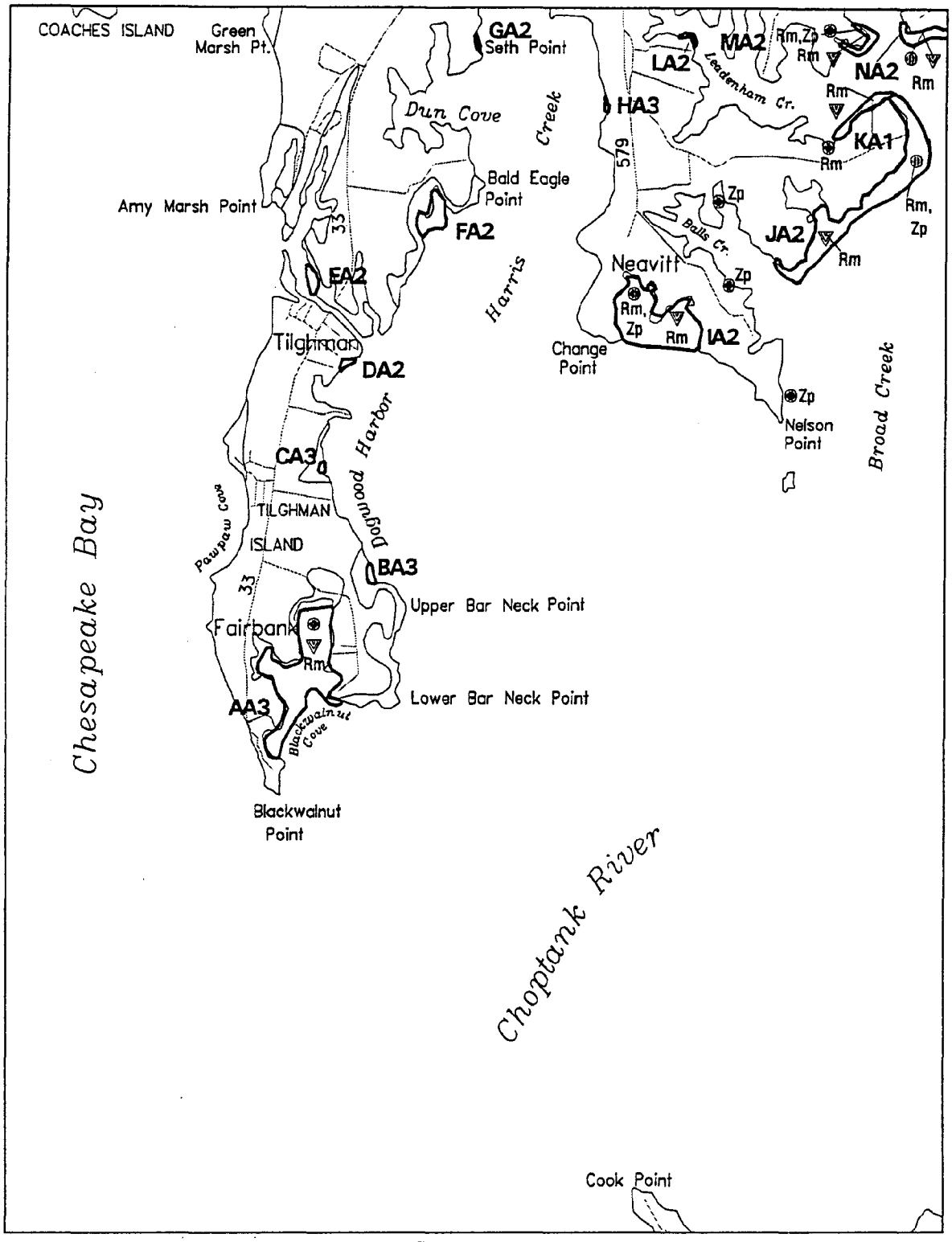
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 07-28-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Tilghman, MD. (043)



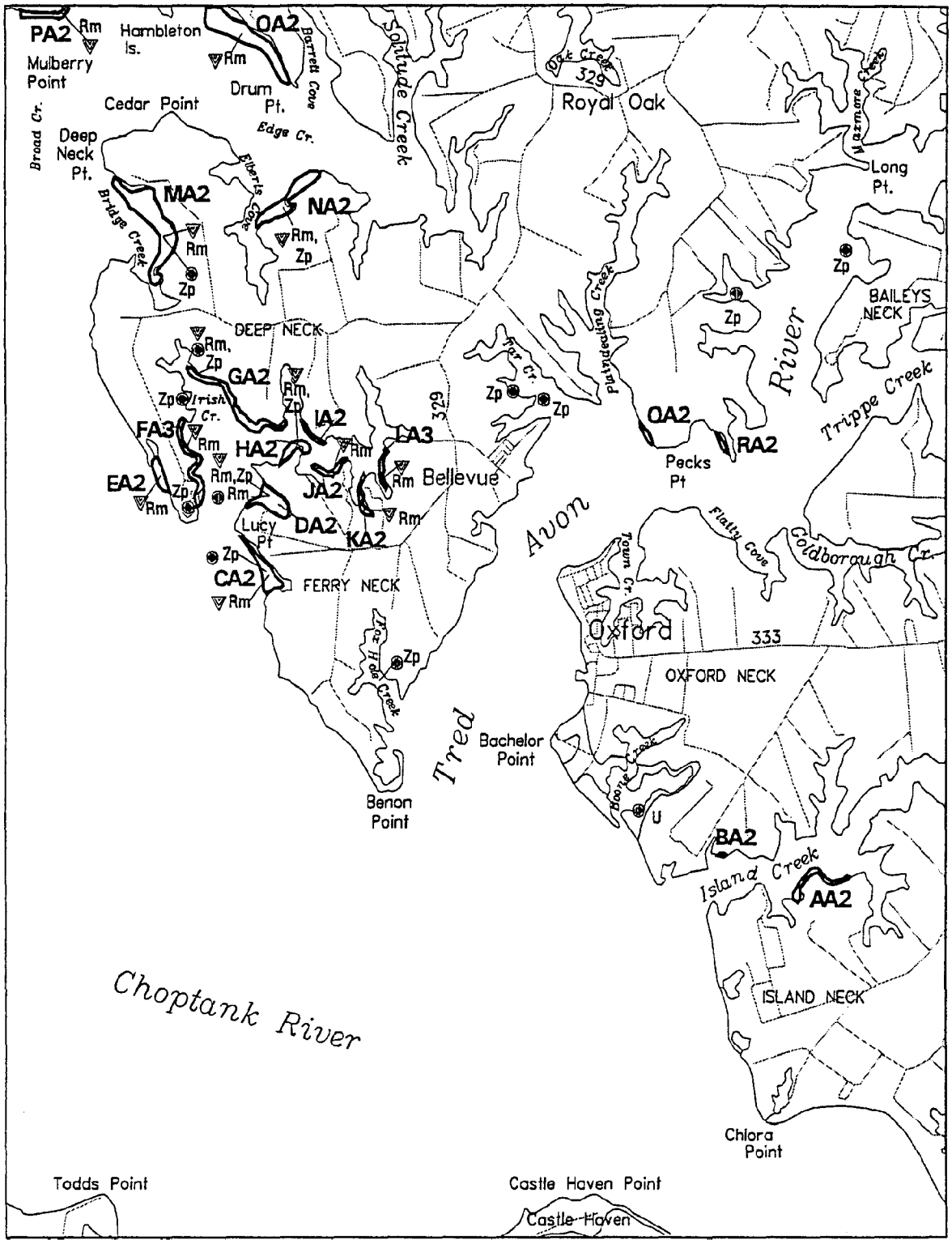
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 08-07-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Oxford, MD. (044)



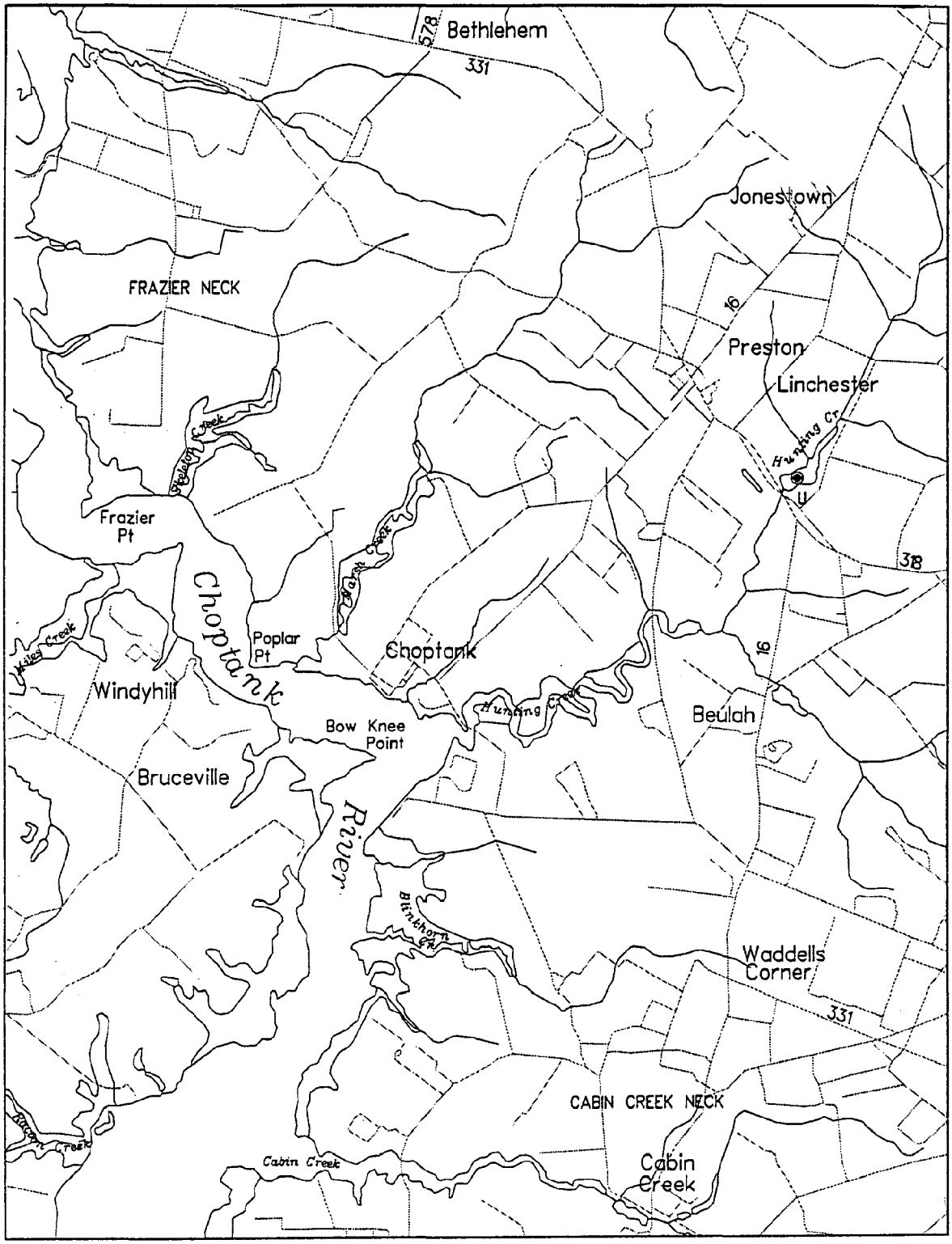
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 08-07-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Preston, MD. (046)



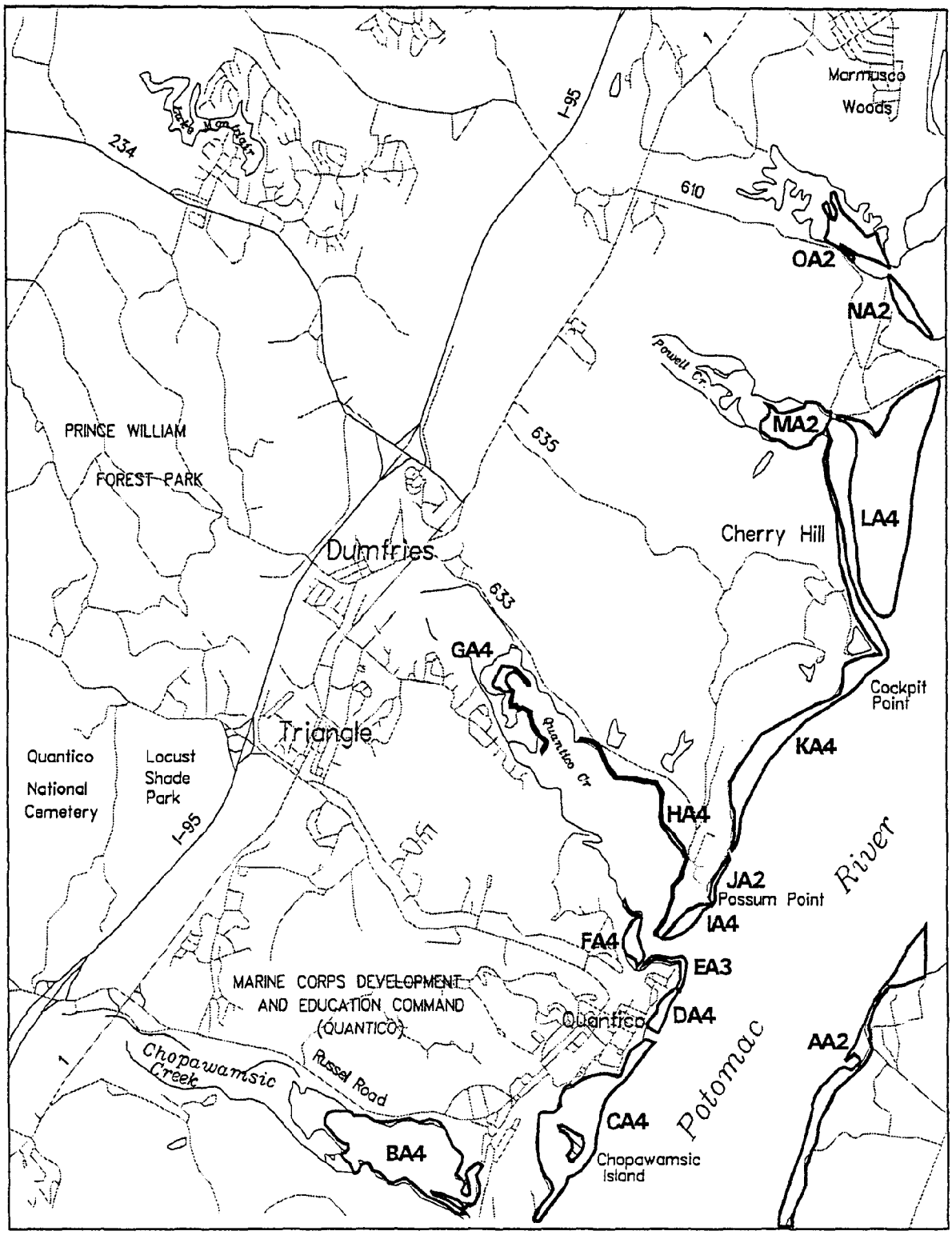
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 08-10-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Quantico, VA.-MD. (047)



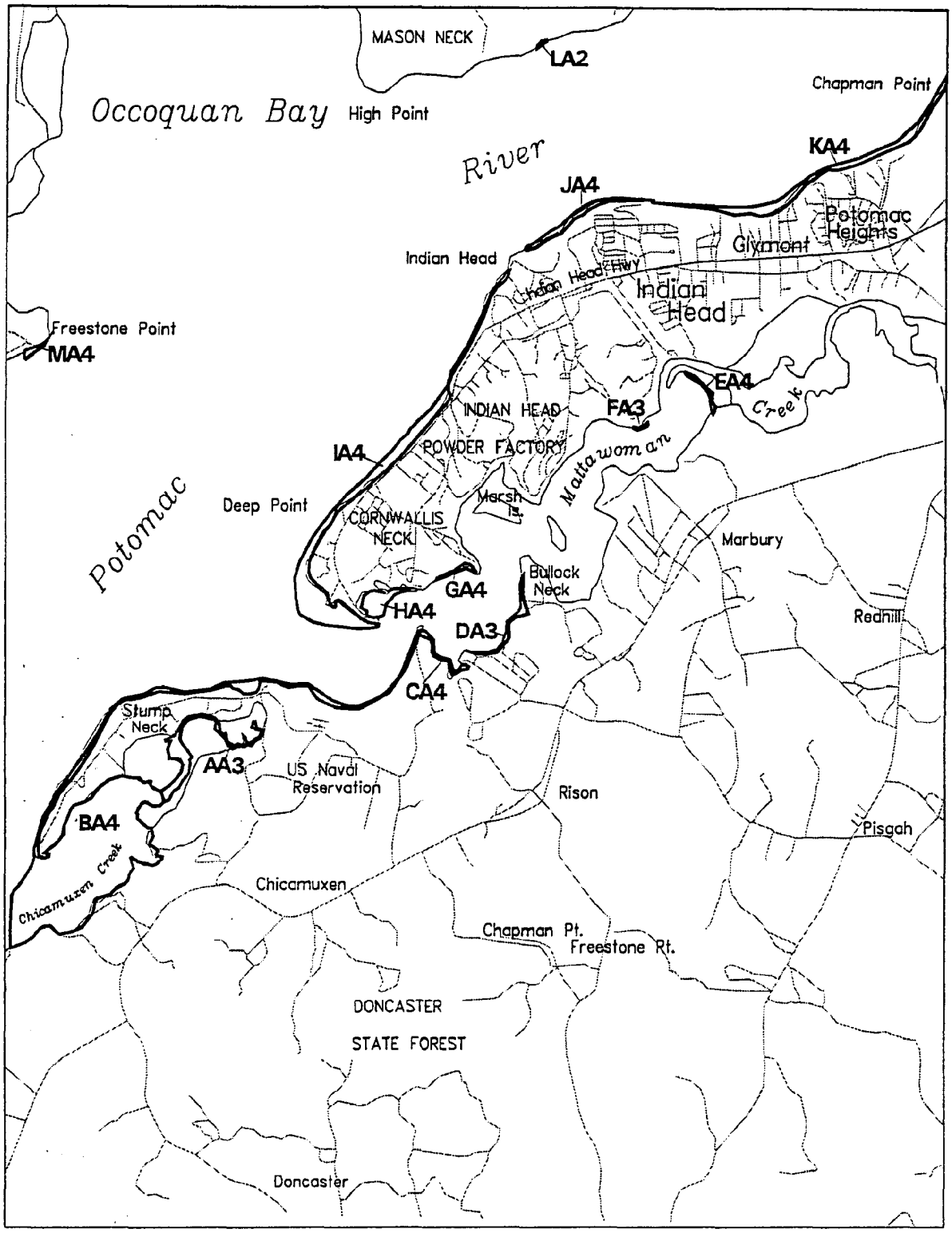
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 08-21-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Indian Head, MD.- VA. (048)



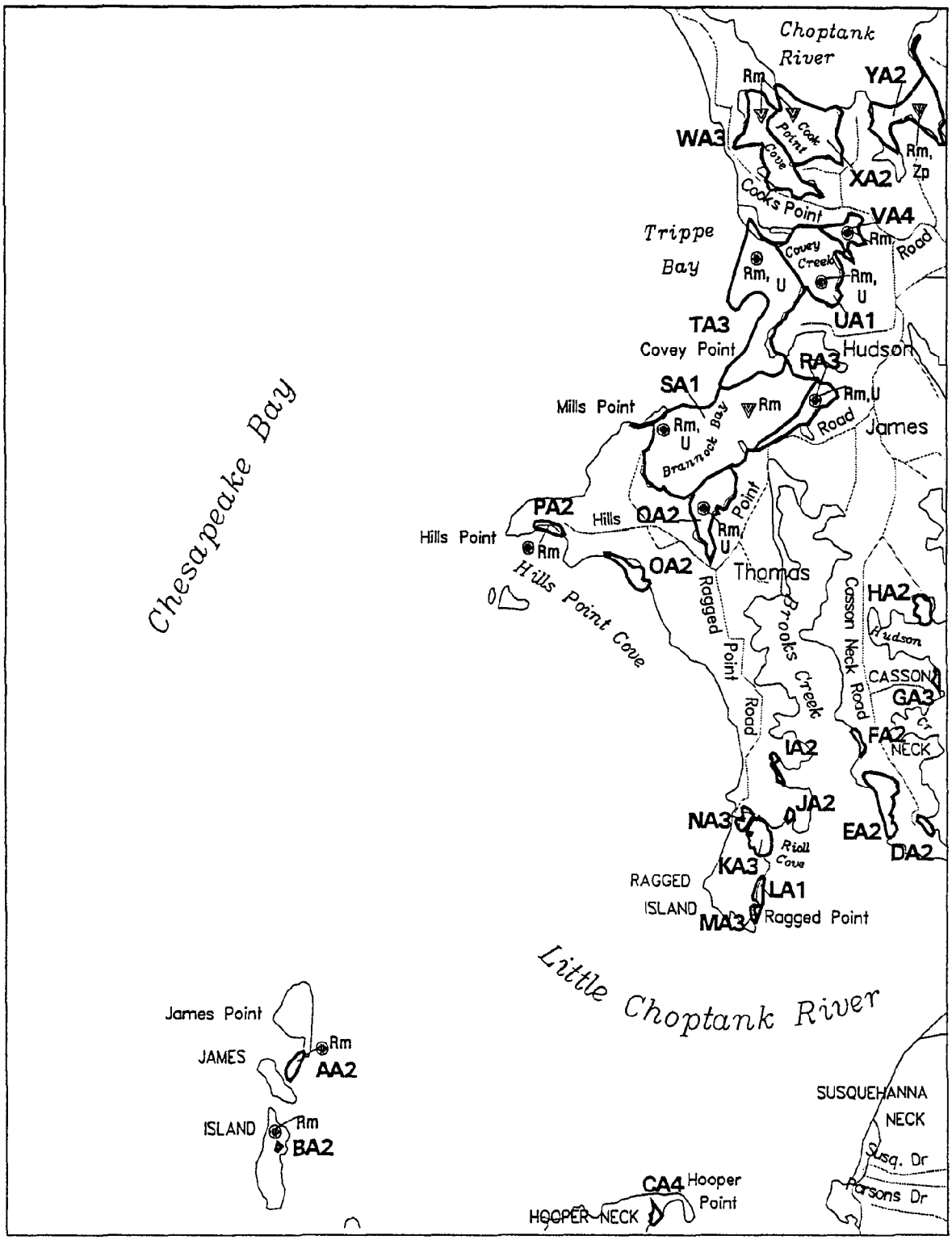
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 08-21-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Hudson, MD. (051)



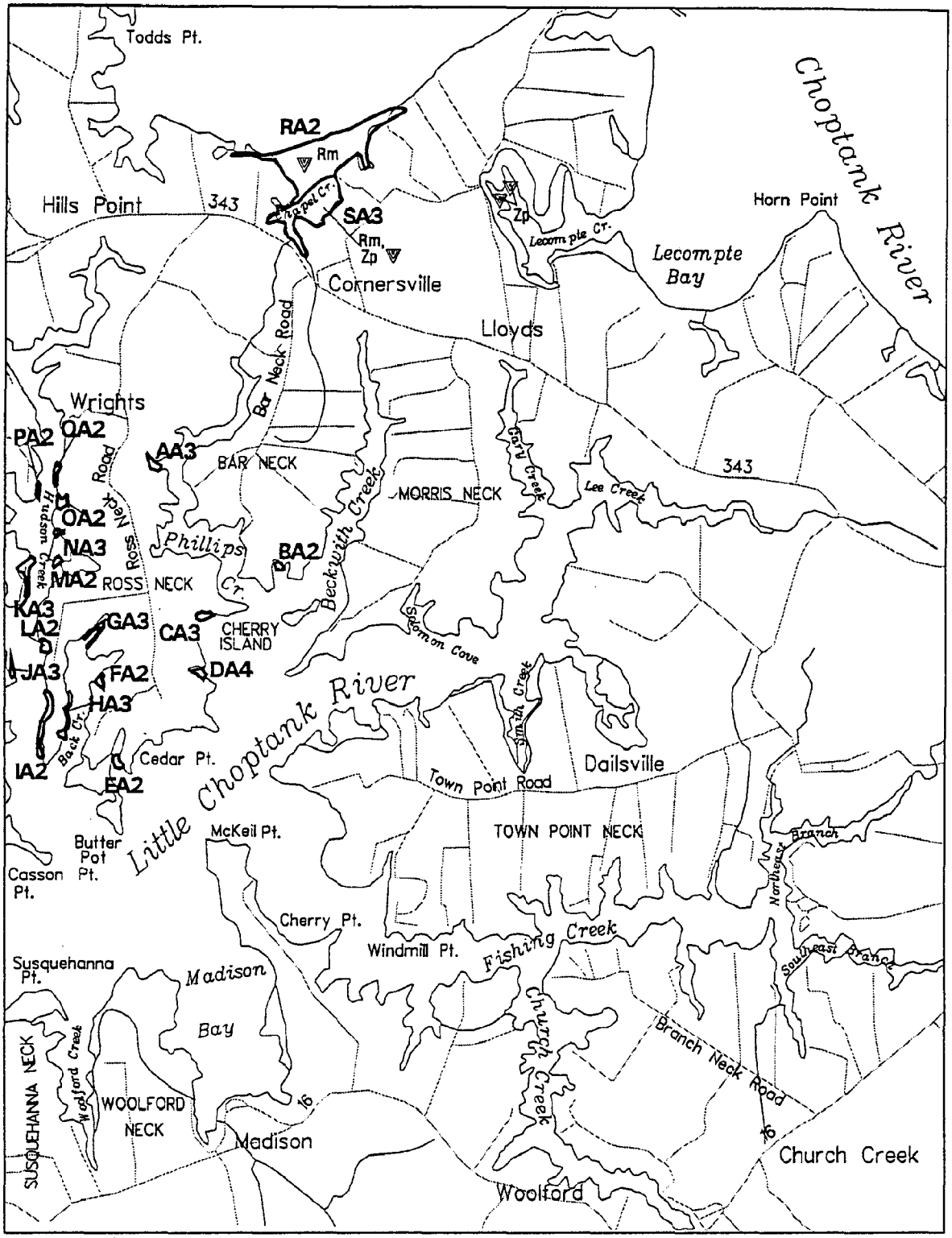
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 07-14-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Church Creek, MD. (052)



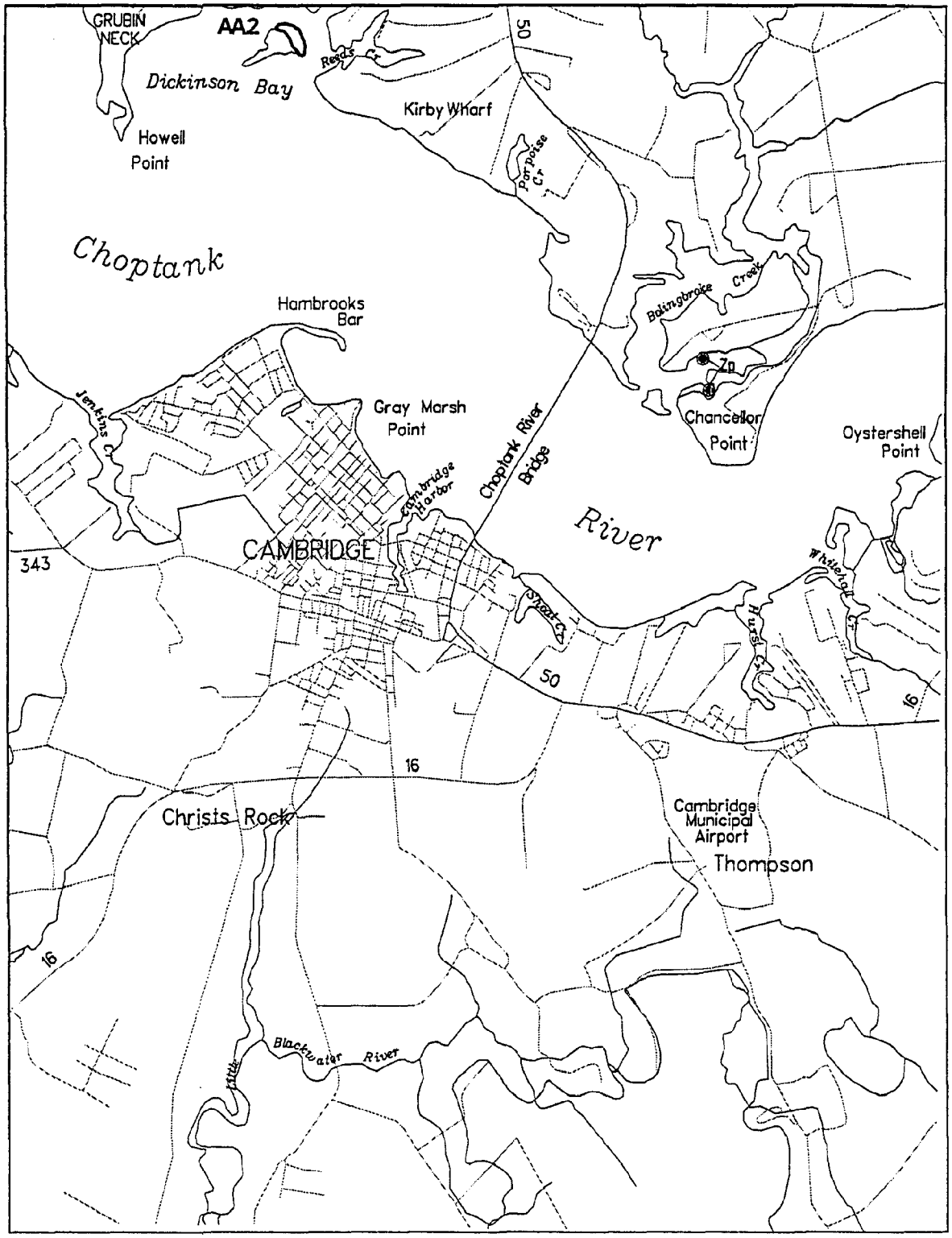
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 07-14-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Cambridge, MD. (053)



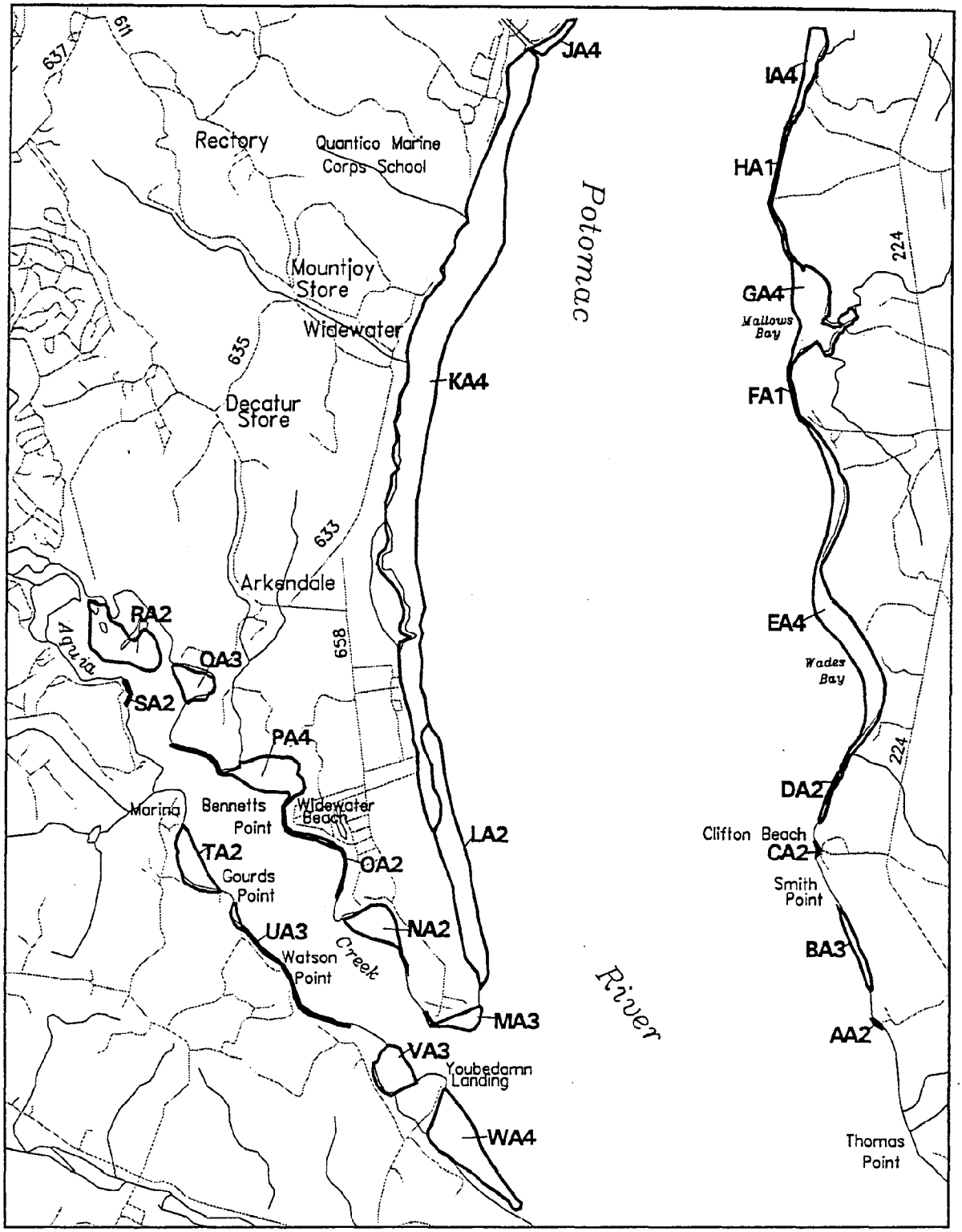
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 07-14-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Widewater, VA.-MD. (055)



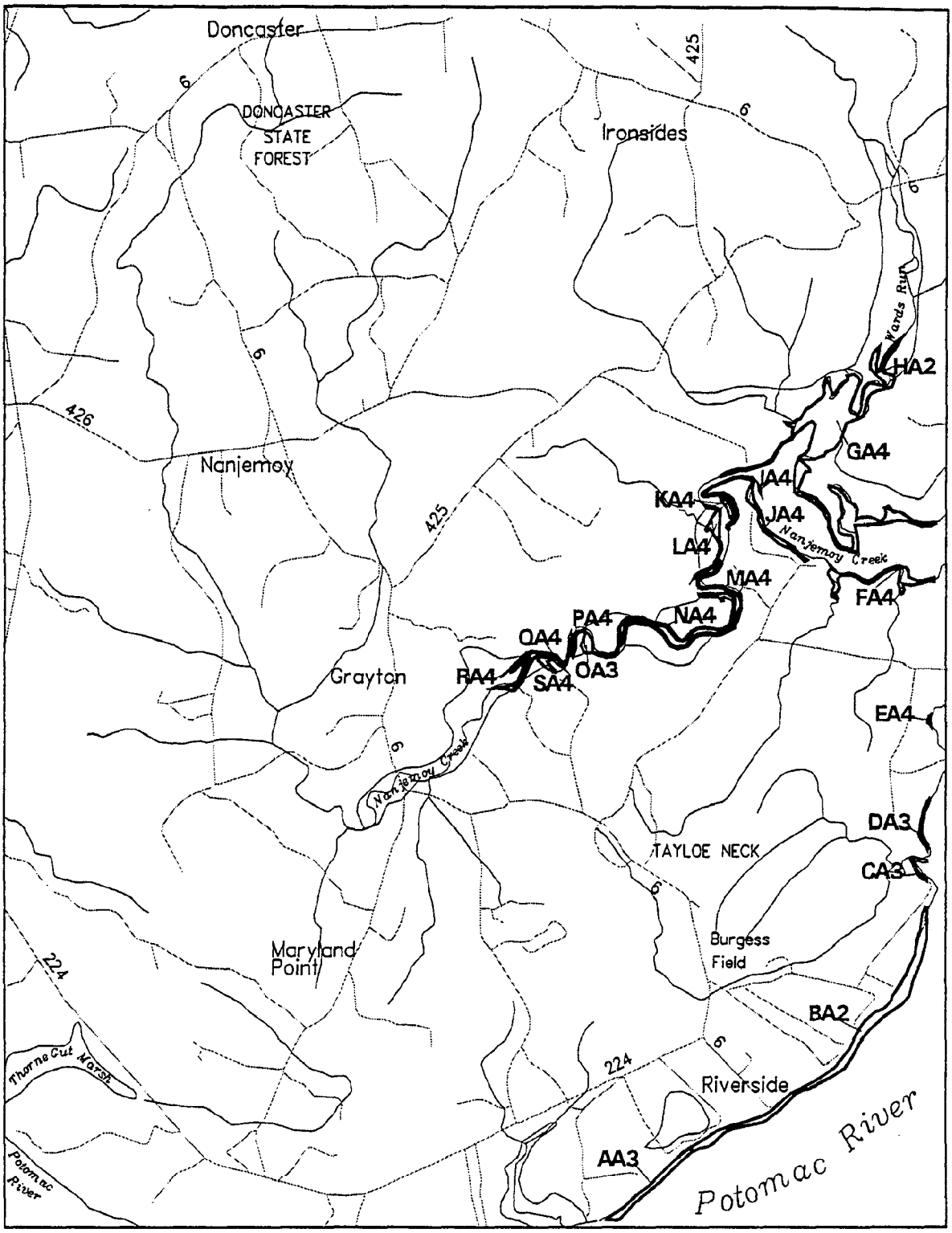
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 08-21-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Nanjemoy, MD. (056)



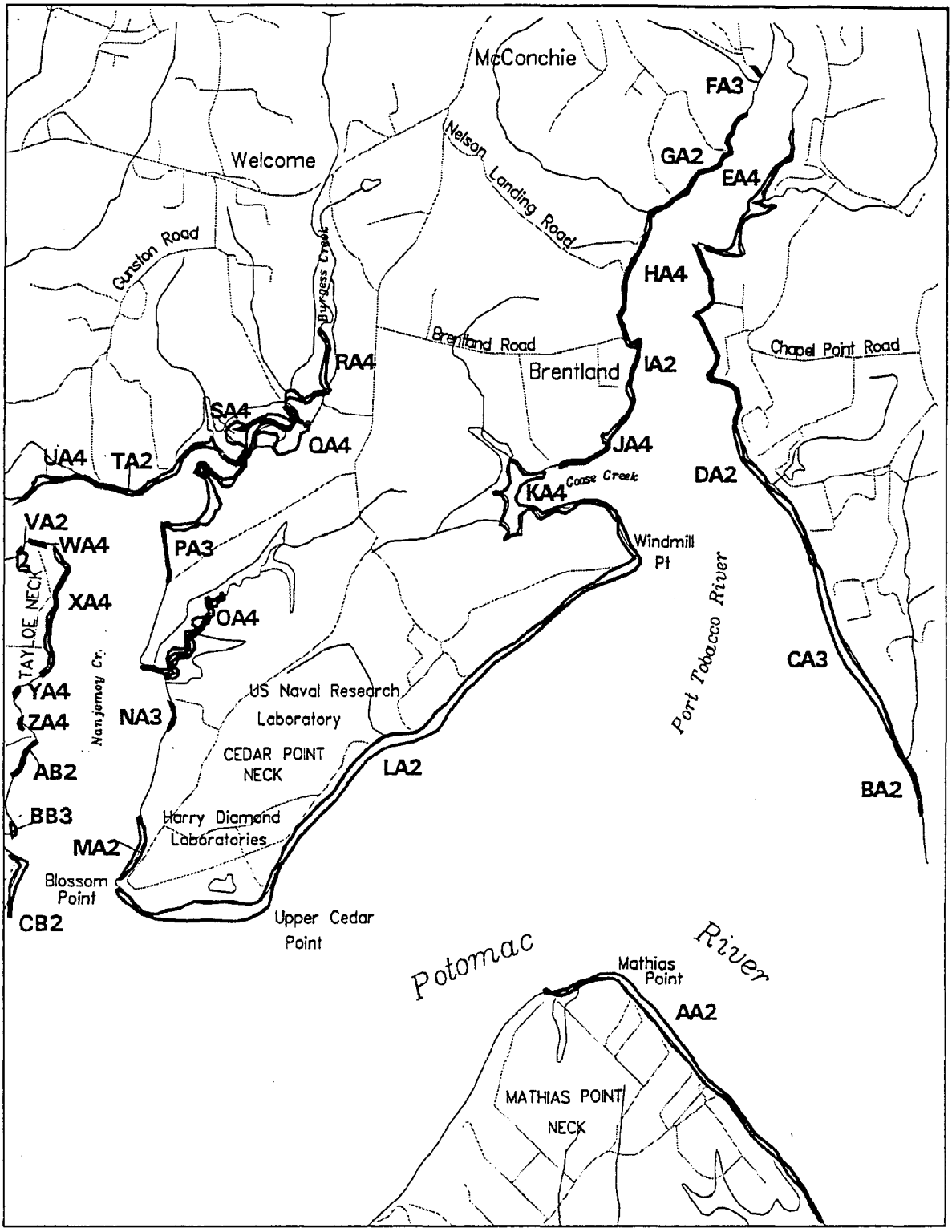
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 09-13-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Mathias Point, MD.-VA. (057)



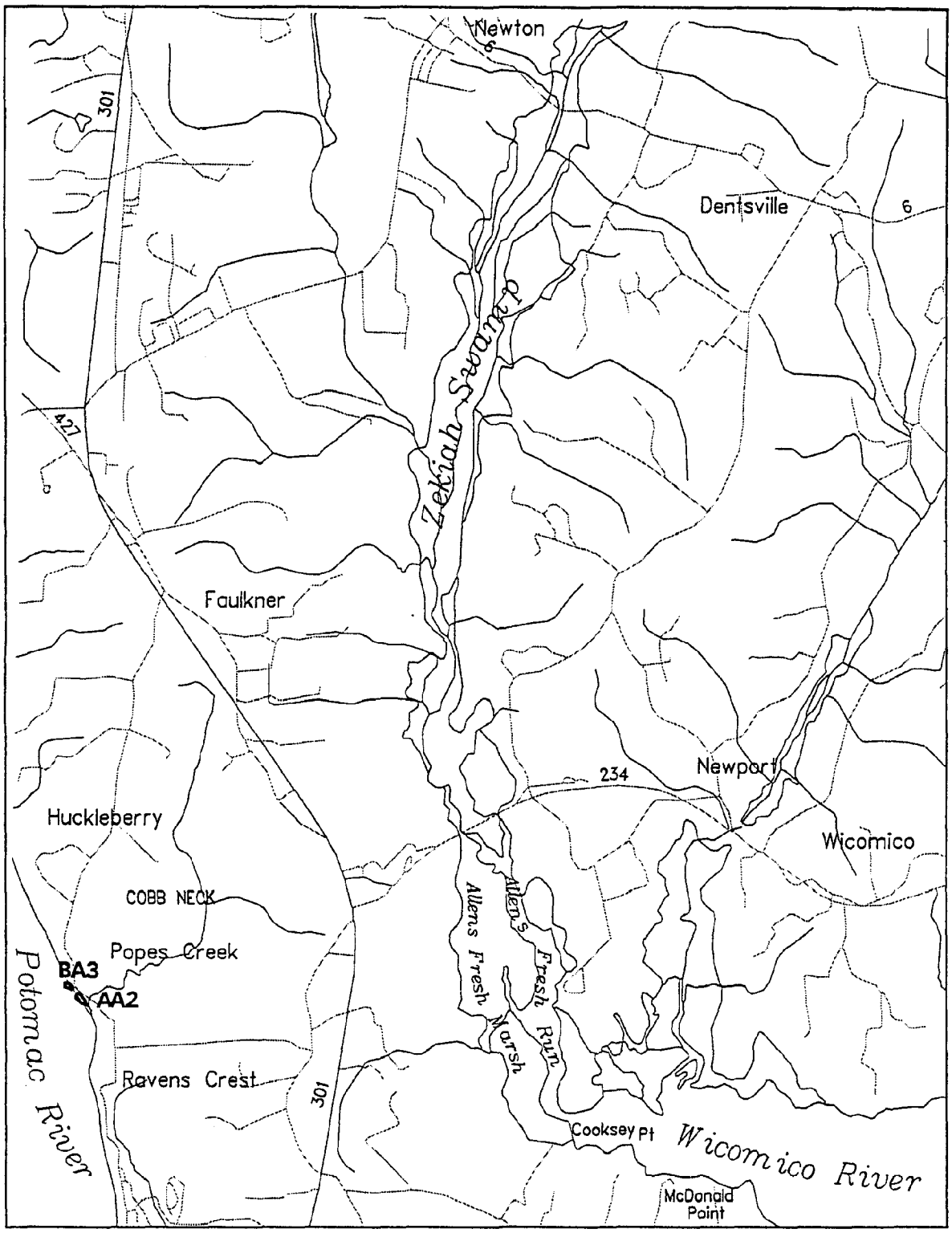
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 09-13-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Popes Creek, MD. (058)



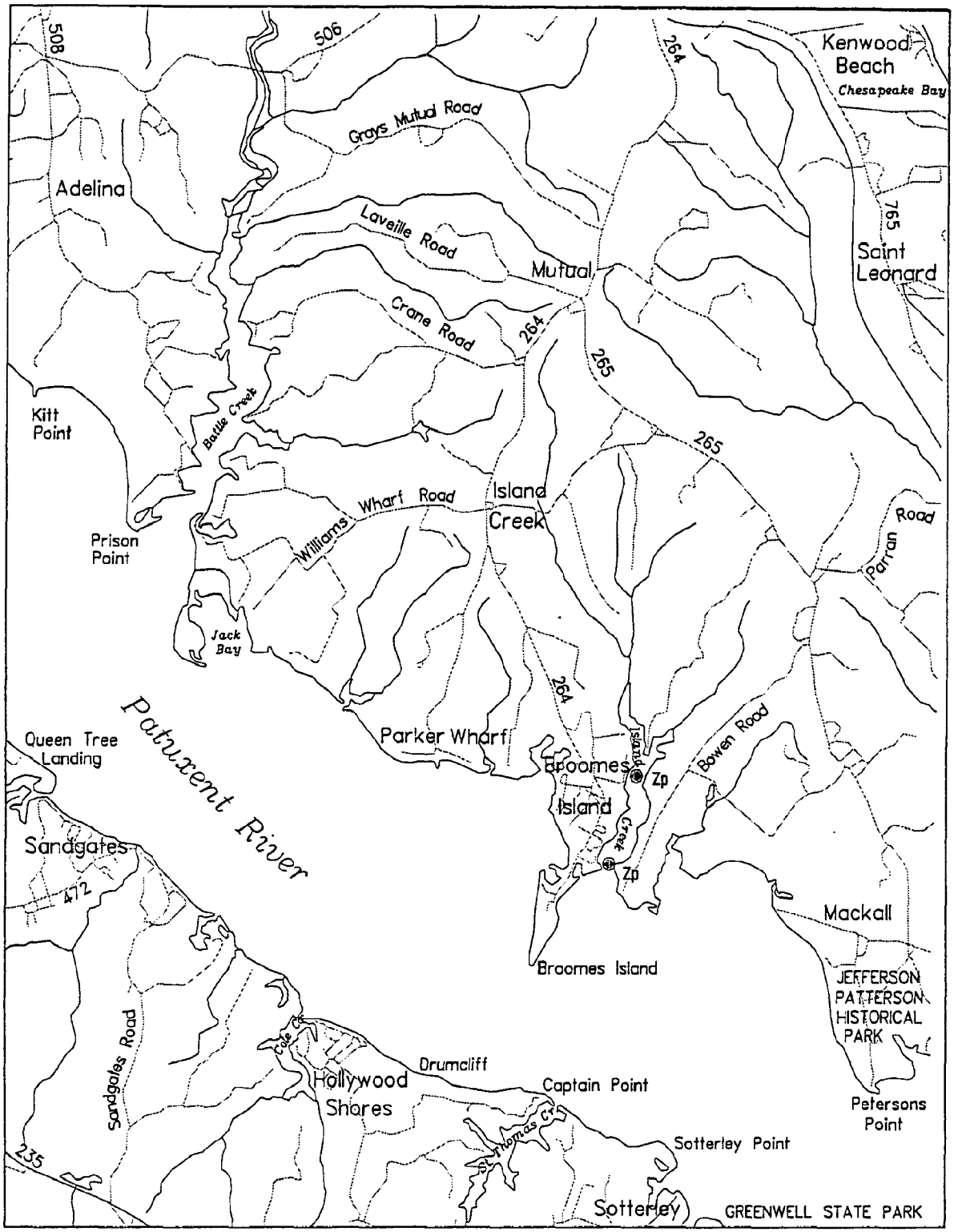
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 07-01-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Broomes Island, MD. (060)



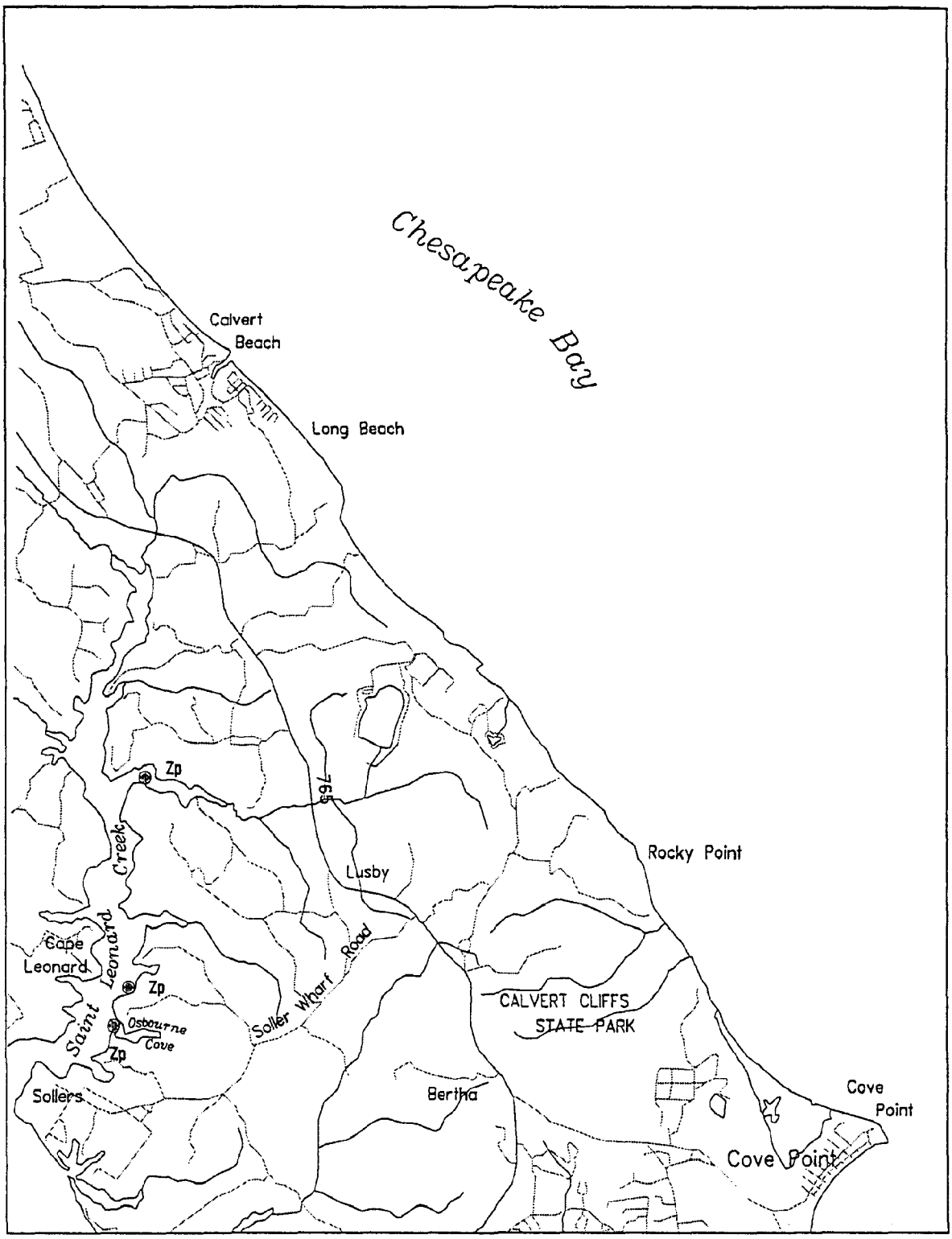
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 07-28-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Cove Point, MD. (061)



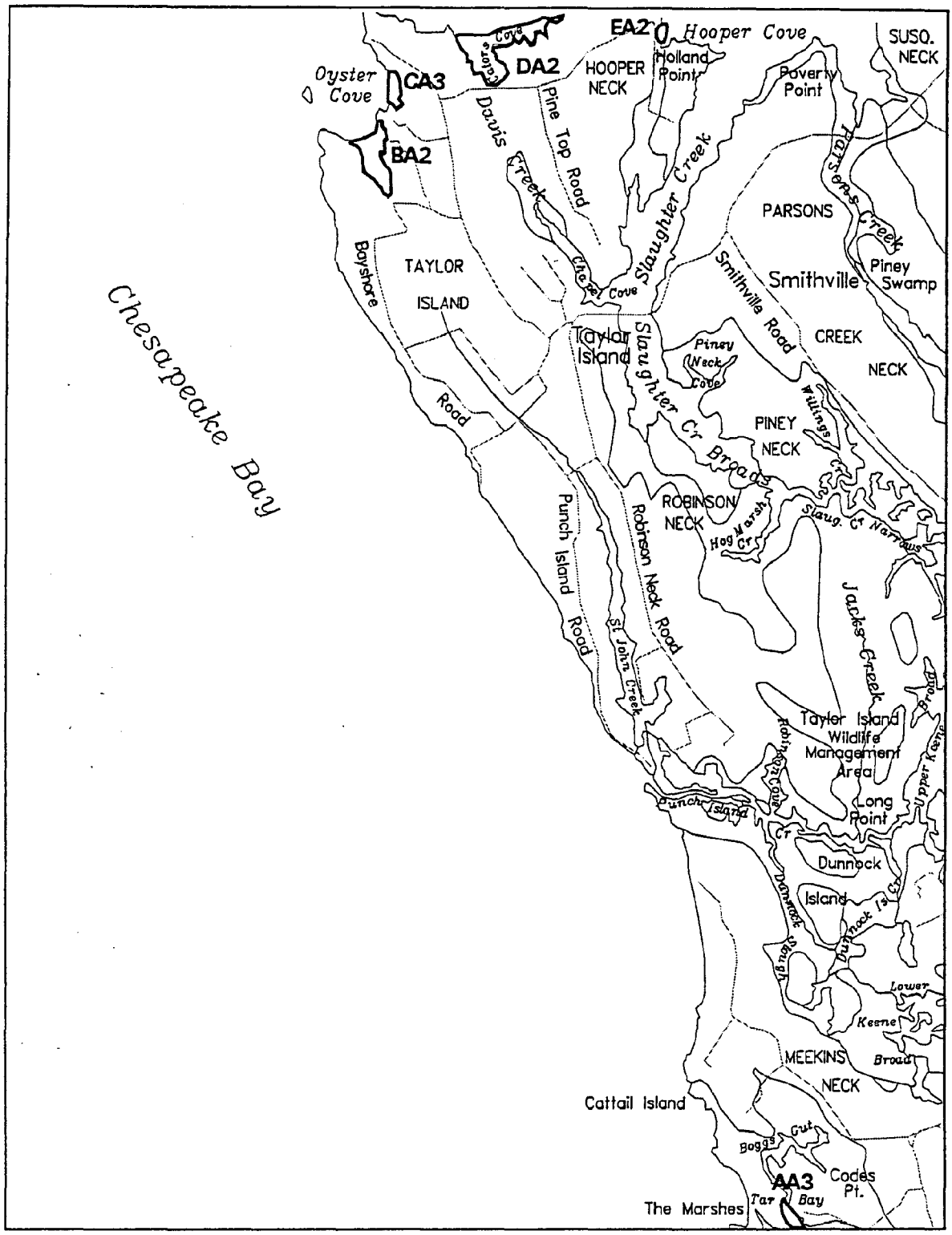
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 07-28-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Taylors Island, MD. (062)



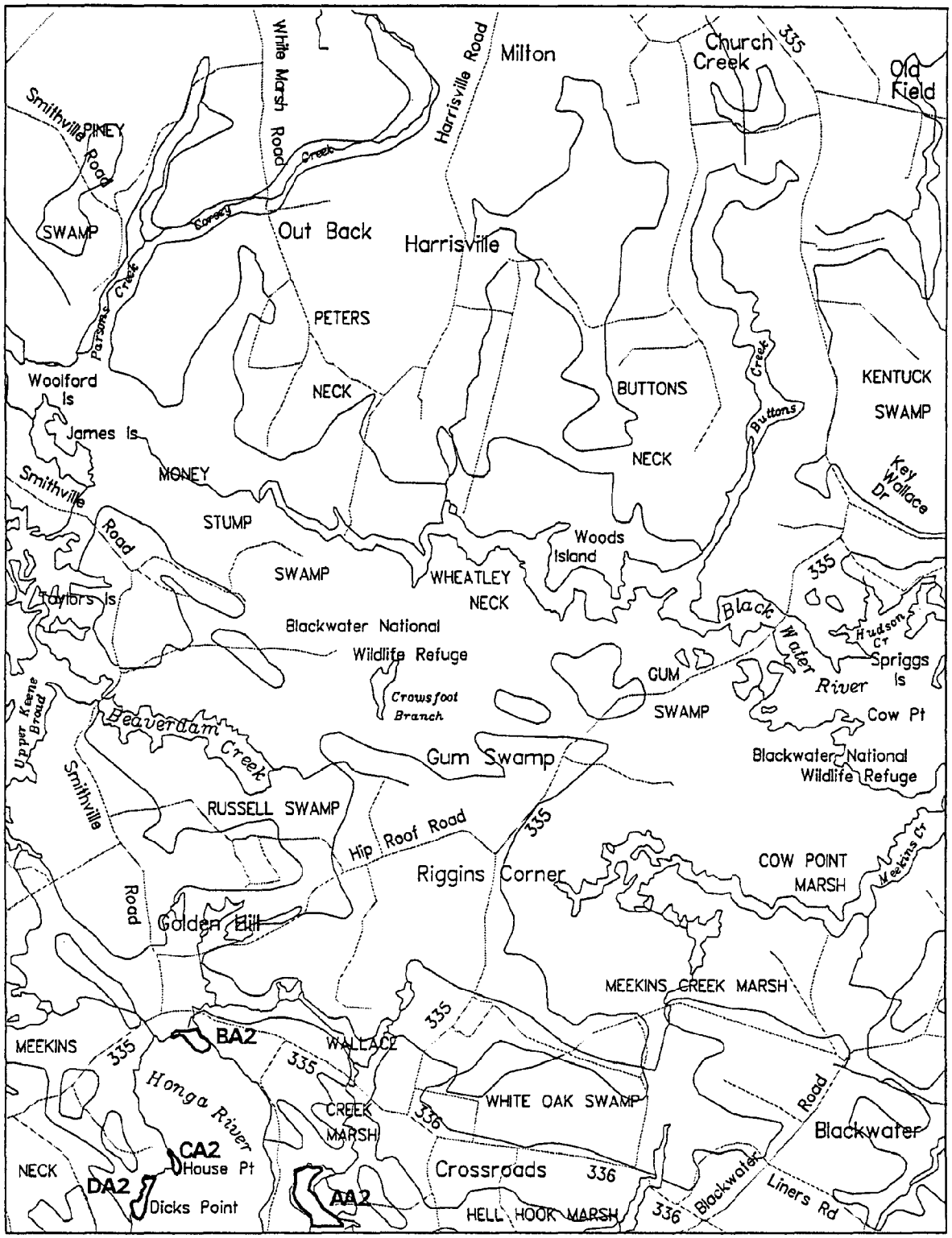
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 07-14-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Golden Hill, MD. (063)



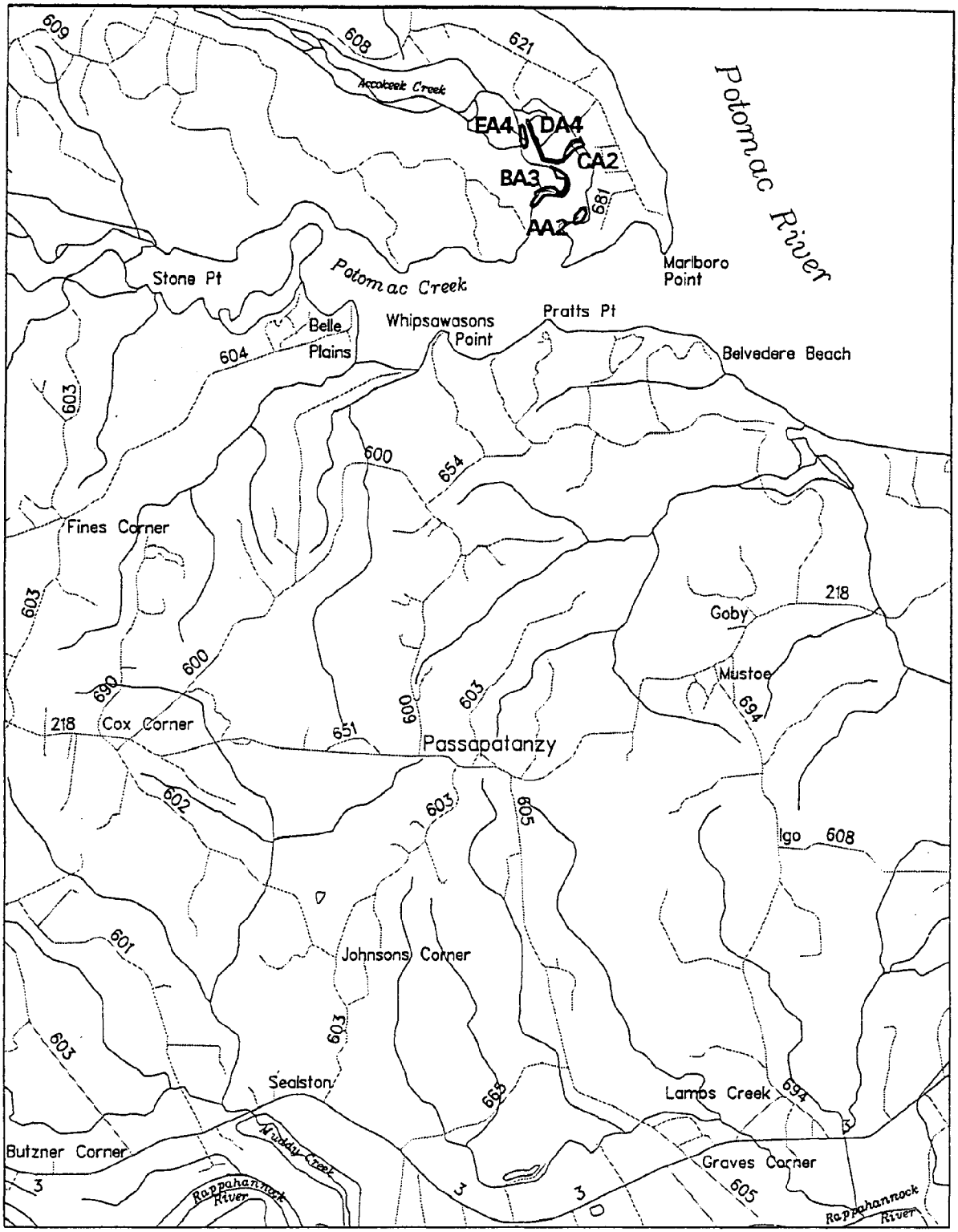
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 07-14-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Passapatanzy, MD.-VA. (064)



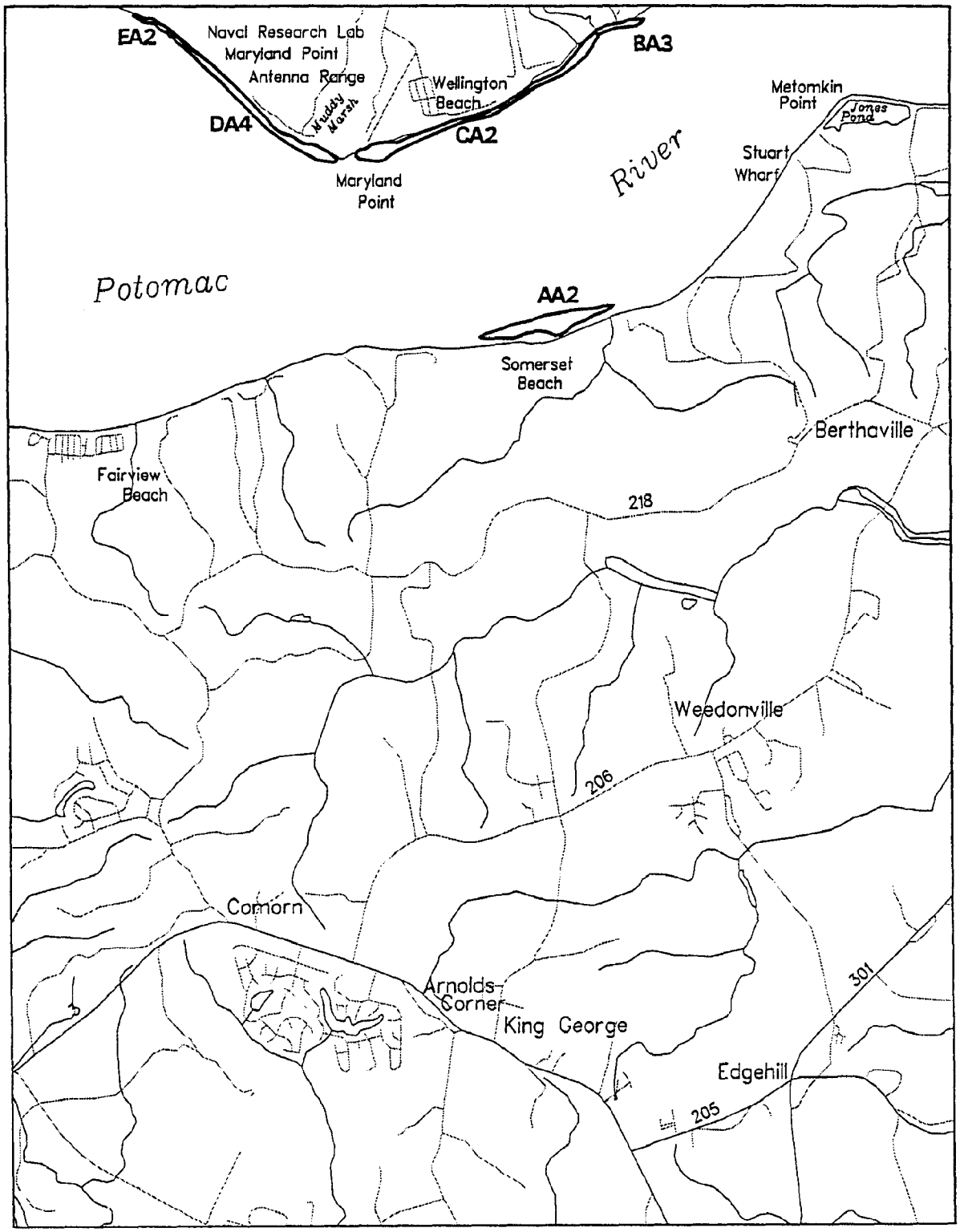
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 09-13-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
King George, VA.-MD. (065)



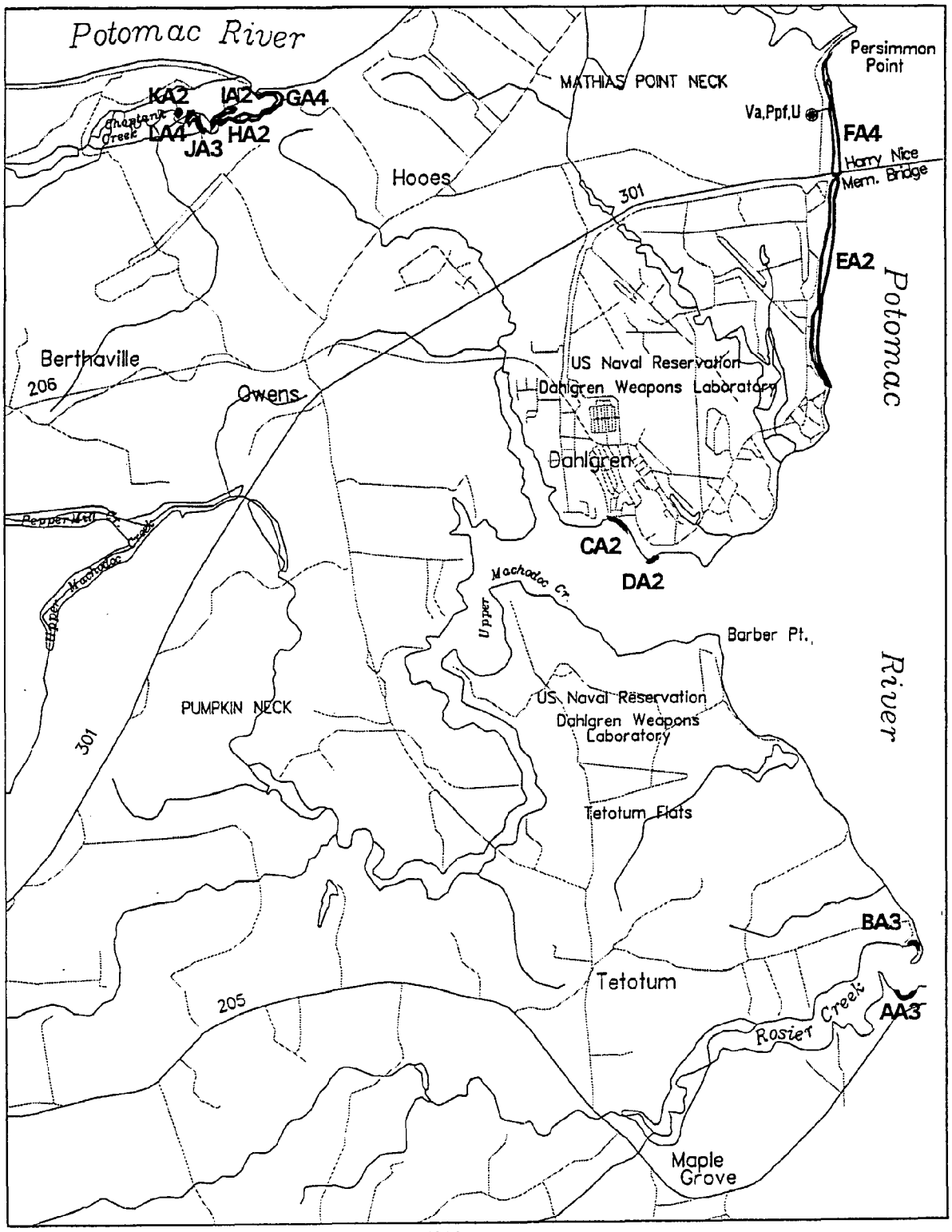
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 09-13-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Dahlgren, VA.-MD. (066)



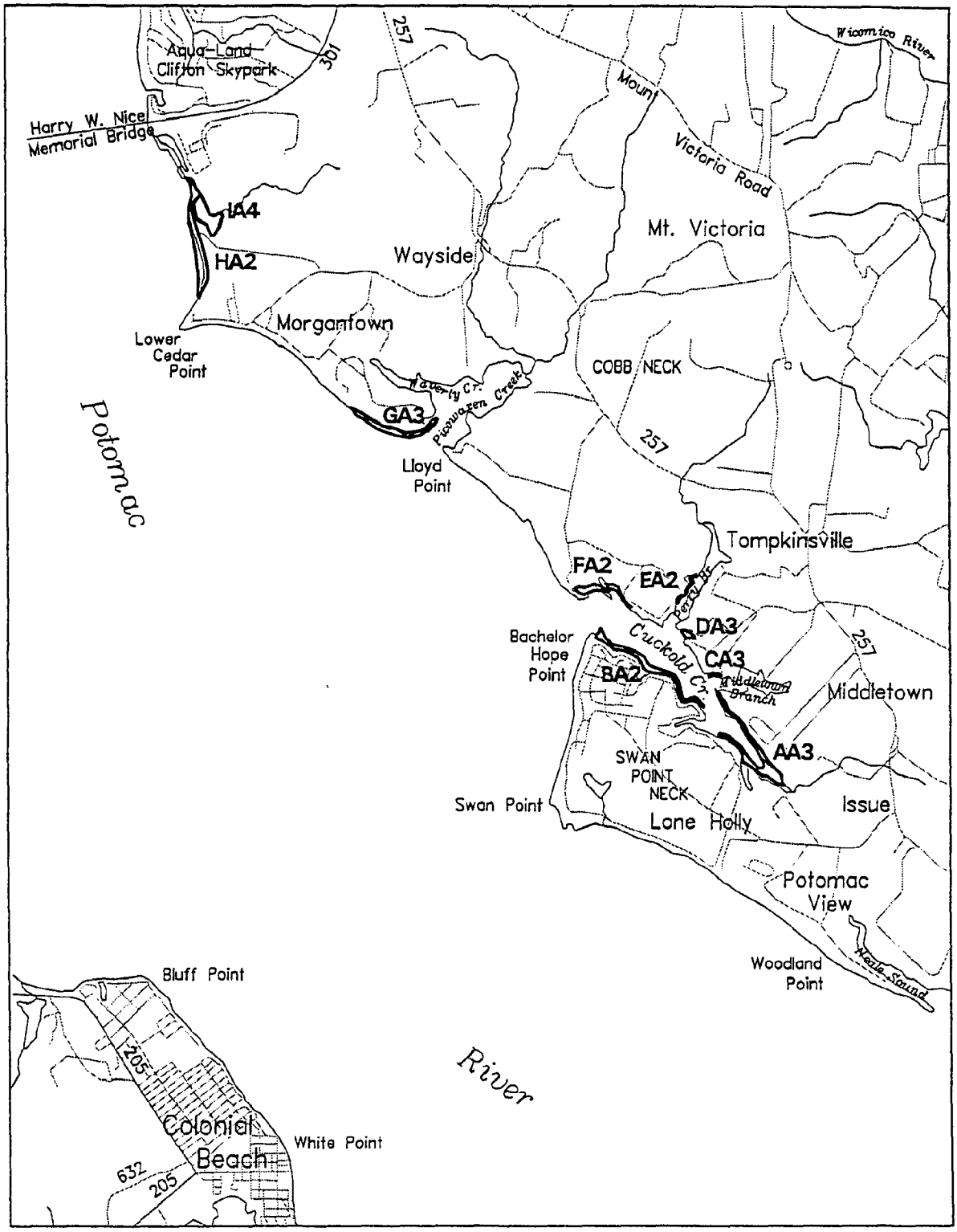
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 08-10-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Colonial Beach North, VA.-MD. (067)



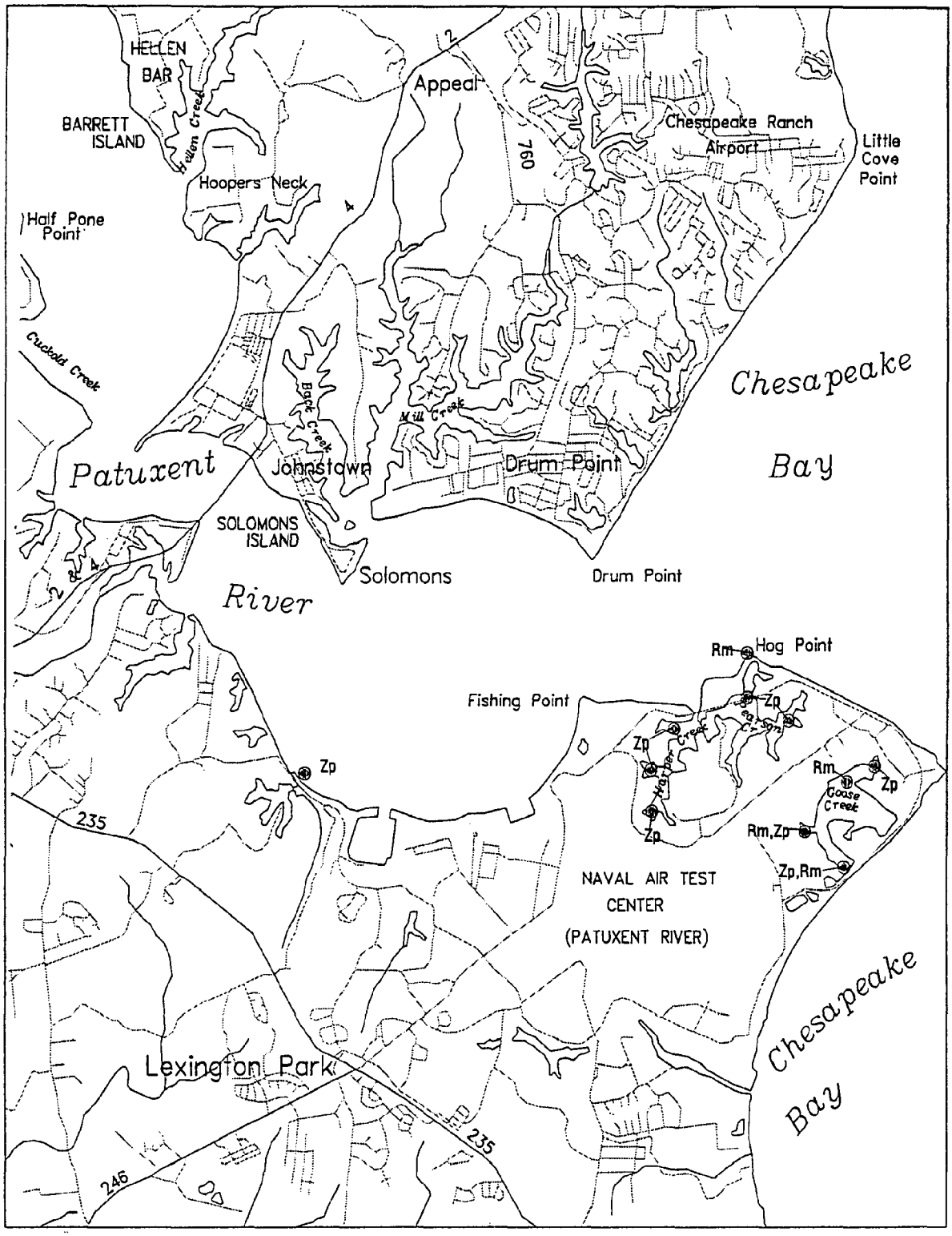
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 08-21-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Solomons Island, MD. (071)



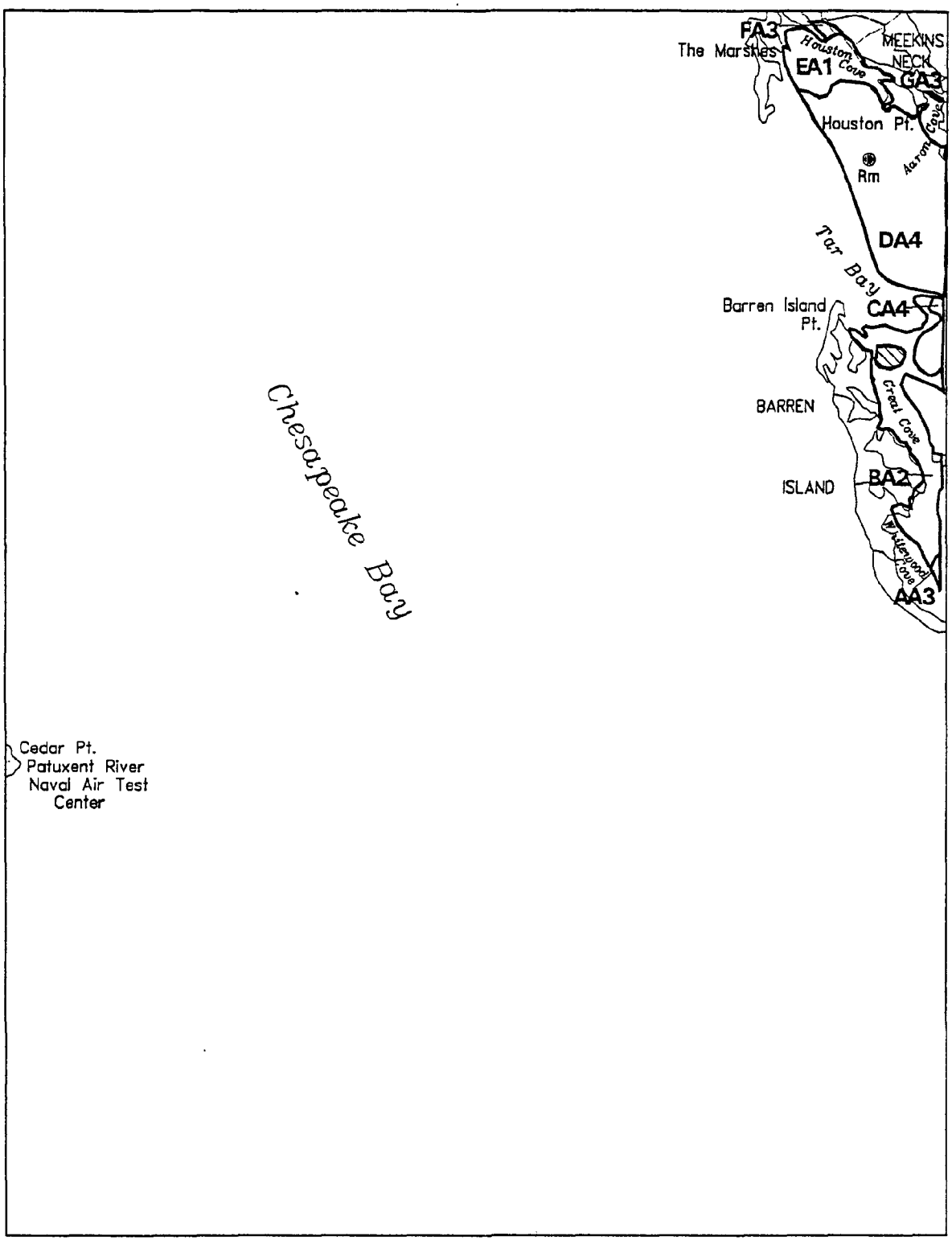
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 07-28-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Barren Island, MD. (072)



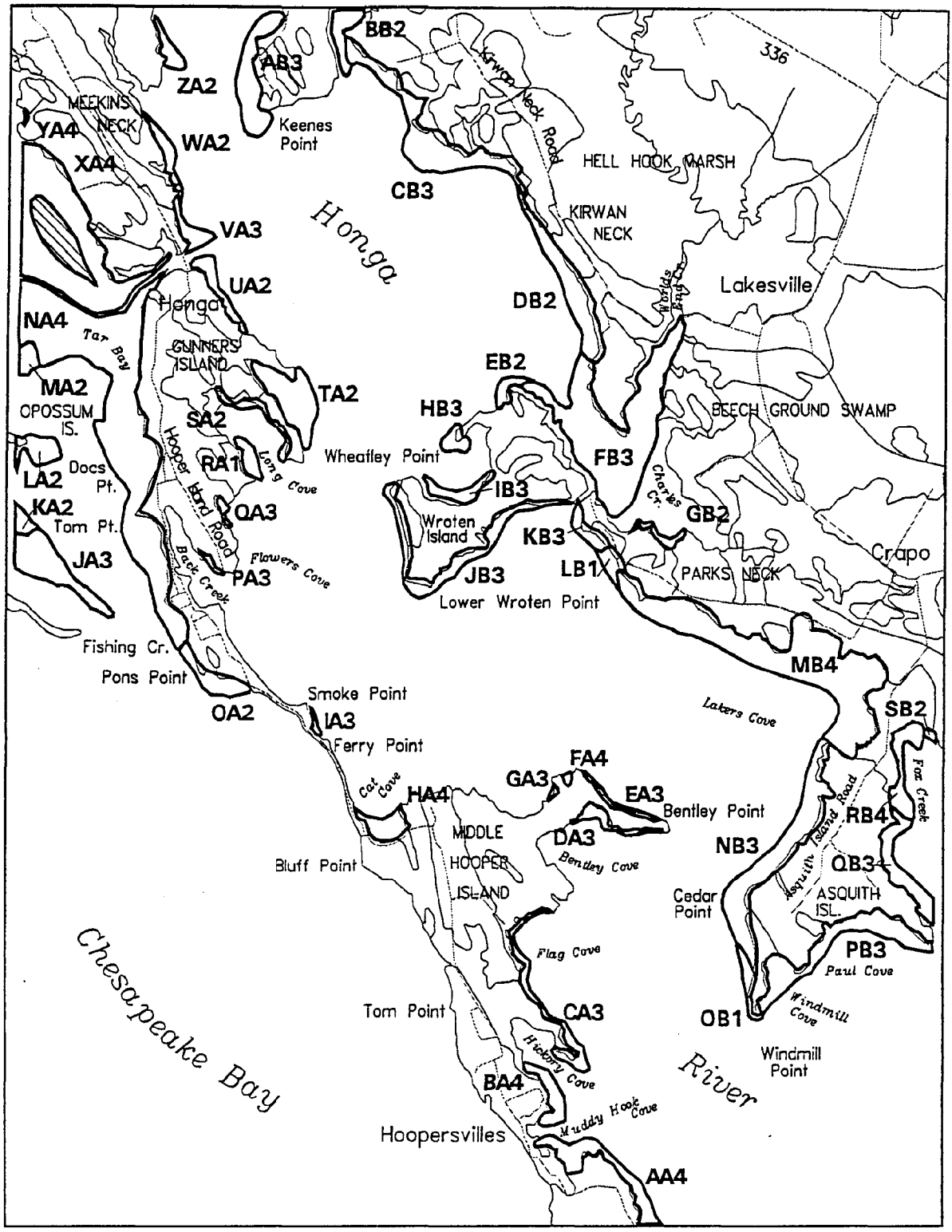
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 07-14-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Honga, MD. (073)



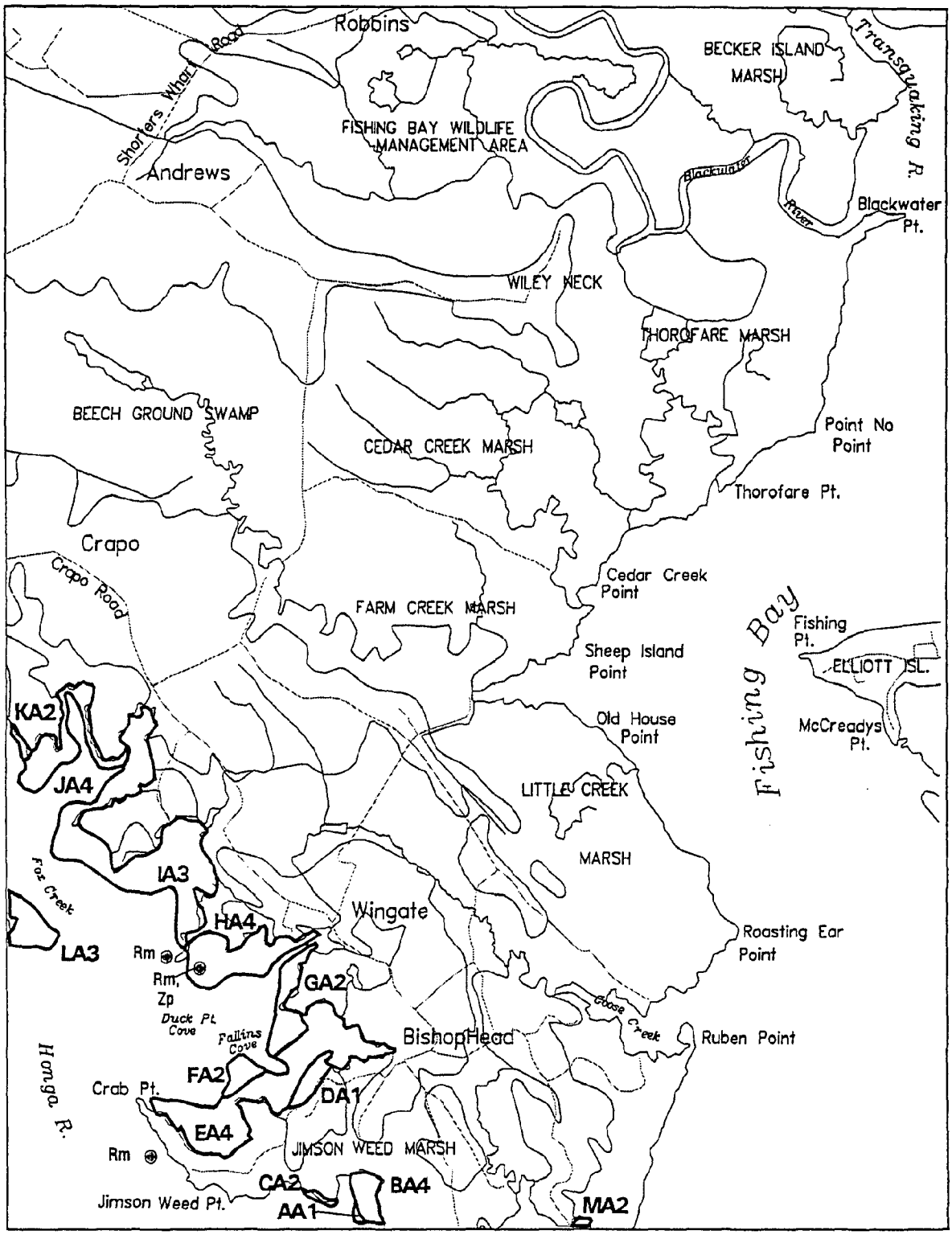
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 07-14-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Wingate, MD. (074)



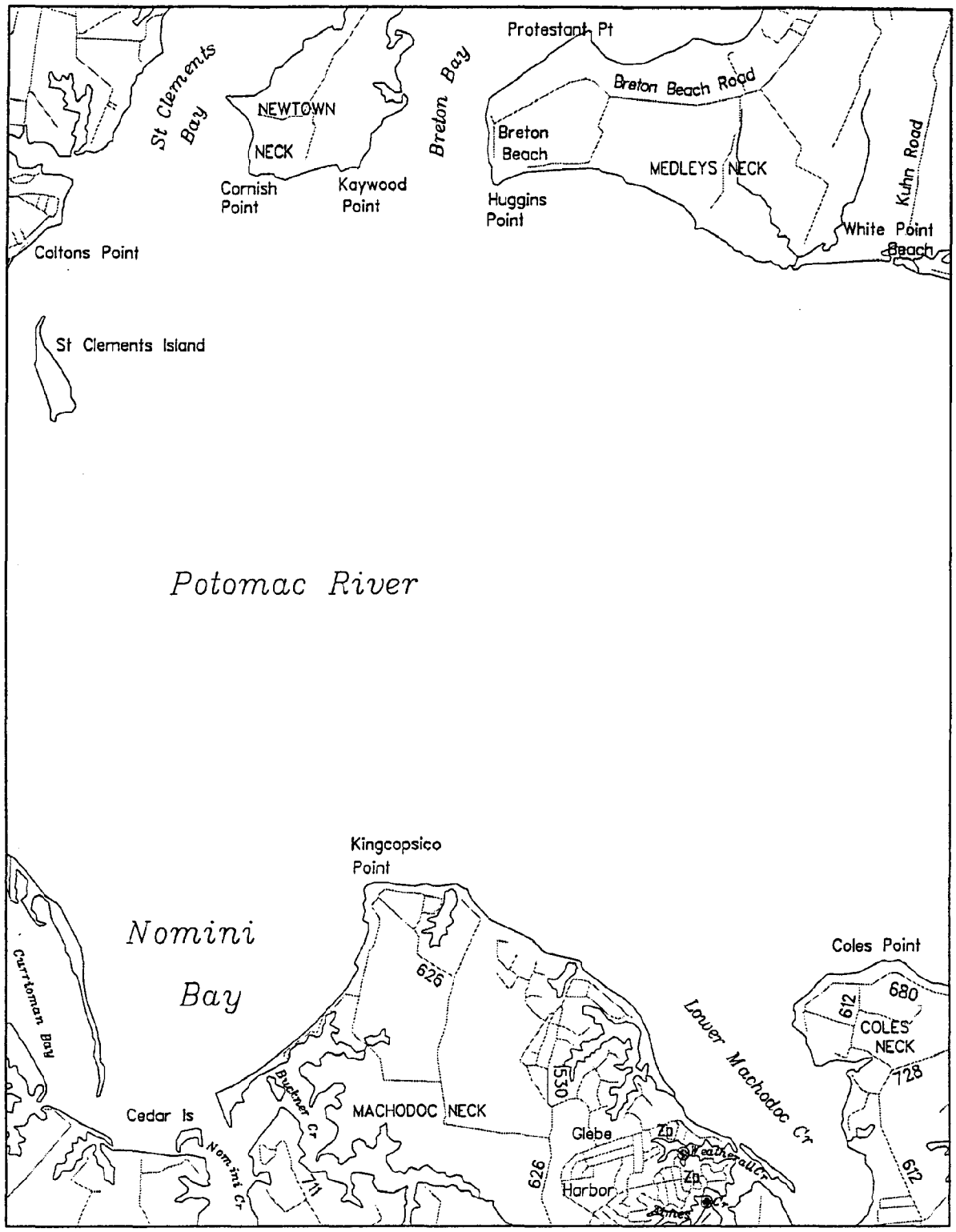
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 07-14-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
St. Clements Island, VA.-MD. (078)



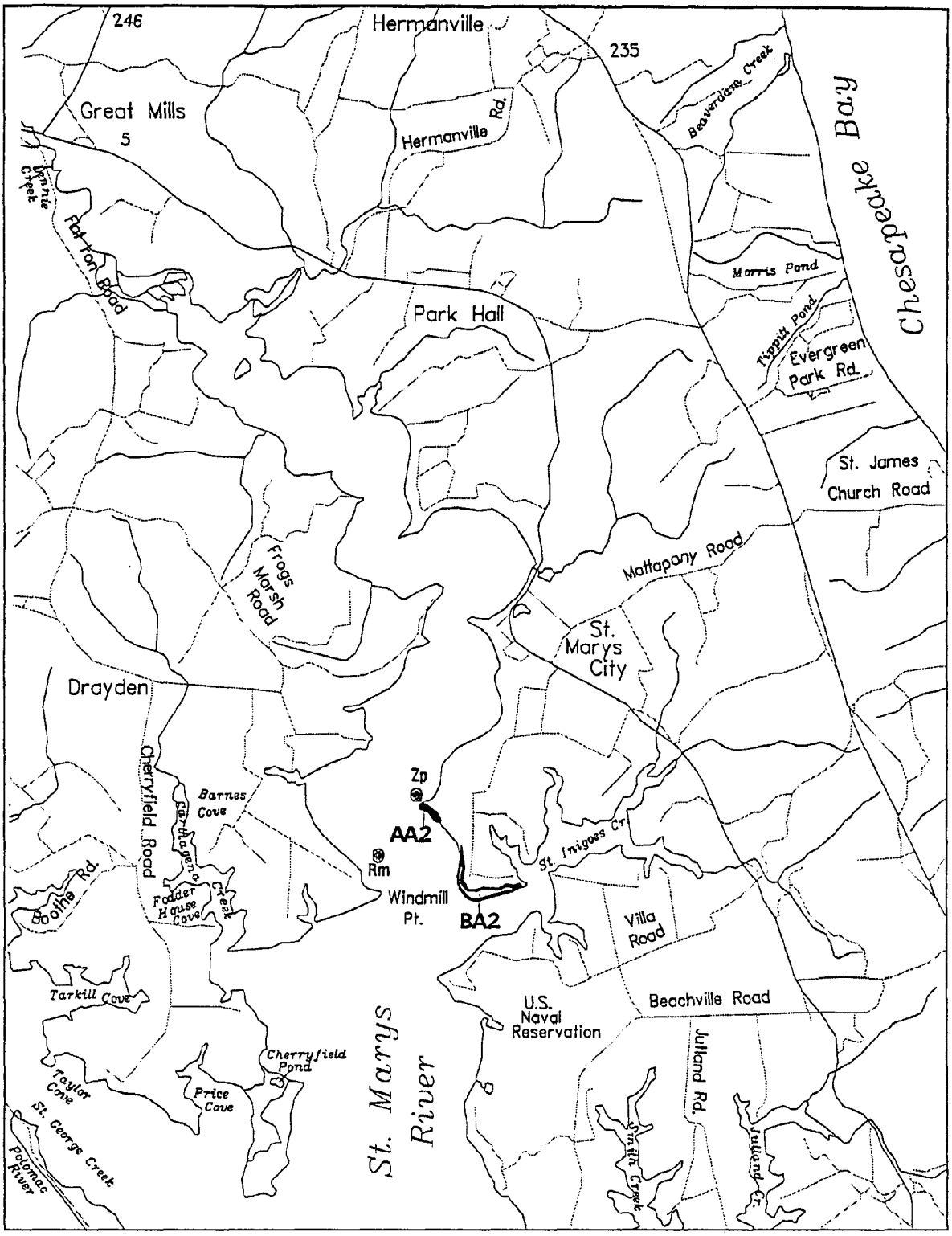
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 07-01-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
St. Mary's City, MD. (080)



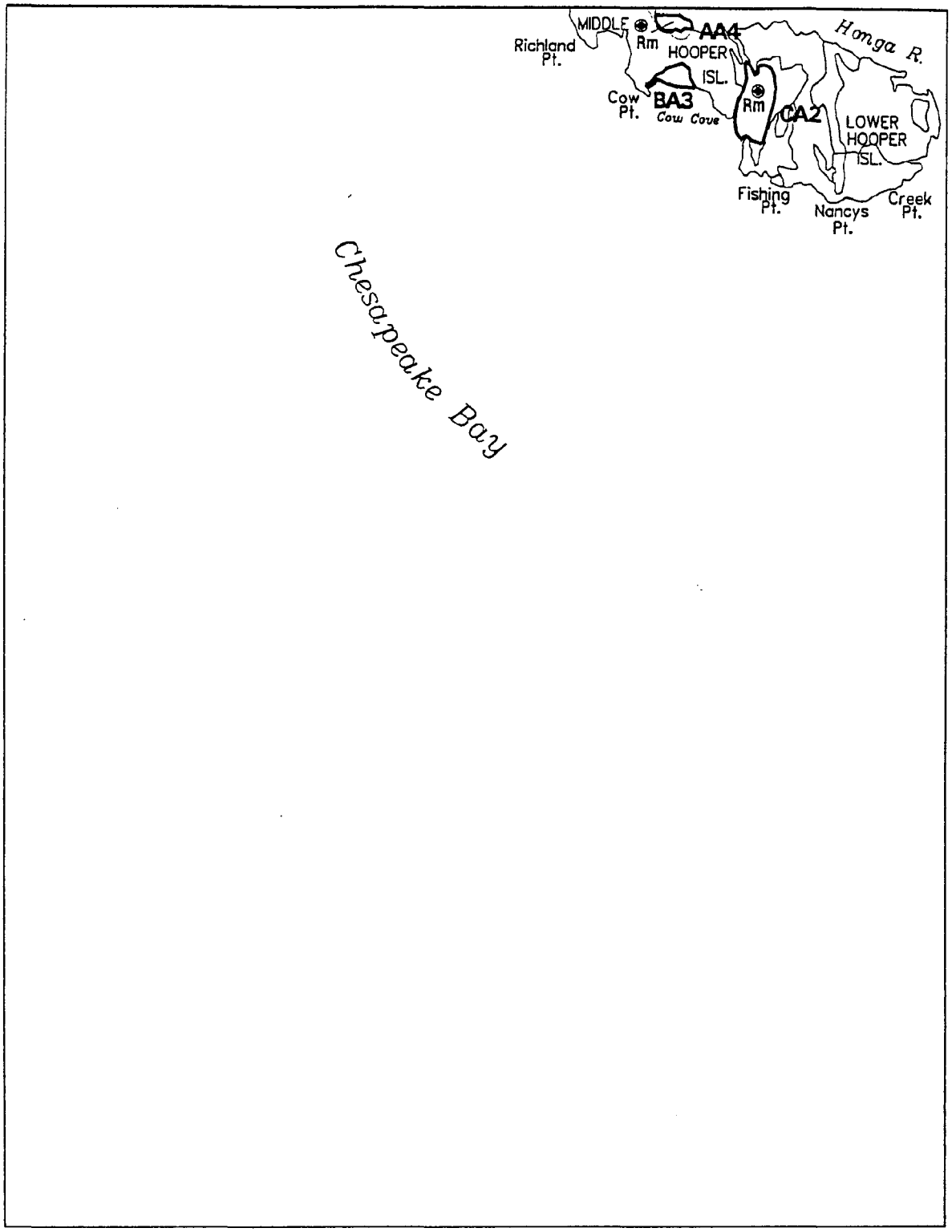
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 07-01-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Richland Point, MD. (082)



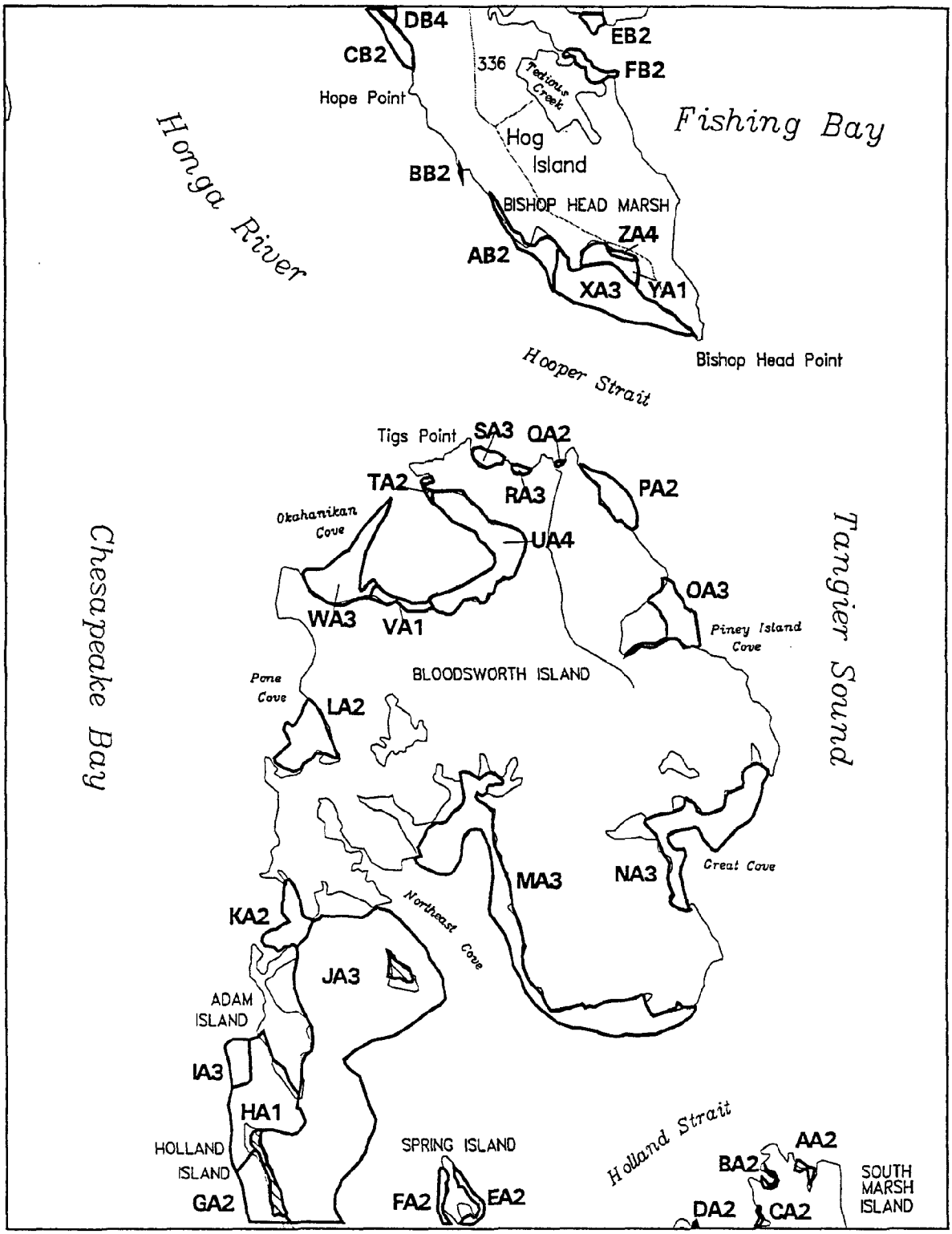
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 07-14-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Bloodsworth Island, MD. (083)



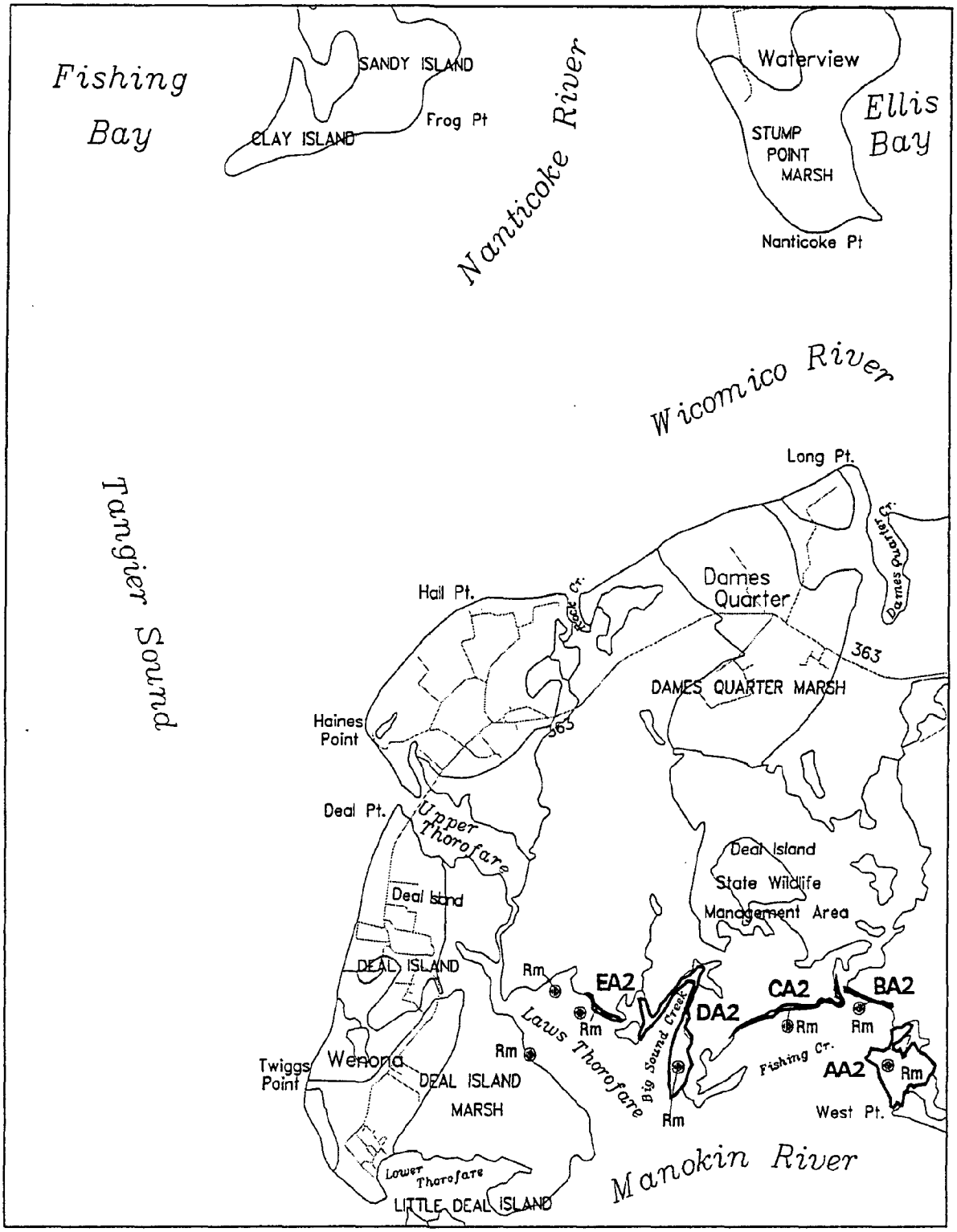
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 06-03-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Deal Island, MD. (084)



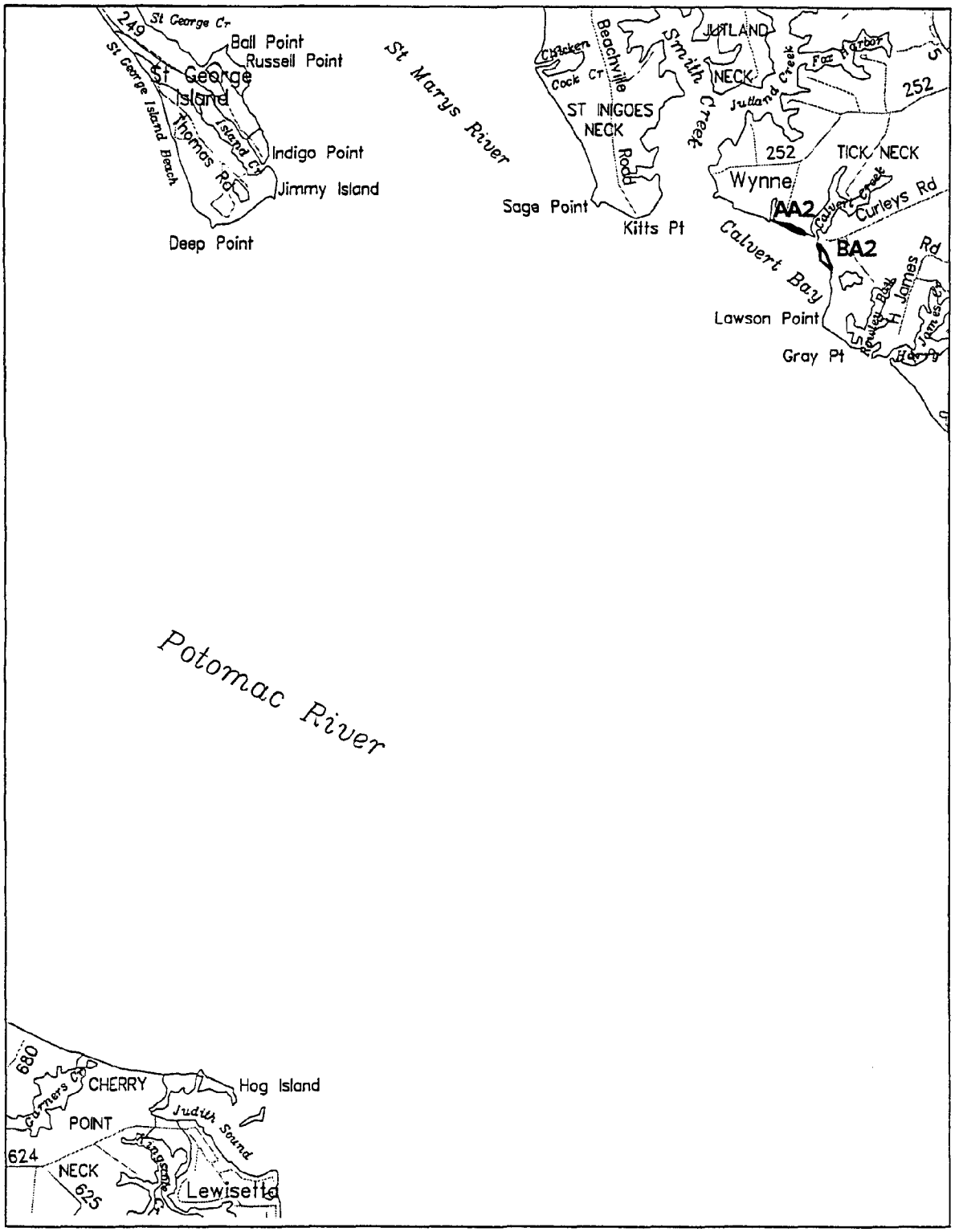
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 06-03-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
St. George Island, MD.-VA. (089)



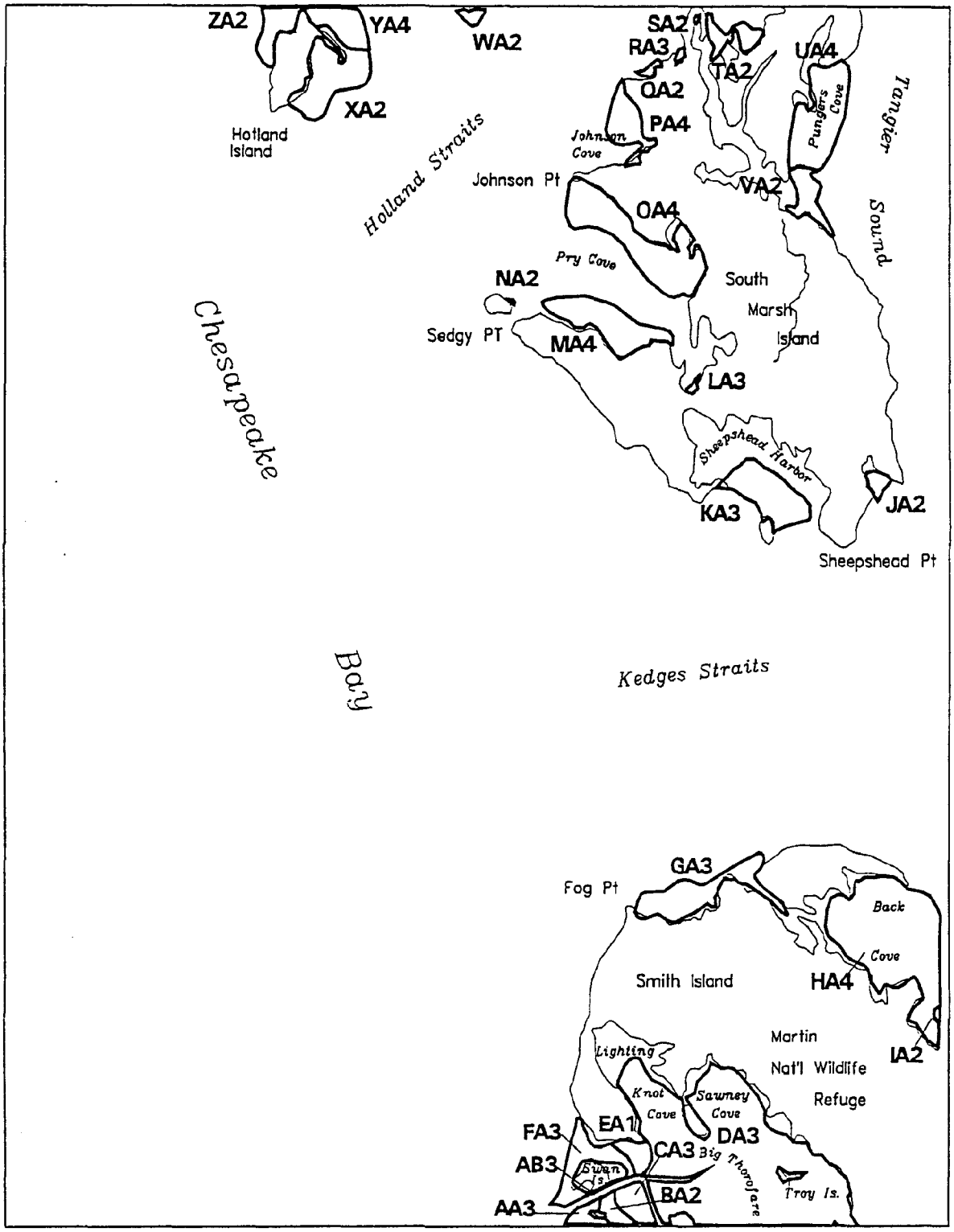
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 07-01-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Kedges Straits, MD. (091)



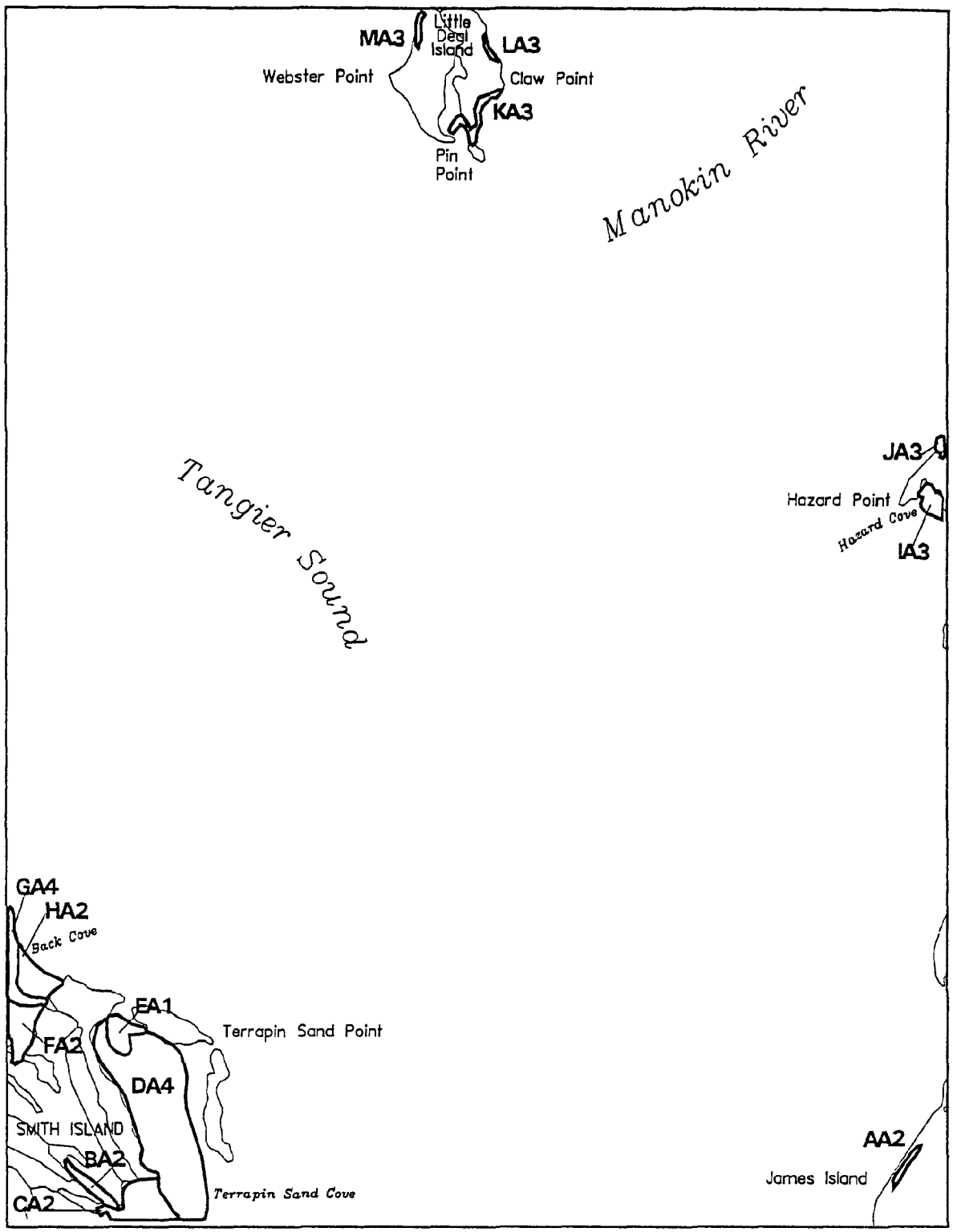
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 06-03-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Terrapin Sand Point, MD. (092)



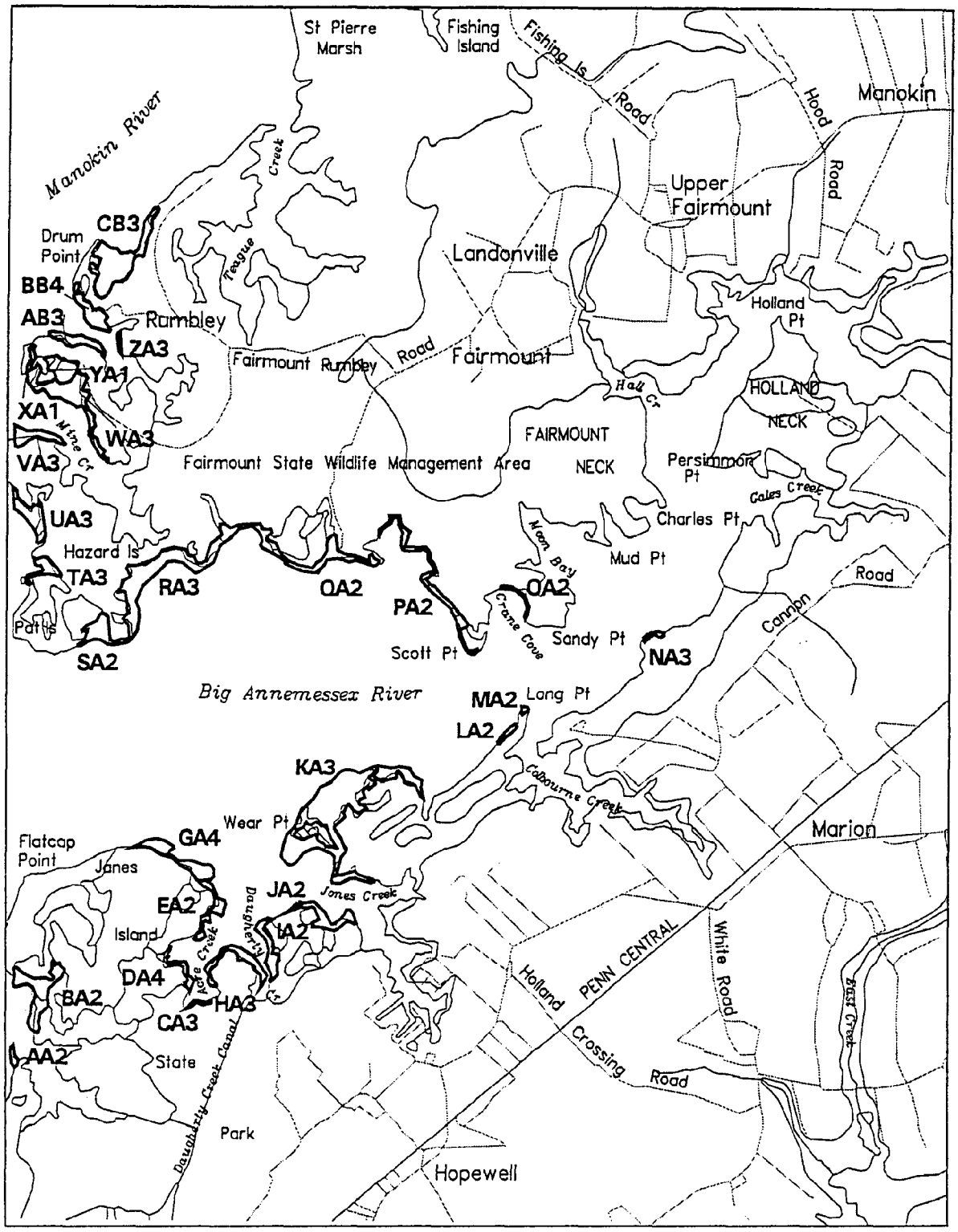
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 06-05-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Marion, MD. (093)



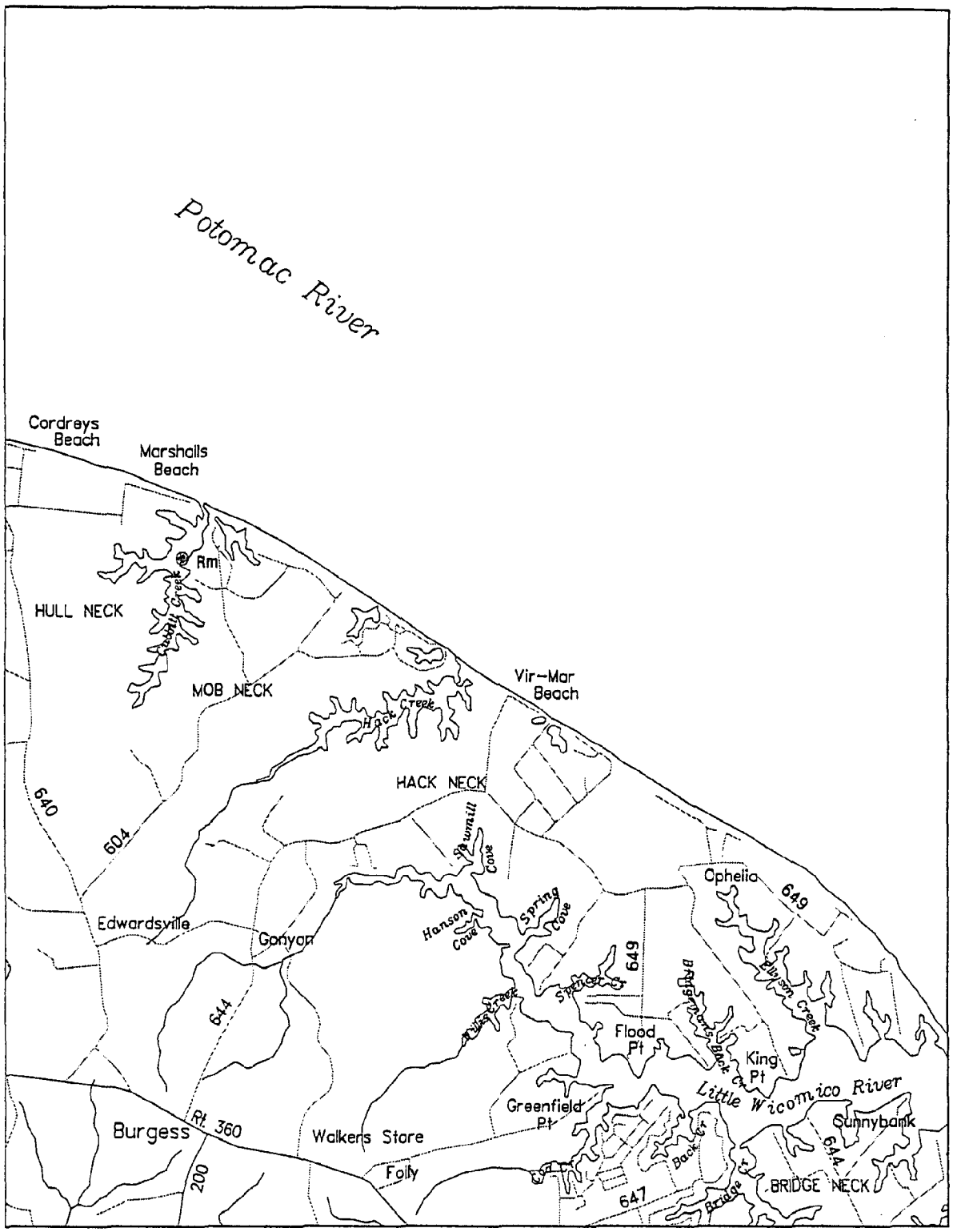
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 06-03-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Burgess, VA.-MD. (098)



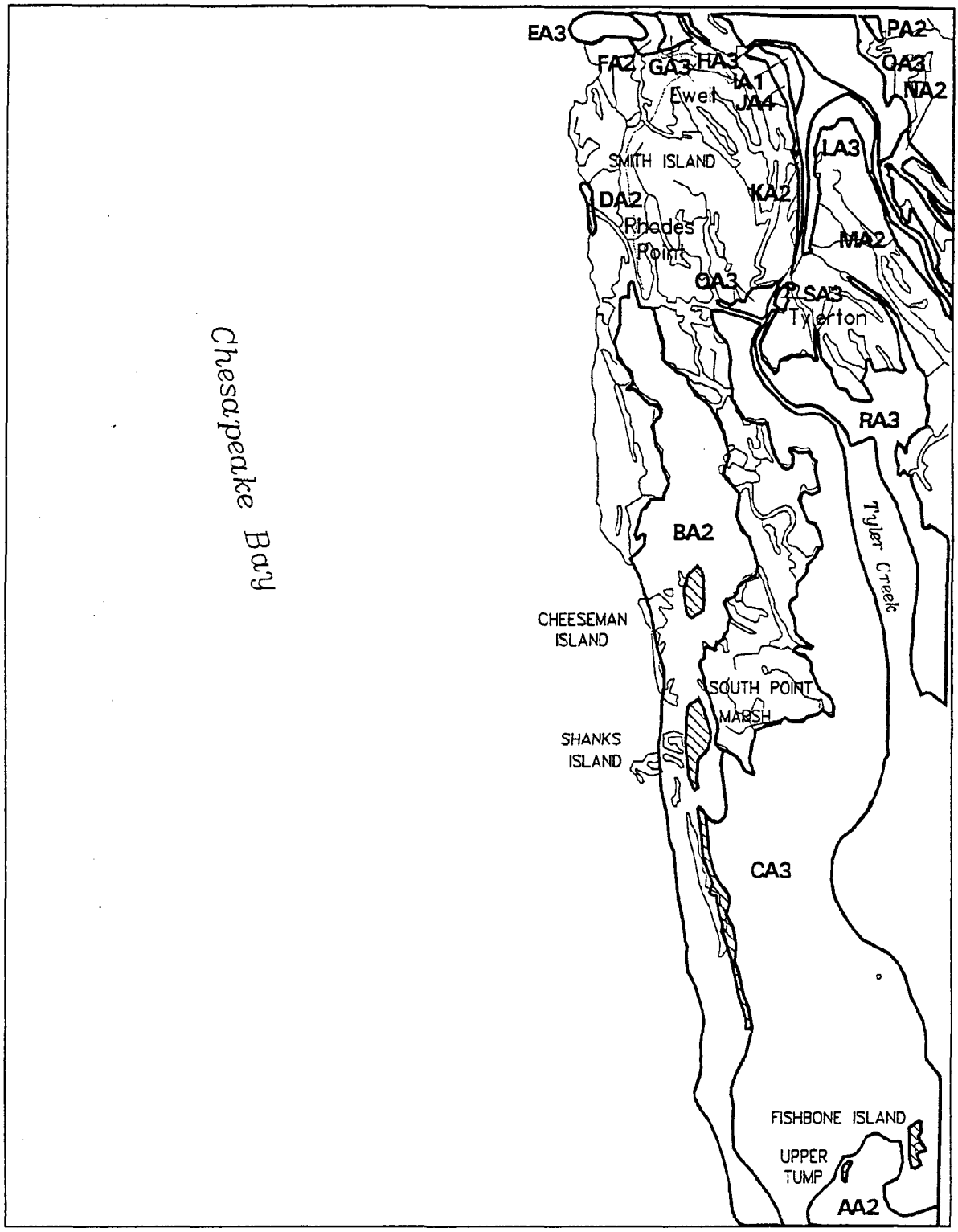
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 07-01-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Ewell, MD.-VA. (099)



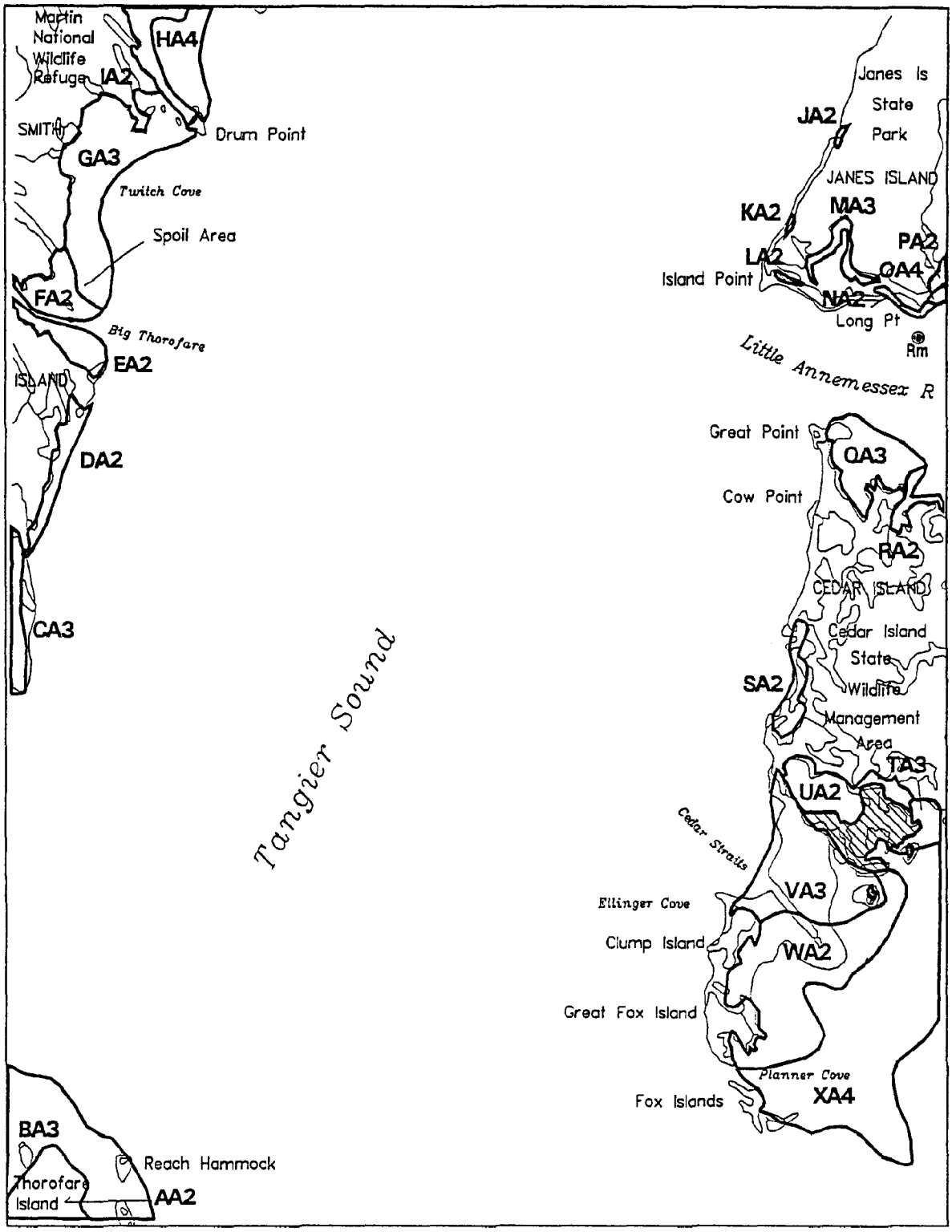
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 06-03-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Great Fox Island, MD.-VA. (100)



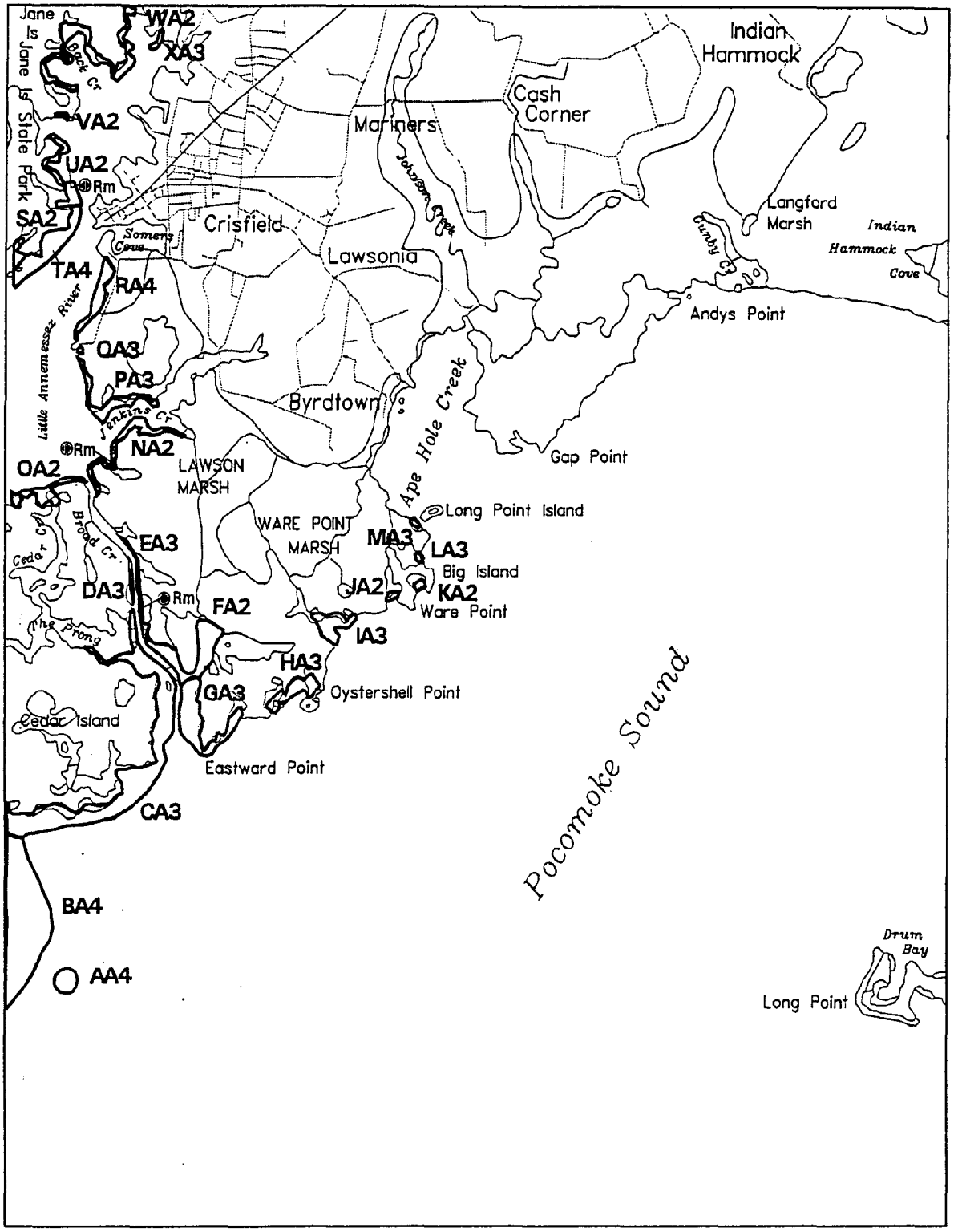
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 06-03-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Crisfield, MD.-VA. (101)



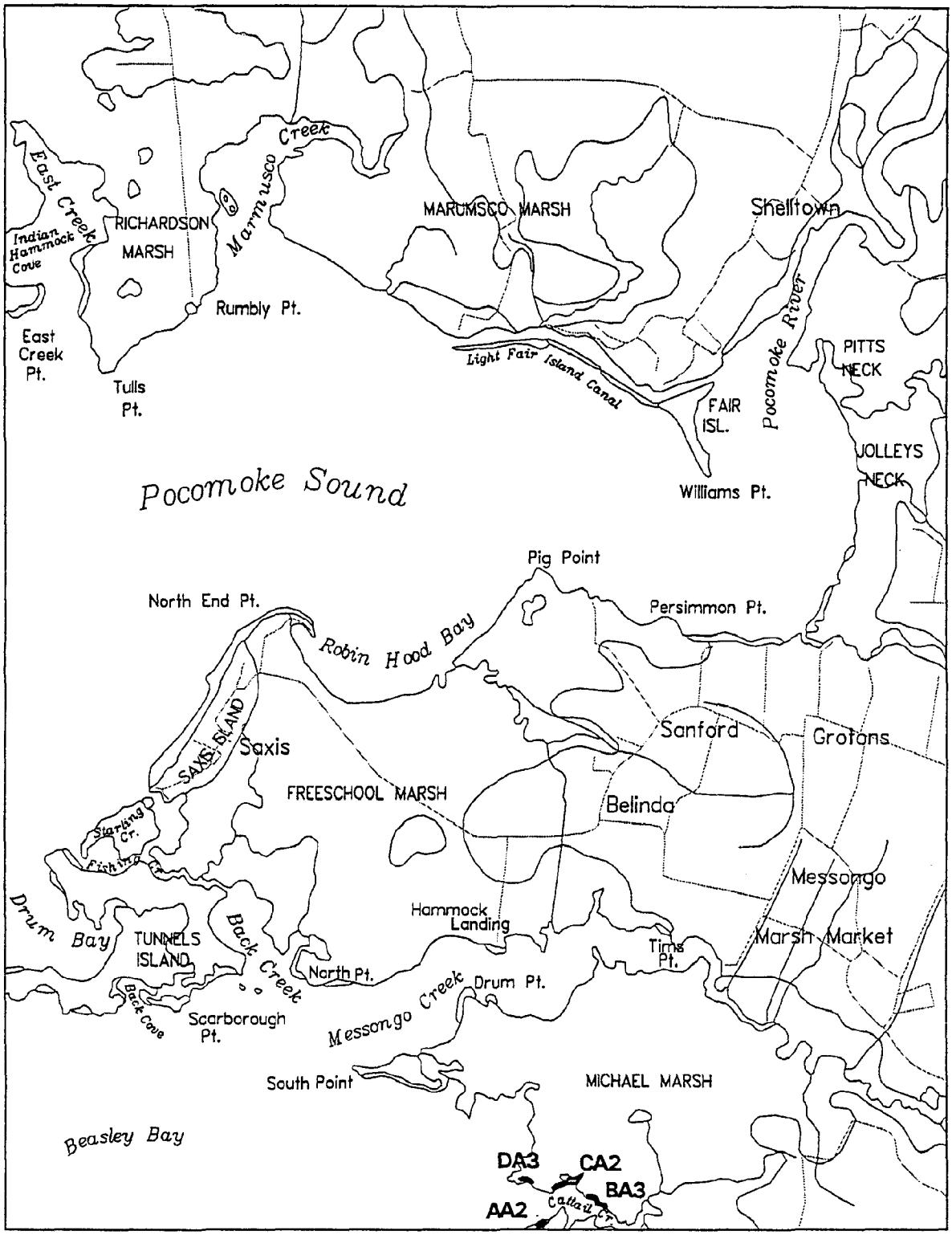
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 06-03-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Saxis, VA.-MD. (102)



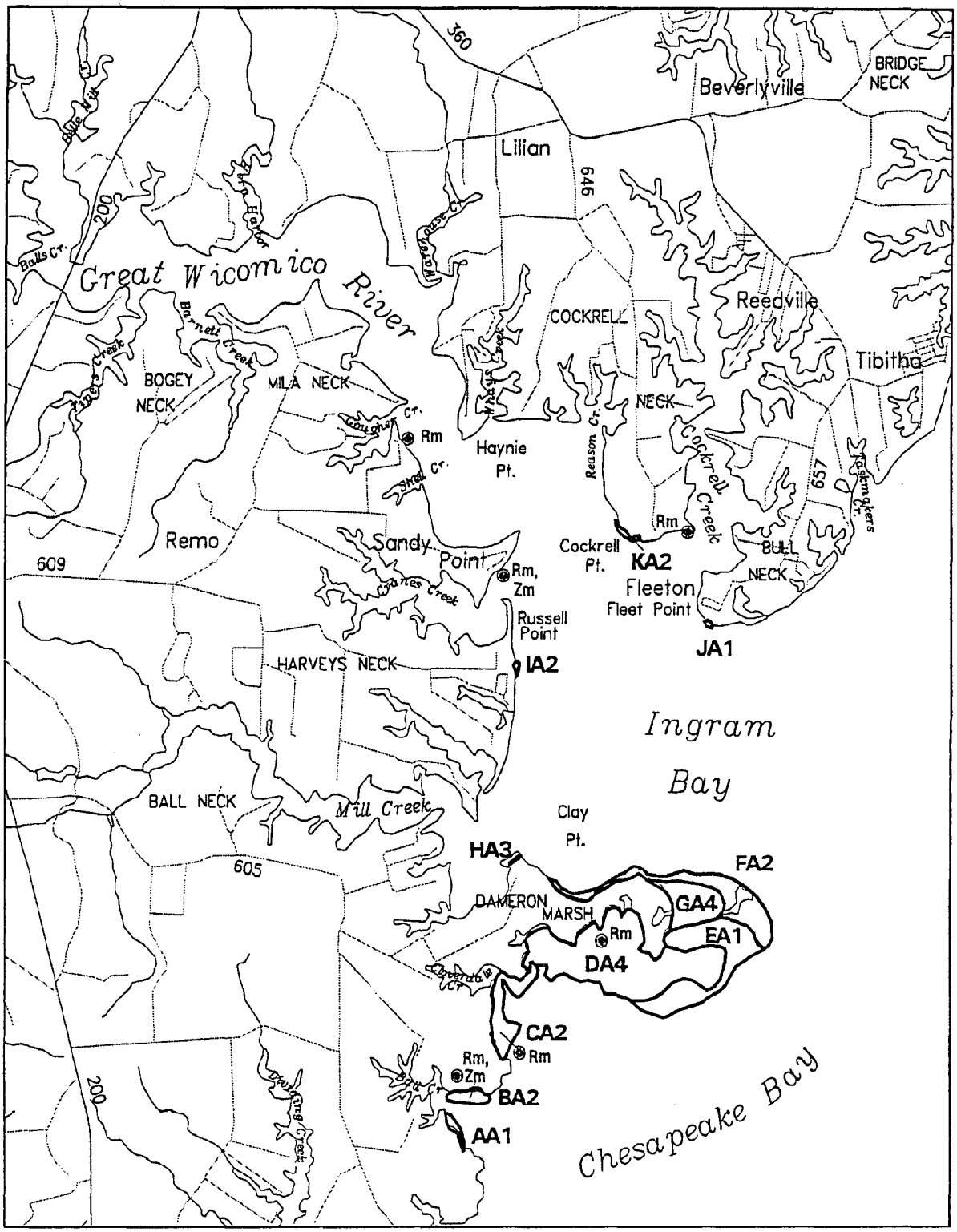
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 05-23-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Reedville, VA. (106)



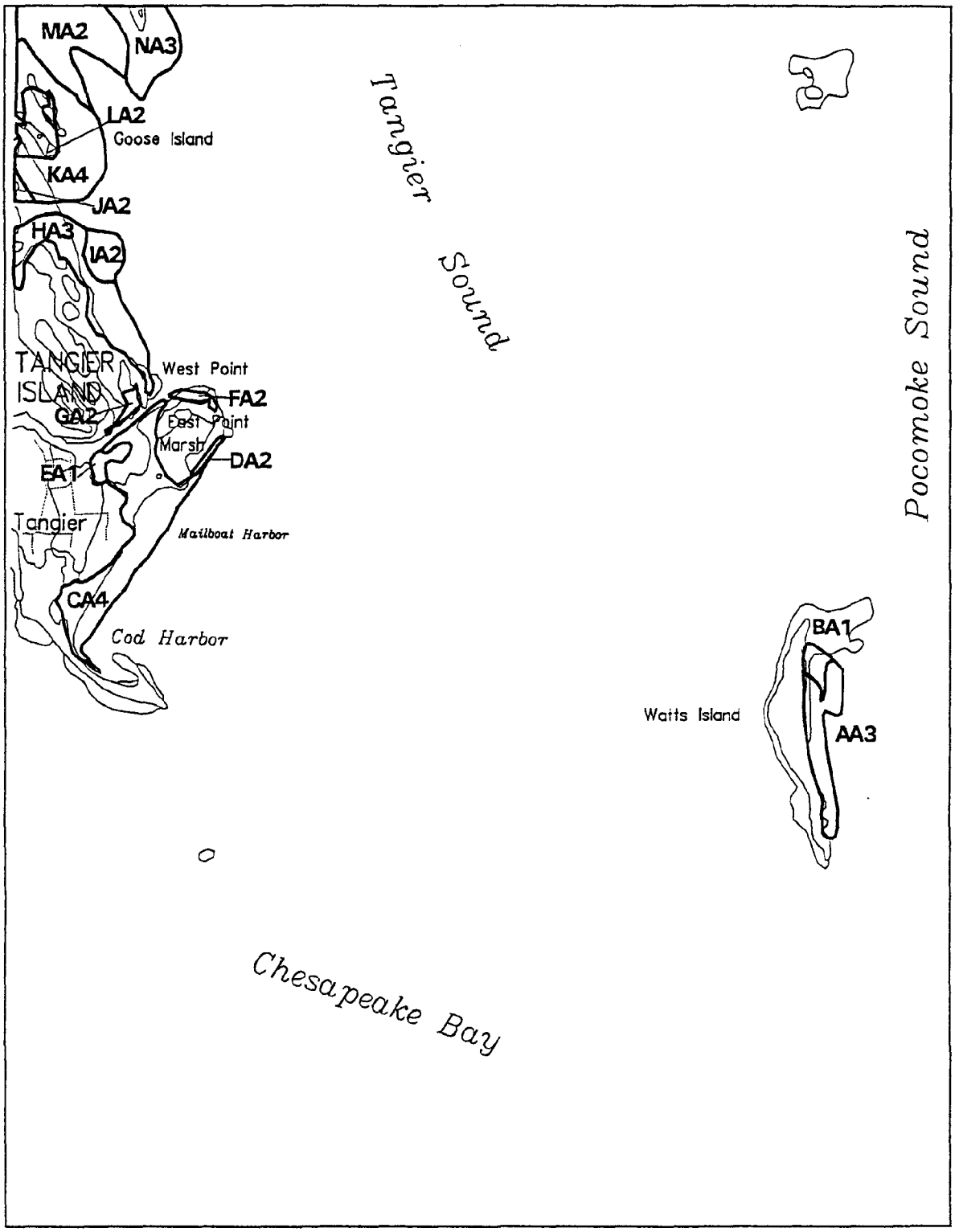
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 05-23-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Tangier Island, VA. (107)



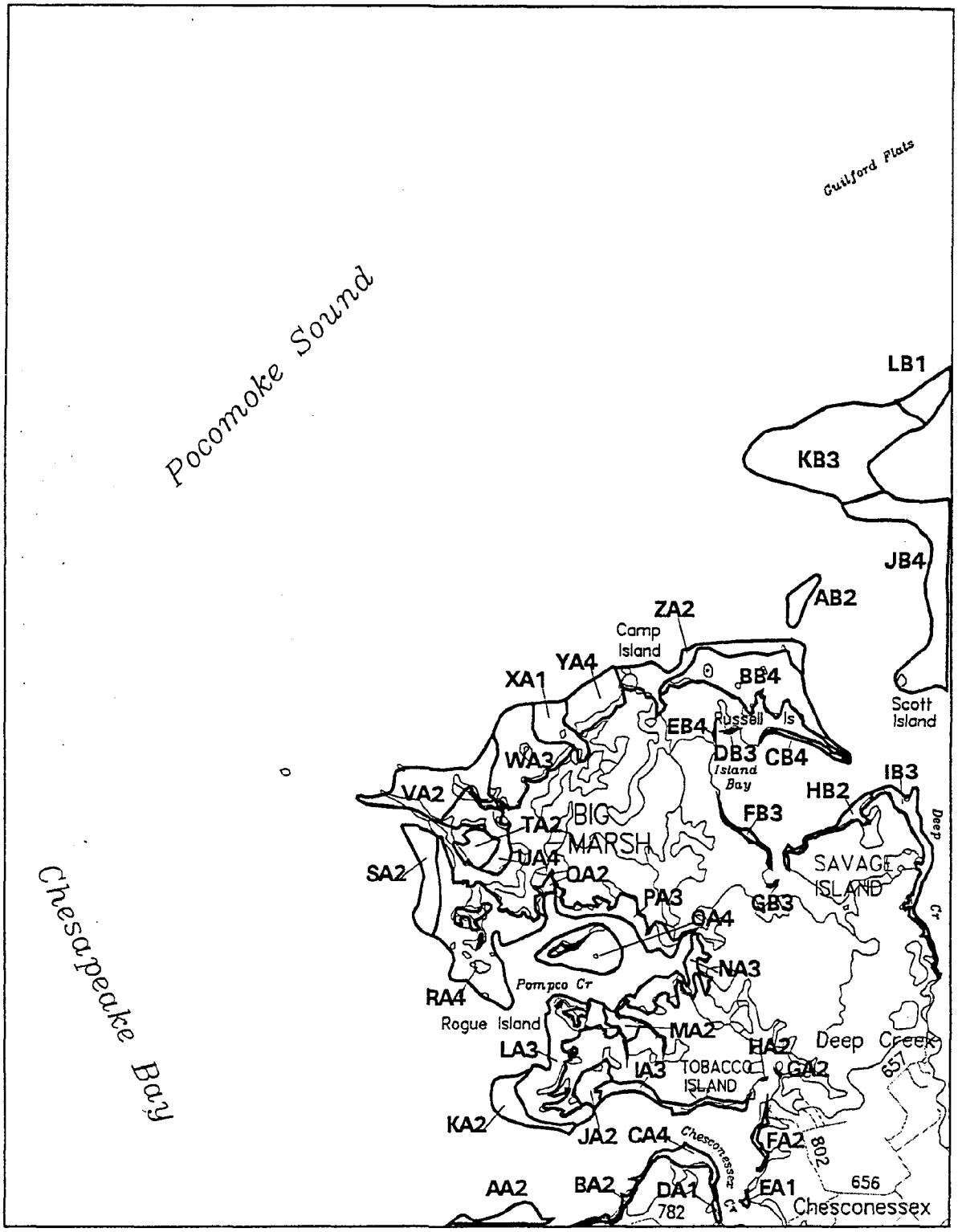
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 06-03-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Chesconessex, VA. (108)



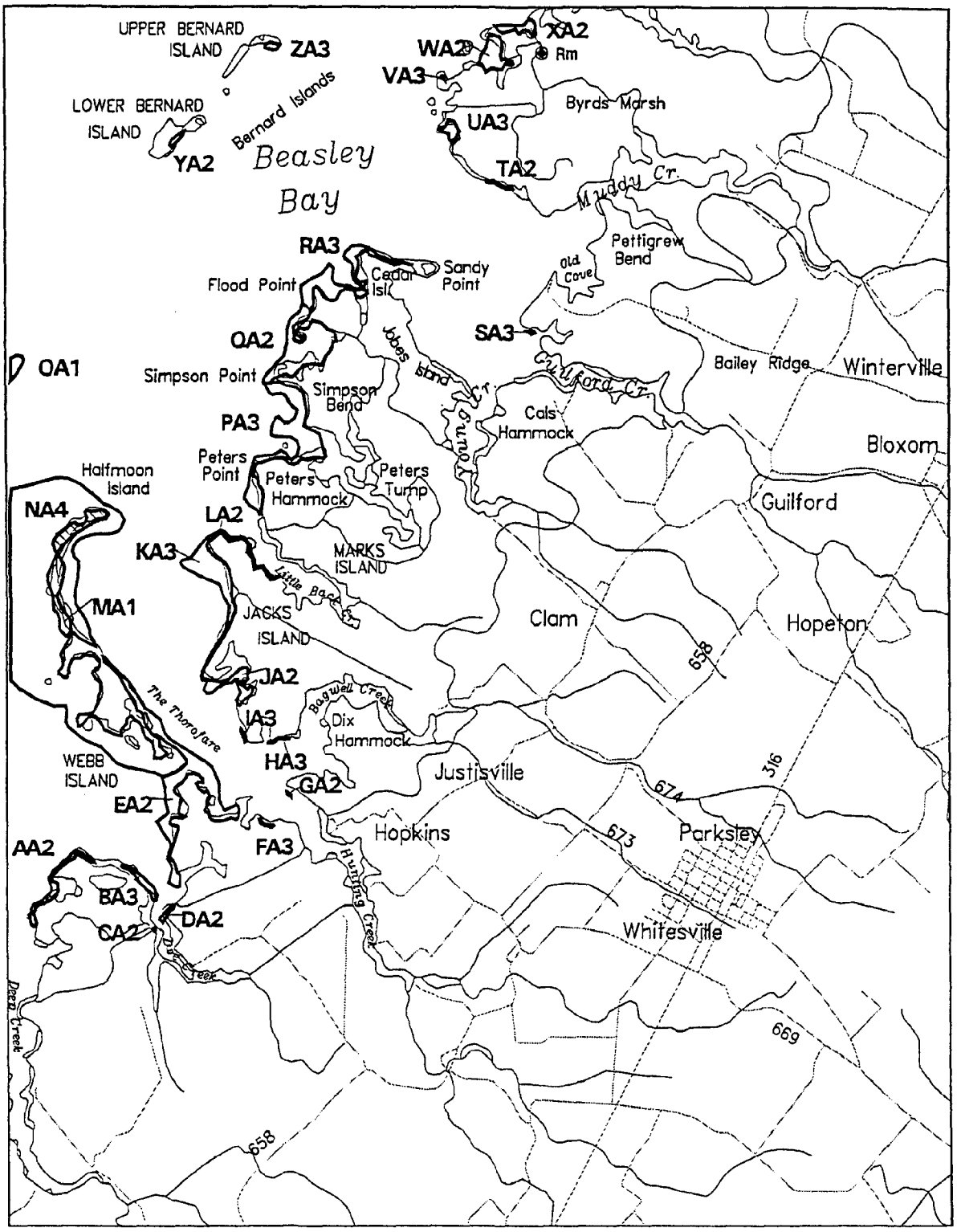
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 05-23-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Parksley, VA. (109)



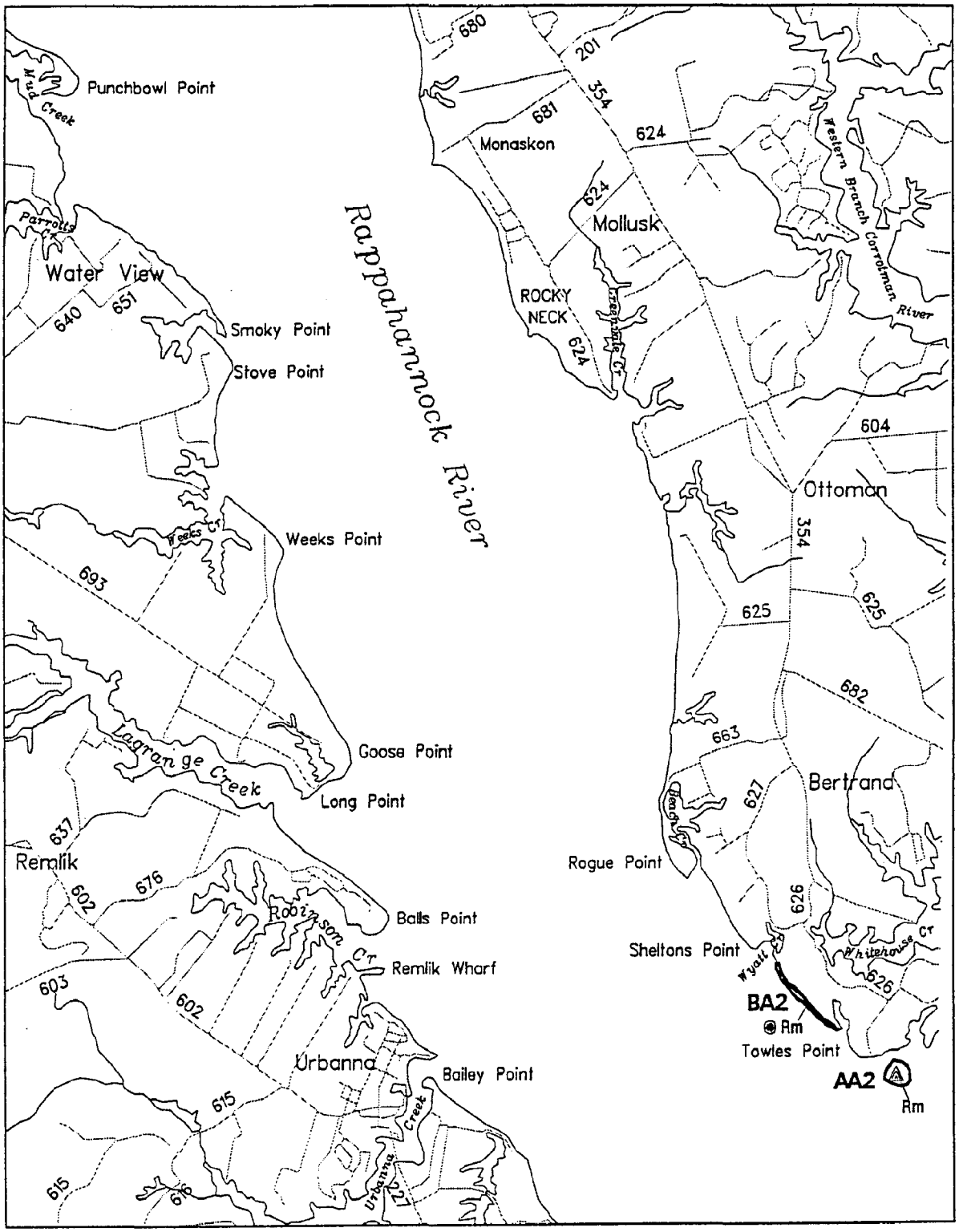
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 05-22-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Urbanna, VA. (110)



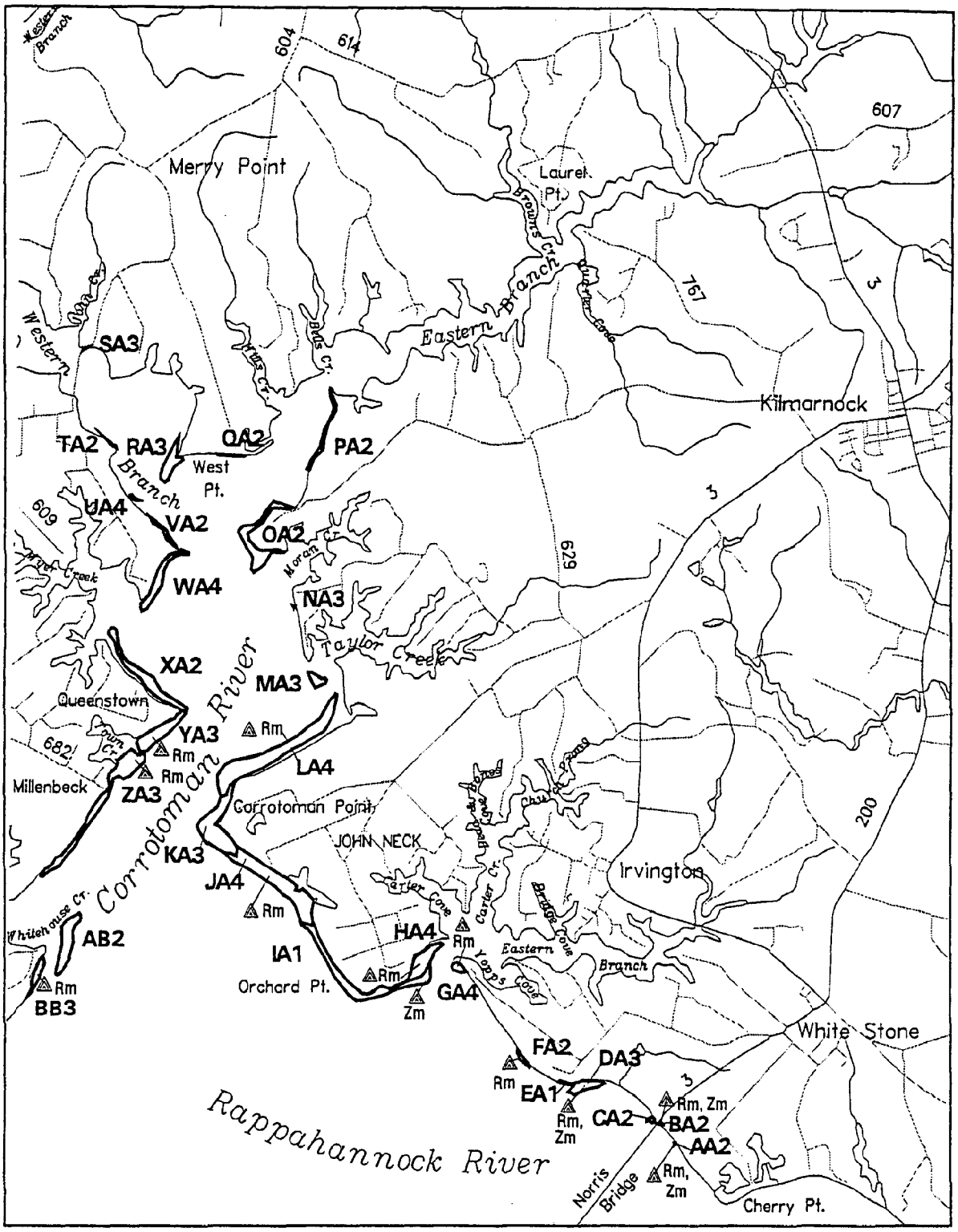
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 05-22-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Irvington, VA. (111)



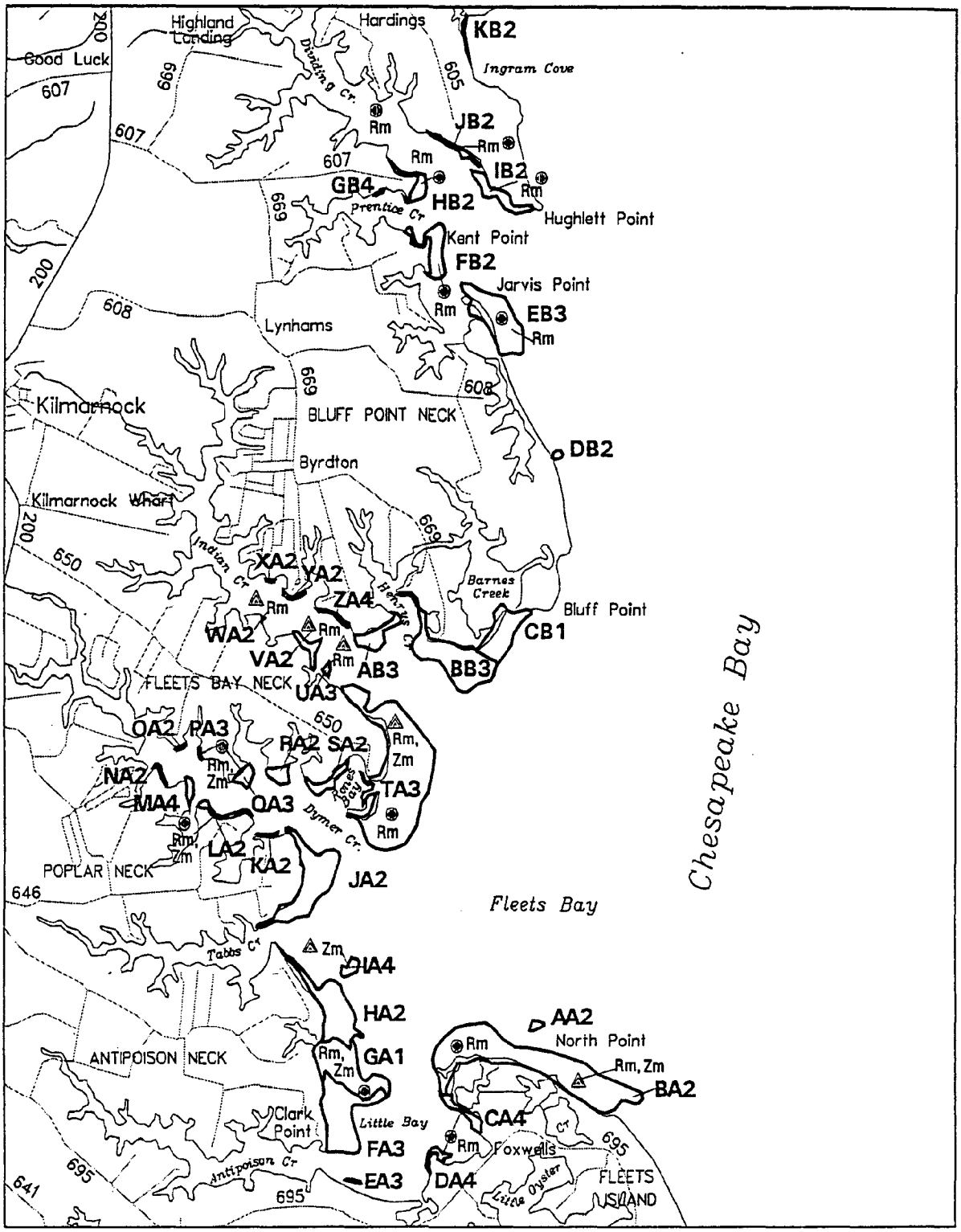
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 05-22-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Fleets Bay, VA. (112)



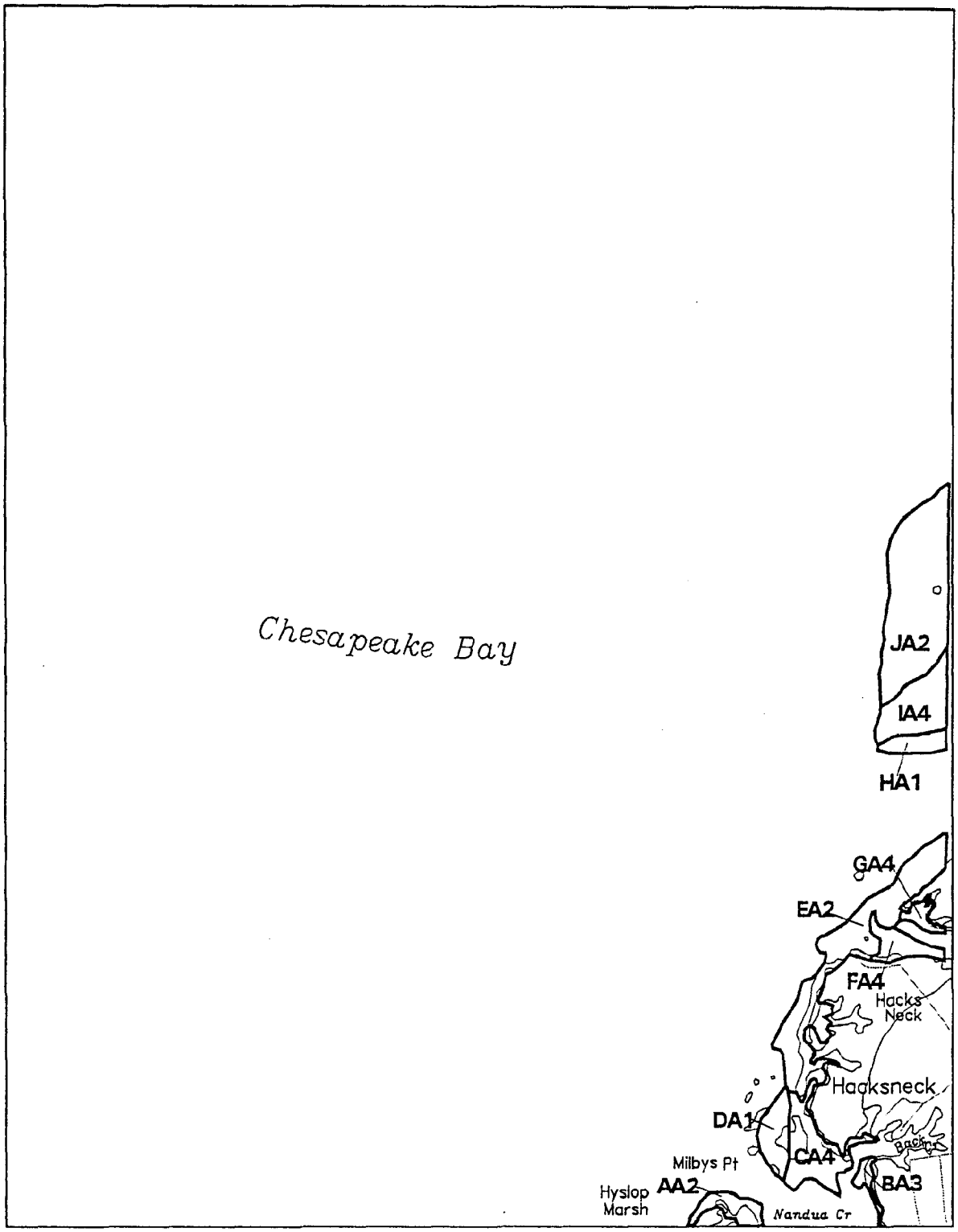
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 05-22-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Nandua Creek, VA. (113)



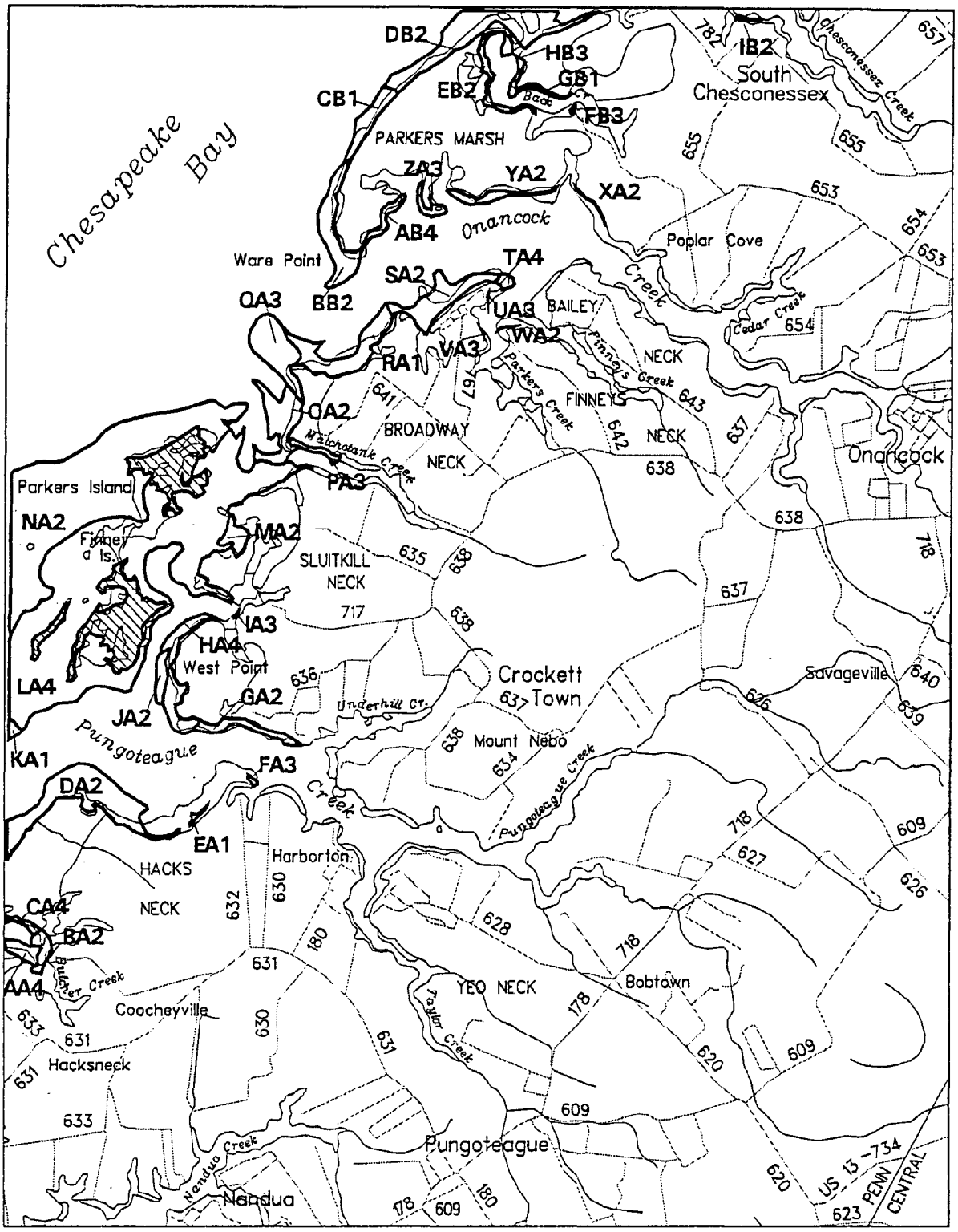
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 05-23-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Pungoteague, VA. (114)



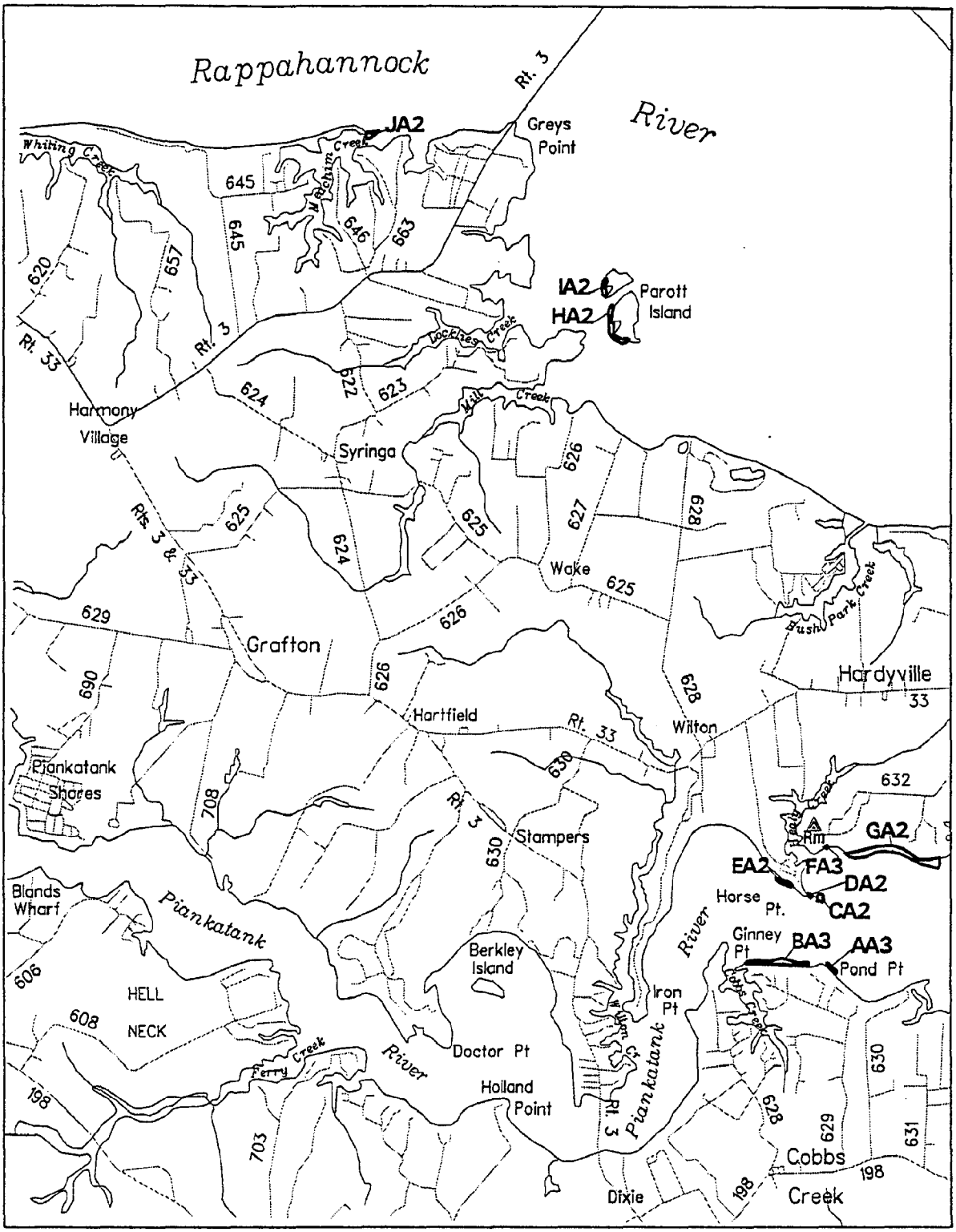
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 05-23-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Wilton, VA. (117)



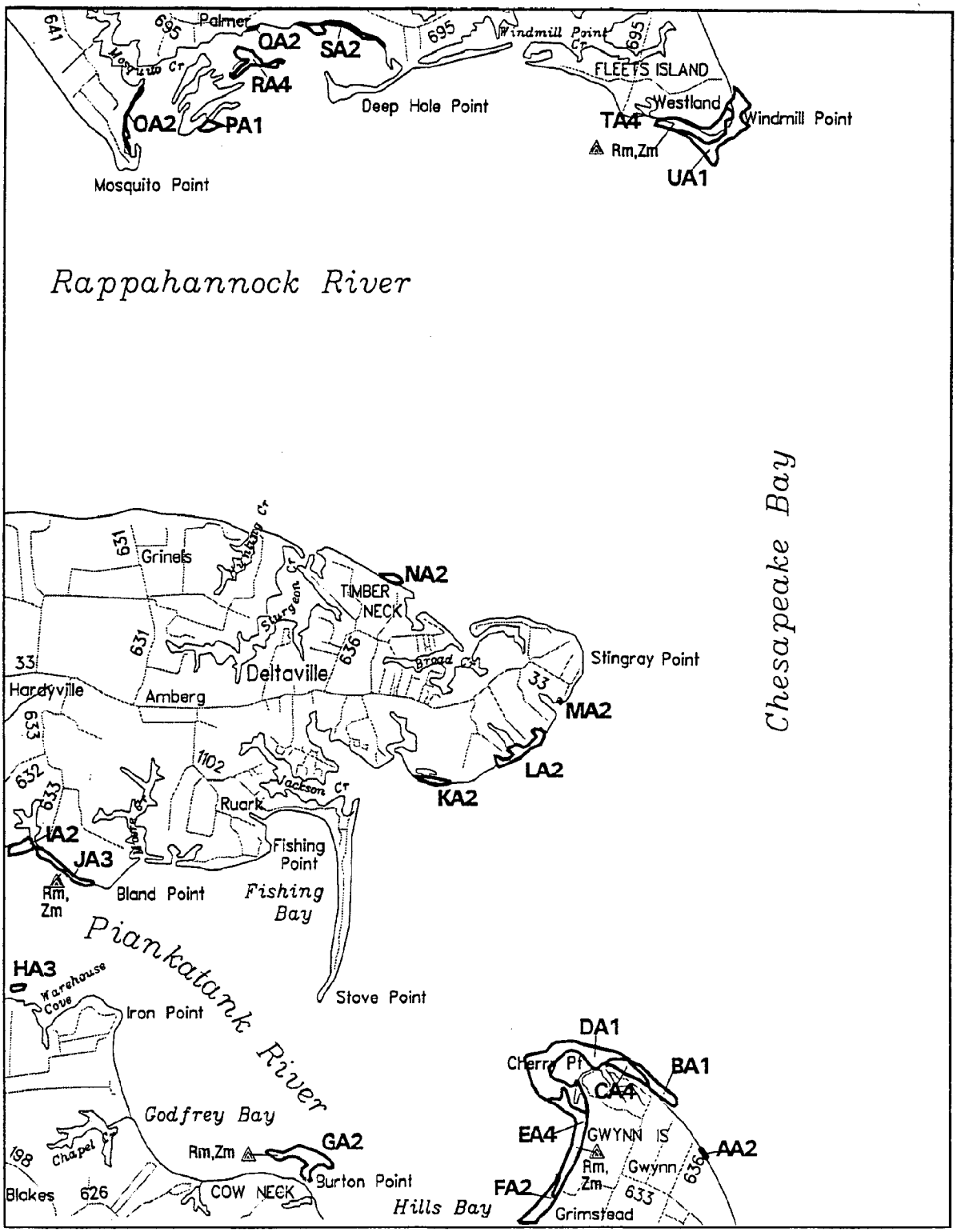
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 05-22-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Deltaville, VA. (118)



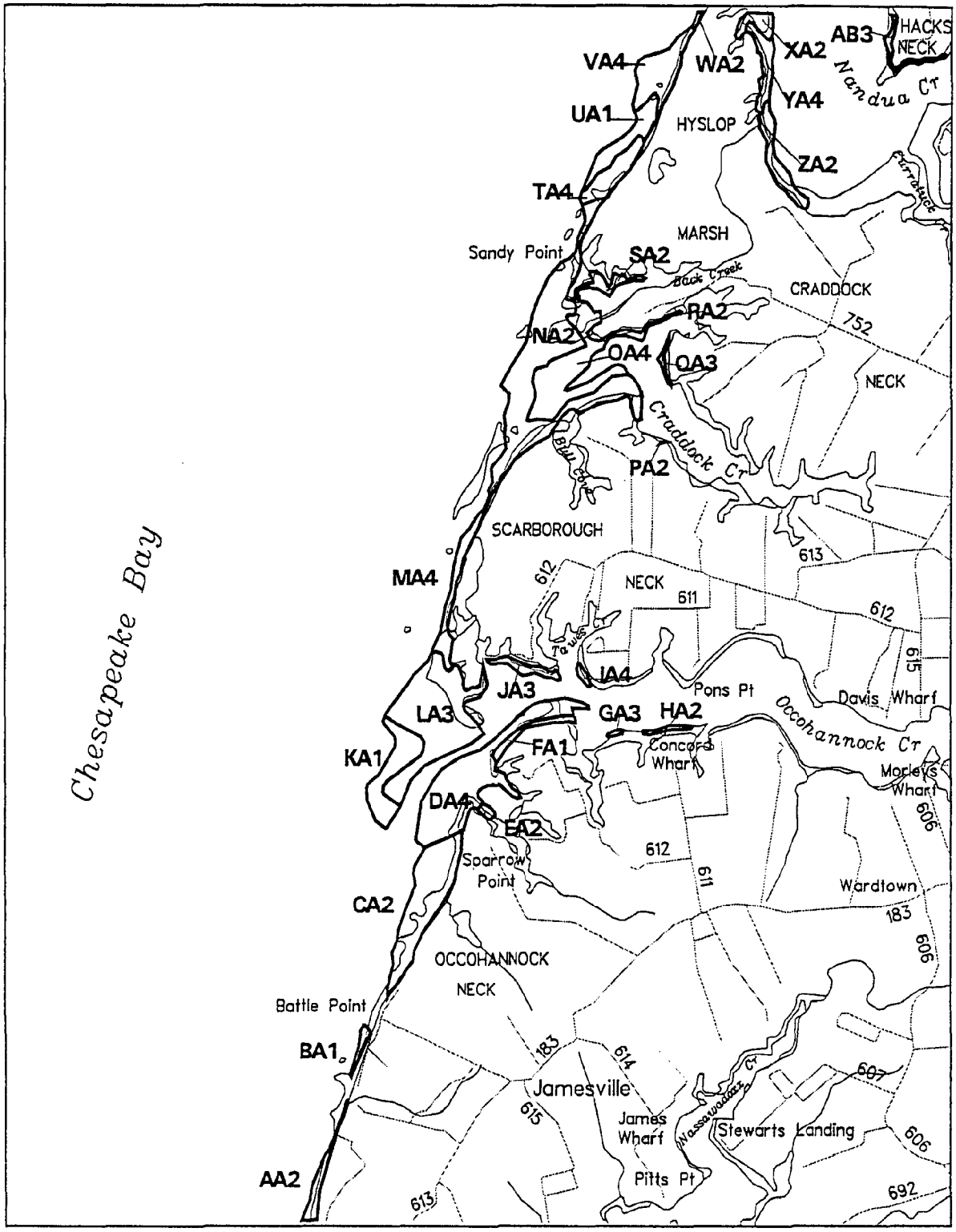
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 05-22-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Jamesville, VA. (119)



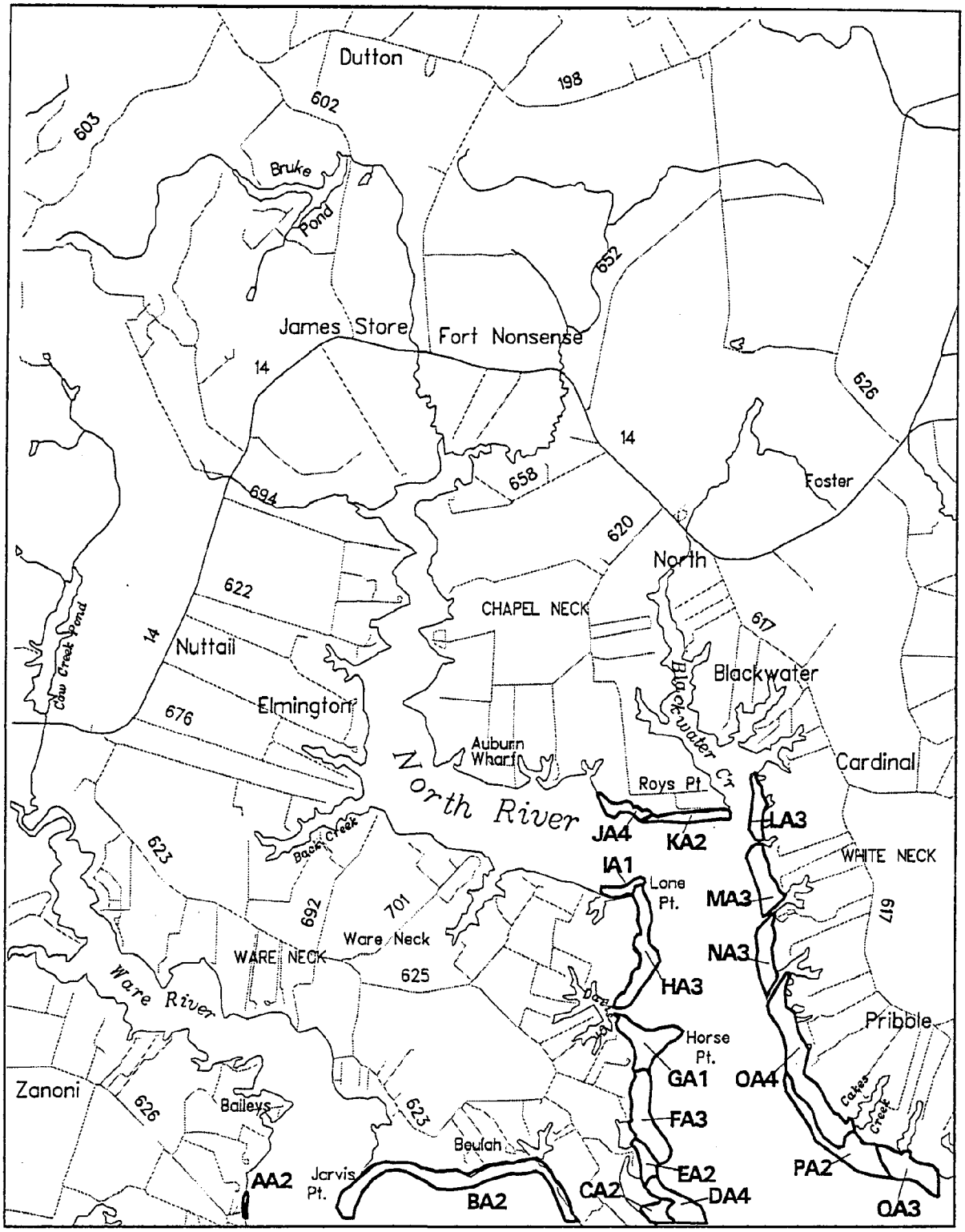
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 05-23-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Ware Neck, VA. (122)



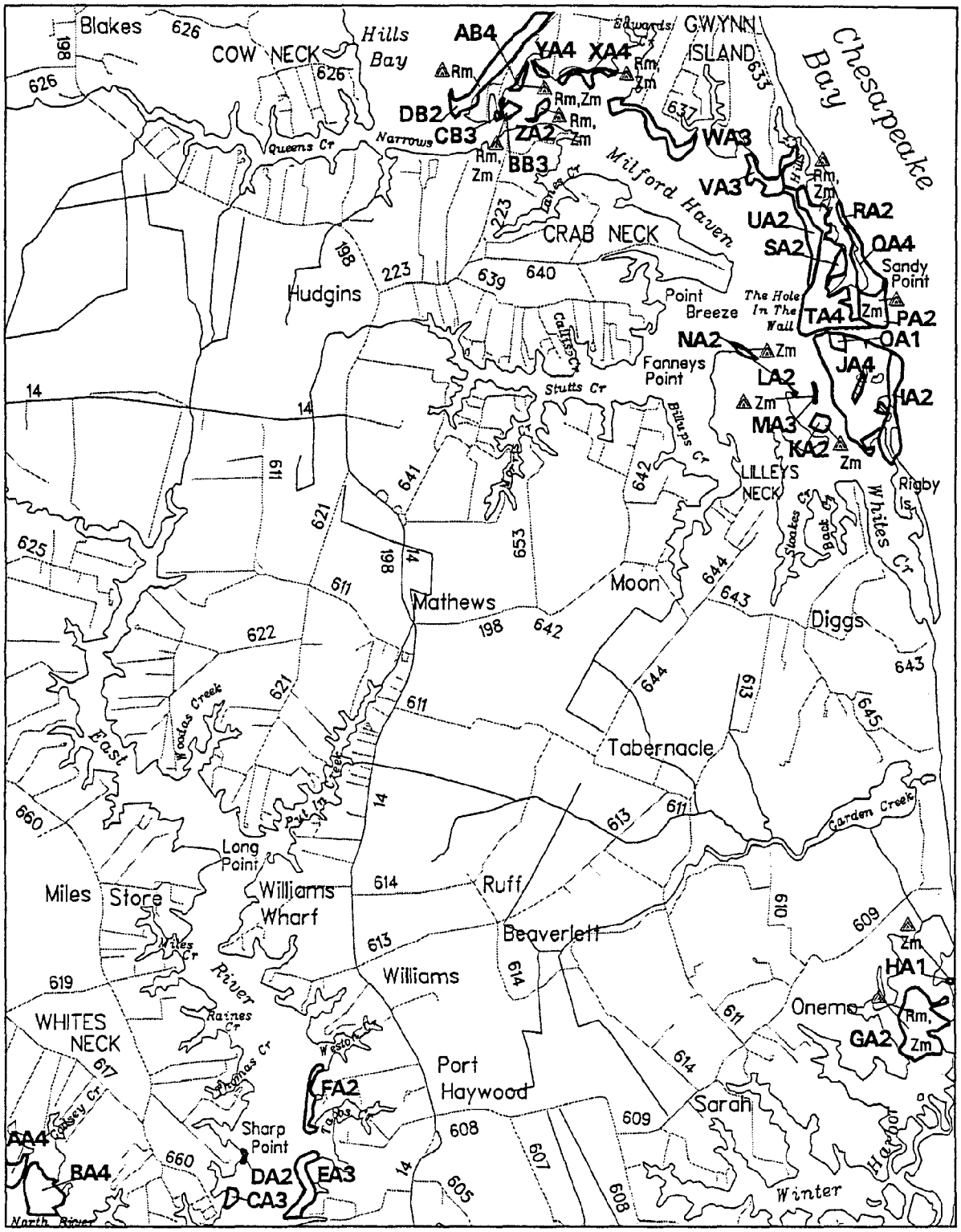
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 05-22-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Mathews, VA. (123)



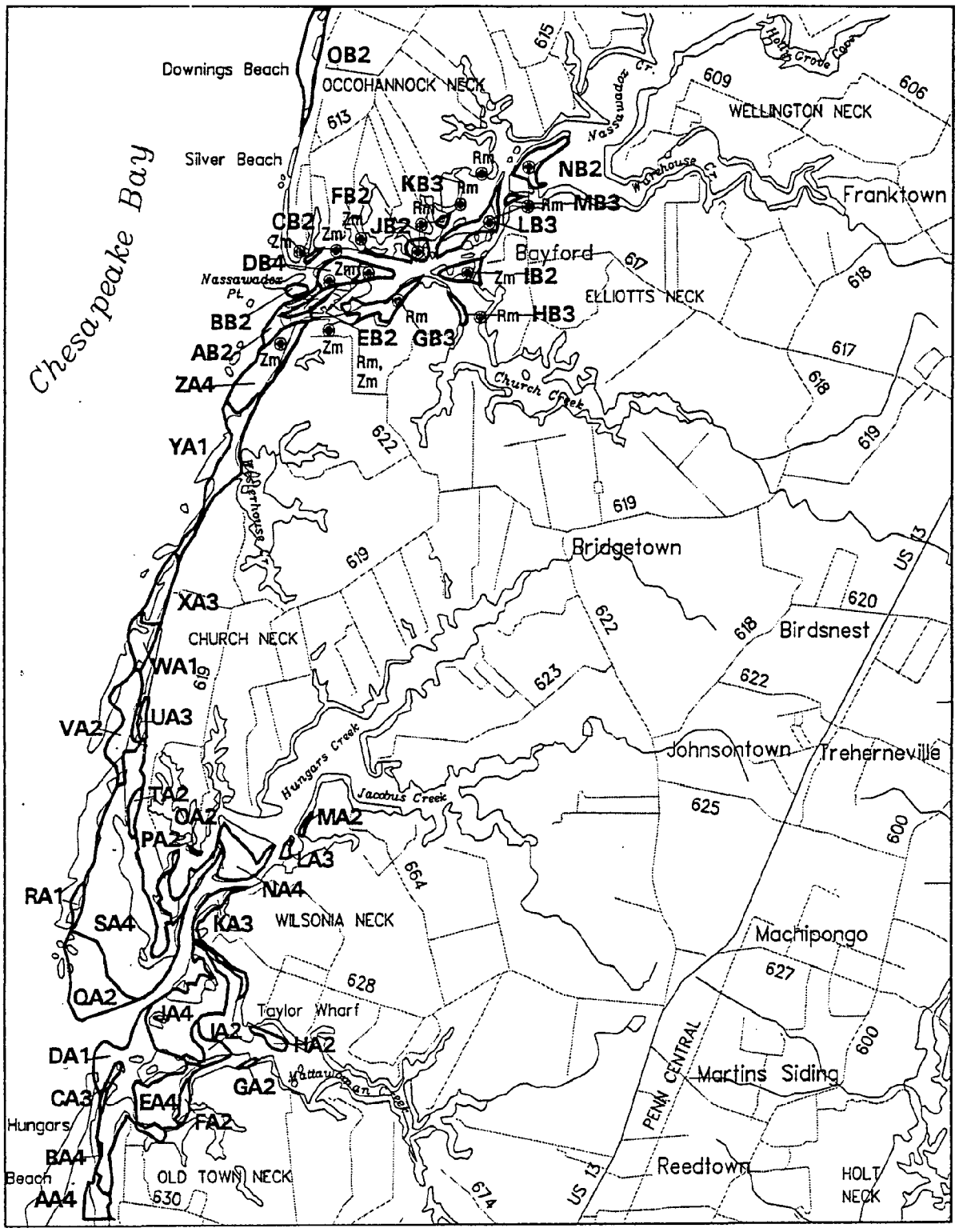
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 05-22-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Franktown, VA. (124)



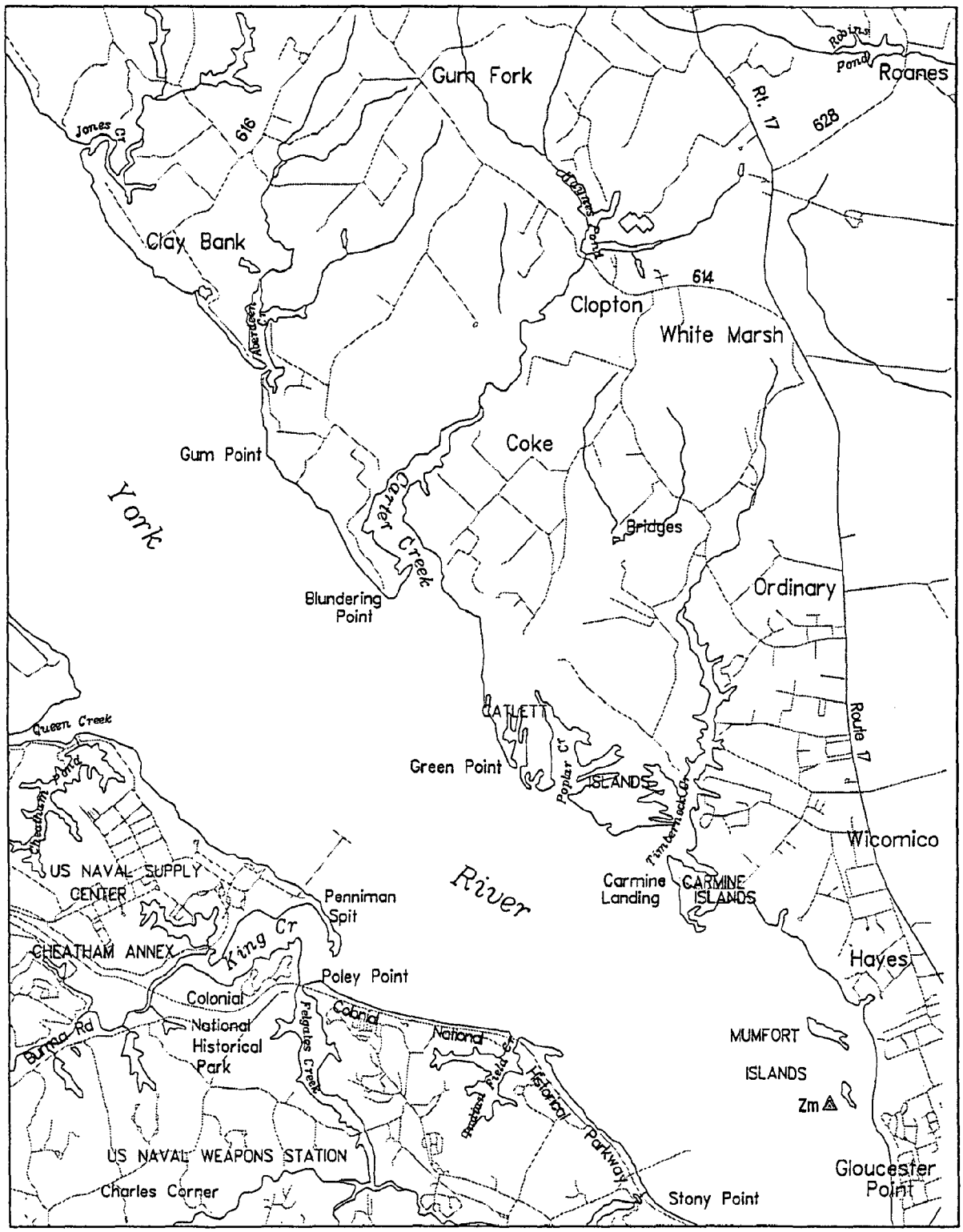
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 05-23-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Clay Bank, VA. (130)



0 1000 2000 3000

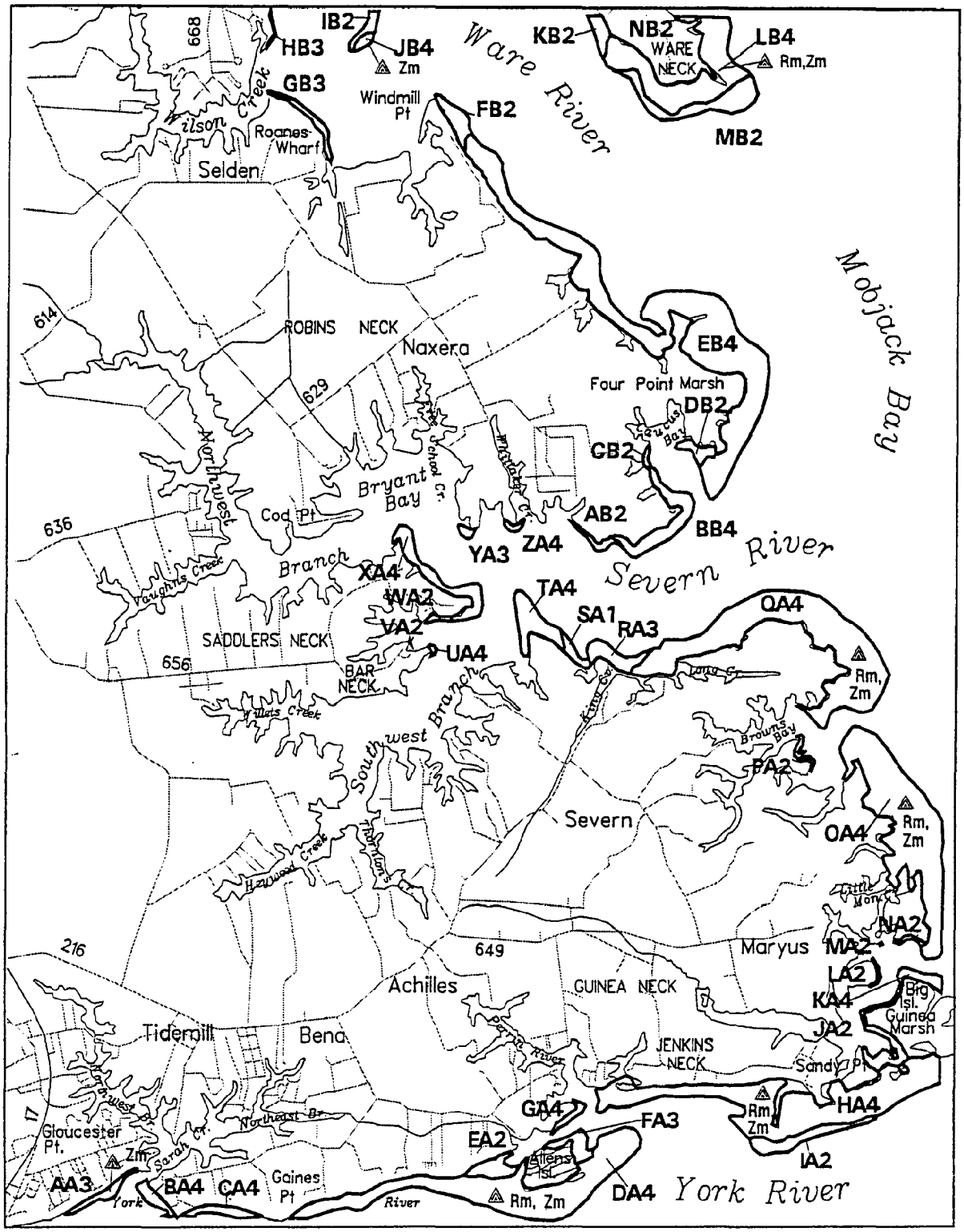
Scale (meters):

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown:

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Achilles, VA. (131)



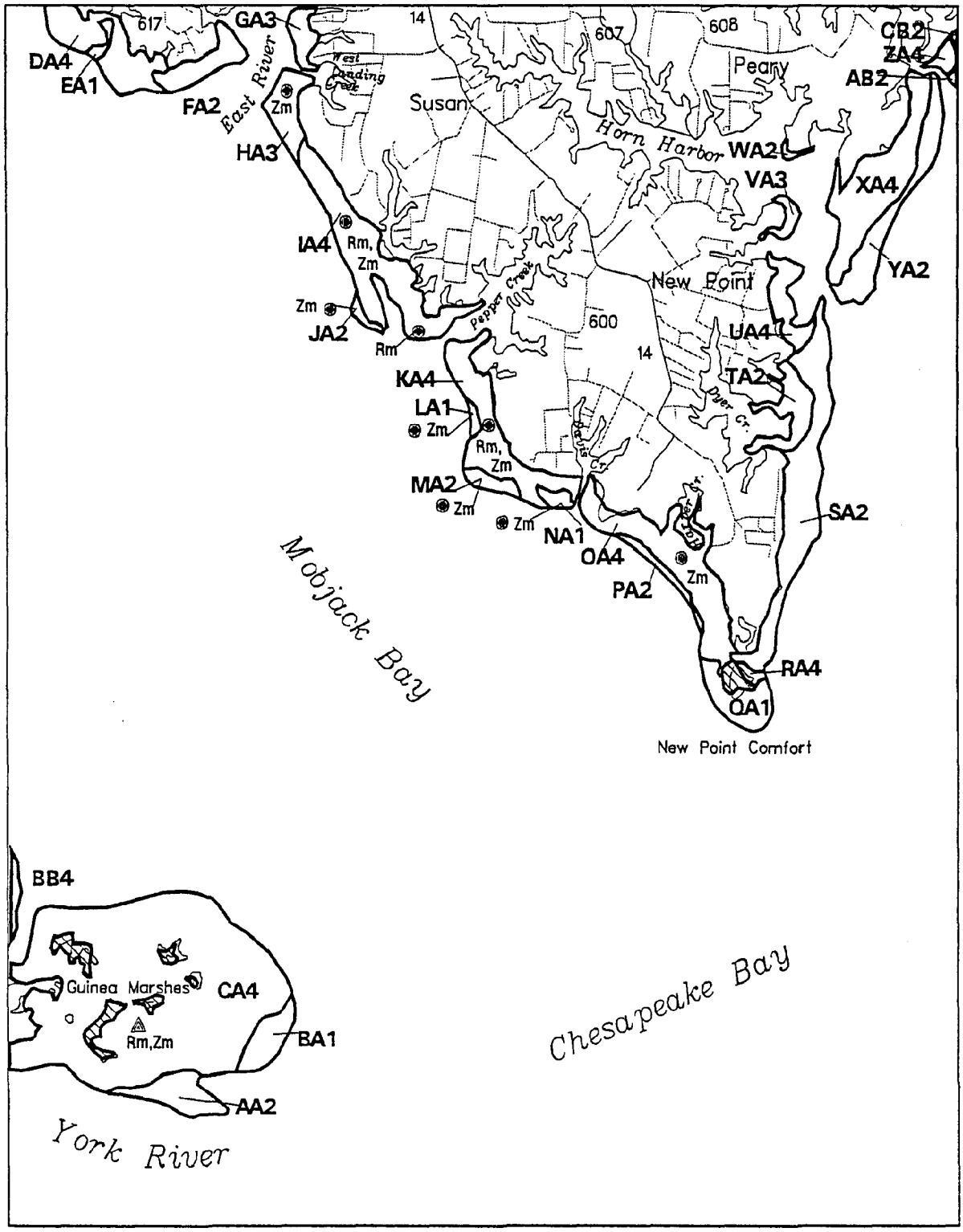
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 05-22-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
New Point Comfort, VA. (132)



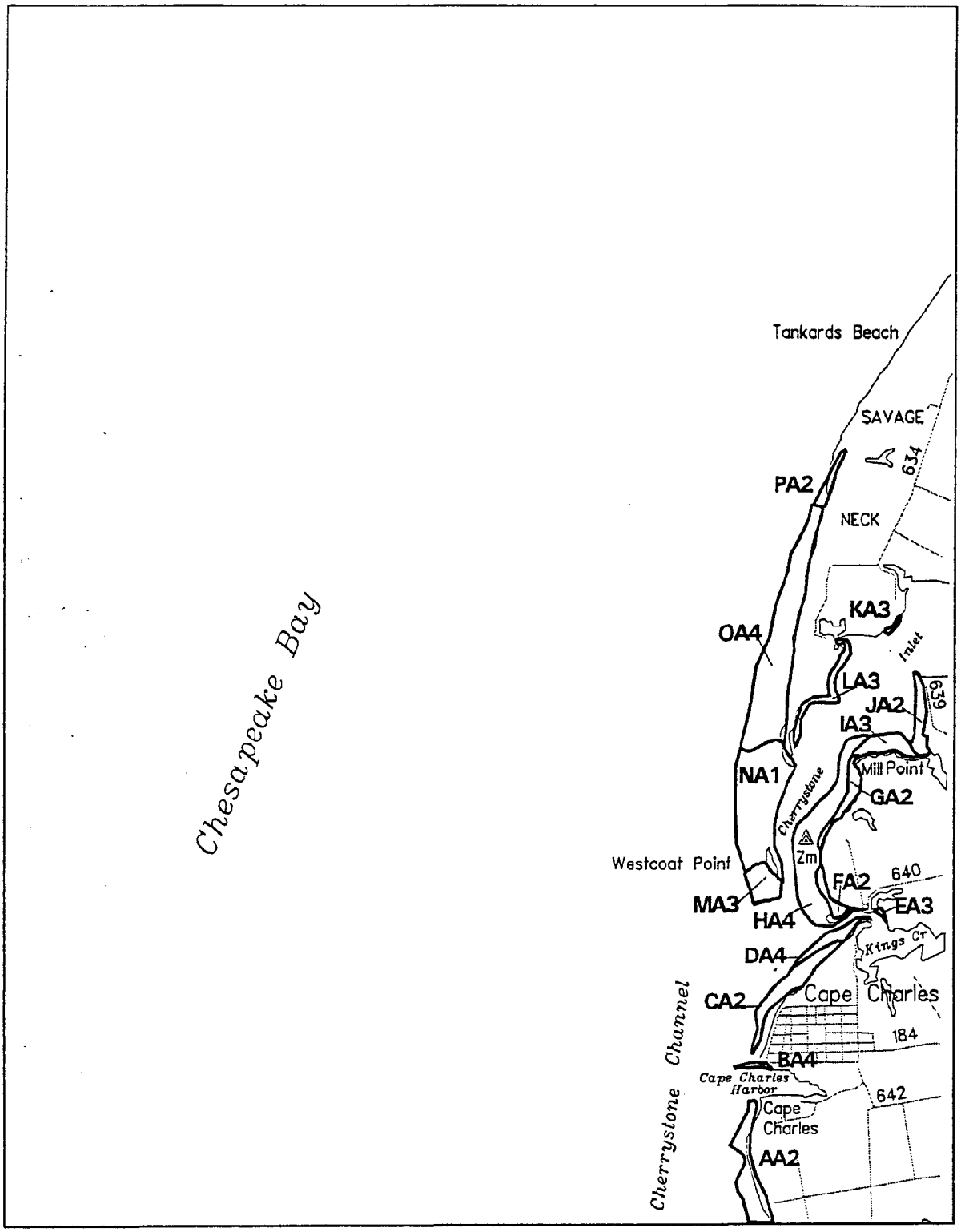
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 05-22-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Cape Charles, VA. (133)



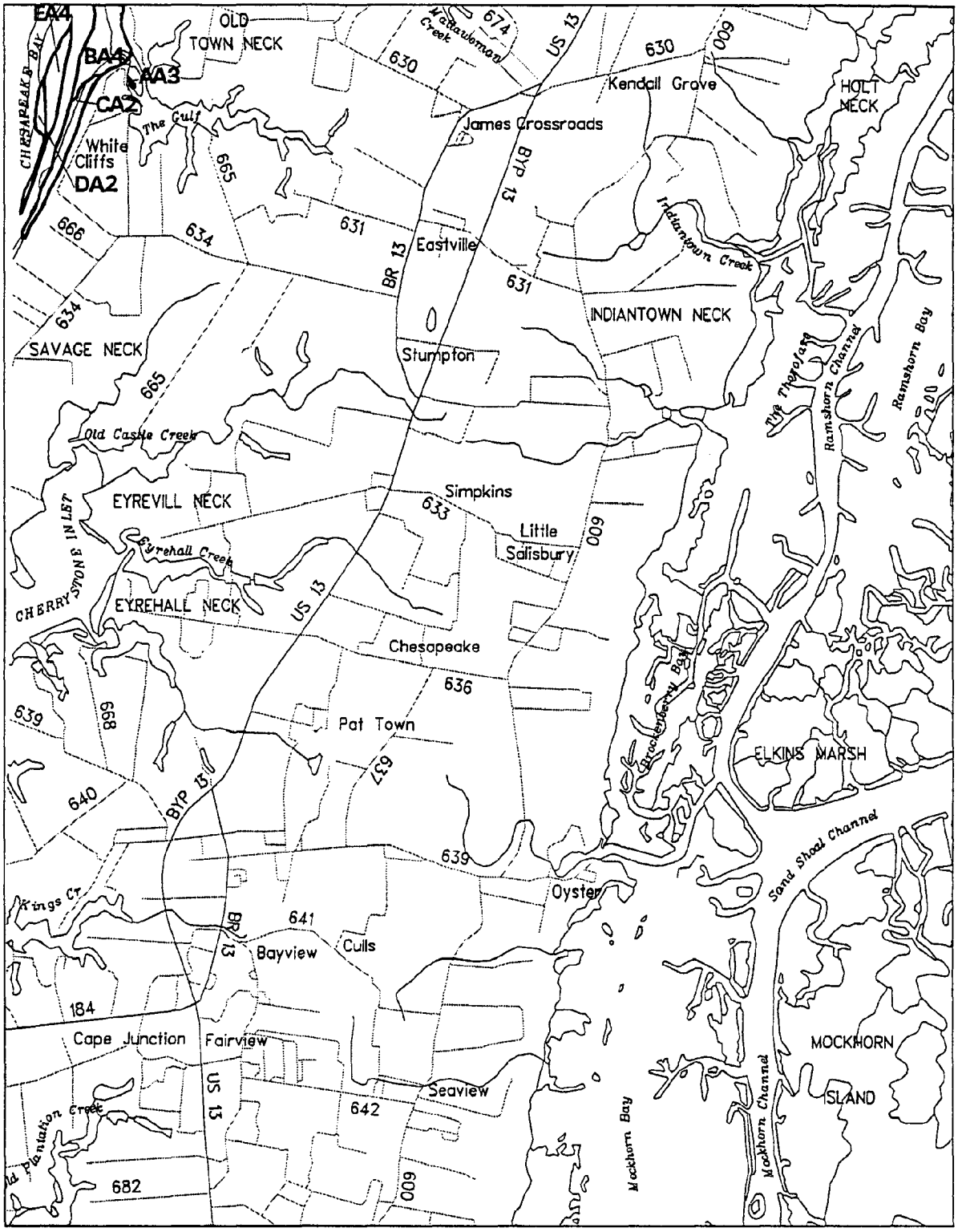
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 05-23-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Cheriton, VA. (134)



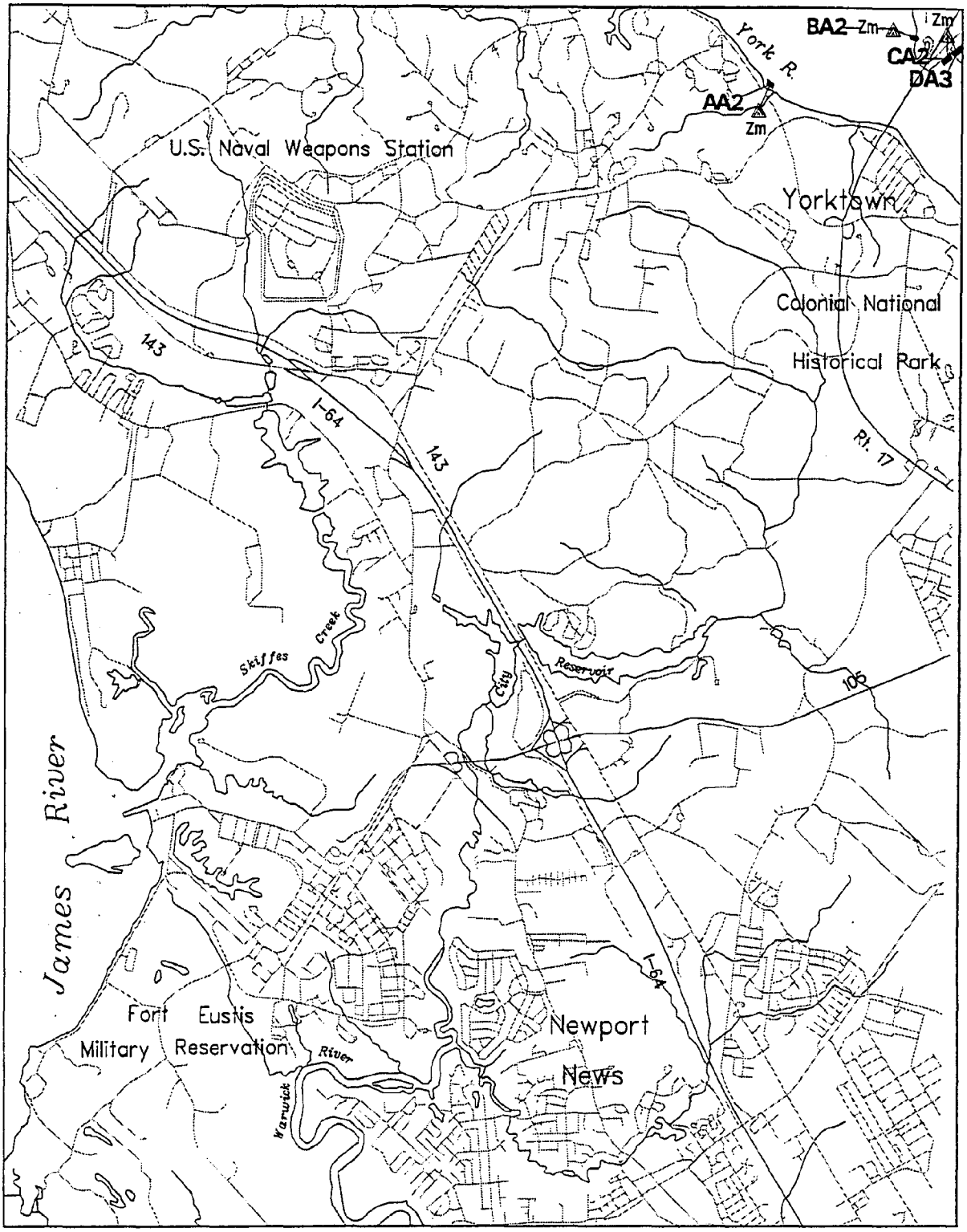
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 05-23-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Yorktown, VA. (139)



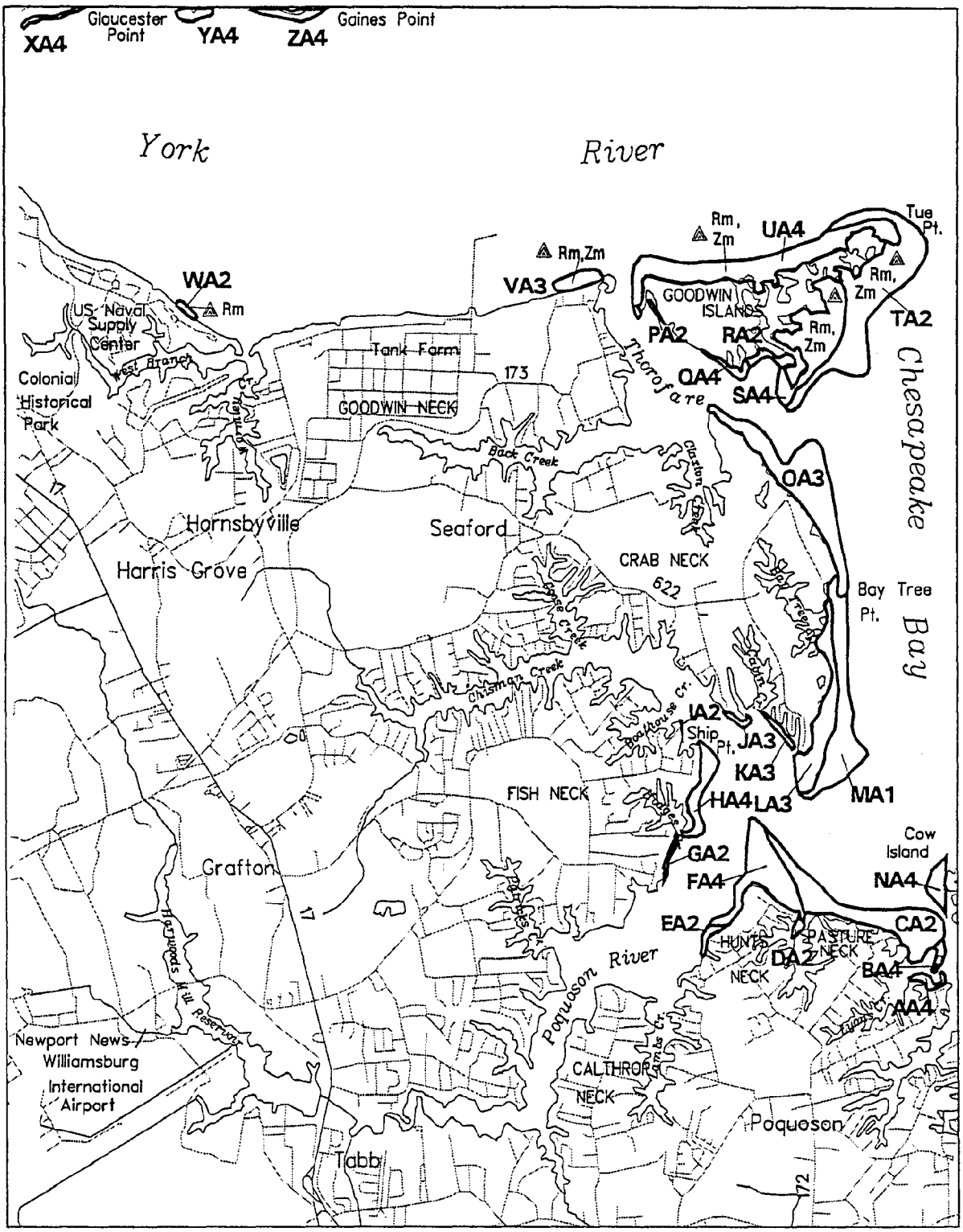
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 05-22-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Poquoson West, VA. (140)



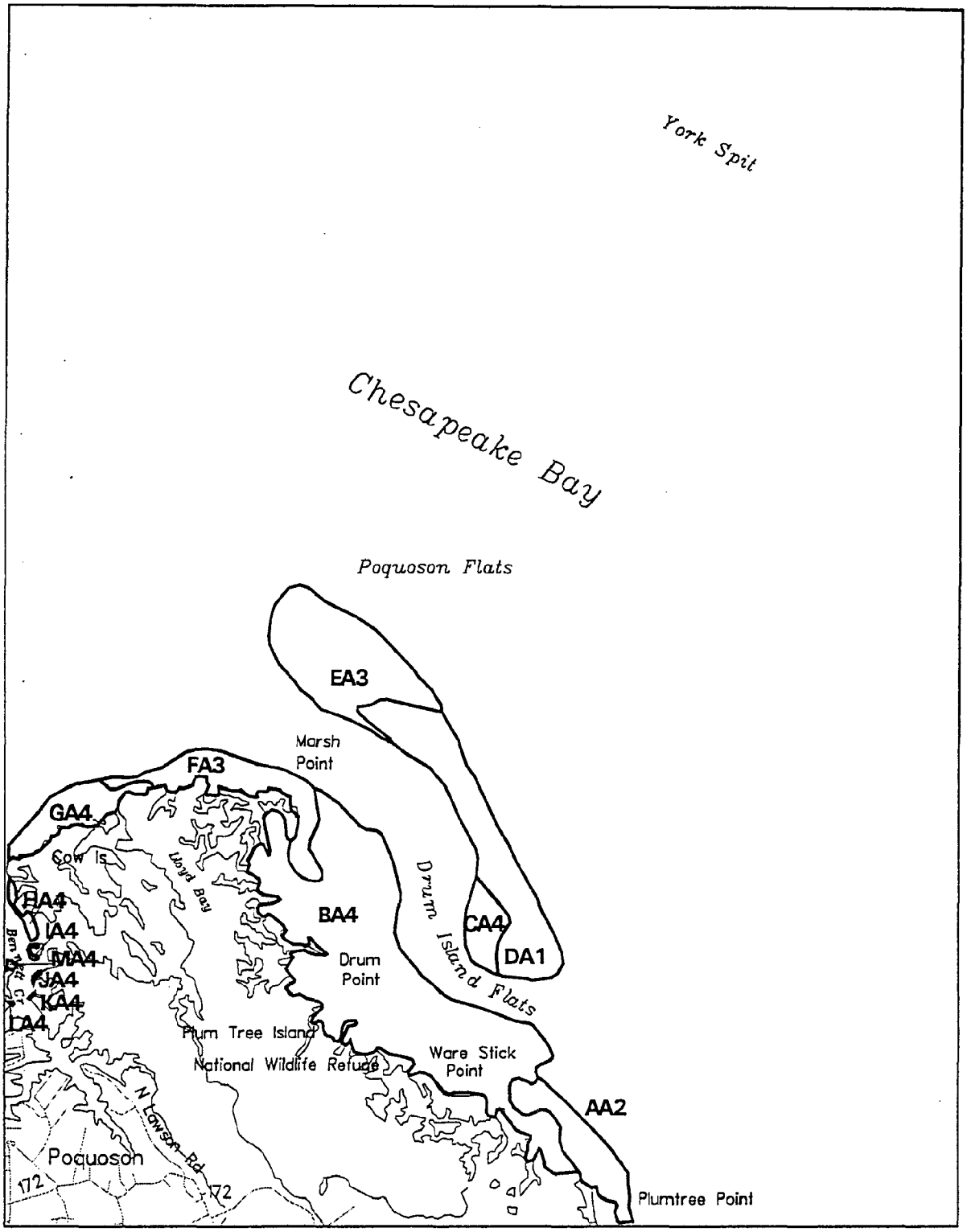
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 05-22-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Poquoson East, VA. (141)



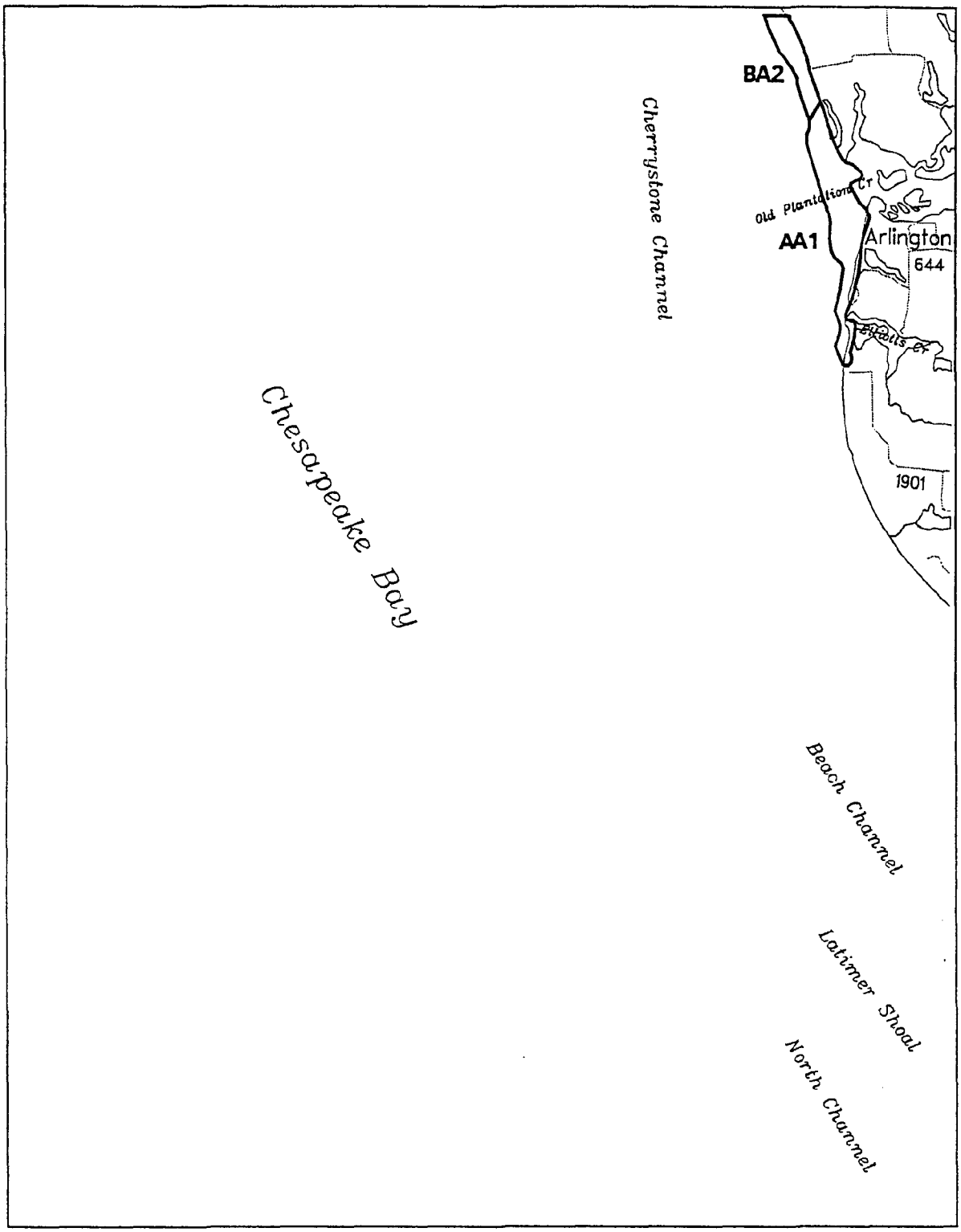
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 05-22-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Elliotts Creek, VA. (142)



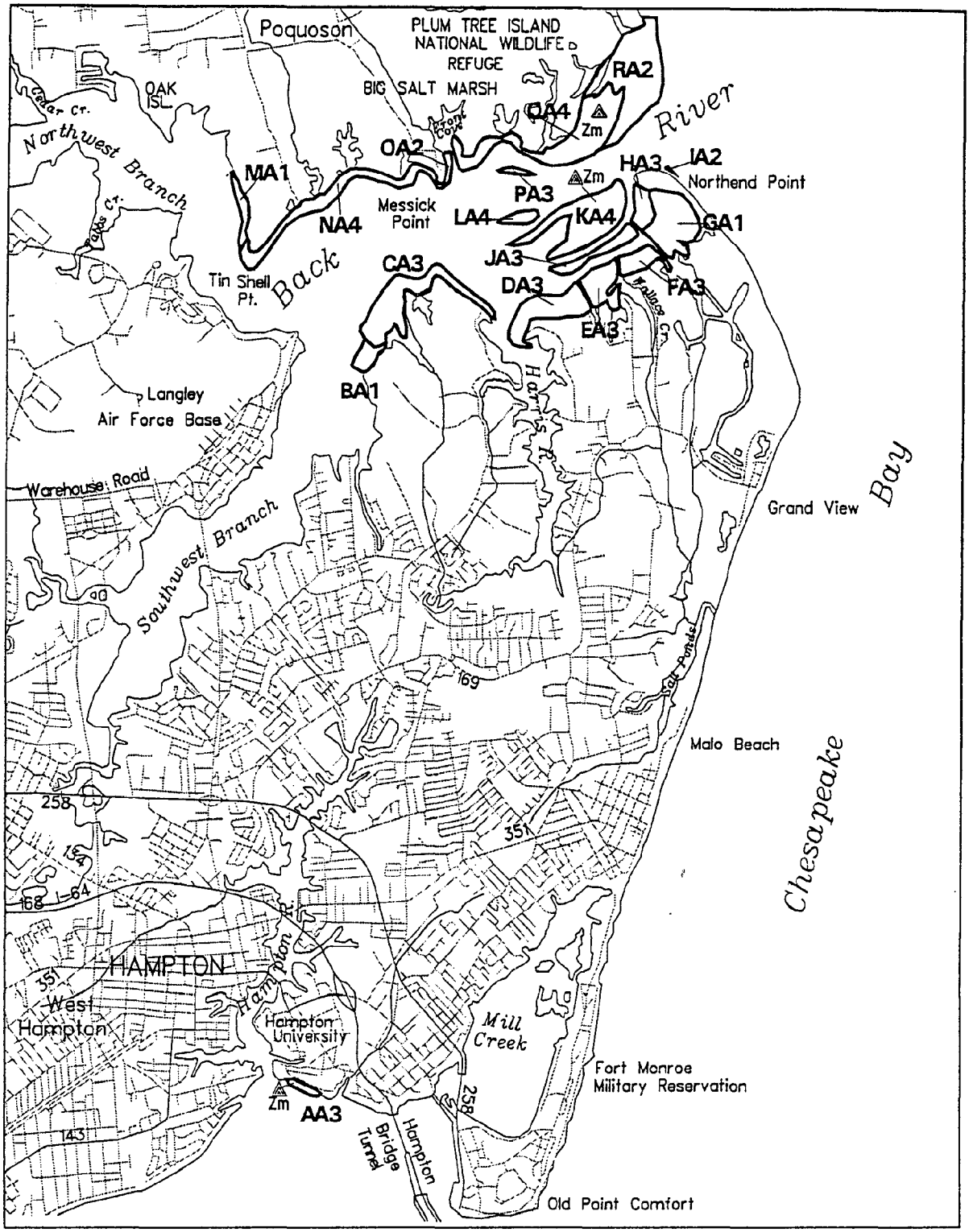
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 05-23-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Hampton, VA. (147)



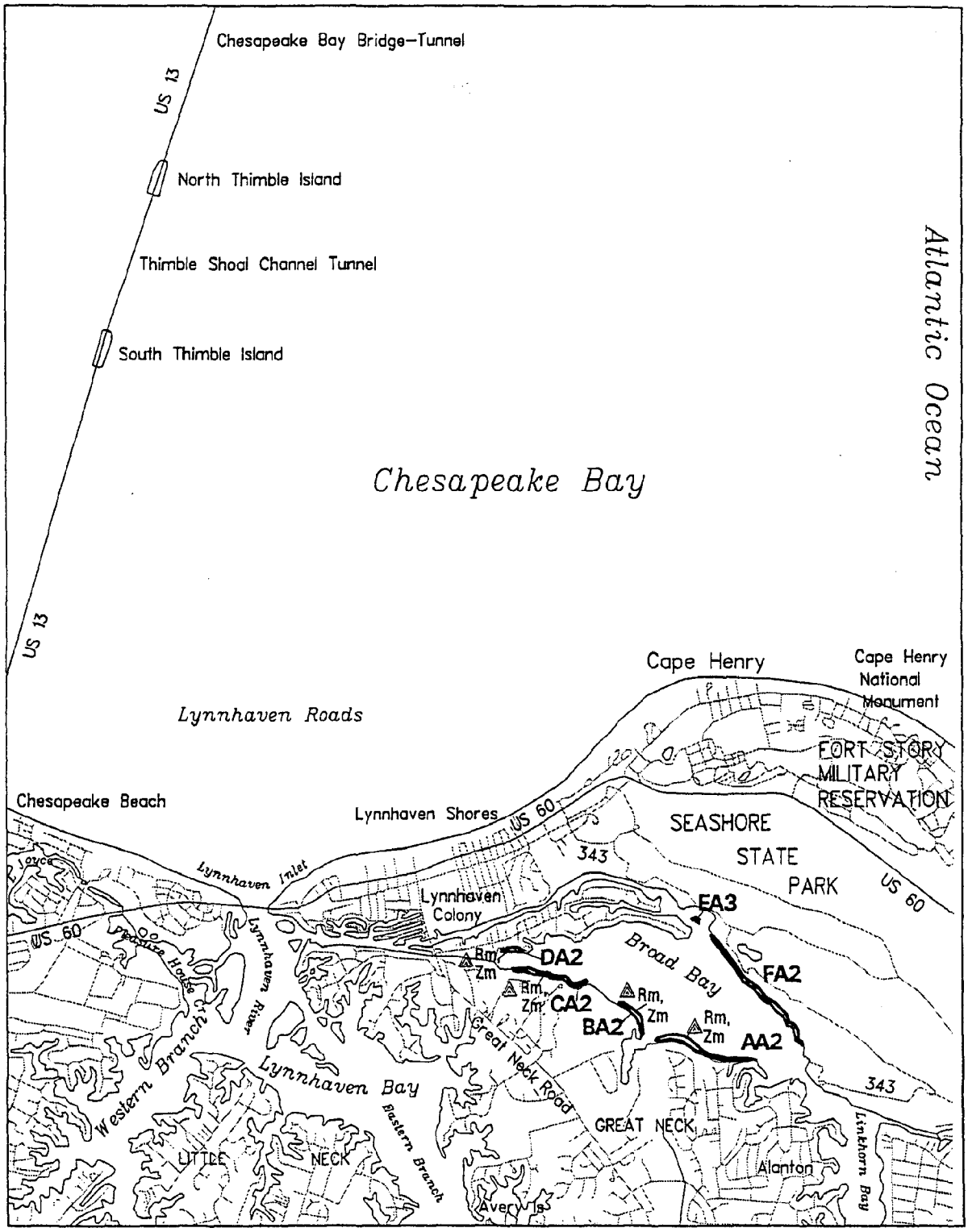
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 05-23-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Cape Henry, VA. (152)



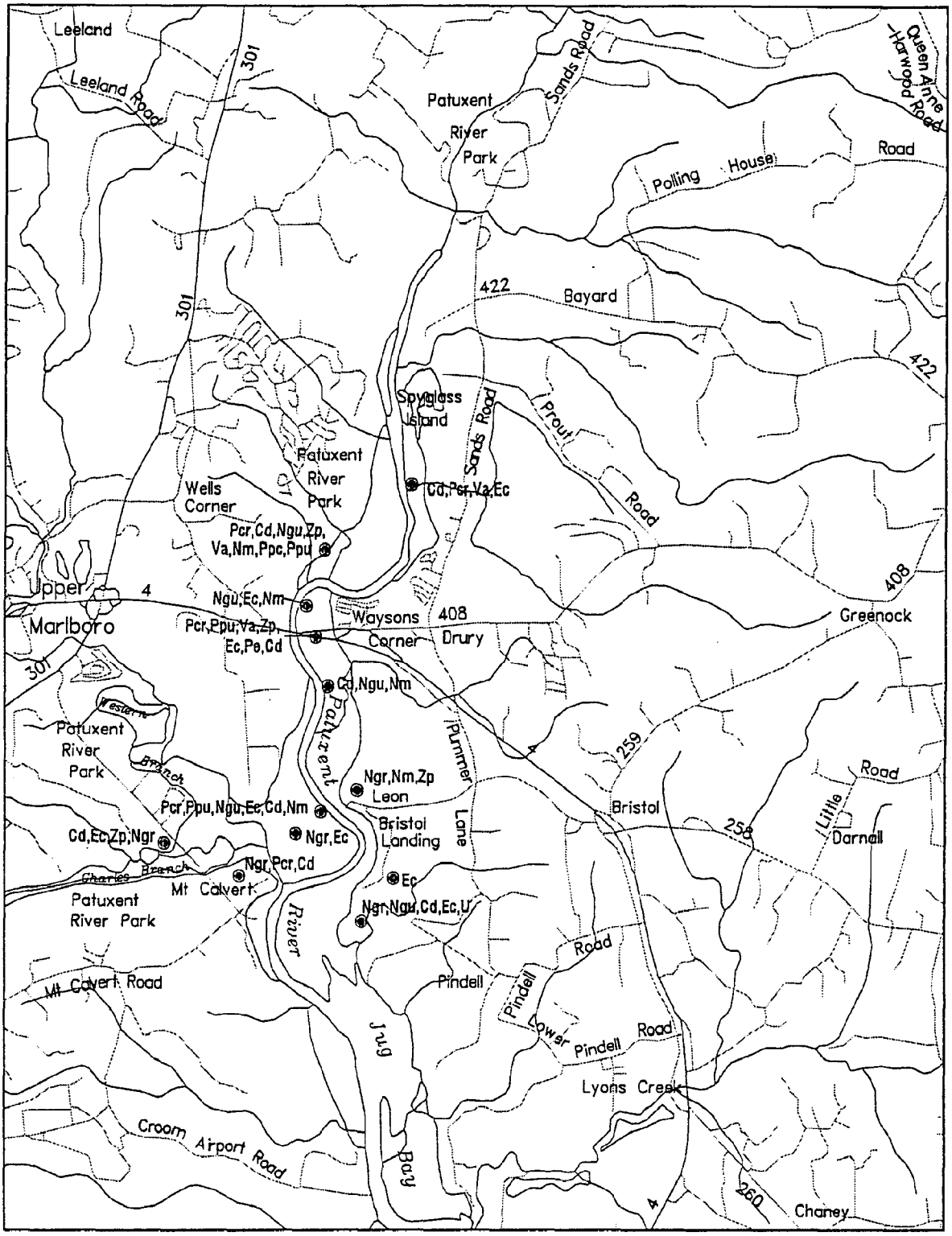
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 05-23-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Bristol, MD. (159)



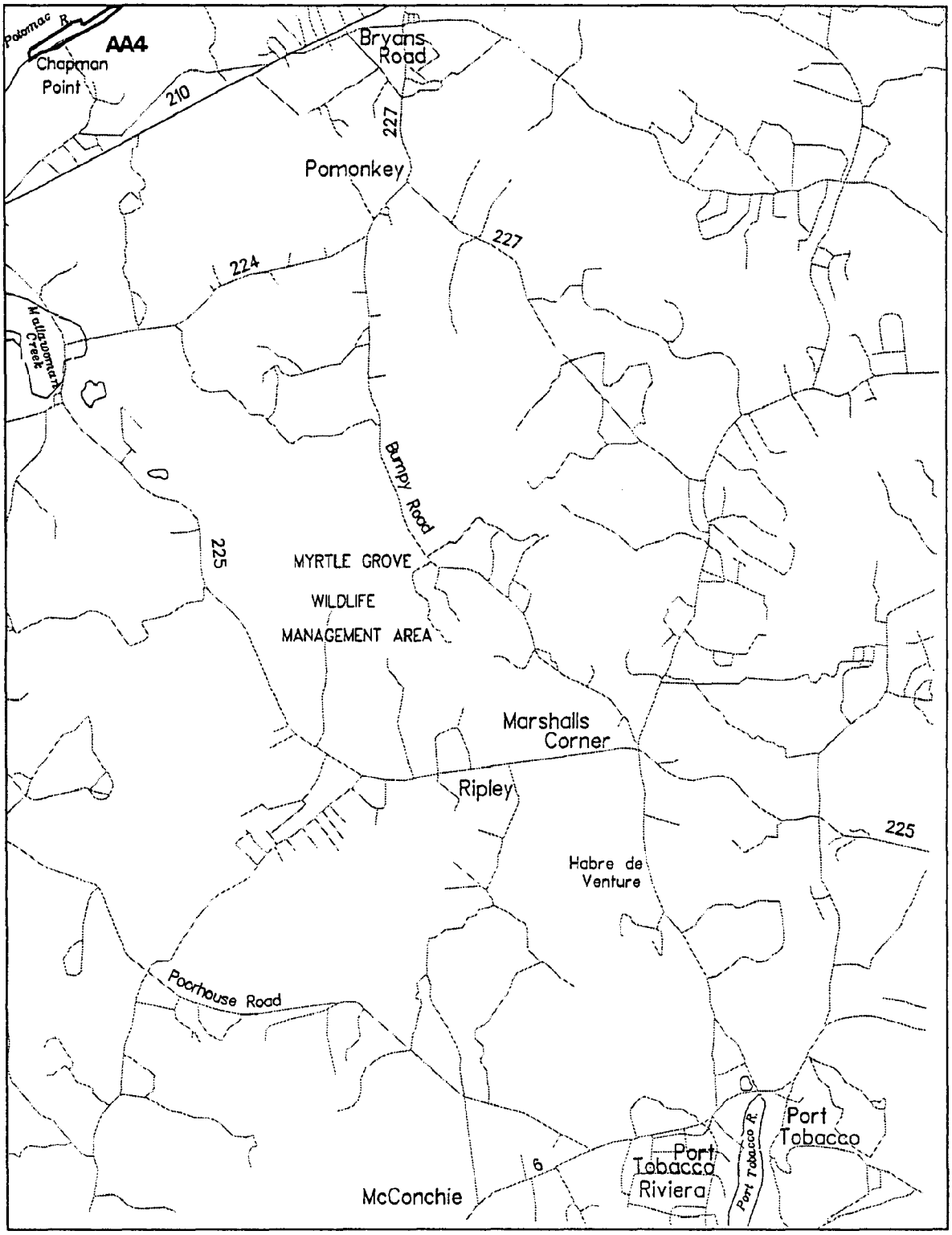
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 07-28-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Port Tobacco, MD. (161)



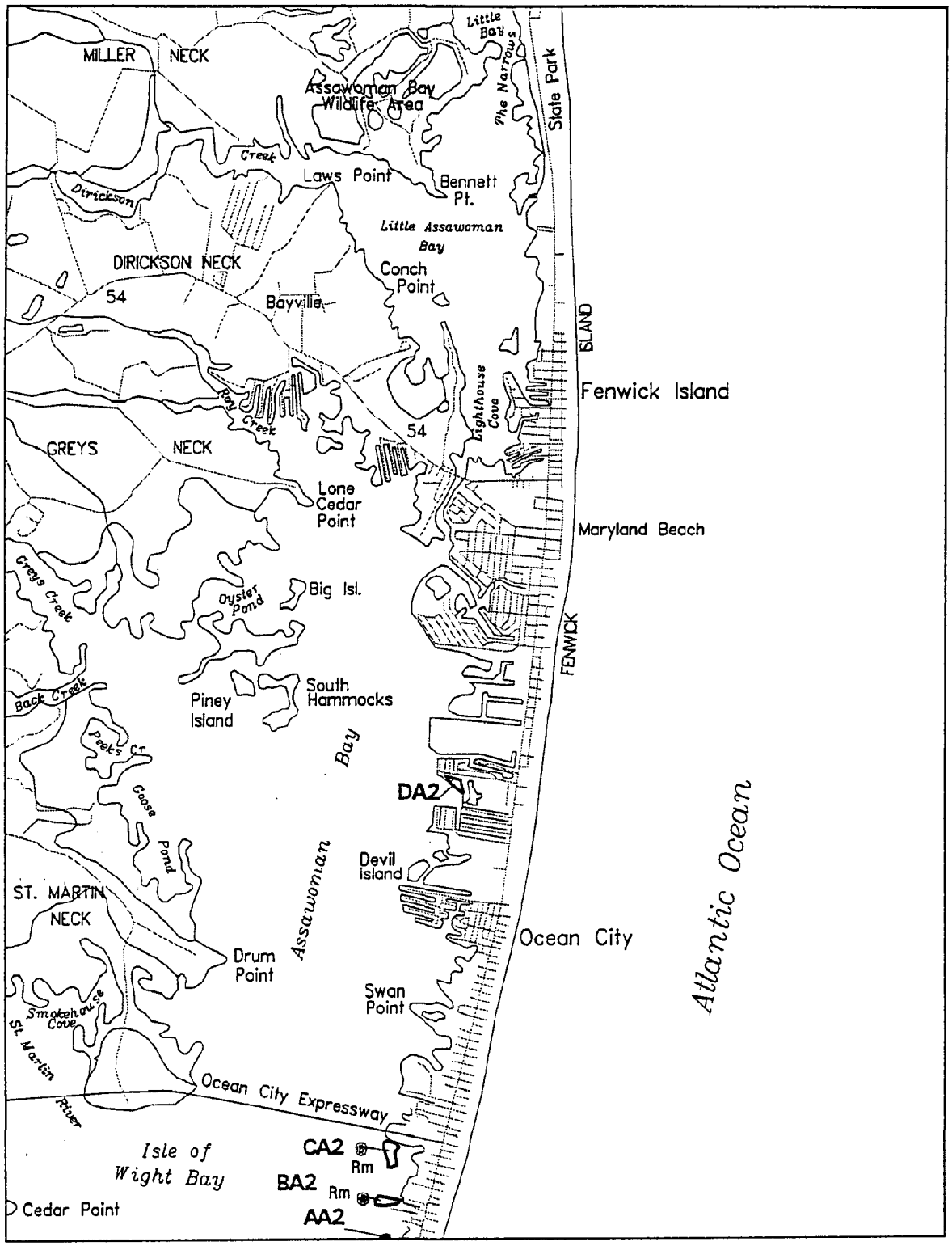
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 08-21-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Assawoman Bay, MD. (166)



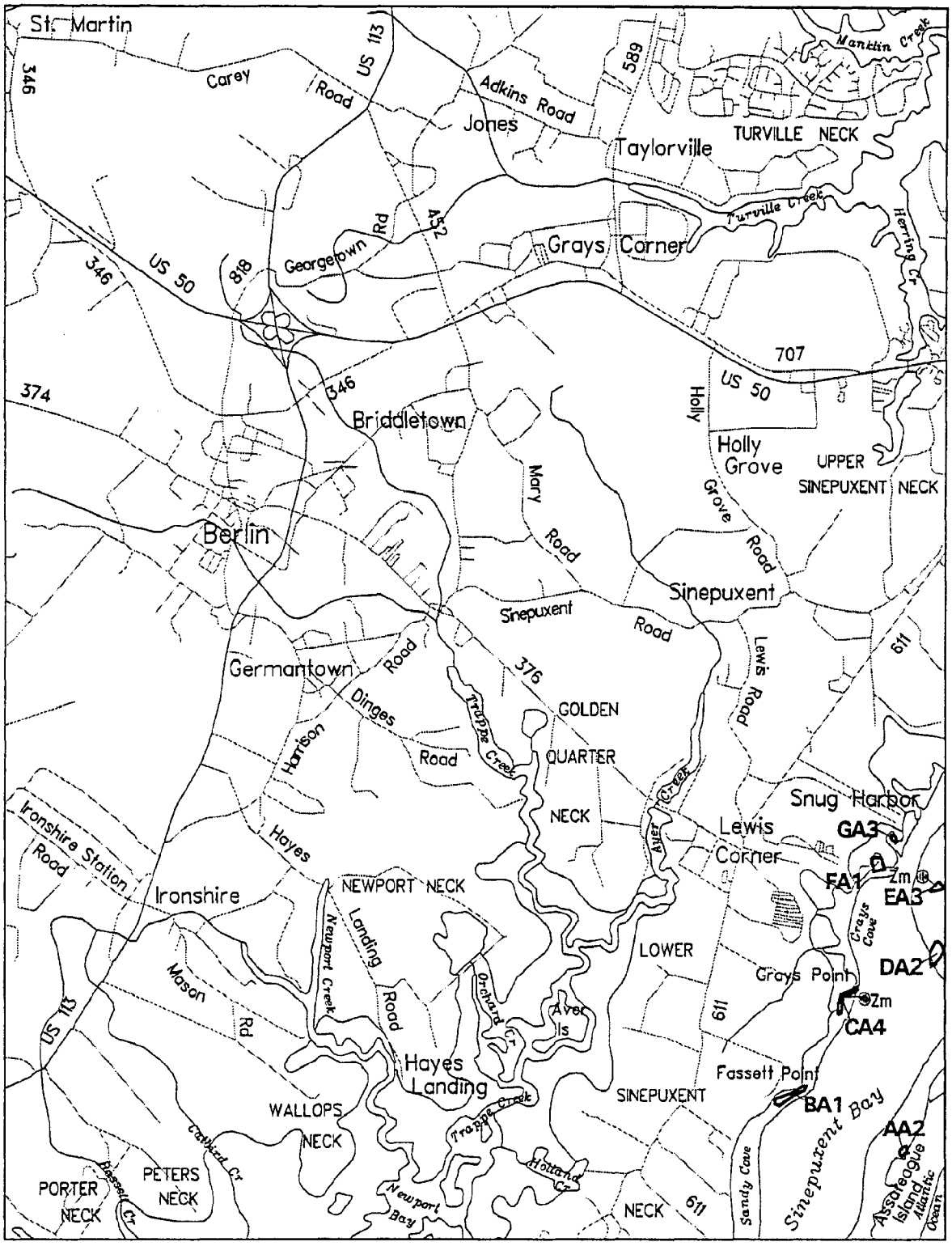
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 06-18-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Berlin, MD. (167)



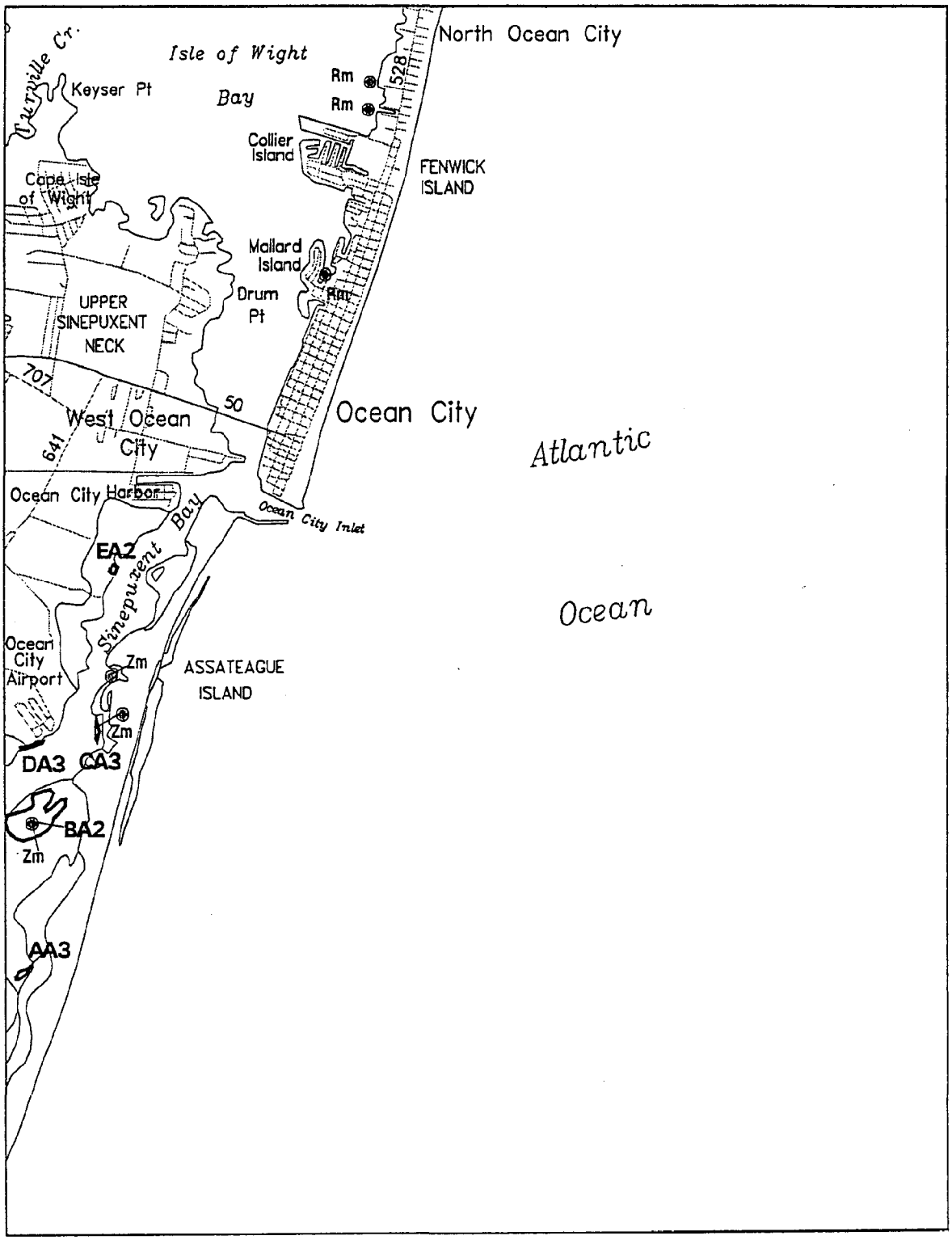
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 06-18-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Ocean City, MD. (168)



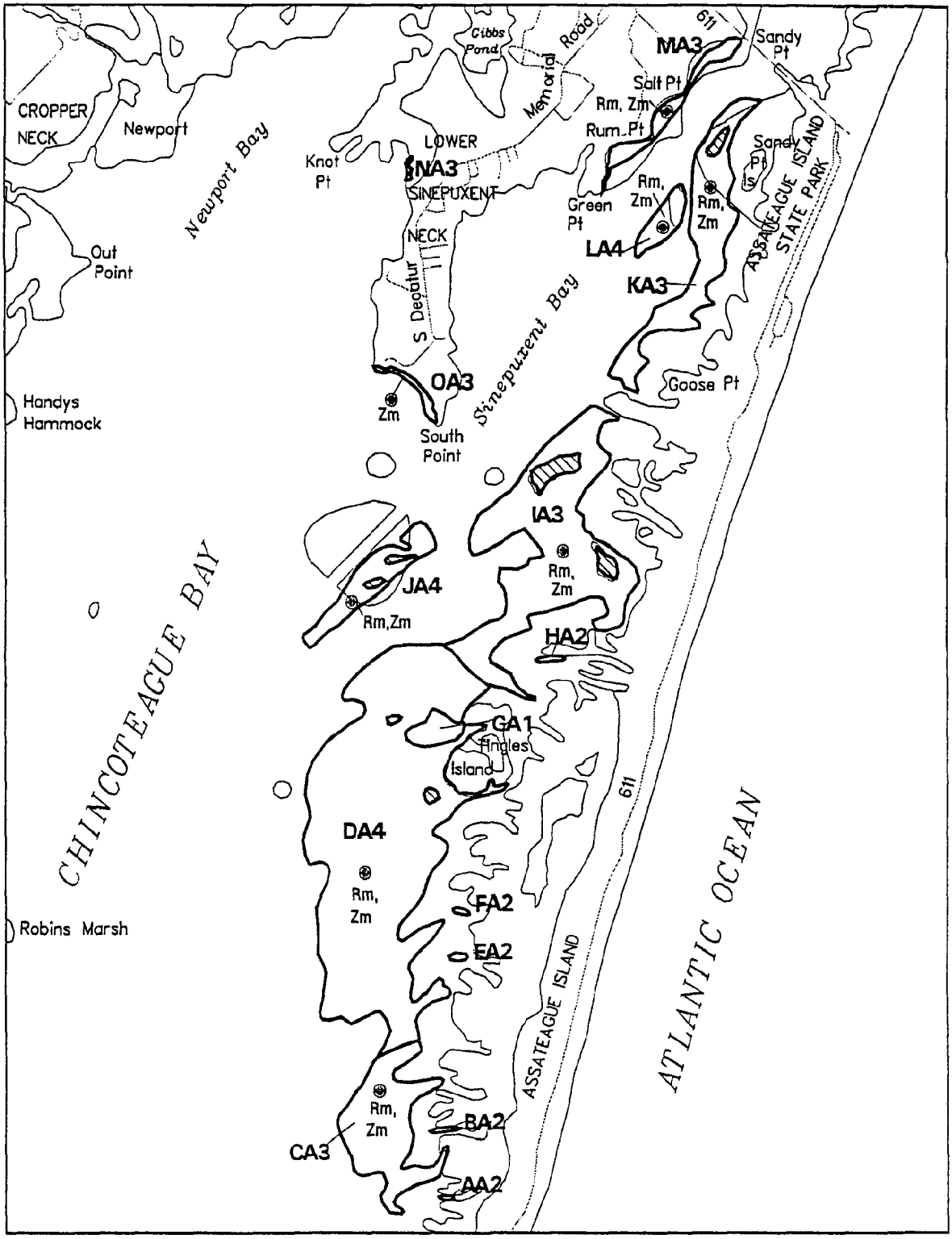
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 06-18-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Tingles Island, MD. (170)



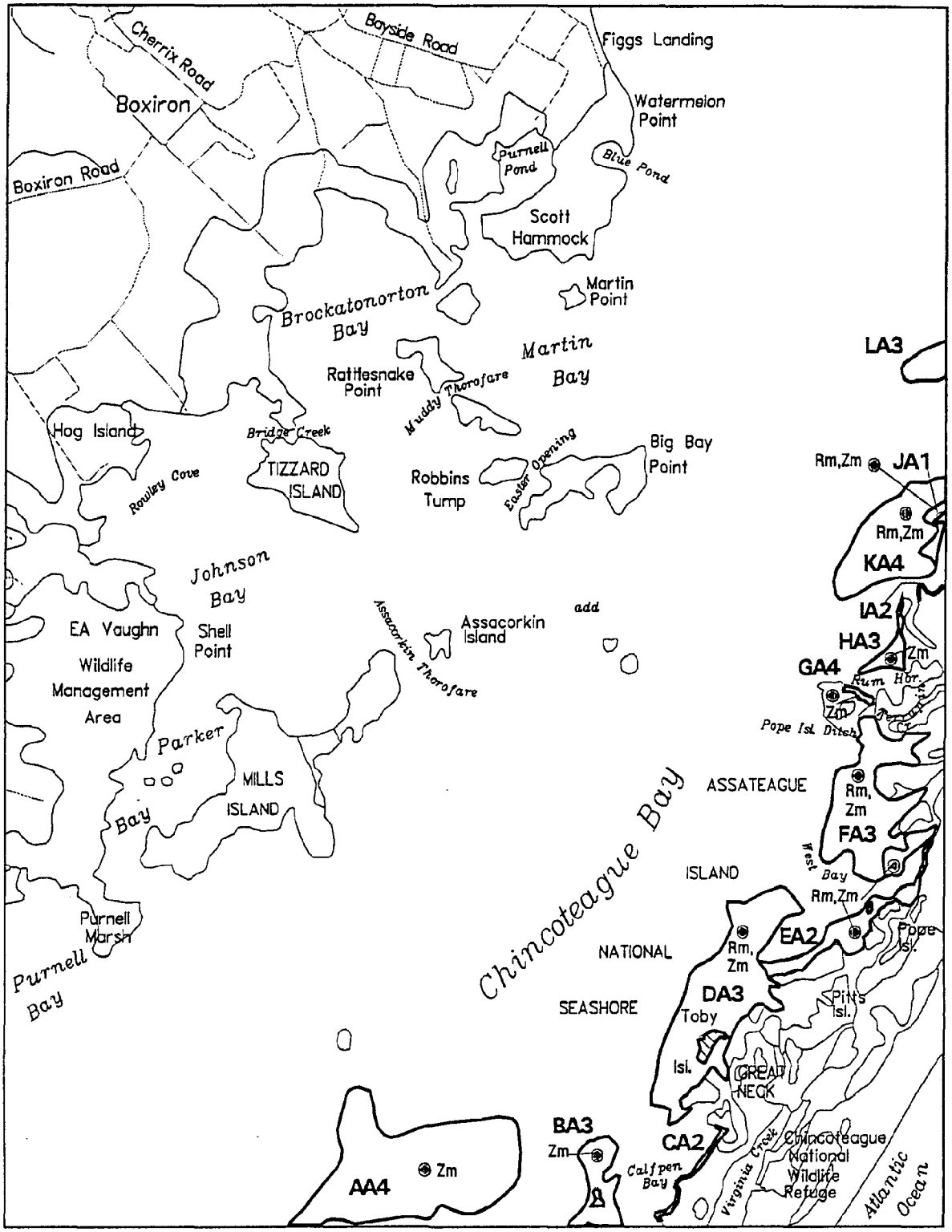
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 06-03-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Boxiron, MD.-VA. (172)



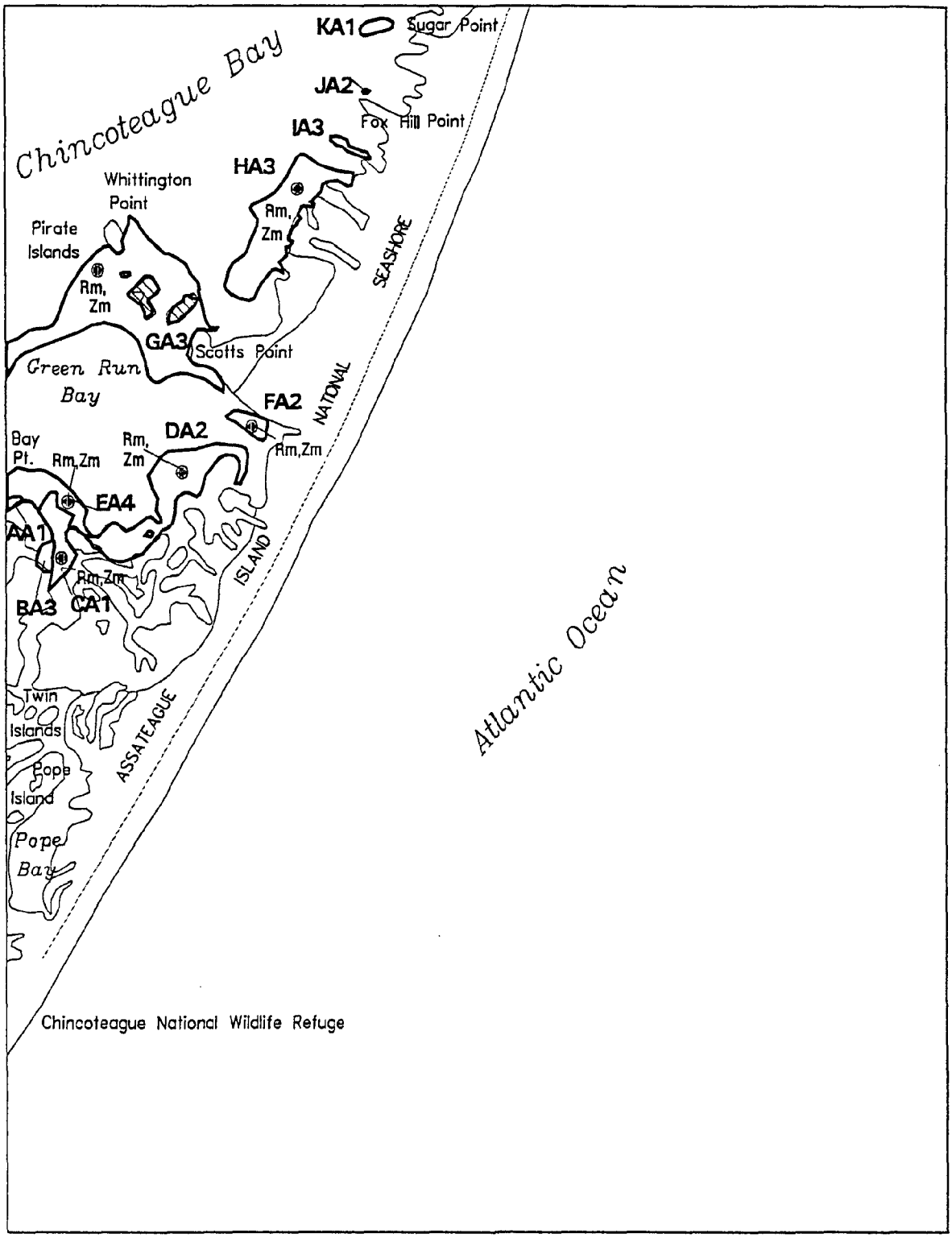
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 06-03-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Whittington Point, MD.-VA. (173)



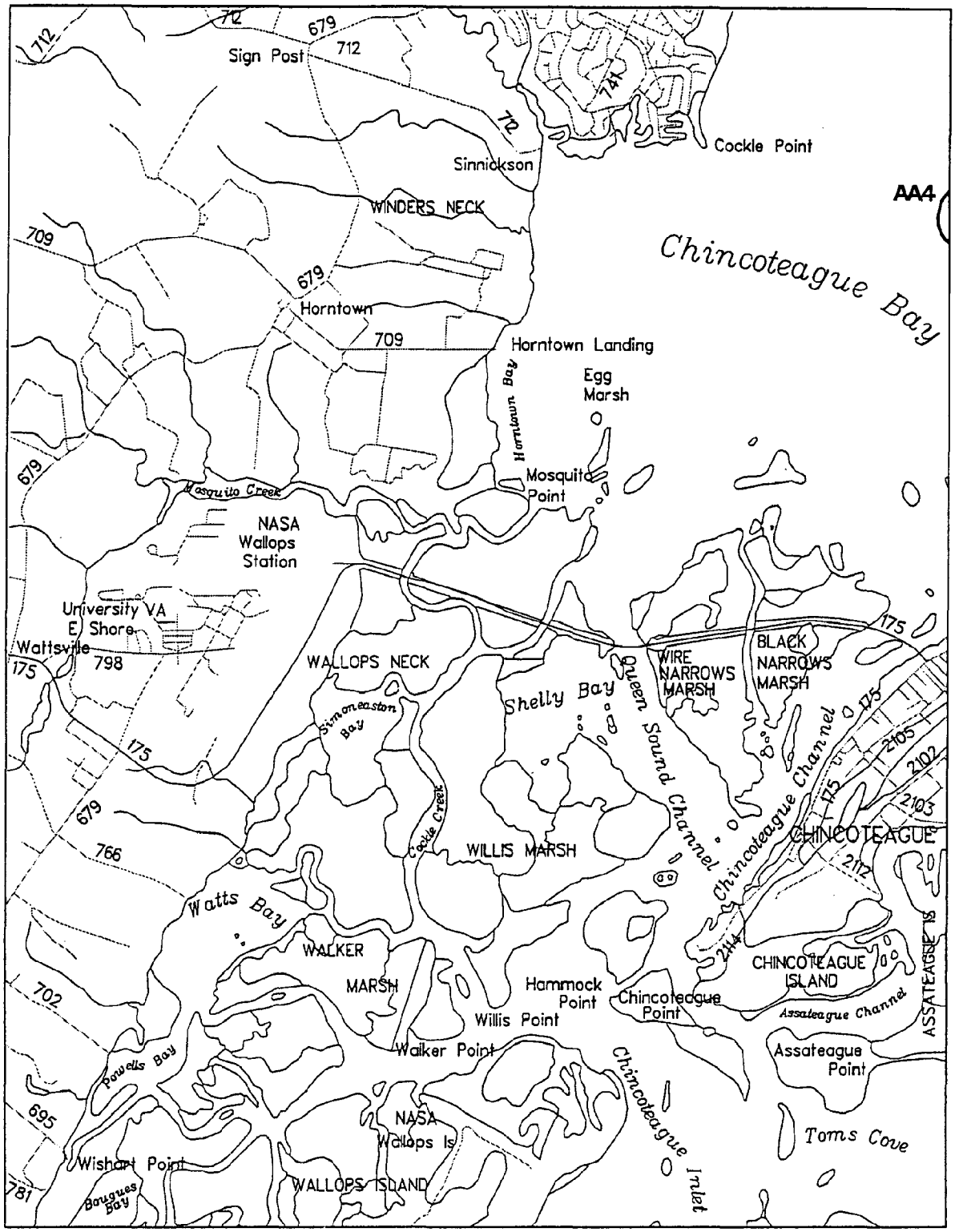
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 06-03-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Chincoteague West, VA. (174)



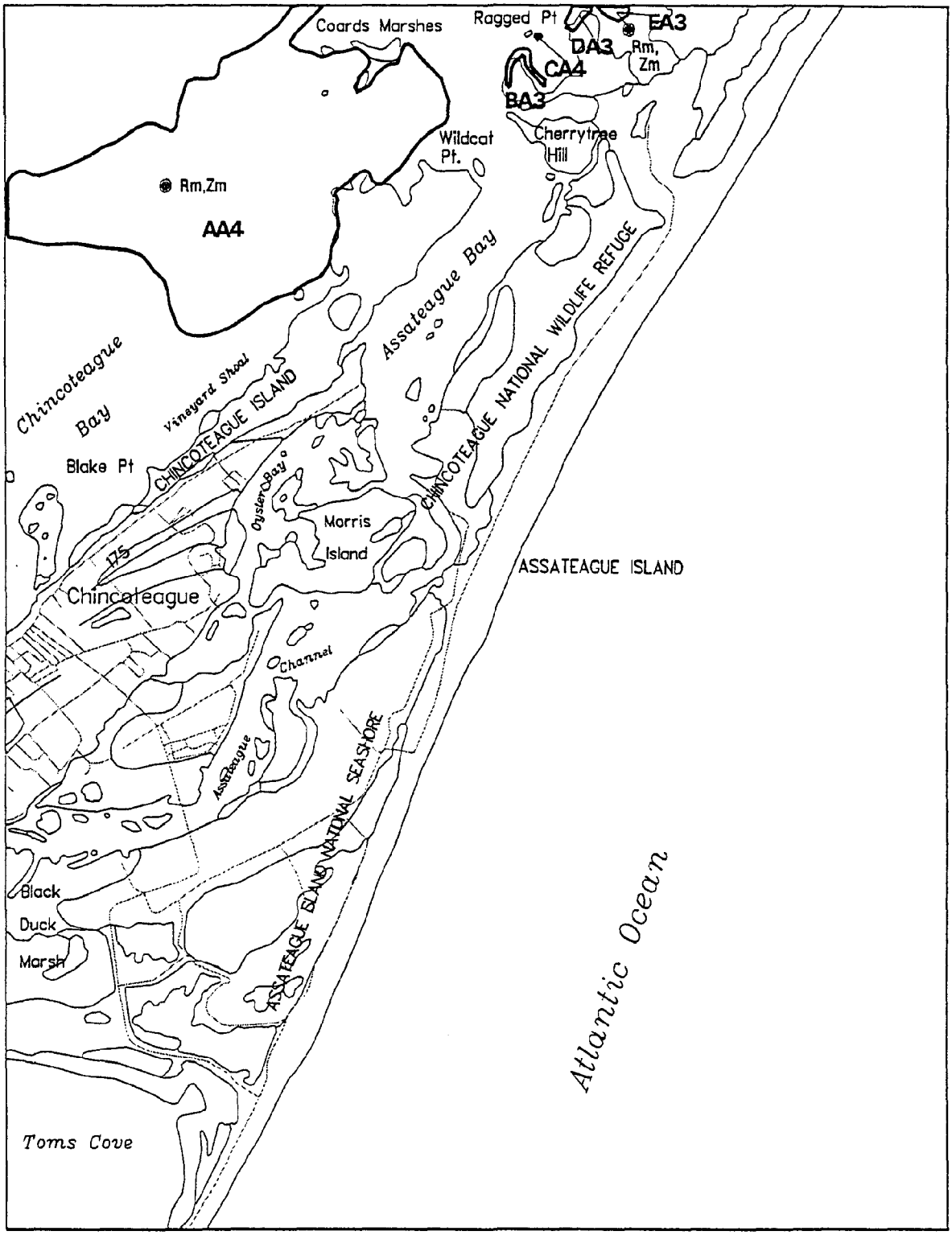
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 06-03-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Chincoteague East, VA. (175)



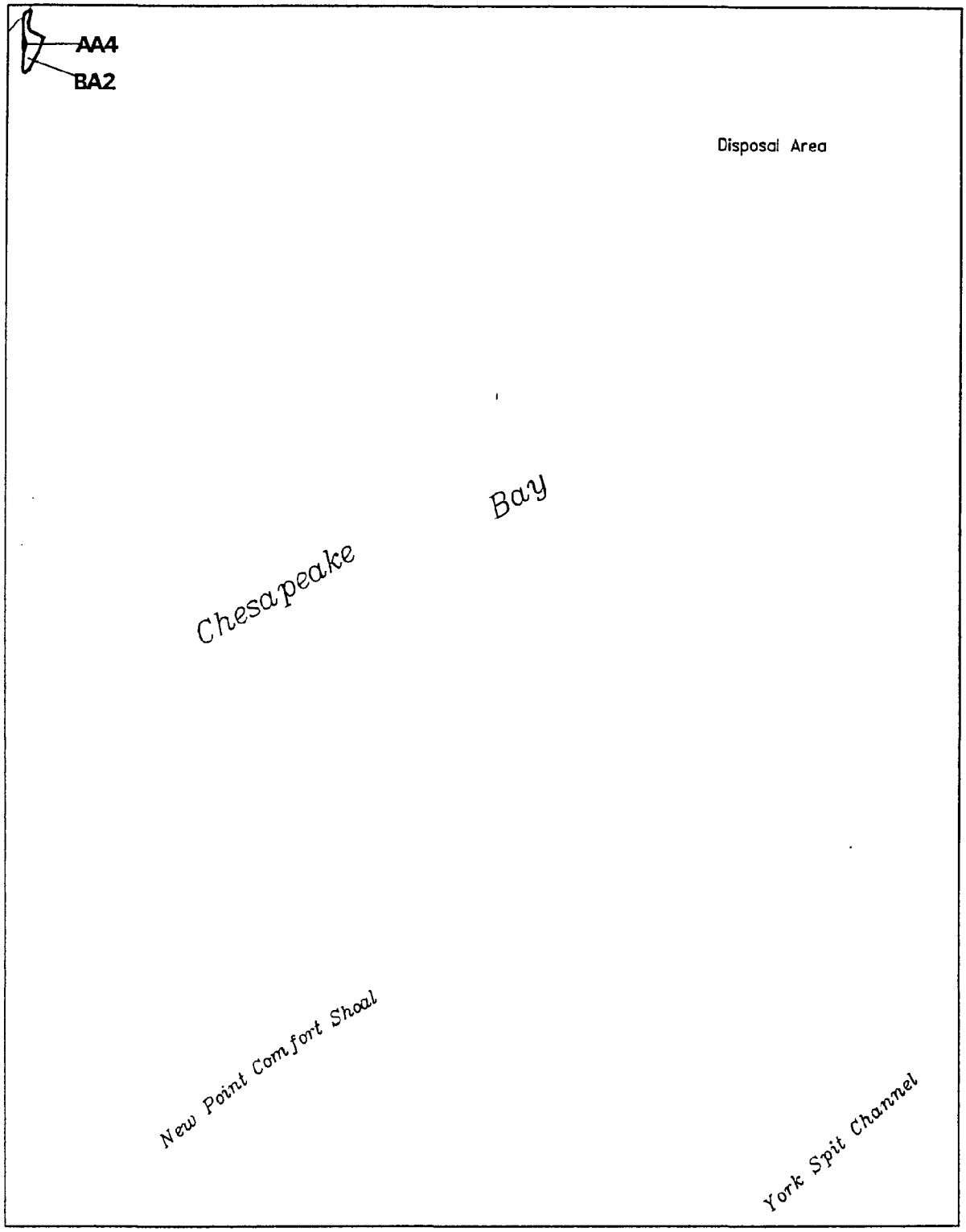
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 06-03-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
East of New Point, VA. (177)



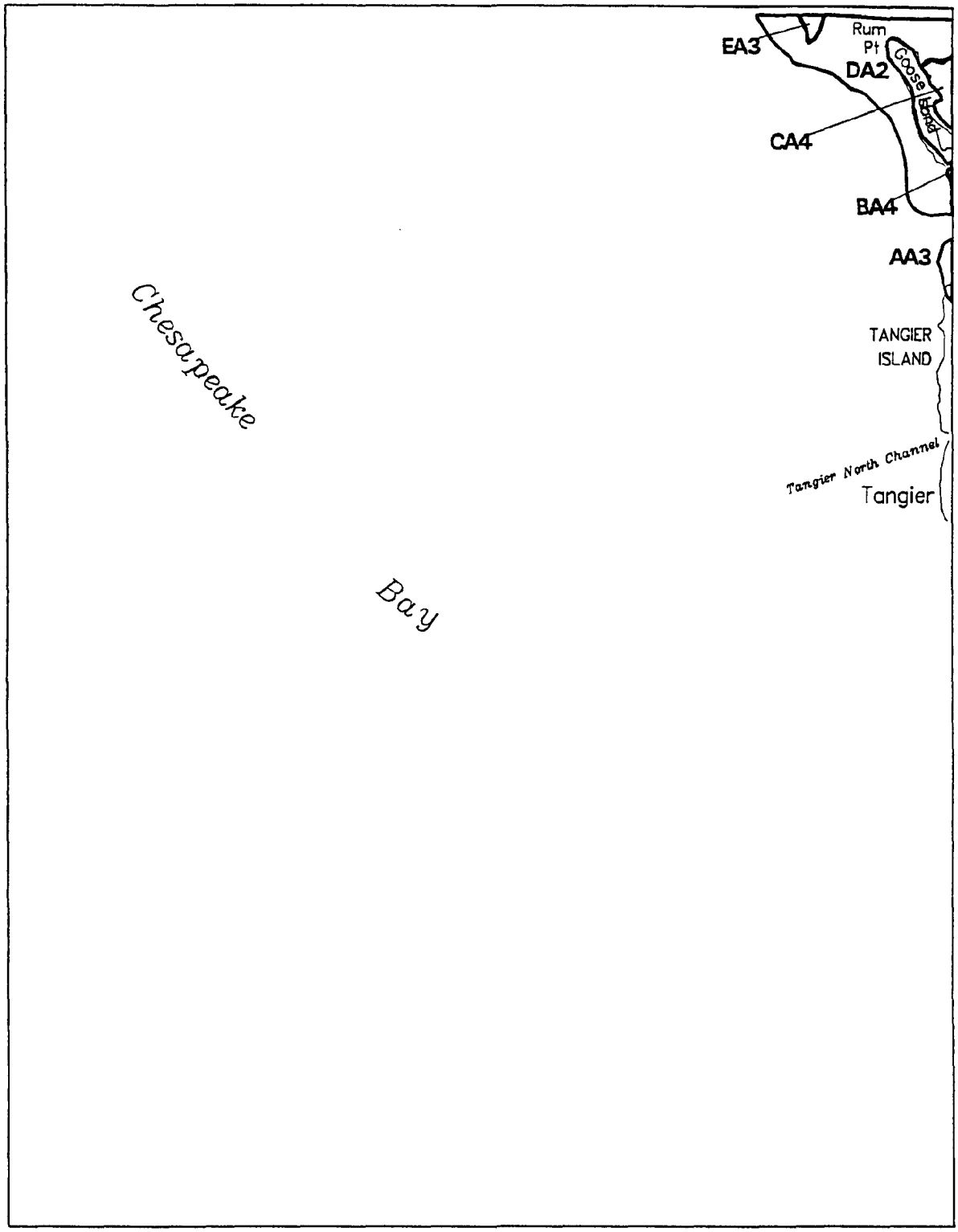
Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 05-22-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

SUBMERGED AQUATIC VEGETATION 1992
Goose Island, VA. (179)



Scale (meters): 0 1000 2000 3000

Sources: Virginia Institute of Marine Science
U.S. Geological Survey

Date Flown: 06-03-92

Produced by:
Virginia Institute of Marine Science
School of Marine Science
College of William and Mary

APPENDIX D

Number of Square Meters of SAV for Individual Beds and Totals For Density Categories For Each USGS 7.5 Minute Quadrangle in 1992.

APPENDIX D

Number of Square Meters of SAV for Individual Beds and Totals for Denisty Categories for Each USGS 7.5 Minute Quadrangle in 1992. [See Maps in Appendix C for Location of Each Bed. Quadrangles Are Listed Numerically by VIMS Map Number. Slight Differences (1 Square Meter) in Quadrangle Totals from Density Totals Are Due to Rounding.]

Aberdeen, MD.
VIMS MAP # 002

AA4	12333
BA4	4352
CA3	5429
DA3	4132
EA3	4615
FA3	14970
GA3	2000
HA3	102001
TOTAL AREA	
DENSITY 1 =	0
DENSITY 2 =	0
DENSITY 3 =	133147
DENSITY 4 =	16685
TOTAL =	149831

Havre de Grace, MD.
VIMS MAP # 003

AA2	7880
BA2	17045
CA4	51063
DA2	10763
EA1	9012
FA1	717134
GA4	304457
HA1	14996144
IA4	15027
JA2	3197
KA2	3154
LA2	4912
MA4	196934
NA4	5851
OA4	32761
PA4	2460
QA4	4696
RA3	8856
SA3	4099
TA4	4437
UA4	7610
VA4	12817
WA4	60709
XA4	84199
YA4	29357
ZA3	18494
AB4	18938
BB4	9370
CB4	3664
DB4	1730
EB4	5536
FB4	6448
GB4	7109
HB4	11726
IB4	4955
JB4	49701
KB4	4246
LB1	48529
MB1	82467
NB4	212708
OB4	107579
PB2	11169
QB4	58850
RB4	65639
SB2	7648
TB2	7489
UB1	6633
VB4	27436
WB2	40001
XB3	44190
TOTAL AREA	
DENSITY 1 =	15859919
DENSITY 2 =	113258
DENSITY 3 =	75639
DENSITY 4 =	1408011
TOTAL =	17456827

North East, MD.
VIMS MAP # 004

AA1	33573
BA1	1083803
CA1	18007
DA1	63872
EA1	13482

FA1	22350
GA1	27022
TOTAL AREA	
DENSITY 1 =	1262109
DENSITY 2 =	0
DENSITY 3 =	0
DENSITY 4 =	0
TOTAL =	1262109

Edgewood, MD.
VIMS MAP # 007

AA3	4258
TOTAL AREA	
DENSITY 1 =	0
DENSITY 2 =	0
DENSITY 3 =	4258
DENSITY 4 =	0
TOTAL =	4258

Perryman, MD.
VIMS MAP # 008

AA2	5782
BA3	15666
CA3	22217
DA3	3282
EA3	14211
FA3	26689
TOTAL AREA	
DENSITY 1 =	0
DENSITY 2 =	5782
DENSITY 3 =	82065
DENSITY 4 =	0
TOTAL =	87846

Spesutie, MD.
VIMS MAP # 009

AA2	69918
BA2	17036
CA3	2595
DA3	2926
EA3	8919
FA2	21727
GA2	13682
HA2	15410
IA2	13462
JA2	5081
KA2	11348
LA3	5342
MA3	2584
NA3	29290
OA2	37445
PA2	12262
QA3	6266
RA3	21943
SA2	11012
TA2	19601
UA3	7079
VA2	3754
WA2	20333
XA2	3840
YA3	16413
ZA2	20066
AB2	33183
BB1	18249
TOTAL AREA	
DENSITY 1 =	18249
DENSITY 2 =	329160
DENSITY 3 =	103358
DENSITY 4 =	0
TOTAL =	450767

Earleville, MD.
VIMS MAP # 010

AA2	22261
BA1	4427
CA2	13501
DA2	29444
EA3	25142
FA1	619020
GA2	49688
HA2	55285
IA1	317588
JA2	25195
TOTAL AREA	
DENSITY 1 =	941035
DENSITY 2 =	195375

DENSITY 3 =	25142
DENSITY 4 =	0
TOTAL =	1161552

Middle River, MD.
VIMS MAP # 013

AA2	41686
BA2	7770
CA2	35090
DA2	9393
EA2	8407
FA2	27110
GA3	3734
HA2	24509
IA2	3006
TOTAL AREA	
DENSITY 1 =	0
DENSITY 2 =	156970
DENSITY 3 =	3734
DENSITY 4 =	0
TOTAL =	160705

Gunpowder Neck, MD.
VIMS MAP # 014

AA2	35276
BA3	131740
CA2	113539
DA2	5660
EA4	24764
FA4	12255
GA3	129306
HA2	41463
IA3	173314
JA2	50482
KA4	98204
LA2	3373
MA2	2081
NA3	134079
OA2	14634
PA2	73255
QA2	58966
RA2	27155
SA3	44467
TA2	13813
UA2	30536
VA3	47121
WA3	30588
XA2	37195
YA3	174785
ZA3	50622
TOTAL AREA	
DENSITY 1 =	0
DENSITY 2 =	507427
DENSITY 3 =	916021
DENSITY 4 =	135224
TOTAL =	1558671

Hanesville, MD.
VIMS MAP # 015

AA1	119860
BA2	23943
CA1	118088
TOTAL AREA	
DENSITY 1 =	237948
DENSITY 2 =	23943
DENSITY 3 =	0
DENSITY 4 =	0
TOTAL =	261890

Betterton, MD.
VIMS MAP # 016

AA3	10901
BA3	7849
CA2	5941
TOTAL AREA	
DENSITY 1 =	0
DENSITY 2 =	5941
DENSITY 3 =	18751
DENSITY 4 =	0
TOTAL =	24692

Galena, MD.
VIMS MAP # 017

AA4	13205
BA4	16564
TOTAL AREA	

DENSITY 1 =	0
DENSITY 2 =	0
DENSITY 3 =	0
DENSITY 4 =	29769
TOTAL =	29769

Swan Point, MD.
VIMS MAP # 020

AA3	13872
BA2	17648
CA2	3932
DA2	6188
EA2	12285

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	40053
DENSITY 3 =	13872
DENSITY 4 =	0
TOTAL =	53925

Rock Hall, MD.
VIMS MAP # 021

AA2	48426
BA1	5504
CA3	3991
DA4	46011
EA2	19446

TOTAL AREA

DENSITY 1 =	5504
DENSITY 2 =	67872
DENSITY 3 =	3991
DENSITY 4 =	46011
TOTAL =	123377

Langford Creek, MD.
VIMS MAP # 026

AA1	2893
BA2	9837
CA1	340630
DA3	613832
EA1	288982
FA2	121958
GA3	42544
HA3	27823
IA2	149843
JA2	136226
KA2	34553
LA2	42200
MA2	82430
NA2	15092
OA2	17438
PA2	99385
QA2	8501
RA2	75731
SA1	39666
TA3	57078

TOTAL AREA

DENSITY 1 =	672171
DENSITY 2 =	793195
DENSITY 3 =	741276
DENSITY 4 =	0
TOTAL =	2206642

Washington West, MD.-D.C.-VA.
VIMS MAP # 028

AA2	21359
BA3	4295
CA3	3743
DA3	8396
EA2	7644
FA3	2091
GA3	3685
HA3	28131
IA2	19824

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	48827
DENSITY 3 =	50341
DENSITY 4 =	0
TOTAL =	99168

Kent Island, MD.
VIMS MAP # 032

AA3	8751
BA2	9082
CA2	1859

DA1	158132
EA2	9051
FA1	40523
GA1	21143
HA1	129637
IA2	143927
JA1	35271
KA1	31695
LA3	5075
MA2	1893
NA2	34953
OA1	27970
PA1	36943
TOTAL AREA	
DENSITY 1 =	481313
DENSITY 2 =	200764
DENSITY 3 =	13826
DENSITY 4 =	0
TOTAL =	695903

Queenstown, MD.
VIMS MAP # 033

AA1	176038
BA1	51003
CA2	6363
DA1	137608
EA1	309494
FA3	25850
GA2	63347
HA3	9116
IA2	54192
JA3	41007
TOTAL AREA	
DENSITY 1 =	674143
DENSITY 2 =	123901
DENSITY 3 =	75973
DENSITY 4 =	0
TOTAL =	874017

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

AA1	112062
BA3	58534
CA4	68280
DA3	14779
EA2	2493
FA1	161421
GA4	306994
HA4	4976
IA2	16614
JA4	20820
KA3	2748
LA2	22937
MA4	32129
NA3	89708
OA4	1051939
PA2	5431
QA2	19234
RA3	6582
SA2	6323
TA4	35967
UA3	28665
VA3	66600
WA2	239038
XA4	169479
YA3	20348
ZA3	8006
AB3	5020
BB2	6343
CB2	38587
DB2	23812
EB3	38890
FB3	9548
GB4	15569
HB2	7547
IB2	391282
JB3	5231
KB3	7279
LB3	19032
MB2	4406
NB3	38296
TOTAL AREA	
DENSITY 1 =	273483
DENSITY 2 =	784047
DENSITY 3 =	419264
DENSITY 4 =	1706151
TOTAL =	3182946

Claiborne, MD.
VIMS MAP # 036

AA2	26115
BA2	48832
CA2	18808
DA2	14910

EA2	51623
FA2	43547
GA2	36764
HA2	32718
IA1	888295
JA2	339357
KA3	22194
LA3	128342
MA1	203570
NA1	68244
OA1	97228
PA1	109434
QA2	81464
RA3	48488
SA1	56446
TOTAL AREA	
DENSITY 1 =	1423217
DENSITY 2 =	694140
DENSITY 3 =	199024
DENSITY 4 =	0
TOTAL =	2316381

St. Michaels, MD.
VIMS MAP # 037

AA2	21018
BA2	203219
CA2	99305
DA2	5861
EA2	12911
FA2	43595
GA3	49643
HA1	16174
IA3	56934
JA1	35759
KA3	124568
LA2	164468
MA2	78222
NA2	117888
OA2	18111
PA2	84651
QA2	146419
RA1	52640
SA2	59417
TA1	160400
UA1	247066
VA2	45005
WA2	164888
XA3	106446
YA2	176360
ZA2	139654
AB2	5683
TOTAL AREA	
DENSITY 1 =	512038
DENSITY 2 =	1586674
DENSITY 3 =	337590
DENSITY 4 =	0
TOTAL =	2436303

Fort Belvoir, VA.-MD.
VIMS MAP # 039

AA3	4693
BA4	55188
CA3	46145
DA4	655313
EA3	301369
FA2	69195
GA2	81436
HA4	55033
IA4	60570
JA4	8235
TOTAL AREA	
DENSITY 1 =	0
DENSITY 2 =	150631
DENSITY 3 =	352206
DENSITY 4 =	834340
TOTAL =	1337177

Mt. Vernon, VA.-MD.
VIMS MAP # 040

AA3	338387
BA4	1508789
CA2	47840
DA4	175072
EA2	29357
FA4	36824
GA2	29041
HA4	67847
IA4	35785
JA2	34507
KA3	5653
LA3	159691
MA2	1914
NA4	74953

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	142659
DENSITY 3 =	503732
DENSITY 4 =	1899270
TOTAL =	2545660

Tilghman, MD.
VIMS MAP # 043

AA3	688145
BA3	17898
CA3	10404
DA2	14639
EA2	32530
FA2	106565
GA2	8655
HA3	7149
IA2	533726
JA2	596762
KA1	69281
LA2	12593
MA2	54301
NA2	72027

TOTAL AREA

DENSITY 1 =	69281
DENSITY 2 =	1431799
DENSITY 3 =	723595
DENSITY 4 =	0
TOTAL =	2224675

Oxford, MD.
VIMS MAP # 044

AA2	46495
BA2	4628
CA2	66103
DA2	85006
EA2	38203
FA3	68721
GA2	99354
HA2	41083
IA2	13220
JA2	26587
KA2	23412
LA3	19261
MA2	240167
NA2	113039
OA2	209785
PA2	38771
QA2	12633
RA2	11410

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	1069897
DENSITY 3 =	87982
DENSITY 4 =	0
TOTAL =	1157879

Quantico, VA.-MD.
VIMS MAP # 047

AA2	573619
BA4	1136416
CA4	811036
DA4	69788
EA3	43279
FA4	90183
GA4	80449
HA4	85381
IA4	80155
JA2	29813
KA4	723756
LA4	1594392
MA2	290605
NA2	94429
OA2	245941

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	1234406
DENSITY 3 =	43279
DENSITY 4 =	4671556
TOTAL =	5949241

Indian Head, MD.- VA.
VIMS MAP # 048

AA3	153606
BA4	2046012
CA4	30474
DA3	45824
EA4	18582
FA3	4927
GA4	19419
HA4	94221

IA4	596943
JA4	75292
KA4	254700
LA2	4130
MA4	16314
TOTAL AREA	
DENSITY 1 =	0
DENSITY 2 =	4130
DENSITY 3 =	204357
DENSITY 4 =	3151957
TOTAL =	3360444

Hudson, MD.
VIMS MAP # 051

AA2	36322
BA2	4360
CA4	18403
DA2	21286
EA2	140441
FA2	20526
GA3	12146
HA2	50516
IA2	18698
JA2	10784
KA3	91098
LA1	37995
MA3	9811
NA3	29818
OA2	68848
PA2	35227
QA2	268202
RA3	169371
SA1	1492836
TA3	836308
UA1	447482
VA4	111824
WA3	388404
XA2	486823
YA2	352060
TOTAL AREA	
DENSITY 1 =	1978313
DENSITY 2 =	1514094
DENSITY 3 =	1536956
DENSITY 4 =	130227
TOTAL =	5159590

Church Creek, MD.
VIMS MAP # 052

AA3	14442
BA2	6747
CA3	13259
DA4	12026
EA2	12634
FA2	10180
GA3	15245
HA3	19603
IA2	44665
JA3	7774
KA3	30206
LA2	15045
MA2	8979
NA3	6452
OA2	14804
PA2	6680
QA2	12384
RA2	534218
SA3	272558
TOTAL AREA	
DENSITY 1 =	0
DENSITY 2 =	666335
DENSITY 3 =	379538
DENSITY 4 =	12026
TOTAL =	1057899

Cambridge, MD.
VIMS MAP # 053

AA2	56571
TOTAL AREA	
DENSITY 1 =	0
DENSITY 2 =	56571
DENSITY 3 =	0
DENSITY 4 =	0
TOTAL =	56571

Widewater, VA.-MD.
VIMS MAP # 055

AA2	6143
BA3	72444
CA2	4424

DA2	31561
EA4	706076
FA1	21830
GA4	447715
HA1	69161
IA4	157657
JA4	58144
KA4	2961664
LA2	660518
MA3	91481
NA2	198561
OA2	14239
PA4	346819
QA3	137320
RA2	362041
SA2	9386
TA2	187159
UA3	74578
VA3	201126
WA4	489430
TOTAL AREA	
DENSITY 1 =	90991
DENSITY 2 =	1474032
DENSITY 3 =	576948
DENSITY 4 =	5167505
TOTAL =	7309477

Nanjemoy, MD.
VIMS MAP # 056

AA3	83392
BA2	335753
CA3	13066
DA3	15821
EA4	4354
FA4	91518
GA4	638452
HA2	103463
IA4	2248
JA4	88106
KA4	12551
LA4	54490
MA4	71164
NA4	68883
OA3	25546
PA4	8557
QA4	22481
RA4	9764
SA4	33572
TOTAL AREA	
DENSITY 1 =	0
DENSITY 2 =	439216
DENSITY 3 =	137826
DENSITY 4 =	1106140
TOTAL =	1683182

Mathias Point, MD.-VA.
VIMS MAP # 057

AA2	272601
BA2	27259
CA3	194194
DA2	166815
EA4	118071
FA3	3660
GA2	49757
HA4	60847
IA2	29175
JA4	47100
KA4	221643
LA2	812012
MA2	44413
NA3	10046
OA4	117047
PA3	17206
QA4	254845
RA4	65079
SA4	163941
TA2	30034
UA4	34959
VA2	6350
WA4	23766
XA4	69813
YA4	4406
ZA4	5288
AB2	19344
BB3	7579
CB2	43247
TOTAL AREA	
DENSITY 1 =	0
DENSITY 2 =	1501007
DENSITY 3 =	232684
DENSITY 4 =	1186805
TOTAL =	2920496

Popes Creek, MD.
VIMS MAP # 058

AA2	8520
BA3	4440
TOTAL AREA	
DENSITY 1 =	0
DENSITY 2 =	8520
DENSITY 3 =	4440
DENSITY 4 =	0
TOTAL =	12960

Taylors Island, MD.
VIMS MAP # 062

AA3	42191
BA2	182617
CA3	53485
DA2	323964
EA2	21602
TOTAL AREA	
DENSITY 1 =	0
DENSITY 2 =	528183
DENSITY 3 =	95676
DENSITY 4 =	0
TOTAL =	623859

Golden Hill, MD.
VIMS MAP # 063

AA2	165069
BA2	56851
CA2	18451
DA2	51966
TOTAL AREA	
DENSITY 1 =	0
DENSITY 2 =	292337
DENSITY 3 =	0
DENSITY 4 =	0
TOTAL =	292337

Passapatanzy, MD.-VA.
VIMS MAP # 064

AA2	16931
BA3	49741
CA2	21408
DA4	18901
EA4	15408
TOTAL AREA	
DENSITY 1 =	0
DENSITY 2 =	38339
DENSITY 3 =	49741
DENSITY 4 =	34309
TOTAL =	122389

King George, VA.-MD.
VIMS MAP # 065

AA2	220898
BA3	35225
CA2	262030
DA4	202011
EA2	24366
TOTAL AREA	
DENSITY 1 =	0
DENSITY 2 =	507294
DENSITY 3 =	35225
DENSITY 4 =	202011
TOTAL =	744531

Dahlgren, VA.-MD.
VIMS MAP # 066

AA3	7421
BA3	4574
CA2	6622
DA2	3412
EA2	167409
FA4	70159
GA4	22326
HA2	25252
IA2	16179
JA3	9907
KA2	3000
LA4	3554

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	221874
DENSITY 3 =	21902
DENSITY 4 =	96039
TOTAL =	339815

Colonial Beach North, VA.-MD.
VIMS MAP # 067

AA3	104330
BA2	72274
CA3	3407
DA3	8924
EA2	9302
FA2	35898
GA3	61680
HA2	109574
IA4	72190

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	227048
DENSITY 3 =	178341
DENSITY 4 =	72190
TOTAL =	477580

Barren Island, MD.
VIMS MAP # 072

AA3	25965
BA2	1104600
CA4	190620
DA4	2371533
EA1	599595
FA3	36307
GA3	7439

TOTAL AREA

DENSITY 1 =	599595
DENSITY 2 =	1104600
DENSITY 3 =	69711
DENSITY 4 =	2562153
TOTAL =	4336059

Honga, MD.
VIMS MAP # 073

AA4	292557
BA4	145036
CA3	213356
DA3	92416
EA3	58272
FA4	12974
GA3	12350
HA4	132725
IA3	18521
JA3	348528
KA2	54776
LA2	135452
MA2	70246
NA4	2226441
OA2	171437
PA3	19619
QA3	24300
RA1	78530
SA2	99581
TA2	348189
UA2	120364
VA3	96786
WA2	100527
XA4	1119071
YA4	6271
ZA2	85413
AB3	350663
BB2	134970
CB3	625099
DB2	407778
EB2	65965
FB3	1391668
GB2	53092
HB3	76253
IB3	109076
JB3	389996
KB3	97472
LB1	79472
MB4	1630431
NB3	722342
OB1	82373
PB3	506413
QB3	242537
RB4	202684
SB2	16740

TOTAL AREA

DENSITY 1 =	240375
DENSITY 2 =	1864528
DENSITY 3 =	5395666
DENSITY 4 =	5768190
TOTAL =	13268759

Wingate, MD.
VIMS MAP # 074

AA1	16746
BA4	161234
CA2	29239
DA1	132526
EA4	1253515
FA2	125540
GA2	284380
HA4	560053
IA3	1514516
JA4	456736
KA2	32880
LA3	224909
MA2	15778

TOTAL AREA

DENSITY 1 =	149272
DENSITY 2 =	487816
DENSITY 3 =	1739425
DENSITY 4 =	2431538
TOTAL =	4808052

St. Mary's City, MD.
VIMS MAP # 080

AA2	13309
BA2	74759

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	88068
DENSITY 3 =	0
DENSITY 4 =	0
TOTAL =	88068

Richland Point, MD.
VIMS MAP # 082

AA4	65313
BA3	85694
CA2	307957

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	307957
DENSITY 3 =	85694
DENSITY 4 =	65313
TOTAL =	458963

Bloodsworth Island, MD.
VIMS MAP # 083

AA2	24881
BA2	17622
CA2	10650
DA2	2711
EA2	63282
FA2	48786
GA2	252065
HA1	713531
IA3	134186
JA3	3694685
KA2	215896
LA2	308329
MA3	1312589
NA3	642271
OA3	259702
PA2	190752
QA2	4823
RA3	18788
SA3	58769
TA2	19502
UA4	598515
VA1	72455
WA3	410167
XA3	613941
YA1	133461
ZA4	21529
AB2	156428
BB2	4153
CB2	2235
DB4	114505
EB2	42081
FB2	77721

TOTAL AREA

DENSITY 1 =	919447
DENSITY 2 =	1441915
DENSITY 3 =	7145098
DENSITY 4 =	734550
TOTAL =	10241010

Deal Island, MD.
VIMS MAP # 084

AA2	336635
BA2	14999
CA2	45424
DA2	268915
EA2	21490

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	687463
DENSITY 3 =	0
DENSITY 4 =	0
TOTAL =	687463

St. George Island, MD.-VA.
VIMS MAP # 089

AA2	12274
BA2	18569

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	30843
DENSITY 3 =	0
DENSITY 4 =	0
TOTAL =	30843

Kedges Straits, MD.
VIMS MAP # 091

AA3	77439
BA2	81944
CA3	153415
DA3	3143462
EA1	109314
FA3	289751
GA3	450745
HA4	1447430
IA2	9964
JA2	58553
KA3	432565
LA3	14542
MA4	458883
NA2	3750
OA4	800460
PA4	247528
QA2	26367
RA3	14062
SA2	4372
TA2	146921
UA4	589229
VA2	177957
WA2	38584
XA2	513932
YA4	226021
ZA2	185154
AB3	9715

TOTAL AREA

DENSITY 1 =	109314
DENSITY 2 =	1247497
DENSITY 3 =	4585695
DENSITY 4 =	3769550
TOTAL =	9712057

Terrapin Sand Point, MD.
VIMS MAP # 092

AA2	31997
BA2	79340
CA2	261233
DA4	1460607
EA1	127101
FA2	180254
GA4	147219
HA2	165743
IA3	78973
JA3	21214
KA3	84888
LA3	15873
MA3	23620

TOTAL AREA

DENSITY 1 =	127101
DENSITY 2 =	718567
DENSITY 3 =	224568
DENSITY 4 =	1607826
TOTAL =	2678062

Marion, MD.
VIMS MAP # 093

AA2	13201
BA2	147407
CA3	7561
DA4	29247
EA2	59711
GA4	110678
HA3	80481
IA2	66756
JA2	79882
KA3	610489
LA2	16725
MA2	5768
NA3	11259
OA2	14672
PA2	119961
QA2	156866
RA3	304462
SA2	85720
TA3	48189
UA3	89400
VA3	63263
WA3	189911
XA1	14130
YA1	76793
ZA3	8641
AB3	58150
BB4	77693
CB3	237269

TOTAL AREA

DENSITY 1 =	90924
DENSITY 2 =	766668
DENSITY 3 =	1709074
DENSITY 4 =	217618
TOTAL =	2784284

Ewell, MD.-VA.
VIMS MAP # 099

AA2	843883
BA2	6261809
CA3	13056196
DA2	45475
EA3	233688
FA2	120756
GA3	99568
HA3	29757
IA1	127218
JA4	154719
KA2	58043
LA3	397122
MA2	161807
NA2	315253
OA3	1071919
PA2	33236
QA3	123768
RA3	2261405
SA3	35968

TOTAL AREA

DENSITY 1 =	127218
DENSITY 2 =	7840263
DENSITY 3 =	17309390
DENSITY 4 =	154719
TOTAL =	25431590

Great Fox Island, MD.-VA.
VIMS MAP # 100

AA2	562376
BA3	1446070
CA3	254369
DA2	306091
EA2	306280
FA2	404043
GA3	1572043
HA4	554826
IA2	331720
JA2	17436
KA2	13033
LA2	19897
MA3	154656
NA2	60585
OA4	32604
PA2	44283

QA3	692731
RA2	136421
SA2	254964
TA3	187095
UA2	538218
VA3	1425150
WA2	2116077
XA4	3618464

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	5111424
DENSITY 3 =	5732114
DENSITY 4 =	4205895
TOTAL =	15049433

Crisfield, MD.-VA.
VIMS MAP # 101

AA4	59205
BA4	671625
CA3	809103
DA3	9898
EA3	27870
FA2	211827
GA3	239681
HA3	98994
IA3	96023
JA2	12462
KA2	11343
LA3	8711
MA3	8137
NA2	104368
OA2	88010
PA3	102786
QA3	3771
RA4	96976
SA2	26005
TA4	187267
UA2	97770
VA2	6444
WA2	223862
XA3	14788

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	782091
DENSITY 3 =	1419762
DENSITY 4 =	1015073
TOTAL =	3216925

Saxis, VA.-MD.
VIMS MAP # 102

AA2	3312
BA3	7208
CA2	14153
DA3	3963

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	17465
DENSITY 3 =	11172
DENSITY 4 =	0
TOTAL =	28637

Reedville, VA.
VIMS MAP # 106

AA1	33193
BA2	70316
CA2	232104
DA4	1318324
EA1	598593
FA2	446777
GA4	290280
HA3	4159
IA2	7108
JA1	6423
KA2	17865

TOTAL AREA

DENSITY 1 =	638208
DENSITY 2 =	774170
DENSITY 3 =	4159
DENSITY 4 =	1608604
TOTAL =	3025141

Tangier Island, VA.
VIMS MAP # 107

AA3	491984
BA1	111836
CA4	1375142
DA2	35700
EA1	103674
FA2	57165
GA2	56730
HA3	815740
IA2	221311
JA2	44441
KA4	1009035
LA2	283047
MA2	854961
NA3	556546
TOTAL AREA	
DENSITY 1 =	215510
DENSITY 2 =	1553355
DENSITY 3 =	1864269
DENSITY 4 =	2384177
TOTAL =	6017311

Chesconessex, VA.
VIMS MAP # 108

AA2	137440
BA2	48920
CA4	132358
DA1	17094
EA1	8741
FA2	38601
GA2	2214
HA2	1156
IA3	166859
JA2	139019
KA2	213618
LA3	657056
MA2	89781
NA3	273477
OA4	363407
PA3	309001
QA2	50553
RA4	952478
SA2	301871
TA2	149166
UA4	295990
VA2	611558
WA3	637404
XA1	235826
YA4	326134
ZA2	432473
AB2	108397
BB4	807984
CB4	55539
DB3	2884
EB4	2541
FB3	41027
GB3	3402
HB2	115419
IB3	247236
JB4	863519
KB3	1401026
LB1	186824
TOTAL AREA	
DENSITY 1 =	448484
DENSITY 2 =	2440186
DENSITY 3 =	3739372
DENSITY 4 =	3799950
TOTAL =	10427992

Parksley, VA.
VIMS MAP # 109

AA2	63667
BA3	32022
CA2	752
DA2	10892
EA2	454005
FA3	4633
GA2	1458
HA3	5601
IA3	3695
JA2	56962
KA3	227122
LA2	37272
MA1	106328
NA4	2528515
OA1	27052
PA3	349437
QA2	310029
RA3	204196
SA3	2471
TA2	9432
UA3	31076
VA3	1586
WA2	88517
XA2	40871
YA2	11548

ZA3	10794
TOTAL AREA	
DENSITY 1 =	133380
DENSITY 2 =	1085405
DENSITY 3 =	872633
DENSITY 4 =	2528515
TOTAL =	4619932

Urbanna, VA.
VIMS MAP # 110

AA2	66618
BA2	45890
TOTAL AREA	
DENSITY 1 =	0
DENSITY 2 =	112509
DENSITY 3 =	0
DENSITY 4 =	0
TOTAL =	112509

Irvington, VA.
VIMS MAP # 111

AA2	819
BA2	1249
CA2	4020
DA3	39288
EA1	5079
FA2	8982
GA4	13051
HA4	68852
IA1	148010
JA4	205519
KA3	160117
LA4	268596
MA3	21381
NA3	632
OA2	99600
PA2	31302
QA2	4766
RA3	48937
SA3	649
TA2	2953
UA4	2074
VA2	13870
WA4	62343
XA2	102702
YA3	82711
ZA3	154661
AB2	81224
BB3	22595
TOTAL AREA	
DENSITY 1 =	153089
DENSITY 2 =	351488
DENSITY 3 =	530971
DENSITY 4 =	620436
TOTAL =	1655983

Fleets Bay, VA.
VIMS MAP # 112

AA2	13212
BA2	866308
CA4	52322
DA4	26173
EA3	5888
FA3	334631
GA1	312038
HA2	269877
IA4	29263
JA2	331084
KA2	7314
LA2	29645
MA4	21764
NA2	9411
OA2	4555
PA3	3935
QA3	37581
RA2	41949
SA2	50750
TA3	991626
UA3	10687
VA2	41229
WA2	876
XA2	3257
YA2	10336
ZA4	14887
AB3	83636
BB3	363058
CB1	188696
DB2	9582
EB3	294195
FB2	117177
GB4	2919
HB2	54973
IB2	85195
JB2	29605

KB2	9272

TOTAL AREA

DENSITY 1 =	500734
DENSITY 2 =	1985605
DENSITY 3 =	2125237
DENSITY 4 =	147329
TOTAL =	4758905

Nandua Creek, VA.
VIMS MAP # 113

AA2	199291
BA3	82176
CA4	529578
DA1	277969
EA2	1249366
FA4	210786
GA4	94277
HA1	164734
IA4	498518
JA2	1432447

TOTAL AREA

DENSITY 1 =	442703
DENSITY 2 =	2881104
DENSITY 3 =	82176
DENSITY 4 =	1333159
TOTAL =	4739142

Pungoteague, VA.
VIMS MAP # 114

AA4	70408
BA2	66896
CA4	25285
DA2	575632
EA1	10016
FA3	7860
GA2	104209
HA4	233921
IA3	2041
JA2	67569
KA1	23418
LA4	3518917
MA2	80349
NA2	2211837
OA2	264507
PA3	39481
QA3	293050
RA1	306982
SA2	270774
TA4	27877
UA3	1123
VA3	627
WA2	1082
XA2	4826
YA2	77630
ZA3	42747
AB4	58165
BB2	268659
CB1	136655
DB2	534470
EB2	102114
FB3	3715
GB1	22087
HB3	30819
IB2	6952

TOTAL AREA

DENSITY 1 =	499156
DENSITY 2 =	4637506
DENSITY 3 =	421463
DENSITY 4 =	3934573
TOTAL =	9492698

Wilton, VA.
VIMS MAP # 117

AA3	5726
BA3	35942
CA2	6951
DA2	2499
EA2	8817
FA3	855
GA2	78478
HA2	25317
IA2	9499
JA2	7754

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	139316
DENSITY 3 =	42523
DENSITY 4 =	0
TOTAL =	181838

Deltaville, VA.
VIMS MAP # 118

AA2	5235
BA1	61919
CA4	55892
DA1	346561
EA4	146683
FA2	70586
GA2	107505
HA3	9373
IA2	33118
JA3	49164
KA2	23279
LA2	66253
MA2	937
NA2	17575
OA2	17444
PA1	18691
QA2	2427
RA4	62327
SA2	49102
TA4	126460
UA1	158021

TOTAL AREA	
DENSITY 1 =	585192
DENSITY 2 =	393461
DENSITY 3 =	58537
DENSITY 4 =	391361
TOTAL =	1428552

Jamesville, VA.
VIMS MAP # 119

AA2	95191
BA1	37153
CA2	594276
DA4	829103
EA2	23102
FA1	72249
GA3	10202
HA2	25499
IA4	21392
JA3	76223
KA1	313743
LA3	930528
MA4	183573
NA2	1269513
OA4	590029
PA2	927
QA3	22429
RA2	11736
SA2	78158
TA4	191984
UA1	203214
VA4	299738
WA2	10012
XA2	84129
YA4	138342
ZA2	175396
AB3	52405

TOTAL AREA	
DENSITY 1 =	626358
DENSITY 2 =	2367938
DENSITY 3 =	1091786
DENSITY 4 =	2254160
TOTAL =	6340243

Ware Neck, VA.
VIMS MAP # 122

AA2	12565
BA2	499416
CA2	71783
DA4	162579
EA2	79321
FA3	261096
GA1	220951
HA3	245672
IA1	52704
JA4	78831
KA2	107268
LA3	98262
MA3	169129
NA3	154237
OA4	485956
PA2	287567
QA3	196329

TOTAL AREA	
DENSITY 1 =	273654
DENSITY 2 =	1057921
DENSITY 3 =	1124726
DENSITY 4 =	727366
TOTAL =	3183667

Mathews, VA.
VIMS MAP # 123

AA4	57298
BA4	186523
CA3	24558
DA2	6607
EA3	117843
FA2	58923
GA2	321031
HA1	4698
IA2	181735
JA4	686108
KA2	33381
LA2	1997
MA3	7777
NA2	17875
OA1	32889
PA2	122076
QA4	137931
RA2	16903
SA2	41902
TA4	476520
UA2	110503
VA3	113879
WA3	138404
XA4	47176
YA4	12524
ZA2	22231
AB4	18897
BB3	31444
CB3	5301
DB2	232069

TOTAL AREA

DENSITY 1 =	37587
DENSITY 2 =	1167232
DENSITY 3 =	439208
DENSITY 4 =	1622976
TOTAL =	3267003

Franktown, VA.
VIMS MAP # 124

AA4	110676
BA4	6866
CA3	34579
DA1	798173
EA4	311962
FA2	51957
GA2	13065
HA2	48832
IA2	110305
JA4	602511
KA3	130301
LA3	18791
MA2	13067
NA4	207498
OA2	5750
PA2	179763
QA2	439244
RA1	46427
SA4	1538410
TA2	53755
UA3	38628
VA2	274467
WA1	133951
XA3	160553
YA1	291346
ZA4	329651
AB2	139017
BB2	27746
CB2	11920
DB4	132075
EB2	63768
FB2	6936
GB3	142354
HB3	26592
IB2	92254
JB2	56994
KB3	13385
LB3	165740
MB3	12789
NB2	121460
OB2	223186

TOTAL AREA

DENSITY 1 =	1269897
DENSITY 2 =	1933486
DENSITY 3 =	743711
DENSITY 4 =	3239649
TOTAL =	7186744

Achilles, VA.
VIMS MAP # 131

AA3	63899
BA4	59695
CA4	78160
DA4	1165569
EA2	104712
FA3	91966

GA4	38662
HA4	1389140
IA2	161798
JA2	145997
KA4	65862
LA2	10490
MA2	1065
NA2	18851
OA4	1250514
PA2	28556
QA4	1449878
RA3	124092
SA1	48617
TA4	186040
UA4	7859
VA2	551
WA2	16739
XA4	217595
YA3	21077
ZA4	17396
AB2	39631
BB4	232318
CB2	14018
DB2	60809
EB4	1964468
FB2	108624
GB3	68736
HB3	10088
IB2	47247
JB4	29338
KB2	67971
LB4	711384
MB2	271628
NB2	13561

TOTAL AREA

DENSITY 1 =	48617
DENSITY 2 =	1112249
DENSITY 3 =	379858
DENSITY 4 =	8863878
TOTAL =	10404602

New Point Comfort, VA.
VIMS MAP # 132

AA2	362513
BA1	288695
CA4	5253737
DA4	661471
EA1	51201
FA2	310887
GA3	166143
HA3	311063
IA4	1119065
JA2	53264
KA4	811409
LA1	40085
MA2	115894
NA1	70846
OA4	998996
PA2	114545
QA1	355619
RA4	46658
SA2	1215995
TA2	351010
UA4	299303
VA3	95231
WA2	28186
XA4	988976
YA2	573868
ZA4	79342
AB2	12542
BB4	74077
CB2	9400

TOTAL AREA

DENSITY 1 =	806446
DENSITY 2 =	3148103
DENSITY 3 =	572437
DENSITY 4 =	10333033
TOTAL =	14860018

Cape Charles, VA.
VIMS MAP # 133

AA2	269528
BA4	19530
CA2	219816
DA4	92716
EA3	7315
FA2	67071
GA2	107358
HA4	576576
IA3	134583
JA2	121884
KA3	11645
LA3	118062
MA3	142359
NA1	757281
OA4	909997
PA2	54617

TOTAL AREA	
DENSITY 1 =	757281
DENSITY 2 =	840274
DENSITY 3 =	413963
DENSITY 4 =	1598819
TOTAL =	3610337

Cheriton, VA.
VIMS MAP # 134

AA3	3901
BA4	371309
CA2	229394
DA2	87067
EA4	180845

TOTAL AREA	
DENSITY 1 =	0
DENSITY 2 =	316460
DENSITY 3 =	3901
DENSITY 4 =	552154
TOTAL =	872516

Yorktown, VA.
VIMS MAP # 139

AA2	1264
BA2	1670
CA2	3939
DA3	4686

TOTAL AREA	
DENSITY 1 =	0
DENSITY 2 =	6872
DENSITY 3 =	4686
DENSITY 4 =	0
TOTAL =	11558

Poquoson West, VA.
VIMS MAP # 140

AA4	39703
BA4	31270
CA2	605271
DA2	19104
EA2	35760
FA4	438815
GA2	20729
HA4	161532
IA2	1249
JA3	23857
KA3	30382
LA3	384626
MA1	552693
NA4	87886
OA3	710900
PA2	8671
QA4	43032
RA2	56898
SA4	547042
TA2	973872
UA4	784049
VA3	90488
WA2	21255
XA4	34334
YA4	51324
ZA4	74660

TOTAL AREA	
DENSITY 1 =	552693
DENSITY 2 =	1742809
DENSITY 3 =	1240252
DENSITY 4 =	2293647
TOTAL =	5829401

Poquoson East, VA.
VIMS MAP # 141

AA2	725482
BA4	5346424
CA4	369382
DA1	1826745
EA3	1735555
FA3	948901
GA4	564417
HA4	63408
IA4	11196
JA4	5591
KA4	2440
LA4	1936
MA4	9143

TOTAL AREA

DENSITY 1 =	1826745
DENSITY 2 =	725482
DENSITY 3 =	2684456
DENSITY 4 =	6373937
TOTAL =	11610619

Elliotts Creek, VA.
VIMS MAP # 142

AA1	847727
BA2	271879

TOTAL AREA

DENSITY 1 =	847727
DENSITY 2 =	271879
DENSITY 3 =	0
DENSITY 4 =	0
TOTAL =	1119606

Hampton, VA.
VIMS MAP # 147

AA3	34956
BA1	75324
CA3	404601
DA3	285787
EA3	171888
FA3	109949
GA1	340244
HA3	94931
IA2	2116
JA3	118402
KA4	458540
LA4	50430
MA1	71103
NA4	311416
OA2	25734
PA3	22012
QA4	569894
RA2	658973

TOTAL AREA

DENSITY 1 =	486671
DENSITY 2 =	686823
DENSITY 3 =	1242526
DENSITY 4 =	1390280
TOTAL =	3806300

Cape Henry, VA.
VIMS MAP # 152

AA2	52769
BA2	20695
CA2	35342
DA2	9741
EA3	3210
FA2	73765

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	192312
DENSITY 3 =	3210
DENSITY 4 =	0
TOTAL =	195521

Port Tobacco, MD.
VIMS MAP # 161

AA4	125953

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	0
DENSITY 3 =	0
DENSITY 4 =	125953
TOTAL =	125953

Assawoman Bay, MD.
VIMS MAP # 166

AA2	3852
BA2	22472
CA2	35578
DA2	17463

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	79365
DENSITY 3 =	0
DENSITY 4 =	0
TOTAL =	79365

Berlin, MD.
VIMS MAP # 167

AA2	7360
BA1	22785
CA4	15955
DA2	29086
EA3	9460
FA1	17989
GA3	4255

TOTAL AREA

DENSITY 1 =	40774
DENSITY 2 =	36446
DENSITY 3 =	13715
DENSITY 4 =	15955
TOTAL =	106891

Ocean City, MD.
VIMS MAP # 168

AA3	9147
BA2	203958
CA3	7774
DA3	8191
EA2	6654

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	210612
DENSITY 3 =	25111
DENSITY 4 =	0
TOTAL =	235723

Tingles Island, MD.
VIMS MAP # 170

AA2	8726
BA2	14739
CA3	1137218
DA4	5669005
EA2	16672
FA2	12225
GA1	178308
HA2	17323
IA3	2542425
JA4	491446
KA3	1158333
LA4	208486
MA3	269154
NA3	12974
OA3	65927

TOTAL AREA

DENSITY 1 =	178308
DENSITY 2 =	69684
DENSITY 3 =	5186031
DENSITY 4 =	6368937
TOTAL =	11802959

Boxiron, MD.-VA.
VIMS MAP # 172

AA4	2482180
BA3	361786
CA2	62290
DA3	1718714
EA2	528802
FA3	1165602
GA4	27750
HA3	127572
IA2	11572
JA1	90542
KA4	968320
LA3	170969

TOTAL AREA

DENSITY 1 =	90542
DENSITY 2 =	602665
DENSITY 3 =	3544643
DENSITY 4 =	3478250
TOTAL =	7716100

Whittington Point, MD.-VA.
VIMS MAP # 173

AA1	17179
BA3	54023

CA1	210650
DA2	706358
EA4	286518
FA2	87634
GA3	1744579
HA3	795089
IA3	36299
JA2	2542
KA1	50176

TOTAL AREA

DENSITY 1 =	278005
DENSITY 2 =	796535
DENSITY 3 =	2629990
DENSITY 4 =	286518
TOTAL =	3991048

Chincoteague West, VA.
VIMS MAP # 174

AA4	62689

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	0
DENSITY 3 =	0
DENSITY 4 =	62689
TOTAL =	62689

Chincoteague East, VA.
VIMS MAP # 175

AA4	9093466
BA3	57949
CA4	2793
DA3	51088
EA3	41691

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	0
DENSITY 3 =	150729
DENSITY 4 =	9096259
TOTAL =	9246987

East of New Point Comfort, VA.
VIMS MAP # 177

AA4	4447
BA2	82259

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	82259
DENSITY 3 =	0
DENSITY 4 =	4447
TOTAL =	86706

Goose Island, VA.
VIMS MAP # 179

AA3	74600
BA4	7304
CA4	164490
DA2	1851487
EA3	50035

TOTAL AREA

DENSITY 1 =	0
DENSITY 2 =	1851487
DENSITY 3 =	124635
DENSITY 4 =	171794
TOTAL =	2147916

APPENDIX E

1992 Submerged Aquatic Vegetation Ground Survey Data Listed by USGS 7.5 Minute Quadrangle and By 1992 SAV Bed.

KEY TO APPENDIX E

* Abbreviations under column "Species" are as follows:

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

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

Cit. - Citizens' Survey
Essex - Essex Community College SAV Research Group
HPEL - University of Maryland Horn Point Environmental Laboratory
Harford - Harford Community College
PRP - Maryland-National Capitol Parks and Planning Commission, Patuxent River Park
VIMS - Virginia Institute of Marine Science

\ - Slash mark separates species data of independent survey sources and independent survey dates.

\# - No SAV bed mapped from 1991 or 1992 aerial photography but SAV bed presence was verified by 1991 groundtruth survey at this location.

APPENDIX E

1992 Submerged Aquatic Vegetation Ground Survey Data Listed by USGS 7.5 Minute Quadrangle and by 1992 SAV Bed.

Quad	1992 Bed	Species*	Surveyor**	1992 Survey Date
002	FA3	Ms,Hd,Va	Cit.	9-15
	EA3	Ms,Hd,Ppc	Cit.	9-15
	DA3	Ms,Hd	Cit.	9-15
	E. Spencer Is. #	Ms,Hd,Va	Cit.	9-15
003	AA2	Va,Ms	Harford	9-16
	BA2	Ms,Hd	Harford	9-16
	CA4	Ms,Cd,Hd	Harford	9-16
	EA1	Ms,Cd	Harford	9-9
	FA1	Ms,Hd,Hv,Cd	Harford	9-9
	GA4	Hv,Ms,Va,Hd	Harford	9-9
	GA4	Hv,Ms,Cd	Harford	9-19
	IA4	Hv,Hd,Ms,Cd	Harford	9-19
	LA2	Ms	Harford	9-19
	MA4	Ms,Hd,Cd	Harford	9-19
	NA4	Ms	Harford	9-19
	OA4	Ms,Hd,Cd,Hv	Harford	9-19
	QA4	Ms,Hv	Harford	9-19
	UA4	Ms	Harford	9-16
	WA4	Ms,Va,Hv,Cd	Harford	9-16
	XA4	Cd,Hd	Harford	9-16
	YA4	Ms,Hv,Hd	Harford	9-16
	ZA3	Ms,Va,Cd	Harford	9-16
	AB4	Ms,Hv,Cd,Hd	Harford	9-16
	BB4	Ms,Hv,Cd,Hd	Harford	9-16
	CB4	Ms,Hv,Va,Hd	Harford	9-16
	EB4	Hv,Va,Ms,Hd	Harford	9-16
	FB4	Hv,Ms,Va	Harford	9-16
	GB4	Hv,Va,Hd,Cd	Harford	9-16
	HB4	Hv,Va,Ms,Cd,Hd	Harford	9-16
	IB4	Hv,Ms,Va,Hd	Harford	9-16
	KB4	Va	Harford	9-16
	LB1	Ms	Harford	9-19
	NB4	Hv,Ms,Va,Hd	Harford	9-19
	OB4	Hv,Ms,Hd,Va	Harford	9-19
	QB4	Ms,Hv,Hd,Va	Harford	9-19
	RB4	Hv,Va,Ms,Hd	Harford	9-19
	VB4	Ms,Hv,Hd	Harford	9-19
	WB2	Ms,Hv	Harford	9-19
	XB3	Ms,Hv,Cd,Hd,Va	Harford	9-19
	HA1	Ms	Harford	9-9
	Northeast R. #	Ms	Cit.	7-12
	Northeast R. #	Ms	Cit.	7-12
	Northeast R. #	Ms,Pcr	Cit.	9-9

Quad	1992 Bed	Species*	Surveyor**	1992 Survey Date
004	BA1	Va,Ms,Pcr,Ppf	Cit.	7-13
	BA1	Ms	Harford	9-21
	EA1	Ms,Va\Ms	Cit.\Harford	9-15\9-21
	FA1	Ms	Cit.\Harford	9-15\9-21
	GA1	Ms	Cit.	9-15
	AA1	Ms,Va,Pcr,Ppf	Cit.	7-13
	AA1	Ms	Harford	9-21
	DA1	Ms	Harford	9-21
	CA1	Ms	Harford	9-21
	Seneca Pt. #	Ms	Cit.	9-9
	Northeast R. #	Ms	Cit.	7-12
	Northeast R. #	Ms	Cit.	7-12
	Northeast R. #	Ms	Cit.	7-12
	Northeast R. #	Ms	Cit.	7-12
	Elk River #	Ms	Cit.	9-12
007	Otter Pt. Cr. #	Ms,Cd	Cit.	9-30
009	BB1	Ms,Va,Cd	Cit.	8-1
	BB1	Ms,Hd,Va,Cd	Harford	10-7
	AA2	Ms	Harford	9-4
	KA2	Ms	Harford	10-7
	OA2	Ms	Harford	10-7
	PA2	Ms,Hv	Harford	10-7
	RA3	Ms	Harford	10-7
	TA2	Ms	Harford	10-7
	AB2	Ms	Harford	10-7
010	AA2	Va,Ms	Harford	9-21
	CA2	Ms,Va	Harford	9-21
	DA2	Ms,Va	Harford	9-21
	EA3	Va,Ms	Harford	9-21
	FA1	Ms,Va,Ppc	Harford	9-21
	GA2	Va	Harford	9-21
	HA2	Ms,Va	Harford	9-21
	IA1	Ms,Va	Harford	9-21
	JA2	Ms	Harford	9-21
	Crystal Beach #	Ms	Cit.	June-Sept
013	Galloway Cr. #	Rm,Ms,Zp	Cit.	Summer
014	KA4	Ms	Essex	6-12
	KA4	Ms,Ec	Essex	10-16, 9-18
	KA4	Ms,Ec	Essex	7-28
	NA3	Ms	Essex	6-12
	NA3	Ms,Ec	Essex	10-16,9-18
	NA3	Ms,Ec	Essex	7-28
	YA3	Ms,Ec	Essex	6-12,9-18
	YA3	Ms,Ec	Essex	7-28
	YA3	Zp,Va	Essex	6-12

Quad	1992 Bed	Species*	Surveyor**	1992 Survey Date
014	GA3	Ms,Ec	Essex	7-18,9-18
	HA2	Ms,Ec	Essex	7-18,9-18
	IA3	Ms,Ec	Essex	6-11
	IA3	Ec,Cd,Ms	Harford	10-7
	XA2	Ms,Ec	Essex	7-28,9-18
	XA2	Ms,Ec	Essex	6-12
	XA2	Ms	Harford	10-7
	DA2	Ms,Ec,Cd	Essex	7-28
	EA4	Ms,Ec,Cd	Essex	7-28
	EA4	Ms,Va,Ec	Harford	10-7
	CA1	Ms	Harford	10-7
	CA1	Pcr,Ms	Essex	6-28
	UA2	Ms	Harford	10-7
	VA3	Ms	Harford	10-7
	Saltpeter Cr. #	Ms	Essex	6-12
	Saltpeter Cr. #	Ms,Ec	Essex	6-3,10-16
	Saltpeter Cr. #	Ms,Ec	Essex	9-18,7-28
	Saltpeter Cr. #	Ms,Cd,Ec	Essex	7-28
	S. Bengies Pt. #	Ms,Ec	Essex	6-12,9-18
	S. Bengies Pt. #	Ms,Ec	Essex	7-28
	White Oak Pt. #	Ms,Ec	Essex	7-28
	NW. Battery Pt. #	Ms,Ec,Cd	Essex	7-28
	Rocky Pt. #	Pcr,Ms	Essex	6-28
	Kirnaird Pt. #	Pcr,Ms	Essex	6-28
	Meeks Pt. #	Pcr,Ms	Essex	6-28
	Dundee Cr. #	Ms,Ec	Essex	10-26
015	CA1	Ms,U	Cit.	6-28
	Still Pond #	Ms,U	Cit.	6-28
	Still Pond #	Ms,U	Cit.	6-28
	Still Pond #	Ms,U	Cit.	6-28
016	CA2	Ms	Harford	9-4
017	AA4	Ms,Va	Harford	9-4
019	Shallow Cr. #	Zp	Cit.	7-18
	Bodkin Main Cr. #	Zp,Ppc	Cit.	5-15
020	AA3	Ppf	Cit.	6-17
	CA2	Ppf	Cit.	6-17
	BA2	Zp	Cit.	6-17
	EA2	Ppf	Cit.	6-17
	Swan Cr. #	Zp	Cit.	6-17
021	EA2	Ppf	Cit.	6-17
	DA4	Ppf	Cit.	6-17
	BA1	Ppf	Cit.	6-17
	CA3	Zp	Cit.	6-17
	AA2	Zp	Cit.	6-17

Quad	1992 Bed	Species*	Surveyor**	1992 Survey Date
023	Luce Cr. #	Zp	Cit.	5-1
	Luce Cr. #	Zp	Cit.	5-1
	Cool Spring Cr. #	Zp	Cit.	5-1
	Brewer Cr. #	Zp	Cit.	5-1
	Asquith Cr. #	Zp	Cit.	5-1
	Asquith Cr. #	Zp	Cit.	5-1
	Sunrise Beach #	Zp	Cit.	5-1
	Brewer Pond #	Zp	Cit.	6-24
	Maynedier Cr. #	Zp	Cit.	6-24
	Gumbottom Br. #	Zp	Cit.	6-24
	Herald Harbor #	Zp	Cit.	6-24
	Herald Harbor #	Zp	Cit.	6-12
	Old Man Cr. #	Zp	Cit.	5-22
	Beachwood #	Zp	Cit.	5-22
	Riverdale #	Zp	Cit.	5-22
	Magothy Beach #	Zp	Cit.	5-22
	Cockey Cr. #	Zp	Cit.	5-22
	Cockey Cr. #	Zp	Cit.	5-22
	Chelsea Beach #	Zp	Cit.	5-22
	Focal Pt. #	Zp	Cit.	5-22
	Cattail Cr. #	Zp	Cit.	5-22
	Cattail Cr. #	Zp	Cit.	5-22
	Cattail Cr. #	Zp	Cit.	5-22
	Steedmans Pt. #	Zp	Cit.	5-22
	Steedmans Pt. #	Zp	Cit.	5-22
	Steedmans Pt. #	Zp	Cit.	5-22
	Steedmans Pt. #	Zp	Cit.	5-22
	Ross Cove #	Zp	Cit.	5-22
	Pea Patch Pt. #	Zp	Cit.	5-22
	Cypress Cr. #	Zp	Cit.	5-22
	Cypress Cr. #	Zp	Cit.	5-22
	Dividing Cr. #	Zp	Cit.	5-22
	Dividing Cr. #	Zp	Cit.	5-22
	Dividing Cr. #	Zp	Cit.	5-22
	Dividing Cr. #	Zp	Cit.	5-22
	Mill Cr. #	Zp	Cit.	5-22
	Breezy Pt. #	Zp	Cit.	5-22
	Mago Vista Bch. #	Zp	Cit.	5-22
024	Hunters Harbor #	Zp	Cit.	6-8
	Forked Cr. #	Zp	Cit.	5-23
026	EA1	Zp	Cit.	7-11
	BA2	Zp	Cit.	6-25
	LA2	Zp	Cit.	6-25
	KA2	Zp	Cit.	6-25
	JA2	Zp	Cit.	6-25
	JA2	Zp	Cit.	6-25
	JA2	Rm	Cit.	6-25
	PA2	Rm	Cit.	6-25
	Goose Cove #	Rm	Cit.	6-25

Quad	1992 Bed	Species*	Surveyor**	1992 Survey Date
026	Gum Pt. #	Rm	Cit.	6-25
	S. Gum Pt. #	Rm	Cit.	6-25
	Frying Pan Cv. #	Ppf	HPEL	8-27
	East Fork #	Zp	Cit.	6-25
	Blakeford Pt. #	Ppc	Cit.	6-25
	Langford Cr. #	Zp	Cit.	6-25
	Langford Cr. #	Zp	Cit.	6-25
	Short Cove #	Zp	Cit.	6-25
	Ringgold Pt. #	Zp	Cit.	6-25
	Wickes Beach #	Rm	Cit.	6-25
030	Ramsey Lake #	Zp	Cit.	4-30
	Ramsey Lake #	Zp	Cit.	4-30
	Ramsey Lake #	Rm	Cit.	4-30
	Cadle Cr. #	Rm	Cit.	4-30
	Muddy Cr. #	Rm	Cit.	4-30
	Fox Cr. #	Rm	Cit.	4-30
	Selby Bay #	Zp	Cit.	4-30
	Bear Neck Cr. #	Zp	Cit.	4-30
	Brewer Cr. #	Rm	Cit.	4-30
	Glebe Bay #	Zp	Cit.	4-30
	Glebe Bay #	Zp	Cit.	4-30
	Glebe Bay #	Zp	Cit.	4-30
	Glebe Cr. #	Zp	Cit.	4-30
	Glebe Cr. #	Zp	Cit.	4-30
	Glebe Cr. #	Zp	Cit.	4-30
	Glebe Cr. #	Zp	Cit.	4-30
	Almhouse Cr. #	Zp	Cit.	4-30
	Almhouse Cr. #	Zp	Cit.	4-30
	Warehouse Cr. #	Zp	Cit.	4-30
	Warehouse Cr. #	Zp	Cit.	4-30
	Beards Cr. #	Zp	Cit.	4-30
	Beards Cr. #	Zp	Cit.	4-30
	Beards Cr. #	Rm	Cit.	4-30
	Hardestys Cv. #	Zp	Cit.	4-30
	S. Down Shores #	Zp	Cit.	4-30
	Beards Cr. #	Rm	Cit.	4-30
	Hambleton #	Zp	Cit.	4-30
	Glen Isle #	Zp	Cit.	4-30
	Upper South R. #	Zp	Cit.	4-30
	Upper South R. #	Zp	Cit.	4-30
	Broad Cr. #	Zp	Cit.	4-30
	Broad Cr. #	Zp	Cit.	4-30
	Boyd Pt. #	Zp	Cit.	4-30
	Gingerville Cr. #	Zp	Cit.	4-30
	Wild Rose Shor. #	Zp	Cit.	4-30
	Wild Rose Shor. #	Zp	Cit.	4-30
	Aberdeen Cr. #	Zp	Cit.	4-30
	Aberdeen Cr. #	Zp	Cit.	4-30
	Harness Cr. #	Zp	Cit.	4-30
	Harness Cr. #	Zp	Cit.	4-30

Quad	1992 Bed	Species*	Surveyor**	1992 Survey Date
030	Harness Cr. #	Zp	Cit.	4-30
	Harness Cr. #	Zp	Cit.	4-30
	Hillsmere #	Zp	Cit.	4-30
	Hillsmere #	Zp	Cit.	4-30
	Selby Bay #	Rm	Cit.	5-20
	Selby Bay #	Rm	Cit.	5-20
	Selby Bay #	Rm	Cit.	5-20
	Church Cr. #	Zp	Cit.	6-13
	Crab Cr. #	Zp	Cit.	6-13
	Crab Cr. #	Zp	Cit.	6-13
	Crab Cr. #	Zp	Cit.	6-13
	Crab Cr. #	Zp	Cit.	6-13
032	LA3	Rm	Cit.	8-30
	MA2	Rm	Cit.	8-30
	OA1	Rm	Cit.	8-30
	PA1	Rm	Cit.	8-30
	Thompson Cr. #	Rm	Cit.	8-30
	Cox Cr. #	Rm	Cit.	8-30
	Long Marsh #	Rm	Cit.	8-30
033	FA3	Rm	HPEL	8-21
	AA1	Rm	HPEL	8-21
	Hood Pt. #	Rm	Cit.	6-20
	Prospect Bay #	Rm	Cit.	6-20
035	Camp Wabanna #	Zp	Cit.	9-7
036	JA2	Rm	HPEL	8-20
	PA1	Rm	HPEL	8-20
	OA1	Rm	HPEL	8-20
	NA1	Rm	HPEL	8-20
	MA1	Rm	HPEL	8-20
	RA3	Rm	HPEL	8-26
037	AA2	Rm	HPEL	7-30
	BA2	Rm	HPEL	7-30
	CA2	Rm	HPEL	7-30
	DA2	Rm	HPEL	7-30
	UA2	Rm	HPEL	7-30
	NA2	Rm	HPEL	7-30
	QA2	Rm	HPEL	8-20
	PA2	Rm	HPEL	8-21
	TA1	Rm	HPEL	8-21
	YA2	Rm	HPEL	8-21
	ZA2	Rm	HPEL	8-21
040	NA4	Cd	Cit.	7-30
	BA4	Va,Hv,Ms,Ngu	Cit.	7-5
	Dogue Cr. #	Ms	Cit.	7-30
	Potomac R. #	Cd	Cit.	7-30

Quad	1992 Bed	Species*	Surveyor**	1992 Survey Date
041	Mataponi Cr. #	Pcr,Cd,Ec	PRP	7-8
	Lyons Cr. #	Ec	PRP	7-8
	Hall Cr. #	Cd,Ngu,Ec,Va,Zp,Ppu	PRP	7-8
	Cocktown Cr. #	Pcr,Cd,Ppu,Va,Ec	PRP	7-8
042	N. Lower Marlboro #	Pcr,Ppu	PRP	7-8
043	NA2	Rm\Rm	Cit.\HPEL	6-26\8-12
	IA2	Rm,Zp\Rm	Cit.\HPEL	6-26\8-25
	MA2	Rm,Zp\Rm	Cit.\HPEL	6-26\8-12
	JA2	Rm,Zp\Rm	Cit.\HPEL	6-26\8-12
	KA1	Rm	HPEL	8-12
	AA3	Rm\Rm	Cit.\HPEL	6-26\8-25
	Nelson Pt. #	Zp	Cit.	10-17
	Balls Cr. #	Zp	Cit.	6-26
	Balls Cr. #	Zp	Cit.	6-26
	Leadenham Cr. #	Rm	Cit.	6-26
044	FA3	Zp\Rm	Cit.\HPEL	6-26\7-29
	MA2	Zp\Rm	Cit.\HPEL	6-26\7-30
	GA2	Zp,Rm\Rm,Zp	Cit.\HPEL	6-26\7-29
	DA2	Rm\Rm,Zp	Cit.\HPEL	6-26\7-29
	CA2	Zp\Rm	Cit.\HPEL	6-26\7-29
	EA2	Rm	HPEL	7-29
	HA2	Rm,Zp	HPEL	7-29
	JA2	Rm	HPEL	7-29
	KA2	Rm	HPEL	7-29
	LA3	Rm	HPEL	7-29
	NA2	Rm,Zp	HPEL	7-30
	PA2	Rm	HPEL	7-30
	Tar Cr. #	Zp	Cit.	6-30
	Tar Cr. #	Zp	Cit.	6-30
	Tred Avon R. #	Zp	Cit.	6-30
	Fox Hole Cr. #	Zp	Cit.	7-7
	Boone Cr. #	U	Cit.	7-6
	Bailey's Neck #	Zp	Cit.	6-1
	Irish Cr. #	Zp	Cit.	6-26
046	Hunting Cr. #	U	Cit.	11-24
051	AA2	Rm	Cit.	7-15
	BA2	Rm	Cit.	7-15
	WA3	Rm	HPEL	7-21
	XA2	Rm	HPEL	7-21
	YA2	Rm,Zp	HPEL	7-21
	PA2	Rm	Cit.	6-17
	SA1	Rm,U\Rm	Cit.\HPEL	Summer\8-25
	QA2	Rm,U	Cit.	Summer
	RA3	Rm,U	Cit.	Summer
	TA3	Rm,U	Cit.	Summer
	UA1	Rm,U	Cit.	Summer
	VA4	Rm,U	Cit.	Summer

Quad	1992 Bed	Species*	Surveyor**	1992 Survey Date
052	RA2	Rm	HPEL	8-26
	SA3	Rm\Zp	HPEL	8-26\7-21
	Lecompte Cr. #	Zp	HPEL	7-20
	Lecompte Cr. #	Zp	HPEL	7-20
053	AA2	Zp	HPEL	6-30
	Choptank Inlet #	Zp	Cit.	5-28
	Choptank Inlet #	Zp	Cit.	5-28
060	Island Cr. #	Zp	Cit.	5-22
	Island Cr. #	Zp	Cit.	5-22
061	Osbourne Cove #	Zp	Cit.	6-12
	St. Leonard Cr. #	Zp	Cit.	6-5
	St. Leonard Cr. #	Zp	Cit.	6-5
066	FA4	Va,Ppf,U	Cit.	8-27
071	Harper Cr. #	Zp	Cit.	6-2
	Harper Cr. #	Zp	Cit.	6-2
	Harper Cr. #	Zp	Cit.	6-2
	Harper Cr. #	Zp	Cit.	6-2
	Pearson Cr. #	Zp	Cit.	6-2
	Pearson Cr. #	Zp	Cit.	6-2
	Pearson Cr. #	Zp	Cit.	6-2
	Goose Cr. #	Zp	Cit.	No Date
	Goose Cr. #	Rm,Zp	Cit.	No Date
	Goose Cr. #	Rm,Zp	Cit.	No Date
	Harper Cr. #	Zp	Cit.	6-2
	Hog Pt. #	Rm	Cit.	6-2
	Patuxent R. #	Zp	Cit.	6-6
	Goose Cr. #	Rm	Cit.	No Date
072	DA4	Rm	Cit.	6-13
074	HA4	Rm,Zp	Cit.	5-23
	Honga R. #	Rm	Cit.	8-9
	S. Crab Pt. #	Rm	Cit.	8-9
078	Weatherall Cr. #	Zp	Cit.	6-6
	Aimes Cr. #	Zp	Cit.	6-6
080	AA2	Zp	Cit.	7-3
	Windmill Pt. #	Rm	Cit.	9-1
082	AA4	Rm	Cit.	9-12
	CA2	Rm	Cit.	9-12
084	AA2	Rm	Cit.	9-26
	BA2	Rm	Cit.	9-26
	CA2	Rm	Cit.	9-26

Quad	1992 Bed	Species*	Surveyor**	1992 Survey Date
084	DA2	Rm	Cit.	9-26
	EA2	Rm	Cit.	9-26
	Laws Gut #	Rm	Cit.	9-26
	Deal Isl. Marsh #	Rm	Cit.	9-26
098	Cubbitt Cr. #	Rm	Cit.	7-29
100	Crisfield #	Rm	Cit.	6-30
101	NA2	Rm	Cit.	6-30
	EA3	Rm	Cit.	6-30
	UA2	Rm	Cit.	6-30
106	CA2	Rm	Cit.	7-28
	DA4	Rm	Cit.	7-28
	BA2	Zm,Rm	Cit.	7-28
	Cockrell Pt. #	Rm	Cit.	7-15
	Sandy Pt. #	Rm,Zm	Cit.	8-30
	Gougher Cr. #	Rm	Cit.	7-28
109	XA2	Rm	Cit.	6-29
110	AA2	Rm	VIMS	7-29\6-10
	BA2	Rm	Cit.	7-29
111	AA2	Zm,Rm	VIMS	6-10
	BA2	Zm,Rm	VIMS	6-10
	DA3	Zm,Rm	VIMS	6-10
	FA2	Rm	VIMS	6-10
	GA4	Rm	VIMS	6-10
	HA4	Rm	VIMS	6-10
	IA1	Zm	VIMS	6-10
	JA4	Rm	VIMS	6-9
	LA4	Rm	VIMS	6-9
	YA3	Rm	VIMS	6-9
	ZA3	Rm	VIMS	6-10
	BB3	Rm	VIMS	6-10
112	TA3	Rm\Rm,Zm	Cit.\VIMS	6-30\6-23
	CA4	Rm	Cit.	6-30
	DA4	Rm	Cit.	6-30
	BA2	Rm\Rm,Zm	Cit.\VIMS	6-30\6-23
	GA1	Rm	Cit.	6-30
	LA2	Rm,Zm	Cit.	6-30
	QA3	Rm,Zm	Cit.	6-30
	PA3	Rm,Zm	Cit.	6-30
	EB3	Rm	Cit.	6-26
	FB2	Rm	Cit.	6-26
	HB2	Rm	Cit.	6-26
	JB2	Rm	Cit.	6-26
	IB2	Rm	Cit.	6-26

Quad	1992 Bed	Species*	Surveyor**	1992 Survey Date
112	IA4	Zm	VIMS	6-23
	UA3	Rm	VIMS	6-23
	VA2	Rm	VIMS	6-23
	WA2	Rm	VIMS	6-23
	Dividing Cr. #	Rm	Cit.	6-26
117	FA3	Rm	VIMS	6-8
118	EA4	Zm,Rm	VIMS	6-8
	GA2	Rm,Zm	VIMS	6-11
	JA3	Rm,Zm	VIMS	6-11
	TA4	Rm,Zm	VIMS	6-23
123	GA2	Zm,Rm	VIMS	6-11
	HA1	Zm	VIMS	6-11
	KA2	Zm	VIMS	6-11
	MA3	Zm	VIMS	6-11
	NA2	Zm	VIMS	6-11
	PA2	Zm	VIMS	6-11
	TA4	Rm,Zm	VIMS	6-8
	XA4	Rm,Zm	VIMS	6-11
	YA4	Rm,Zm	VIMS	6-11
	ZA2	Rm,Zm	VIMS	6-11
	AB4	Rm,Zm	VIMS	6-11
	BB3	Rm,Zm	VIMS	6-11
	DB2	Rm	VIMS	6-8
124	ZA4	Zm	Cit.	8-12
	CB2	Zm	Cit.	8-12
	DB4	Zm	Cit.	8-12
	FB2	Zm	Cit.	8-12
	GB3	Rm	Cit.	8-12
	HB3	Rm	Cit.	8-12
	IB2	Zm	Cit.	8-12
	KB3	Rm	Cit.	8-12
	JB2	Rm	Cit.	8-12
	LB3	Rm	Cit.	8-12
	MB3	Rm	Cit.	8-12
	NB2	Rm	Cit.	8-12
	NB2	Rm	Cit.	8-12
	EB2	Rm,Zm	Cit.	8-12
	Nassawadox Cr. #	Zm	Cit.	6-27
	Nassawadox Cr. #	Rm	Cit.	8-12
	E. Long Pt. #	Rm	Cit.	8-12
	E. Shooting Pt. #	Zm	Cit.	8-12
130	Mumfort Island #	Zm	VIMS	Summer
131	AA3	Zm	VIMS	10-19
	DA4	Zm,Rm	VIMS	10-19
	HA4	Zm,Rm	VIMS	10-19

Quad	1992 Bed	Species*	Surveyor**	1992 Survey Date
131	OA4	Zm,Rm	VIMS	5-18
	QA4	Zm,Rm	VIMS	5-18
	JB4	Zm	VIMS	June
	LB4	Zm,Rm	VIMS	June
132	IA4	Rm	Cit.	8-10
	IA4	Rm,Zm	Cit.	8-10
	IA4	Zm	Cit.	8-10
	JA2	Zm	Cit.	8-10
	HA3	Zm	Cit.	8-10
	IA4	Zm,Rm	Cit.	8-10
	KA4	Zm,Rm	Cit.	8-10
	KA4	Zm	Cit.	8-10
	LA1	Zm	Cit.	8-10
	MA2	Zm	Cit.	8-10
	NA1	Zm	Cit.	8-10
	OA4	Zm	Cit.	8-10
	CA4	Zm,Rm	VIMS	5-27
133	HA4	Zm	VIMS	July
139	AA2	Zm	VIMS	June
	BA2	Zm	VIMS	June
	CA2	Zm	VIMS	June
	DA3	Zm	VIMS	June
140	TA2	Rm,Zm	VIMS	7-8
	SA4	Rm,Zm	VIMS	7-8
	UA4	Rm,Zm	VIMS	7-8
	VA3	Rm,Zm	VIMS	7-8
	WA2	Rm	VIMS	7-8
147	AA3	Zm	VIMS	8-19
	KA4	Zm	VIMS	8-19
	QA4	Zm	VIMS	8-19
152	DA2	Rm,Zm	VIMS	9-29
	CA2	Rm,Zm	VIMS	9-29
	BA2	Rm,Zm	VIMS	9-29
	AA2	Rm,Zm	VIMS	9-29
159	S. Bristol Landing #	Ec	PRP	7-21
	Tavo Run #	Ec,Cd,Ngu,Ngr,U	PRP	7-21
	W. Bristol Landing #	Ppu,Pcr,Ec,Cd,Ngu,Nm	PRP	7-2
	W. Waysons Corner #	Va,Ec,Pe,Ppu,Cd,Zp	PRP	7-2
	N. Hills Bridge #	Ec,Ngu,Nm	PRP	7-2
	Back Channel #	Pcr,Cd,Ngu,Zp,Va	PRP	7-2
	Back Channel #	Nm,Ppc,Ppu	PRP	7-2
	S. Spyglass Is.#	Cd,Pcr,Va,Ec	PRP	7-2
	Mill Creek #	Cd,Ngu,Nm	PRP	7-2
	Galloway Gut #	Ngr,Nm,Zp	PRP	7-2

Quad	1992 Bed	Species*	Surveyor**	1992 Survey Date
159	Railroad Cr. #	Ngr,Ec	PRP	7-2
	Western Br. #	Cd,Pcr,Ngr	PRP	7-2
	Charles Br. #	Ec,Zp,Cd,Ngr	PRP	7-2
166	CA2	Rm	Cit.	8-25
	BA2	Rm	Cit.	8-25
167	EA3	Zm	Cit.	6-25
	CA4	Zm	Cit.	6-25
168	CA3	Zm	Cit.	6-25
	BA2	Zm	Cit.	6-25
	Isle of Wight Bay #	Rm	Cit.	8-25
	Isle of Wight Bay #	Rm	Cit.	8-25
	Mallard Island #	Rm	Cit.	8-25
	Sinepuxent Bay #	Zm	Cit.	6-25
170	MA3	Zm	Cit.	7-28
	MA3	Zm	Cit.	7-28
	MA3	Zm	Cit.	7-28
	MA3	Zm	Cit.	7-28
	MA3	Zm,Rm	Cit.	7-28
	KA3	Zm,Rm	Cit.	7-28
	LA4	Zm,Rm	Cit.	7-28
	LA4	Zm,Rm	Cit.	7-28
	JA4	Zm,Rm	Cit.	7-23
	JA4	Zm	Cit.	6-25
	OA3	Zm	Cit.	9-29
	OA3	Zm	Cit.	9-29
	IA3	Zm,Rm	Cit.	7-23
	DA4	Rm,Zm	Cit.	6-25
	CA3	Rm,Zm	Cit.	6-25
172	KA4	Zm,Rm	Cit.	7-1
	JA1	Zm,Rm	Cit.	7-1
	HA3	Zm	Cit.	7-1
	GA4	Zm,Rm	Cit.	7-1
	FA3	Zm,Rm	Cit.	7-1
	EA2	Zm,Rm	Cit.	7-1
	EA2	Rm,Zm	Cit.	7-1
	DA3	Rm,Zm	Cit.	7-1
	DA3	Zm,Rm	Cit.	7-1
	BA3	Zm	Cit.	7-1
	AA4	Zm	Cit.	7-1
	AA4	Zm	Cit.	7-1
173	HA3	Rm,Zm	Cit.	6-25
	HA3	Rm,Zm	Cit.	6-25
	HA3	Rm,Zm	Cit.	6-25
	GA3	Rm,Zm	Cit.	6-25
	FA2	Rm,Zm	Cit.	6-25
	DA2	Rm,Zm	Cit.	6-25

Quad	1992 Bed	Species*	Surveyor**	1992 Survey Date
173	DA2	Zm,Rm	Cit.	6-25
	EA4	Zm,Rm	Cit.	6-25
	CA1	Zm,Rm	Cit.	6-25
	DA2	Zm,Rm	Cit.	6-25
175	AA4	Rm,Zm	Cit.	9-16
	EA3	Rm,Zm	Cit.	9-16

APPENDIX F

1992 Horn Point Environmental Laboratory SAV Ground Survey of the Choptank River and Eastern Bay with Listings by Approximate Latitude and Longitude as Determined by a LORAN C Navigation System.

APPENDIX F

Coordinates of Sample Points

26 JUNE HPEL West Bolingbrook Creek

LATITUDE Deg Min	LONGITUDE Deg Min	SPECIES		DATE
38 35.76	76 07.84	Zp		6/26/92
38 35.70	76 07.82	0		6/26/92
38 35.63	76 07.71	0		6/26/92
38 35.49	76 07.52	0		6/26/92
38 35.09	76 06.86	0		6/26/92
38 35.01	76 06.80	Zp,U		6/26/92
38 39.96	76 06.81	Zp		6/26/92
38 34.94	76 06.85	0		6/26/92
38 34.77	76 06.84	0		6/26/92
38 34.61	76 07.74	0		6/26/92
38 35.30	76 06.46	0		6/26/92
38 35.60	76 05.82	0		6/26/92
38 35.58	76 04.98	0		6/26/92
38 34.27	76 03.68	0		6/26/92
38 34.17	76 03.47	0		6/26/92
38 33.84	76 02.70	0		6/26/92
38 34.78	76 01.73	0		6/26/92
38 34.80	76 01.82	0		6/26/92
38 34.94	76 02.05	0		6/26/92
38 35.13	76 02.24	0		6/26/92
38 35.28	76 02.21	0		6/26/92
38 35.31	76 02.00	Zp	Begin Bolingbrook Cr.	6/26/92
38 35.30	76 01.99	Zp		6/26/92
38 35.28	76 01.96	Zp		6/26/92
38 35.40	76 01.90	0		6/26/92
38 35.39	76 01.71	Zp		6/26/92
38 35.48	76 01.61	Zp		6/26/92
38 35.50	76 01.59	Zp		6/26/92
38 35.47	76 02.10	Zp,U		6/26/92
38 35.39	76 02.23	0		6/26/92
38 35.43	76 02.40	0		6/26/92
38 33.56	76 02.33	0		6/26/92
38 35.70	76 02.39	0		6/26/92
38 35.90	76 02.08	0		6/26/92
38 35.81	76 01.89	0		6/26/92
38 35.88	76 01.79	0		6/26/92
38 36.12	76 01.28	0		6/26/92
38 36.28	76 01.89	0		6/26/92
38 36.16	76 02.30	Zp		6/26/92
38 36.25	76 02.25	Zp		6/26/92
38 36.18	76 02.24	0		6/26/92

29 JUNE North Shore Choptank, Bolingbrook to Reeds Creek

LATITUDE Deg Min	LONGITUDE Deg Min	SPECIES		DATE
38 36.32	76 01.75	0	Top Bolingbrook Cr.	6/29/92
38 36.40	76 01.71	0		6/29/92
38 36.47	76 01.65	0		6/29/92
38 36.50	76 01.61	0		6/29/92
38 36.53	76 01.59	0		6/29/92
38 36.56	76 01.59	0		6/29/92
38 36.59	76 01.60	0		6/29/92
38 36.64	76 01.59	0		6/29/92
38 36.75	76 01.63	0		6/29/92
38 36.77	76 01.60	0		6/29/92
38 36.78	76 01.65	0		6/29/92
38 36.82	76 01.68	0		6/29/92
38 36.88	76 01.70	0		6/29/92
38 36.94	76 01.72	0		6/29/92
38 36.98	76 01.76	0		6/29/92
38 37.05	76 01.81	0		6/29/92
38 37.12	76 01.86	0		6/29/92
38 36.99	76 01.80	0		6/29/92
38 36.93	76 01.74	0		6/29/92
38 36.84	76 01.73	0		6/29/92
38 36.78	76 01.72	0		6/29/92
38 36.70	76 01.68	0		6/29/92
38 36.63	76 01.64	0		6/29/92
38 36.53	76 01.67	0		6/29/92
38 36.45	76 01.80	0	End of Bolingbrook Cr.	6/29/92
38 35.96	76 02.26	Zp	Where left off 28 JUNE	6/29/92
38 35.97	76 02.26	Zp		6/29/92
38 35.98	76 02.31	U		6/29/92
38 35.98	76 02.35	Zp,U		6/29/92
38 35.98	76 02.39	Zp		6/29/92
38 35.97	76 02.43	0		6/29/92
38 35.97	76 02.49	0		6/29/92
38 35.98	76 02.53	0		6/29/92
38 35.95	76 02.32	0		6/29/92
38 35.93	76 02.37	0		6/29/92
38 35.92	76 02.42	U		6/29/92
38 35.93	76 02.52	Zp,U		6/29/92
38 35.92	76 02.53	U		6/29/92
38 35.88	76 02.56	0		6/29/92
38 35.78	76 02.59	Zp,U		6/29/92
38 35.73	76 02.59	U		6/29/92
38 35.67	76 02.55	0		6/29/92
38 35.62	76 02.58	0		6/29/92
38 35.48	76 02.63	Zp,U		6/29/92
38 35.46	76 02.67	Zp		6/29/92
38 35.41	76 02.69	0		6/29/92
38 35.13	76 02.36	0		6/29/92
38 35.16	76 02.51	0		6/29/92

LATITUDE Deg Min	LONGITUDE Deg Min	SPECIES		DATE
38 35.30	76 02.60	0		6/29/92
38 35.34	76 02.71	0		6/29/92
38 35.46	76 02.83	0		6/29/92
38 35.72	76 03.21	0	Choptank Bridge	6/29/92
38 35.98	76 03.29	0		6/29/92
38 36.01	76 03.33	0		6/29/92
38 36.06	76 03.37	0		6/29/92
38 36.09	76 03.35	0		6/29/92
38 36.17	76 03.32	0		6/29/92
38 36.25	76 03.30	0		6/29/92
38 36.35	76 03.37	0		6/29/92
38 36.40	76 03.53	0		6/29/92
38 36.47	76 03.64	0		6/29/92
38 36.57	76 03.93	0		6/29/92
38 36.64	76 04.14	0		6/29/92
38 37.79	76 04.41	0		6/29/92
38 36.85	76 04.52	0		6/29/92
38 36.90	76 04.68	0		6/29/92
38 36.96	76 04.99	0		6/29/92
38 37.06	76 05.18	0		6/29/92
38 37.21	76 05.20	0		6/29/92
38 37.26	76 04.96	0		6/29/92
38 37.33	76 04.88	0	Begin Reeds Cr.	6/29/92
38 37.32	76 04.74	0		6/29/92
38 37.29	76 04.64	0		6/29/92
38 37.32	76 04.44	0		6/29/92
38 37.33	76 04.66	0		6/29/92
38 37.38	76 04.75	0		6/29/92
38 37.45	76 04.73	0		6/29/92
38 37.54	76 04.66	0		6/29/92
38 37.45	76 04.78	0	End Reeds Cr.	6/29/92

30 JUNE North Shore Choptank West of HPEL

LATITUDE Deg Min	LONGITUDE Deg Min	SPECIES		DATE
38 37.57	76 05.39	Zp		6/30/92
38 37.47	76 03.32	0		6/30/92
38 37.44	76 05.34	Zp(D)		6/30/92
38 37.42	76 05.33	Zp(D)		6/30/92
38 37.38	76 05.33	0		6/30/92
38 37.38	76 05.29	Zp(D)		6/30/92
38 37.37	76 05.26	Zp(D)		6/30/92
38 37.31	76 05.22	0		6/30/92
38 37.33	76 05.13	0		6/30/92
38 37.37	76 05.14	0		6/30/92
38 37.39	76 05.17	0		6/30/92
38 37.42	76 05.20	Zp	edge	6/30/92
38 37.45	76 05.24	Zp		6/30/92

LATITUDE Deg Min	LONGITUDE Deg Min	SPECIES		DATE
38 37.49	76 05.26	Zp		6/30/92
38 37.54	76 05.25	Zp		6/30/92
38 37.58	76 05.20	0		6/30/92
38 37.58	76 05.34	Zp(D)		6/30/92
38 37.62	76 05.47	Zp(D)		6/30/92
38 37.57	76 05.57	Zp(D		6/30/92
38 37.53	76 05.62	Zp(D		6/30/92
38 37.52	76 05.65	Zp(D)		6/30/92
38 37.48	76 05.72	0		6/30/92
38 37.67	76 05.85	0		6/30/92
38 3758	76 05.85	0		6/30/92
38 37.53	76 06.15	0		6/30/92
38 37.59	76 06.11	0		6/30/92
38 37.68	76 06.13	0	sand	6/30/92
38 37.67	76 06.15	Zp		6/30/92
38 37.67	76 06.20	Zp		6/30/92
38 37.71	76 06.13	0		6/30/92
38 37.74	76 06.08	0		6/30/92
38 37.79	76 06.04	Rm		6/30/92
38 37.89	76 05.95	Zp		6/30/92
38 37.92	76 05.84	Zp		6/30/92
38 37.94	76 05.22	0	End Dickinson Bay	6/30/92
38 37.89	76 05.90	0	Along Howell Pt.	6/30/92
38 37.56	76 06.25	0		6/30/92
38 37.55	76 06.28	0		6/30/92
38 37.53	76 06.35	0		6/30/92
38 38.49	76 06.44	0		6/30/92
38 37.41	76 06.58	0		6/30/92
38 37.27	76 06.71	0		6/30/92
38 37.17	76 06.72	0		6/30/92
38 36.98	76 06.66	0		6/30/92
38 36.83	76 06.90	0	Start West side Howell Pt.	6/30/92
38 36.95	76 06.98	0	Howell Pt. & La Trappe Cr.	6/30/92
38 37.19	76 07.00	0		6/30/92
38 37.38	76 06.99	0		6/30/92
38 37.48	76 07.07	0		6/30/92
38 37.60	76 07.19	0		6/30/92
38 37.75	76 07.15	0		6/30/92
38 37.92	76 07.02	0	La Trappe Cr.	6/30/92
38 37.98	76 07.04	0		6/30/92
38 38.03	76 07.05	0		6/30/92
38 38.09	76 07.01	Zp		6/30/92
38 38.14	76 06.87	0		6/30/92
38 38.14	76 06.79	0		6/30/92
38 38.23	76 06.68	0		6/30/92
38 38.28	76 06.57	0		6/30/92
38 38.25	76 06.53	Zp		6/30/92
38 38.35	76 06.62	Zp		6/30/92
38 38.39	76 06.65	Zp		6/30/92
38 38.42	76 06.65	Zp		6/30/92

LATITUDE Deg Min	LONGITUDE Deg Min	SPECIES		DATE
38 38.66	76 06.62	0		6/30/92
38 38.50	76 06.48	0		6/30/92
38 38.55	76 06.51	0		6/30/92
38 38.61	76 06.67	0		6/30/92
38 38.72	76 06.65	0		6/30/92
38 38.73	76 06.56	0		6/30/92
38 38.35	76 06.41	0		6/30/92
38 38.82	76 06.34	Zp	sparse	6/30/92
38 38.86	76 06.29	0		6/30/92
38 38.89	76 06.24	0		6/30/92
38 38.96	76 06.09	Zp	sparse	6/30/92
38 39.03	76 06.09	0		6/30/92
38 39.09	76 06.10	0		6/30/92
38 39.09	76 05.97	0		6/30/92
38 39.08	76 05.90	0		6/30/92
38 39.04	76 05.81	0		6/30/92
38 38.95	76 05.70	0		6/30/92
38 38.89	76 05.57	Zp	very sparse	6/30/92
38 38.89	76 05.46	0		6/30/92
38 38.85	76 05.32	0	End of Trappe Cr., East side	6/30/92

7 JULY Top Trappe Creek & down West side

LATITUDE Deg Min	LONGITUDE Deg Min	SPECIES		DATE
38 38.95	76 05.24	0	Into Lowry Cove	7/7/92
38 38.99	76 05.14	0		7/7/92
38 38.99	76 05.05	0		7/7/92
38 39.00	76 04.99	0		7/7/92
38 39.09	76 04.85	0		7/7/92
38 39.10	76 04.68	0		7/7/92
38 39.10	76 04.60	0		7/7/92
38 39.09	76 04.50	0		7/7/92
38 39.09	76 04.41	0		7/7/92
38 39.09	76 04.31	0	Top of Lowry Cove	7/7/92
38 39.15	76 04.34	0	Left fork of Lowry	7/7/92
38 39.11	76 04.86	0		7/7/92
38 39.02	76 05.06	0		7/7/92
38 39.25	76 05.09	0		7/7/92
38 39.40	76 05.01			7/7/92
38 39.32	76 05.16	0		7/7/92
38 39.38	76 05.22	0		7/7/92
38 39.49	76 05.20	0		7/7/92
38 39.07	76 05.18	0		7/7/92
38 38.96	76 05.44	Zp		7/7/92
38 38.47	76 05.47	Zp		7/7/92
38 38.97	76 05.51	0		7/7/92
38 39.07	76 05.57	0		7/7/92
38 39.11	76 05.64	Zp		7/7/92

LATITUDE Deg Min	LONGITUDE Deg Min	SPECIES		DATE
38 39.13	76 05.67	Zp		7/7/92
38 39.09	76 05.63	Zp		7/7/92
38 38.85	76 05.67	Zp		7/7/92
38 38.83	76 05.71	0		7/7/92
38 38.66	76 05.91	Zp		7/7/92
38 38.61	76 06.08	0		7/7/92
38 38.60	76 06.26	0		7/7/92
38 38.74	76 06.26	Zp	Tip of cove	7/7/92
38 38.69	76 06.29	0		7/7/92
38 38.72	76 06.43	Zp,Rm		7/7/92
38 38.83	76 06.48	0		7/7/92
38 38.77	76 06.53	0		7/7/92
38 38.58	76 06.67	Zp		7/7/92
38 38.57	76 06.54	0		7/7/92
38 38.58	76 06.34	0		7/7/92
38 38.45	76 06.35	Zp		7/7/92
38 38.40	76 06.40	Zp		7/7/92
38 38.40	76 06.38	0		7/7/92
38 38.28	76 06.29	0		7/7/92
38 38.19	76 06.24	0		7/7/92
38 38.17	76 06.33	Zp		7/7/92
38 38.19	76 06.34	Zp		7/7/92
38 38.19	76 06.37	Zp	West Shore La Trappe Creek	7/7/92
38 38.06	76 06.46	0		7/7/92
38 38.09	76 06.56	0		7/7/92
38 37.99	76 06.59	Zp		7/7/92
38 37.90	76 06.67	Zp		7/7/92
38 37.90	76 06.71	Zp		7/7/92
38 37.90	76 06.73	0		7/7/92
38 37.90	76 06.80	0		7/7/92
38 37.94	76 06.76	0		7/7/92
38 38.01	76 06.76	0		7/7/92
38 38.08	76 06.76	Zp		7/7/92
38 38.12	76 06.87	Zp		7/7/92
38 38.12	76 06.97	Zp		7/7/92
38 38.16	76 07.01	Zp		7/7/92
38 38.17	76 07.06	Zp		7/7/92
38 38.19	76 07.08	Zp		7/7/92
38 38.08	76 07.03	Zp		7/7/92
38 38.02	76 06.90	Zp		7/7/92
38 37.96	76 06.86	0		7/7/92
38 37.95	76 06.94	Zp		7/7/92
38 37.77	76 06.86	0		7/7/92
38 37.71	76 06.81	0		7/7/92
38 37.72	76 06.76	0	Leaving Trappe Cr.	7/7/92
38 37.64	76 07.06	0	Martin Pt .	7/7/92
38 37.94	76 07.22	0		7/7/92
38 38.16	76 08.15	0		7/7/92
38 38.13	76 08.30	0	Chlora Pt.	7/7/92
38 38.12	76 08.49	0	Chlora Pt.	7/7/92

8 JULY Chlora Point & West (Up Island Creek)

LATITUDE Deg Min	LONGITUDE Deg Min	SPECIES	DATE
38 38.14	76 08.53	0	7/8/92
38 38.17	76 08.49	0	7/8/92
38 38.41	76 08.60	0	7/8/92
38 38.60	76 08.72	0	7/8/92
38 38.94	76 08.80	0	7/8/92
38 39.26	76 08.95	0	7/8/92
38 39.42	76 08.82	0	7/8/92
38 39.50	76 08.78	0	7/8/92
38 39.60	76 08.56	0	7/8/92
38 39.52	76 08.47	Zp 20 feet from shore	7/8/92
38 39.53	76 08.48	Zp 20 feet from shore	7/8/92
38 39.50	76 08.46	0	7/8/92
38 39.47	76 08.43	Zp(D),Rm	7/8/92
38 39.46	76 08.44	0	7/8/92
38 39.42	76 08.46	0	7/8/92
38 39.42	76 08.40	Zp,U	7/8/92
38 39.42	76 08.37	Zp	7/8/92
38 39.41	76 08.29	0	7/8/92
38 39.39	76 08.26	0	7/8/92
38 39.48	76 08.38	0	7/8/92
38 39.52	76 08.25	0	7/8/92
38 39.50	76 08.22	Rm	7/8/92
38 39.50	76 08.17	Zp,Rm	7/8/92
38 39.59	76 08.22	0	7/8/92
38 39.65	76 08.12	Zp(D),Rm	7/8/92
38 39.68	76 08.12	Zp(D),Rm	7/8/92
38 39.67	76 08.12	Zp(D),Rm	7/8/92
38 39.68	76 08.05	Zp(D),Rm	7/8/92
38 39.65	76 08.00	0	7/8/92
38 39.62	76 07.97	0	7/8/92
38 39.62	76 07.91	Zp,Rm	7/8/92
38 39.63	76 07.83	U	7/8/92
38 39.65	76 07.79	0	7/8/92
38 39.69	76 07.71	0	7/8/92
38 39.68	76 07.67	0	7/8/92
38 39.62	76 07.61	0	7/8/92
38 39.54	76 07.59	0	7/8/92
38 39.50	76 07.60	0	7/8/92
38 39.48	76 07.62	0	7/8/92
38 39.44	76 07.59	0	7/8/92
38 39.44	76 07.65	0	7/8/92
38 39.35	76 07.51	Zp	7/8/92
38 39.33	76 07.41	0	7/8/92
38 39.37	76 07.52	0	7/8/92
38 39.46	76 07.59	0	7/8/92
38 39.60	76 07.42	Zp,Rm	7/8/92
38 39.67	76 07.57	0	7/8/92
38 39.76	76 07.66	Zp	7/8/92

LATITUDE Deg Min	LONGITUDE Deg Min	SPECIES	DATE
38 39.81	76 07.75	Zp	7/8/92
38 39.85	76 07.73	Zp	7/8/92
38 39.89	76 07.70	Zp	7/8/92
38 39.92	76 07.67	0	7/8/92
38 39.99	76 07.66	0	7/8/92
38 40.08	76 07.56	0	7/8/92
38 40.09	76 07.44	0	7/8/92
38 40.08	76 07.40	0	7/8/92
38 40.07	76 07.38	0	7/8/92
38 40.13	76 07.33	0	7/8/92
38 40.20	76 07.33	0	7/8/92
38 40.25	76 07.24	0	7/8/92
38 40.18	76 07.14	0	7/8/92
38 40.12	76 07.07	0	7/8/92
38 40.05	76 06.97	0	7/8/92
38 40.03	76 06.94	0	7/8/92
38 39.98	76 06.82	0	7/8/92
38 40.01	76 06.87	0	7/8/92
38 40.11	76 06.98	0	7/8/92
38 40.21	76 07.04	0	7/8/92
38 40.17	76 06.78	0	7/8/92
38 40.05	76 06.58	0	7/8/92
38 39.98	76 06.55	0	7/8/92
38 40.13	76 06.45	0	7/8/92
38 40.14	76 06.34	0	7/8/92
38 40.15	76 06.34	0	7/8/92
38 40.37	76 06.48	0	7/8/92
38 40.51	76 06.35	0	7/8/92
38 40.29	76 06.06	0	7/8/92
38 40.24	76 05.78	0	7/8/92
38 40.24	76 05.42	0	7/8/92
38 40.47	76 05.43	0	7/8/92

13 JULY Island Creek

LATITUDE Deg Min	LONGITUDE Deg Min	SPECIES	DATE
			7/13/92
38 40.47	76 06.21	0	7/13/92
38 40.60	76 05.85	0	7/13/92
38 40.69	76 05.78	0	7/13/92
38 40.71	76 05.70	0	7/13/92
38 40.86	76 05.56	0	7/13/92
38 40.98	76 05.59	0	7/13/92
38 41.09	76 05.51	0	7/13/92
38 41.10	76 05.41	0	7/13/92
38 41.12	76 05.48	0	7/13/92
38 41.11	76 05.53	0	7/13/92
38 41.00	76 05.62	0	7/13/92

LATITUDE Deg Min	LONGITUDE Deg Min	SPECIES	DATE
38 41.93	76 05.69	0	7/13/92
38 41.81	76 05.76	0	7/13/92
38 40.67	76 05.88	0	7/13/92
38 40.67	76 06.01	0	7/13/92
38 40.54	76 06.14	0	7/13/92
38 40.60	76 06.30	Zp(D),Rm	7/13/92
38 40.62	76 06.32	Zp,Rm(D)	7/13/92
38 40.62	76 06.39	Zp,Rm	7/13/92
38 40.69	76 06.42	0	7/13/92
38 40.70	76 06.45	Zp,Rm	7/13/92
38 40.75	76 06.42	Zp	7/13/92
38 40.69	76 06.48	Zp	7/13/92
38 40.66	76 06.54	Zp	7/13/92
38 40.71	76 06.61	0	7/13/92
38 40.65	76 06.77	Zp,Rm	7/13/92
38 40.67	76 06.75	Zp	7/13/92
38 40.65	76 06.58	U	7/13/92
38 40.57	76 06.56	0	7/13/92
38 40.54	76 06.60	0	7/13/92
38 40.54	76 06.66	0	7/13/92
38 40.42	76 06.63	0	7/13/92
38 40.33	76 06.57	0	7/13/92
38 40.25	76 06.69	0	7/13/92
38 40.33	76 06.76	U	7/13/92
38 40.39	76 06.84	U	7/13/92
38 40.34	76 07.02	0	7/13/92
38 40.37	76 07.26	0	7/13/92
38 40.36	76 07.40	0	7/13/92
38 40.26	76 07.41	0	7/13/92
38 40.19	76 07.61	0	7/13/92
38 40.11	76 07.72	0	7/13/92
38 40.01	76 07.76	U	7/13/92
38 39.89	76 07.91	0	7/13/92
38 39.95	76 07.98	0	7/13/92
38 40.10	76 07.88	Zp Bottom of Island Creek	7/13/92
38 40.17	76 07.85	Zp	7/13/92
38 40.18	76 07.91	Zp	7/13/92
38 40.29	76 07.91	0	7/13/92
38 40.38	76 07.89	0	7/13/92
38 40.47	76 07.83	Zp	7/13/92
38 40.44	76 07.92	0	7/13/92
38 40.42	76 07.99	Zp	7/13/92
38 40.37	76 07.88	Zp	7/13/92
38 40.34	76 08.07	0	7/13/92
38 40.30	76 08.04	Zp	7/13/92
38 40.22	76 08.01	0	7/13/92
38 40.12	76 06.97	0	7/13/92
38 40.11	76 08.06	0	7/13/92
38 40.13	76 08.09	0	7/13/92
38 40.03	76 08.03	Zp	7/13/92

LATITUDE Deg Min	LONGITUDE Deg Min	SPECIES		DATE
38 39.89	76 08.11	0		7/13/92
38 39.86	76 08.24	Zp		7/13/92
38 39.88	76 08.28	Zp		7/13/92
38 39.95	76 08.24	Zp		7/13/92
38 39.96	76 08.31	0		7/13/92
38 39.99	76 08.37	0		7/13/92
38 39.98	76 08.40	Zp		7/13/92
38 39.90	76 08.34	Zp		7/13/92
38 39.78	76 08.74	0		7/13/92

20 JULY Choptank River: From HPEL East

LATITUDE Deg Min	LONGITUDE Deg Min	SPECIES		DATE
38 35.54	76 07.37	0		7/20/92
38 35.61	76 07.51	0		7/20/92
38 35.75	76 07.67	0		7/20/92
38 35.83	76 07.75	0		7/20/92
38 35.96	76 07.88	0		7/20/92
38 36.09	76 07.93	0		7/20/92
38 36.21	76 07.98	0	Horn Pt.	7/20/92
38 36.15	76 08.22	0		7/20/92
38 36.07	76 08.33	0		7/20/92
38 35.97	76 08.44	0		7/20/92
38 35.85	76 08.57	0		7/20/92
38 35.65	76 08.86	0		7/20/92
38 35.62	76 09.09	0		7/20/92
38 35.65	76 09.36	0		7/20/92
38 35.78	76 09.50	0		7/20/92
38 35.89	76 09.63	0		7/20/92
38 36.00	76 09.66	0		7/20/92
38 36.07	76 09.72	0		7/20/92
38 36.04	76 09.78	0		7/20/92
38 36.02	76 09.94	0		7/20/92
38 35.98	76 10.06	0		7/20/92
38 35.96	76 10.18	0		7/20/92
38 35.90	76 10.30	0		7/20/92
38 35.85	76 10.27	0		7/20/92
38 35.80	76 10.36	0		7/20/92
38 35.85	76 10.44	0		7/20/92
38 35.97	76 10.48	U		7/20/92
38 36.10	76 10.57	0		7/20/92
38 36.18	76 10.60	0		7/20/92
38 36.29	76 10.71	Zp,Rm	Lecompte Cove	7/20/92
38 36.34	76 10.76	Zp,Rm	Lecompte Cove	7/20/92
38 36.30	76 10.70	0	Lecompte Cove	7/20/92
38 36.37	76 10.66	0	Lecompte Cove	7/20/92
38 36.42	76 10.67	0	Lecompte Cove	7/20/92
38 36.39	76 10.61	Zp	Lecompte Cove	7/20/92

LATITUDE Deg Min	LONGITUDE Deg Min	SPECIES		DATE
38 36.31	76 10.58	Zp	Lecompte Cove	7/20/92
38 36.26	76 10.53	0	Lecompte Cove	7/20/92
38 36.15	76 10.43	0	Lecompte Cove	7/20/92
38 36.08	76 10.38	0	Lecompte Cove	7/20/92
38 36.05	76 10.29	Zp	Lecompte Cove	7/20/92
38 36.07	76 10.23	Zp	Lecompte Cove	7/20/92
38 36.10	76 10.20	0		7/20/92
38 36.14	76 10.17	0		7/20/92
38 36.21	76 10.15	0		7/20/92
38 36.34	76 10.20	0		7/20/92
38 36.38	76 10.10	0		7/20/92
38 36.28	76 10.09	0		7/20/92
38 36.25	76 10.02	0		7/20/92
38 36.19	76 10.01	0	Leaving Lecompte Creek	7/20/92
38 36.16	76 09.81	0		7/20/92
38 36.19	76 09.71	0		7/20/92
38 36.45	76 09.56	0		7/20/92
38 36.60	76 09.47	0		7/20/92
38 36.89	76 09.49	0		7/20/92
38 37.09	76 09.44	0		7/20/92
38 37.20	76 09.48	0		7/20/92
38 37.20	76 09.72	0		7/20/92
38 37.29	76 09.85	0	Castle Haven Inlet	7/20/92
38 37.28	76 09.98	0		7/20/92
38 37.31	76 10.06	0		7/20/92
38 37.29	76 10.20	0		7/20/92
38 37.27	76 10.31	0		7/20/92
38 37.32	76 10.30	0		7/20/92
38 37.38	76 10.27	0		7/20/92
38 37.41	76 10.17	U		7/20/92
38 37.38	76 10.11	0		7/20/92
38 37.38	76 10.91	0		7/20/92
38 37.39	76 10.76	0	Castle Haven Pt.	7/20/92
38 37.41	76 10.52	0		7/20/92
38 37.48	76 10.54	0		7/20/92
38 37.65	76 10.81	0		7/20/92
38 37.63	76 11.15	0		7/20/92
38 37.11	76 11.20	0		7/20/92
38 37.17	76 11.82	0		7/20/92
38 37.67	76 11.86	Rm	Cornersville, patchy	7/20/92

21 JULY Choptank River: From Todd's Cove & East

LATITUDE Deg Min	LONGITUDE Deg Min	SPECIES		DATE
38 36.70	76 11.85	Rm		7/21/92
38 36.74	76 11.90	Rm	North edge	7/21/92
38 36.67	76 11.91	Rm	North edge	7/21/92
38 36.67	76 11.97	0		7/21/92

LATITUDE Deg Min	LONGITUDE Deg Min	SPECIES		DATE
38 36.64	76 12.07	Rm	North edge	7/21/92
38 36.60	76 12.24	Rm	North edge	7/21/92
38 36.53	76 12.43	Rm	North edge	7/21/92
38 36.23	76 12.36	Zp,Rm(D)		7/21/92
38 36.17	76 12.45	Zp(D),Rm		7/21/92
38 36.21	76 12.48	Zp		7/21/92
38 36.12	76 12.57	Zp	Cornersville	7/21/92
38 36.19	76 12.10	Rm	Southeast edge	7/21/92
38 36.53	76 12.58	Rm		7/21/92
38 36.52	76 12.63	Rm		7/21/92
38 36.55	76 12.72	Rm		7/21/92
38 36.54	76 12.91	0		7/21/92
38 36.53	76 12.97	Rm		7/21/92
38 36.62	76 13.00	0		7/21/92
38 36.68	76 13.19	0		7/21/92
38 36.75	76 13.44	0		7/21/92
38 36.70	76 13.59	0		7/21/92
38 36.66	76 13.56	0		7/21/92
38 36.56	76 13.59	0		7/21/92
38 36.46	76 13.60	Zp	Hills Pt.	7/21/92
38 36.37	76 13.47	Zp		7/21/92
38 36.45	76 13.65	U		7/21/92
38 36.52	76 13.74	0		7/21/92
38 36.48	76 13.79	Zp	dying	7/21/92
38 36.45	76 13.83	0		7/21/92
38 36.57	76 13.73	0		7/21/92
38 36.69	76 13.83	0		7/21/92
38 36.65	76 13.95	0		7/21/92
38 36.69	76 13.99	0		7/21/92
38 36.88	76 13.83	0		7/21/92
38 36.93	76 13.92	0		7/21/92
38 37.03	76 13.84	0		7/21/92
38 37.17	76 13.73	0		7/21/92
38 37.20	76 13.78	0		7/21/92
38 37.52	76 13.67	0		7/21/92
38 37.40	76 14.86	0		7/21/92
38 37.25	76 14.92	0		7/21/92
38 37.06	76 14.79	Rm	Cooks Cove, patchy	7/21/92
38 37.05	76 14.84	Rm	West edge	7/21/92
38 36.99	76 14.95	Rm	West edge	7/21/92
38 36.99	76 15.15	Rm	Southwest edge	7/21/92
38 36.88	76 15.18	Rm	patchy	7/21/92
38 36.89	76 15.50	Rm	North Cooks Pt. Cove	7/21/92
38 37.02	76 15.82	0	edge	7/21/92
38 37.19	76 15.97	0	along Cooks Pt.	7/21/92
38 37.31	76 15.14	0		7/21/92
38 36.45	76 15.39	0		7/21/92
38 36.58	76 16.75	0		7/21/92
38 39.58	76 09.41	0	North shore	7/21/92
38 39.79	76 09.55	0		7/21/92

LATITUDE Deg Min	LONGITUDE Deg Min	SPECIES		DATE
38 38.06	76 09.94	0		7/21/92
38 38.16	76 09.71	0		7/21/92
38 38.38	76 09.88	0		7/21/92
38 41.30	76 12.71	0	Irish Creek	7/21/92
38 41.39	76 12.58	Rm		7/21/92
38 41.50	76 12.63	Rm		7/21/92
38 41.60	76 12.72	Rm	sparse	7/21/92
38 41.72	76 12.88	0		7/21/92
38 41.87	76 12.78	Rm	dying	7/21/92
38 41.92	76 12.68	Zp,Rm	sparse	7/21/92
38 42.02	76 12.67	0		7/21/92
38 42.15	76 12.67	Zp		7/21/92
38 42.16	76 12.63	Zp,Rm		7/21/92
38 42.26	76 12.40	Rm	patchy	7/21/92
38 42.38	76 12.36	0		7/21/92
38 42.39	76 12.34	Rm		7/21/92
38 42.56	76 12.38	0		7/21/92
38 42.66	76 12.46	0		7/21/92
38 42.65	76 12.49	0		7/21/92
38 42.54	76 12.48	0		7/21/92
38 42.33	76 12.54	0		7/21/92
38 42.35	76 12.64	Rm,Zp		7/21/92
38 42.36	76 12.72	Rm,Zp		7/21/92
38 42.46	76 12.90	0		7/21/92
38 42.62	76 13.02	Zp	patchy	7/21/92
38 42.68	76 13.25	Rm		7/21/92
38 42.71	76 13.36	0		7/21/92
38 42.63	76 13.26	0		7/21/92
38 42.53	76 13.23	Zp,Rm		7/21/92
38 42.50	76 13.23	0		7/21/92
38 42.47	76 13.24	0		7/21/92
38 42.47	76 13.22	Rm	patchy	7/21/92
38 42.36	76 13.23	Rm	patchy	7/21/92
38 42.24	76 13.26	Rm	patchy	7/21/92
38 42.15	76 13.16	Zp,Rm	patchy	7/21/92

29 JULY Tred Avon/Broad Cr

LATITUDE Deg Min	LONGITUDE Deg Min	SPECIES		DATE
38 40.70	76 11.47	0	Cove at Benoni Pt.	7/29/92
38 40.77	76 11.51	Zp,Rm,U		7/29/92
38 40.83	76 11.61	0		7/29/92
38 41.03	76 11.68	0		7/29/92
38 41.15	76 11.65	0		7/29/92
38 40.99	76 11.76	0		7/29/92
38 40.82	76 11.76	0		7/29/92
38 40.76	76 11.61	Zp		7/29/92
38 40.63	76 11.57	Zp		7/29/92

LATITUDE Deg Min	LONGITUDE Deg Min	SPECIES		DATE
38 40.53	76 11.53	Zp		7/29/92
38 40.46	76 11.55	Zp,U	small patches	7/29/92
38 40.44	76 11.56	Zp		7/29/92
38 42.61	76 13.98	0	Start Broad Cr.	7/29/92
38 42.88	76 14.13	Rm	sparse	7/29/92
38 43.04	76 14.13	0		7/29/92
38 43.36	76 14.06	0		7/29/92
38 43.45	76 13.70	0	Bridge Cr.	7/29/92
38 43.43	76 13.64	Rm	patchy	7/29/92
38 43.32	76 13.60	Rm	patchy	7/29/92
38 43.81	76 13.91	Rm	patchy	7/29/92
38 43.98	76 14.02	0	Edge Cr.	7/29/92
38 44.20	76 13.80	0		7/29/92
38 44.31	76 13.24	0		7/29/92
38 44.13	76 12.93	0		7/29/92
38 43.93	76 12.82	Zp		7/29/92
38 43.85	76 12.64	0	Elbert Cove	7/29/92
38 43.58	76 12.28	0		7/29/92
38 43.43	76 12.78	Rm	clumpy	7/29/92
38 43.29	76 12.74	0		7/29/92
38 43.23	76 12.70	0		7/29/92
38 43.41	76 12.67	Rm	sparse	7/29/92
38 43.52	76 12.74	0		7/29/92
38 43.66	76 12.64	Zp,Rm	Leaving Elbert Cove	7/29/92
38 43.90	76 12.04	0	Edge Cr.	7/29/92
38 43.81	76 11.85	0		7/29/92
38 43.48	76 11.89	0		7/29/92
38 43.41	76 11.87	0		7/29/92
38 43.70	76 11.69	0		7/29/92
38 43.64	76 11.67	0		7/29/92
38 43.72	76 11.38	0		7/29/92
38 43.64	76 11.33	0		7/29/92
38 43.58	76 11.32	0		7/29/92
38 43.61	76 11.25	0		7/29/92
38 43.57	76 10.99	0		7/29/92
38 43.35	76 10.93	0		7/29/92
38 43.46	76 10.86	0		7/29/92
38 43.55	76 10.78	0		7/29/92
38 43.67	76 10.78	0		7/29/92
38 43.73	76 10.72	0		7/29/92
38 43.76	76 10.71	Rm		7/29/92
38 43.67	76 10.80	0		7/29/92
38 43.68	76 10.97	0		7/29/92
38 43.83	76 11.03	0		7/29/92
38 44.11	76 10.98	0		7/29/92
38 44.17	76 10.81	Rm		7/29/92
38 44.27	76 10.71	Rm		7/29/92
38 44.16	76 10.93	0		7/29/92
38 44.02	76 11.13	0		7/29/92
38 44.08	76 11.15	0		7/29/92

LATITUDE Deg Min	LONGITUDE Deg Min	SPECIES		DATE
38 43.70	76 11.12	0		7/29/92
38 43.70	76 11.23	0		7/29/92
38 43.88	76 11.30	0		7/29/92
38 44.16	76 11.48	0		7/29/92
38 44.49	76 11.42	0		7/29/92
38 44.50	76 11.21	0		7/29/92
38 44.65	76 11.11	0		7/29/92
38 44.75	76 11.08	0		7/29/92
38 44.75	76 11.27	0		7/29/92
38 44.98	76 11.23	0		7/29/92
38 44.90	76 11.27	0		7/29/92
38 44.64	76 11.32	0		7/29/92
38 44.63	76 11.55	0		7/29/92
38 44.88	76 11.67	0		7/29/92
38 45.02	76 11.77	0		7/29/92
38 45.16	76 11.68	Rm,Zp		7/29/92
38 45.89	76 11.91	Rm		7/29/92
38 44.99	76 11.84	Rm		7/29/92
38 44.86	76 11.88	0		7/29/92
38 44.80	76 11.68	0		7/29/92
38 44.45	76 11.62	0		7/29/92
38 44.27	76 11.62	0		7/29/92

30 JULY Broad Creek

LATITUDE Deg Min	LONGITUDE Deg Min	SPECIES		DATE
38 44.08	76 11.68	0	From Solitude Cr. Pt.	7/30/92
38 44.15	76 11.91	Rm	patchy, muddy	7/30/92
38 44.24	76 12.00	Rm	epiphytes	7/30/92
38 44.28	76 12.14	Rm		7/30/92
38 44.27	76 12.18	Rm		7/30/92
38 44.36	76 12.26	Rm		7/30/92
38 44.37	76 12.28	Rm		7/30/92
38 44.39	76 12.33	0		7/30/92
38 44.43	76 12.22	Rm		7/30/92
38 44.51	76 12.16	0		7/30/92
38 44.61	76 12.19	0		7/30/92
38 44.76	76 12.26	Rm	patchy along shore	7/30/92
38 44.77	76 12.27	Rm		7/30/92
38 44.88	76 12.38	0		7/30/92
38 44.97	76 12.43	Rm	Dense bed	7/30/92
38 45.08	76 12.49	Rm	Dense bed	7/30/92
38 45.05	76 12.52	0		7/30/92
38 44.96	76 12.49	0		7/30/92
38 44.88	76 12.45	0		7/30/92
38 44.78	76 12.42	0		7/30/92
38 44.60	76 12.35	Rm		7/30/92
38 44.39	76 12.51	0		7/30/92

LATITUDE Deg Min	LONGITUDE Deg Min	SPECIES		DATE
38 44.46	76 12.50	Rm		7/30/92
38 44.48	76 12.53	Rm		7/30/92
38 44.52	76 12.59	Rm		7/30/92
38 44.61	76 12.67	Rm		7/30/92
38 44.72	76 12.79	Rm		7/30/92
38 44.77	76 12.91	Rm		7/30/92
38 44.81	76 12.96	Rm		7/30/92
38 44.89	76 13.14	0		7/30/92
38 45.17	76 13.20	Rm	short, patchy	7/30/92
38 45.30	76 13.17	Rm		7/30/92
38 45.58	76 13.36	Rm		7/30/92
38 45.64	76 13.45	0		7/30/92
38 45.87	76 13.27	0		7/30/92
38 46.03	76 13.15	0		7/30/92
38 45.90	76 12.94	0		7/30/92
38 45.79	76 12.90	0		7/30/92
38 45.76	76 12.87	Rm		7/30/92
38 45.82	76 12.85	0		7/30/92
38 45.89	76 12.86	Rm	short with epiphytes	7/30/92
38 45.89	76 12.98	0		7/30/92
38 46.08	76 12.92	0		7/30/92
38 46.20	76 12.79	0		7/30/92
38 46.19	76 12.76	0		7/30/92
38 46.13	76 12.69	Rm	short	7/30/92
38 46.16	76 12.88	0		7/30/92
38 46.28	76 12.01	0		7/30/92
38 46.28	76 13.01	0		7/30/92
38 46.36	76 13.00	0		7/30/92
38 46.43	76 13.03	0		7/30/92
38 46.30	76 13.26	0		7/30/92
38 46.12	76 13.37	Rm		7/30/92
38 46.20	76 13.44	0		7/30/92
38 46.27	76 13.52	0		7/30/92
38 46.39	76 13.56	0		7/30/92
38 46.56	76 13.44	0		7/30/92
38 46.61	76 13.27	0		7/30/92
38 46.68	76 13.31	0		7/30/92
38 46.69	76 13.45	0		7/30/92
38 46.64	76 13.63	0		7/30/92
38 46.60	76 13.74	0		7/30/92
38 46.70	76 13.73	0		7/30/92
38 46.69	76 13.65	Rm	sparse	7/30/92
38 46.54	76 13.59	0		7/30/92
38 46.38	76 13.64	0		7/30/92
38 46.26	76 13.81	0		7/30/92
38 46.25	76 13.95	0		7/30/92
38 46.23	76 14.08	Rm	dense	7/30/92
38 46.19	76 13.86	0		7/30/92
38 46.21	76 13.68	0		7/30/92
38 46.18	76 13.51	0		7/30/92

LATITUDE Deg Min	LONGITUDE Deg Min	SPECIES		DATE
38 45.97	76 13.50	0		7/30/92
38 45.82	76 13.50	0		7/30/92
38 45.74	76 13.63	Rm	patchy	7/30/92
38 45.65	76 13.58	Rm	all around island	7/30/92
38 45.64	76 13.81	0		7/30/92
38 45.66	76 13.83	0		7/30/92
38 45.69	76 13.91	Rm	Abundantly patchy	7/30/92
38 45.73	76 13.99	Rm	Abundantly patchy	7/30/92
38 45.79	76 14.08	Rm		7/30/92
38 45.86	76 14.20	0		7/30/92
38 45.97	76 14.23	0		7/30/92
38 46.02	76 14.31	0		7/30/92
38 46.01	76 14.41	Rm		7/30/92
38 46.00	76 14.50	Rm		7/30/92
38 45.95	76 14.62	0		7/30/92
38 46.17	76 14.70	0		7/30/92
38 46.25	76 14.74	0		7/30/92
38 46.24	76 14.87	0		7/30/92
38 46.40	76 14.94	0		7/30/92
38 46.59	76 14.90	Rm	small amount	7/30/92
38 46.75	76 14.81	0		7/30/92
38 46.83	76 14.70	0		7/30/92
38 46.98	76 14.52	0		7/30/92
38 46.87	76 14.83	0		7/30/92

12 AUGUST Broad Creek

LATITUDE Deg Min	LONGITUDE Deg Min	SPECIES		DATE
38 46.87	76 14.83	0		8/12/92
38 45.05	76 14.17	0		8/12/92
38 45.12	76 14.34	0		8/12/92
38 45.20	76 14.40	0		8/12/92
38 45.05	76 14.35	Rm	flowers, epiphytes, thick bed off Mulberry Pt.	8/12/92
38 45.06	76 14.32	Rm	edge	8/12/92
38 45.85	76 14.31	Rm	edge	8/12/92
38 44.99	76 14.29	Rm	edge	8/12/92
38 44.95	76 14.25	Rm	edge	8/12/92
38 44.82	76 14.39	Rm	patchy	8/12/92
38 44.83	76 14.51	0		8/12/92
38 44.80	76 14.62	Rm	patchy, flowers	8/12/92
38 44.81	76 14.71	Rm		8/12/92
38 44.83	76 14.76	Rm	flowers	8/12/92
38 44.82	76 14.79	Rm	edge	8/12/92
38 44.78	76 14.92	Rm	edge	8/12/92
38 44.79	76 15.01	Rm	edge	8/12/92
38 44.84	76 15.05	Rm	edge	8/12/92

LATITUDE Deg Min	LONGITUDE Deg Min	SPECIES		DATE
38 44.94	76 15.08	Rm	1 acre patch, flowers, epiphytes	8/12/92
38 45.02	76 15.03	Rm		8/12/92
38 45.03	76 14.95	0		8/12/92
38 46.80	76 15.10	0		8/12/92
38 46.95	76 15.16	0		8/12/92
38 46.12	76 15.08	0		8/12/92
38 46.26	76 15.02	0		8/12/92
38 46.38	76 14.88	0		8/12/92
38 47.48	76 14.78	0		8/12/92
38 47.58	76 14.73	0		8/12/92
38 47.70	76 14.49	0		8/12/92
38 47.71	76 14.34	0		8/12/92
38 47.84	76 14.30	0		8/12/92
38 47.89	76 14.16	0		8/12/92
38 47.98	76 14.26	0		8/12/92
38 48.09	76 14.28	0		8/12/92
38 48.22	76 14.25	0	tip top of Broad Creek	8/12/92
38 48.20	76 14.32	0		8/12/92
38 48.07	76 14.34	0		8/12/92
38 47.91	76 14.44	0		8/12/92
38 47.78	76 14.53	0		8/12/92
38 47.79	76 14.53	0		8/12/92
38 47.72	76 14.70	0		8/12/92
38 47.55	76 15.87	0		8/12/92
38 47.78	76 15.00	0		8/12/92
38 47.87	76 15.11	0		8/12/92
38 47.81	76 15.16	0		8/12/92
38 47.61	76 14.16	0		8/12/92
38 47.45	76 14.05	0		8/12/92
38 47.33	76 14.15	0		8/12/92
38 47.22	76 15.14	0		8/12/92
38 47.17	76 15.38	0		8/12/92
38 47.12	76 15.40	0		8/12/92
38 46.78	76 15.32	0		8/12/92
38 46.47	76 15.26	0		8/12/92
38 46.31	76 15.35	0		8/12/92
38 46.24	76 15.31	0		8/12/92
38 45.94	76 15.14	0		8/12/92
38 45.97	76 15.30	0		8/12/92
38 45.72	76 15.75	Rm	patchy	8/12/92
38 45.73	76 15.77	Rm	patchy	8/12/92
38 45.75	76 14.76	0		8/12/92
38 45.72	76 14.54	0		8/12/92
38 45.60	76 14.59	0		8/12/92
38 45.56	76 14.28	Rm		8/12/92
38 45.36	76 14.27	Rm		8/12/92
38 45.35	76 14.29	Rm		8/12/92
38 45.32	76 14.32	Rm	edge	8/12/92

18 AUGUST Broad Creek, Started Marked Spots on Photos Only

LATITUDE Deg Min	LONGITUDE Deg Min	SPECIES		DATE
38 43.57	76 13.52	Rm	Photo 25-3 7AUG North Pt. of Balls Cr.	8/18/92
38 45.21	76 15.15	Rm	lots epiphytes	8/18/92
38 45.23	76 15.20	Rm	edge	8/18/92
38 45.23	76 15.21	Rm	edge	8/18/92
38 45.16	76 15.20	0		8/18/92
38 45.17	76 15.20	Rm	edge	8/18/92
38 45.18	76 15.23	Rm	flowers, epiphytes	8/18/92
38 45.15	76 15.27	Rm	edge	8/18/92
38 45.14	76 15.31	Rm	edge,patchy	8/18/92
38 45.10	76 15.37	Rm	edge	8/18/92
38 45.06	76 15.33	0		8/18/92
38 44.46	76 15.23	Rm	epiphytes,patchy	8/18/92
38 44.45	76 15.31	Rm	edge	8/18/92
38 44.51	76 15.09	0	South Pt. Leadenham Cr.	8/18/92
38 44.74	76 15.44	0	North Pt. Leadenham Cr.	8/18/92
38 44.73	76 15.41	0		8/18/92
38 44.74	76 15.31	Rm	patchy,epiphytes	8/18/92
38 44.79	76 15.27	Rm	flowers,dense	8/18/92
38 44.83	76 15.23	Rm	edge	8/18/92
38 44.89	76 15.31	Rm	edge	8/18/92
38 44.37	76 15.94	Rm	flowers,epiphytes,dense	8/18/92
38 44.05	76 14.72	Rm	edge	8/18/92
38 44.96	76 14.90	Rm	no epiphtes	8/18/92
38 44.87	76 14.94	Rm	edge	8/18/92
38 43.67	76 15.46	Rm		8/18/92
38 43.42	76 15.65	Rm		8/18/92
38 43.32	76 15.80	Rm	North Pt. Balla Cr.	8/18/92
38 43.37	76 15.99	Rm	flowers, few epiphytes	8/18/92
38 49.76	76 16.83	Rm	epiphytes, Wades Pt.	8/18/92

20 AUGUST Eastern Bay

LATITUDE Deg Min	LONGITUDE Deg Min	SPECIES		DATE
38 50.80	76 28.20	Rm	Photo 25-8, Clairborne boat ramp, patchy	8/20/92
38 50.98	76 15.42	Rm	complete cover of filamentous algae, flowers	8/20/92
38 50.07	76 14.92	Rm	complete cover of filamentous algae, flowers	8/20/92
38 49.48	76 14.53	0	nothing since last pt.	8/20/92
38 49.33	76 14.42	0		8/20/92
38 46.29	76 11.25	0	Photo 23-7	8/20/92
38 46.22	76 11.17	Rm	filamentous algae, no flowers	8/20/92
38 46.04	76 10.92	0		8/20/92
38 46.02	76 10.86	0		8/20/92

LATITUDE Deg Min	LONGITUDE Deg Min	SPECIES		DATE
38 45.94	76 10.79	0		8/20/92
38 45.87	76 10.66	0		8/20/92
36 45.72	76 10.60	0		8/20/92
38 45.56	76 10.59	Rm	filamentous algae, no flowers	8/20/92
38 45.36	76 10.61	Rm	other epiphytes, flowers	8/20/92
38 45.25	76 10.41	0		8/20/92
38 45.23	76 09.93	Rm	Long, dense, filamentous algae, epiphytes	8/20/92
38 45.34	76 09.83	Rm	edge North East Side of bridge #2	8/20/92
38 45.71	76 09.63	0		8/20/92
38 45.74	76 09.60	0		8/20/92
38 45.85	76 09.52	Rm	total cover of flowers and epiphytes	8/20/92
38 46.15	76 09.06	Rm	filamentous algae, epiphytes	8/20/92
38 46.39	76 09.24	Rm	epiphytes	8/20/92

21 AUGUST Eastern Bay

LATITUDE Deg Min	LONGITUDE Deg Min	SPECIES		DATE
38 47.71	76 11.23	Rm	Photo 23-10, dead w/ br. & gr. fil. algae	8/21/92
38 47.78	76 11.24	0	Leads Cr. cladophora, fil. algae	8/21/92
38 47.77	76 11.23	Rm	Begin Leads Cr. dead	8/21/92
38 47.90	76 11.19	Rm	dead, Cl, fil. algae	8/21/92
38 48.02	76 11.15	Rm	dead	8/21/92
38 48.14	76 10.99	Rm	New shoots, Cl	8/21/92
38 48.20	76 10.91	Rm	dead, Cl	8/21/92
38 48.24	76 10.85	Rm	new shoots, end Leads Cr	8/21/92
38 48.44	76 11.62	0	#7	8/21/92
38 48.55	76 11.67	0		8/21/92
38 48.78	76 11.59	Rm	sparse, Cl	8/21/92
38 49.04	76 11.49	Rm	new shoots, fil. algae, Cl	8/21/92
38 49.53	76 11.31	Rm	new shoots, fil. algae, patchy	8/21/92
38 49.68	76 11.32	Rm	new shoots, fil. algae	8/21/92
38 50.18	76 11.52	Rm	mostly algae	8/21/92
38 50.37	76 11.55	Rm	mostly algae	8/21/92
38 50.56	76 11.63	Rm	Photo 23-12 Shaw Bay, East Wye R., sparse, fil. algae	8/21/92
38 50.73	76 11.56	0		8/21/92
38 51.01	76 10.80	Rm	dense, flowers, lots Cl	8/21/92
38 51.05	76 10.72	Cl	mats of Cl	8/21/92
38 51.15	76 10.51			8/21/92
38 51.44	76 10.29	0		8/21/92
38 52.81	76 10.30	Rm	dead	8/21/92
38 52.82	76 10.31	Rm	Photo 23-14, dead, Cl, fil. algae	8/21/92
38 52.18	76 10.20	0	end photo	8/21/92

NOAA COASTAL SERVICES CTR LIBRARY
3 6668 14110956 3

SCHOOL OF MARINE SCIENCE
VIRGINIA INSTITUTE OF MARINE SCIENCE
THE COLLEGE OF WILLIAM AND MARY
GLOUCESTER POINT, VA 23062