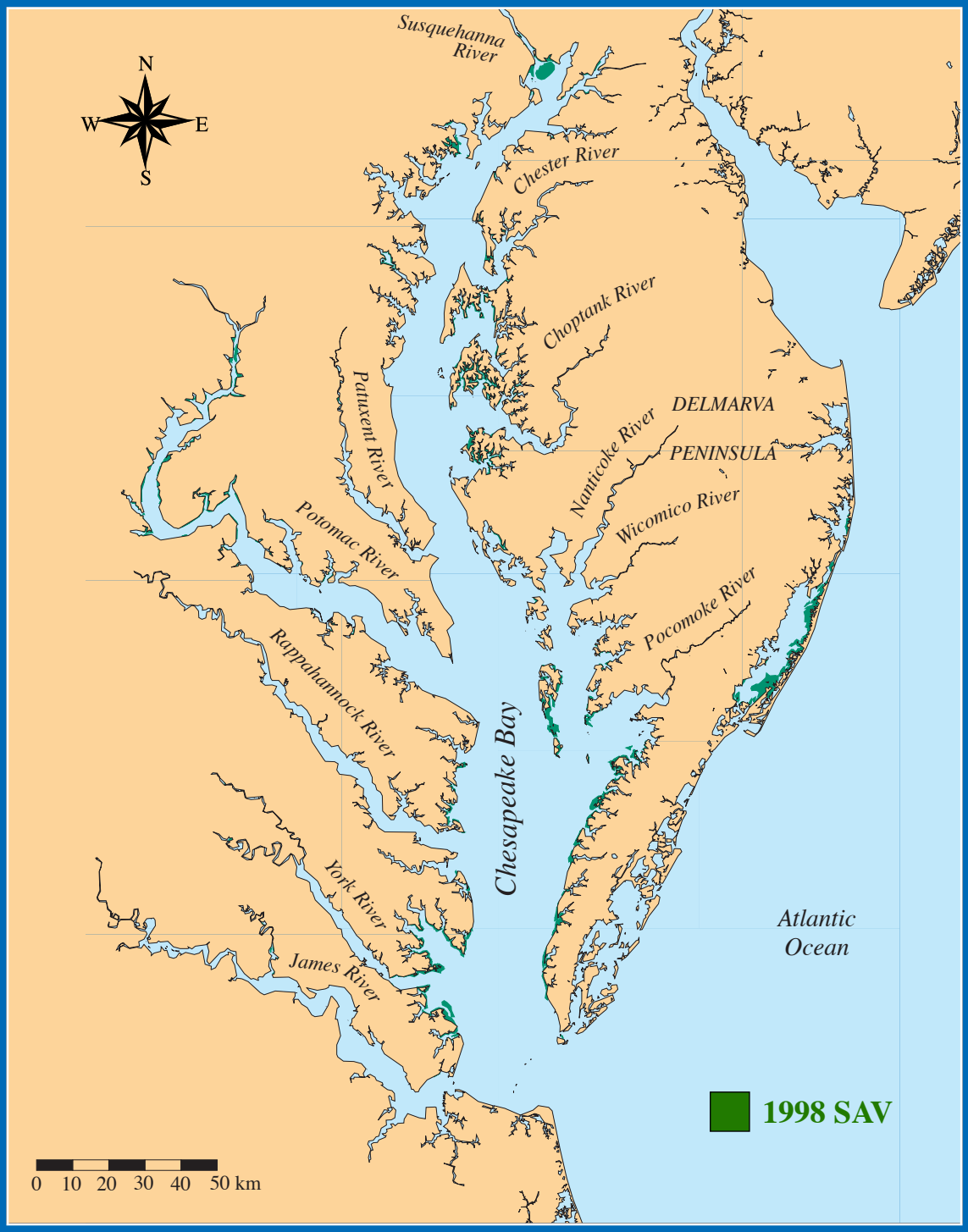
1998 Distribution of Submerged Aquatic Vegetation in the Chesapeake Bay



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Distribution of Submerged Aquatic Vegetation in the Chesapeake Bay and Tributaries and the Coastal Bays - 1998

by

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Cover: Distribution of submerged aquatic vegetation in Chesapeake Bay, its tributaries, and the Delmarva Peninsula coastal bays (front) and trends in bay grasses from 1984 to 1998 (back).

CONTENTS

CONTENTS

RESULTS (continued) Page

CONTENTS

RESULTS (continued) Page

CONTENTS

LIST OF TABLES

LIST OF FIGURES

FIGURES (continued)

Number Page

FIGURES (continued)

Number Page

EXECUTIVE SUMMARY

The distribution of submerged aquatic vegetation (SAV), principally rooted vascular macrophytes in Chesapeake Bay, its tributaries, and the coastal bays of the Delmarva Peninsula, was mapped from 1,987 black and white aerial photographs. These were taken between May and October 1998, at a scale of 1:24,000, encompassing 169 flight lines covering 2,290 miles of shoreline.

CHESAPEAKE BAY

In 1998, 25,704 hectares of SAV were mapped in Chesapeake Bay and its tributaries (Figure 1). This represented an overall decrease of 8% (2,328 ha) from 1997 levels (Figure 2a). However, in 1998 portions of the upper James, York and Rappahannock rivers were flown for the first time in the history of the aerial survey adding 365 hectares of SAV to the 1998 total that was not present in 1997. Comparing the same mapped areas between 1997 and 1998, the SAV decrease is 10% (2,693 ha). This decline reverses the trend of increasing SAV over 1996 and 1997 and offsets the gain noted in 1997 over 1996 of 2,336 hectares. The abundance of SAV in 1998 represented 56% of the Tier I goal (46,022 hectares) set by the Chesapeake Executive Council in Directive 93-3 (1993).

SAV increased in one (Upper Bay) and decreased in two (Middle and Lower Bay) geographic zones delineated for Chesapeake Bay. In 1998, SAV increased in 21, decreased in 25, remained unvegetated in 26, and was newly mapped in six of 78 CBP segments (Figure 2b).

Upper Bay Zone

In the Upper Bay Zone (17 CBP segments from the Susquehanna River, south to the Chester and Magothy rivers), SAV increased to 4,559 hectares (from 4,439 hectares in 1997), representing 63% of the Tier I goal for that Zone.

Five of the 17 segments increased by 20% and at least 5 hectares over 1997 totals. These areas include (Figure 3):

- ↑ Northeast River (NORTF), 10 ha (1998) vs. 5 ha (1997) + 100%
- ↑ Elk River (ELKOH), 206 ha (1998) vs. 67 ha (1997) + 206%
- ↑ Bohemia River (BOHOH), 46 ha (1998) vs. 15 ha (1997) + 207%
- ↑ Gunpowder River (GUNOH), 871 ha (1998) vs. 637 ha (1997) + 37%
- ↑ Magothy River (MAGMH), 80 ha (1998) vs. 53 ha (1997) + 50%

Three of the 17 segments decreased by 20% and at least 5 hectares over 1997 totals. These areas include (Figure 3):

- ↓ Sassafras River (SASOH), 69 ha (1998) vs. 111 ha (1997) - 38%
- ↓ Bush River (BSHOH), 2 ha (1998) vs. 35 ha (1997) - 93%
- ↓ Middle River (MIDOH), 43 ha (1998) vs. 117 ha (1997) - 64%

Four of the 17 segments had no SAV mapped (Figure 3).

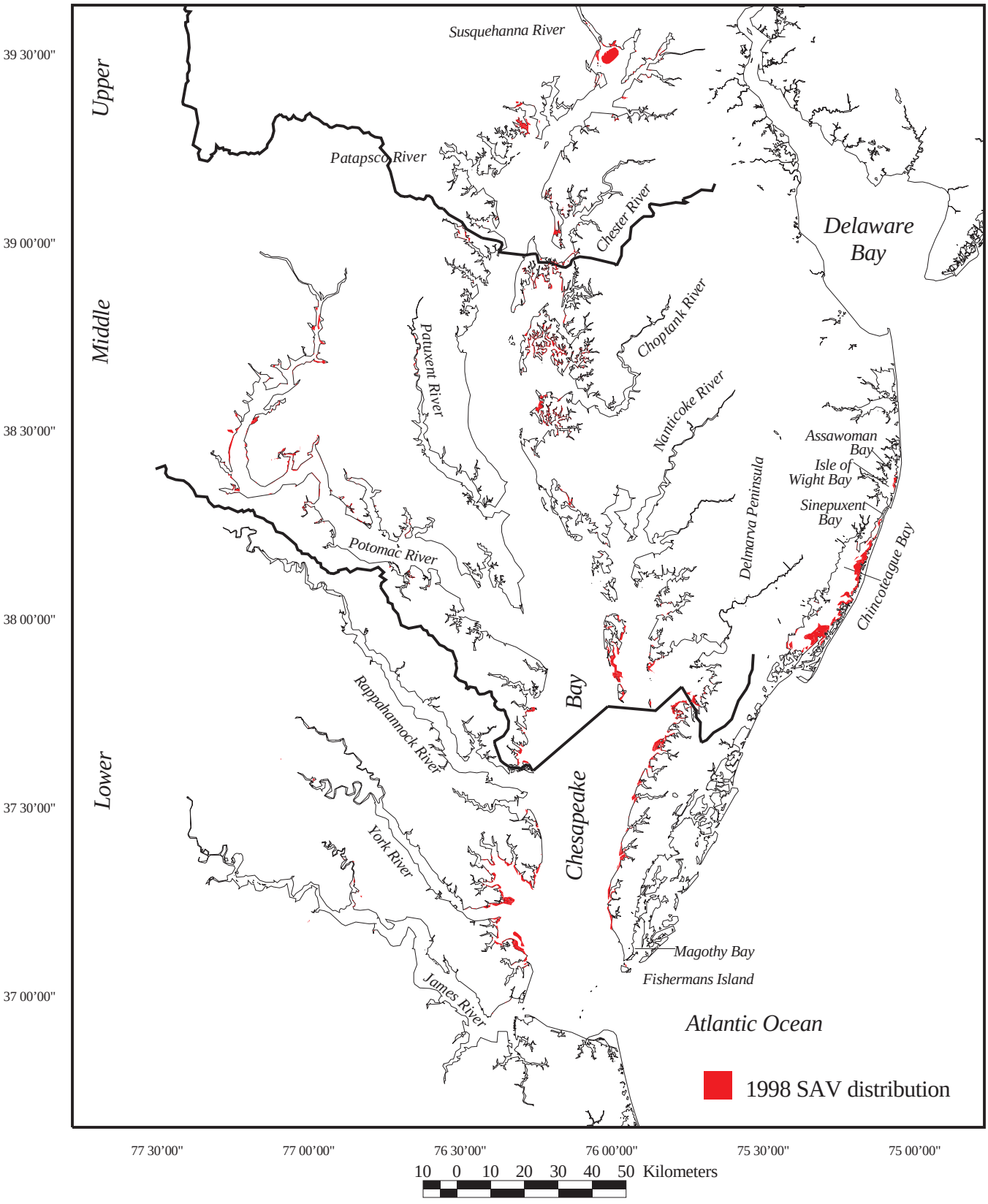

Figure 1: Location of the 1998 SAV beds in Chesapeake Bay (Upper, Middle, and Lower zones), its tributaries, and the Delmarva Peninsula coastal bays.

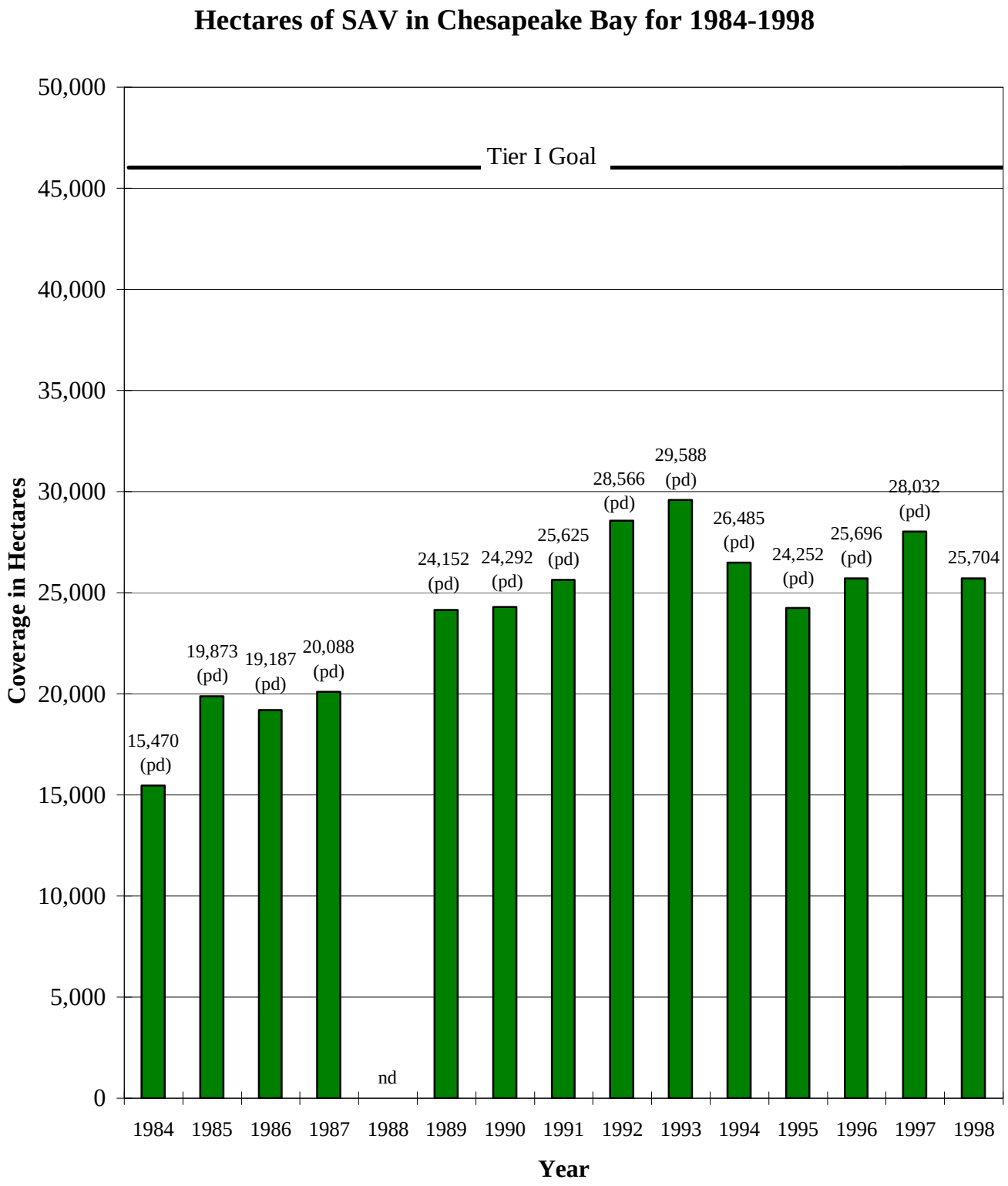

Figure 2a. Total hectares of SAV in Cheseapeake Bay for 1984-1998. [(pd-partial data; nd- no data surveyed for that year) See Results section regarding partial data.]

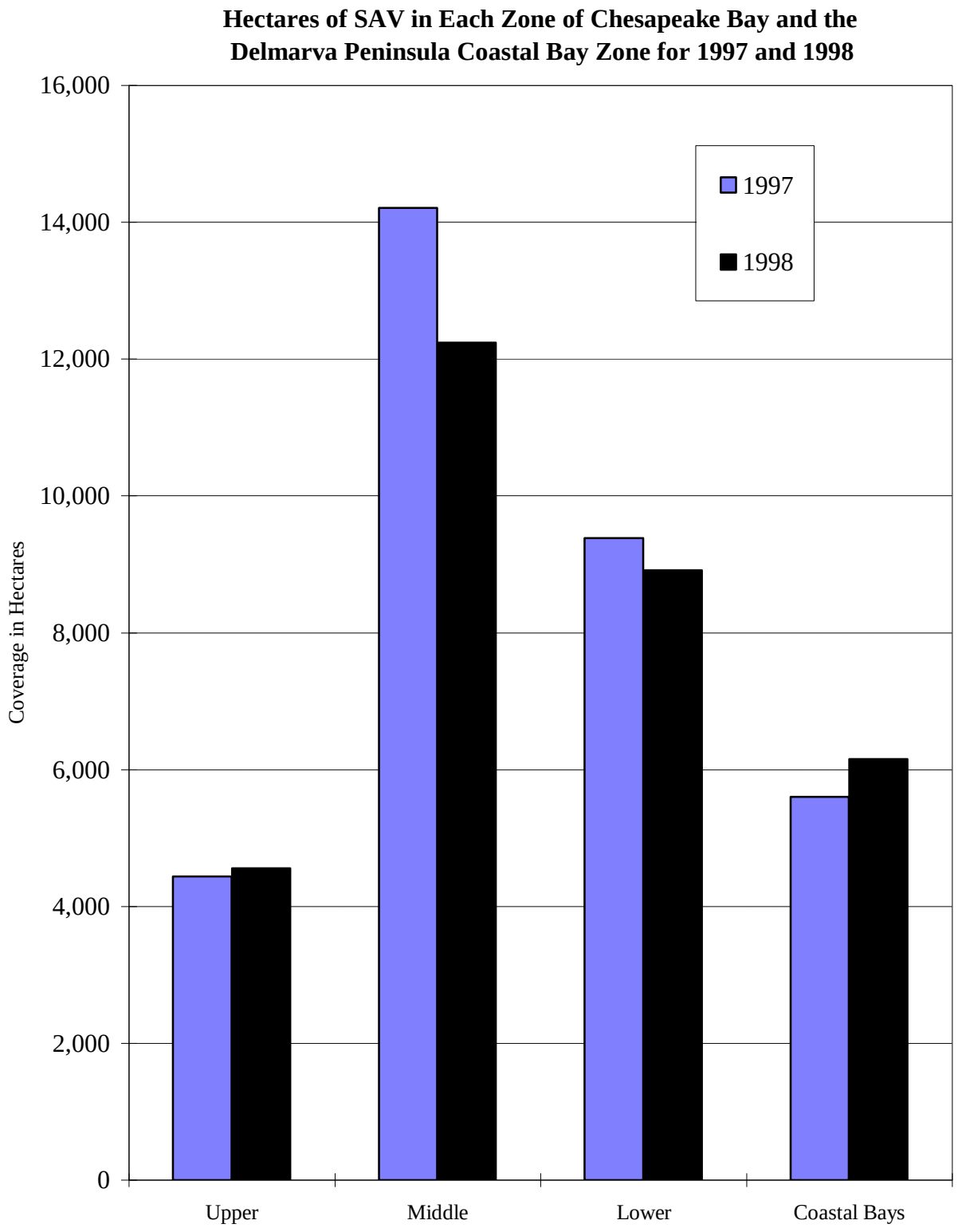

Figure 2b. A comparison of the total hectares of SAV for the Upper, Middle, and Lower zones of Chesapeake Bay and the Delmarva Peninsula Coastal Bays Zone for 1997 and 1998. (Refer to Figure 1 and Figure 10 for zone locations.)

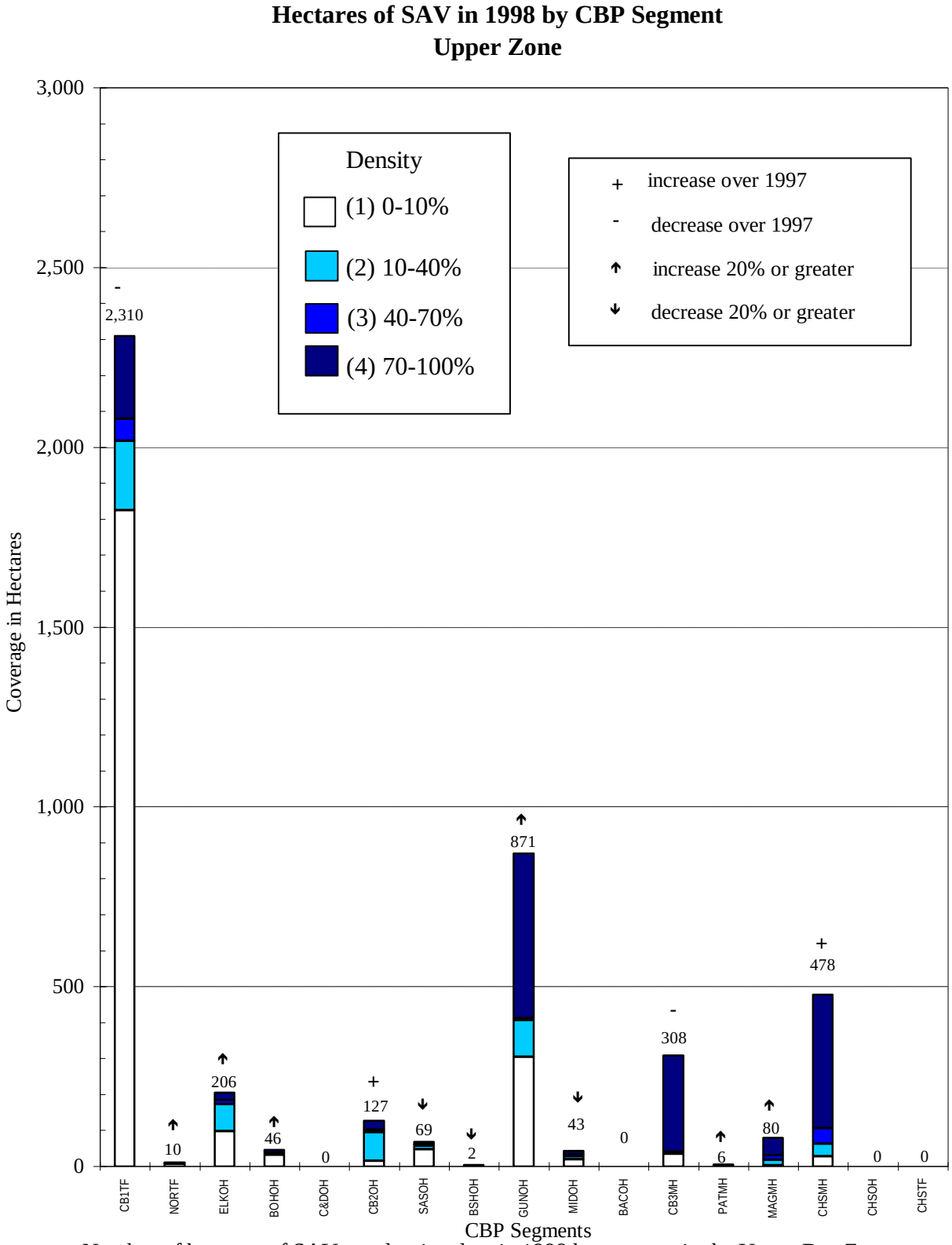

Figure 3. Number of hectares of SAV per density class in 1998 by segment in the Upper Bay Zone of Chesapeake Bay (Refer to Figure 10, Table 4, and Appendix B for segment locations and boundaries.)

Middle Bay Zone

In the Middle Bay Zone (33 CBP segments from the Bay Bridge, south to the Rappahannock River and Pocomoke Sound, and including the Potomac River), SAV decreased to 12,237 hectares from 14,209 hectares in 1997, representing 49% of the Tier I goal for that Zone.

Five of the 33 segments increased by 20% and at least 5 hectares over 1997 totals. These areas include (Figure 4):

- ↑ Severn River (SEVMH), 163 ha (1998) vs. 124 ha (1997) + 32%
- ↑ South River (SOUMH), 22 ha (1998) vs. 16 ha (1997) + 35%
- ↑ Middle Potomac River (POTOH), 1,743 ha (1998) vs. 1,206 ha (1997) + 44%
- ↑ Upper Potomac River (POTTF), 1,089 ha (1998) vs. 554 ha (1997) + 96%
- ↑ Mattawoman Creek (PISTF), 66 ha (1998) vs. 50 ha (1997) + 31%

Six of the 33 segments decreased by 20% and at least 5 hectares over 1997 totals. These areas include (Figure 4):

- ↓ Middle Central Chesapeake Bay (CB4MH), 0 ha (1998) vs. 20 ha (1997) - 100%
- ↓ Eastern Bay (EASMH), 1,107 ha (1998) vs. 1,848 ha (1997) - 40%
- ↓ Honga River (HNGMH), 316 ha (1998) vs. 891 ha (1997) - 64%
- ↓ Tangier Sound (TANMH), 2,676 ha (1998) vs. 3,826 ha (1997) - 30%
- ↓ Manokin River (MANMH), 14 ha (1998) vs. 56 ha (1997) - 75%
- ↓ Big Annemessex River (BIGMH), 94 ha (1998) vs. 143 ha (1997) - 34%

Fourteen of the 33 segments had no SAV mapped (Figure 4).

An alarming trend noted in previous years surveys continues in the mid-section of Chesapeake Bay with SAV abundance in the Tangier Sound and Honga River segments showing the largest single year decline in 1998 (1,724 ha). The Choptank River Mouth segment (CHOMH1) accounted for an additional noteworthy decrease of 509 hectares, representing an 18% decline (Figure 4).

Lower Bay Zone

In the Lower Bay Zone (28 CBP segments from the Rappahannock River and Pocomoke Sound areas, south to the mouth of the Bay), SAV decreased to 8,912 hectares (from 9,383 hectares in 1997), representing 65% of the Tier I goal for the Zone.

None of the 28 segments increased by 20% and at least 5 hectares over 1997 totals; however, six segments were either flown for the first time since the annual survey commenced or had not been flown since 1986 (CHKOH). These areas included (Figure 5):

Upper Rappahannock River (RPPTF), 7 ha
Upper Mattaponi River (MPNTF), 34 ha
Upper Pamunkey River (PMKTF), 76 ha

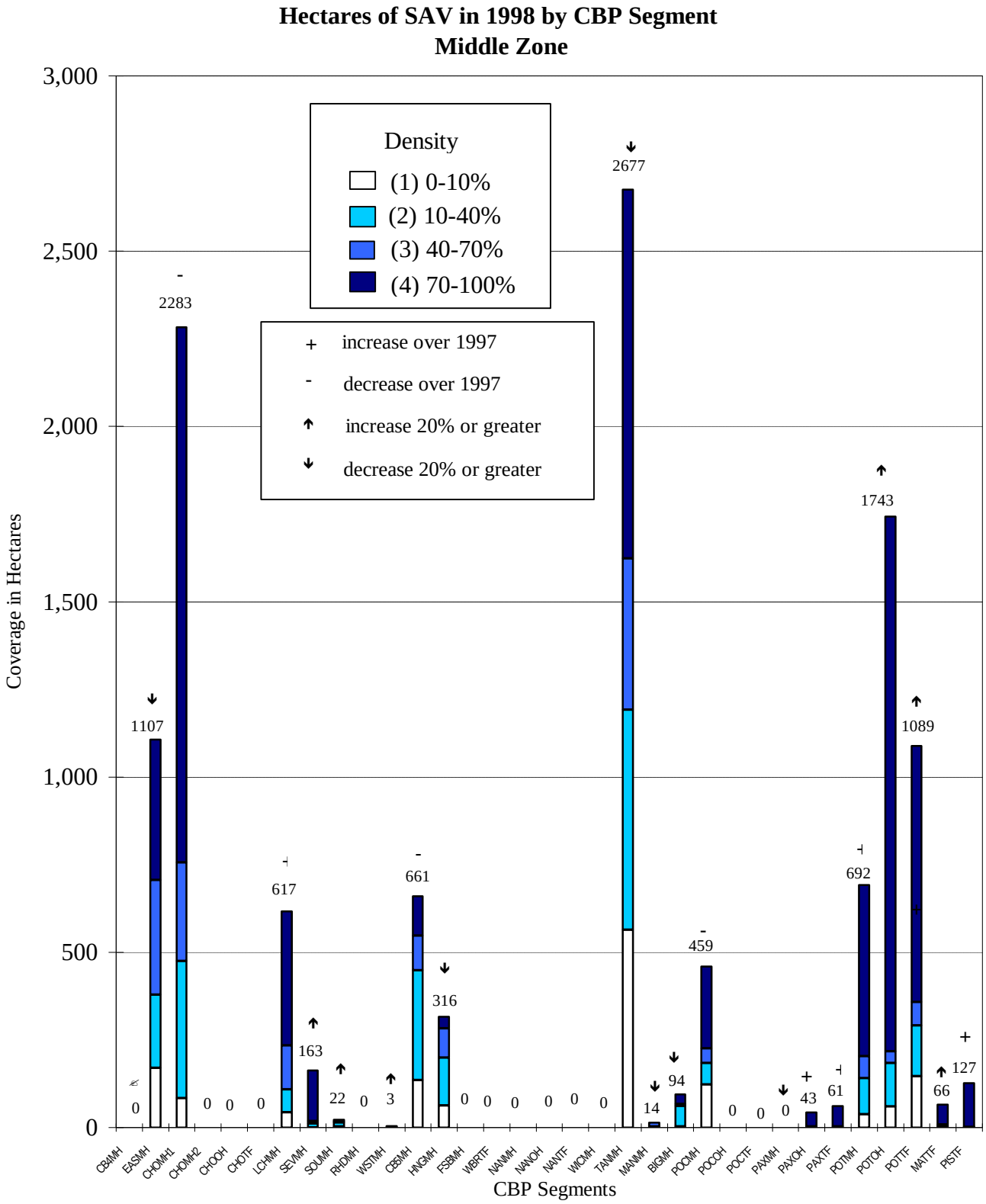

Figure 4. Number of hectares of SAV per density class in 1998 by segment in the Middle Bay Zone of Chesapeake Bay (Refer to Figure 10, Table 4, and Appendix B for segment locations and boundaries.)

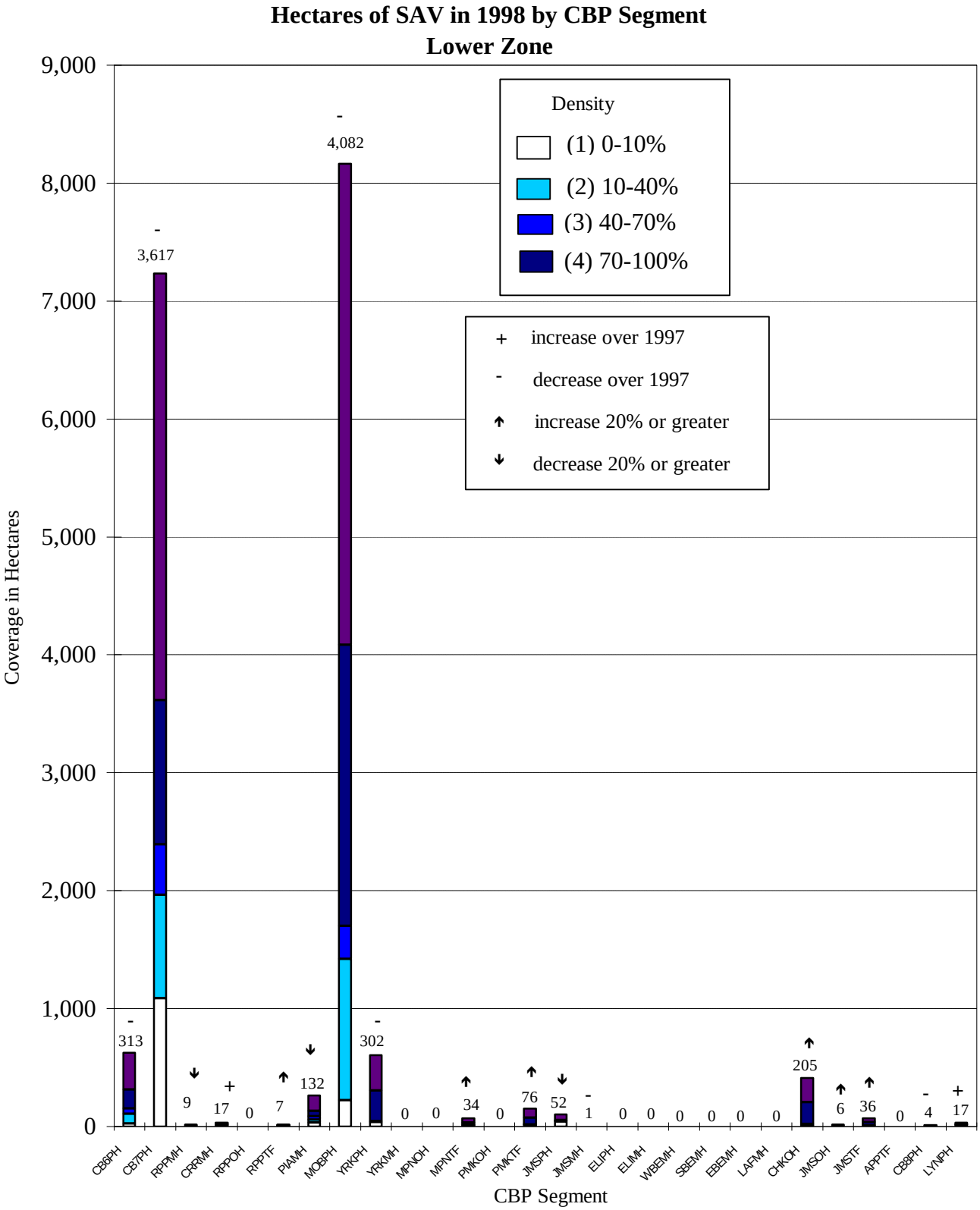

Figure 5. Number of hectares of SAV per density class in 1998 by segment in the Lower Bay Zone of Chesapeake Bay (Refer to Figure 10, Table 4, and Appendix B for segment locations and boundaries).

Middle James River (JMSOH), 6 ha
Chickahominy River (CHKOH), 205 ha
Upper James River (JMSTF), 36 ha

Three of the 28 segments decreased by 20% and at least 5 hectares over 1997 totals. These areas include (Figure 5):

- ↓ Lower Rappahannock River (RPPMH), 9 ha (1998) vs. 15 ha (1997) - 40%
- ↓ Piankatank River (PIAMH), 132 ha (1998) vs. 175 ha (1997) - 25%
- ↓ Mouth of the James River (JMSPH), 52 ha (1998) vs. 76 ha (1997) - 31%

SAV in the Eastern Lower Chesapeake Bay (CB7PH) and Mobjack Bay (MOBPH) segments had declines of 321 and 360 hectares, respectively, representing a loss of 8% in each of these segments (Figure 5).

Eleven segments had no SAV mapped (Figure 5).

DELMARVA PENINSULA COASTAL BAYS ZONE

SAV beds in the Delmarva Peninsula Coastal Bays Zone (Assawoman, Isle of Wight, Sinepuxent, Chincoteague, and Southern Virginia Coastal Bays) continue to be heavily scarred by clam dredge activities (Orth *et al*., 1998). However, SAV beds continue to expand in area to 6,155 hectares, an increase of 556 hectares over 1997 (Figure 6):

- ↓ Assawoman Bay (AAWPH), 175 ha (1998) vs. 180 ha (1997) - 3% decrease
- ↑ Isle of Wight Bay (IOWPH), 81 ha (1998) vs. 80 ha (1997) + 1% increase
- ↑ Sinepuxent Bay (SPXPH), 478 ha (1998) vs. 421 ha (1997) + 13% increase
- ↑ Chincoteague Bay (CHNPH), 5,421 ha (1998) vs. 4,917 ha (1997) + 10% increase

There continues to be no SAV mapped in the Southern Virginia Coastal Bays Segment.

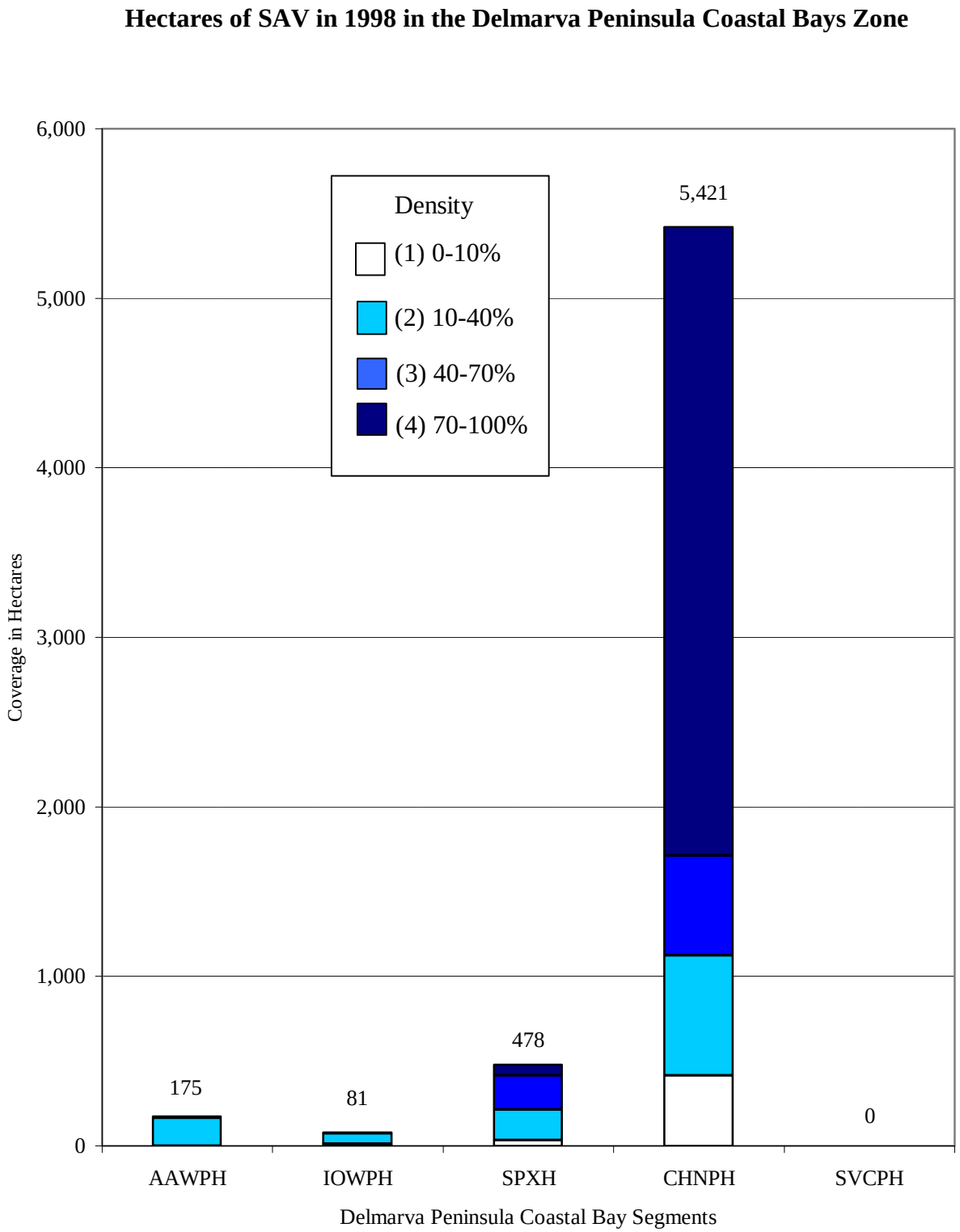

Figure 6. Number of hectares of SAV per density class in 1998 by Delmarva Peninsula Coastal Bays Zone segments. (Refer to Figure 10, Table 4, and Appendix B for segment locations and boundaries.)

ACKNOWLEDGMENTS

We gratefully acknowledge the 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 Department of Environmental Quality (VA-DEQ) and the Maryland Department of Natural Resources (MD-DNR) Coastal Zone Management Act of 1972, as amended, administered by the Office of Ocean and Coastal Resource Management (OCRM); National Oceanic and Atmospheric Administration (NOAA); and the School of Marine Science, Virginia Institute of Marine Science (VIMS), College of William and Mary. Also, we thank the Allied - Signal Foundation for providing a private grant to VIMS in partial support of this work.

Acknowledgments would not be complete without commendation for the groups that provided groundtruthing of SAV beds, which was used in conjunction with interpretation of the 1998 photography. The USFWS, with the Chesapeake Bay Foundation, organized citizens, students, educators, and staff including the Alliance for the Chesapeake Bay, Chesapeake Bay Youth Conservation Corp, the Chester River Association, Friends of Mattawoman Creek, the Jug Bay Wetlands Sanctuary, Lancaster/Morattico Watershed Group, Maryland-National Capital Parks and Planning Commission Patuxent River Park staff, Millersville University, the National Aquarium in Baltimore, The Rappahannock River Resource Council, and the students from Calvert, Plum Point, South, and Northern middle schools to report locations and species composition of grass beds around the bay for The SAV Hunt program. Kathryn Reshetiloff of the USFWS was responsible for compiling and tabulating the SAV Hunt ground-truth data. Stan Kollar of Harford Community College (HCC) in Maryland; Peter Bergstrom of the USFWS; Mike Naylor of Maryland Department of Natural Resources (MD-DNR); U.S. Army Environmental Center/U.S. Army Research Laboratory (USAEC/ARL) (Aberdeen Proving Ground); Derek Orner of National Oceanographic Atmospheric Administration (NOAA); Bob Stankelis of Chesapeake Biological Laboratory (CBL) and Donna Lloyd of Horn Point Lab (HPL) of University of Maryland provided ground-truth data for specific regions of the Maryland portion of the Bay. Virginia Carter, Nancy Rybicki, Henry Ruhl, and Justin Reel of the USGS National Center, and Dan Stotts of the Biological Resources Division (BRD) of the U.S. Department of the Interior, provided ground-truth data for the Potomac and Wye rivers. Ken Moore, James Fishman, David Combs, Matthew Harwell, Al Lombana, Scott Marion, Jennifer Rhode, and Kelly Dorgan of VIMS Department of Biological Sciences SAV Program, as well as the faculty, staff and students of the VIMS Department of Fisheries Crustacean Ecology program, including Jacques van Montfrans and Mike Seebo, provided ground-truth data for the lower Bay. VIMS, Harry Womack of Salisbury State University (SSU), and the Ocean Pines Yacht Club (SAV Hunt) provided ground truth for the Delmarva Peninsula coastal bays.

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Air Photographics, Inc. conducted the aerial photographic missions and was responsible for the high quality aerial photographs.

SAV SPECIES

The term “submerged aquatic vegetation” (SAV) for the purpose of this report encompasses twenty-three taxa from twelve vascular macrophyte families and three taxa from one freshwater macrophytic algal family, the Characeae. The term ASAV@ in this report excludes all other algae, both benthic and planktonic, which occur in Chesapeake Bay, its tributaries, and the Delmarva Penisula coastal bays (Appendix A). Although these other algae species do constitute a portion of the SAV biomass in this region (Humm, 1979), this survey did not attempt to identify, delineate, or discuss the algal component of the vegetation nor its relative importance in the flora. The aerial survey cannot differentiate epiphtic algae on submersed vascular plants or differentiate many benthic marine algae species, including many macrophytes, which can co-occur in the same SAV beds.

Twelve species of submerged aquatic vegetation are commonly found in Chesapeake Bay and its tributaries. *Zostera marina* (eelgrass), the only “true” seagrass species, can tolerate salinities as low as 10‰, and 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), *Hydrilla verticillata* (hydrilla), *Heteranthera dubia* (water stargrass), and *Najas guadalupensis* (southern naiad) are freshwater species that have the capacity to tolerate some level of salt, 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 14 other species are only occasionally found. When present, these species occur primarily in the middle and upper reaches of the bay and the tidal rivers (Appendix A).

Zostera marina and *R. maritima* are the dominant SAV species found in the Delmarva Peninsula coastal bays.

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 Chesapeake Bay, its tributaries, and the Delmarva Peninsula coastal bays from Assawoman Bay to Magothy Bay in 1998. There were 169 flight lines that yielded 1,987 photographs that were carefully examined to identify all SAV beds visible on the photography. Outlines of SAV beds were subsequently drawn onto USGS 7.5 minute quadrangles and then digitized, providing a geographic information system (GIS) digital database for analysis of bed areas and locations. Ground survey information collected in 1998 was tabulated, then drawn onto the same 7.5 minute quadrangles, and, finally, entered into the VIMS SAV GIS digital database.

AERIAL PHOTOGRAPHY

The 1998 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, mounted in the bottom fuselage of a Piper Aztec, a twin engine reconnaissance aircraft. Photography was acquired from an altitude of approximately 12,000 feet, yielding 1:24,000 scale photographs.

The 169 flight lines, which cover 2,290 miles of shoreline, were numbered and included land features necessary to establish control points for accurate mapping (Figure 7). Flight lines to obtain the photography were predetermined by Air Photographics to include all areas known to have SAV, as well as most areas which could potentially have SAV in the Middle and Upper Zones [i.e., all areas where water depths were less than two meters at mean low water (MLW)]. Sections of the upper Rappahannock and upper York rivers, and most of the James River, were photographed for the first time in the history of the annual aerial survey.

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

Guidelines for acquisition of aerial photography (Table 1) address tidal stage, plant growth, sun angle, atmospheric transparency, turbidity, wind, sensor operation, and land features. Adherence to the guidelines assured acquisition of photography under nearly optimal conditions for detection of SAV, thus insuring accurate photo interpretation. 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 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, and focal length combination was coordinated so that SAV patches of one square meter could be resolved. Ground-level wind speed was monitored

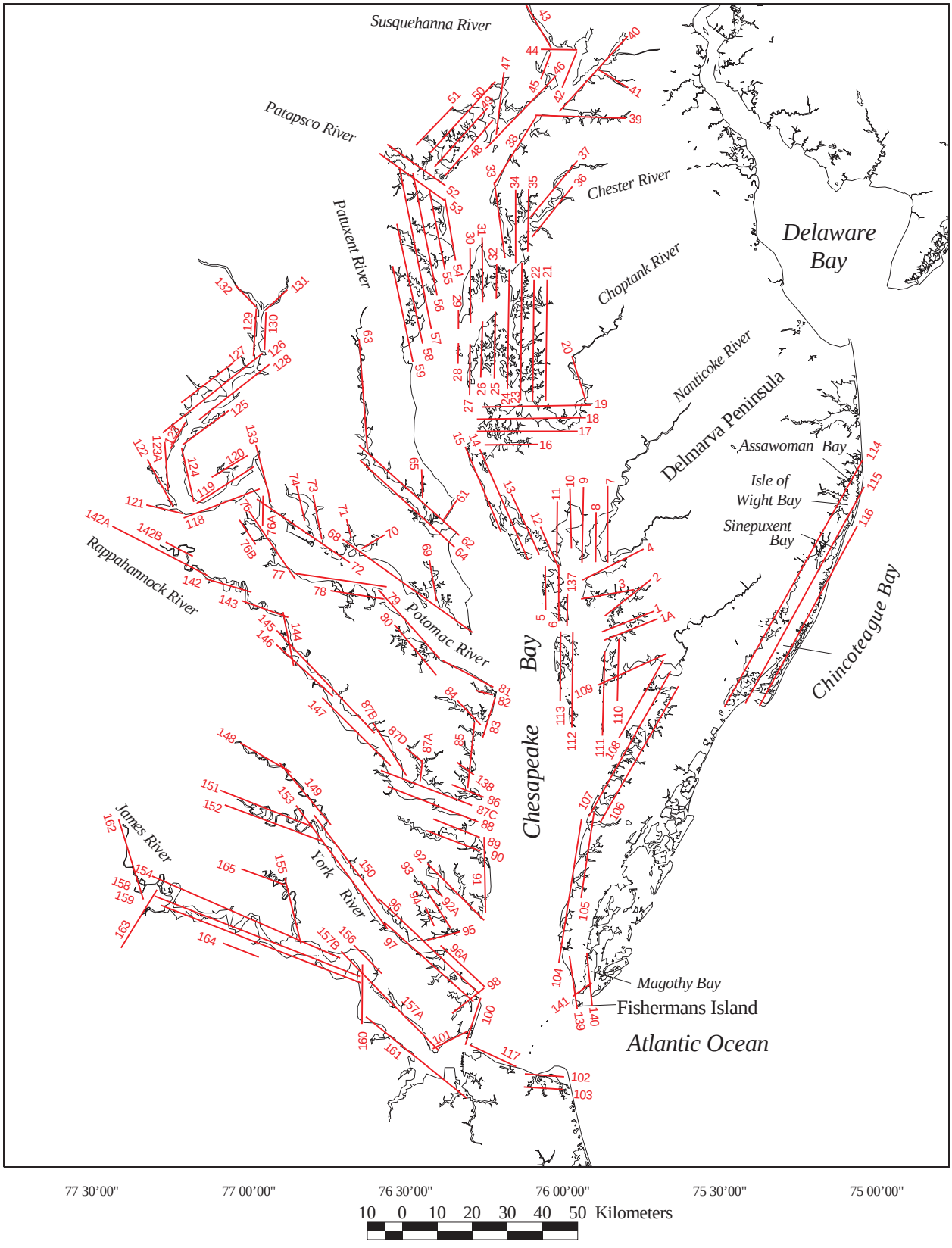

Figure 7: Map of Chesapeake Bay, its tributaries, and Delmarva Penisula coastal bays with approximate locations of flight lines for 1998 SAV photography.

TABLE 1

Guidelines Followed During Acquisition of Aerial Photographs

1. **Tidal Stage** - Photography was acquired at low tide, +/- 0-1.5 feet, 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^{o} and 40^{o} to minimize water surface glitter. At least 60 percent line overlap and 20 percent side lap were 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 the observer could see SAV.

5. **Wind** - Photography was acquired during periods of no or low wind. Offshore winds were preferred to onshore 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 contrast to bottom.

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. **Land Features** - Each flight line included sufficient identifiable land area to assure accurate plotting of grass beds.

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 the acceptable level of turbidity that 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 for prioritizing and executing the photography, the flights were planned to coincide with these atmospheric conditions where possible. Air Photographics processed all film. A 9-inch by 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 the flight line number. Film and photographs are 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, for mapping ground-truth data, and for compiling SAV bed area measurements. Figure 8 gives the locations of the 230 quadrangles in the study area that 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 8 is listed in Table 2. Identification and delineation of SAV beds by photo interpretation utilized all available information including: knowledge of aquatic grass signatures on film, distribution of SAV in 1998 from aerial photography, 1998 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 from which to make copies. Distortion-free, identical copies of these base maps were made at the same scale on stable, transparent mylar, using a contact print process. SAV beds from 1998 aerial photographs were mapped onto these mylar copies of USGS 7.5 minute quadrangles. Delineation of each SAV bed was facilitated by superimposing the photographic print with the appropriate mylar quadrangle on a light table. SAV bed boundaries were then traced directly onto the mylar quadrangle with a pencil. Where minor scale differences were evident between a photograph and a quadrangle, or where significant shoreline erosion or accretion had occurred since USGS publication of a map, either a best fit was obtained or shoreline changes were noted on the quadrangle. All photo interpretation of 1998 aerial photography for SAV beds was done by one scientist who also photo interpreted the 1987 to 1997 aerial photographs.

SAV beds were identified and ground truthed with the collaboration of Stan Kollar for the head of the Bay region, including Susquehanna Flats and the Elk, Bohemia, and Sassafras rivers; and with Virginia Carter, Nancy Rybicki, and Henry Ruhl for the Potomac River. Delineation of the large bed on the Havre de Grace map was facilitated by both aerial photography and ground observations.

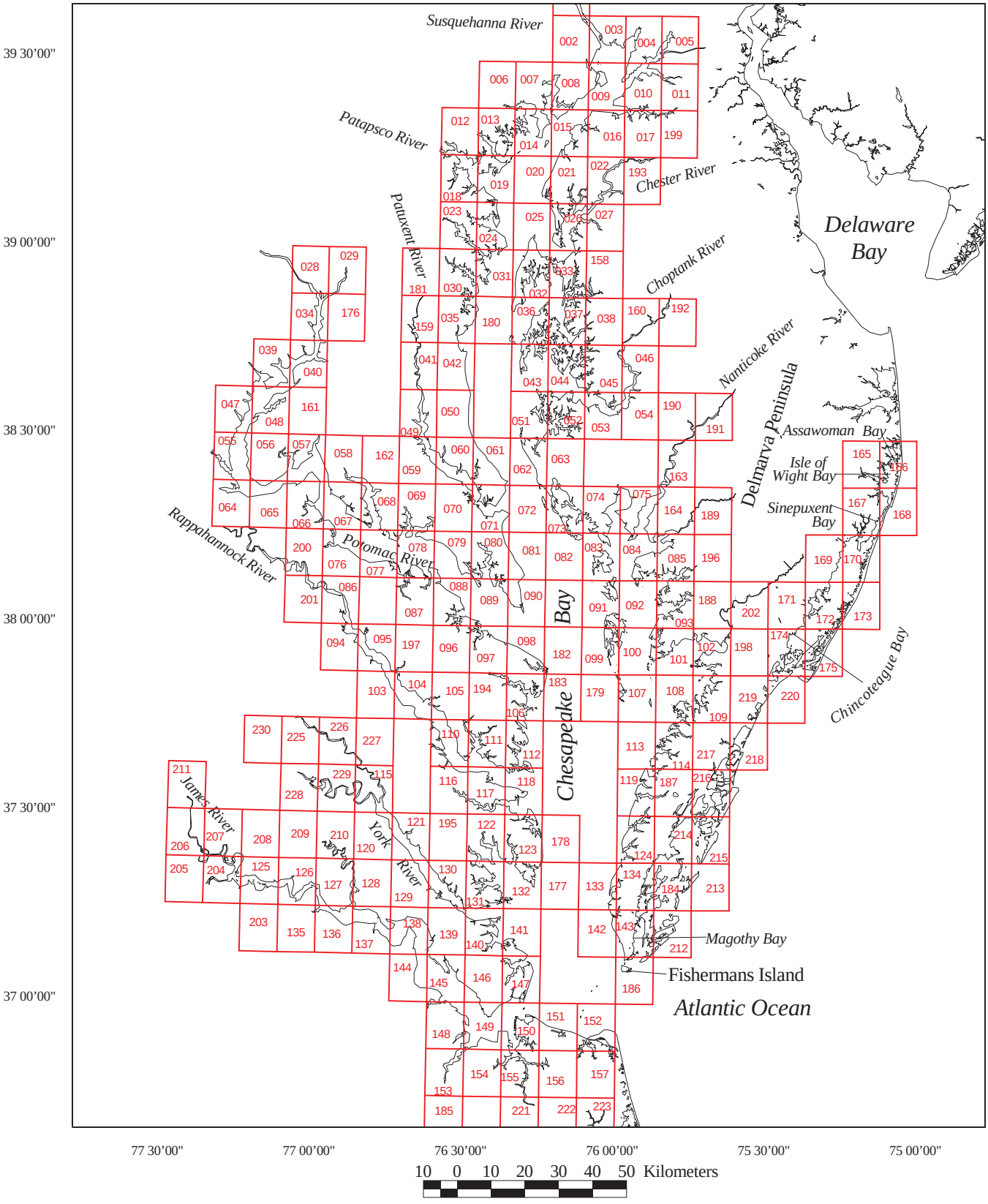

Figure 8: Location of USGS 7.5 minute quadrangles in Chesapeake Bay, its tributaries, and in the Delmarva Peninsula coastal bays with corresponding code numbers. (See Table 2 for quad names.)

TABLE 2

List of USGS 7.5 Minute Quadrangles for Chesapeake Bay and the Delmarva Peninsula Coastal Bays SAV Study Areas with Corresponding Code Numbers

See Figure 7 for location of quadrangles. ArcInfo generated 7.5 minute quadrangles with SAV beds and groundtruthing are reproduced in Appendix B.

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.

Table 2 (continued)

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.
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.

Table 2 (continued)

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.-Del.
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.
180. Horseshoe Point, Md.
181. Bowie, Md.
182. Smith Point, Va.-Md.
183. East of Reedville, Va.
184. Cobb Island, Va.
185. Suffolk, Va.
186. Fishermans Island, Va.
187. Exmore, Va.
188. Kingston, Md.
189. Eden, Md.
190. Rhodesdale, Md.
191. Sharptown, Md.-Del.
192. Hobbs, Md.
193. Church Hill, Md.
194. Lancaster, Va.
195. Gloucester, Va.
196. Princess Anne, Md.
197. Haynesville, Va.
198. Hallwood, Va.-Md.
199. Millington, Md.
200. Rollins Fork, Va.
201. Loretto, Va.
202. Pocomoke City, Md.-Va.
203. Diputanta North, Va.
204. Hopewell, Va.
205. Chester, Va.
206. Drewrys Bluff, Va.
207. Dutch Gap, Va.
208. Roxbury, Va.
209. Providence Forge, Va.
210. Walkers, Va.
211. Richmond, Va.
212. Ship Shoal Inlet, Va.
213. Great Machipongo Inlet, Va.
214. Nassawadox, Va.
215. Quimbly Inlet, Va.
216. Wachapreague, Va.
217. Accomax, Va.
218. Metompkin Inlet, Va.
219. Bloxom, Va.
220. Wallops Island, Va.
221. Deep Creek, Va.
222. Fentress, Va.
223. Pleasant Ridge, Va.
224. Creeds, Va.
225. King William, Va.
226. King and Queen Courthouse, Va.
227. Truhart, Va.
228. Tunstall, Va.
229. New Kent, Va.
230. Manquin, Va.

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 (Figure 9) similar to those developed for estimating crown cover of forest trees from aerial photography (Paine, 1981). 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 variations of SAV density. Additionally, each distinct SAV bed or bed subsection was assigned an identifying one or two letter designation unique to its map. Subsections were further identified as contiguous beds by addition of one or two letters unique to that sequence. Contiguous bed identifications aided tracking and analysis of single natural bed units subsectioned due to variations of SAV density. Coupled with the appropriate SAV map number and year of photography, these letter designations uniquely identify each SAV bed in the database.

SAV PERIMETER DIGITIZATION AND QUALITY ASSURANCE PROCEDURES

Perimeters of all SAV beds mapped from aerial photography onto mylar copies were digitized in ArcInfo, using an Altek Model 41 tablet with a resolution of .001 inches (.00254 cm) and an accuracy of .005 inches (.0127 cm). Beds for each quadrangle were digitized in a primary ArcInfo coverage and, as a quality assurance check, in a secondary ArcInfo coverage. These coverages were overlaid digitally. If the portion of a bed that differed between the two copies was more than one hectare and made up more than 2% of the bed, or was more than 0.1 hectare and made up more than 10% of the bed, the bed was flagged for additional review. The primary coverage was then plotted at a scale of 1:24,000 on translucent plotter paper and overlaid on the original mylar for a visual check of all beds, with additional emphasis on beds flagged by the overlay step. In instances where the digitized SAV bed boundaries did not correspond to within 0.5 mm of the original, the bed was redigitized. The bed-by-bed comparison was useful in identifying registration errors or instances where SAV beds were incorrectly labeled, thus eliminating coding errors.

After all quadrangles were digitized, the resulting digital data was combined to form a single data set for the entire Bay. The quadrangle borders were then scanned (edgematched) to ensure that the SAV polygons were consistent. Inconsistencies were resolved by checking the mylar maps and re-interpreting the photography if necessary. The resulting digital data was added to the VIMS SAV GIS Database containing data from all previous years.

Maximum accuracy was maintained by exclusively using mylar quadrangles, which do not change scale as a result of changes in air temperature and humidity in the digitizer room.

Standard operating procedures (SOPs) were developed to facilitate orderly and efficient processing of 1998 SAV maps and SAV computer files produced from them, and to comply with the need for consistency, quality assurance, and quality control. SOPs included: a detailed procedure for digitization of SAV maps; a digitizer log in which all operations were recorded and dated to guide and verify operations; and a flow chart to track progress of all operations.

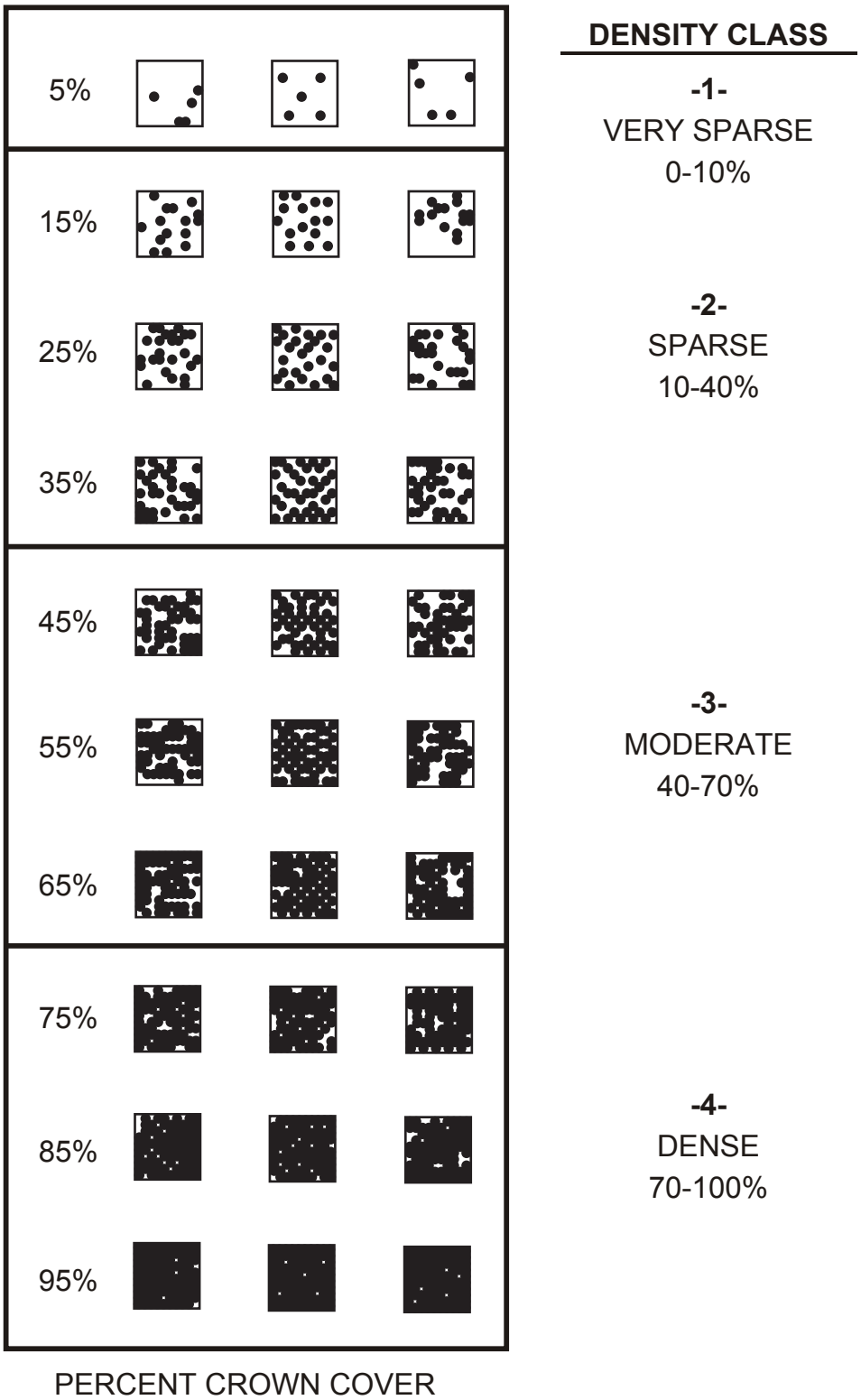

Figure 9. Crown density scale used for estimating density of SAV beds from aerial photography. (Rows of squares with black and white patterns represent three different arrangements of vegetated cover for a given percentage.) *Adapted from Paine, 1981.*

CALCULATION OF 1998 SAV AREAS

ArcInfo SAV coverages in a Universal Transverse Mercator (UTM) Zone 18 projection were used to calculate area in square meters for all SAV beds. These areas are summarized by USGS 7.5 minute quadrangle, Chesapeake Bay Program and Delmarva Peninsula coastal bay segments, and zone in tables in the Results section. Segment and zone totals were calculated using an overlay operation of segment and zone regions on the SAV beds in ArcInfo.

ORGANIZATIONAL PROCEDURES FOR ANALYSIS AND DISCUSSION

SAV distribution data are presented and discussed based on a new segmentation and zonation scheme from those used in SAV distribution and abundance reports prior to 1997. The segmentation scheme used in this report was tentatively adopted by the Chesapeake Bay Program (CBP) in 1998 (Figure 10; Tables 3 and 4; DAWG, 1997). The Upper, Middle, and Lower zonation scheme used in previous reports, as established by Orth and Moore (1982) and modified by Orth *et al.*, (1989) was adapted to the new segments. It was followed as closely as possible but, necessarily, had to be modified to accommodate the new segment boundaries (Figure 10). Data are presented for 1978-1998, where available, using the new CBP segments.

The Upper Bay Zone includes the Susquehanna River and extends to the Chesapeake Bay Bridge; the Middle Bay Zone extends to the southern boundaries of CB5MH, TANMH, and POCMH; the Lower Bay Zone extends to the mouth of Chesapeake Bay and includes the James River (Figure 10). The salinity within each zone roughly coincides with the major salinity zones of estuaries: polyhaline Lower Zone (18-25 ‰), mesohaline Middle Zone (5-18 ‰); oligohaline Upper Zone (0.5-5 ‰). 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. SAV distribution in the Delmarva Peninsula coastal bays is presented and discussed separately from Chesapeake Bay. The Delmarva Peninsula Coastal Bays Zone, for the purpose of discussion in the figures and tables, includes the region from Assawoman Bay to Magothy Bay and is subdivided into five segments: Assawoman, Isle of Wight, Sinepuxent, Chincoteague, and Southern Virginia Coastal bays.

GROUND SURVEYS AND OTHER DATABASES

Ground surveys were accomplished by cooperative efforts from a number of agencies and individuals. Although not all areas of Chesapeake Bay and the Delmarva Peninsula coastal bays were ground surveyed, the data did provide valuable supplemental information. The ground surveys confirmed the existence of some SAV beds mapped from the 1998 aerial photography, as well as SAV beds that were too small to be visible on the 1:24,000 scale photography. The surveys also provided species data for many of the SAV beds. Ground survey information supplied to VIMS researchers is included on the SAV distribution and abundance digital maps reproduced in Appendix B and included in the VIMS SAV GIS Database. Each survey is designated by a unique symbol to identify the different methods of sampling. In most cases the symbols on the SAV maps (Appendix B) have been enlarged and offset from the actual sampling point to avoid confusion with the mapped SAV bed. Where species information was available, it is included on the map. Because of space limitations on the maps reproduced in Appendix B, occasionally one or more survey points are combined where the information was duplicated. All ground survey data supplied to VIMS are tabulated in Appendix D.

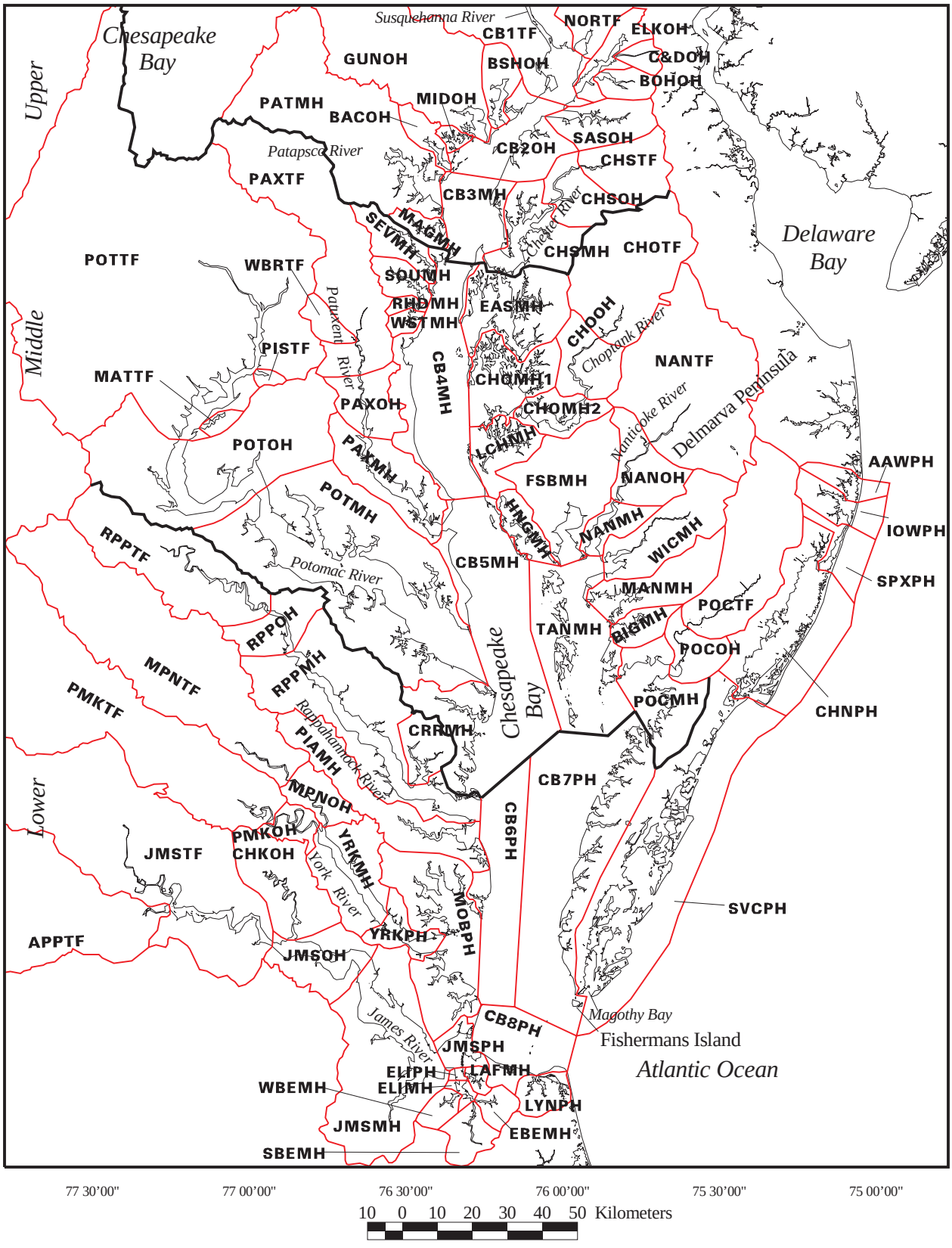

Figure 10: Location of the 78 Chesapeake Bay Program segments in the Upper, Middle, and Lower Chesapeake Bay zones and the 5 Delmarva Peninsula coastal bay segments.

TABLE 3

Chesapeake Bay Program and Delmarva Peninsula
Coastal Bay Segments with Salinity Regime

Upper Zone

Segment	Name	Salinity Regime
CB1TF	Northern Chesapeake Bay	Tidal Fresh
NORTF	Northeast River	Tidal Fresh
ELKOH	Elk River	Oligohaline
BOHOH	Bohemia River	Oligohaline
C&DOH	Chesapeake & Delaware Canal	Oligohaline
CB2OH	Upper Chesapeake Bay	Oligohaline
SASOH	Sassafras River	Oligohaline
BSHOH	Bush River	Oligohaline
GUNOH	Gunpowder River	Oligohaline
MIDOH	Middle River	Oligohaline
BACOH	Back River	Oligohaline
CB3MH	Upper Central Chesapeake Bay	Mesohaline
PATMH	Patapsco River	Mesohaline
MAGMH	Magothy River	Mesohaline
CHSMH	Lower Chester River	Mesohaline
CHSOH	Middle Chester River	Oligohaline
CHSTF	Upper Chester River	Tidal Fresh

Middle Zone

Segment	Name	Salinity Regime
CB4MH	Middle Central Chesapeake Bay	Mesohaline
EASMH	Eastern Bay	Mesohaline
CHOMH1	Mouth of the Choptank River	Mesohaline
CHOMH2	Lower Choptank River	Mesohaline
CHOOH	Middle Choptank River	Oligohaline
CHOTF	Upper Choptank River	Tidal Fresh
LCHMH	Little Choptank River	Mesohaline
SEVMH	Severn River	Mesohaline
SOUMH	South River	Mesohaline
RHDMH	Rhode River	Mesohaline
WSTMH	West River	Mesohaline
CB5MH	Lower Central Chesapeake Bay	Mesohaline
HNGMH	Honga River	Mesohaline

TABLE 3 (continued)

Middle Zone (concluded)

Segment	Name	Salinity Regime
FSBMH	Fishing Bay	Mesohaline
NANMH	Lower Nanticoke River	Mesohaline
NANOH	Middle Nanticoke River	Oligohaline
NANTF	Upper Nanticoke River	Tidal Fresh
WICMH	Wicomico River	Mesohaline
TANMH	Tangier Sound	Mesohaline
MANMH	Manokin River	Mesohaline
BIGMH	Big Annemessex River	Mesohaline
POCMH	Lower Pocomoke River	Mesohaline
POCOH	Middle Pocomoke River	Oligohaline
POCTF	Upper Pocomoke River	Tidal Fresh
PAXMH	Lower Patuxent River	Mesohaline
PAXOH	Middle Patuxent River	Oligohaline
PAXTF	Upper Patuxent River	Tidal Fresh
WBRTF	Western Branch of the Patuxent River	Tidal Fresh
POTMH	Lower Potomac River	Mesohaline
POTOH	Middle Potomac River	Oligohaline
POTTF	Upper Potomac River	Tidal Fresh
MATTF	Mattawoman Creek	Tidal Fresh
PISTF	Piscataway Creek	Tidal Fresh

Lower Zone

Segment	Name	Salinity Regime
CB6PH	Western Lower Chesapeake Bay	Polyhaline
CB7PH	Eastern Lower Chesapeake Bay	Polyhaline
RPPMH	Lower Rappahannock River	Mesohaline
CRRMH	Corrotoman River	Mesohaline
RPPOH	Middle Rappahannock River	Oligohaline
RPPTF	Upper Rappahannock River	Tidal Fresh
PIAMH	Piankatank River	Mesohaline
MOBPH	Mobjack Bay	Polyhaline
YRKPH	Lower York River	Polyhaline
YRKMH	Middle York River	Mesohaline
MPNOH	Lower Mattaponi River	Oligohaline
MPNTF	Upper Mattaponi River	Tidal Fresh
PMKOH	Lower Pamunkey River	Oligohaline

TABLE 3 (concluded)

Lower Zone (concluded)

Segment	Name	Salinity Regime
PMKTF	Upper Pamunkey River	Tidal Fresh
JMSPH	Mouth of the James River	Polyhaline
JMSMH	Lower James River	Mesohaline
ELIPH	Lower Elizabeth River	Polyhaline
ELIMH	Middle Elizabeth River	Mesohaline
WBEMH	Western Branch Elizabeth River	Mesohaline
SBEMH	Southern Branch Elizabeth River	Mesohaline
EBEMH	Eastern Branch Elizabeth River	Mesohaline
LAFMH	Lafayette River	Mesohaline
CHKOH	Chickahominy River	Oligohaline
JMSOH	Middle James River	Oligohaline
JMSTF	Upper James River	Tidal Fresh
APPTF	Appomattox River	Tidal Fresh
CB8PH	Mouth of the Chesapeake Bay	Polyhaline
LYNPH	Lynnhaven and Back Bays	Polyhaline

Delmarva Peninsula Coastal Bays Zone

Segment	Name	Salinity Regime
AAWPH	Assawoman Bay	Polyhaline
IOWPH	Isle of Wight Bay	Polyhaline
SPXPH	Sinepuxent Bay	Polyhaline
CHNPH	Chincoteague Bay	Polyhaline
SVCPH	Southern Virginia Coastal Bays	Polyhaline

TABLE 4

CBP and Delmarva Peninsula Coastal Bay Segment Descriptions

Upper Zone

Northern Chesapeake Bay (CB1TF): head of Bay segment, excluding the Northeast River but including Swan and Pond creeks. CB1TF adjoins CB2OH at a boundary that extends from Cherry Tree Point, south of Mosquito Creek on the west, to Grove Point of Grove Neck on the east.

Northeast (NORTF), Elk (ELKOH), Bohemia (BOHOH), Chesapeake & Delaware Canal (C&DOH), and Sassafras (SASOH) rivers: upper eastern shore tributary segments adjoining main stem Bay segments at their respective mouths. The Northeast River flows into CB1TF east of Furnace Bay. The Bohemia River and the Chesapeake & Delaware Canal join the Elk River which flows into CB1TF at Turkey Point. SASOH flows into CB2OH further south at Grove Point.

Upper Chesapeake Bay (CB2OH) and Upper Central Chesapeake Bay (CB3MH): upper main stem Bay segments, excluding main tributaries. CB2OH includes Romney, Delph, Boone, Brown, Worton, Fairlee, and Still Pond creeks; Pooles Island; and Hawks Cove by Hart Island. The boundary of CB2OH with CB3MH extends from Ramona Beach on Patapsco River Neck, to Tolchester Beach. CB3MH includes Tavern and Swan creeks and The Haven, all east of Swan Point, and Huntingfield and Shallow creeks, and Eastern Neck Narrows. The boundary of CB3MH with CB4MH extends from Moss Pond, south of the Magothy River on the east, to Kent Island, at a point above the Memorial Bridge.

Bush (BSHOH), Gunpowder (GUNOH), Middle (MIDOH), Back (BACOH), Patapsco (PATMH), and Magothy (MAGMH) rivers: upper western shore tributary segments adjoining main stem Bay segments at their respective mouths. BSHOH adjoins southwestern CB2OH west of Abbey Point. GUNOH includes Saltpeter and Dundee creeks and adjoins northwestern CB2OH at Carroll Point. MIDOH adjoins middle-western CB2OH at Weir Point. MIDOH includes Seneca Creek, which is connected to Saltpeter Creek. BACOH adjoins CB3OH at a boundary extending from Cedar Point on the north shore, to Swan Point on the south shore, and does not include Hawk Cove, west of Hart Island. PATMH adjoins CB3MH at the boundary extending from North Point on the north shore, to a point approximately midway between Cedar and Bodkin points on Bodkin Neck on the south shore, and includes Bodkin Creek. MAGMH adjoins CB3MH at Gibson Island and includes Sillery Bay.

Lower, Middle, and Upper Chester River (CHSMH, CHSOH, CHSTF): eastern shore tributary segments. The Chester River adjoins southeastern CB3MH at a boundary extending across the mouth from Kent Island below Love Point, to Wickes Beach on the western side of Eastern Neck Island.

TABLE 4 (continued)

Middle Zone

Middle Central Chesapeake Bay (CB4MH): main stem Bay segment, including Whitehall and Herring bays. CB4MH extends in the north from Whitehall Bay, western shore, to Kent Island, eastern shore, and in the south from Cove Point, western shore, to Cattail Island, eastern shore. CB4MH excludes major tributaries and embayments, which adjoin it on the east and the west. CB4MH includes the islands of Poplar Harbor at the mouth of Eastern Bay, including Jefferson and Coaches islands.

Eastern Bay (EASMH): eastern shore embayment segment, including the eastern side of Kent Island, Prospect Bay, and the Wye and Miles rivers. The boundary with CB4MH extends from Kent Point to Tilghman Island. EASMH does not include the islands of Poplar Harbor at its mouth.

The Mouth, Lower, Middle, and Upper Choptank River (CHOMH1, CHOMH2, CHOOH, CHOTF); and the Little Choptank River (LCHMH): eastern shore embayment segments and adjoining tributary segments; adjoins main stem Bay segment CB4MH at a boundary extending south from Tilghman Island, to Oyster Cove at the north end of Taylor Island. CHOMH1 includes Harris, Broad, Irish, Trippe, and Islands creeks; the Tred Avon River; and Trippe Bay. LCHMH includes Brannock Bay, Slaughter Creek, and the Little Choptank River in the south. The CHOMH1 boundary with CHOMH2 extends across the Choptank River from Castle Haven Point to Island Neck.

Severn (SEVMH), South (SOUMH), Rhode (RHDMH), and West (WSTMH) rivers: upper western shore tributary segments adjoining main stem Bay segment at their respective mouths. SEVMH includes Lake Ogleton and adjoins northwestern CB4MH at a boundary extending from Greenbury Point on the north shore, to Tolly Point on the south shore. SOUMH, RHDMH, and WSTMH adjoin northwestern CB4MH at a boundary line extending from Marshy Point on the north shore of the mouth of the South River, to Felicity Cove on the south shore of the mouth of the West River.

Lower Central Chesapeake Bay (CB5MH): middle main stem Bay segment extending in the north from Cove point, on the western shore, across the Bay to Cattail Island, and south to Windmill Point on the western shore, then northeast to a point about four km west of the southern end of Tangier Island. In the east, CB5MH includes Tar Bay, Barren Island, and the western side of the Hooper Islands. In the west, CB5MH includes St. Jerome Creek, north of the mouth of the Potomac River, and the Wicomico and Great Wicomico rivers, Dividing Creek, and Fleets Bay to the south. CB5MH adjoins CB4MH in the north, CB6PH and CB7PH in the south, the Patuxent and Potomac rivers on the west, and Tangier Sound on the east.

TABLE 4 (continued)

Middle Zone (continued)

Honga (HNGMH); Fishing Bay (FSBMH); and Lower, Middle, and Upper Nanticoke (NANMH, NANOH, NANTF); Wicomico (WICMH); Manokin (MANMH); Big Annemessex (BIGMH); Lower, Middle, and Upper Pocomoke (POCMH, POCOH, POCTF) rivers: eastern shore tributary segments adjoining Tangier Sound (TANMH) at their respective mouths. The boundary of HNGMH with TANMH extends from Nancys Point at the south end of Lower Hooper Island, to Bishop Head Point on Hog Island. The boundary of FSBMH with TANMH extends from Bishop Head Point to the east end of Clay Island. The boundary of NANMH with TANMH extends from Sandy Island on the west shore, to Stump Point Marsh on the east shore. WICMH includes Ellis and Monie bays, and its boundary with TANMH extends from Stump Point Marsh to Long Point on the south shore. WICMH includes Laws Thorofare, and Fishing, Broad, Geanquakin, and St. Peters creeks on the north shore; and Back, Wolftrap, Broad, Teague, and Mine creeks on the south shore; and its boundary with TANMH extends from Claw Point on Little Deal Island in the north, to Hazard Point on Hazard Island in the south. BIGMH includes Mine, Shirtpond, Flatland, Fords, and Crane coves, and Moon Bay on the north shore, and Gales, Colbourn, Jones, Dougherty, and Acre creeks, and Joes Cove on the south shore; and its boundary with TANMH extends from Pat Island on the north shore, to Flatcap Point on Janes Island on the south shore. POCMH includes Pocomoke Sound and Beasley and Robin Hood bays. The boundary of POCMH with TANMH extends from Eastward Point in the north to Custis Point between Doe and Deep creeks, east of Big Marsh in the south. POCOH includes a small part of eastern Pocomoke Sound, and its boundary with POCMH extends from Pig Point, at the eastern end of Robin Hood Bay on the south shore, to a point directly north on Marumsco Marsh, west of Fair Island on the north shore. POCTF begins above Cypress Swamp near Unionville.

Tangier Sound (TANMH): generally, the area around Bloodsworth, South Marsh, Smith, and Tangier islands, extending in the north from the mouths of the Honga River and Fishing Bay, to south of Watts Island, north of Big Marsh, and east of Great Fox Islands on the eastern shore. TANMH includes the Little Annemessex River; the Great Fox Islands; western Pocomoke Sound; Watts and Cedar islands.

Lower, Middle, and Upper Patuxent River (PAXMH, PAXOH, PAXTF); and the Western Branch of the Patuxent River (WBRTF): western shore tributary segments. PAXMH adjoins main stem Bay segment CB5MH at a boundary extending from Fishing Point on the south shore, to Drum Point on the north shore. Upstream, PAXMH adjoins PAXOH at a boundary extending approximately from Chalk Point on the west shore, to Gods Grace Point on the east shore. PAXOH adjoins PAXTF by Spice Creek. WBRTF adjoins PAXTF above Jug Bay on the west shore by the mouth of the Western Branch of the Patuxent River.

TABLE 4 (continued)

Middle Zone (concluded)

Lower, Middle, and Upper Potomac River (POTMH, POTOH, POTTF); and Mattawoman (MATTF) and Piscataway (PISTF) creeks: middle western shore tributary segments. POTMH includes the St. Marys and Wicomico rivers, and Breton and St. Clements bays on the north shore, and on the south shore, the Coan and Yeocomico rivers, the Lower Machodoc, Nomini, Popes, Mattox, and Upper Machodoc creeks, and Currioman Bay. POTMH adjoins CB5MH at a boundary extending from Point Lookout to Ginny Beach. POTOH includes the Port Tobacco River and Nanjemoy Creek on the north shore, and Aquia, Potomac, and Chopawamsic creeks on the south shore. POTOH adjoins POTMH at a boundary extending from just above Popes Creek to Mathias Neck. The tidal fresh zone, POTTF, includes Broad, Pomonkey, and Chicamuxen creeks and the Anacostia River on the east shore, and on the west shore, Quantico, Powells, Neabsco, and Dogue creeks; Occoquan and Belmont bays; Occoquan River; Gunston Cove; and Accotink Bay. POTTF adjoins POTOH at a boundary extending from Quantico on the west shore, to Moss Point on the east shore. MATTF and PISTF adjoin POTTF on the eastern shore below Broad Creek.

Lower Zone

Western Lower Chesapeake Bay (CB6PH): lower main stem Bay segment whose eastern boundary bisects the lower Bay and adjoins CB7PH. The western boundary extends in the north from Windmill Point, across the mouth of the Piankatank River (PIAMH), across the mouths of Mobjack Bay and the York, Poquoson, and Back rivers (MOBPH), to Northend Point at the south shore of the mouth of the Back River. CB6PH is bounded to the north by CB5MH and to the south by CB8PH and includes Winter and Horn Harbors

Eastern Lower Chesapeake Bay (CB7PH): lower main stem Bay segment whose western boundary bisects the lower Bay and adjoins CB6PH. The eastern boundary extends in the north from Deep Creek east of Big Marsh, south to the middle of the mouth of the Bay. The northern boundary adjoins CB5MH and TANMH. The southern boundary adjoins CB8PH and bisects the mouth of the Chesapeake Bay. Along its eastern shore CB7PH includes several tributary creeks, Cherrystone Inlet, Fishermans Island, and all of Big Marsh.

Lower, Middle, and Upper Rappahannock River (RPPMH, RPPOH, RPPTF); and Corrotoman River (CRRMH): lower western shore tributary segments. RPPMH adjoins CB6PH at a boundary across its mouth extending from Windmill Point to Stingray Point. RPPOH adjoins RPPMH at a boundary extending from Mulberry Point on the north shore, to Jenkins Landing. RPPOH adjoins RPPTF at Peedee Creek and Hutchinson Swamp.

Piankatank River (PIAMH): lower western shore tributary segment. Adjoins CB6PH at its mouth from Stingray Point in the north, to Cherry Point on Gwynn Island in the south. PIAMH includes Queens, Stutts, Billups and Whites creeks; Milford Haven; and The Hole in the Wall.

TABLE 4 (continued)

Lower Zone (continued)

Mobjack Bay (MOBPH): western shore embayment segment. MOBPH adjoins southeastern CB6PH at a boundary extending in the north from New Point Comfort, to Northend Point in the south. MOBPH includes the East, North, Ware, Severn, Poquoson, and Back rivers; the Guinea Marshes; Goodwin Islands; and the mouth of the York River. MOBPH also includes Bay Tree Point, the Poquoson Flats, and Plum Tree Island. MOBPH adjoins YRKPH on its western boundary.

Lower and Middle York River (YRKPH, YRKMH); Lower and Upper Mattaponi River (MPNOH, MPNTF); Lower and Upper Pamunkey River (PMKOH, PMKTF): lower western shore tributary segments. YRKPH adjoins MOBPH at a boundary extending from approximately west of Hog Island, on the north shore, to west of Thorofare by Goodwin Island, on the south shore. YRKMH adjoins YRKPH at a boundary extending from Blundering Point, north of the mouth of Carter Creek on the north shore, to a point on the south shore below Queens Creek. MPNOH and PMKOH adjoin YRKMH at points just upstream of the mouths of the Mattaponi and Pamunkey rivers. MPNTF and PMKTF adjoin MPNOH and PMKOH, respectively, and include the headwaters of Mattaponi and Pamunkey rivers.

The Mouth of the James River (JMSPH); the Lower, Middle, and Upper James River (JMSMH, JMSOH, JMSTF): lower western shore tributary segments comprising the southernmost major river entering the Bay. JMSPH adjoins the main stem Bay at its mouth, at a boundary extending from just north of Old Point Comfort on the north shore, to the end of Willoughby Spit on the south shore. JMSPH adjoins the mouth of the Elizabeth River. JMSPH adjoins JMSMH at a boundary extending from Newport News Point on the north shore, to the US Army Disposal Area on the south shore. JMSMH includes the Warwick, Pagan, and Nanesmond rivers; Lawnes, Chuckatuck, and Skiffes creeks; Mulberry Island (Fort Eustis); and the sewage waste and water treatment plant east of Carters Grove. JMSMH adjoins JMSOH at a boundary extending from Hog Island on the south shore, to Carters Grove on the north shore. JMSOH includes Hog Island, Surry Nuclear Power Plant, Jamestown Island, and the mouth of the Chickahominy River. JMSOH adjoins JMSTF at a boundary extending from Sloop Point on the south shore to Tettington on the north shore. JMSTF includes the rest of the James River to the headwaters, including the mouth of the Appomattox River.

Lower and Middle Elizabeth River (ELIPH and ELIMH); Western Branch (WBEMH), Southern Branch (SBEMH), and Eastern Branch (EBEMH) of the Elizabeth River; Lafayette River (LAFMH); Chickahominy River (CHKOH); and Appomattox River (APPTF): western shore tributary segments of the James River watershed. APPTF adjoins JMSTF at City Point by Hopewell. CHKOH adjoins JMSOH between During and Barrets points. ELIPH adjoins JMSPH between Sewells Point Spit and Craney Island Flats. LAFMH adjoins ELIPH on its east shore at Tanners Point. ELIMH adjoins ELIPH between Edgewater on the east and the US Naval Supply Center on the west. WBEMH, SBEMH, and EBEMH adjoin ELIMH.

TABLE 4 (continued)

Lower Zone (concluded)

Mouth of the Chesapeake Bay (CB8PH): southernmost main stem Bay segment including Little Creek. CB8PH adjoins the Atlantic Ocean at the mouth of the Bay at a boundary extending from Cape Henry on the south shore, to a point approximately midway across the mouth, at the boundary with CB7PH. CB8PH adjoins CB6PH and CB7PH in the north, JMSPH in the west, and LYNPH in the south.

Lynnhaven Bay (LYNPH): southernmost tributary segment adjoining CB8PH at its mouth. LYNPH includes the Lynnhaven River and Broad and Linkhorn bays.

Delmarva Peninsula Coastal Bays Zone

Assawoman Bay (AAWPH): northernmost coastal bay segment. AAWPH includes all of Assawoman Bay and is separated from IOWPH to the south by the Assawoman Bay Bridge.

Isle of Wight Bay (IOWPH): northern coastal bay segment. IOWPH includes all of Isle of Wight Bay and is separated from AAWPH to the north by the Assawoman Bay Bridge and from SPXPH to the south by the Ocean City Inlet.

Sinepuxent Bay (SPXPH): middle coastal bay segment. SPXPH includes all of Sinepuxent Bay and is separated from IOWPH to the north by the Ocean City Inlet and from CHNPH to the south by a boundary running from a point north of South Point on the west shore to a point south of Goose Point on the east shore.

Chincoteague Bay (CHNPH): southern coastal bay segment. CHNPH includes all of Chincoteague Bay, Chincoteague Channel, Chincoteague Inlet, Assateague Bay, Assateague Channel, and Toms Cove. CHNPH is separated from SPXPH to the north by a boundary running from a point north of South Point on the west shore to a point south of Goose Point on the east shore. CHNPH is bounded to the south by a boundary running from a point on Wallops Island to a point on Assateague Island.

Southern Virginia Coastal Bays (SVCPH): southernmost coastal bay segment. SVCPH includes all of the Virginia coastal bays on the seaside of the Delmarva Peninsula that are south of Chincoteague Bay. SVCPH is separated from CB7PH, which completely includes Fishermans Island, to the west by a boundary running from Wise Point to a point in Smith Island Inlet then across the Bay mouth to Cape Henry

Ground survey data were obtained in 1998 by:

- VIMS for the Honga, Potomac, St. Marys, York, and James rivers; Eastern Bay; and the Delmarva Peninsula coastal bays
- Stan Kollar of Harford Community College for Susquehanna Flats
- Virginia Carter, Nancy Rybicki, Henry Ruhl, and Justin Reel of the USGS National Center for the Potomac River
- Dan Stotts of the Biological Resources Division (BRD) of the U.S. Department of the Interior for the Wye River
- Peter Bergstrom of the U.S. Fish and Wildlife Service (USFWS) for the Magothy, Severn, and Patapsco rivers
- Derek Orner of National Oceanographic Atmospheric Administration (NOAA) for the Patuxent River
- Mike Naylor of Maryland Department of Natural Resources (MD-DNR) for Lloyd and Shellcross creeks and the Bird River
- U.S. Army Environmental Center/Army Research Laboratory (USAEC/ARL) (Aberdeen Proving Ground) for the Aberdeen Proving Ground area
- The U.S. Army Corps of Engineers, Baltimore District (ACOE) for the Middle River
- Bob Stankelis of Chesapeake Bay Laboratories (CBL) and Donna Lloyd of Horn Point Laboratory (HPL) of the University of Maryland for the Patuxent River and the Choptank River
- Bob Murphy of Alliance for the Chesapeake Bay (ACB) for Parkers Creek
- Jamie Baxter of Chesapeake Bay Foundation (CBF) for the Honga River
- Harry Womack of Salisbury State University (SSU) for the Delmarva Peninsula coastal bays
- Ocean Pines Yacht Club for the Delmarva Peninsula coastal bays
- The SAV Hunt

The SAV Hunt under the guidance of the USFWS and assisted by the Chesapeake Bay Foundation, included groundtruthing by:

- students and educators at Calvert, Plum Point, South, and Northern Middle schools and Millersville University
- members of Chesapeake Bay Youth Conservation Corps, Chester River Association, Friends of Mattawoman Creek, the Rappahannock River Resource Council, and the National Aquarium in Baltimore
- staff at the Maryland-National Capital Parks and Planning Commission at Patuxent River Park, Jug Bay Wetlands Sanctuary, and Lancaster/Morratico Watershed Group obtained Patuxent River ground survey data.
- other citizen volunteers

SAV Hunt volunteers identified SAV locations and SAV species throughout Chesapeake Bay and the Delmarva Peninsula coastal bays. Volunteers recruited through press releases, newsletters, and personal letters, were provided with a SAV identification guide, reduced 1996 SAV maps to aid in the location of SAV beds, and data sheets for reporting visits to numerous sites around the bays. USFWS staff mapped

the data on copies of 1996 SAV distribution maps (USGS 7.5 minute quadrangles with 1996 SAV beds). These maps were supplied to VIMS SAV researchers and transferred to the 1998 SAV distribution maps reproduced in Appendix B. Data from the SAV Hunt were compiled and tabulated by USFWS. This table became the basis of the much expanded table published in Appendix D.

One 1998 SAV research project being conducted on the Susquehanna Flats by Stan Kollar of Harford Community College, Maryland, also provided data in the form of species presence by estimated percent cover, although these percentages are not reported here.

Observations by VIMS reasearchers were principally made from small boats and by divers in areas identified from the aerial photographs. In the York and James rivers, where VIMS researchers transplanted SAV (principally *Zostera marina*), 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-speckled trout study (VIMS, unpublished data).

Ground survey data from all sources reported here are presented in Appendices B and D.

RESULTS

DATA PRESENTATION

Chesapeake Bay 1998 SAV distribution data and ground-truth data are presented and discussed based on the 1997 Chesapeake Bay Program (CBP) segmentation scheme, as well as on Upper, Middle, and Lower Chesapeake Bay Zones (Figure 10; Tables 3 and 4). In addition, 1998 SAV distribution data and ground-truth data are presented for the five Delmarva Peninsula coastal bay segments: Assawoman, Isle of Wight, Sinepuxent, Chincoteague, and Southern Virginia Coastal bays which compose the Delmarva Peninsula Coastal Bays Zone (Figure 10, Tables 3 and 4).

The 1998 SAV bed data were edgematched using ArcInfo GIS software, as were all the historical SAV bed data, in order to bring separately digitized USGS 7.5 minute topographic quadrangle SAV coverages into one unified coverage for the entire Chesapeake Bay (Methods; Orth *et al.*, 1996). Therefore, SAV distribution data presented in this report reflect edgematching adjustments, and may differ from previously published data for years derived from separate coverages which were not edgematched (i.e., Orth *et al.*, 1992, 1993, and 1994).

SAV distribution data for 1998 and 1997 are presented in hectares by:

- Quadrangle (Table 5)
- Chesapeake Bay and Delmarva Peninsula Coastal Bays Zone (Figures 2a and 2b)
- CBP segment and zone (Figures 3, 4, and 5; Tables 6 and 7)
- USGS 7.5 minute quadrangles for each CBP and Delmarva Peninsula coastal bay segment (Table 8)

Distribution data for 1998 and 1997 by SAV density class are presented for:

- CBP segments (Figures 3, 4, and 5; Table 9)
- Delmarva Peninsula coastal bay segments (Figure 6; Table 9)
- Chesapeake Bay and Delmarva Peninsula Coastal Bays Zone (Figures 2a and 2b; Table 10)

Quadrangle maps annotated with all 1998 SAV beds and ground-truth data are presented in Appendix B, and 1998 ground-truth data are also tabulated in Appendix D and by segment in Table 11. The calculated areas for individual 1998 SAV beds for each quadrangle are tabulated in square meters in Appendix C.

The 1998 SAV data are summarized, compared with 1997 data, and are discussed relative to their zones, 78 CBP segments and the five Delmarva Peninsula coastal bay segments. The 1998 distribution of SAV is plotted on maps of each CBP and Delmarva Peninsula coastal bay segment; distribution data for 1971-1998 are graphed by segment, by year, and by density class in insets within these figures. A key for the 1998 segment maps is shown in Figure 11.

1998 SUMMARY

CHESAPEAKE BAY

In 1998, 25,704 hectares of SAV were mapped in Chesapeake Bay and its tributaries (Figure 1). This represented an overall decrease of 8% (2,328 ha) from 1997 levels (Figure 2a). However, in 1998 portions of the upper James, York, and Rappahannock rivers were flown for the first time in the history of the aerial survey, adding 365 hectares of SAV to the 1998 total that was not present in 1997. Comparing the same mapped areas between 1997 and 1998, the SAV decrease is 10% (2,693 ha). This decline reverses the trend of increasing SAV over 1996 and 1997 and offsets the gain noted in 1997 over 1996 of 2,336 hectares. The abundance of SAV in 1998 represented 56% of the Tier I goal (46,022 hectares) set by the Chesapeake Executive Council in Directive 93-3 (1993).

SAV increased in one (Upper Bay) and decreased in two (Middle and Lower Bay) geographic zones delineated for Chesapeake Bay. In 1998, SAV increased in 21, decreased in 25, remained unvegetated in 26, and was newly mapped in six of 78 CBP segments (Figure 2b, Table 6).

Upper Bay Zone

In the Upper Bay Zone (17 CBP segments from the Susquehanna River, south to the Chester and Magothy rivers), SAV increased to 4,559 hectares (from 4,439 hectares in 1997), representing 63% of the Tier I goal for the Zone (Table 7).

Five of the 17 segments increased by 20% and at least 5 hectares over 1997 totals. These areas include (Figure 3, Table 6):

- ↑ Northeast River (NORTF), 10 ha (1998) vs. 5 ha (1997) + 100%
- ↑ Elk River (ELKOH), 206 ha (1998) vs. 67 ha (1997) + 206%
- ↑ Bohemia River (BOHOH), 46 ha (1998) vs. 15 ha (1997) + 207%
- ↑ Gunpowder River (GUNOH), 871 ha (1998) vs. 637 ha (1997) + 37%
- ↑ Magothy River (MAGMH), 80 ha (1998) vs. 53 ha (1997) + 50%.

Three of the 17 segments decreased by 20% and at least 5 hectares over 1997 totals. These areas include (Figure 3; Table 6):

- ↓ Sassafras River (SASOH), 69 ha (1998) vs. 111 ha (1997) - 38%
- ↓ Bush River (BSHOH), 2 ha (1998) vs. 35 ha (1997) - 93%
- ↓ Middle River (MIDOH), 43 ha (1998) vs. 117 ha (1997) - 64%

Four of the 17 segments had no SAV mapped (Figure 3; Table 6).

Middle Bay Zone

In the Middle Bay Zone (33 CBP segments from the Bay Bridge, south to the Rappahannock River and Pocomoke Sound, and including the Potomac River), SAV decreased to 12,237 hectares from 14,209 hectares in 1997, representing 49% of the Tier I goal for the Zone (Table 7).

Five of the 33 segments increased by 20% and at least 5 hectares over 1997 totals. These areas include (Figure 4; Table 6):

- ↑ Severn River (SEVMH), 163 ha (1998) vs. 124 ha (1997) + 32%
- ↑ South River (SOUMH), 22 ha (1998) vs. 16 ha (1997) + 35%
- ↑ Middle Potomac River (POTOH), 1,743 ha (1998) vs. 1,206 ha (1997) + 44%
- ↑ Upper Potomac River (POTTF), 1,089 ha (1998) vs. 554 ha (1997) + 96%
- ↑ Mattawoman Creek (PISTF), 66 ha (1998) vs. 50 ha (1997) + 31%

Six of the 33 segments decreased by 20% and at least 5 hectares over 1997 totals. These areas include (Figure 4; Table 6):

- ↓ Middle Central Chesapeake Bay (CB4MH), 0 ha (1998) vs. 20 ha (1997) - 100%
- ↓ Eastern Bay (EASMH), 1,107 ha (1998) vs. 1,848 ha (1997) - 40%
- ↓ Honga River (HNGMH), 316 ha (1998) vs. 891 ha (1997) - 64%
- ↓ Tangier Sound (TANMH), 2,676 ha (1998) vs. 3,826 ha (1997) - 30%
- ↓ Manokin River (MANMH), 14 ha (1998) vs. 56 ha (1997) - 75%
- ↓ Big Annemessex River (BIGMH), 94 ha (1998) vs. 143 ha (1997) - 34%

Fourteen of the 33 segments had no SAV mapped (Figure 4; Table 6).

An alarming trend noted in previous years surveys continues in the mid-section of Chesapeake Bay with SAV abundance in the Tangier Sound and Honga River segments showing the largest single year decline in 1998 (1,724 ha). The Choptank River Mouth segment (CHOMH1) accounted for an additional noteworthy decrease of 509 hectares, representing an 18% decline (Figure 9; Table 6).

Lower Bay Zone

In the Lower Bay Zone (28 CBP segments from the Rappahannock River and Pocomoke Sound areas, south to the mouth of the Bay), SAV decreased to 8,912 hectares (from 9,383 hectares in 1997), representing 65% of the Tier I goal for the Zone (Table 7).

None of the 28 segments increased by 20% and at least 5 hectares over 1997 totals; however, six segments were either flown for the first time since the annual survey commenced or had not been flown since 1986 (CHKOH). These areas include (Figure 5; Table 6):

Upper Rappahannock River (RPPTF), 7 ha
Upper Mattaponi River (MPNTF), 34 ha
Upper Pamunkey River (PMKTF), 76 ha

Middle James River (JMSOH), 6 ha
Chickahominy River (CHKOH), 205 ha
Upper James River (JMSTF), 36 ha

Three of the 28 segments decreased by 20% and at least 5 hectares over 1997 totals. These areas include (Figure 5; Table 6):

- Lower Rappahannock River (RPPMH), 9 ha (1998) vs. 15 ha (1997) - 40%
- Piankatank River (PIAMH), 132 ha (1998) vs. 175 ha (1997) - 25%
- Mouth of the James River (JMSPH), 52 ha (1998) vs. 76 ha (1997) - 31%

SAV in the Eastern Lower Chesapeake Bay (CB7PH) and Mobjack Bay (MOBPH) segments had declines of 321 and 360 hectares, respectively, representing a loss of 8% in each of these segments (Figure 5; Table 6).

Eleven segments had no SAV mapped (Figure 5; Table 6).

DELMARVA PENINSULA COASTAL BAYS ZONE

SAV beds in the Delmarva Peninsula Coastal Bays Zone (Assawoman, Isle of Wight, Sinepuxent, Chincoteague, and Southern Virginia Coastal Bays) continue to be heavily scarred by clam dredge activities (Orth *et al.*, 1998). However, SAV beds continue to expand in area to 6,155 hectares, an increase of 556 hectares over 1997 (Figure 6; Table 6):

- Assawoman Bay (AAWPH), 175 ha (1998) vs. 180 ha (1997) - 3% decrease
- Isle of Wight Bay (IOWPH), 81 ha (1998) vs. 80 ha (1997) + 1% increase
- Sinepuxent Bay (SPXPH), 478 ha (1998) vs. 421 ha (1997) + 13% increase
- Chincoteague Bay (CHNPH), 5,421 ha (1998) vs. 4,917 ha (1997) + 10% increase

There continues to be no SAV mapped in the Southern Virginia Coastal Bays Segment.

TABLE 5

Total Area of SAV in Hectares by USGS 7.5 Minute Quadrangles for 1997 and 1998

Quadrangle	1997	1998
001. Conowingo Dam, Md.-Pa.	0	-
002. Aberdeen, Md.	17.06	16.38
003. Havre de Grace, Md.	2,307.56	2,141.24
004. North East, Md.	23.13	118.90
005. Elkton, Md.-Del.	0	20.60
006. White Marsh, Md.	0.58	0.32
007. Edgewood, Md.	160.79	145.62
008. Perryman, Md.	30.54	24.66
009. Spesutie, Md.	121.13	117.86
010. Earleville, Md.	120.85	157.43
011. Cecilton, Md.	0	-
012. Baltimore East, Md.	0	-
013. Middle River, Md.	77.18	16.59
014. Gunpowder Neck, Md.	589.84	821.81
015. Hanesville, Md.	33.93	24.02
016. Betterton, Md.	72.96	71.91
017. Galena, Md.	32.59	6.24
018. Curtis Bay, Md.	#	#
019. Sparrows Point, Md.	16.82	14.37
020. Swan Point, Md.	26.73	40.32
021. Rock Hall, Md.	35.90	52.05
022. Chestertown, Md.	0	#
023. Round Bay, Md.	128.46	169.33
024. Gibson Island, Md.	50.82	79.95
025. Love Point, Md.	0	-
026. Langford Creek, Md.	563.50	497.98
027. Centreville, Md.	0	2.87
028. Washington West, Md.-D.C.-Va	0.20	#
029. Washington East, D.C.-Md.	#	0
030. South River, Md.	16.35	22.00
031. Annapolis, Md.	#	#
032. Kent Island, Md.	683.88	492.55
033. Queenstown, Md.	527.43	533.25
034. Alexandria, Va.-D.C.-Md.	136.56	439.02
035. Deale, Md.	0	3.21
036. Claiborne, Md.	661.30	533.85
037. St. Michaels, Md.	717.55	320.75
038. Easton, Md.	12.45	12.53

TABLE 5 (continued)

Quadrangle	1997	1998
039. Fort Belvoir, Va.-Md.	206.77	158.55
040. Mt. Vernon, Md.-Va.	247.05	316.86
041. Lower Marlboro, Md.	69.28	77.42
042. North Beach, Md.	15.31	0
043. Tilghman, Md.	528.07	397.81
044. Oxford, Md.	820.84	671.03
045. Trappe, Md.	40.74	40.36
046. Preston, Md.	#	#
047. Quantico, Va.-Md.	212.27	324.37
048. Indian Head, Va.-Md.	65.82	264.35
049. Benedict, Md.	0	#
050. Prince Frederick, Md.	-	#
051. Hudson, Md.	703.68	666.83
052. Church Creek, Md.	582.34	504.55
053. Cambridge, Md.	#	-
054. East New Market, Md.	0	-
055. Widewater, Va.-Md.	135.00	491.54
056. Nanjemoy, Md.	184.56	197.63
057. Mathias Point, Md.-Va.	443.88	565.97
058. Popes Creek, Md.	35.95	45.12
059. Mechanicsville, Md.	0	0
060. Broomes Island, Md.	#	#
061. Cove Point, Md.	#	#
062. Taylors Island, Md.	51.44	12.86
063. Golden Hill, Md.	9.49	12.27
064. Passapatanzy, Md.-Va.	252.53	199.62
065. King George, Va.-Md.	40.42	60.45
066. Dahlgren, Va.-Md.	93.03	164.51
067. Colonial Beach North, Md.-Va.	197.02	162.58
068. Rock Point, Md.	140.70	92.66
069. Leonardtown, Md.	50.54	42.12
070. Hollywood, Md.	#	#
071. Solomons Island, Md.	1.02	#
072. Barren Island, Md.	25.15	0
073. Honga, Md.	574.79	238.37
074. Wingate, Md.	350.02	56.15
075. Nanticoke, Md.	0	-
076. Colonial Beach South, Va.-Md.	0	1.98
077. Stratford Hall, Va.-Md.	20.05	21.56
078. St. Clements Island, Va.-Md.	85.71	106.59

TABLE 5 (continued)

Quadrangle	1997	1998
079. Piney Point, Md.-Va.	0	-
080. St. Marys City, Md.	18.68	23.07
081. Point No Point, Md.	-	-
082. Richland Point, Md.	0	-
083. Bloodsworth Island, Md.	38.36	48.93
084. Deal Island, Md.	#	#
085. Monie, Md.	0	0
086. Champlain, Va.	-	-
087. Machodoc, Va.	16.81	23.35
088. Kinsale, Va.-Md.	#	#
089. St. George Island, Va.-Md.	#	0
090. Point Lookout, Md.	0	#
091. Kedges Straits, Md.	345.52	165.86
092. Terrapin Sand Point, Md.	137.87	65.50
093. Marion, Md.	229.11	120.62
094. Mount Landing, Va.	-	-
095. Tappahannock, Va.	-	-
096. Lottsburg, Va.	#	#
097. Heathsville, Va.-Md.	#	#
098. Burgess, Va.-Md.	0	-
099. Ewell, Md.-Va.	1,503.02	1,084.61
100. Great Fox Island, Va.-Md.	1,048.36	678.73
101. Crisfield, Md.-Va.	160.36	83.28
102. Saxis, Va.-Md.	0.83	0
103. Dunnsville, Va.	-	-
104. Morattico, Va.	-	-
105. Lively, Va.	-	#
106. Reedville, Va.	235.88	224.16
107. Tangier Island, Va.	437.00	424.34
108. Chesconessex, Va.	932.00	806.75
109. Parksley, Va.	340.40	352.31
110. Urbanna, Va.	0	#
111. Irvington, Va.	20.51	20.97
112. Fleets Bay, Va.	431.25	434.37
113. Nandua Creek, Va.	378.30	343.86
114. Pungoteague, Va.	891.14	806.09
115. West Point, Va.	-	0
116. Saluda, Va.	0	-
117. Wilton, Va.	0	#
118. Deltaville, Va.	91.66	55.00

TABLE 5 (continued)

Quadrangle	1997	1998
119. Jamesville, Va.	546.09	473.04
120. Toano, Va.	-	-
121. Gressitt, Va.	-	#
122. Ware Neck, Va.	257.84	179.35
123. Mathews, Va.	173.64	145.78
124. Franktown, Va.	645.06	634.92
125. Westover, Va.	-	#
126. Charles City, Va.	-	#
127. Brandon, Va.	- *	100.91
128. Norge, Va.	- *	90.53
129. Williamsburg, Va.	-	-
130. Clay Bank, Va.	0	-
131. Achilles, Va.	1,197.73	1,073.88
132. New Point Comfort, Va.	1,513.93	1,415.90
133. Cape Charles, Va.	428.29	357.11
134. Cheriton, Va.	88.31	74.91
135. Savedge, Va.	- *	36.00
136. Claremont, Va.	-	#
137. Surry, Va.	- *	7.23
138. Hog Island, Va.	- *	0.24
139. Yorktown, Va.	5.00	2.09
140. Poquoson West, Va.	584.69	497.08
141. Poquoson East, Va.	1,185.90	1,183.96
142. Elliotts Creek, Va.	183.33	198.41
143. Townsend, Va.	#	#
144. Bacons Castle, Va.	-	-
145. Mulberry Island, Va.	-	-
146. Newport News North, Va.	-	0
147. Hampton, Va.	369.03	327.32
148. Benns Church, Va.	-	-
149. Newport News South, Va.	24.52	7.38
150. Norfolk North, Va.	-	-
151. Little Creek, Va.	4.37	4.16
152. Cape Henry, Va.	16.14	16.86
153. Chuckatuck, Va.	-	-
154. Bowers Hill, Va.	-	-
155. Norfolk South, Va.	-	-
156. Kempsville, Va.	-	-
157. Princess Anne, Va.	-	-
158. Wye Mills, Md.	-	-

TABLE 5 (continued)

Quadrangle	1997	1998
159. Bristol, Md.	23.95	27.14
160. Fowling Creek, Md.	-	-
161. Port Tobacco, Md.	0.74	1.01
162. Charlotte Hall, Md.	16.09	12.46
163. Mardela Springs, Md.	-	-
164. Wetipquin, Md.	0	-
165. Selbyville, Md.	0	#
166. Assawoman Bay, Md.-Del.	243.31	234.73
167. Berlin, Md.	73.82	85.16
168. Ocean City, Md.	79.85	96.31
169. Public Landing, Md.	0	#
170. Tingles Island, Md.	1,522.43	1,769.87
171. Girdle Tree, Md.-Va.	15.34	18.22
172. Boxiron, Md.-Va.	1,034.63	1,084.80
173. Whittington Point, Md.-Va.	567.77	607.55
174. Chincoteague West, Va.	411.88	435.65
175. Chincoteague East, Va.	1,649.34	1,822.56
176. Anacostia, D.C.-Md.	0.35	0.14
177. East of New Point Comfort, Va.	0.37	0
178. Bethel Beach, Va.	0.78	0.31
179. Goose Island, Va.	137.36	127.87
180. Horseshoe Point, Md.	0	-
181. Bowie, Md.	-	-
182. Smith Point, Va. -Md.	0	-
183. East of Reedville, Va.	0	-
184. Cobb Island, Va.	-	-
185. Suffolk, Va.	-	-
186. Fishermans Island, Va.	21.57	24.54
187. Exmore, Va.	0	-
188. Kingston, Md.	-	-
189. Eden, Md.	-	-
190. Rhodesdale, Md.	-	-
191. Sharptown, Md.-Del.	-	-
192. Hobbs, Md.	-	-
193. Church Hill, Md.	0	-
194. Lancaster, Va.	-	-
195. Gloucester, Va.	-	-
196. Princess Anne, Md.	0	-
197. Haynesville, Va.	-	-
198. Hallwood, Va. -Md.	-	-

TABLE 5 (concluded)

Quadrangle	1997	1998
199. Millington, Md.	0	-
200. Rollins Fork, Va.	- *	5.20
201. Loretto, Va.	- *	2.09
202. Pocomoke City, Md.-Va.	-	-
203. Diputanta North, Va.	-	-
204. Hopewell, Va.	-	-
205. Chester, Va.	-	-
206. Drewrys Bluff, Va.	-	-
207. Dutch Gap, Va.	-	-
208. Roxbury, Va.	-	-
209. Providence Forge, Va.	-	-
210. Walkers, Va.	- *	12.62
211. Richmond, Va.	-	-
212. Ship Shoal Inlet, Va.	-	-
213. Great Machipongo Inlet, Va.	-	-
214. Nassawadox, Va.	-	-
215. Quimbly Inlet, Va.	-	-
216. Wachapreague, Va.	-	-
217. Accomax, Va.	-	-
218. Metompkin Inlet, Va.	-	-
219. Bloxom, Va.	-	-
220. Wallops Island, Va.	-	-
221. Deep Creek, Va.	-	-
222. Fentress, Va.	-	-
223. Pleasant Ridge, Va.	-	-
224. Creeds, Va.	-	-
225. King William, Va.	- *	30.30
226. King & Queen Courthouse, Va.	- *	9.98
227. Truhart, Va.	-	0
228. Tunstall, Va.	- *	69.72
229. New Kent, Va.	-	0
230. Manquin, Va.	- *	0.27
Total for Chesapeake Bay:	28,031.75 *	25,704.15
Total for the Coastal Bays:	5,598.37	6,154.85

- = Indicates quadrangle not photographed and assumed to have no SAV.
0 = Indicates quadrangle photographed and no SAV noted.
# = SAV detected by groundtruthing only.
* Area not completely flown in 1997 but most likely had SAV in 1997 based on 1998 data.

TABLE 6

Number of Hectares of SAV in 1997 and 1998 and Percent Change for the CBP and Delmarva Peninsula Coastal Bay Segments and Zones

Upper Zone

Segment		1997	1998	Change
CB1TF	Northern Chesapeake Bay	2,489.99	2,310.07	-7%
NORTF	Northeast River	4.98	9.95	+100%
ELKOH	Elk River	67.44	206.07	+206%
BOHOH	Bohemia River	15.09	46.40	+207%
C&DOH	Chesapeake & Delaware Canal	0.00	0.00	0%
CB2OH	Upper Chesapeake Bay	110.19	126.56	+15%
SASOH	Sassafras River	110.78	68.60	-38%
BSHOH	Bush River	34.95	2.47	-93%
GUNOH	Gunpowder River	637.36	870.73	+37%
MIDOH	Middle River	117.37	42.73	-64%
BACOH	Back River	0.00	0.00	0%
CB3MH	Upper Central Chesapeake Bay	370.83	308.28	-17%
PATMH	Patapsco River	1.93	5.86	+203%
MAGMH	Magothy River	53.48	80.02	+50%
CHSMH	Lower Chester River	424.81	477.89	+12%
CHSOH	Middle Chester River	0.00	0.00	0%
CHSTF	Upper Chester River	0.00	0.00	0%
	Zone Total:	4,439.21	4,555.63	+3%

Middle Zone

Segment		1997	1998	Change
CB4MH	Middle Central Chesapeake Bay	20.28	0.00	-100%
EASMH	Eastern Bay	1,848.32	1,107.25	-40%
CHOMH1	Mouth of the Choptank River	2,792.59	2,283.31	-18%
CHOMH2	Lower Choptank River	1.76	0.00	-100%
CHOOH	Middle Choptank River	0.00	0.00	0%
CHOTF	Upper Choptank River	0.00	0.00	0%
LCHMH	Little Choptank River	529.39	617.22	+17%
SEVMH	Severn River	123.87	163.40	+32%
SOUMH	South River	16.35	22.00	+35%
RHDMH	Rhode River	0.00	0.00	0%
WSTMH	West River	0.00	3.21	

TABLE 6 (continued)

Middle Zone (continued)

Segment		1997	1998	Change
CB5MH	Lower Central Chesapeake Bay	736.07	660.55	-10%
HNGMH	Honga River	890.51	316.37	-64%
FSBMH	Fishing Bay	0.00	0.00	0%
NANMH	Lower Nanticoke River	0.00	0.00	0%
NANOH	Middle Nanticoke River	0.00	0.00	0%
NANTF	Upper Nanticoke River	0.00	0.00	0%
WICMH	Wicomico River	0.00	0.00	0%
TANMH	Tangier Sound	3,825.57	2,675.71	-30%
MANMH	Manokin River	56.44	14.01	-75%
BIGMH	Big Annemessex River	143.25	94.35	-34%
POCMH	Lower Pocomoke River	529.84	459.46	-13%
POCOH	Middle Pocomoke River	0.00	0.00	0%
POCTF	Upper Pocomoke River	0.00	0.00	0%
PAXMH	Lower Patuxent River	1.02	0.00	-100%
PAXOH	Middle Patuxent River	40.08	43.25	+8%
PAXTF	Upper Patuxent River	53.16	61.30	+15%
WBRTF	Western Branch of the Patuxent River	0.00	0.00	0%
POTMH	Lower Potomac River	666.84	691.72	+4%
POTOH	Middle Potomac River	1,206.26	1,742.51	+44%
POTTF	Upper Potomac River	554.11	1,088.71	+96%
MATTF	Mattawoman Creek	50.28	65.93	+31%
PISTF	Piscataway Creek	123.25	126.62	+3%
	Zone Total:	14,209.23	12,236.88	-14%

Lower Zone

Segment		1997	1998	Change
CB6PH	Western Lower Chesapeake Bay	361.84	312.58	-14%
CB7PH	Eastern Lower Chesapeake Bay	3,937.20	3,616.52	-8%
RPPMH	Lower Rappahannock River	14.70	8.79	-40%
CRRMH	Corrotoman River	15.29	17.03	+11%
RPPOH	Middle Rappahannock River	0.00	0.00	0%
RPPTF	Upper Rappahannock River	0.00*	7.29	
PIAMH	Piankatank River	175.01	132.11	-25%
MOBPH	Mobjack Bay	4,442.49	4,082.34	-8%
YRKPH	Lower York River	339.50	302.79	-11%

TABLE 6 (concluded)

Lower Zone (continued)

Segment		1997	1998	Change
YRKMH	Middle York River	0.00	0.00	0%
MPNOH	Lower Mattaponi River	0.00	0.00	0%
MPNTF	Upper Mattaponi River	0.00*	34.38	
PMKOH	Lower Pamunkey River	0.00	0.00	0%
PMKTF	Upper Pamunkey River	0.00*	75.89	
JMSPH	Mouth of the James River	75.74	52.49	-31%
JMSMH	Lower James River	1.05	0.89	-15%
ELIPH	Lower Elizabeth River	0.00	0.00	0%
ELIMH	Middle Elizabeth River	0.00	0.00	0%
WBEMH	Western Branch of the Elizabeth River	0.00	0.00	0%
SBEMH	South Branch of the Elizabeth River	0.00	0.00	0%
EBEMH	Eastern Branch of the Elizabeth River	0.00	0.00	0%
LAFMH	Lafayette River	0.00	0.00	0%
CHKOH	Chickahominy River	0.00*	205.32	
JMSOH	Middle James River	0.00*	6.21	
JMSTF	Upper James River	0.00*	36.00	
APPTF	Appomattox River	0.00	0.00	0%
CB8PH	Mouth of the Chesapeake Bay	4.37	4.16	-5%
LYNPH	Lynnhaven & Back Bays	16.14	16.86	+4%
	Zone Total:	9,383.31*	8,911.64	-5%
	Total for Chesapeake Bay:	28,031.75*	25,704.15	-8%

Delmarva Peninsula Coastal Bays Zone

Segment		1997	1998	Change
AAWPH	Assawoman Bay	180.32	174.63	-3%
IOWPH	Isle of Wight Bay	79.87	80.71	+1%
SPXPH	Sinepuxent Bay	421.40	478.25	+13%
CHNPH	Chincoteague Bay	4,916.78	5,421.27	+10%
SVCPH	Southern Virginia Coastal Bays	0.00	0.00	0%
	Zone Total:	5,598.37	6,154.85	+10%

* Area not completely flown in 1997 but most likely had SAV in 1997 based on 1998 data.

TABLE 7

Comparison of the Number of Hectares of SAV in the Tier I Restoration Goal and 1998 SAV Area for the CBP Segments and the Zones of Chesapeake Bay

CBP Segments that have met the Tier I Goal are shown in **bold**.

Upper Zone

Segment	Tier I Goal	1998 SAV	Percent of Goal
CB1TF	3,112.24	2,310.07	+74%
NORTF	**7.54**	**9.95**	**+132%**
ELKOH	447.29	206.07	+46%
BOHOH	**17.32**	**46.40**	**+268%**
C&DOH	0.62	0.00	0%
CB2OH	266.97	126.56	+47%
SASOH	164.71	68.60	+42%
BSHOH	23.38	2.47	+11%
GUNOH	**350.21**	**870.73**	**+249%**
MIDOH	347.54	42.73	+12%
BACOH	0.00	0.00	0%
CB3MH	697.59	308.28	+44%
PATMH	50.22	5.86	+12%
MAGMH	236.73	80.02	+34%
CHSMH	1,517.81	477.89	+31%
CHSOH	0.00	0.00	0%
CHSTF	0.00	0.00	0%
Zone Total:	7,240.18	4,555.63	+63%

Middle Zone

Segment	Tier I Goal	1998 SAV	Percent of Goal
CB4MH	152.02	0.00	0%
EASMH	2,479.02	1,107.25	+45%
CHOMH1	2,990.36	2,283.31	+76%
CHOMH2	186.95	0.00	0%
CHOOH	0.00	0.00	0%
CHOTF	0.00	0.00	0%
LCHMH	**616.39**	**617.22**	**+100%**
SEVMH	187.76	163.40	+87%
SOUMH	**20.59**	**22.00**	**+107%**

TABLE 7 (continued)

Middle Zone (concluded)

Segment	Tier I Goal	1998 SAV	Percent of Goal
RHDMH	5.92	0.00	0%
WSTMH	46.75	3.21	+7%
CB5MH	1,933.24	660.55	+34%
HNGMH	1,599.11	316.37	+20%
FSBMH	13.43	0.00	0%
NANMH	0.00	0.00	0%
NANOH	0.00	0.00	0%
NANTF	0.00	0.00	0%
WICMH	0.00	0.00	0%
TANMH	8,053.10	2,675.71	+33%
MANMH	276.20	14.01	+5%
BIGMH	364.52	94.35	+26%
POCMH	840.77	459.46	+55%
POCOH	0.00	0.00	0%
POCTF	0.00	0.00	0%
PAXMH	143.61	0.00	0%
PAXOH	**0.83**	**43.25**	**+5217%**
PAXTF	**5.64**	**61.30**	**+1086%**
WBRTF	0.00	0.00	0%
POTMH	**400.13**	**691.72**	**+173%**
POTOH	**1,725.78**	**1,742.51**	**+101%**
POTTF	2,591.90	1,088.71	+42%
MATTF	**54.33**	**65.93**	**+121%**
PISTF	337.83	126.62	+37%
Zone Total:	25,026.19	12,236.88	+49%

Lower Zone

Segment	Tier I Goal	1998 SAV	Percent of Goal
CB6PH	511.84	312.58	+61%
CB7PH	4,888.75	3,616.52	+74%
RPPMH	999.92	8.79	+1%
CRRMH	218.56	17.03	+8%
RPPOH	0.00	0.00	0%
RPPTF	0.00	7.29	
PIAMH	806.85	132.11	+16%

TABLE 7 (concluded)

Lower Zone (continued)

Segment	Tier I Goal	1998 SAV	Percent of Goal
MOBPH	5,561.72	4,082.34	+73%
YRKPH	566.98	302.79	+53%
YRKMH	22.21	0.00	0%
MPNOH	0.00	0.00	0%
MPNTF	0.00	34.38	
PMKOH	0.00	0.00	0%
PMKTF	0.00	75.89	
JMSPH	**15.89**	**52.49**	**+330%**
JMSMH	0.00	0.89	
ELIPH	0.00	0.00	0%
ELIMH	0.00	0.00	0%
WBEMH	0.00	0.00	0%
SBEMH	0.00	0.00	0%
EBEMH	0.00	0.00	0%
LAFMH	0.00	0.00	0%
CHKOH	**91.28**	**205.32**	**+225%**
JMSOH	0.00	6.21	
JMSTF	0.00	36.00	
APPTF	0.00	0.00	0%
CB8PH	0.00	4.16	
LYNPH	71.18	16.86	+24%
Zone Total:	13,755.17	8,911.64	+65%
Total for Chesapeake Bay:	46,021.53	25,704.15	+56%

TABLE 8

Number of Hectares of SAV in 1997 and 1998 for each USGS 7.5 Minute Quadrangle of the CBP and Delmarva Peninsula Coastal Bay Segments in Hectares and Acres

Upper Zone

Segment		1997	1998
CB1TF	Conowingo Dam, Md.-Pa. (1)	0.00	0.00
	Aberdeen, Md. (2)	17.06	16.38
	Havre de Grace, Md. (3)	2,307.55	2,136.19
	North East, Md. (4)	0.00	0.00
	Perryman, Md. (8)	2.01	0.69
	Spesutie, Md. (9)	120.16	117.86
	Earleville, Md. (10)	43.22	38.95
	Total (hectares):	2,489.99	2,310.07
	Total (acres):	6,150.28	5,705.87
NORTF	Havre de Grace, Md. (3)	0.00	5.05
	North East, Md. (4)	4.98	4.89
	Total (hectares):	4.98	9.95
	Total (acres):	12.30	24.57
ELKOH	North East, Md. (4)	18.16	114.01
	Elkton, Md.-Del. (5)	0.00	20.60
	Spesutie, Md. (9)	0.00	0.00
	Earleville, Md. (10)	49.28	71.47
	Total (hectares):	67.44	206.07
	Total (acres):	166.57	509.00
BOHOH	Earleville, Md. (10)	15.09	46.40
	Cecilton, Md. (11)	0.00	0.00
	Total (hectares):	15.09	46.40
	Total (acres):	37.27	114.60
C&DOH	Elkton, Md.-Del. (5)	0.00	0.00
	Total (hectares):	0.00	0.00
	Total (acres):	0.00	0.00
CB2OH	Perryman, Md. (8)	21.01	23.66
	Spesutie, Md. (9)	0.00	0.00
	Middle River, Md. (13)	11.13	0.30
	Gunpowder Neck, Md. (14)	36.74	70.17
	Hanesville, Md. (15)	32.30	22.27

TABLE 8 (continued)

Upper Zone (continued)

Segment		1997	1998
CB2OH (continued)	Betterton, Md. (16)	9.01	10.17
	Sparrows Point, Md. (19)	0.00	0.00
	Swan Point, Md. (20)	0.00	0.00
	Rock Hall, Md. (21)	0.00	0.00
	Total (hectares):	110.19	126.56
	Total (acres):	272.16	312.61
SASOH	Spesutie, Md. (9)	0.97	0.00
	Earleville, Md. (10)	13.27	0.61
	Cecilton, Md. (11)	0.00	0.00
	Betterton, Md. (16)	63.95	61.75
	Galena, Md. (17)	32.59	6.24
	Millington, Md. (199)	0.00	0.00
	Total (hectares):	110.78	68.60
	Total (acres):	273.64	169.44
BSHOH	Edgewood, Md. (7)	5.38	0.00
	Perryman, Md. (8)	7.53	0.31
	Gunpowder Neck, Md. (14)	20.43	0.41
	Hanesville, Md. (15)	1.62	1.76
	Total (hectares):	34.95	2.47
	Total (acres):	86.34	6.11
GUNOH	White Marsh, Md. (6)	0.58	0.32
	Edgewood, Md. (7)	155.41	145.62
	Middle River, Md. (13)	9.43	2.66
	Gunpowder Neck, Md. (14)	471.93	722.12
	Total (hectares):	637.36	870.73
	Total (acres):	1,574.29	2,150.70
MIDOH	Middle River, Md. (13)	56.62	13.62
	Gunpowder Neck, Md. (14)	60.74	29.11
	Total (hectares):	117.37	42.73
	Total (acres):	289.89	105.55
BACOH	Baltimore East, Md. (12)	0.00	0.00
	Middle River, Md. (13)	0.00	0.00

TABLE 8 (continued)

Upper Zone (continued)

Segment		1997	1998
BACOH (continued)	Sparrows Point, Md. (19)	0.00	0.00
	Total (hectares):	0.00	0.00
	Total (acres):	0.00	0.00
CB3MH	Sparrows Point, Md. (19)	16.82	14.37
	Swan Point, Md. (20)	26.73	40.32
	Rock Hall, Md. (21)	30.14	31.67
	Gibson Island, Md. (24)	0.00	0.00
	Love Point, Md. (25)	0.00	0.00
	Langford Creek, Md. (26)	297.15	221.93
	Annapolis, Md. (31)	0.00	0.00
	Kent Island, Md. (32)	0.00	0.00
	Total (hectares):	370.83	308.28
	Total (acres):	915.96	761.46
PATMH	Baltimore East, Md. (12)	0.00	0.00
	Middle River, Md. (13)	0.00	0.00
	Curtis Bay, Md. (18)	0.00	0.00
	Sparrows Point, Md. (19)	0.00	0.00
	Gibson Island, Md. (24)	1.93	5.86
	Total (hectares):	1.93	5.86
	Total (acres):	4.77	14.47
MAGMH	Round Bay, Md. (23)	4.60	6.98
	Gibson Island, Md. (24)	48.89	73.03
	Total (hectares):	53.48	80.02
	Total (acres):	132.10	197.64
CHSMH	Rock Hall, Md. (21)	5.77	20.38
	Chestertown, Md. (22)	0.00	0.00
	Love Point, Md. (25)	0.00	0.00
	Langford Creek, Md. (26)	266.35	276.05
	Centreville, Md. (27)	0.00	2.87
	Kent Island, Md. (32)	15.03	35.68
	Queenstown, Md. (33)	137.67	142.91
	Total (hectares):	424.81	477.89
	Total (acres):	1,049.28	1,180.38

TABLE 8 (continued)

Upper Zone (concluded)

Segment		1997	1998
CHSOH	Betterton, Md. (16)	0.00	0.00
	Chestertown, Md. (22)	0.00	0.00
	Centreville, Md. (27)	0.00	0.00
	Church Hill, Md. (193)	0.00	0.00
	Total (hectares):	0.00	0.00
	Total (acres):	0.00	0.00
CHSTF	Galena, Md. (17)	0.00	0.00
	Church Hill, Md. (193)	0.00	0.00
	Millington, Md. (199)	0.00	0.00
	Total (hectares):	0.00	0.00
	Total (acres):	0.00	0.00

Middle Zone

Segment		1997	1998
CB4MH	Gibson Island, Md. (24)	0.00	0.00
	Annapolis, Md. (31)	0.00	0.00
	Kent Island, Md. (32)	4.97	0.00
	Deale, Md. (35)	0.00	0.00
	Claiborne, Md. (36)	0.00	0.00
	North Beach, Md. (42)	15.31	0.00
	Tilghman, Md. (43)	0.00	0.00
	Prince Frederick, Md. (50)	0.00	0.00
	Hudson, Md. (51)	0.00	0.00
	Broomes Island, Md. (60)	0.00	0.00
	Cove Point, Md. (61)	0.00	0.00
	Taylors Island, Md. (62)	0.00	0.00
	Horseshoe Point, Md. (180)	0.00	0.00
	Total (hectares):	20.28	0.00
	Total (acres):	50.09	0.00
EASMH	Kent Island, Md. (32)	663.89	456.87
	Queenstown, Md. (33)	389.77	390.35
	Claiborne, Md. (36)	273.51	146.32
	St. Michaels, Md. (37)	521.16	113.72
	Easton, Md. (38)	0.00	0.00
	Oxford, Md. (44)	0.00	0.00

TABLE 8 (continued)

Middle Zone (continued)

Segment		1997	1998
EASMH (continued)	Wye Mills, Md. (158)	0.00	0.00
	Total (hectares):	1,848.32	1,107.25
	Total (acres):	4,565.36	2,734.91
CHOMH1	Claiborne, Md. (36)	387.78	387.53
	St. Michaels, Md. (37)	196.39	207.03
	Easton, Md. (38)	12.45	12.53
	Tilghman, Md. (43)	528.07	397.81
	Oxford, Md. (44)	820.84	671.03
	Trappe, Md. (45)	40.74	40.36
	Hudson, Md. (51)	568.45	501.80
	Church Creek, Md. (52)	237.87	65.22
	Total (hectares):	2,792.59	2,283.31
	Total (acres):	6,897.70	5,639.77
CHOMH2	Oxford, Md. (44)	0.00	0.00
	Trappe, Md. (45)	0.00	0.00
	Preston, Md. (46)	0.00	0.00
	Church Creek, Md. (52)	1.76	0.00
	Cambridge, Md. (53)	0.00	0.00
	East New Market, Md. (54)	0.00	0.00
	Total (hectares):	1.76	0.00
	Total (acres):	4.35	0.00
CHOOH	Easton, Md. (38)	0.00	0.00
	Trappe, Md. (45)	0.00	0.00
	Preston, Md. (46)	0.00	0.00
	Fowling Creek, Md. (160)	0.00	0.00
	Hobbs, Md. (192)	0.00	0.00
	Total (hectares):	0.00	0.00
	Total (acres):	0.00	0.00
CHOTF	Fowling Creek, Md. (160)	0.00	0.00
	Hobbs, Md. (192)	0.00	0.00
	Total (hectares):	0.00	0.00
	Total (acres):	0.00	0.00

TABLE 8 (continued)

Middle Zone (continued)

Segment		1997	1998
LCHMH	Hudson, Md. (51)	135.23	165.03
	Church Creek, Md. (52)	342.71	439.33
	Taylors Island, Md. (62)	51.44	12.86
	Golden Hill, Md. (63)	0.00	0.00
	Total (hectares):	529.39	617.22
	Total (acres):	1,307.59	1,524.54
SEVMH	Round Bay, Md. (23)	123.87	162.34
	Gibson Island, Md. (24)	0.00	1.06
	South River, Md. (30)	0.00	0.00
	Annapolis, Md. (31)	0.00	0.00
	Total (hectares):	123.87	163.40
	Total (acres):	305.95	403.60
SOUMH	South River, Md. (30)	16.35	22.00
	Annapolis, Md. (31)	0.00	0.00
	Total (hectares):	16.35	22.00
	Total (acres):	40.38	54.34
RHDMH	South River, Md. (30)	0.00	0.00
	Annapolis, Md. (31)	0.00	0.00
	Deale, Md. (35)	0.00	0.00
	Horseshoe Point, Md. (180)	0.00	0.00
	Total (hectares):	0.00	0.00
	Total (acres):	0.00	0.00
WSTMH	Deale, Md. (35)	0.00	3.21
	Horseshoe Point, Md. (180)	0.00	0.00
	Total (hectares):	0.00	3.21
	Total (acres):	0.00	7.93
CB5MH	Cove Point, Md. (61)	0.00	0.00
	Taylors Island, Md. (62)	0.00	0.00
	Solomons Island, Md. (71)	0.00	0.00
	Barren Island, Md. (72)	25.15	0.00
	Honga, Md. (73)	43.80	2.02
	St. Marys City, Md. (80)	0.00	0.00
	Point No Point, Md. (81)	0.00	0.00
	Richland Point, Md. (82)	0.00	0.00

TABLE 8 (continued)

Middle Zone (continued)

Segment		1997	1998
CB5MH (continued)	Point Lookout, Md. (90)	0.00	0.00
	Heathsville, Va.- Md. (97)	0.00	0.00
	Burgess, Va.- Md. (98)	0.00	0.00
	Reedville, Va. (106)	235.88	224.16
	Fleets Bay, Va. (112)	431.25	434.37
	Deltaville, Va. (118)	0.00	0.00
	Goose Island, Va. (179)	0.00	0.00
	Smith Point, Va. - Md. (182)	0.00	0.00
	East of Reedville, Va. (183)	0.00	0.00
	Lancaster, Va. (194)	0.00	0.00
	Total (hectares):	736.07	660.55
	Total (acres):	1,818.10	1,631.57
HNGMH	Golden Hill, Md. (63)	9.49	12.27
	Honga, Md. (73)	530.99	236.34
	Wingate, Md. (74)	350.02	56.15
	Richland Point, Md. (82)	0.00	0.00
	Bloodsworth Island, Md. (83)	0.00	11.61
	Total (hectares):	890.51	316.37
	Total (acres):	2,199.55	781.43
FSBMH	Wingate, Md. (74)	0.00	0.00
	Nanticoke, Md. (75)	0.00	0.00
	Bloodsworth Island, Md. (83)	0.00	0.00
	Deal Island, Md. (84)	0.00	0.00
	Total (hectares):	0.00	0.00
	Total (acres):	0.00	0.00
NANMH	Nanticoke, Md. (75)	0.00	0.00
	Deal Island, Md. (84)	0.00	0.00
	Mardela Springs, Md. (163)	0.00	0.00
	Wetipquin, Md. (164)	0.00	0.00
	Total (hectares):	0.00	0.00
	Total (acres):	0.00	0.00
NANOH	Mardela Springs, Md. (163)	0.00	0.00
	Rhodesdale, Md. (190)	0.00	0.00

TABLE 8 (continued)

Middle Zone (continued)

Segment		1997	1998
NANOH	Sharptown, Md.- Del. (191)	0.00	0.00
(continued)	Total (hectares):	0.00	0.00
	Total (acres):	0.00	0.00
NANTF	Rhodesdale, Md. (190)	0.00	0.00
	Sharptown, Md.- Del. (191)	0.00	0.00
	Total (hectares):	0.00	0.00
	Total (acres):	0.00	0.00
WICMH	Nanticoke, Md. (75)	0.00	0.00
	Deal Island, Md. (84)	0.00	0.00
	Monie, Md. (85)	0.00	0.00
	Wetipquin, Md. (164)	0.00	0.00
	Eden, Md. (189)	0.00	0.00
	Total (hectares):	0.00	0.00
	Total (acres):	0.00	0.00
TANMH	Richland Point, Md. (82)	0.00	0.00
	Bloodsworth Island, Md. (83)	38.36	37.32
	Deal Island, Md. (84)	0.00	0.00
	Kedges Straits, Md. (91)	345.52	165.86
	Terrapin Sand Point, Md. (92)	137.39	65.50
	Marion, Md. (93)	29.89	12.26
	Ewell, Md.- Va. (99)	1,503.02	1,084.61
	Great Fox Island, Va.- Md. (100)	1,048.36	678.73
	Crisfield, Md.- Va. (101)	148.66	79.23
	Tangier Island, Va. (107)	437.00	424.34
	Chesconessex, Va. (108)	0.00	0.00
	Goose Island, Va. (179)	137.36	127.87
	Total (hectares):	3,825.57	2,675.71
	Total (acres):	9,449.17	6,609.01
MANMH	Deal Island, Md. (84)	0.00	0.00
	Monie, Md. (85)	0.00	0.00
	Terrapin Sand Point, Md. (92)	0.48	0.00
	Marion, Md. (93)	55.97	14.01
	Princess Anne, Md. (196)	0.00	0.00
	Total (hectares):	56.44	14.01
	Total (acres):	139.42	34.61

TABLE 8 (continued)

Middle Zone (continued)

Segment		1997	1998
BIGMH	Marion, Md. (93)	143.25	94.35
	Kingston, Md. (188)	0.00	0.00
	Total (hectares):	143.25	94.35
	Total (acres):	353.83	233.04
POCMH	Crisfield, Md.- Va. (101)	11.69	4.06
	Saxis, Va.- Md. (102)	0.83	0.00
	Chesconessex, Va. (108)	177.76	103.82
	Parksley, Va. (109)	339.55	351.58
	Kingston, Md. (188)	0.00	0.00
	Accomax, Va. (217)	0.00	0.00
	Total (hectares):	529.84	459.46
	Total (acres):	1,308.70	1,134.86
POCOH	Saxis, Va.- Md. (102)	0.00	0.00
	Kingston, Md. (188)	0.00	0.00
	Hallwood, Va. - Md. (198)	0.00	0.00
	Pocomoke City, Md. - Va. (202)	0.00	0.00
	Total (hectares):	0.00	0.00
	Total (acres):	0.00	0.00
POCTF	Girdle Tree, Md.- Va. (171)	0.00	0.00
	Pocomoke City, Md. - Va. (202)	0.00	0.00
	Total (hectares):	0.00	0.00
	Total (acres):	0.00	0.00
PAXMH	Benedict, Md. (49)	0.00	0.00
	Mechanicsville, Md. (59)	0.00	0.00
	Broomes Island, Md. (60)	0.00	0.00
	Cove Point, Md. (61)	0.00	0.00
	Hollywood, Md. (70)	0.00	0.00
	Solomons Island, Md. (71)	1.02	0.00
	Total (hectares):	1.02	0.00
	Total (acres):	2.51	0.00
PAXOH	Lower Marlboro, Md. (41)	40.08	43.25
	Benedict, Md. (49)	0.00	0.00
	Total (hectares):	40.08	43.25
	Total (acres):	99.00	106.83

TABLE 8 (continued)

Middle Zone (continued)

Segment		1997	1998
PAXTF	Lower Marlboro, Md. (41)	29.20	34.17
	Bristol, Md. (159)	23.95	27.14
	Bowie, Md. (181)	0.00	0.00
	Total (hectares):	53.16	61.30
	Total (acres):	131.29	151.42
WBRTF	Bristol, Md. (159)	0.00	0.00
	Total (hectares):	0.00	0.00
	Total (acres):	0.00	0.00
POTMH	Mathias Point, Md.- Va. (57)	12.87	13.60
	Popes Creek, Md. (58)	35.95	45.12
	Mechanicsville, Md. (59)	0.00	0.00
	Broomes Island, Md. (60)	0.00	0.00
	King George, Va.- Md. (65)	0.00	0.00
	Dahlgren, Va.- Md. (66)	72.42	146.64
	Colonial Beach North, Md.- Va. (67)	197.02	162.58
	Rock Point, Md. (68)	140.70	92.66
	Leonardtown, Md. (69)	50.54	42.12
	Colonial Beach South, Va.- Md. (76)	0.00	1.98
	Stratford Hall, Va.- Md. (77)	20.05	21.56
	St. Clements Island, Va.- Md. (78)	85.71	106.59
	Piney Point, Md.- Va. (79)	0.00	0.00
	St. Marys City, Md. (80)	18.68	23.07
	Point No Point, Md. (81)	0.00	0.00
	Machodoc, Va. (87)	16.81	23.35
	Kinsale, Va.- Md. (88)	0.00	0.00
	St. George Island, Va.- Md. (89)	0.00	0.00
	Point Lookout, Md. (90)	0.00	0.00
	Lottsburg, Va. (96)	0.00	0.00
	Heathsville, Va.- Md. (97)	0.00	0.00
	Burgess, Va.- Md. (98)	0.00	0.00
	Charlotte Hall, Md. (162)	16.09	12.46
	Total (hectares):	666.84	691.72
	Total (acres):	1,647.10	1,708.54

TABLE 8 (continued)

Middle Zone (continued)

Segment		1997	1998
POTOH	Quantico, Va.- Md. (47)	141.39	222.04
	Indian Head, Va.- Md. (48)	0.00	0.00
	Widewater, Va.- Md. (55)	135.00	491.54
	Nanjemoy, Md. (56)	184.56	197.63
	Mathias Point, Md.- Va. (57)	431.01	552.37
	Popes Creek, Md. (58)	0.00	0.00
	Passapatanzy, Md.- Va. (64)	252.53	199.62
	King George, Va.- Md. (65)	40.42	60.45
	Dahlgren, Va.- Md. (66)	20.61	17.86
	Port Tobacco, Md. (161)	0.74	1.01
	Total (hectares):	1,206.26	1,742.51
	Total (acres):	2,979.46	4,304.01
POTTF	Washington West, Md.- D.C.- Va (28)	0.20	0.00
	Washington East, D.C.- Md. (29)	0.00	0.00
	Alexandria, Va.- D.C.- Md. (34)	136.56	439.02
	Fort Belvoir, Va.- Md. (39)	206.77	158.55
	Mt. Vernon, Md.- Va. (40)	123.80	190.24
	Quantico, Va.- Md. (47)	70.87	102.34
	Indian Head, Va.- Md. (48)	15.54	198.42
	Port Tobacco, Md. (161)	0.00	0.00
	Anacostia, D.C.- Md. (176)	0.35	0.14
	Total (hectares):	554.11	1,088.71
	Total (acres):	1,368.64	2,689.11
MATTF	Indian Head, Va.- Md. (48)	50.28	65.93
	Total (hectares):	50.28	65.93
	Total (acres):	124.19	162.84
PISTF	Mt. Vernon, Md.- Va. (40)	123.25	126.62
	Total (hectares):	123.25	126.62
	Total (acres):	304.42	312.74
CB6PH	Deltaville, Va. (118)	5.58	6.19
	Mathews, Va. (123)	17.76	15.91
	New Point Comfort, Va. (132)	337.35	290.17
	Hampton, Va. (147)	0.00	0.00

TABLE 8 (continued)

Lower Zone

Segment		1997	1998
CB6PH (continued)	East of New Point Comfort, Va. (177)	0.37	0.00
	Bethel Beach, Va. (178)	0.78	0.31
	Total (hectares):	361.84	312.58
	Total (acres):	893.74	772.07
CB7PH	Chesconessex, Va. (108)	754.24	702.92
	Parksley, Va. (109)	0.86	0.73
	Nandua Creek, Va. (113)	378.30	343.86
	Pungoteague, Va. (114)	891.14	806.09
	Jamesville, Va. (119)	546.09	473.04
	Franktown, Va. (124)	645.06	634.92
	Cape Charles, Va. (133)	428.29	357.11
	Cheriton, Va. (134)	88.31	74.91
	Elliotts Creek, Va. (142)	183.33	198.41
	Townsend, Va. (143)	0.00	0.00
	Fishermans Island, Va. (186)	21.57	24.54
	Exmore, Va. (187)	0.00	0.00
	Accomax, Va. (217)	0.00	0.00
	Total (hectares):	3,937.20	3,616.52
	Total (acres):	9,724.87	8,932.81
RPPMH	Machodoc, Va. (87)	0.00	0.00
	Mount Landing, Va. (94)	0.00	0.00
	Tappahannock, Va. (95)	0.00	0.00
	Lottsburg, Va. (96)	0.00	0.00
	Dunnsville, Va. (103)	0.00	0.00
	Morattico, Va. (104)	0.00	0.00
	Lively, Va. (105)	0.00	0.00
	Urbanna, Va. (110)	0.00	0.00
	Irvington, Va. (111)	5.23	3.95
	Fleets Bay, Va. (112)	0.00	0.00
	Saluda, Va. (116)	0.00	0.00
	Wilton, Va. (117)	0.00	0.00
	Deltaville, Va. (118)	9.47	4.84
	Haynesville, Va. (197)	0.00	0.00
	Total (hectares):	14.70	8.79
	Total (acres):	36.31	21.71

TABLE 8 (continued)

Lower Zone (continued)

Segment		1997	1998
RPPOH	Colonial Beach South, Va.- Md. (76)	0.00	0.00
	Stratford Hall, Va.- Md. (77)	0.00	0.00
	Champlain, Va. (86)	0.00	0.00
	Mount Landing, Va. (94)	0.00	0.00
	Loretto, Va. (201)	0.00	0.00
	Total (hectares):	0.00	0.00
	Total (acres):	0.00	0.00
RPPTF	Passapatanzy, Md.- Va. (64)	0.00	0.00
	King George, Va.- Md. (65)	0.00	0.00
	Colonial Beach South, Va.- Md. (76)	0.00	0.00
	Champlain, Va. (86)	0.00	0.00
	Rollins Fork, Va. (200)	0.00*	5.20
	Loretto, Va. (201)	0.00*	2.09
	Total (hectares):	0.00*	7.29
	Total (acres):	0.00*	18.00
CRRMH	Lively, Va. (105)	0.00	0.00
	Urbanna, Va. (110)	0.00	0.00
	Irvington, Va. (111)	15.29	17.03
	Lancaster, Va. (194)	0.00	0.00
	Total (hectares):	15.29	17.03
	Total (acres):	37.76	42.05
PIAMH	Saluda, Va. (116)	0.00	0.00
	Wilton, Va. (117)	0.00	0.00
	Deltaville, Va. (118)	76.61	43.97
	Mathews, Va. (123)	98.40	88.14
	Total (hectares):	175.01	132.11
	Total (acres):	432.27	326.31
MOBPH	Ware Neck, Va. (122)	257.84	179.35
	Mathews, Va. (123)	57.48	41.73
	Achilles, Va. (131)	904.69	798.66
	New Point Comfort, Va. (132)	1,176.58	1,125.73
	Poquoson West, Va. (140)	543.24	471.59
	Poquoson East, Va. (141)	1,185.90	1,183.96
	Newport News North, Va. (146)	0.00	0.00

TABLE 8 (continued)

Lower Zone (continued)

Segment		1997	1998
MOBPH (continued)	Hampton, Va. (147)	316.76	281.32
	Total (hectares):	4,442.49	4,082.34
	Total (acres):	10,972.95	10,083.37
YRKPH	Clay Bank, Va. (130)	0.00	0.00
	Achilles, Va. (131)	293.04	275.22
	Yorktown, Va. (139)	5.00	2.09
	Poquoson West, Va. (140)	41.45	25.48
	Total (hectares):	339.50	302.79
	Total (acres):	838.55	747.90
YRKMH	West Point, Va. (115)	0.00	0.00
	Toano, Va. (120)	0.00	0.00
	Gressitt, Va. (121)	0.00	0.00
	Williamsburg, Va. (129)	0.00	0.00
	Clay Bank, Va. (130)	0.00	0.00
	Total (hectares):	0.00	0.00
	Total (acres):	0.00	0.00
MPNOH	West Point, Va. (115)	0.00	0.00
	King & Queen Courthouse, Va. (226)	0.00	0.00
	Truhart, Va. (227)	0.00	0.00
	New Kent, Va. (229)	0.00	0.00
	Total (hectares):	0.00	0.00
	Total (acres):	0.00	0.00
MPNTF	King William, Va. (225)	0.00*	24.40
	King & Queen Courthouse, Va. (226)	0.00*	9.98
	Manquin, Va. (230)	0.00	0.00
	Total (hectares):	0.00*	34.38
	Total (acres):	0.00*	84.93
PMKOH	West Point, Va. (115)	0.00	0.00
	New Kent, Va. (229)	0.00	0.00
	Total (hectares):	0.00	0.00
	Total (acres):	0.00	0.00
PMKTF	King William, Va. (225)	0.00*	5.90
	Tunstall, Va. (228)	0.00*	69.72

TABLE 8 (continued)

Lower Zone (continued)

Segment		1997	1998
PMKTF	New Kent, Va. (229)	0.00	0.00
(continued)	Manquin, Va. (230)	0.00*	0.27
	Total (hectares):	0.00*	75.89
	Total (acres):	0.00*	187.45
CB8PH	Hampton, Va. (147)	0.00	0.00
	Norfolk North, Va. (150)	0.00	0.00
	Little Creek, Va. (151)	4.37	4.16
	Cape Henry, Va. (152)	0.00	0.00
	Total (hectares):	4.37	4.16
	Total (acres):	10.81	10.28
LYNPH	Cape Henry, Va. (152)	16.14	16.86
	Kempsville, Va. (156)	0.00	0.00
	Princess Anne, Va. (157)	0.00	0.00
	Total (hectares):	16.14	16.86
	Total (acres):	39.86	41.63
JMSPH	Hampton, Va. (147)	52.27	46.00
	Newport News South, Va. (149)	23.47	6.49
	Norfolk North, Va. (150)	0.00	0.00
	Total (hectares):	75.74	52.49
	Total (acres):	187.08	129.64
ELIPH	Norfolk North, Va. (150)	0.00	0.00
	Total (hectares):	0.00	0.00
	Total (acres):	0.00	0.00
LAFMH	Norfolk North, Va. (150)	0.00	0.00
	Little Creek, Va. (151)	0.00	0.00
	Norfolk South, Va. (155)	0.00	0.00
	Total (hectares):	0.00	0.00
	Total (acres):	0.00	0.00
ELIMH	Norfolk North, Va. (150)	0.00	0.00
	Norfolk South, Va. (155)	0.00	0.00
	Total (hectares):	0.00	0.00
	Total (acres):	0.00	0.00

TABLE 8 (continued)

Lower Zone (continued)

Segment		1997	1998
WBEMH	Bowers Hill, Va. (154)	0.00	0.00
	Norfolk South, Va. (155)	0.00	0.00
	Total (hectares):	0.00	0.00
	Total (acres):	0.00	0.00
SBEMH	Norfolk South, Va. (155)	0.00	0.00
	Deep Creek, Va. (221)	0.00	0.00
	Total (hectares):	0.00	0.00
	Total (acres):	0.00	0.00
EBEMH	Norfolk South, Va. (155)	0.00	0.00
	Kempsville, Va. (156)	0.00	0.00
	Total (hectares):	0.00	0.00
	Total (acres):	0.00	0.00
JMSMH	Hog Island, Va. (138)	0.00	0.00
	Yorktown, Va. (139)	0.00	0.00
	Bacons Castle, Va. (144)	0.00	0.00
	Mulberry Island, Va. (145)	0.00	0.00
	Newport News North, Va. (146)	0.00	0.00
	Benns Church, Va. (148)	0.00	0.00
	Newport News South, Va. (149)	1.05	0.89
	Chuckatuck, Va. (153)	0.00	0.00
	Bowers Hill, Va. (154)	0.00	0.00
	Total (hectares):	1.05	0.89
	Total (acres):	2.58	2.20
JMSOH	Claremont, Va. (136)	0.00	0.00
	Surry, Va. (137)	0.00*	5.97
	Hog Island, Va. (138)	0.00*	0.24
	Total (hectares):	0.00*	6.21
	Total (acres):	0.00*	15.34
CHKOH	Brandon, Va. (127)	0.00*	100.91
	Norge, Va. (128)	0.00*	90.53
	Claremont, Va. (136)	0.00	0.00
	Surry, Va. (137)	0.00*	1.26
	Providence Forge, Va. (209)	0.00	0.00

TABLE 8 (continued)

Lower Zone (continued)

Segment		1997	1998
CHKOK (continued)	Walkers, Va. (210)	0.00*	12.62
	Total (hectares):	0.00*	205.32
	Total (acres):	0.00*	507.13
JMSTF	Westover, Va. (125)	0.00	0.00
	Charles City, Va. (126)	0.00	0.00
	Brandon, Va. (127)	0.00	0.00
	Savedge, Va. (135)	0.00*	36.00
	Claremont, Va. (136)	0.00	0.00
	Diputanta North, Va. (203)	0.00	0.00
	Hopewell, Va. (204)	0.00	0.00
	Chester, Va. (205)	0.00	0.00
	Drewrys Bluff, Va. (206)	0.00	0.00
	Dutch Gap, Va. (207)	0.00	0.00
	Roxbury, Va. (208)	0.00	0.00
	Richmond, Va. (211)	0.00	0.00
	Total (hectares):	0.00*	36.00
	Total (acres):	0.00	88.92
APPTF	Hopewell, Va. (204)	0.00	0.00
	Chester, Va. (205)	0.00	0.00
	Total (hectares):	0.00	0.00
	Total (acres):	0.00	0.00

Delmarva Peninsula Coastal Bays Zone

Segment		1997	1998
AAWPH	Selbyville, Md. (165)	0.00	0.00
	Assawoman Bay, Md.- Del. (166)	180.32	174.63
	Total (hectares):	180.32	174.63
	Total (acres):	445.40	431.33
IOWPH	Selbyville, Md. (165)	0.00	0.00
	Assawoman Bay, Md.- Del. (166)	62.98	60.10
	Berlin, Md. (167)	0.00	0.00
	Ocean City, Md. (168)	16.88	20.61
	Total (hectares):	79.87	80.71
	Total (acres):	197.27	199.34

TABLE 8 (concluded)

Delmarva Peninsula Coastal Bays Zone (concluded)

Segment		1997	1998
SPXPH	Berlin, Md. (167)	73.82	85.16
	Ocean City, Md. (168)	62.97	75.71
	Tingles Island, Md. (170)	284.61	317.38
	Total (hectares):	421.40	478.25
	Total (acres):	1,040.86	1,181.28
CHNPH	Berlin, Md. (167)	0.00	0.00
	Public Landing, Md. (169)	0.00	0.00
	Tingles Island, Md. (170)	1,237.82	1,452.49
	Girdle Tree, Md.- Va. (171)	15.34	18.22
	Boxiron, Md.- Va. (172)	1,034.63	1,084.80
	Whittington Point, Md.- Va. (173)	567.77	607.55
	Chincoteague West, Va. (174)	411.88	435.65
	Chincoteague East, Va. (175)	1,649.34	1,822.56
	Wallops Island, Va. (220)	0.00	0.00
	Total (hectares):	4,916.78	5,421.27
	Total (acres):	12,144.44	13,390.54
SVCPH	Franktown, Va. (124)	0.00	0.00
	Cheriton, Va. (134)	0.00	0.00
	Townsend, Va. (143)	0.00	0.00
	Cobb Island, Va. (184)	0.00	0.00
	Fishermans Island, Va. (186)	0.00	0.00
	Exmore, Va. (187)	0.00	0.00
	Ship Shoal Inlet, Va. (212)	0.00	0.00
	Great Machipongo Inlet, Va. (213)	0.00	0.00
	Nassawadox, Va. (214)	0.00	0.00
	Quimbly Inlet, Va. (215)	0.00	0.00
	Wachapreague, Va. (216)	0.00	0.00
	Accomax, Va. (217)	0.00	0.00
	Metompkin Inlet, Va. (218)	0.00	0.00
	Bloxom, Va. (219)	0.00	0.00
	Wallops Island, Va. (220)	0.00	0.00
	Total (hectares):	0.00	0.00
	Total (acres):	0.00	0.00

* Area not completely flown in 1997 but most likely had SAV in 1997 based on 1998 data.

TABLE 9

Number of Hectares and the Percentage of SAV in 1997 and 1998 by Density Class for the CBP and Delmarva Peninsula Coastal Bay Segments

Upper Zone

Segment	Year	Class 1		Class 2		Class 3		Class 4		Total
CB1TF	1997	1,879.69	75%	285.47	11%	83.14	3%	241.69	10%	2,489.99
	1998	1,824.71	79%	192.70	8%	62.03	3%	230.64	10%	2,310.07
NORTF	1997	0.00	0%	0.00	0%	0.00	0%	4.98	100%	4.98
	1998	6.92	70%	1.03	10%	1.99	20%	0.00	0%	9.95
ELKOH	1997	6.18	9%	36.16	54%	13.33	20%	11.77	17%	67.44
	1998	98.12	48%	75.67	37%	10.43	5%	21.86	11%	206.07
BOHOH	1997	4.34	29%	10.75	71%	0.00	0%	0.00	0%	15.09
	1998	32.65	70%	2.86	6%	2.54	5%	8.35	18%	46.40
C&DOH	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
	1998	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
CB2OH	1997	22.42	20%	13.62	12%	33.55	30%	40.60	37%	110.19
	1998	16.05	13%	79.61	63%	6.83	5%	24.07	19%	126.56
SASOH	1997	56.94	51%	37.53	34%	0.00	0%	16.32	15%	110.78
	1998	47.90	70%	8.88	13%	4.57	7%	7.25	11%	68.60
BSHOH	1997	0.52	1%	11.23	32%	4.94	14%	18.26	52%	34.95
	1998	1.05	42%	0.87	35%	0.31	13%	0.24	10%	2.47
GUNOH	1997	92.47	15%	108.16	17%	62.47	10%	374.27	59%	637.36
	1998	304.58	35%	101.98	12%	5.29	1%	458.89	53%	870.73
MIDOH	1997	34.67	30%	38.17	33%	19.28	16%	25.24	22%	117.37
	1998	20.20	47%	7.26	17%	5.75	13%	9.53	22%	42.73
BACOH	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
	1998	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
CB3MH	1997	21.15	6%	37.29	10%	18.06	5%	294.33	79%	370.83
	1998	35.54	12%	4.17	1%	0.11	0%	268.46	87%	308.28
PATMH	1997	0.00	0%	0.00	0%	1.93	100%	0.00	0%	1.93
	1998	0.00	0%	0.00	0%	1.21	21%	4.65	79%	5.86
MAGMH	1997	4.00	7%	6.42	12%	7.61	14%	35.46	66%	53.48
	1998	2.21	3%	15.30	19%	12.55	16%	49.95	62%	80.02

TABLE 9 (continued)

Upper Zone (concluded)

Segment	Year	Class 1		Class 2		Class 3		Class 4		Total
CHSMH	1997	25.49	6%	47.03	11%	19.29	5%	333.00	78%	424.81
	1998	28.25	6%	35.19	7%	42.85	9%	371.60	78%	477.89
CHSOH	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
	1998	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
CHSTF	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
	1998	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00

Middle Zone

Segment	Year	Class 1		Class 2		Class 3		Class 4		Total
CB4MH	1997	0.00	0%	1.35	7%	15.31	75%	3.62	18%	20.28
	1998	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
EASMH	1997	182.07	10%	246.68	13%	320.14	17%	1,099.44	59%	1,848.32
	1998	169.26	15%	209.77	19%	326.94	30%	401.28	36%	1,107.25
CHOMH1	1997	203.41	7%	291.54	10%	254.28	9%	2,043.35	73%	2,792.59
	1998	83.61	4%	391.45	17%	280.58	12%	1,527.67	67%	2,283.31
CHOMH2	1997	0.00	0%	0.00	0%	0.00	0%	1.76	100%	1.76
	1998	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
CHOOH	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
	1998	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
CHOTF	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
	1998	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
LCHMH	1997	36.32	7%	152.40	29%	165.31	31%	175.36	33%	529.39
	1998	43.15	7%	64.85	11%	126.46	20%	382.76	62%	617.22
SEVMH	1997	2.04	2%	6.73	5%	11.46	9%	103.63	84%	123.87
	1998	0.00	0%	11.45	7%	6.49	4%	145.47	89%	163.40
SOUMH	1997	1.25	8%	1.60	10%	12.16	74%	1.35	8%	16.35
	1998	2.39	11%	11.48	52%	3.27	15%	4.86	22%	22.00
RHDMH	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
	1998	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
WSTMH	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
	1998	1.11	35%	0.97	30%	0.00	0%	1.13	35%	3.21

TABLE 9 (continued)

Middle Zone (continued)

Segment	Year	Class 1		Class 2		Class 3		Class 4		Total
CB5MH	1997	192.22	26%	397.99	54%	130.66	18%	15.21	2%	736.07
	1998	134.35	20%	313.72	47%	98.72	15%	113.77	17%	660.55
HNGMH	1997	38.03	4%	457.15	51%	275.49	31%	119.84	13%	890.51
	1998	61.96	20%	137.01	43%	83.95	27%	33.44	11%	316.37
FSBMH	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
	1998	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
NANMH	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
	1998	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
NANOH	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
	1998	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
NANTF	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
	1998	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
WICMH	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
	1998	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
TANMH	1997	862.79	23%	707.12	18%	366.33	10%	1,889.33	49%	3,825.57
	1998	564.09	21%	627.24	23%	431.99	16%	1,052.40	39%	2,675.71
MANMH	1997	0.00	0%	31.75	56%	24.70	44%	0.00	0%	56.44
	1998	0.34	2%	2.01	14%	11.65	83%	0.00	0%	14.01
BIGMH	1997	14.78	10%	35.91	25%	92.56	65%	0.00	0%	143.25
	1998	2.27	2%	58.31	62%	6.16	7%	27.60	29%	94.35
POCMH	1997	81.77	15%	209.02	39%	11.53	2%	227.52	43%	529.84
	1998	121.93	27%	62.09	14%	41.47	9%	233.96	51%	459.46
POCOH	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
	1998	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
POCTF	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
	1998	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
PAXMH	1997	0.00	0%	1.02	100%	0.00	0%	0.00	0%	1.02
	1998	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
PAXOH	1997	0.00	0%	0.00	0%	0.80	2%	39.28	98%	40.08
	1998	0.00	0%	0.00	0%	2.96	7%	40.30	93%	43.25

TABLE 9 (continued)

Middle Zone (concluded)

Segment	Year	Class 1		Class 2		Class 3		Class 4		Total
PAXTF	1997	0.00	0%	1.59	3%	2.33	4%	49.24	93%	53.16
	1998	0.00	0%	0.22	0%	2.22	4%	58.86	96%	61.30
WBRTF	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
	1998	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
POTMH	1997	31.42	5%	125.94	19%	72.63	11%	436.84	66%	666.84
	1998	37.42	5%	102.94	15%	62.29	9%	489.06	71%	691.72
POTOH	1997	49.01	4%	211.49	18%	116.19	10%	829.57	69%	1,206.26
	1998	59.52	3%	124.66	7%	32.50	2%	1,525.83	88%	1,742.51
POTTF	1997	67.74	12%	59.58	11%	21.15	4%	405.64	73%	554.11
	1998	146.48	13%	143.88	13%	67.13	6%	731.23	67%	1,088.71
MATTF	1997	0.00	0%	1.10	2%	2.09	4%	47.09	94%	50.28
	1998	0.00	0%	3.78	6%	3.92	6%	58.23	88%	65.93
PISTF	1997	0.00	0%	0.18	0%	0.00	0%	123.07	100%	123.25
	1998	0.00	0%	1.05	1%	0.00	0%	125.57	99%	126.62

Lower Zone

Segment	Year	Class 1		Class 2		Class 3		Class 4		Total
CB6PH	1997	63.41	18%	33.58	9%	40.00	11%	224.85	62%	361.84
	1998	25.62	8%	80.47	26%	45.22	14%	161.27	52%	312.58
CB7PH	1997	1,306.35	33%	787.17	20%	363.90	9%	1,479.78	38%	3,937.20
	1998	1,087.11	30%	876.67	24%	429.44	12%	1,223.31	34%	3,616.52
RPPMH	1997	9.73	66%	4.97	34%	0.00	0%	0.00	0%	14.70
	1998	8.79	100%	0.00	0%	0.00	0%	0.00	0%	8.79
CRRMH	1997	0.00	0%	4.86	32%	10.43	68%	0.00	0%	15.29
	1998	0.49	3%	0.81	5%	13.24	78%	2.49	15%	17.03
RPPOH	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
	1998	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
RPPTF	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
	1998	0.00	0%	1.04	14%	2.09	29%	4.16	57%	7.29
PIAMH	1997	29.46	17%	71.13	41%	37.17	21%	37.24	21%	175.01
	1998	33.21	25%	25.95	20%	25.57	19%	47.39	36%	132.11

TABLE 9 (continued)

Lower Zone (continued)

Segment	Year	Class 1		Class 2		Class 3		Class 4		Total
MOBPH	1997	312.54	7%	700.68	16%	545.51	12%	2,883.77	65%	4,442.49
	1998	222.00	5%	1,198.35	29%	279.68	7%	2,382.31	58%	4,082.34
YRKPH	1997	27.32	8%	19.06	6%	0.00	0%	293.11	86%	339.50
	1998	36.72	12%	6.84	2%	0.00	0%	259.23	86%	302.79
YRKMH	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
	1998	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
MPNOH	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
	1998	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
MPNTF	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00*
	1998	0.00	0%	8.62	25%	8.13	24%	17.63	51%	34.38
PMKOH	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
	1998	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
PMKTF	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00*
	1998	0.22	0%	10.72	14%	6.54	9%	58.40	77%	75.89
JMSPH	1997	64.12	85%	2.20	3%	0.70	1%	8.72	12%	75.74
	1998	42.60	81%	2.27	4%	7.62	15%	0.00	0%	52.49
JMSMH	1997	0.00	0%	1.05	100%	0.00	0%	0.00	0%	1.05
	1998	0.00	0%	0.89	100%	0.00	0%	0.00	0%	0.89
ELIPH	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
	1998	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
ELIMH	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
	1998	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
WBEMH	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
	1998	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
SBEMH	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
	1998	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
EBEMH	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
	1998	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
LAFMH	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
	1998	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00

TABLE 9 (continued)

Lower Zone (continued)

Segment	Year	Class 1		Class 2		Class 3		Class 4		Total
CHKOH	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00*
	1998	1.04	1%	6.72	3%	12.94	6%	184.62	90%	205.32
JMSOH	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00*
	1998	0.30	5%	1.52	24%	0.24	4%	4.15	67%	6.21
JMSTF	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00*
	1998	0.00	0%	1.36	4%	8.17	23%	26.48	74%	36.00
APPTF	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
	1998	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
CB8PH	1997	0.77	18%	3.60	82%	0.00	0%	0.00	0%	4.37
	1998	2.98	71%	0.00	0%	1.19	29%	0.00	0%	4.16
LYNPH	1997	13.90	86%	1.29	8%	0.95	6%	0.00	0%	16.14
	1998	9.48	56%	4.12	24%	3.25	19%	0.00	0%	16.86

Delmarva Peninsula Coastal Bays Zone

Segment	Year	Class 1		Class 2		Class 3		Class 4		Total
AAWPH	1997	52.07	29%	13.73	8%	4.57	3%	109.95	61%	180.32
	1998	0.00	0%	166.27	95%	8.35	5%	0.00	0%	174.63
IOWPH	1997	7.88	10%	33.78	42%	0.00	0%	38.21	48%	79.87
	1998	12.63	16%	61.97	77%	0.00	0%	6.10	8%	80.71
SPXPH	1997	13.68	3%	158.22	38%	18.86	4%	230.64	55%	421.40
	1998	34.08	7%	178.04	37%	202.96	42%	63.17	13%	478.25
CHNPH	1997	391.28	8%	1,241.93	25%	194.50	4%	3,089.07	63%	4,916.78
	1998	414.84	8%	707.37	13%	591.16	11%	3,707.90	68%	5,421.27
SVCPH	1997	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00
	1998	0.00	0%	0.00	0%	0.00	0%	0.00	0%	0.00

* Area not completely flown in 1997 but most likely had SAV in 1997 based on 1998 data.

TABLE 10

Total Area of SAV in Hectares by Density Class for the Three Zones of Chesapeake Bay and for the Delmarva Peninsula Coastal Bays Zone in 1997 and 1998, Including the Percentage of the Zone Total

1997	Class 1		Class 2		Class 3		Class 4		Total
Upper	2,147.86	48%	631.83	14%	263.60	6%	1,395.91	31%	4,439.21
Middle	1,762.85	12%	2,940.12	21%	1,895.11	13%	7,611.14	54%	14,209.23
Lower	1,827.60	19%	1,629.60	17%	998.65	11%	4,927.46	53%	9,383.31*
Total	5,738.32	20%	5,201.54	19%	3,157.37	11%	13,934.52	50%	28,031.75*
Coastal Bays	464.91	8%	1,447.66	26%	217.93	4%	3,467.87	62%	5,598.37

1998	Class 1		Class 2		Class 3		Class 4		Total
Upper	2,418.19	53%	525.50	12%	156.47	3%	1,455.47	32%	4,555.63
Middle	1,427.89	12%	2,266.87	19%	1,588.70	13%	6,953.43	57%	12,236.88
Lower	1,470.56	17%	2,226.33	25%	843.30	9%	4,371.44	49%	8,911.64
Total	5,316.63	21%	5,018.71	20%	2,588.46	10%	12,780.35	50%	25,704.15
Coastal Bays	461.55	7%	1,113.66	18%	802.48	13%	3,777.17	61%	6,154.85

Total Area of SAV in Hectares for Density Classes One and Two Combined and Three and Four Combined, for 1997 and 1998, Including the Percentage of Zone Totals

1997	Class 1 and 2		Class 3 and 4		Total
Upper	2,779.69	63%	1,659.51	37%	4,439.21
Middle	4,702.97	33%	9,506.26	67%	14,209.23
Lower	3,457.20	37%	5,926.11	63%	9,383.31*
Total	10,939.86	39%	17,091.89	61%	28,031.75*
Coastal Bays	1,912.57	34%	3,685.80	66%	5,598.37

1998	Class 1 and 2		Class 3 and 4		Total
Upper	2,943.69	65%	1,611.94	35%	4,555.63
Middle	3,694.76	30%	8,542.12	70%	12,236.88
Lower	3,696.89	41%	5,214.75	59%	8,911.64
Total	10,335.34	40%	15,368.81	60%	25,704.15
Coastal Bays	1,575.21	26%	4,579.64	74%	6,154.85

* Area not completely flown in 1997 but most likely had SAV in 1997 based on 1998 data.

TABLE 11

SAV Species Reported on 1998 Ground Surveys for each CBP and Delmarva Peninsula Coastal Bay Segment

Upper Zone

Segment	Species Reported
CB1TF	*C. demersum, E. canadensis, H. dubia, H. verticillata, M. spicatum, Najas* sp., *N. minor, P. nodosus, V. americana, Z. palustris*
NORTF	*C. demersum, H. dubia, M. spicatum, Najas* sp.
ELKOH	*C. demersum, H. dubia, H. verticillata, M. spicatum, P. pectinatus, V. americana*
BOHOH	*C. demersum, H. verticillata, M. spicatum, P. crispus, V. americana*
C&DOH	No SAV Reported
CB2OH	*C. demersum, M. spicatum, P. crispus, P. pectinatus, P. perfoliatus, P. pusillus, V. americana, Z. palustris*
SASOH	*C. demersum, H. verticillata, M. spicatum, T. natans, V. americana*
BSHOH	*C. demersum, H. verticillata, M. spicatum, N. flexilis, P. crispus, V. americana, Z. palustris*
GUNOH	*C. demersum, E. canadensis, H. verticillata, M. spicatum, N. guadalupensis, N. minor, P. crispus, P. pectinatus, P. perfoliatus, P. pusillus, T. natans, V. americana, Z. palustris*
MIDOH	*C. demersum, E. canadensis, M. spicatum, P. crispus, V. americana, Z. palustris*
BACOH	No SAV Reported
CB3MH	*Chara* sp., *E. canadensis, M. spicatum, V. americana, Z. palustris*
PATMH	*M. spicatum, P. crispus, P. perfoliatus, V. americana, Z. palustris*
MAGMH	*Callitriche* sp., *E. canadensis, M. spicatum, P. epihydrus, P. pectinatus, P. perfoliatus, R. maritima, Sparganium* sp., *V. americana, Z. palustris*
CHSMH	*E. canadensis, M. spicatum, P. pectinatus, P. perfoliatus, R. maritima, Z. palustris*
CHSOH	No SAV Reported
CHSTF	No SAV Reported

Middle Zone

Segment	Species Reported
CB4MH	*C. demersum, M. spicatum, R. maritima*
EASMH	*P. pectinatus, P. perfoliatus, R. maritima, Z. marina, Z. palustris*
CHOMH1	*R. maritima, Z. palustris*

TABLE 11 (continued)

Middle Zone (concluded)

Segment	Species Reported
CHOMH2	No SAV Reported
CHOOH	*Z. palustris*
CHOTF	No SAV Reported
LCHMH	*R. maritima, Z. palustris*
SEVMH	*M. spicatum, P. pectinatus, P. perfoliatus, R. maritima, Z. palustris*
SOUMH	*R. maritima, Z. palustris*
RHDMH	*M. spicatum, R. maritima, Z. palustris*
WSTMH	*Z. palustris*
CB5MH	*M. spicatum, P. pectinatus, R. maritima, Z. marina, Z. palustris*
HNGMH	*R. maritima, Z. marina, Z. palustris*
FSBMH	No SAV Reported
NANMH	No SAV Reported
NANOH	No SAV Reported
NANTF	No SAV Reported
WICMH	No SAV Reported
TANMH	*R. maritima, Z. marina*
MANMH	*R. maritima*
BIGMH	No SAV Reported
POCMH	*R. maritima, Z. marina*
POCOH	No SAV Reported
POCTF	No SAV Reported
PAXMH	*M. spicatum, P. pectinatus, Z. palustris*
PAXOH	*C. demersum, E. canadensis, H. verticillata, M. spicatum, N. guadalupensis, N. minor, P. crispus, P. pusillus, V. americana, Z. palustris*
PAXTF	*C. demersum, E. canadensis, H. verticillata, Najas* sp., *N. gracillima, N. guadalupensis, N. minor, P. crispus, P. perfoliatus, P. pusillus, V. americana, Z. palustris*
WBRTF	*C. demersum, E. canadensis, H. verticillata, N. gracillima, N. minor, P. crispus, P. pusillus*
POTMH	*C. demersum, E. canadensis, M. spicatum, P. crispus, P. pectinatus, P. perfoliatus, R. maritima, V. americana, Z. palustris*
POTOH	*C. demersum, E. canadensis, H. dubia, H. verticillata, M. spicatum, N. guadalupensis, N. minor, P. crispus, P. pectinatus, P. perfoliatus, V. americana, Z. palustris*
POTTF	*Chara* sp., *C. demersum, H. dubia, H. verticillata, M. spicatum, Najas* sp., *N. guadalupensis, N. minor, P. pectinatus, V. americana*
MATTF	*C. demersum, H. verticillata, N. minor, V. americana*
PISTF	*C. demersum, H. dubia, H. verticillata, N. minor, V. americana*

TABLE 11 (concluded)

Lower Zone

Segment	Species Reported
CB6PH	*R. maritima, Z. marina*
CB7PH	*R. maritima, Z. marina*
RPPMH	*C. demersum, E. canadensis, R. maritima*
CRRMH	*R. maritima, Z. marina*
RPPOH	No SAV Reported
RPPTF	No SAV Reported
PIAMH	*R. maritima, Z. marina, Z. palustris*
MOBPH	*R. maritima, Z. marina*
YRKPH	*R. maritima, Z. marina*
YRKMH	*P. pectinatus*
MPNOH	No SAV Reported
MPNTF	No SAV Reported
PMKOH	No SAV Reported
PMKTF	No SAV Reported
JMSPH	*Z. marina*
JMSMH	No SAV Reported
ELIPH	No SAV Reported
ELIMH	No SAV Reported
WBEMH	No SAV Reported
SBEMH	No SAV Reported
EBEMH	No SAV Reported
LAFMH	No SAV Reported
CHKOH	*C. demersum, N. minor*
JMSOH	*C. demersum*
JMSTF	*C. demersum, E. canadensis, N. minor*
APPTF	No SAV Reported
CB8PH	*R. maritima, Z. marina*
LYNPH	*R. maritima, Z. marina*

Delmarva Peninsula Coastal Bays Zone

Segment	Species Reported
AAWPH	*R. maritima, Z. marina*
IOWPH	*R. maritima, Z. marina*
SPXPH	*Z. marina*
CHNPH	*R. maritima, Z. marina*
SVCPH	*Z. marina*

Key for 1998 SAV Segment Maps

SAV Map

1998 SAV beds are shown in red Inset of Chesapeake Bay shows figure location

Inset of bar graph shows yearly SAV abundance and density

Bar Graph Key

Horizontal axis shows year, Vertical axis shows hectares

- Density Class 1 (0 to 10% Cover)
- Density Class 2 (10% to 40% Cover)
- Density Class 3 (40 to 70% Cover)
- Density Class 4 (70 to 100% Cover)
- Unclassified Density

nd = no data pd = partial data
* = data not visible at graph scale

The following segments are not graphed because they had no SAV beds mapped from 1971-1998: BACOH, CHSOH, CHSTF, CHOOH, CHOTF, RHDMH, NANMH, NANOH, NANTF, WICMH, POCOH, POCTF, WBRTF, RPPOH, ELIPH, ELIMH, LAFMH, WBEMH, EBEMH, SBEMH, APPTF, MPNOH, PMKOH, and SVCPH. (Refer to Table 3 for a list of CBP segment names and abbreviations.) On the segment maps, SAV is shown in red; segment boundaries are represented by bold, black lines; and USGS 7.5 minute quadrangles are represented by a grid of numbered rectangles (refer to Table 2 for quadrangle names listed by VIMS map number). Where possible, places that are referenced in the text are labeled on the segment maps. In addition, all referenced places are labeled on the quadrangle maps in Appendix B. In the graphs of yearly SAV data, “partial data” refers to those instances when data for only a portion of a segment is available for a particular year. SAV bed density classification is explained in the Methods section (Figure 9).

Figure 11. Key for 1998 Chesapeake Bay Program and Delmarva Peninsula coastal bay Segment SAV Maps.

Northern Chesapeake Bay (CB1TF)

In 1998, SAV area in CB1TF decreased to 2,310.07 ha, 7% less than in 1997 (2,489.99 ha). The Tier I goal (3,112.24 ha) was not met for CB1TF. This segment accounted for 51% of the SAV in the Upper Bay Zone and 9% of the Bay total.

Notable increases occurred in Furnace Bay (Map 3), in the area immediately south of the small island offshore of Havre de Grace (Map 3), in Mosquito Creek (Map 9), and in the mouth of Pond Creek (Map 9). The large bed south of Havre de Grace decreased by more than half, primarily in the lower portion (Map 3).

The following species were identified in CB1TF in 1998: *C. demersum, E. canadensis, H. dubia, H. verticillata, M. spicatum, Najas* sp., *N. minor, P. nodosus, V. americana,* and *Z. palustris.*

Figure 12; Tables 6-8 and 11; and Maps 2, 3, 8, 9, and 10 in Appendices B, C, and D cover the Northern Chesapeake Bay Segment (CB1TF).

Northeast River (NORTF)

In 1998, SAV area in NORTF increased to 9.95 ha, 100% more than in 1997 (4.98 ha). The Tier I goal (7.54 ha) was achieved for NORTF. This segment accounted for only a small portion (0.2%) of the SAV in the Upper Bay Zone. SAV in NORTF became less dense, from 100% classified as very dense in 1997 to a majority (70%) classified as very sparse in 1998.

The existing SAV bed in Cara Cove (Map 4), was smaller and less dense in 1998. Additional SAV fringing beds were mapped on the western shore, upriver from Carpenter Point (Map 3).

The following species were identified in NORTF in 1998: *C. demersum, H. dubia, M. spicatum,* and *Najas* sp.

Figure 12; Tables 6-9 and 11; and Maps 3 and 4 in Appendices B, C, and D cover the Northeast River Segment (NORTF).

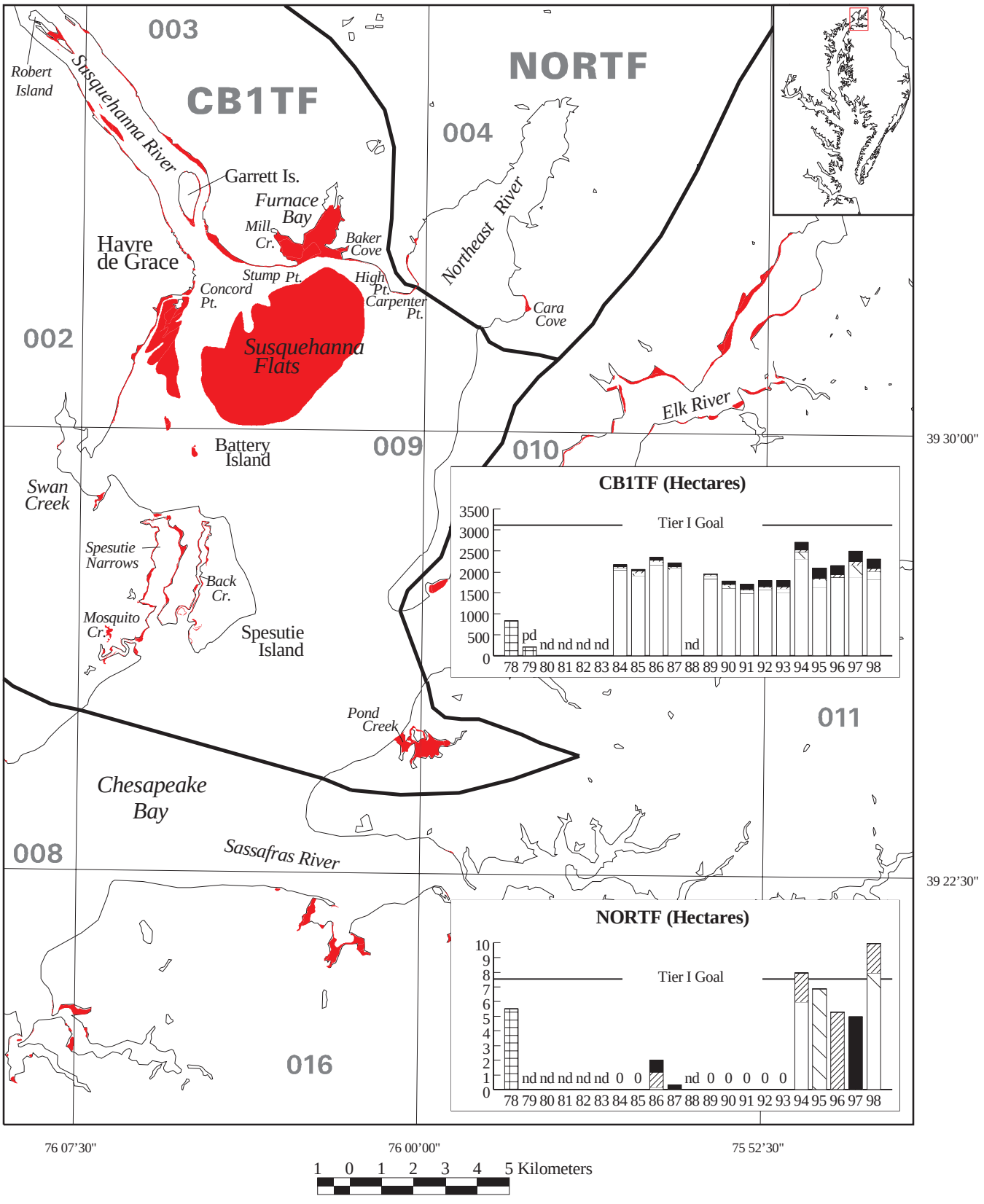

Figure 12: SAV distribution in Northern Chesapeake Bay (CB1TF) and the Northeast River (NORTF) in 1998. (See Figure 11 for key.)

Elk River (ELKOH)

In 1998, SAV area in ELKOH increased to 206.07 ha, 206% more than in 1997 (67.44 ha). The Tier I goal (447.29 ha) was not met for ELKOH. This segment accounted for 5% of the SAV in the Upper Bay Zone. The average density of SAV in ELKOH decreased, resulting from new and expanding very sparse beds.

SAV area increased on both the eastern and western shores of the Elk River with the growth of existing beds, and the addition of new fringing beds. Particularly notable were increases in the area of Piney Creek Cove (Map 4), Paddy Piddle Cove (Map 5), and Cabin John Creek (Map 10). A notable decrease occurred with the loss of several SAV beds at the head of Cabin John Creek (Map 10).

The following species were identified for ELKOH in 1998: *C. demersum, H. dubia, H. verticillata, M. spicatum, P. pectinatus,* and *V. americana.*

Figure 13; Tables 6-8 and 11; and Maps 4, 5, and 10 in Appendices B, C, and D cover the Elk River Segment (ELKOH).

Bohemia River (BOHOH)

In 1998, SAV area in BOHOH increased to 46.40 ha, 207% more than in 1997 (15.09 ha). The Tier I goal (17.32 ha) was achieved for BOHOH. This segment accounted for only a small portion (1%) of SAV in the Upper Bay Zone.

The SAV beds in Veazey Cove (Map 10) became very dense inshore and expanded with sparse coverage offshore, to almost three times the 1997 area. A similar expansion occurred on the north shore, with the Rich Point bed (Map 10) growing to more than four times the 1997 area.

The following species were identified for BOHOH in 1998: *C. demersum, H. verticillata, M. spicatum, P. crispus,* and *V. americana.*

Figure 13; Tables 6-8 and 11; and Map 10 in Appendices B, C, and D cover the Bohemia River Segment (BOHOH).

Chesapeake & Delaware Canal (C&DOH)

The Chesapeake & Delaware Canal (C&DOH), had no SAV mapped or ground survey data reported in 1998. The only SAV ever mapped by the aerial survey for C&DOH was the 0.62 ha mapped in 1978 that established the Tier I goal.

Figure 13 and Tables 6-8 and 11 cover Chesapeake & Delaware Canal Segment (C&DOH).

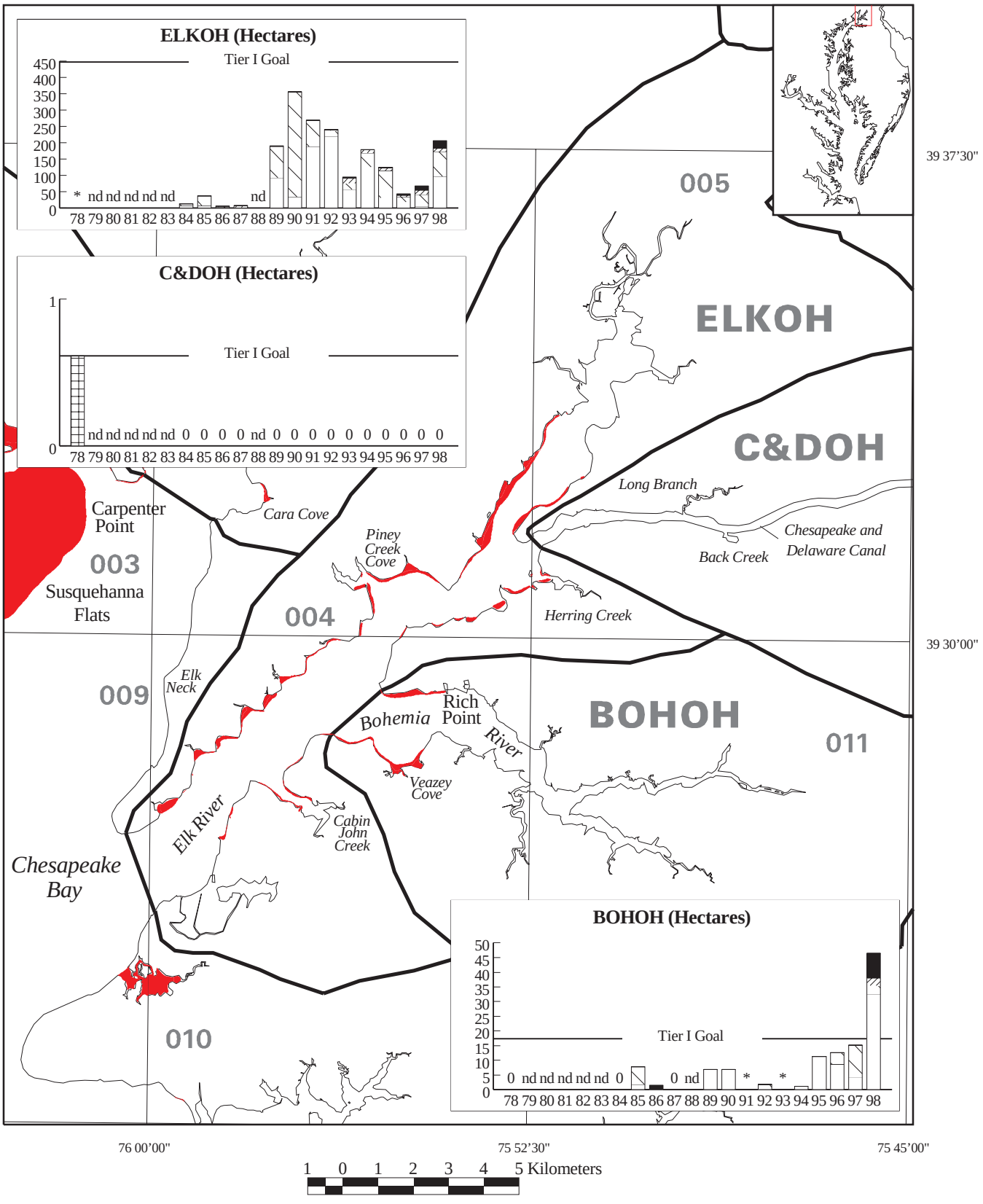

Figure 13: SAV distribution in the Elk and Bohemia Rivers (ELKOH and BOHOH) and the Chesapeake and Delaware Canal (C&DOH) in 1998. (See Figure 11 for key.)

Upper Chesapeake Bay (CB2OH)

In 1998, SAV area in CB2OH increased to 126.56 ha, 15% more than in 1997 (110.19 ha). The Tier I goal (266.97 ha) was not met for CB2OH. This segment accounted for 3% of the SAV in the Upper Bay Zone.

Notable increases for CB2OH occurred in the large bed between Weir and Carroll points on Carroll Island (Map 14); west of Ricketts Point (Map 14); and in the fringing beds surrounding Pooles Island (Map 14). Notable decreases for this segment occurred in Browns Creek on the eastern shore (Map 13), and in Churn and Fairlee creeks on the western shore (Map 15).

The following species were identified for CB2OH in 1998: *C. demersum, M. spicatum, P. crispus, P. pectinatus, P. perfoliatus, P. pusillus, V. americana,* and *Z. palustris.*

Figure 14; Tables 6-8 and 11; and Maps 8, 9, 13, 14, 15, and 16 in Appendices B, C, and D cover the Upper Chesapeake Bay Segment (CB2OH).

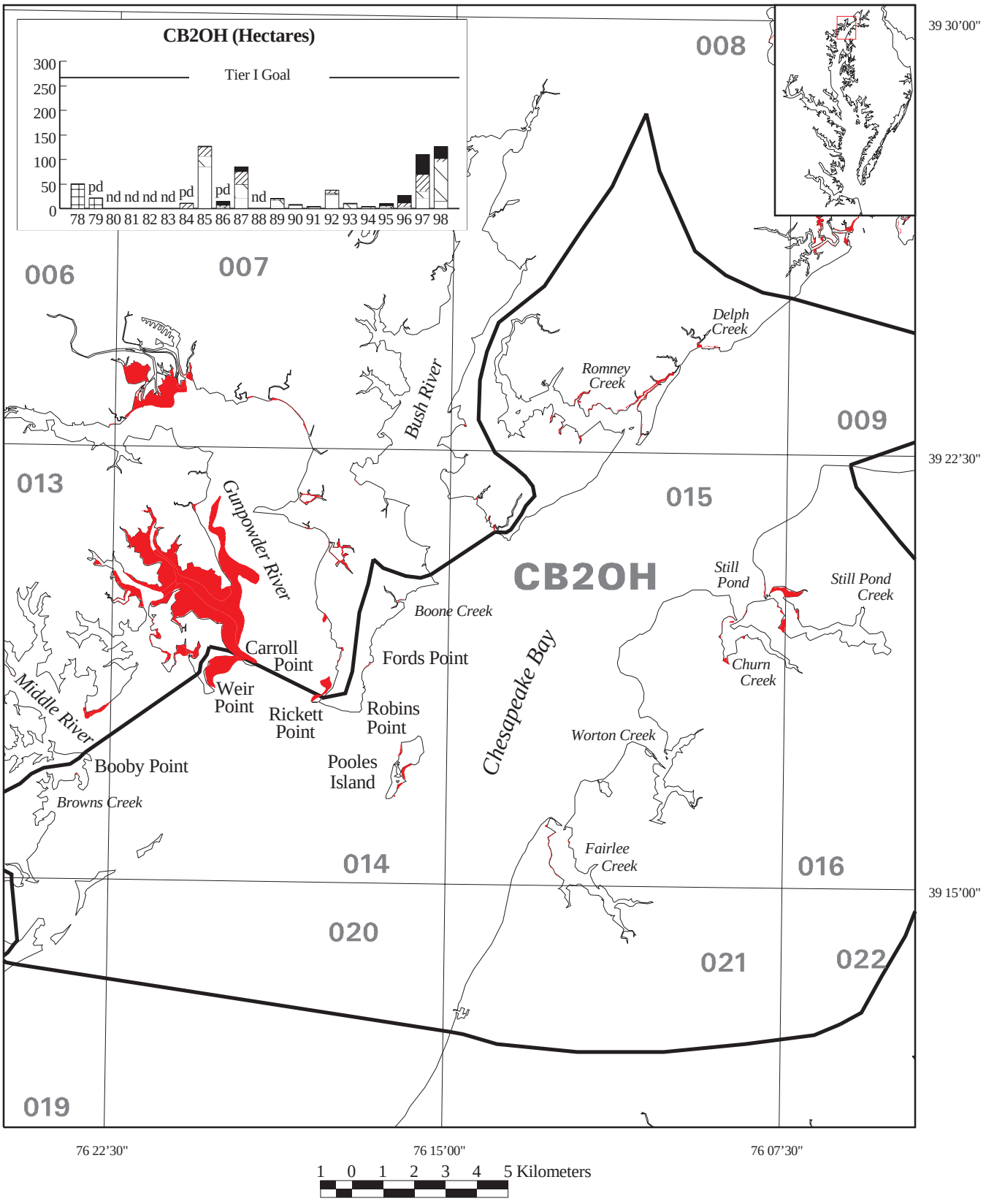

Figure 14: SAV distribution in Upper Chesapeake Bay (CB2OH) in 1998. (See Figure 11 for key.)

Sassafras River (SASOH)

In 1998, SAV area in SASOH decreased to 68.60 ha, 38% less than in 1997 (110.78 ha). The Tier I goal (164.71 ha) was not met for SASOH. This segment accounted for 1.5% of the SAV in the Upper Bay Zone.

There was a slight increase in the SAV beds in Lloyd Creek (Map 16). Notable decreases occurred with the loss of beds near Grove Point at the mouth of the Sassafras River (Map 9), in Money Creek (Map 10), and in Turner and Freeman creeks (Map 17).

The following species were reported for SASOH in 1998: *C. demersum, H. verticillata, M. spicatum, T. natans* and *V. americana.*

Figure 15; Tables 6-8 and 11; and Maps 9, 10, 16, and 17 in Appendices B, C, and D cover the Sassafras River Segment (SASOH).

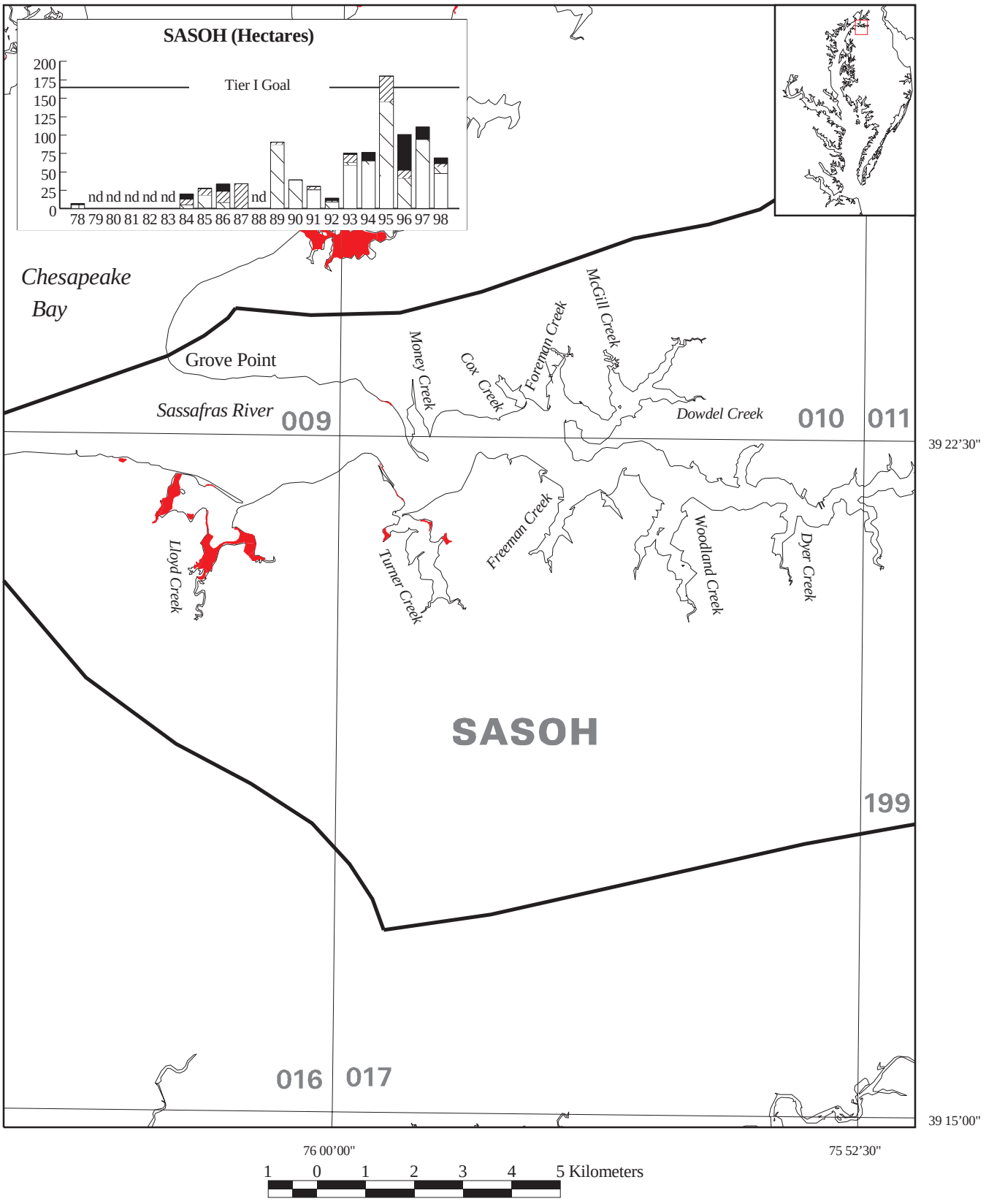

Figure 15: SAV distribution in the Sassafras River (SASOH) in 1998. (See Figure 11 for key.)

Bush River (BSHOH)

In 1998, SAV area in BSHOH decreased to 2.47 ha, 93% less than in 1997 (34.95 ha). The Tier I goal (23.38 ha) was not met for BSHOH. This segment accounted for only a small portion (0.05%) of the SAV in the Upper Bay Zone.

With the exception of several small, new, and expanding beds at Abbey Point (Map 15), notable changes for this segment were decreases that occurred south of Kings Creek (Map 7), in Church Creek (Map 8), and in Doves Cove (Map 14).

The following species were reported for BSHOH in 1998: *C. demersum, H. verticillata, M. spicatum, N. flexilis, P. crispus, V. americana,* and *Z. palustris.*

Figure 16; Tables 6-8 and 11; and Maps 7, 8, 14, and 15 in Appendices B, C, and D cover the Bush River Segment (BSHOH).

Gunpowder River (GUNOH)

In 1998, SAV area in GUNOH increased to 870.73 ha, 37% more than 1997 (637.36 ha). The Tier I goal (350.21 ha) was achieved for GUNOH. This segment accounted for 19% of the SAV in the Upper Bay Zone and 3% of the Bay total.

Notable increases for this segment occurred with the expansion of SAV in Dundee Creek out into the Gunpowder River and extending north almost three km from Battery Point (Map 14). Additional increases were found on the eastern shore in Swaderick and Watson creeks (Map 14), and in the area between Rickett and Days points (Map 14). Notable decreases occurred in the fringing bed off of the Army Chemical Center (Map 7); in Railroad Creek (Map 13); and in portions of Saltpeter Creek (Map 14).

The following species were reported for GUNOH in 1998: *C. demersum, E. canadensis, H. verticillata, M. spicatum, N. guadalupensis, N. minor, P. crispus, P. pectinatus, P. perfoliatus, P. pusillus, T. natans, V. americana,* and *Z. palustris.*

Figure 16; Tables 6-8 and 11; and Maps 6, 7, 13, and 14 in Appendices B, C, and D cover the Gunpowder River Segment (GUNOH).

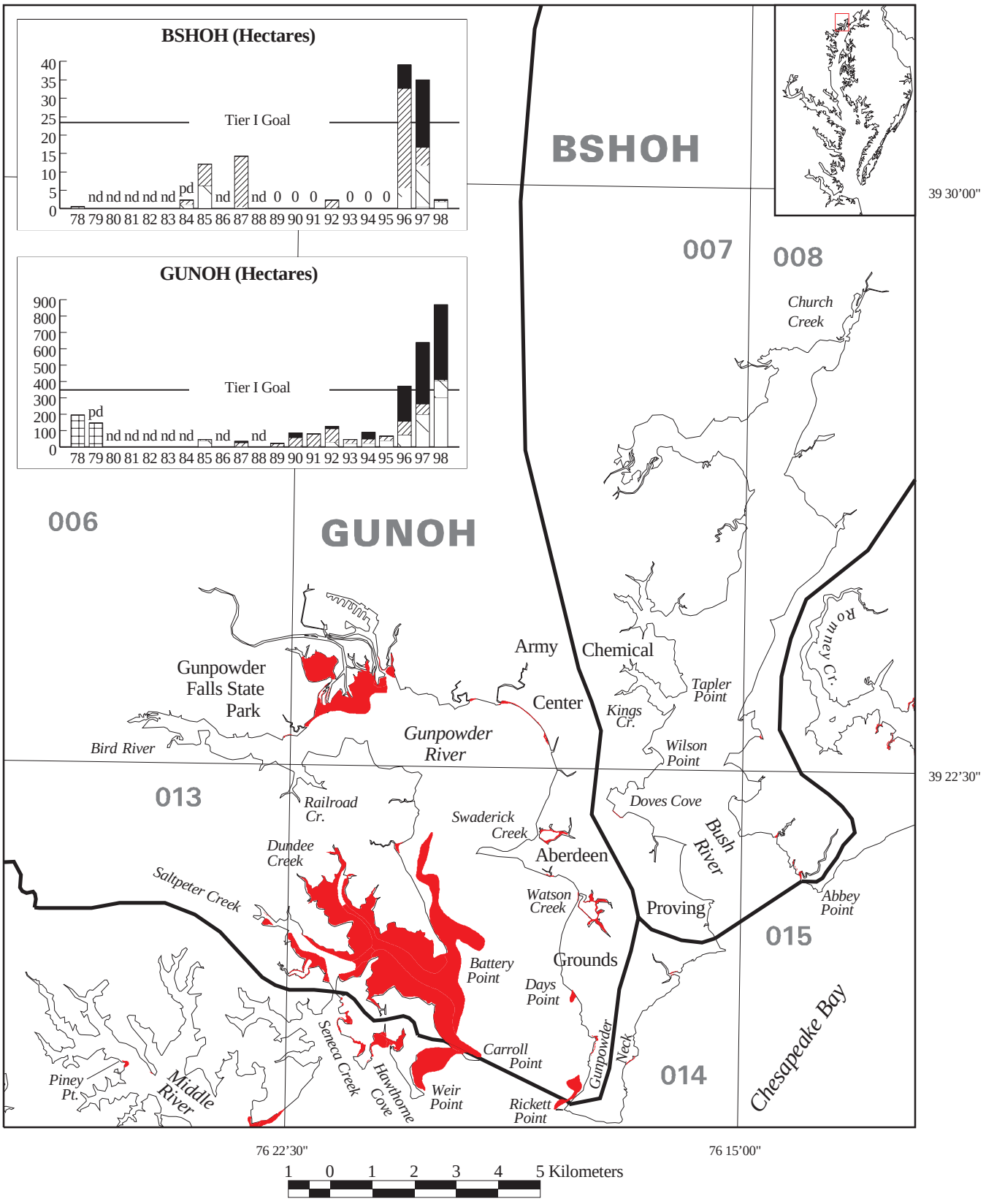

Figure 16: SAV distribution in the Bush and Gunpowder Rivers (BSHOH, GUNOH) in 1998. (See Figure 11 for key.)

Middle River (MIDOH)

In 1998, SAV area in MIDOH decreased to 42.73 ha, 64% less than 1997 (117.37 ha). The Tier I goal (347.54 ha) was not met for MIDOH. This segment accounted for 1% of the SAV in the Upper Bay Zone.

SAV increased for this segment in the bed off of Bowley Bar (Map 13). Notable areas of decrease occurred in Dark Head and Galloway creeks, off of Holly Beach (Map 13), and in Seneca Creek (Map 14).

The following species were reported for MIDOH in 1978: *C. demersum, E. canadensis, M. spicatum, P. crispus, V. americana,* and *Z. palustris.*

Figure 17; Tables 6-8 and 11; and Maps 13 and 14 in Appendices B, C, and D cover the Middle River Segment (MIDOH).

Back River (BACOH)

SAV was not mapped and ground survey data was not reported for BACOH in 1998, or for any year since the segment was first mapped by the aerial survey in 1978. The Tier I goal has not been established for BACOH.

Figure 17 and Tables 6-8 and 11 cover the Back River Segment (BACOH).

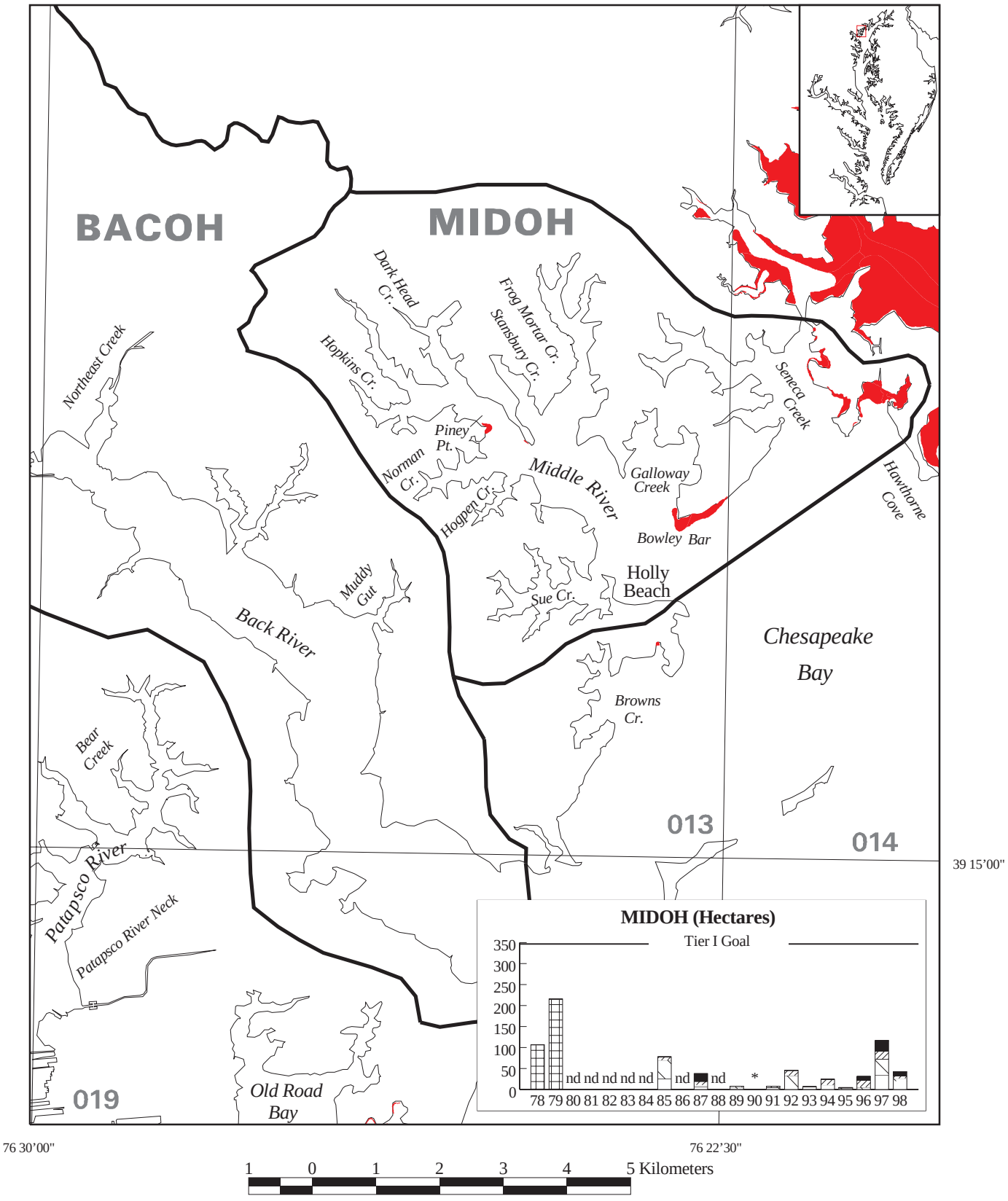

Figure 17: SAV distribution in the Middle and Back Rivers (MIDOH, BACOH) in 1998. BACOH is not graphed as no SAV was mapped from 1971-98. (See Figure 11 for key.)

Upper Central Chesapeake Bay (CB3MH)

In 1998, SAV area in CB3MH decreased to 308.28 ha, 17% less than in 1997 (370.83 ha). The Tier I goal (697.59 ha) was not met for CB3MH. This segment accounted for 7% of the SAV in the Upper Bay Zone and 1% of the Bay total.

Notable increases for this segment occurred in Tavern and Swan creeks (Map 20); in fringing beds in The Haven (Map 20); and in Wilson Pond (Map 26). Notable decreases for this segment occurred in Shallow Creek (Map 19); Huntington Creek (Map 26); and west of Eastern Neck and Eastern Neck Island (Map 26).

The following species were reported for CB3MH in 1998: *Chara* sp., *E. canadensis, M. spicatum, V. americana,* and *Z. palustris.*

Figure 18; Tables 6-8 and 11; and Maps 19, 20, 21, 24, and 26 in Appendices B, C, and D cover the Upper Central Chesapeake Bay Segment (CB3MH).

Patapsco River (PATMH)

In 1998, SAV area in PATMH increased to 5.86 ha, 203% more than in 1997 (1.93 ha). The Tier I goal (50.22 ha) was not met for PATMH. This segment accounted for a small portion (0.1%) of the SAV in the Upper Bay Zone.

SAV increased in new and small fringing beds in Wharf Creek, Locust Cove, and Ashlar Pond (Map 24). There were no notable areas of decrease.

The following species were identified for PATMH in 1998: *M. spicatum, P. crispus, P. perfoliatus, V. americana,* and *Z. palustris.*

Figure 18; Tables 6-8 and 11; and Maps 18, 19, and 24 in Appendices B, C, and D cover the Patapsco River Segment (PATMH).

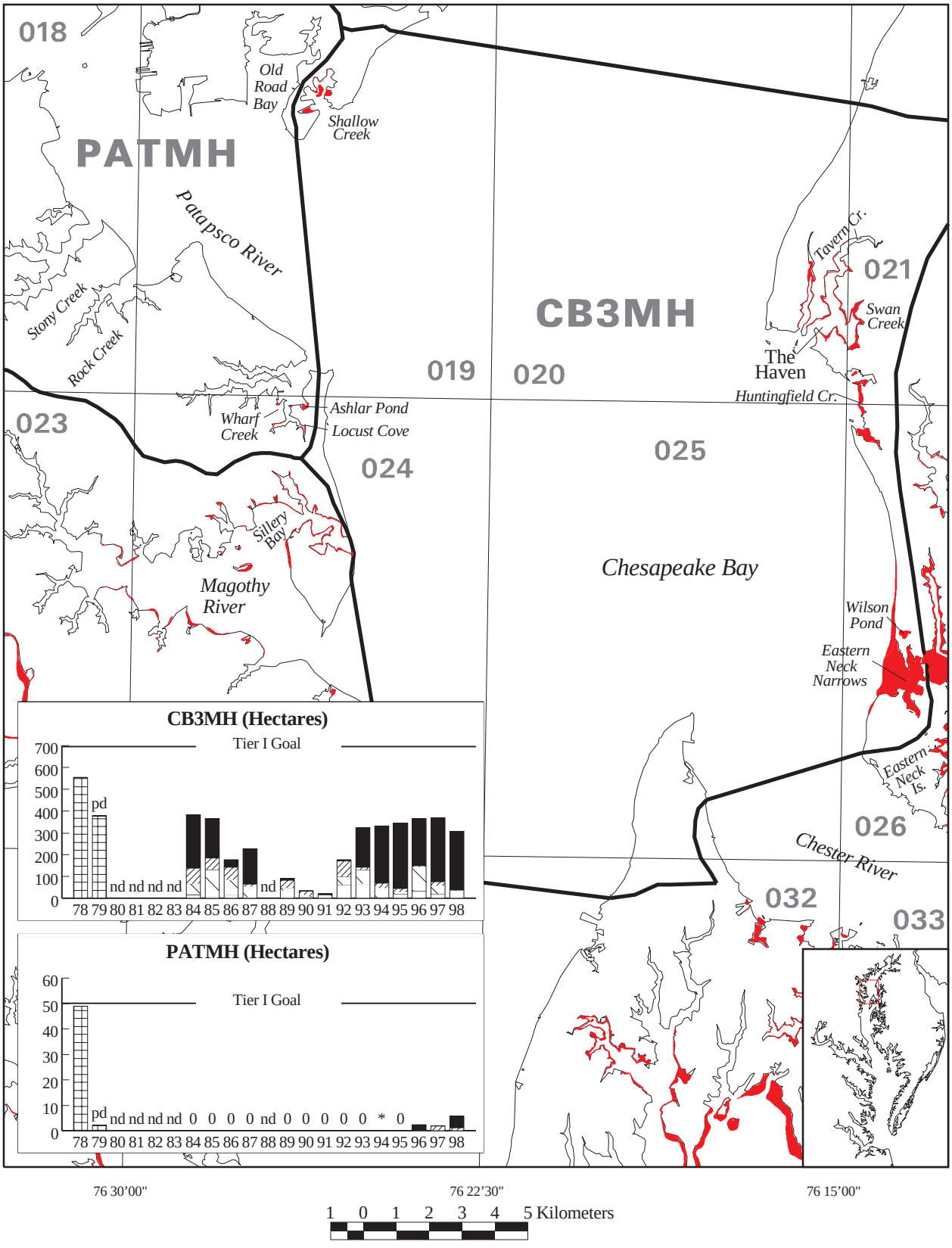

Figure 18: SAV distribution in Upper Central Chesapeake Bay (CB3MH) and the Patapsco River (PATMH) in 1998. (See Figure 11 for key.)

Magothy River (MAGMH)

In 1998, SAV area in MAGMH increased to 80.02 ha, 50% more than in 1997 (53.48 ha). The Tier I goal (236.73 ha) was not met for MAGMH. This segment accounted for 2% of the SAV in the Upper Bay Zone.

SAV increased for this segment in fringing beds on the southern shore from Deep Creek (Map 24) to Mill Creek (Map 23), and on the northern shore from Gibson Island (Map 24) to Steedmans Point (Map 23). SAV also increased in the small bed at the mouth of Little Magothy River (Map 24). There were no notable areas of decrease.

The following species were identified for MAGMH in 1998: *Callitriche* sp., *E. canadensis*, *M. spicatum, P. epihydrus, P. pectinatus, P. perfoliatus, R. maritima, Sparganium* sp.,*V. americana,* and *Z. palustris.*

Figure 19; Tables 6-8 and 11; and Maps 23 and 24 in Appendices B, C, and D cover the Magothy River Segment (MAGMH).

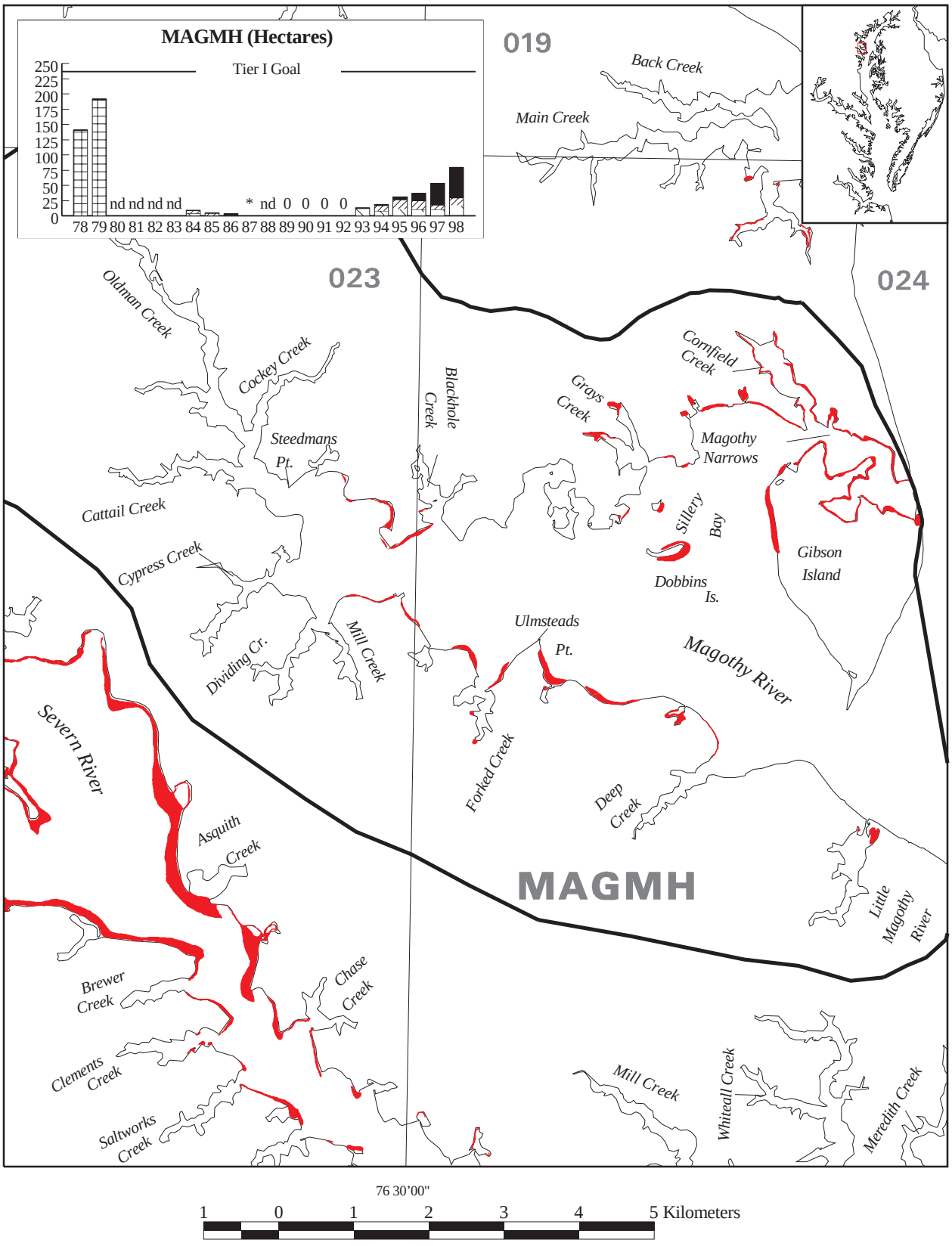

Figure 19: SAV distribution in the Magothy River (MAGMH) in 1998. (See Figure 11 for key).

Lower Chester River (CHSMH)

In 1998, SAV area in CHSMH increased to 477.89 ha, 12% more than in 1997 (424.81 ha). The Tier I goal (1,517.81 ha) was not met for CHSMH. This segment accounted for 10% of the SAV in the Upper Bay Zone and 2% of the Bay total.

Notable increases for this segment occurred on the north shore in fringing beds in Philip Creek (Map 21); fringing beds in Herringtown, Grays Inn, Comegys, and Fore creeks (Map 26); and Burnt House Cove (Map 26). Additional increases occurred on the south shore in Macum and Piney creeks (Map 32), and in Grove and Winchester creeks (Maps 26, 33). Notable areas of decrease occurred in Hail Creek and off of Grays Inn Point (Map 26).

The following species were reported for CHSMH in 1998: *E. canadensis, M. spicatum, P. pectinatus, P. perfoliatus, R. maritima,* and *Z. palustris.*

Figure 20; Tables 6-8 and 11; and Maps 21, 26, 27, 32, and 33 in Appendices B, C, and D cover the Lower Chester River Segment (CHSMH).

Middle Chester River (CHSOH)

The Middle Chester River had no SAV mapped or ground survey data reported in 1998, or for any year since the segment was first mapped by the aerial survey in 1978. The Tier I goal has not been established for CHSOH.

Figure 20 and Tables 6-8 and 11 cover the Middle Chester River Segment (CHSOH).

Upper Chester River (CHSTF)

The Lower Chester River had no SAV mapped or ground survey data reported in 1998, or for any year since the segment was first mapped by the aerial survey in 1978. The Tier I goal has not been established for CHSTF.

Figure 20 and Tables 6-8 and 11 cover the Lower Chester River Segment (CHSTF).

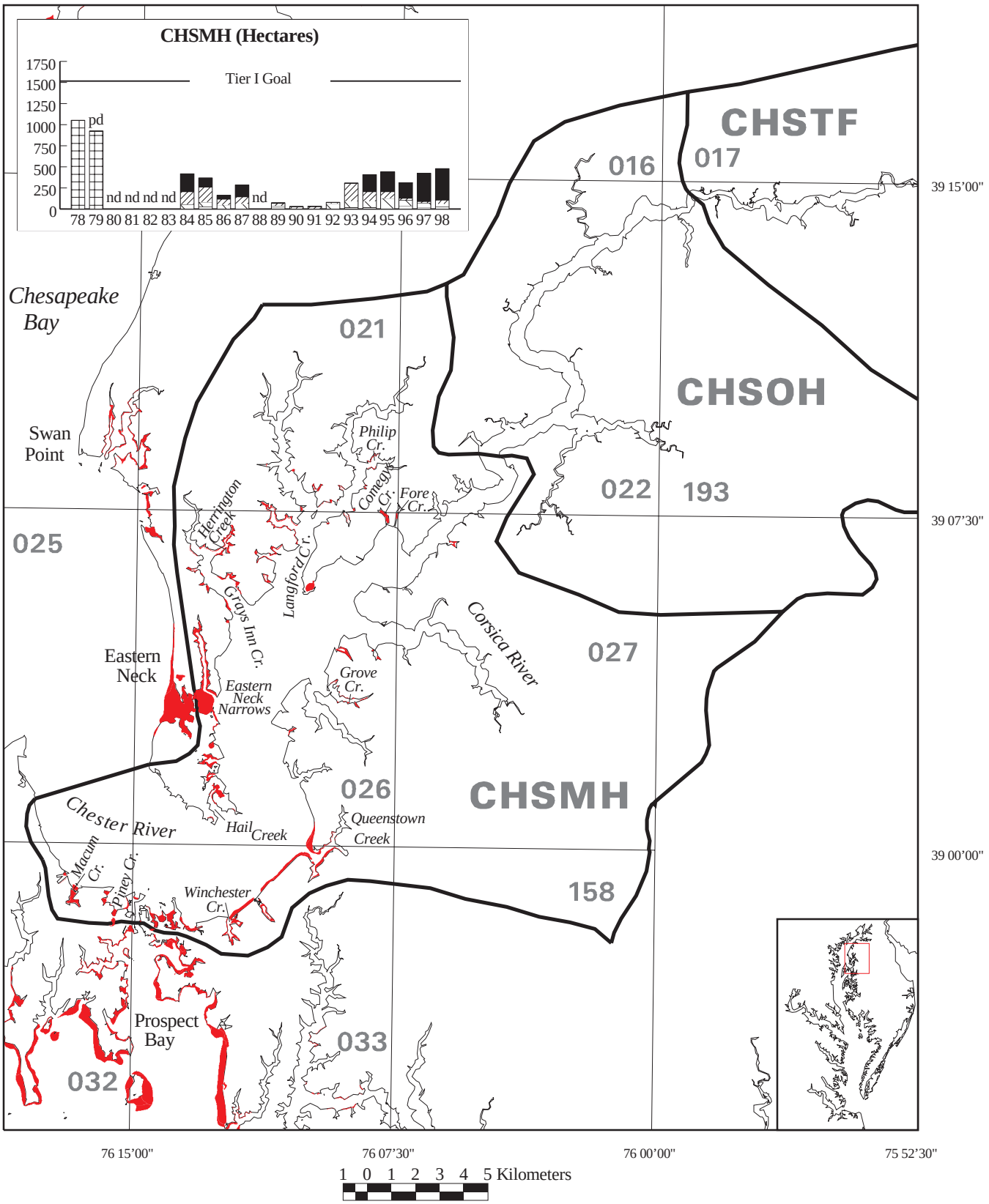

Figure 20: SAV distribution in the Lower (CHSMH), Middle (CHSOH), and Upper (CHSTF) Chester River in 1998. CHSOH and CHSTF are not graphed as no SAV was mapped from 1971–1998. (See Figure 11 for key.)

Middle Central Chesapeake Bay (CB4MH)

In 1998, no SAV was mapped in CB4MH. The 20.28 ha of SAV mapped in 1997 from beds in Old Colony Cove (Map 42), and near the east side of the Chesapeake Bay Bridge (Map 32), were not observed in 1998. The Tier I goal (152.02 ha) was not met for this segment.

The following species were reported for CB4MH in 1998: *C. demersum, M. spicatum,* and *R. maritima.*

Figure 21; Tables 6-8 and 11; and Maps 50 and 61 in Appendices B and D cover the Middle Central Chesapeake Bay Segment (CB4MH).

Eastern Bay (EASMH)

In 1998, SAV area in EASMH decreased to 1,107.25 ha, 40% less than in 1997 (1,848.32 ha). The Tier I goal (2,479.02 ha) was not met for EASMH. This segment accounted for 9% of the SAV in the Middle Bay Zone and 4% of the Bay total.

Though there was widespread decline of SAV in this segment, there were gains in some areas. Notable increases occurred in northern Prospect Bay (Maps 32, 33), in Kirwan (Map 32) and Marshy (Map 33) creeks, and in Harbor Cove (Map 36). Notable decreases occurred along both shores of the Eastern Bay, specifically in Shipping and Cox creeks, as well as east of Philpots Island (Map 32). Other notable decreases occurred in the area from Kent Point to Cox Creek (Maps 32, 36); east of Wades Point (Map 36); Tilghman Creek (Map 36); along both shores of Miles River (Map 37); and in the Wye and Wye East rivers (Map 37).

The following species were reported for EASMH in 1998: *P. pectinatus, P. perfoliatus, R. maritima, Z. marina,* and *Z. palustris.*

Figure 21; Tables 6-8 and 11; and Maps 32, 33, 36, and 37 in Appendices B, C, and D cover the Eastern Bay Segment (EASMH).

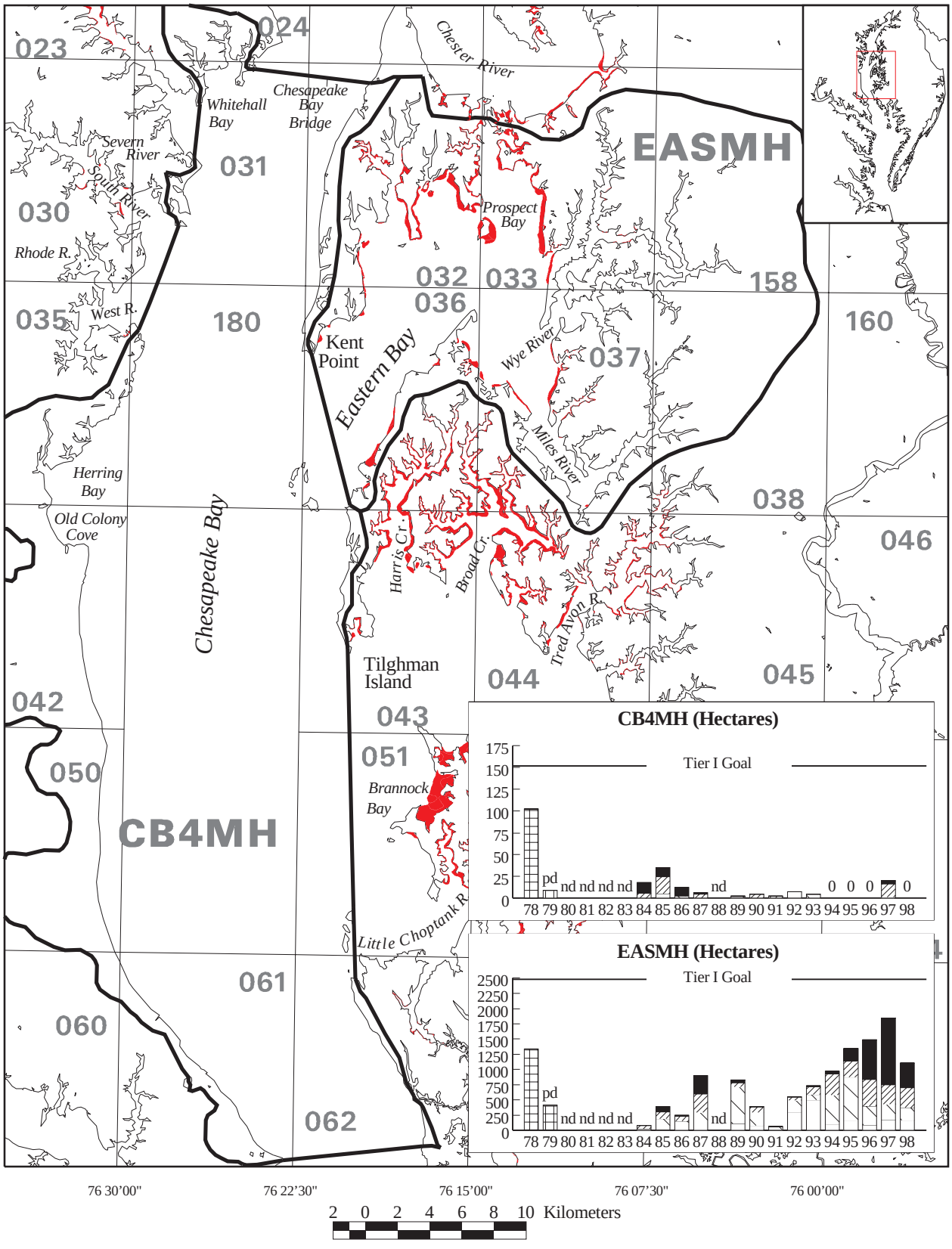

Figure 21: SAV distribution in the Middle Central Chesapeake Bay (CB4MH) and Eastern Bay (EASMH) in 1998. (See Figure 11 for key.)

Mouth of the Choptank River (CHOMH1)

In 1998, SAV area in CHOMH1 decreased to 2,283.31 ha, 18% less than in 1997 (2,792.59 ha). The Tier I goal (2,990.36 ha) was not met for CHOMH1. This segment accounted for 19% of the SAV in the Middle Bay Zone and 9% of the Bay total.

SAV increased in the middle portions of Harris (Map 36) and Broad (Maps 36, 37) creeks; in Leadenham (Maps 36, 43), San Domingo (Map 37), and Solitude (Map 37) creeks; and in the upper portion of Irish Creek (Map 44). Notable decreases for this segment occurred on both shores of the Choptank River in Blackwalnut Cove (Map 43); in the mouths of Harris, Broad, Irish, and Fox Hole creeks (Maps 43, 44); in the north end of Trippe Bay (Map 51); in Cook Point Cove (Map 51); and in the area of Chapel Creek and Todds Point (Map 52).

The following species were reported for CHOMH1 in 1998: *R. maritima* and *Z. palustris.*

Figure 22; Tables 6-8 and 11; and Maps 36, 37, 38, 43, 44, 45, 51, and 52 in Appendices B, C, and D cover the Mouth of the Choptank River Segment (CHOMH1).

Lower Choptank River (CHOMH2)

In 1998, no SAV was mapped in CHOMH2. The 1.76 ha mapped in the three dense beds in Lecompte Creek, on the south shore of the Choptank River in 1997 (Map 52), was not observed in 1998. The Tier I goal (186.95 ha) was not met for this segment. No ground survey data were reported for CHOMH2 in 1998.

Figure 22 and Tables 6-8 and 11 cover the Lower Choptank River Segment (CHOMH2).

Middle Choptank River (CHOOH) and Upper Choptank River (CHOTF)

SAV was not mapped for either CHOOH or CHOTF in 1998, or for any year since the segments were first mapped by the aerial survey in 1978. Tier I goals have not been established for either CHOOH or CHOTF.

The following species was identified for CHOOH in 1998: *Z. palustris.* No ground survey data were reported for CHOTF.

Figure 22; Tables 6-8 and 11; and Map 46 in Appendices B and D cover the Middle Choptank River Segment (CHOOH).

Figure 22 and Tables 6-8 and 11 cover the Upper Choptank River Segment (CHOTF).

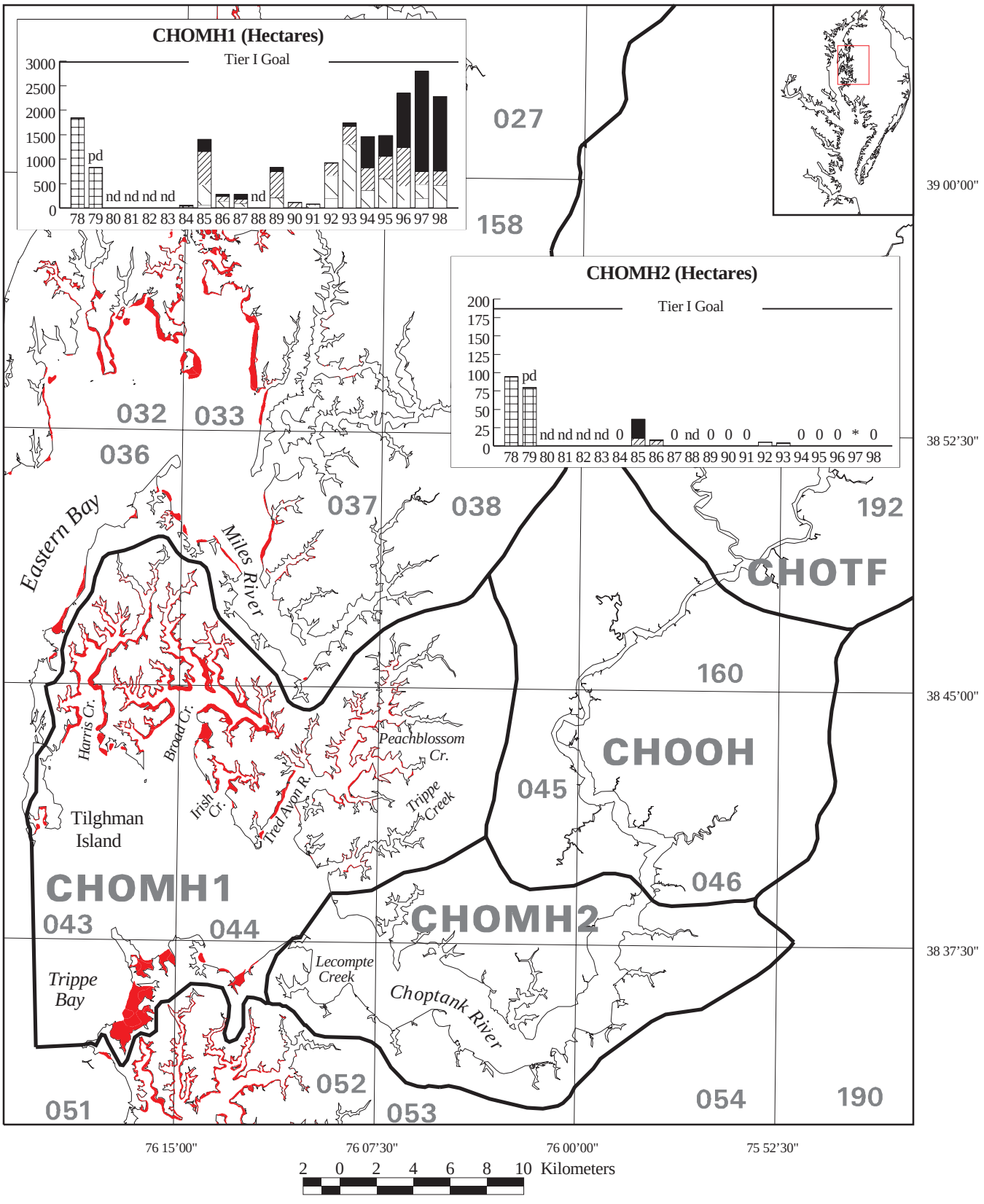

Figure 22: SAV distribution in the Mouth of the Choptank River (CHOMH1), the Lower (CHOMH2), the Middle (CHOOH), and the Upper (CHOTF) Choptank River in 1998. CHOOH and CHOTF are not graphed as no SAV was mapped from 1971–1998. (See Figure 11 for key.)

Little Choptank River (LCHMH)

In 1998, SAV area in LCHMH increased to 617.22 ha, 17% more than in 1997 (529.39 ha). The Tier I goal (616.39 ha) was achieved for LCHMH. This segment accounted for 5% of the SAV in the Middle Bay Zone and 2% of the Bay total.

SAV increased and became more dense throughout the northern shore and the upper portion of Little Choptank River, including Brooks (Map 51), Hudson (Maps 51, 52), Back, Phillips, Beckwith, and Fishing creeks (Map 52), and the east shore of Madison Bay (Map 52). Notable losses occurred on the south shore of Little Choptank River in Oyster, Cators, and Hooper coves and in Slaughter Creek (Map 62).

The following species were reported for LCHMH in 1998: *R. maritima* and *Z. palustris.*

Figure 23; Tables 6-8 and 11; and Maps 51, 52, and 62 in Appendices B, C, and D cover the Little Choptank River Segment (LCHMH).

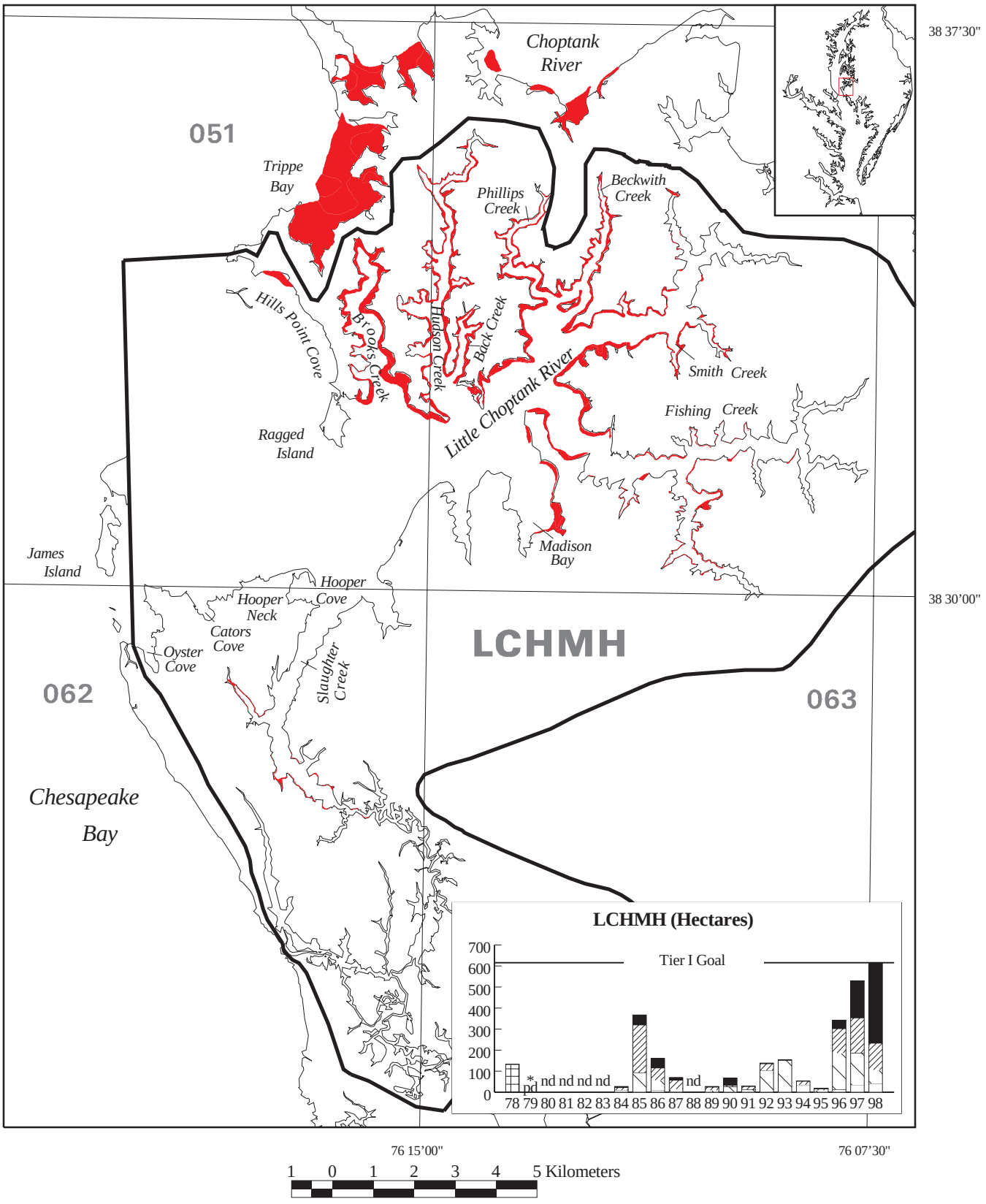

Figure 23: SAV distribution in the Little Choptank River (LCHMH) in 1998. (See Figure 11 for key.)

Severn River (SEVMH)

In 1998, SAV area in SEVMH increased to 163.40 ha, 32% more than in 1997 (123.87 ha). The Tier I goal (187.76 ha) was not met for SEVMH. This segment accounted for only 1% of the SAV in the Middle Bay Zone.

SAV increased in the fringing beds along both shores of the Severn River. Notable increases were observed from Forked Creek to Sullivan Cove; in Little Round Bay; surrounding St. Helena Island; and from Brewer Creek to Luce Creek in the lower portion of the Severn River (Map 23). There were no notable decreases.

The following species were reported for SEVMH in 1998: *M. spicatum, P. pectinatus, P. perfoliatus, R. maritima,* and *Z. palustris.*

Figure 24; Tables 6-8 and 11; and Maps 23, 24, 30, and 31 in Appendices B, C, and D cover the Severn River Segment (SEVMH).

South River (SOUMH)

In 1998, SAV area increased in SOUMH to 22.00 ha, 35% more than in 1997 (16.35 ha). The Tier I goal (20.59 ha) was achieved for SOUMH. This segment accounted for only a small portion (0.2%) of the SAV in the Middle Bay Zone.

SAV increased in beds at Melvin Point, Glebe Bay, and between Limehouse Cove and Selby Bay; a new bed was mapped off of Hillsmere Shores (Map 30). However, the SAV bed that was present in Ramsey Lake (Map 30) in 1997, was not observed on aerial photography in 1998.

The following species were reported for SOUMH in 1998: *R. maritima* and *Z. palustris.*

Figure 24; Tables 6-8 and 11; and Maps 30 and 31 in Appendices B, C, and D cover the South River Segment (SOUMH).

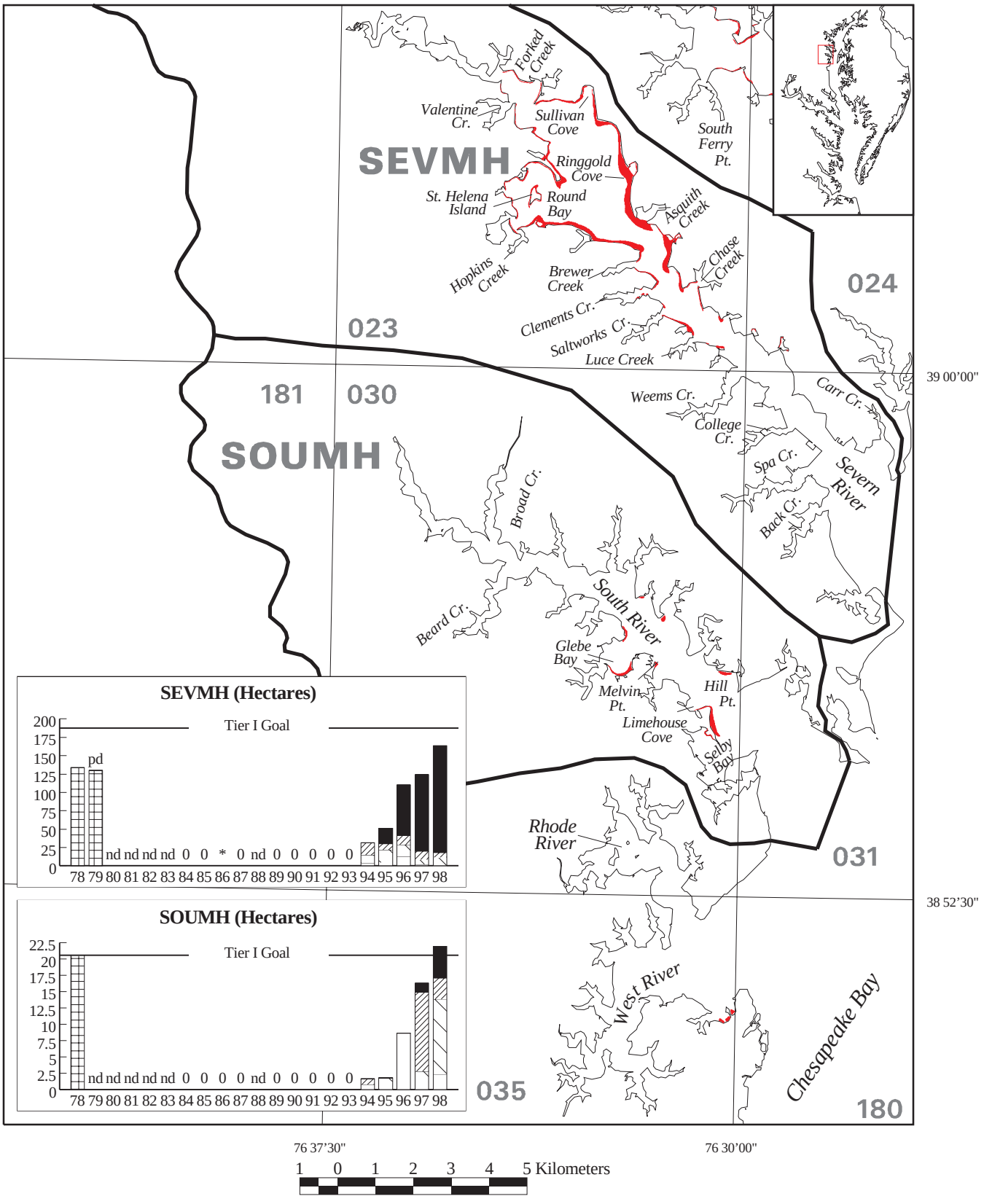

Figure 24: SAV distribution in the Severn River (SEVMH) and South River (SOUMH) in 1998. (See Figure 11 for key.)

Rhode River (RHDMH)

SAV has not been mapped in RHDMH since 1978 when 5.92 ha were mapped, setting the Tier I goal.

The following species were reported for RHDMH in 1998: *M. spicatum, R. maritima,* and *Z. palustris.*

Figure 25; Tables 6-8 and 11; and Maps 30 and 35 in Appendices B and D cover the Rhode River Segment (RHDMH).

West River (WSTMH)

SAV in WSTMH increased from none reported in 1997 to 3.21 ha in 1998. The Tier I goal (46.75 ha) was not met for WSTMH. This segment accounted for a small portion (0.03%) of the SAV in the Middle Bay Zone.

Three new beds were mapped at the mouth of Parish Creek in the West River (Map 35).

The following species was identified for WSTMH in 1998: *Z. palustris*.

Figure 25; Tables 6-8 and 11; and Map 35 in Appendices B, C, and D cover the West River Segment (WSTMH).

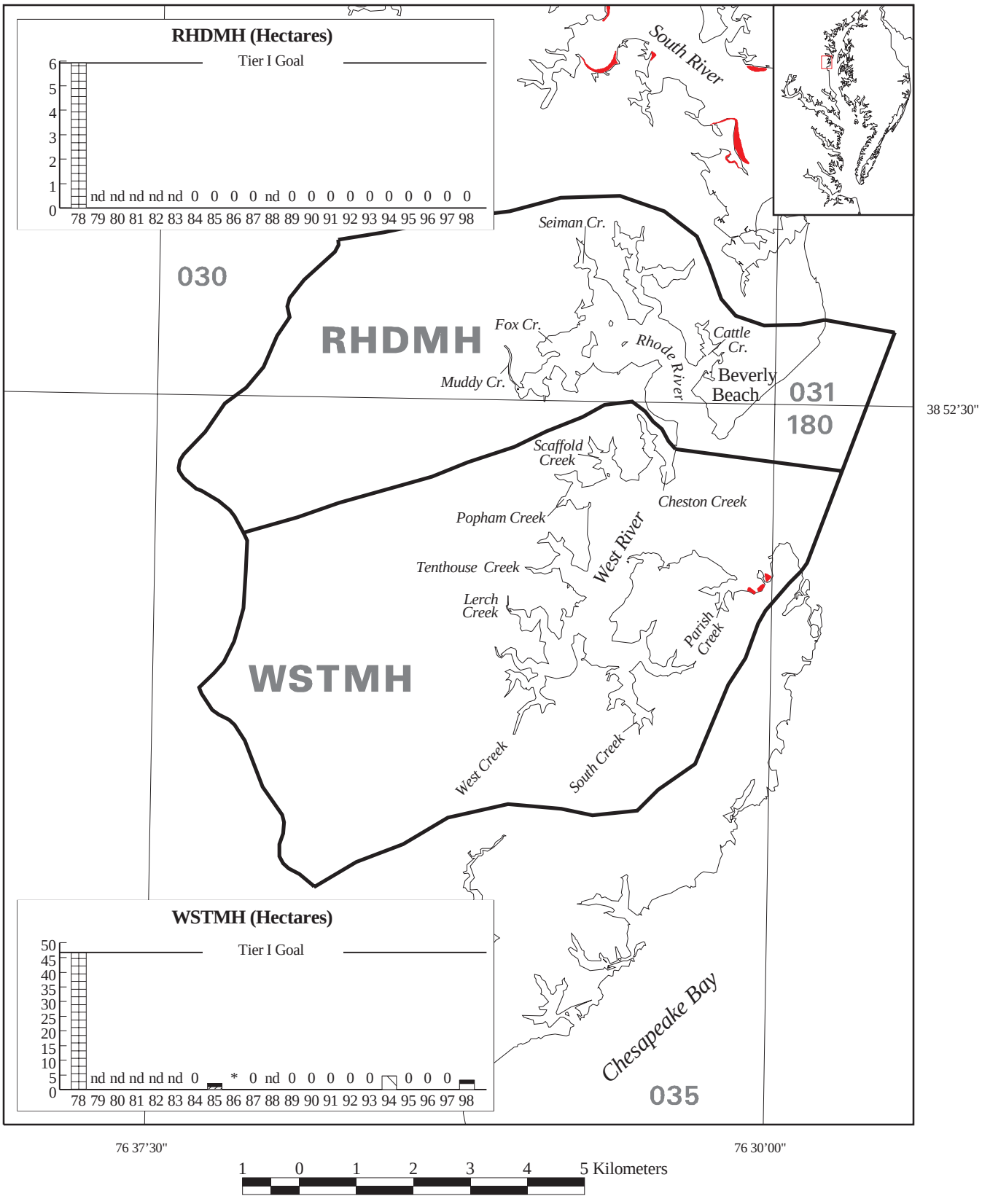

Figure 25: SAV distribution in the Rhode River (RHDMH) and West River (WSTMH) in 1998. (See Figure 11 for key.)

Lower Central Chesapeake Bay (CB5MH)

In 1998, SAV area in CB5MH decreased to 660.55 ha, 10% less than in 1997 (736.07 ha). The Tier I goal (1,933.24 ha) was not met for CB5MH. This segment accounted for 5% of the SAV in the Middle Bay Zone and 3% of the Bay total.

Notable increases occurred in Ball Creek (Map 106); in Dividing, Prentice, and Dymer creeks; and Little Bay (Map 112). Except for three small beds, SAV was completely lost in Tar Bay (Maps 72, 73). In addition, the southern portion of the bed off of Dameron Marsh (Map 106) receded, as did the bed to the east of the mouth of Henrys Creek (Map 112).

The following species were reported for CB5MH in 1998: *M. spicatum, P. pectinatus, R. maritima, Z. marina,* and *Z. palustris.*

Figure 26; Tables 6-8 and 11; and Maps 62, 71, 73, 106, and 112 in Appendices B, C, and D cover the Lower Central Chesapeake Bay Segment (CB5MH).

Honga River (HNGMH)

In 1998, SAV area in HNGMH decreased to 316.37 ha, 64% less than in 1997 (890.51 ha). The Tier I goal (1,599.11 ha) was not achieved for HNGMH. This segment accounted for 3% of the Middle Bay Zone and 1% of the Bay total.

Notable increases occurred in fringing beds in the upper Honga River (Map 63); Charles Creek (Map 73); Norman Cove (Map 74); and Hopkins Cove (Map 83). SAV declined throughout the Honga River with notable decreases at Keenes and Cedar points; Wallace and Back creeks; Wroten and Gunners islands; and Lakes, Muddy Hook, Hickory, Flag, Bentley, Cat, and Flowers coves (Map 73). Additional decreases occurred in Fallins and Duck Point coves as well as Fox Creek (Map 74).

The following species were reported for HNGMH in 1998: *R. maritima, Z. marina,* and *Z. palustris.*

Figure 26; Tables 6-8 and 11; and Maps 63, 73, 74, and 83 in Appendices B, C, and D cover the Honga River Segment (HNGMH).

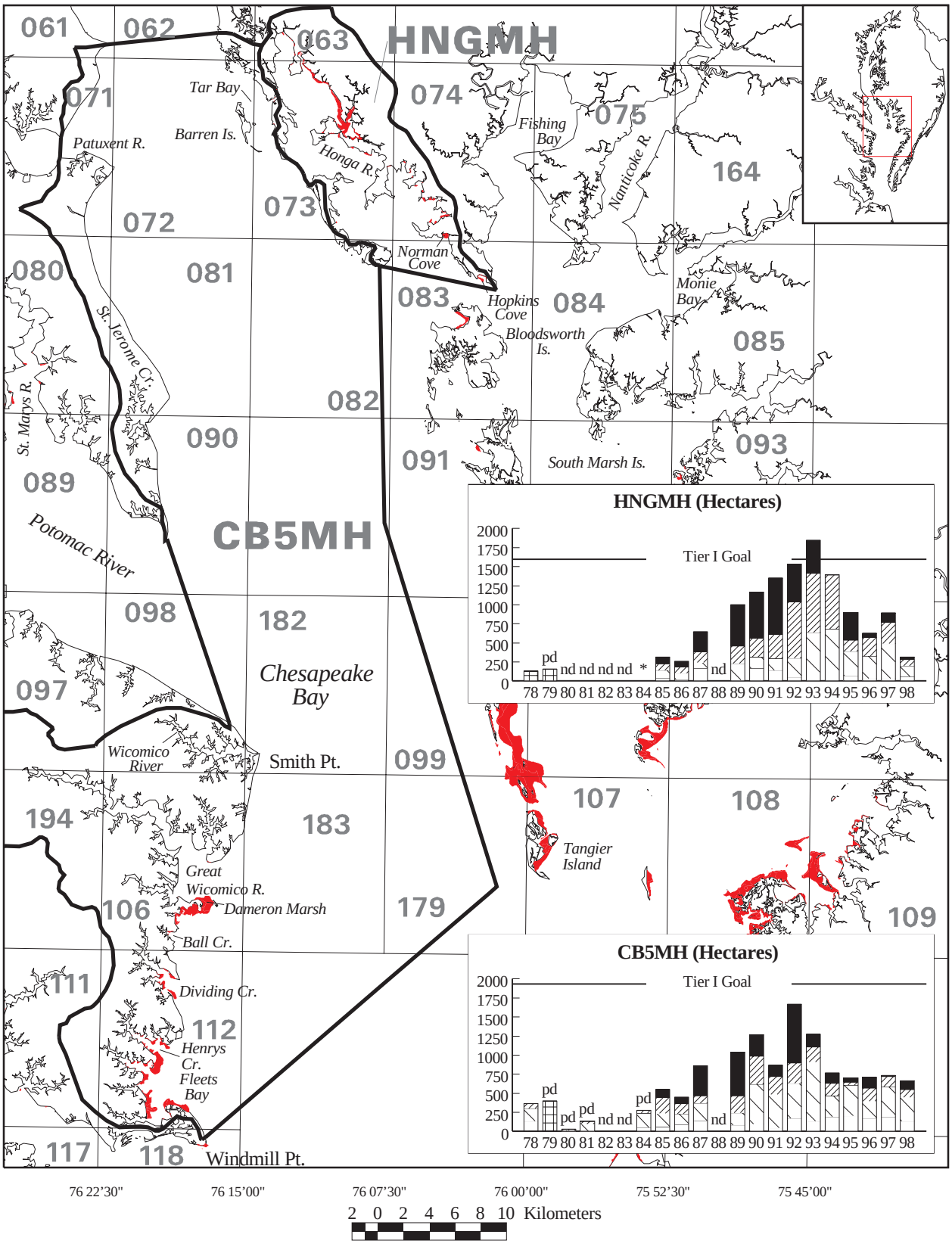

Figure 26: SAV distribution in the Lower Central Chesapeake Bay (CB5MH) and the Honga River (HNGMH) in 1998. (See Figure 11 for key.)

Fishing Bay (FSBMH)

SAV was not mapped in 1998 and has not been mapped in the Fishing Bay Segment since 1995. No ground survey data were reported for FSBMH in 1998. The Tier I goal for this segment is 13.43 ha.

Figure 27 and Tables 6-8 and 11 cover the Fishing Bay Segment (FSBMH).

Lower Nanticoke River (NANMH)

SAV was not mapped nor was any ground survey data reported for the Lower Nanticoke River Segment in 1998, or for any year since the segment was first mapped by the aerial survey in 1978. The Tier I goal has not been established for NANMH.

Figure 27 and Tables 6-8 and 11 cover the Lower Nanticoke River Segment (NANMH).

Middle Nanticoke River (NANOH)

SAV was not mapped and ground survey data was not reported for the Middle Nanticoke River Segment in 1998, or for any year since the segment was first mapped by the aerial survey in 1978. The Tier I goal has not been established for NANMH.

Figure 27 and Tables 6-8 and 11 cover the Middle Nanticoke River Segment (NANOH).

Upper Nanticoke River (NANTF)

SAV was not mapped and ground survey data was not reported for the Upper Nanticoke River Segment in 1998, or for any year since the segment was first mapped by the aerial survey in 1978. The Tier I goal has not been established for NANTF.

Figure 27 and Tables 6-8 and 11 cover the Upper Nanticoke River Segment (NANTF).

Wicomico River (WICMH)

SAV was not mapped and ground survey data was not reported for the Wicomico River Segment in 1998, or for any year since the segment was first mapped by the aerial survey in 1978. The Tier I goal has not been established for WICMH.

Figure 27 and Tables 6-8 and 11 cover the Wicomico River Segment (WICMH).

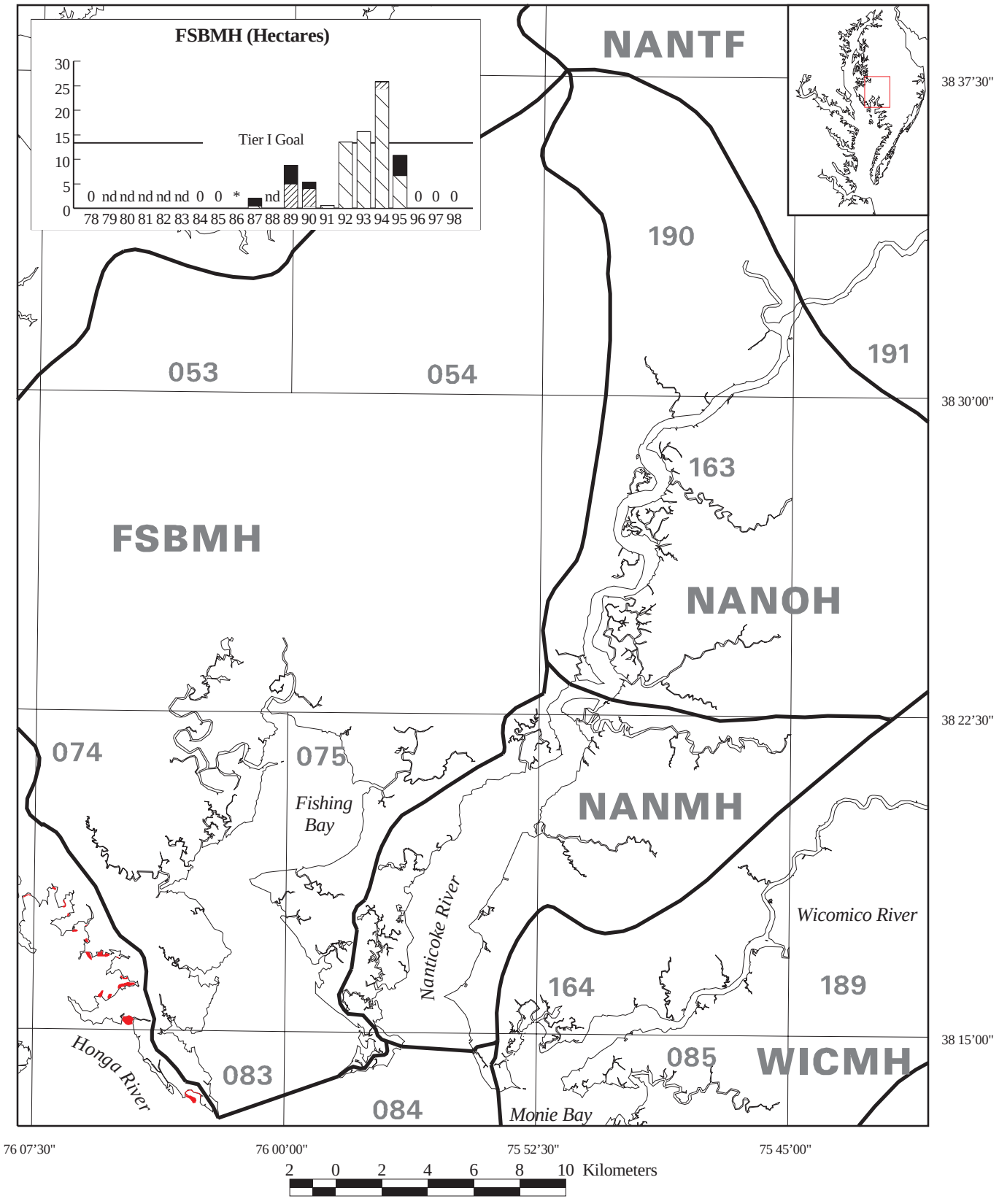

Figure 27: SAV distribution in Fishing Bay (FSBMH); the Lower, Middle, and Upper (NANMH, NANOH, NANTF) Nanticoke River; and the Wicomico River (WICMH) in 1998. NANMH, NANOH, NANTF, and WICMH are not graphed as no SAV was mapped from 1971–1998. (See Figure 11 for key.)

Tangier Sound (TANMH)

In 1998, SAV area in TANMH decreased to 2,675.71 ha, 30% less than in 1997 (3,825.57 ha). The Tier I goal (8,053.10 ha) was not met for TANMH. This segment accounted for 22% of the SAV in the Middle Bay Zone and 10% of the Bay total.

SAV declined throughout TANMH, but there were some slight increases in Back Cove (Map 91); the lower eastern portion of Tyler Creek (Maps 99, 100); the eastern portion of Twitch Cove (Map 100); south of Goose Island (Maps 107, 179); and the eastern tip of Thorofare Island (Map 100). Notable decreases occurred in Johnson and Fog Point coves (Map 91); the southeast side of Little Deal Island and Terrapin Sand Cove (Map 92); from Cheeseman Island to Rum Point (Maps 99, 179); on the eastern shore in Cedar Straits (Map 100); in Back, Daughterty, Jenkins, and Broad creeks, and east of Cedar Island (Map 101).

The following species were reported for TANMH in 1998: *R. maritima* and *Z. marina.*

Figure 28; Tables 6-8 and 11; and Maps 83, 91, 92, 93, 99, 100, 101, 107, and 179 in Appendices B, C, and D cover the Tangier Sound Segment (TANMH).

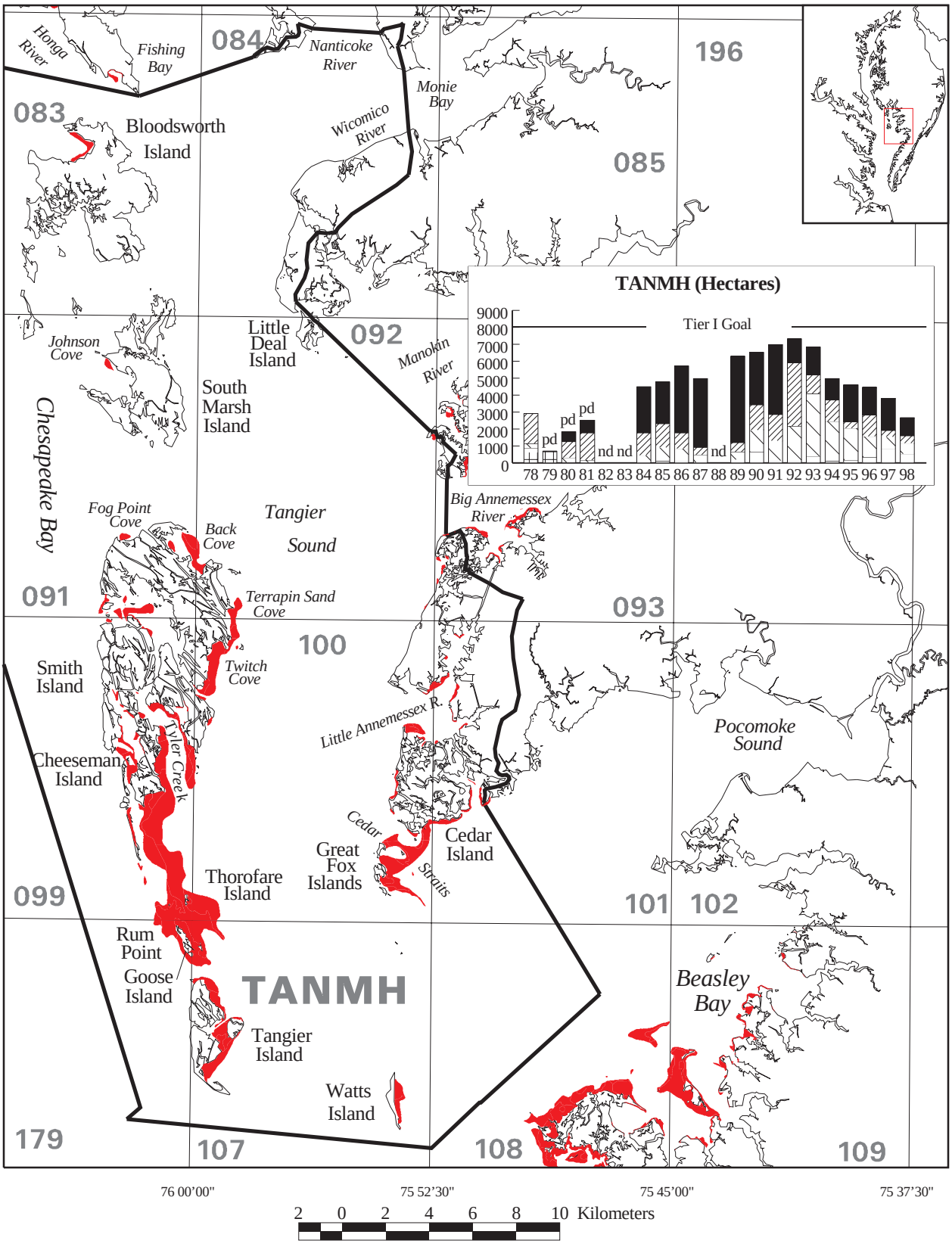

Figure 28: SAV distribution in Tangier Sound (TANMH) in 1998. (See Figure 11 for key.)

Manokin River (MANMH)

In 1998, SAV area in MANMH decreased to 14.01 ha, 75% less than in 1997 (56.44 ha). The Tier I goal (276.20 ha) was not met for MANMH. This segment accounted for a small portion (0.1%) of the Middle Bay Zone.

There were no notable areas of increase for this segment in 1998. Notable decreases occurred in Drum Point Cove and in Goose and Mine creeks (Map 93).

The following species was identified for MANTF in 1998: *R. maritima.*

Figure 29; Tables 6-8 and 11; and Maps 84 and 93 in Appendices B, C, and D cover the Manokin River Segment (MANMH).

Big Annemessex River (BIGMH)

In 1998, SAV area in BIGMH decreased to 94.35 ha, 34% less than in 1997 (143.25 ha). The Tier I goal (364.52 ha) was not met for BIGMH. This segment accounted for only 0.8% of the SAV in Middle Bay Zone.

There were no notable areas of increase for this segment in 1998. Notable decreases occurred in the upper Big Annemessex River between Fords Cove and Scott Point and from Jones Creek to Sandy Point (Map 93).

Ground survey data was not reported for BIGMH in 1998.

Figure 29; Tables 6-8 and 11; and Map 93 in Appendices B and C cover the Big Annemessex River Segment (BIGMH).

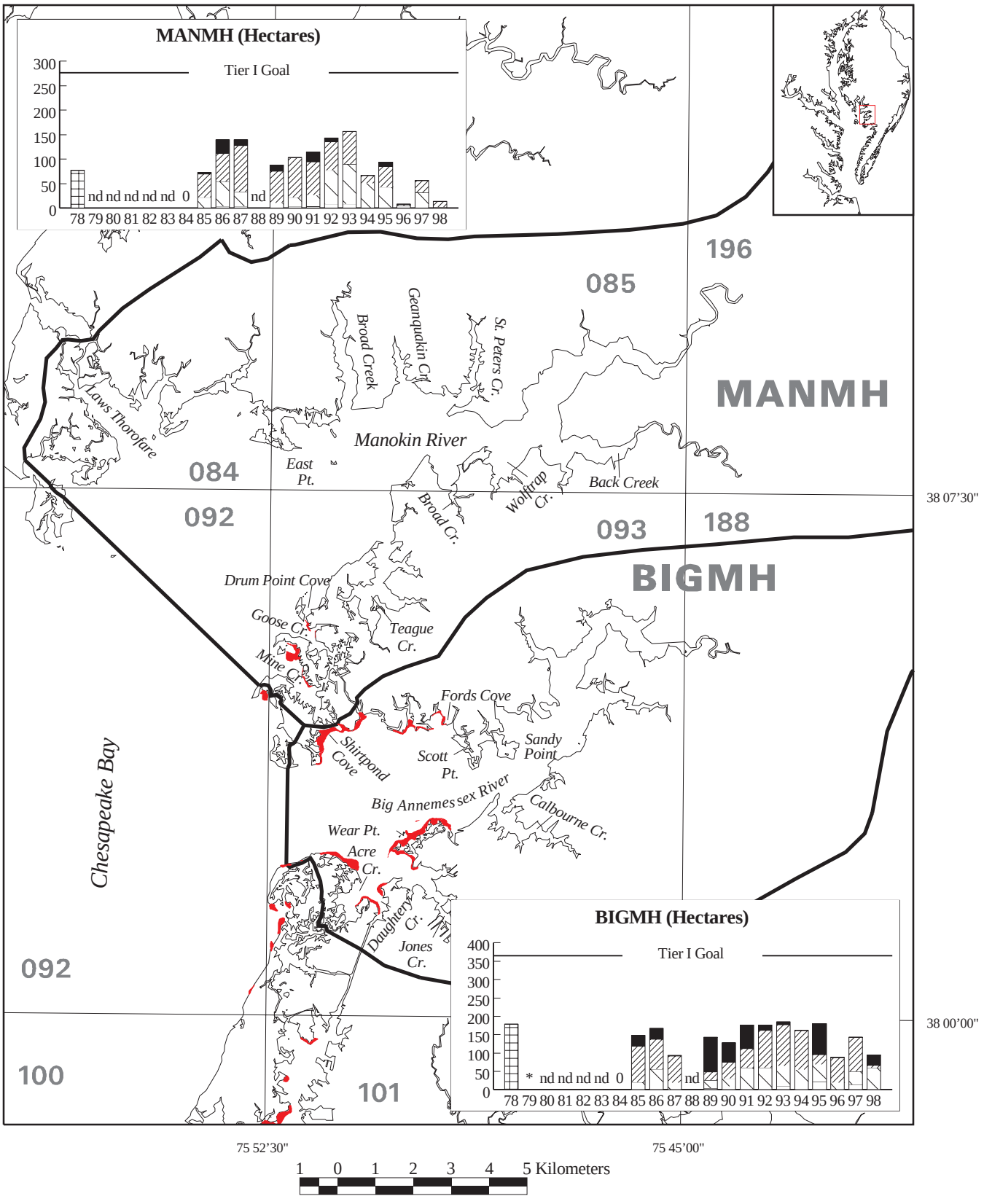

Figure 29: SAV distribution in the Manokin River (MANMH) and the Big Annesmessex River (BIGMH) in 1998. (See Figure 11 for key.)

Lower Pocomoke River (POCMH)

In 1998, SAV area in POCMH decreased to 459.46 ha, 13% less than in 1997 (529.84 ha). The Tier I goal (840.77 ha) was not met for POCMH. This segment accounted for 4% of the SAV in the Middle Bay Zone and 2% of the Bay total.

There were some small areas of SAV increase at the mouth of Doe Creek, around Web Island to the west of Jacks Island, and at Flood Point (Map 109). Notable decreases occurred on the south shore between Scott Island and the Guilford Flats (Map 108); in the bed east of Lower Bernard Island (Map 109); off of Sandy Point (Map 109); and in the mouth of Guilford Creek (Map 109).

The following species were reported for POCMH in 1998: *R. maritima* and *Z. marina.*

Figure 30; Tables 6-8 and 11; and Maps 101, 108, and 109 in Appendices B, C, and D cover the Lower Pocomoke River Segment (POCMH).

Middle Pocomoke River (POCOH)

For POCOH, SAV was not mapped and ground survey data was not reported in 1998, or for any year since the segment was first mapped by the aerial survey in 1978. The Tier I goal has not been established for POCOH.

Figure 30 and Tables 6-8 and 11 cover the Middle Pocomoke River Segment (POCOH).

Upper Pocomoke River (POCTF)

For POCTF, SAV was not mapped and ground survey data was not reported in 1998, or for any year since the segment was first mapped by the aerial survey in 1978. The Tier I goal has not been established for POCTF.

Figure 30 and Tables 6-8 and 11 cover the Upper Pocomoke River Segment (POCTF).

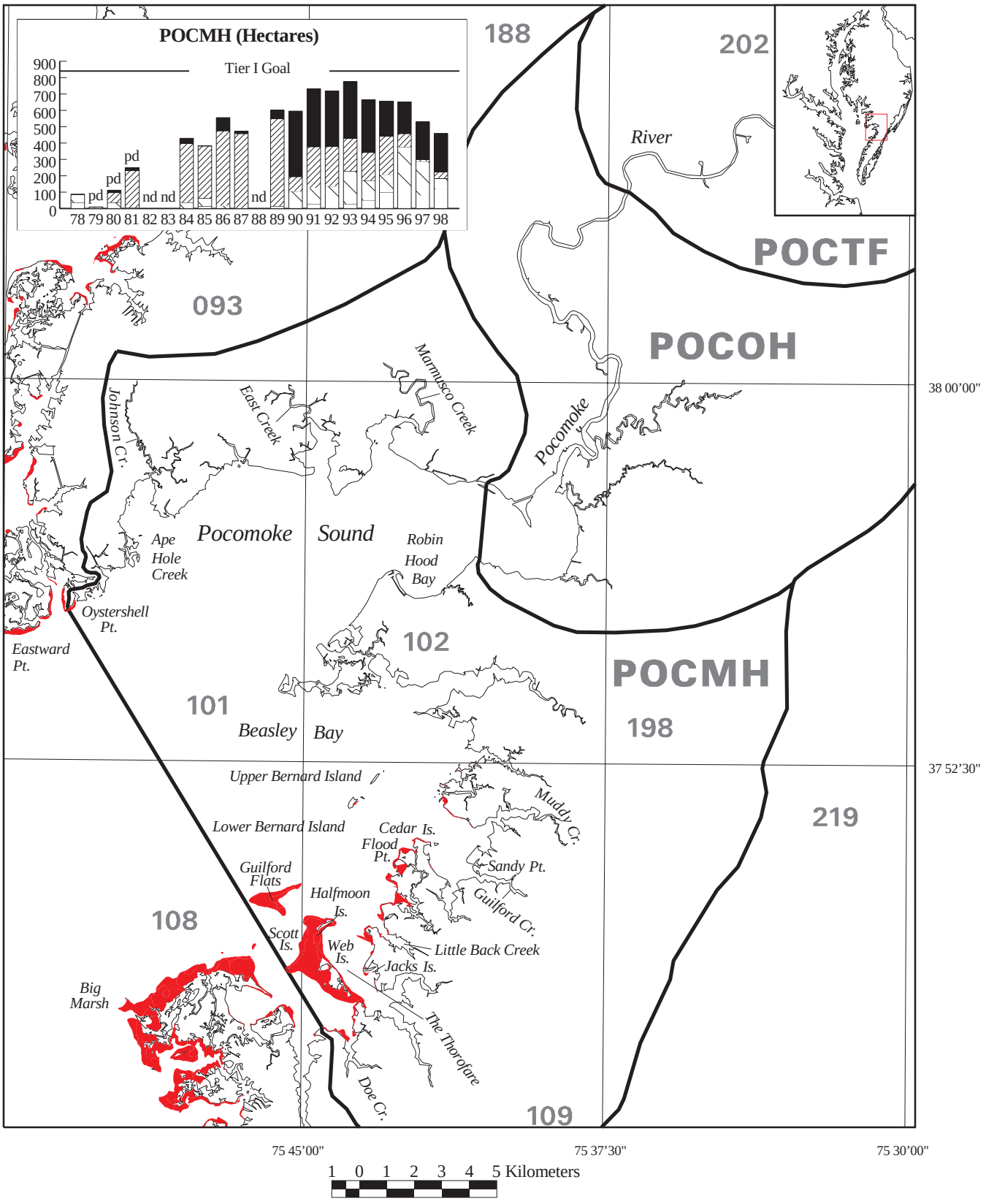

Figure 30: SAV distribution in the Lower (POCMH), Middle (POCOH), and Upper (POCTF) Pocomoke River in 1998. POCOH and POCTF are not graphed as no SAV was mapped from 1971–1998. (See Figure 11 for key.)

Lower Patuxent River (PAXMH)

None of the 1.02 ha of SAV that was mapped in 1997 was observed on the 1998 aerial photography. The Tier I goal (143.61 ha) was not met for PAXMH.

The SAV bed at the mouth of Hungerford Creek (Map 71) in 1997 was not observed on the aerial photography in 1998.

The following species were reported for PAXMH in 1998: *M. spicatum, P. pectinatus,* and *Z. palustris.*

Figure 31; Tables 6-8 and 11; and Maps 60, 61, 70, and 71 in Appendices B and D cover the Lower Patuxent River Segment (PAXMH).

Middle Patuxent River (PAXOH)

In 1998, SAV area in PAXOH increased to 43.25 ha, 8% more than in 1997 (40.08 ha). The Tier I goal (0.83 ha) was achieved for PAXOH. This segment accounted for a small portion (0.4%) of the SAV in the Middle Bay Zone.

SAV increased with new beds on both shores of the middle Patuxent River, at the mouths of Hall, Friday, and Cocktown creeks (Map 41). There were no notable areas of decrease.

The following species were reported for PAXOH in 1998: *C. demersum, E. canadensis, H. verticillata, M. spicatum, N. guadalupensis, N. minor, P. crispus, P. pusillus, V. americana,* and *Z. palustris.*

Figure 31; Tables 6-8 and 11; and Maps 41 and 49 in Appendices B, C, and D cover the Middle Patuxent River Segment (PAXOH).

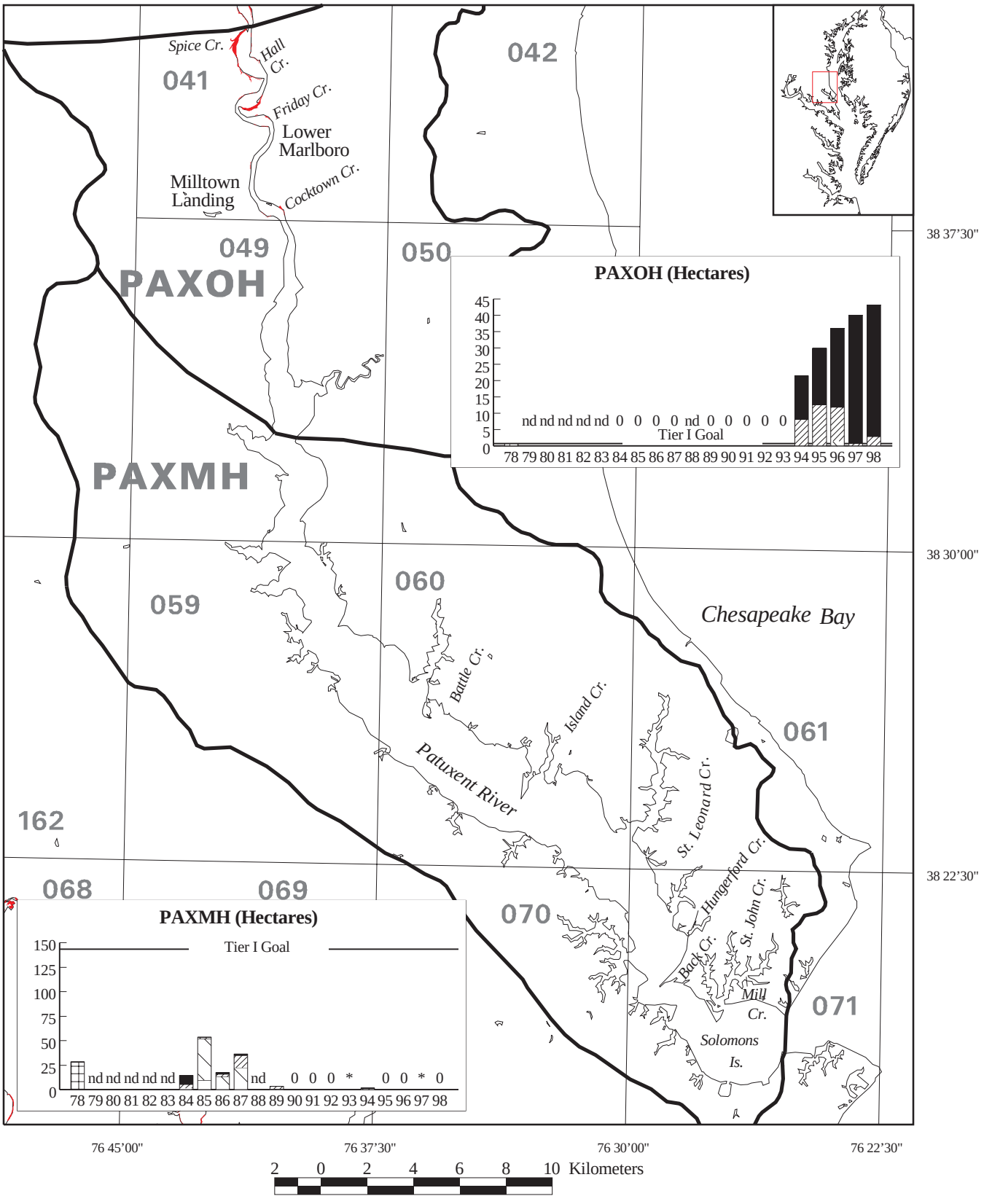

Figure 31: SAV distribution in the Lower (PAXMH) and Middle (PAXOH) Patuxent River in 1998. (See Figure 11 for key.)

Upper Patuxent River (PAXTF)

In 1998, SAV area in PAXTF increased to 61.30 ha, 15% more than in 1997 (53.16 ha). The Tier I goal (5.64 ha) was achieved for PAXTF. This segment accounted for a small portion (0.5%) of the Middle Bay Zone.

Notable increases occurred on both shores of the upper Patuxent River, in the section just north of Kings Creek (Map 41), and in Jugs Bay (Map 159). There were no notable areas of decrease.

The following species were reported for PAXTF in 1998: *C. demersum, E. canadensis, H. verticillata, Najas* sp., *N. gracillima, N. guadalupensis, N. minor, P. crispus, P. perfoliatus, P. pusillus, V. americana,* and *Z. palustris.*

Figure 32; Tables 6-8 and 11; and Maps 41 and 159 in Appendices B, C, and D cover the Upper Patuxent River Segment (PAXTF).

Western Branch of the Patuxent River (WBRTF)

SAV was not mapped in WBRTF in 1998, or in any year since the segment was first mapped by the aerial survey in 1978. The Tier I goal has not been established for WBRTF.

The following species were reported for WBRTF in 1998: *C. demersum, E. canadensis, H. verticillata, N. gracillima, N. minor, P. crispus,* and *P. pusillus.*

Figure 32; Tables 6-8 and 11; and Map 159 in Appendices B and D cover the Western Branch of the Patuxent River Segment (WBRTF).

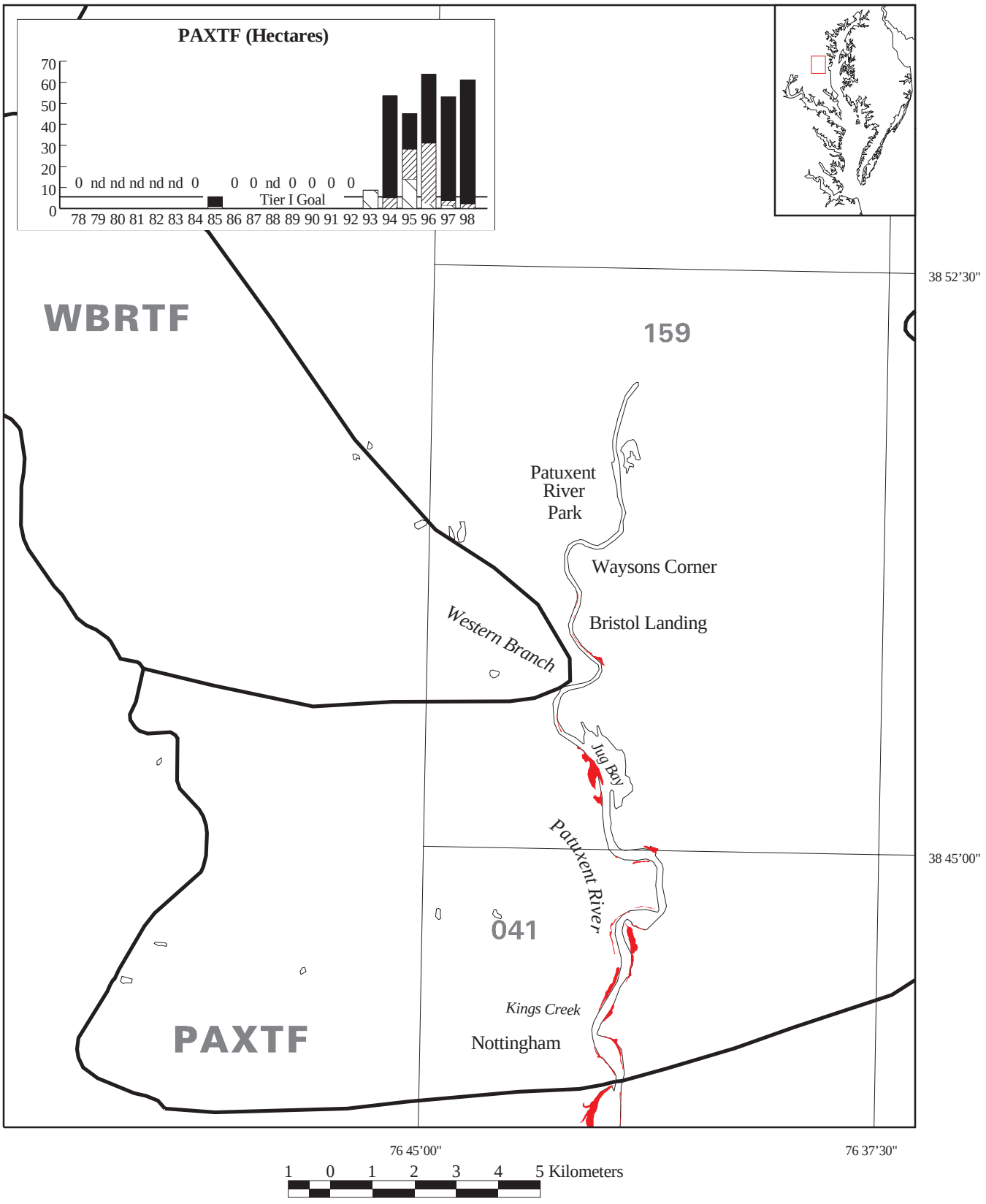

Figure 32: SAV distribution in the Upper Patuxent River (PAXTF), and the Western Branch of the Patuxent River (WBRTF) in 1998. WBRTF is not graphed as no SAV was mapped from 1971–1998. (See Figure 11 for key.)

Lower Potomac River (POTMH)

In 1998, SAV area in POTMH increased to 691.72 ha, 4% more than in 1997 (666.48 ha). The Tier I goal (400.13 ha) was achieved for POTMH. This segment accounted for 6% of the SAV in the Middle Bay Zone and 3% of the Bay total.

Notable increases occurred on the southern shore of the Potomac River in Upper Machodoc and Rosier creeks (Map 66); Monroe Bay (Map 76); and in Currioman, Poor Jack, Nomini, Buckner, and Lower Machodoc creeks (Maps 77, 78). On the northern shore, SAV increased south of Swan Point (Map 67); in the mouth of Neale Sound (Map 68); at the mouth of Allens Fresh Run in the Wicomico River (Map 58); on the east side of St. Catherine Island (Map 77); in the mouth of Breton Bay (Map 78); and in St. Marys River (Map 80).

Notable decreases occurred on the northern shore of the Potomac River in Picowaxen and Cuckold creeks (Map 67); the area north and south of Dolly Boarmans Creek (Map 68); Bushwood Cove and Chaptico Bay in the Wicomico River (Map 68); the eastern shore of St. Catherine Sound (Map 77); and near Dodson Point in St. George Creek (Map 80).

The following species were identified in POTMH in 1998: *C. demersum, E. canadensis, M. spicatum, P. crispus, P. pectinatus, P. perfoliatus, R. maritima, V. americana,* and *Z. palustris.*

Figure 33; Tables 6-8 and 11; and Maps 57, 58, 66, 67, 68, 69, 76, 77, 78, 80, 87, 88, 90, 96, 97, and 162 in Appendices B, C, and D cover the Lower Potomac River Segment (POTMH).

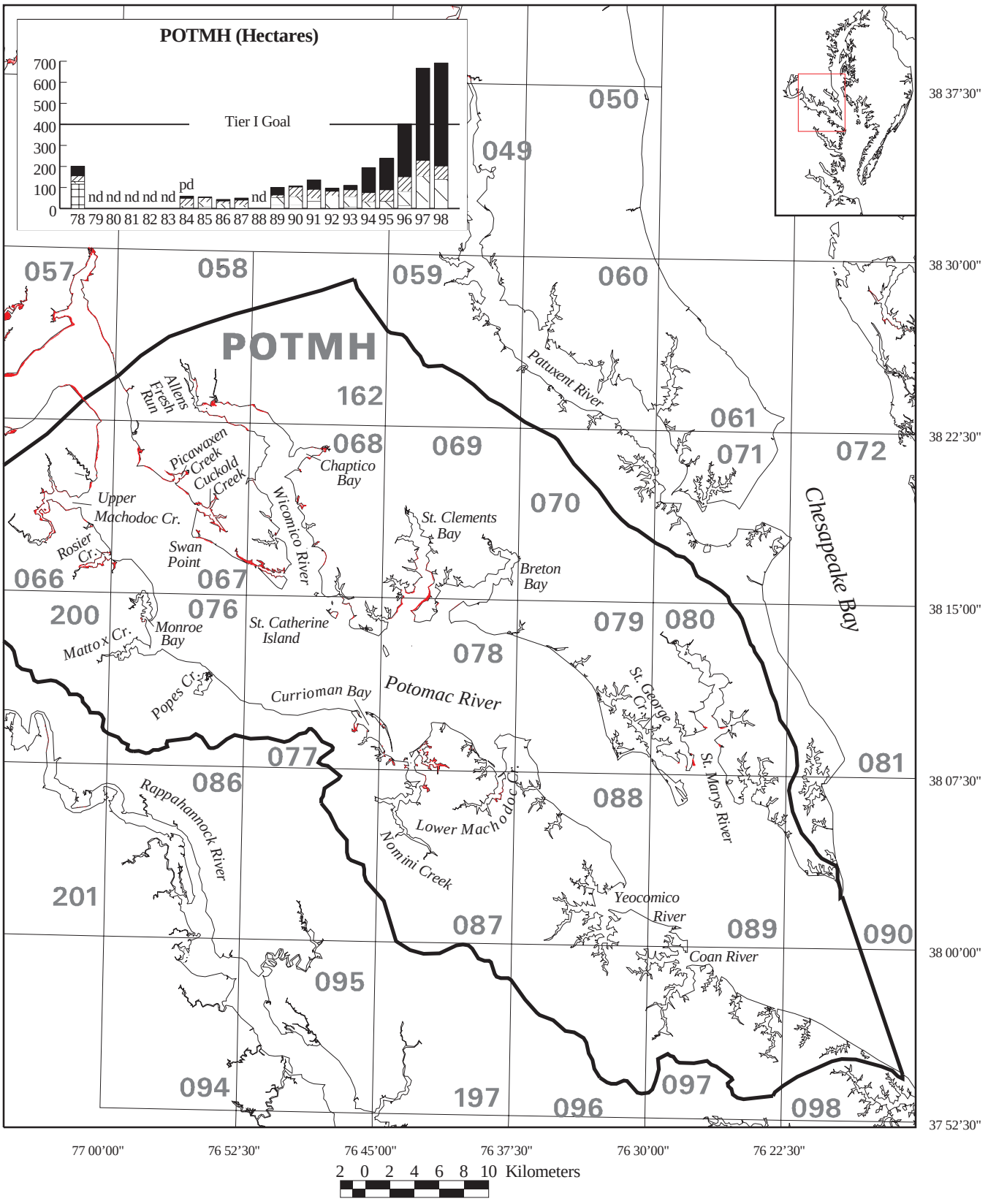

Figure 33: SAV distribution in the Lower Potomac River (POTMH) in 1998. (See Figure 11 for key.)

Middle Potomac River (POTOH)

In 1998, SAV area in POTOH increased to 1,742.51 ha, 44% more than in 1997 (1,206.26 ha). The Tier I goal (1,725.78 ha) was achieved in POTOH. This segment accounted for 14% of the SAV in the Middle Bay Zone and 7% of the Bay total.

Notable increases occurred on both shores of the middle Potomac River. Increases were observed in Chopawamsic Creek and Chopawamsic Island (Map 47); in Mallows and Wades bays (Map 55); along the western shore between Chopawamsic Island and Youbedamn Landing (Maps 47, 55); in Aquia Creek (Map 55); in Nanjemoy Creek (Map 56); at the mouth of Potomac Creek (Map 64); north of Somerset Beach (Map 65). Notable decreases occurred at the head of Chopawamsic Creek (Map 47); and at the head of the Potomac Creek (Map 64).

The following species were reported for POTOH in 1998: *C. demersum, E. canadensis, H. dubia, H. verticillata, M. spicatum, N. guadalupensis, N. minor, P. crispus, P. pectinatus, P. perfoliatus, V. americana,* and *Z. palustris.*

Figure 34; Tables 6-8 and 11; and Maps 47, 48, 55, 56, 57, 64, 65, 66, and 161 in Appendices B, C, and D cover the Middle Potomac River Segment (POTOH).

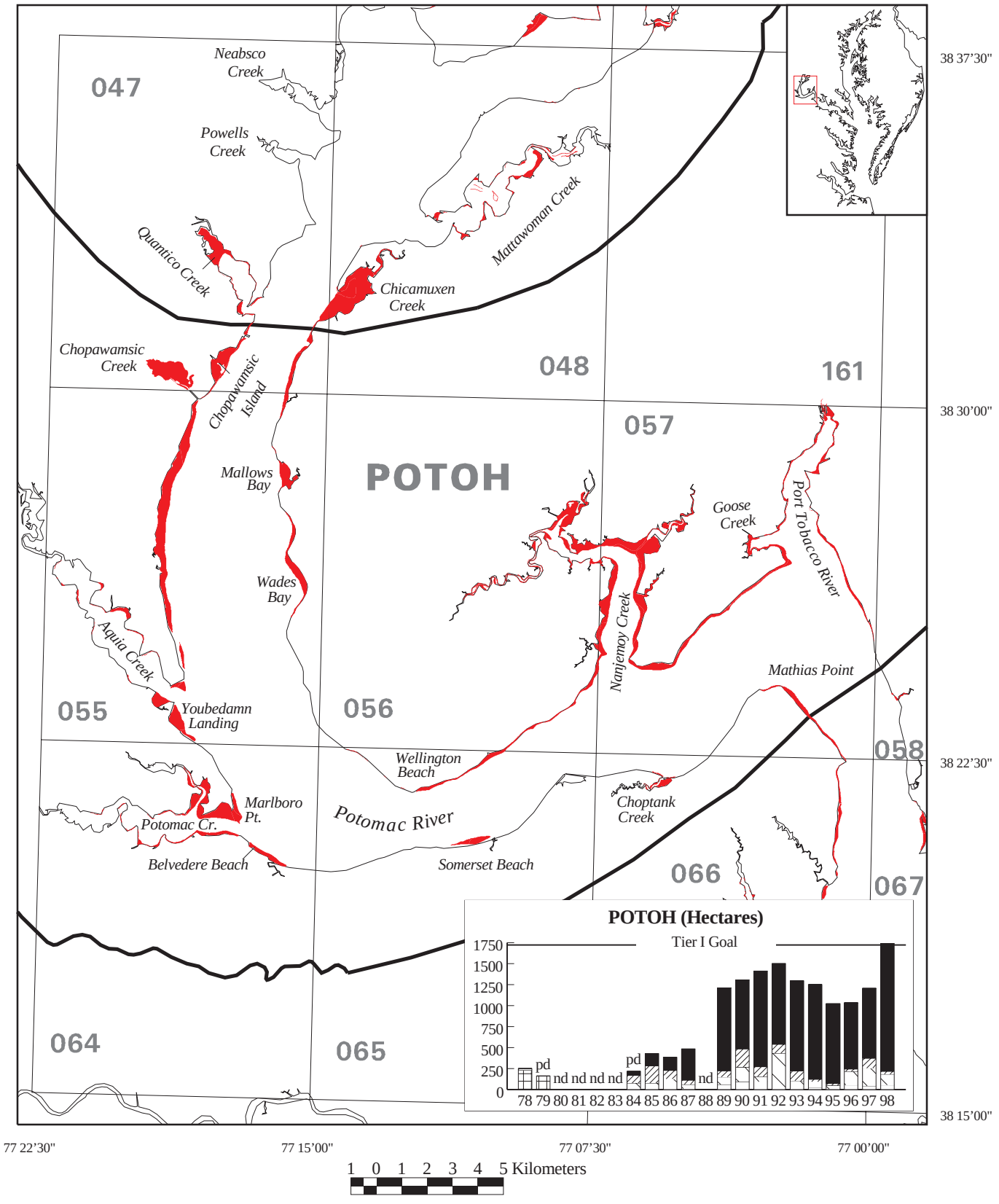

Figure 34: SAV distribution in the Middle Potomac River (POTOH) in 1998. (See Figure 11 for key.)

Upper Potomac River (POTTF)

In 1998, SAV area in POTTF increased to 1,088.71 ha, 96% more than in 1997 (554.11 ha). The Tier I goal (2,591.90 ha) was achieved for POTTF. This segment accounted for 9% of the SAV in the Middle Bay Zone and 4% of the Bay total.

Notable increases occurred on the western shore of the upper Potomac River north and south of the Woodrow Wilson Bridge (Map 34); in Broad and Piscataway creeks (Map 40); and in Chicamuxen Creek (Map 48). Notable decreases occurred in Occoquan River and the mouth of Massey Creek (Map 39); at the head of Piscataway Creek (Map 40); and in Neabsco Creek (Map 47).

The following species were identified for POTTF in 1998: *Chara* sp., *C. demersum, H. dubia, H. verticillata, M. spicatum, Najas* sp., *N. guadalupensis, N. minor, P. pectinatus,* and *V. americana.*

Figure 35; Tables 6-8 and 11; and Maps 28, 34, 39, 40, 47, 48, 161, and 176 in Appendices B, C, and D cover the Upper Potomac River Segment (POTTF).

Mattawoman Creek (MATTF)

In 1998, SAV area in MATTF increased to 65.93 ha, 31% more than in 1997 (50.28 ha). The Tier I goal (54.33 ha) was achieved for MATTF. This segment accounted for a small portion (0.5%) of the SAV in the Middle Bay Zone. SAV increased notably in the upper portion of Mattawoman Creek (Map 48).

The following species were reported for MATTF in 1998: *C. demersum, H. verticillata, N. minor,* and *V. americana.*

Figure 35; Tables 6-8 and 11; and Map 48 in Appendices B, C, and D cover the Mattawoman Creek Segment (MATTF).

Piscataway Creek (PISTF)

In 1998, SAV area in PISTF increased to 126.62 ha, 3% more than in 1997 (123.25 ha). The Tier I goal (337.83 ha) was not met for PISTF. This segment accounted for 1% of the SAV in the Middle Bay Zone. SAV increased at the mouth of Piscataway Creek, while decreases were observed in the upper portion of the creek (Map 40).

The following species were identified for PISTF in 1998: *C. demersum, H. dubia, H. verticillata, N. minor,* and *V. americana.*

Figure 35; Tables 6-8 and 11; and Map 40 in Appendices B, C, and D cover the Piscataway Creek Segment (PISTF).

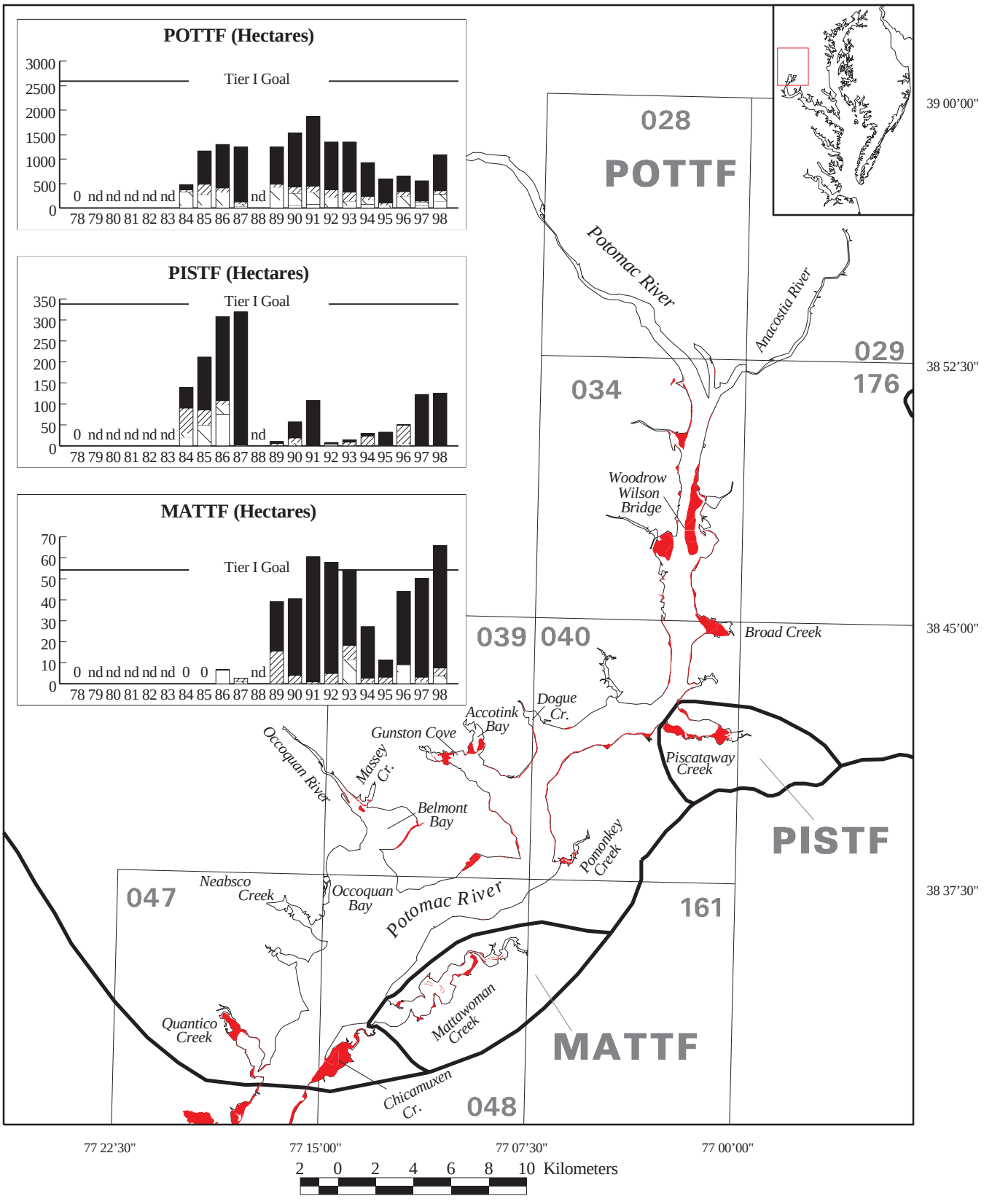

Figure 35: SAV distribution in the Upper Potomac River (POTTF), Mattawoman Creek (MATTF), and Piscataway Creek (PISTF) in 1998. (See Figure 11 for key.)

Western Lower Chesapeake Bay (CB6PH)

In 1998, SAV area in CB6PH decreased to 312.58 ha, 14% less than in 1997 (361.84 ha). The Tier I goal (511.84 ha) was not met for CB6PH. This segment accounted for 4% of the SAV in the Lower Bay Zone and 1% of the Bay total.

There were not any notable areas of increase for segment CB6PH. Notable decreases occurred in the bed north of Winter Harbor (Map 123), and in the beds that extend from Potato Neck to New Point Comfort (Map 132).

The following species were identified for CB6PH in 1998: *R. maritima* and *Z. marina.*

Figure 36; Tables 6-8 and 11; and Maps 118, 123, 132, and 178 in Appendices B, C, and D cover the Western Lower Chesapeake Bay Segment (CB6PH).

Eastern Lower Chesapeake Bay (CB7PH)

In 1998, SAV area in CB7PH decreased to 3,616.52 ha, 8% less than in 1997 (3,937.20 ha). The Tier I goal (4,888.75 ha) was not met for CB7PH. This segment accounted for 41% of the SAV in the Lower Bay Zone and 14% of the Bay total.

Notable increases for segment CB7PH occurred in Island Bay (Map 108); Pompco Creek (Map 108); Onancock Creek (Map 114); on the south shore of Nandua Creek (Map 119); at the mouth of Occohannock (Map 119) and Mattawoman (Map 124) creeks; off of Hungars Beach (Map 124); in Cherrystone Inlet, east of Mill Point (Map 133); south of Cape Charles Harbor (Map 133); south of Old Plantation Creek (Map 142); and east of the bridge in Fishermans Inlet (Map 186). Notable decreases occurred on the west side of Big Marsh and Tobacco Island (Map 108); in the northwest portion of the large bed north of Pungoteague Creek, and north of Parkers Marsh (Maps 113, 114); south of Bull Cove (Map 119); in the western portion of beds on Occohannock Neck (Maps 119, 124); in the mouth of Church Creek (Map 124); and in the large bed at Westcoat Point in the mouth of Cherrystone Inlet (Map 133).

The following species were identified for CB7PH in 1998: *R. maritima* and *Z. marina.*

Figure 36; Tables 6-8 and 11; and Maps 108, 109, 113, 114, 119, 124, 133, 134, 142, and 186 in Appendices B, C, and D cover the Eastern Lower Chesapeake Bay Segment (CB7PH).

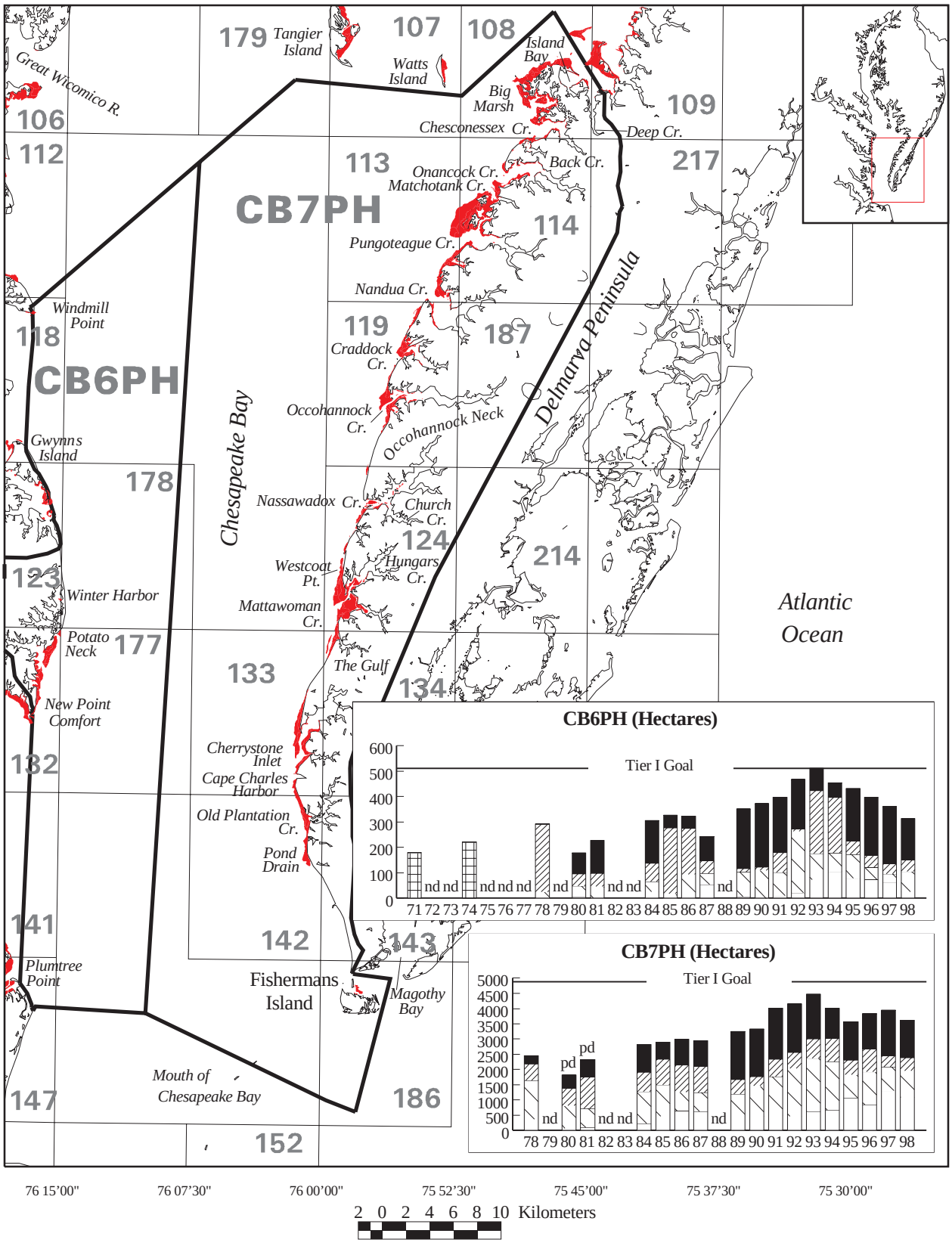

Figure 36: SAV distribution in the Western Lower Chesapeake Bay (CB6PH) and the Eastern Lower Chesapeake Bay (CB7PH) in 1998. (See Figure 11 for key.)

Lower Rappahannock River (RPPMH)

In 1998, SAV area in RPPMH decreased to 8.79 ha, 40% less than in 1997 (14.70 ha). The Tier I goal (999.92 ha) was not met for RPPMH. This segment accounted for a small portion (0.1%) of SAV in the Lower Bay Zone.

On the northern shore of the lower Rappahannock River, SAV increased in the bed west of Sanders Cove (Map 111). SAV decreased in the mouth of Carter Creek (Map 111), to the east side of Mosquito Island (Map 118), and off of Windmill Point (Map 118).

The following species were identified for RPPMH in 1998: *C. demersum, E. canadensis,* and *R. maritima.*

Figure 37; Tables 6-8 and 11; and Maps 111 and 118 in Appendices B, C, and D cover the Lower Rappahannock River Segment (RPPMH).

Corrotoman River (CRRMH)

In 1998, SAV area in CRRMH increased to 17.03 ha, 11% more than in 1997 (15.29 ha). The Tier I goal (218.56 ha) was not met for CRRMH. This segment accounted for a small portion (0.2%) of the SAV in the Lower Bay Zone.

SAV increased for CRRMH in both the Eastern and Western branches of the Corrotoman River, and just north of the mouth of Myer Creek (Map 111). SAV decreased in the bed off of Queenstown in the mouth of Myer Creek (Map 111).

The following species were identified for CRRMH in 1998: *R. maritima* and *Z. marina.*

Figure 37; Tables 6-8 and 11; and Map 111 in Appendices B, C, and D cover the Corrotoman River Segment (CRRMH).

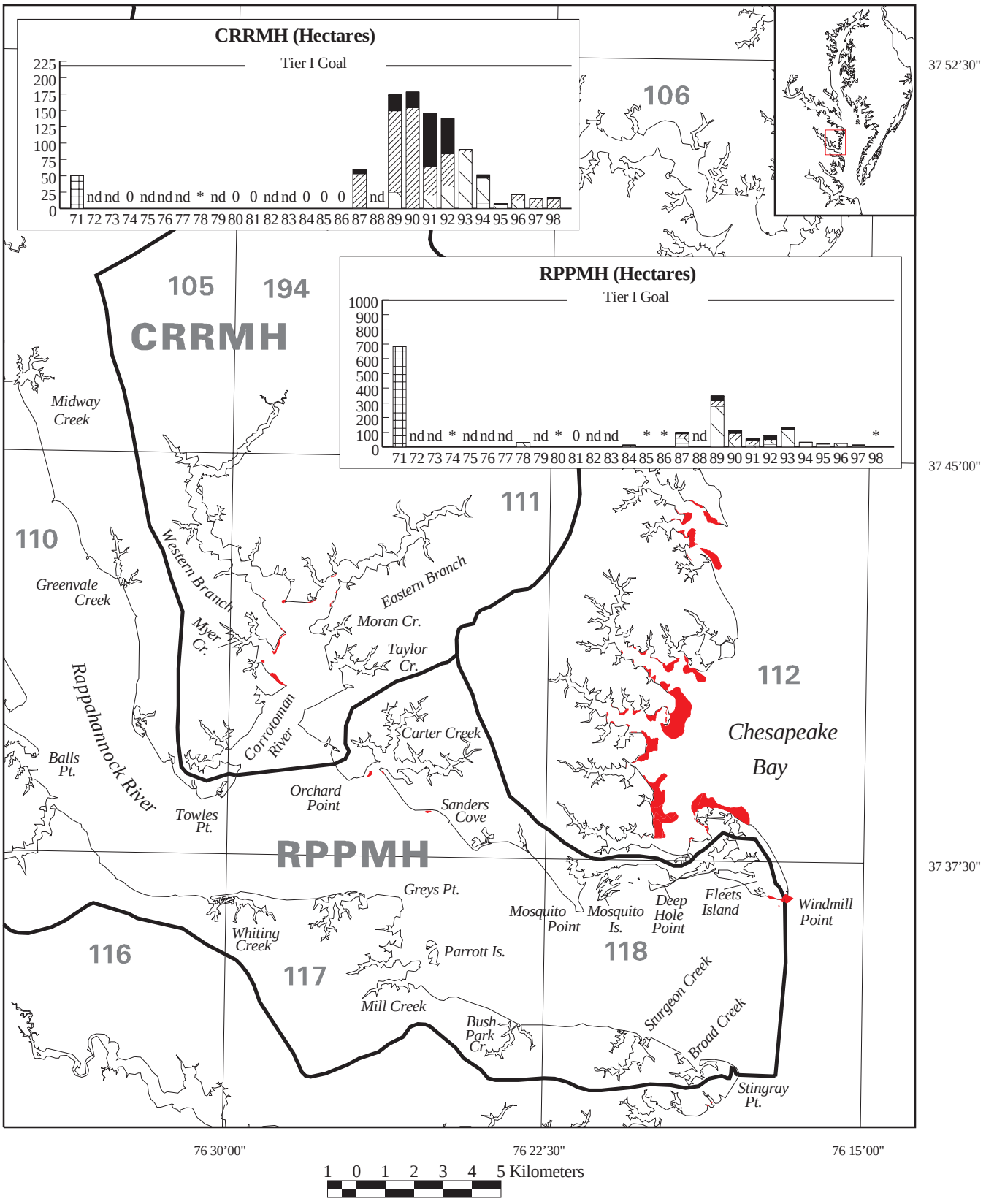

Figure 37: SAV distribution in the Lower Rappahannock River (RPPMH) and the Corrotoman River (CRRMH) in 1998. (See Figure 11 for key.)

Middle Rappahannock River (RPPOH)

SAV was not mapped and ground survey data was not reported in the Middle Rappahannock River (RPPOH) in 1998, or for any year since the segment was first mapped by the aerial survey in 1978. The Tier I goal has not been established for RPPOH.

Figure 38 and Tables 6-8 and 11 cover the Middle Rappahannock River Segment (RPPOH).

Upper Rappahannock River (RPPTF)

In 1998, 7.29 ha of SAV was mapped for segment RPPTF, which was flown for the first time in the history of the annual survey. This segment accounted for a small portion (0.08%) of the Lower Bay Zone. The Tier I goal has not been established for RPPTF.

SAV beds were mapped on the south shore of the Rappahannock River, west of Horse Head Point (Map 201), and on the north shore off of Drakes Marsh (Map 201).

No ground survey data was reported for RPPTF.

Figure 38; Tables 6-8 and 11; and Maps 200 and 201 in Appendices B and C cover the Upper Rappahannock River Segment (RPPTF).

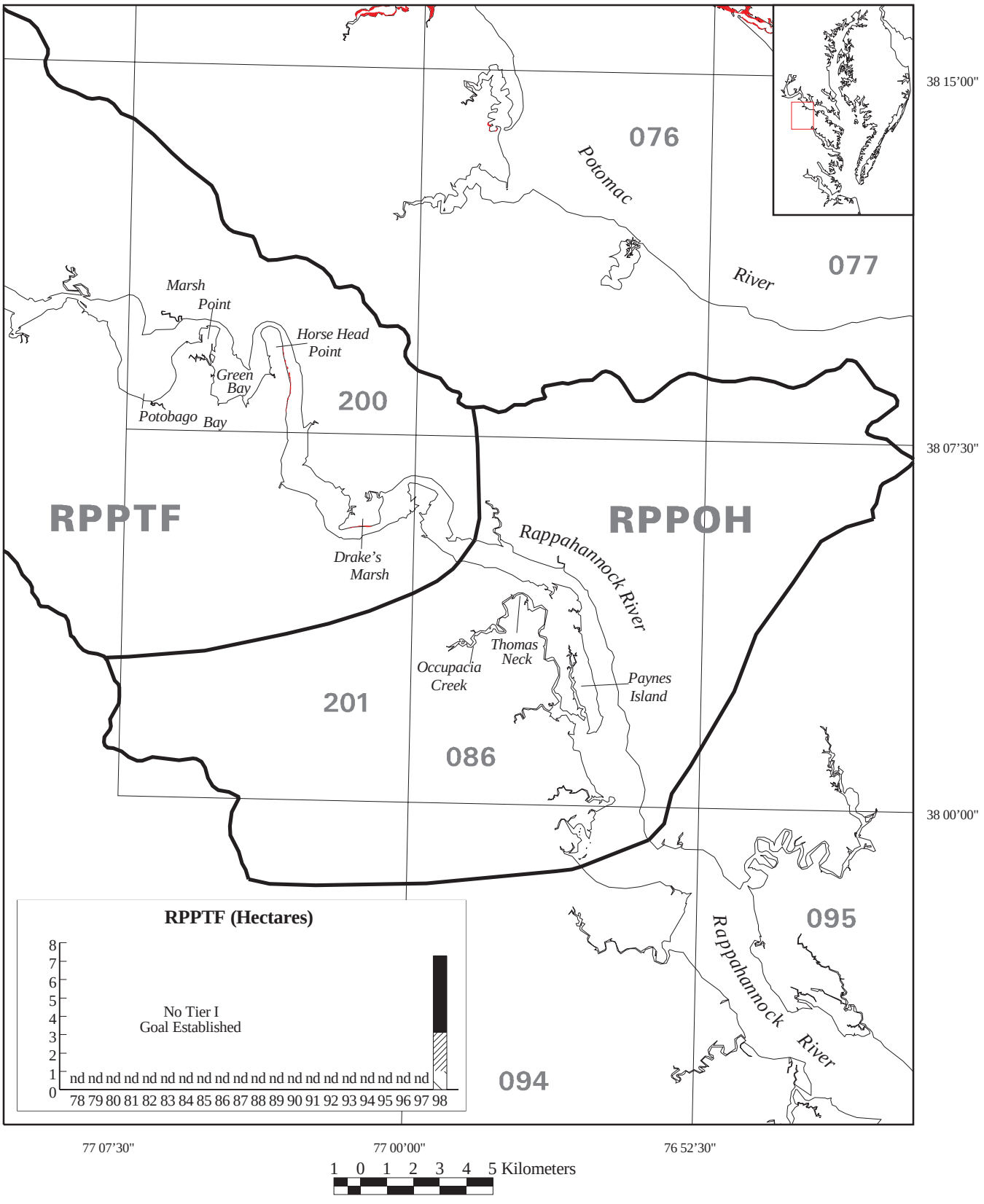

Figure 38: SAV distribution in the Middle (RPPOH) and Upper (RPPTF) Rappahannock River in 1998. The Middle Rappahannock River (RPPOH) is not graphed as no SAV was mapped from 1971–98. (See Figure 11 for key.)

Piankatank River (PIAMH)

In 1998, SAV area in PIAMH decreased to 132.11 ha, 25% less than in 1997 (175.01 ha). The Tier I goal (806.85 ha) was not met for PIAMH. This segment accounted for 2% of the SAV in the Lower Bay Zone.

SAV increased in segment PIAMH with two new small beds to the south of Stingray Point and the expansion east and west of the bed at Cherry Point (Map 118). SAV also decreased at Cherry Point with the loss of the northern portion of the bed (Map 118). Small beds in Coves Creek, that were present in 1997, were not observed on the 1998 aerial photography (Map 118). Additional decreases occurred in The Hole in the Wall and south of Edwards Creek in Milford Haven (Map 123).

The following species were identified for PIAMH in 1998: *R. maritima, Z. marina,* and *Z. palustris.*

Figure 39; Tables 6-8 and 11; and Maps 118 and 123 in Appendices B, C, and D cover the Piankatank River Segment (PIAMH).

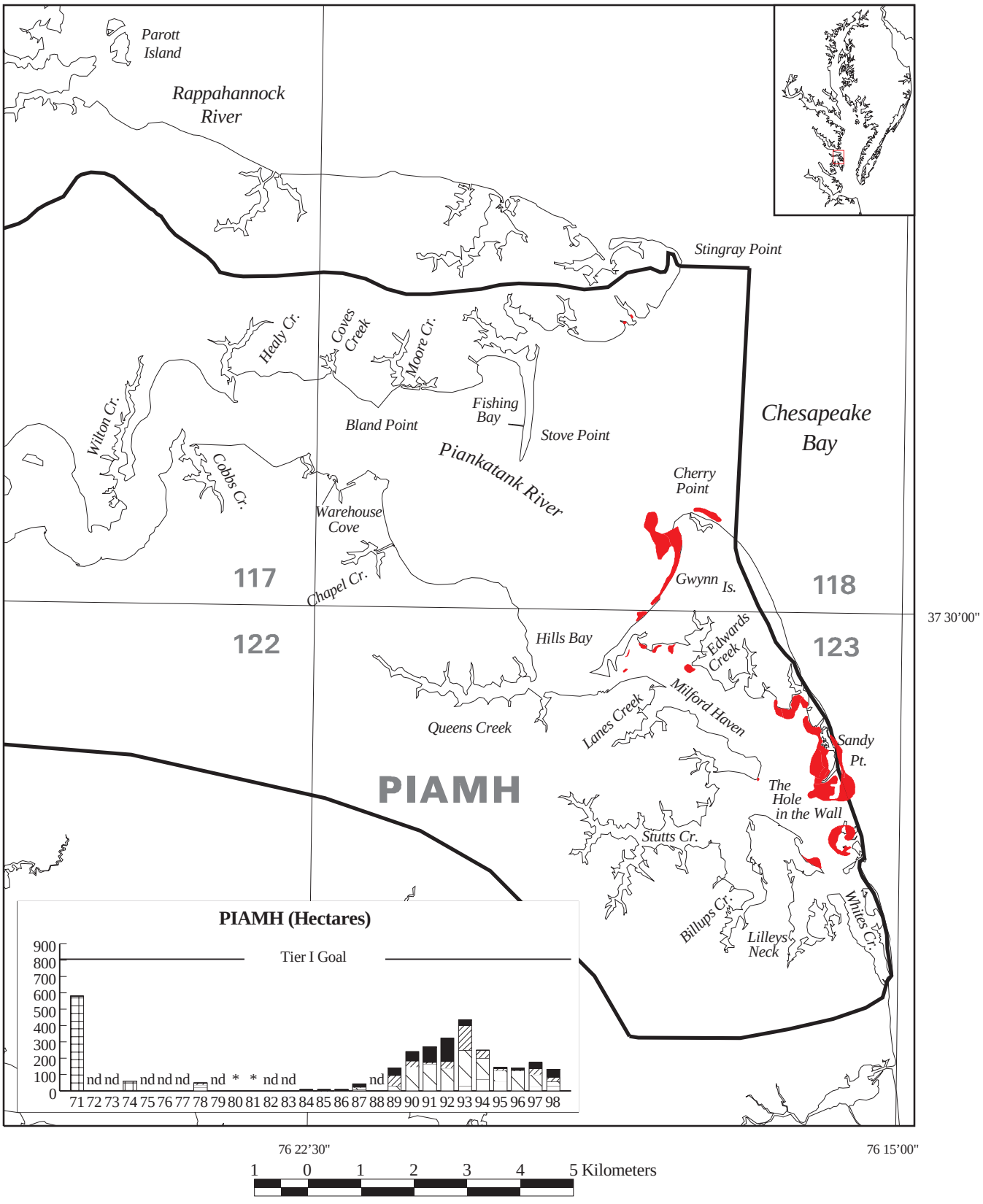

Figure 39: SAV distribution in the Piankatank River (PIAMH) in 1998. (See Figure 11 for key.)

Mobjack River (MOBPH)

In 1998, SAV area in MOBPH decreased to 4,082.34 ha, 8% less than in 1997 (4,442.49 ha). The Tier I goal (5,561.72 ha) was not achieved for MOBPH. This segment accounted for 46% of the SAV in the Lower Bay Zone and 16% of the Bay total.

SAV increased in MOBPH in the bed off of Cakes Creek in the North River (Map 122), and in the northern and southern portions of the bed between the Poquoson and Drum Island Flats (Map 141). Notable decreases occurred in the East River above Sharp Point and Tabb Creek (Map 123); on both shores of the North River above Horse Point (Map 122); in the Ware River above Windmill Point (Map 131); off of Four Point Marsh (Map 131); and at the mouth of the Poquoson (Map 140) and Back rivers (Map 147).

The following species were identified for MOBPH in 1998: *R. maritima* and *Z. marina.*

Figure 40; Tables 6-8 and 11; and Maps 122, 123, 131, 132, 140, 141, and 147 in Appendices B, C, and D cover the Mobjack River Segment (MOBPH).

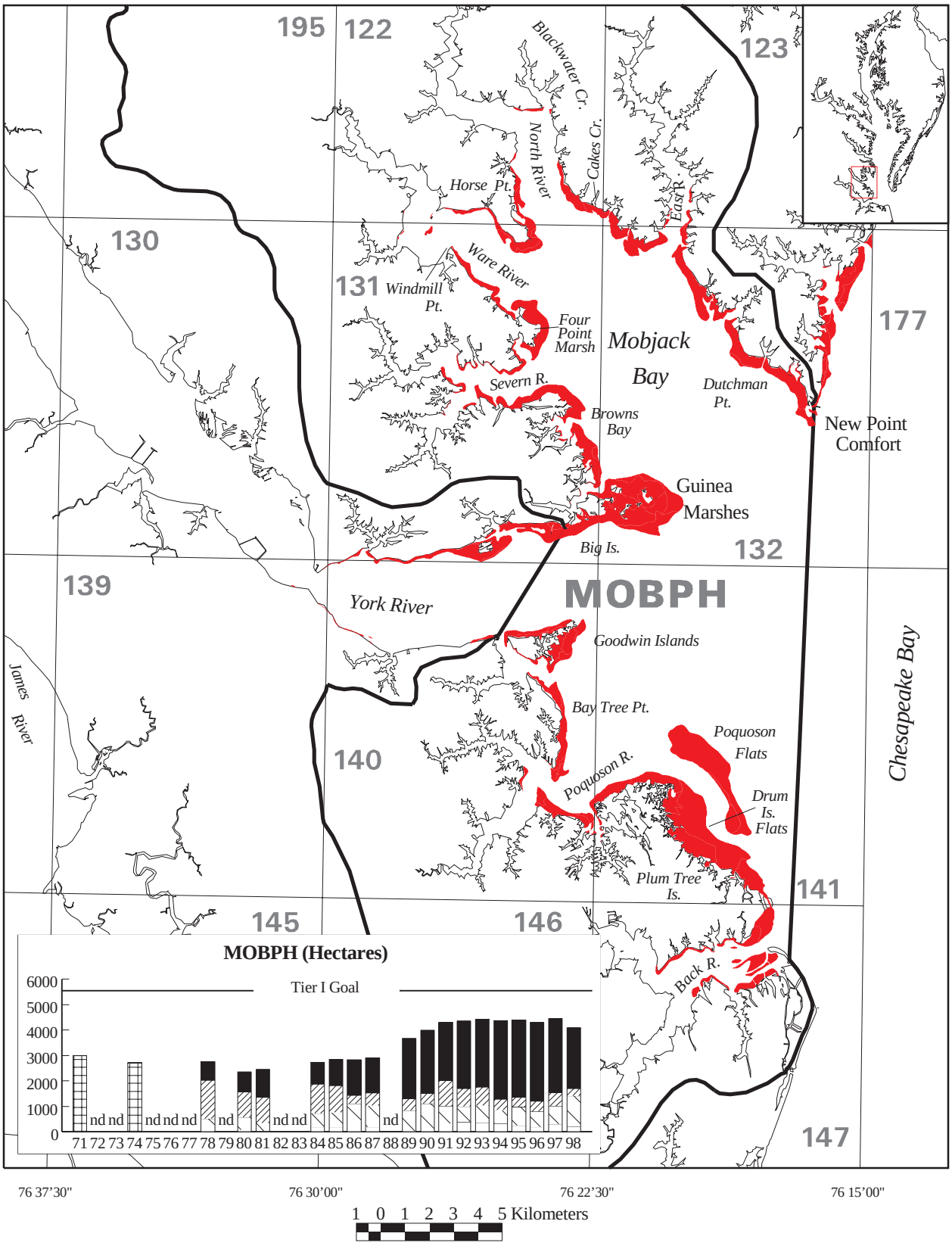

Figure 40: SAV distribution in Mobjack Bay (MOBPH) in 1998. (See Figure 11 for key.)

Lower York River (YRKPH)

In 1998, SAV area in YRKPH decreased to 302.79 ha, 11% less than in 1997 (339.50 ha). The Tier I goal (566.98 ha) was not achieved for YRKPH. This segment accounted for 3% of the SAV in the Lower Bay Zone and 1% of the Bay total.

There were no notable areas of increase for YRKPH. Declines occurred in SAV beds along both shores of the lower York River. Notable decreases occurred on the north shore in the area of Allens Island (Map 131); in Quarter and Gloucester points (Map 140); and on the south shore from Yorktown to Wormley Creek, and at the east end of Goodwin Neck (Maps 139, 140).

The following species were identified for YRKPH in 1998: *R. maritima* and *Z. marina.*

Figure 41; Tables 6-8 and 11; and Maps 131, 139, and 140 in Appendices B, C, and D cover the Lower York River Segment (YRKPH).

Middle York River (YRKMH)

No SAV has been mapped by the aerial survey for YRKMH since 1974, when 0.86 ha of SAV were mapped. The Tier I goal established for YRKMH is 22.21 ha.

The following species was identified for YRKMH in 1998: *P. pectinatus.*

Figure 41; Tables 6-8 and 11; and Map 121 in Appendices B and D cover the Middle York River Segment (YRKMH).

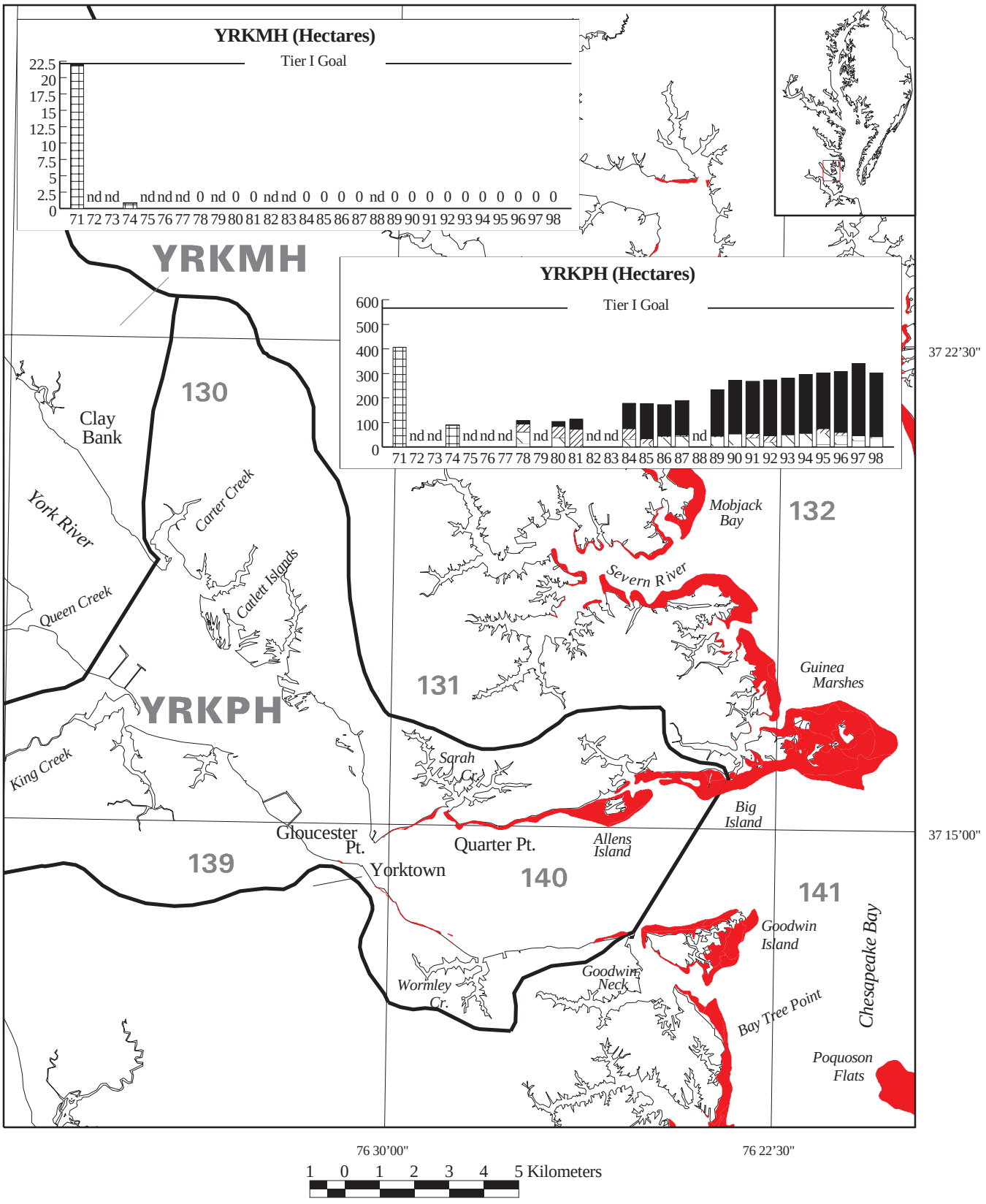

Figure 41: SAV distribution in the Lower (YRKPH) and Middle (YRKMH) York River in 1998. (See Figure 11 for key.)

Lower Mattaponi River (MPNOH)

SAV was not mapped and ground survey data was not reported for MPNOH in 1998. This segment was flown for the first time in the history of the annual SAV survey. The Tier I goal has not been established for MPNOH.

Figure 42 and Tables 6-8 and 11 cover the Lower Mattaponi River Segment (MPNOH).

Upper Mattaponi River (MPNTF)

In 1998, 34.38 ha of SAV were mapped for segment MPNTF, which was flown for the first time in the history of the annual survey. The Tier I goal has not been established for MPNTF. This segment accounted for only a small portion (0.4%) of the Lower Bay Zone.

New beds were mapped from Roanes Wharf to Walkerton (Map 226) and near Mantua Ferry (Maps 225, 226).

Ground survey data was not reported for MPNTF in 1998.

Figure 42; Tables 6-8 and 11; and Maps 225 and 226 in Appendices B and C cover the Upper Mattaponi River Segment (MPNTF).

Lower Pamunkey River (PMKOH)

SAV was not mapped and ground survey data was not reported for PMKOH in 1998. This segment was flown for the first time in the history of the annual SAV survey. The Tier I goal has not been established for PMKOH.

Figure 42 and Tables 6-8 and 11 cover the Lower Pamunkey River Segment (PMKOH).

Upper Pamunkey River (PMKTF)

In 1998, 75.89 ha of SAV were mapped for segment PMKTF, which was flown for the first time in the history of the annual survey. No Tier I goal has been established for PMKTF. This segment accounted for a small portion (0.9%) of the SAV in the Lower Bay Zone.

SAV beds were mapped in the upper Pamunkey River, from White House (Map 228) to Broad Creek (Map 225); and small beds were mapped near the towns of Chericoke (Map 225) and Retreat (Map 230).

Ground survey data was not reported for PMKTF in 1998.

Figure 42; Tables 6-8 and 11; and Maps 225, 228, and 230 in Appendices B and C cover the Upper Pamunkey River Segment (PMKTF).

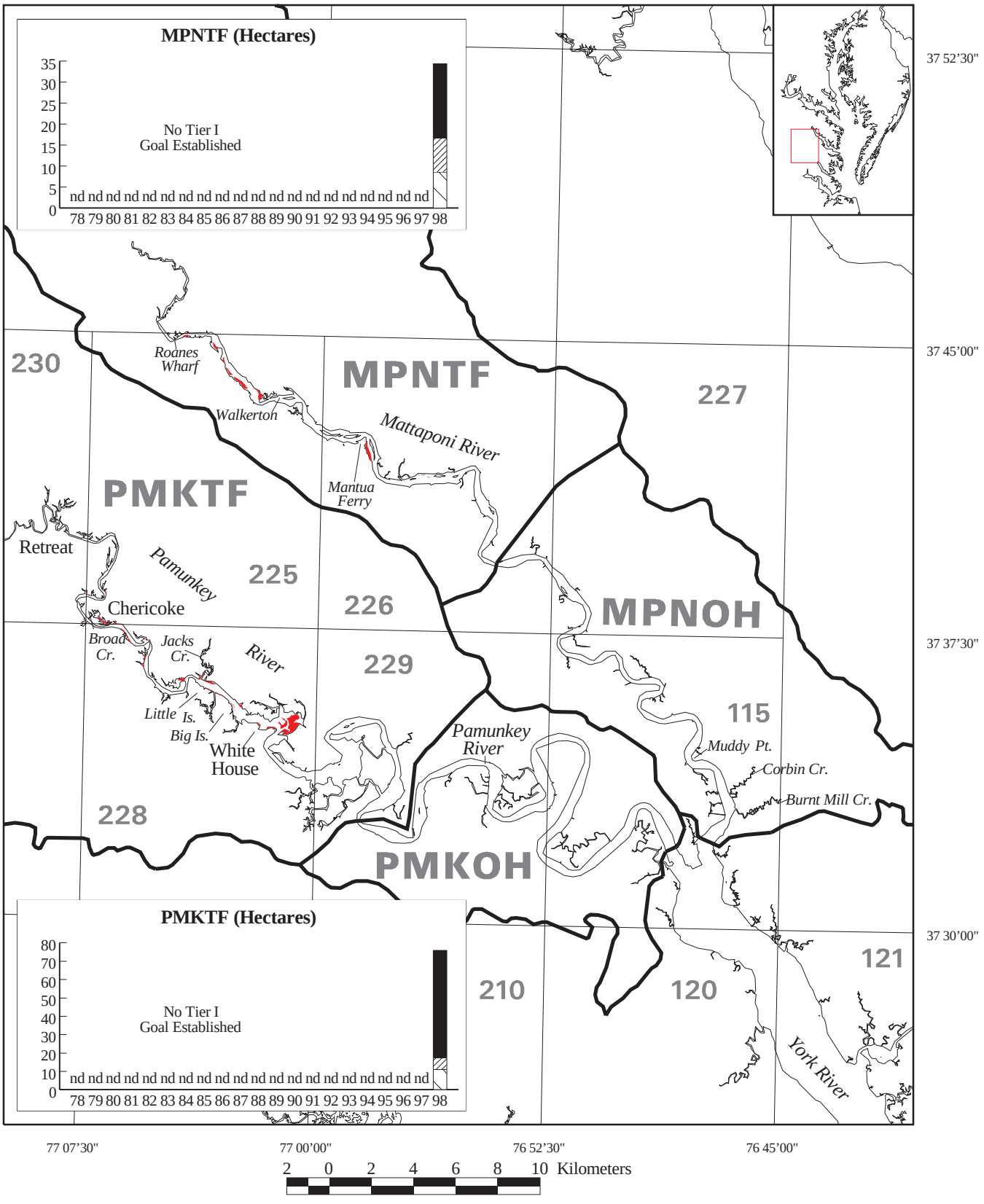

Figure 42: Distribution of SAV in the Lower and Upper Mattaponi (MPNOH, MPNTF), and Lower and Upper Pamunkey (PMKOH, PMKTF) Rivers in 1998. The Lower Mattaponi (MPNOH) and Lower Pamunkey (PMKOH) Rivers were not graphed as no SAV was mapped from 1971–1998. (See Figure 11 for key.)

Mouth of the James River (JMSPH)

In 1998, SAV area in JMPSH decreased to 52.49 ha, 31% less than in 1997 (75.74 ha). The Tier I goal (15.89 ha) was achieved for JMSPH. This segment accounted for a small portion (0.6%) of the SAV in the Lower Bay Zone.

SAV increased in JMSPH on the northern shore near Raleigh Terrace (Map 147). Notable decreases occurred with the loss of beds both north and south of Salter Creek and the decline of SAV off of Merrimac Shores (Maps 147, 149).

The following species was identified for JMSPH in 1998: *Z. marina.*

Figure 43; Tables 6-8 and 11; and Maps 147 and 149 in Appendices B, C, and D cover the Mouth of the James River Segment (JMSPH).

Lower James River (JMSMH)

In 1998, SAV area in JMSMH decreased to 0.89 ha, 15% less than in 1997 (1.05 ha). The Tier I goal has not been established for JMSMH. This segment accounted for a small portion (0.01%) of the SAV in the Lower Bay Zone.

A slight decline occurred in the one bed in JMSMH, on the northern shore, down river from the James River Bridge (Map 149).

Ground survey data was not reported for JMSMH in 1998.

Figure 43; Tables 6-8 and 11; and Map 149 in Appendices B and C cover the Lower James River Segment (JMSMH).

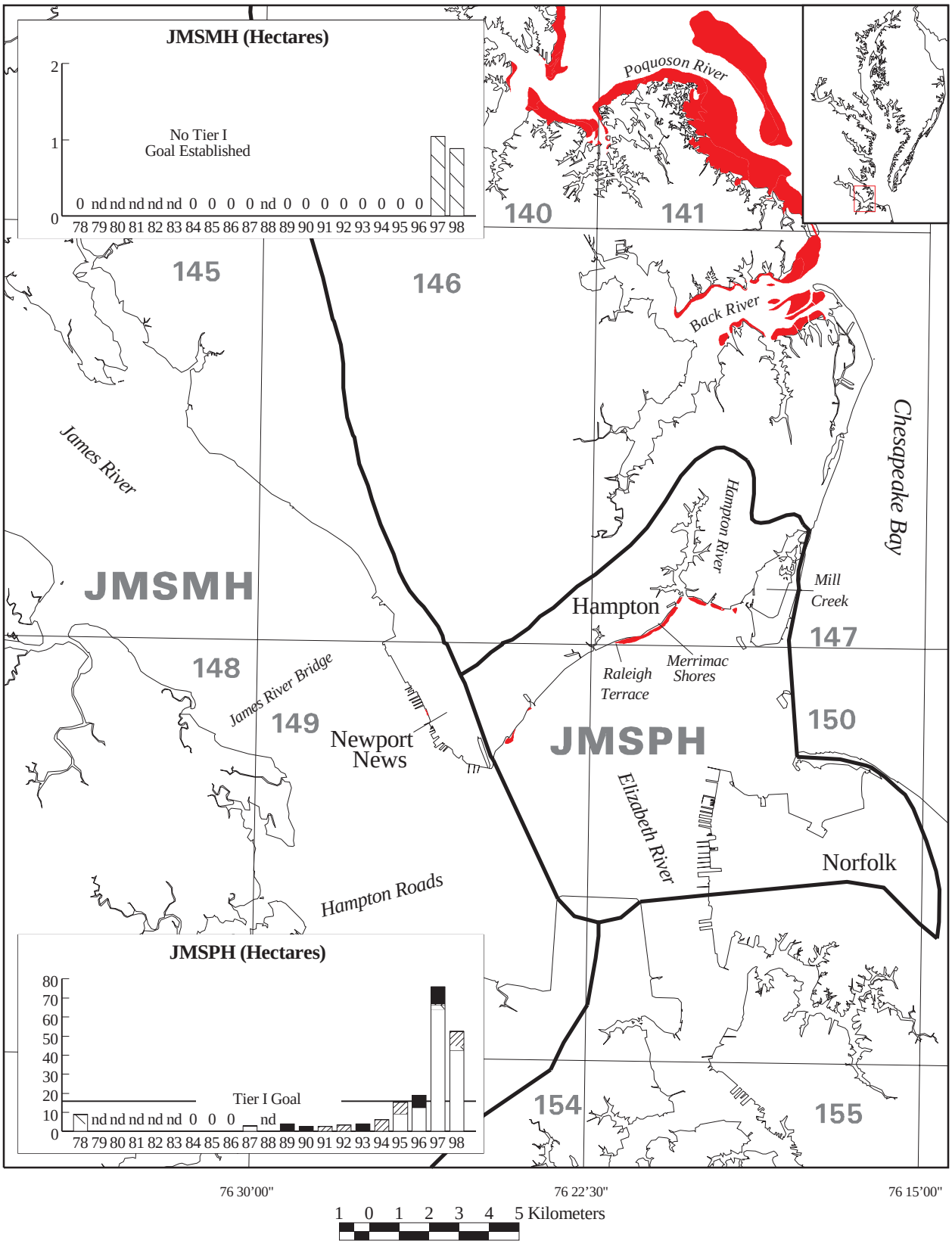

Figure 43: SAV distribution in the Mouth of the James River (JMSPH), and the Lower James River (JMSMH) in 1998. (See Figure 11 for key).

Lower (ELIPH), Middle (ELIMH), Western Branch (WBEMH), South Branch (SBEMH), and Eastern Branch (EBEMH) of the Elizabeth River and Lafayette River (LAFMH)

In 1998, SAV was not mapped and ground survey information was not reported for ELIPH, ELIMH, WBEMH, SBEMH, EBEMH, or LAFMH. Tier I goals have not been established for these segments.

Figure 44 and Tables 6-8 and 11 cover the Lower Elizabeth River Segment (ELIPH), Middle Elizabeth River Segment (ELIMH), the Western Branch of the Elizabeth River Segment (WBEMH), the South Branch of the Elizabeth River Segment (SBEMH), the Eastern Branch of the Elizabeth River Segment (EBEMH), and the Lafayette River Segment (LAFMH).

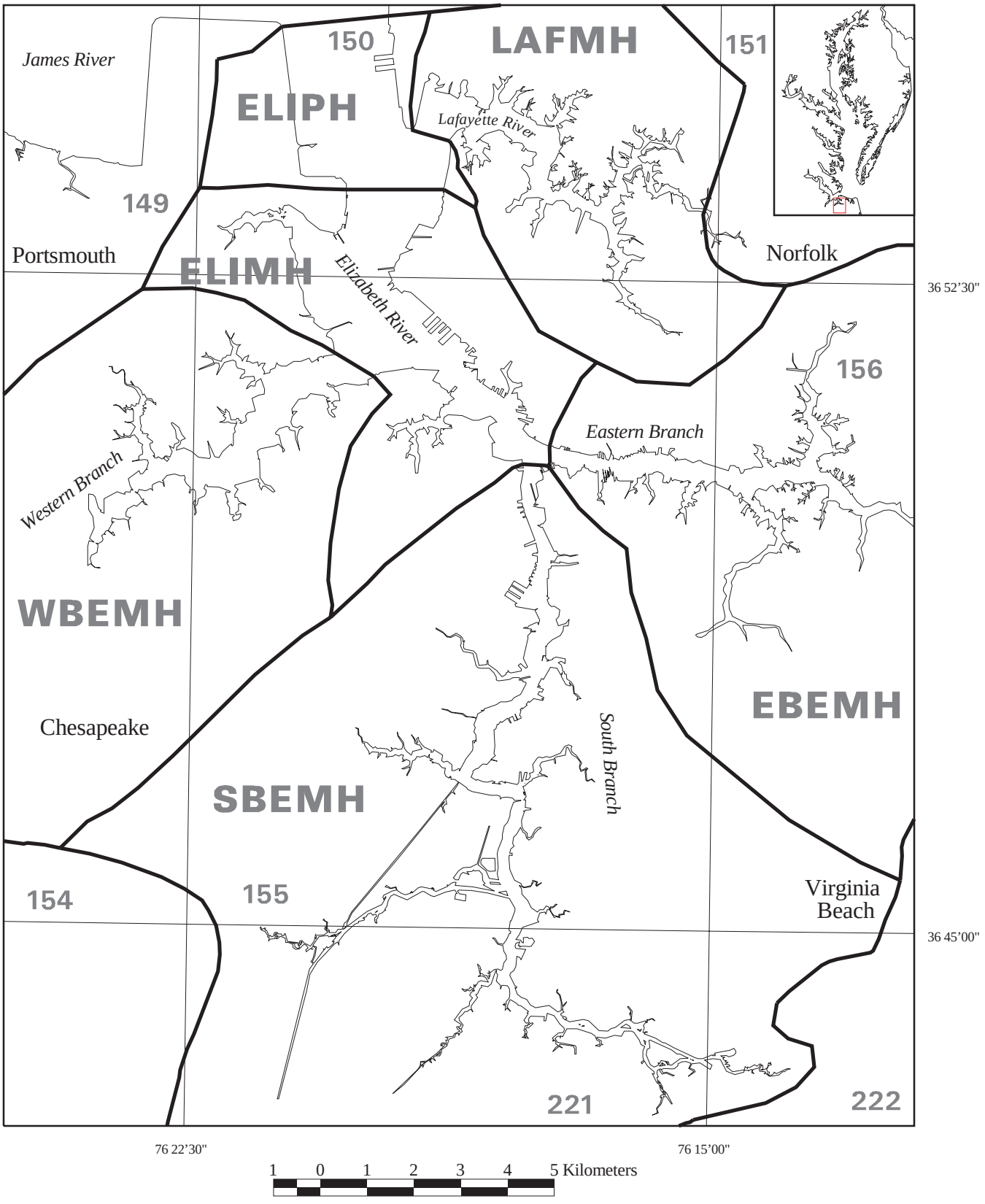

Figure 44: SAV distribution in the Elizabeth and Lafayette River segments (ELIPH, ELIMH, LAFMH, WBEMH, EBEMH, SBEMH) in 1998. No SAV was mapped for these segments from 1971–1998. (See Figure 11 for key.)

Chickahominy River (CHKOH)

In 1998, SAV in segment CHKOH was photographed for the first time since 1986. In CHKOH 205.32 ha were mapped, exceeding the Tier I goal (91.28 ha). This segment accounted for 2% of the SAV in the Lower Bay Zone.

SAV beds were mapped on both shores of the Chickahominy River from the mouth to Wilcox Neck. On the western shore, beds were mapped in Tomahund Creek; from the Route 5 Bridge to Morris Creek (Map 127); in Morris Creek; from south of Eastern Bottom to Old Neck, including a large bed in the mainstem of the river off of Eastern Bottom (Map 127); north and south of Watts Point (Maps 127, 210); and the south side of Wilcox Neck (Map 210). On the eastern shore, beds were mapped from the mouth to Gordon Creek (Map 128); in Gordon Creek and Nayes Bay (Map 128); in Buzzard Bay (Map 128); from Shields Point to Shipyard Creek (Map 128); from Uncles Neck to the north side of Chickahominy Haven (Maps 127, 128); and across from the southern end of Wilcox Neck (Map 210).

The following species were identified for CHKOH in 1998: *C. demersum* and *N. minor*.

Figure 45; Tables 6-8 and 11; and Maps 127, 128, 137, and 210 in Appendices B, C, and D cover the Chickahominy River Segment (CHKOH).

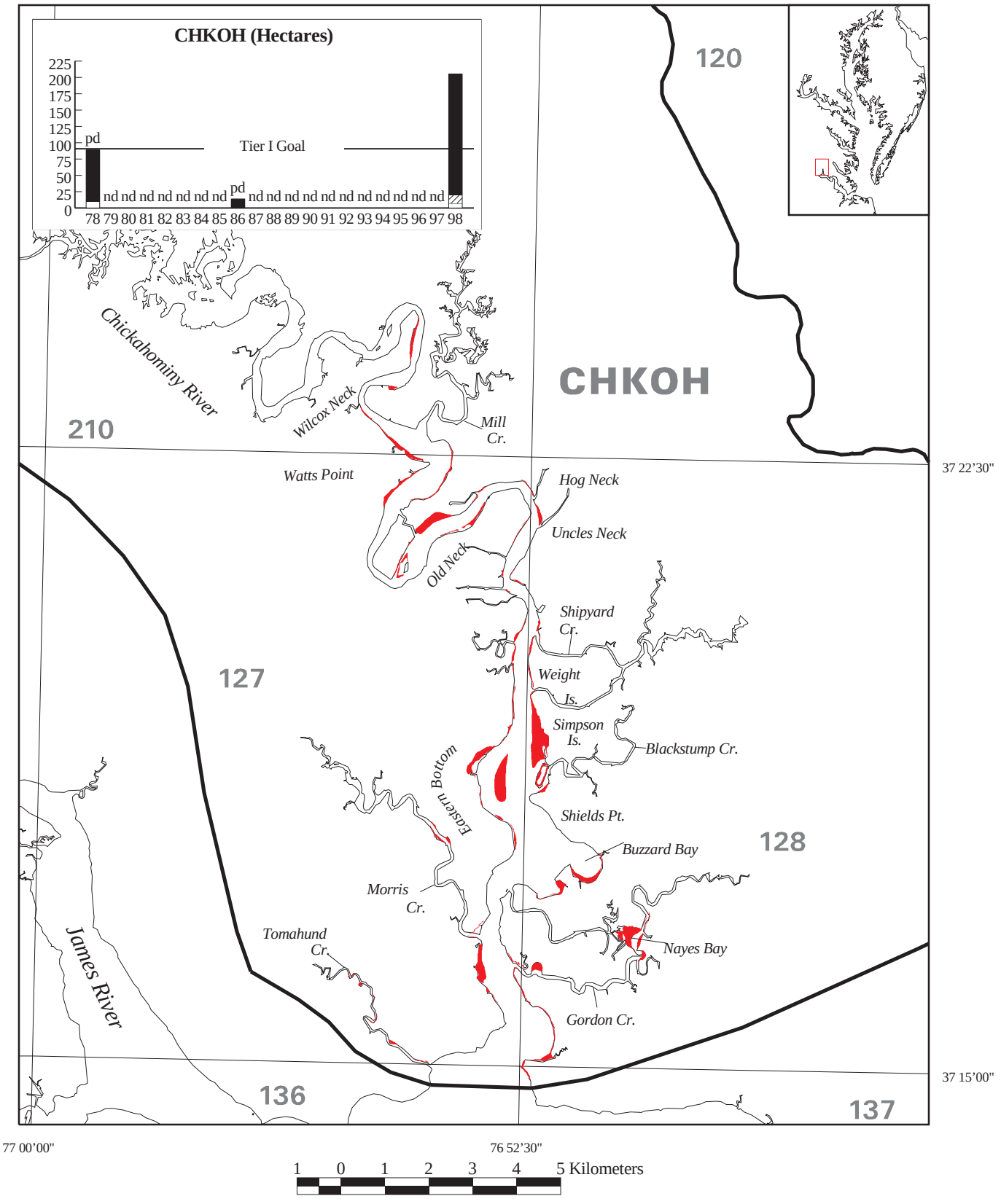

Figure 45: SAV distribution in the Chickahominy River (CHKOH) in 1998. (See Figure 11 for key.)

Middle James River (JMSOH)

In 1998, 6.21 ha of SAV was mapped for segment JMSOH, which was flown for the first time in the history of the aerial survey. The Tier I goal has not been established for JMSOH. This segment accounted for a small portion (0.07%) of the SAV in the Lower bay Zone.

SAV beds were mapped in Grays Creek (Map 137) and in Mill Creek (Map 138).

The following species was identified for JMSOH in 1998: *C. demersum*.

Figure 46; Tables 6-8 and 11; and Maps 137 and 138 in Appendices B, C, and D cover the Middle James River Segment (JMSOH).

Upper James River (JMSTF)

In 1998, 36.00 ha of SAV was mapped for segment JMSTF, which was flown for the first time in the history of the aerial survey. The Tier I goal has not been established for JMSTF. This segment accounted for a small portion (0.04%) of the SAV in the Lower Bay Zone.

SAV beds were mapped in Wards and Upper Chippokes creeks in the Upper James River Segment (Map 135).

The following species were identified for JMSTF in 1998: *C. demersum, E. canadensis,* and *N. minor.*

Figure 46; Tables 6-8 and 11; and Maps 125, 126, 127 135, and 136 in Appendices B, C, and D cover the Upper James River Segment (JMSTF).

Appomattox River (APPTF)

SAV was not mapped and ground survey data was not reported for APPTF in 1998. This segment was flown for the first time in the history of the annual SAV survey. The Tier I goal has not been established for this segment.

Figure 46 and Tables 6-8 and 11 cover the Appomattox River Segment (APPTF).

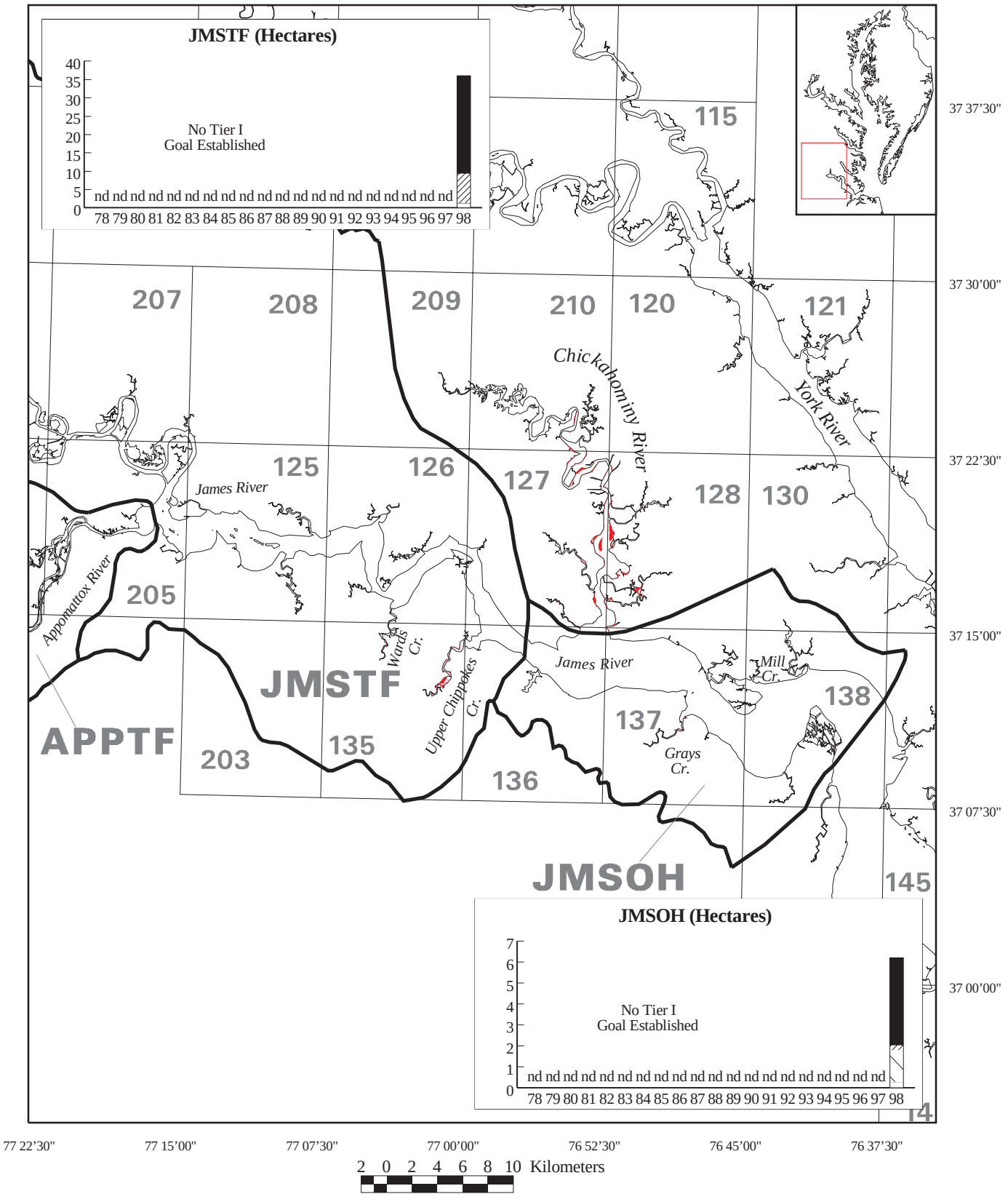

Figure 46: SAV distribution in the Appomattox River (APPTF), and the Middle (JMSOH) and Upper (JMSTF) James River in 1998. The Appomattox (APPTF) River was not graphed as no SAV was mapped from 1971–1998. (See Figure 11 for key).

Mouth of the Chesapeake Bay (CB8PH)

In 1998, SAV area in CB8PH decreased to 4.16 ha, 5% less than in 1997 (4.37 ha). The Tier I goal has not been established for CB8PH. This segment accounted for a small portion (0.05%) of the SAV in the Lower Bay Zone.

SAV in CB8PH was observed in two locations in Little Creek (Map 151). The SAV bed in Little Creek Cove increased in length and density. In Little Creek Channel the SAV bed decreased slightly in size and became less dense (Map 151).

The following species were identified for CB8PH in 1998: *R. maritima* and *Z. marina.*

Figure 47; Tables 6-8 and 11; and Map 151 in Appendices B, C, and D cover the Mouth of the Chesapeake Bay Segment (CB8PH).

Lynnhaven and Broad Bays (LYNPH)

In 1998, SAV area in LYNPH increased to 16.86 ha, 4% more than in 1997 (16.14 ha). The Tier I goal (71.18 ha) was not achieved for LYNPH. This segment accounted for a small portion (0.2%) of the SAV in the Lower Bay Zone.

SAV increased in LYNPH in the eastern portion of Broad Bay, and decreased in the western portion of Broad Bay and at the mouth of Linkhorn Bay (Map 152).

The following species were identified for LYNPH in 1998: *R. maritima* and *Z. marina.*

Figure 47; Tables 6-8 and 11; and Map 152 in Appendices B, C, and D cover the Lynnhaven and Broad Bays Segment (LYNPH).

Southern Virginia Coastal Bays (SVCPH)

SAV was not mapped in SVCPH in 1998 or in any year in this history of the annual survey. The Tier I goal has not been established for SVCPH.

VIMS and the Virginia Marine Resources Commission (VMRC) transplanted *Z. marina* to sites in the Magothy Bay in 1996,1997, and 1998, the only species reported for SVCPH in 1998.

Figure 47; Tables 6-8 and 11; and Map 143 in Appendices B and D cover the Southern Virginia Coastal Bay Segment (SVCPH).

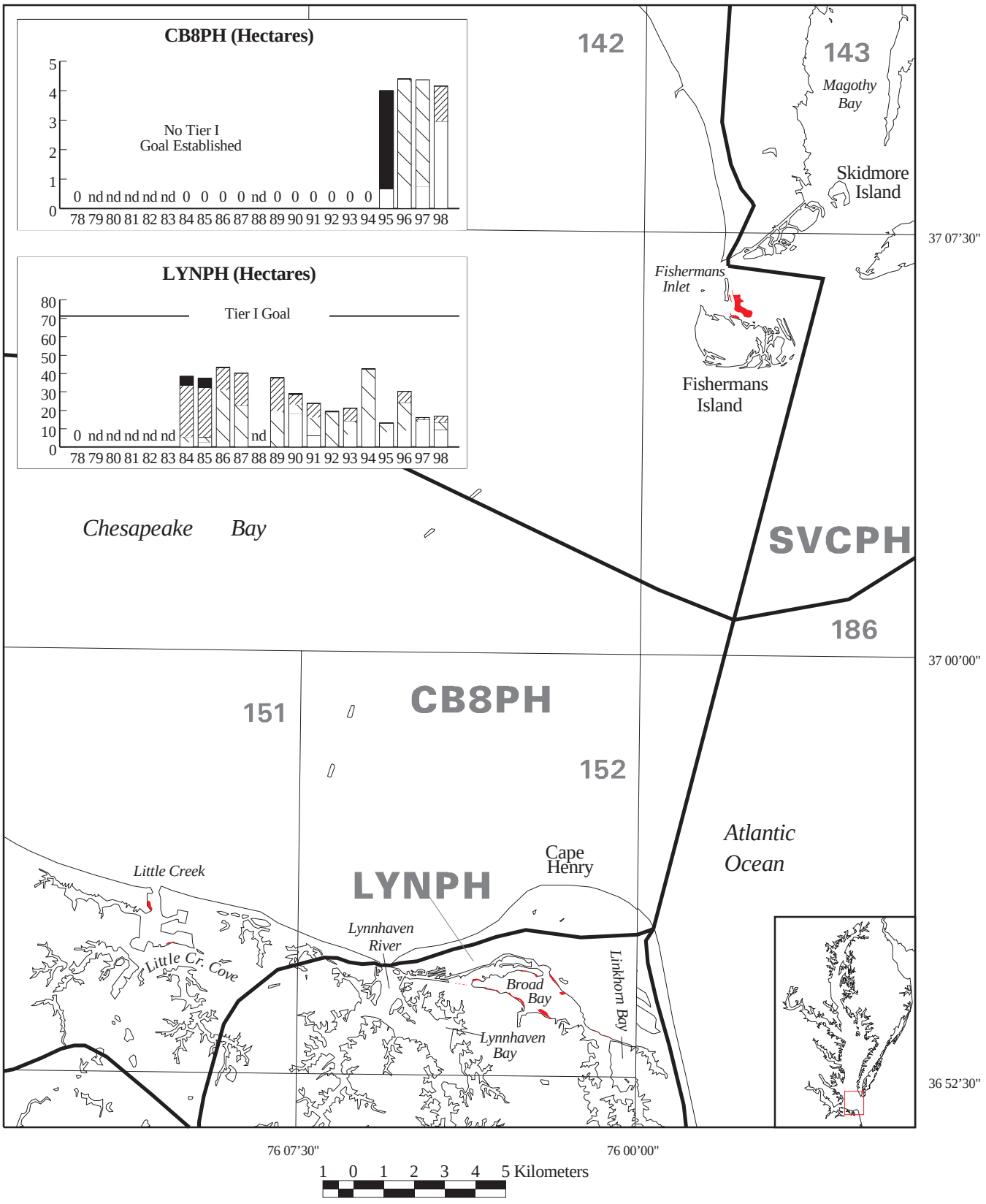

Figure 47: SAV distribution in the Mouth of the Chesapeake Bay (CB8PH), in Lynnhaven and Broad Bays (LYNPH), and in Southern Virginia Coastal Bays (SCVPH) in 1998. (See Figure 11 for key.)

Assawoman Bay (AAWPH)

In 1998, SAV area in AAWPH decreased to 174.63 ha, 3% less than 1997 (180.32 ha). The Assawoman Bay segment accounted for 3% of SAV in the Delmarva Peninsula Coastal Bays Zone.

The SAV bed south of Montego Bay (Map 166) almost tripled in size, but this increase was offset by the loss of SAV south of Devil Island (Map 166), resulting in a notable decline in the segment.

The following species were identified for AAWPH in 1998: *R. maritima* and *Z. marina.*

Figure 48; Tables 6-8 and 11; and Map 166 in Appendices B, C, and D cover the Assawoman Bay Segment (AAWPH).

Isle of Wight (IOWPH)

In 1998, SAV area in IOWPH increased to 80.71 ha, 1% more than in 1997 (79.87 ha). The Isle of Wight Segment accounted for 1% of SAV in the Delmarva Peninsula Coastal Bays Zone.

SAV increased on the western shore, where a new bed was mapped off of Cape Isle of Wight (Map 168). SAV distribution on the eastern shore remained similar to 1997, but the beds were more sparsely vegetated in 1998 (Maps 166, 168).

The following species were identified for IOWPH in 1998: *R. maritima* and *Z. marina.*

Figure 48; Tables 6-8 and 11; and Maps 165, 166, and 168 in Appendices B, C, and D cover the Isle of Wight Segment (IOWPH).

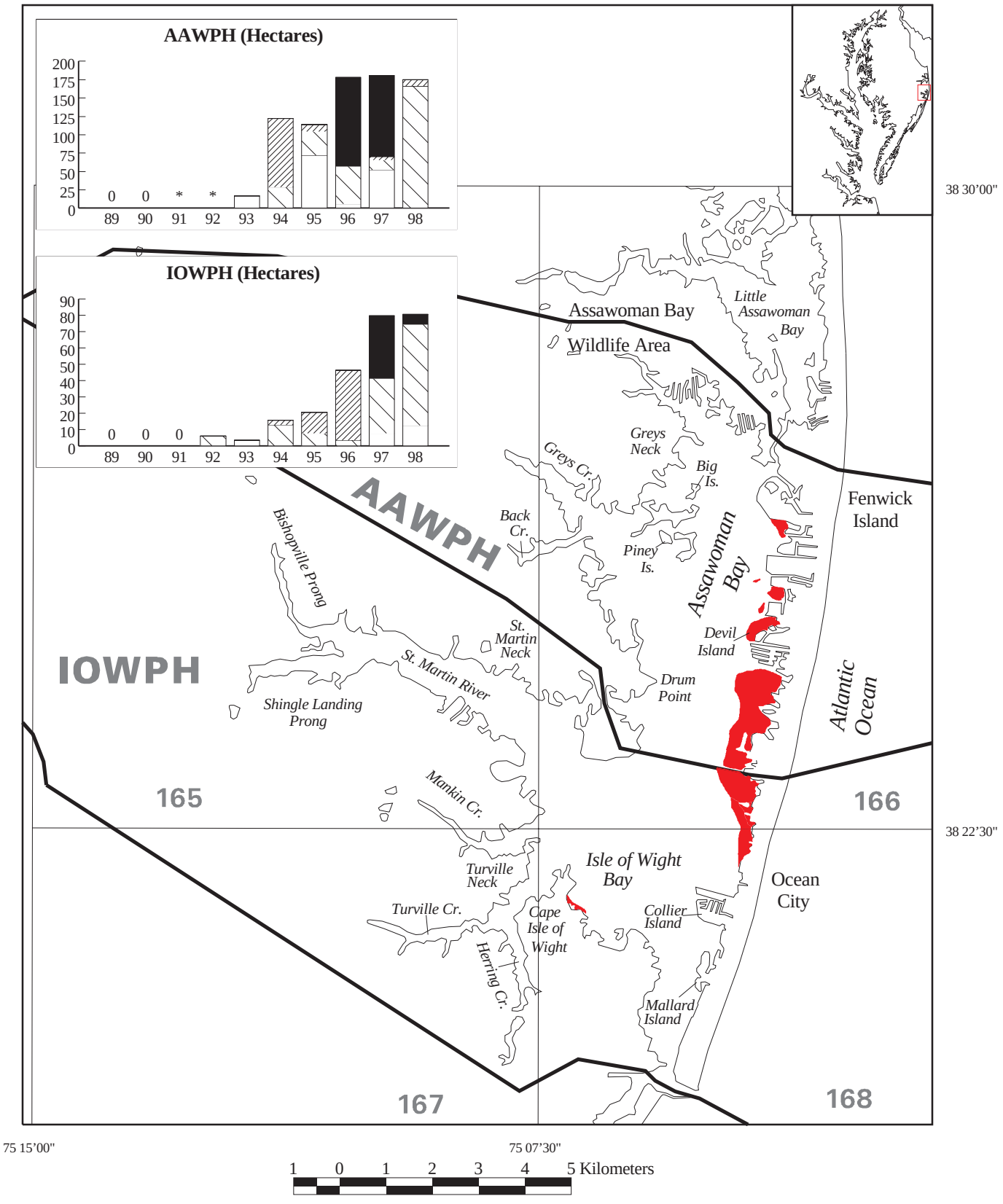

Figure 48: SAV distribution in Assawoman Bay (AAWPH) and Isle of Wight Bay (IOWPH) in 1998. (See Figure 11 for key.)

Sinepuxent Bay (SPXPH)

In 1998, SAV area in SPXPH increased to 478.25 ha, 13% more than in 1997 (421.40 ha). The Sinepuxent Bay Segment accounted for 8% of the SAV in the Delmarva Peninsula Coastal Bays Zone.

SAV increased on the western shore of Sinepuxent Bay from Fassett Point to Grays Point (Map 167); in new SAV beds north of Grays Cove (Map 167); and on both shores just north of Ocean City Airport (Map 168). SAV expanded to fill the shoals on the eastern shore across from Snug Harbor, and extended farther inshore from Goose Point to Sandy Point Island (Map 170). Notable declines occurred on the eastern shore across from Fassett Point (Map 167), and in the deeper portions of the area across from Snug Harbor (Maps 167, 168).

The following species was identified for SPXPH in 1998: *Z. marina.*

Figure 49; Tables 6-8 and 11; and Maps 167, 168, and 170 in Appendices B, C, and D cover the Sinepuxent Bay Segment (SPXPH).

Chincoteague Bay (CHNPH)

In 1998, SAV area in CHNPH increased to 5,421.27 ha, 10% more than in 1997 (4,916.78 ha). The Chincoteague Bay Segment accounted for 88% of the SAV in the Delmarva Peninsula Coastal Bays Zone.

SAV continues to expand in CHNPH. On the western shore, the large bed at Egg Marsh (Map 174), has extended notably into the bay; there are new SAV beds on the west side of Mills Island (Map 172); on the south and north sides of Tizzard Island, and off of Scott Hammock (Map 172). On the eastern shore, SAV has expanded inshore from Fox Hill Point (Map 173) to Goose Point (Map 170); there is a new dense SAV bed in Assateague Bay (Map 175); and SAV has notably increased in the area south of Blake Point (Map 175). Notable decreases occurred in Horntown Bay (Map 174), at the mouth of Middlemoor Thorofare (Map 173), and in Calfpen Bay (Maps 172, 175).

The following species were identified for CHNPH in 1998: *R. maritima* and *Z. marina.*

Figure 49; Tables 6-8 and 11; and Maps 170, 171, 172, 173, 174, and 175 in Appendices B, C, and D cover the Chincoteague Bay Segment (CHNPH).

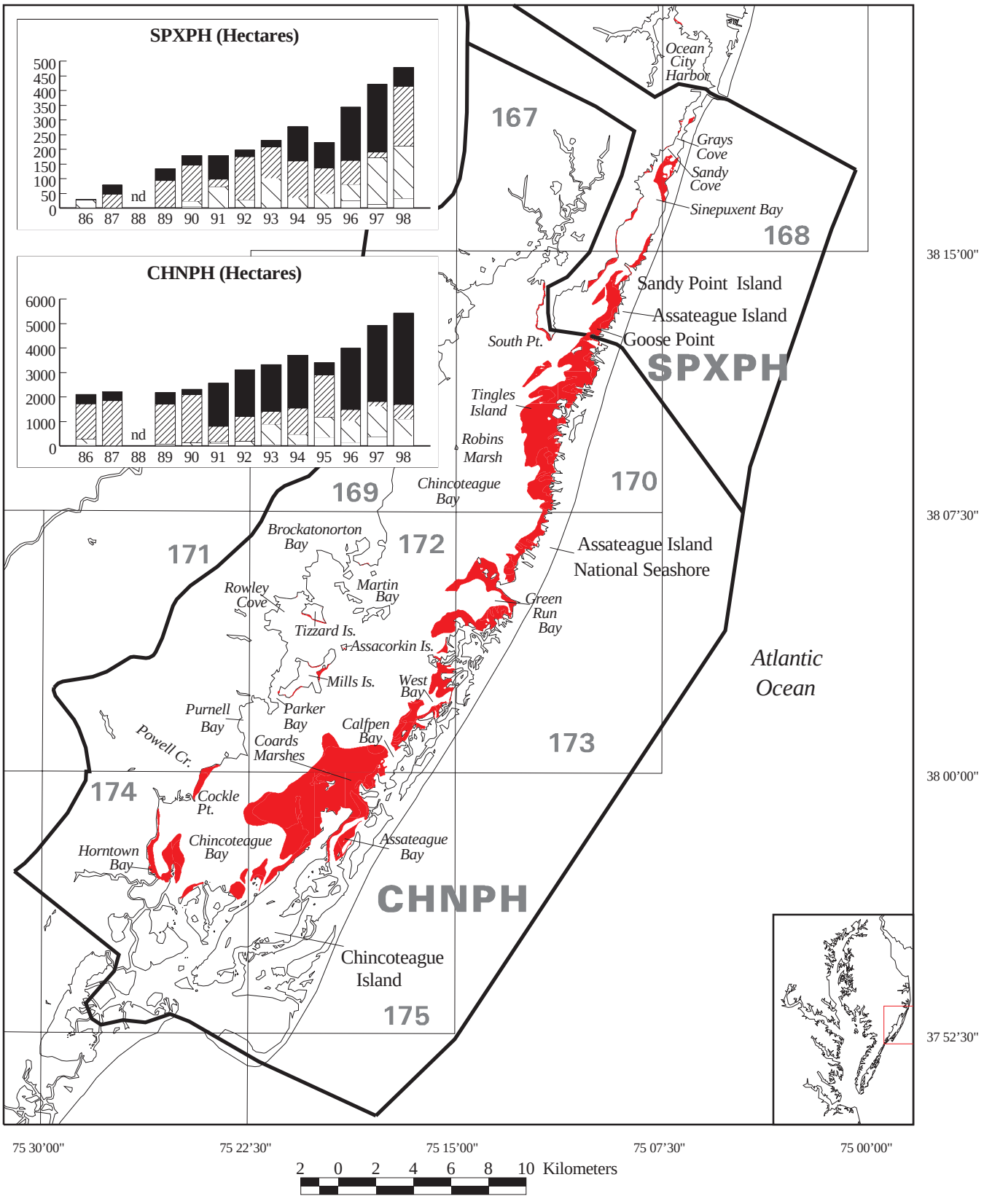

Figure 49: SAV distribution in Sinepuxent Bay (SPXPH) and Chincoteague Bay (CHNPH) in 1998. (See Figure 11 for key.)

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