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Shoreline Situation Report Westmoreland County

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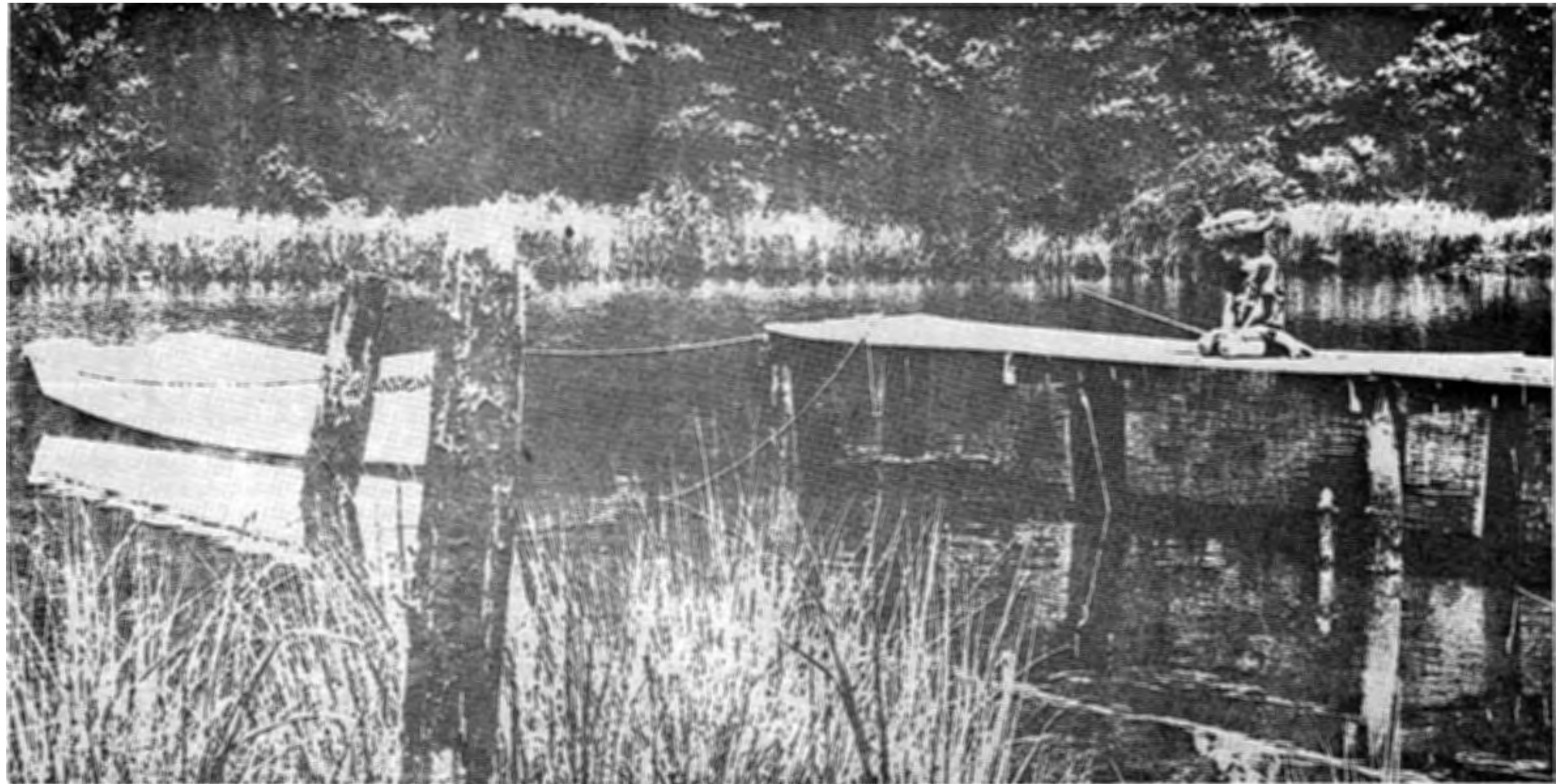
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Shoreline Situation Report WESTMORELAND COUNTY



Prepared and Published With Funds Provided to the Commonwealth by the Office of Coastal Zone Management,
National Oceanic and Atmospheric Administration, Grant Nos. 04-7-158-44041 and 04-8-MO1-309

Special Report In Applied Marine Science and Ocean Engineering Number 162 of the

VIRGINIA INSTITUTE OF MARINE SCIENCE
Gloucester Point, Virginia 23062

1978

Shoreline Situation Report WESTMORELAND COUNTY

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Special Report In Applied Marine Science and Ocean Engineering Number 162 of the

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CHAPTER 1

Introduction

CHAPTER 1

INTRODUCTION

1.1 PURPOSES AND GOALS

It is the objective of this report to supply an assessment, and at least a partial integration, of those important shoreland parameters and characteristics which will aid the planners and the managers of the shorelands in making the best decisions for the utilization of this limited and very valuable resource. The report gives particular attention to the problem of shore erosion and to recommendations concerning the alleviation of the impact of this problem. In addition, we have tried to include in our assessment a discussion of those factors which might significantly limit development of the shoreline and, in some instances, a discussion of some of the potential or alternate uses of the shoreline, particularly with respect to recreational use, since such information could aid potential users in the perception of a segment of the shoreline.

The basic advocacy of the authors in the preparation of the report is that the use of shorelands should be planned rather than haphazardly developed in response to the short term pressures and interests. Careful planning could reduce the conflicts which may be expected to arise between competing interests. Shoreland utilization in many areas of the country, and indeed in some places in Virginia, has proceeded in a manner such that the very elements which attracted people to the shore have been destroyed by the lack of planning and forethought.

The major man-induced uses of the shorelands are:

- Residential, commercial, or industrial development
- Recreation
- Transportation
- Waste disposal
- Extraction of living and non-living resources

Aside from the above uses, the shorelands serve various ecological functions.

The role of planners and managers is to optimize the utilization of the shorelands and to minimize the conflicts arising from competing demands. Furthermore, once a particular use has been decided upon for a given segment of shoreland, both the planners and the users want that selected use to operate in the most effective manner. A park planner, for example, wants the allotted space to fulfill the design most efficiently. We hope that the results of our work are useful to the planner in designing the beach by pointing out the technical feasibility of altering or enhancing the present configuration of the shore zone. Alternately, if the use were a residential development, we would hope our work would be useful in specifying the shore erosion problem and by indicating defenses likely to succeed in containing the erosion. In summary our objective is to provide a useful tool for enlightened utilization of a limited resource, the shorelands of the Commonwealth.

Shorelands planning occurs, either formally or informally, at all levels from the private owner of shoreland property to county governments, to planning districts and to the state and federal agency level. We feel our results will be useful at all these levels. Since the most basic level of comprehensive planning and zoning is at the county or city level, we have executed our report on that level although we realize some of the information may be most useful at a higher governmental level. The Commonwealth of Virginia has traditionally chosen to place as much as possible, the regulatory decision processes at the county level. The Virginia Wetlands Act of 1972 (Chapter 2.1, Title 62.1, Code of Virginia), for example, provides for the establishment of County Boards to act on applications for alterations of wetlands. Thus, our focus at the county level is intended to interface with and to support the existing or pending county regulatory mechanisms concerning activities in the shorelands zone.

1.2 ACKNOWLEDGEMENTS

This report has been prepared and published with funds provided to the Commonwealth by the Office of Coastal Zone Management, National Oceanic and Atmospheric Administration, grant numbers 04-7-158-44041 and 04-8-MO1-309. The Shoreline Situation Report series was originally developed in the Wetlands/Edges Program of the Chesapeake Research Consortium, Inc., as supported by the Research Applied to National Needs (RANN) program of the National Science Foundation. The completion of this report would have been impossible without the expert services of Beth Marshall, who typed several drafts of the manuscript, Bill Jenkins and Ken Thornberry, who prepared the photographs, and Sam White, who piloted the aircraft on the many photo acquisition and reconnaissance flights. Also we thank the numerous other persons who, through their direct aid, criticisms, and suggestions, have assisted our work.

CHAPTER 2
Approach Used and Elements Considered

CHAPTER 2

APPROACH USED AND ELEMENTS CONSIDERED

2.1 APPROACH TO THE PROBLEM

In the preparation of this report the authors utilized existing information wherever possible. For example, for such elements as water quality characteristics, zoning regulations, or flood hazard, we reviewed relevant reports by local, state, or federal agencies. Much of the desired information, particularly with respect to erosional characteristics, shoreland types, and use was not available, so we performed the field work and developed classification schemes. In order to analyze successfully the shoreline behavior we placed heavy reliance on low altitude, oblique, color, 35 mm photography. We photographed the entire shoreline of each county and cataloged the slides for easy access at VIMS, where they remain available for use. We then analyzed these photographic materials, along with existing conventional aerial photography and topographic and hydrographic maps, for the desired elements. We conducted field inspection over much of the shoreline, particularly at those locations where office analysis left questions unanswered. In some cases we took additional photographs along with the field visits to document the effectiveness of shoreline defenses.

The basic shoreline unit considered is called a subsegment, which may range from a few hundred feet to several thousand feet in length. The end points of the subsegments were generally chosen on physiographic consideration such as changes in the character of erosion or deposition. In those cases where a radical change in land use occurred, the point of change was taken as a boundary point of the subsegment. Segments are groups of subsegments. The boundaries for segments also were selected on physiographic units such as necks or peninsulas between major tidal creeks. Finally, the county itself is considered as a sum of shoreline segments.

The format of presentation in the report follows a sequence from general summary statements for the county (Chapter 3) to tabular segment summaries and finally detailed descriptions and maps for each subsegment (Chapter 4). The purpose in choosing this format was to allow selective use

of the report since some users' needs will adequately be met with the summary overview of the county while others will require the detailed discussion of particular subsegments.

2.2 CHARACTERISTICS OF THE SHORELANDS INCLUDED IN THE STUDY

The characteristics which are included in this report are listed below followed by a discussion of our treatment of each.

- a) Shorelands physiographic classification
- b) Shorelands use classification
- c) Shorelands ownership classification
- d) Zoning
- e) Water quality
- f) Shore erosion and shoreline defenses
- g) Limitations to shore use and potential or alternate shore uses
- h) Distribution of marshes
- i) Flood hazard levels
- j) Shellfish leases and public shellfish grounds
- k) Beach quality

a) Shorelands Physiographic Classification

The shorelands of the Chesapeake Bay System may be considered as being composed of three interacting physiographic elements: the fastlands, the shore and the nearshore. A graphic classification based on these three elements has been devised so that the types for each of the three elements portrayed side by side on a map may provide the opportunity to examine joint relationships among the elements. As an example, the application of the system permits the user to determine miles of high bluff shoreland interfacing with marsh in the shore zone.

For each subsegment there are two length measurements, the shore-nearshore interface or shoreline, and the fastland-shore interface. The two interface lengths differ most when the shore zone is embayed or extensive marsh. On the subsegment maps, a dotted line represents the fastland-shore interface when it differs from the shoreline. The fastland-shore interface length is the base for the fastland statistics.

Definitions:

Shore Zone

This is the zone of beaches and marshes. It is a buffer zone between the water body and the fastland. The seaward limit of the shore zone is the break in slope between the relatively steeper shoreface and the less steep nearshore zone. The approximate landward limit is a contour line representing one and a half times the mean tide range above mean low water (refer to Figure 1). In operation with topographic maps the inner fringe of the marsh symbols is taken as the landward limit.

The physiographic character of the marshes has also been separated into three types (see Figure 2). Fringe marsh is that which is less than 400 feet in width and which runs in a band parallel to the shore. Extensive marsh is that which has extensive acreage projecting into an estuary or river. An embayed marsh is a marsh which occupies a reentrant or drowned creek valley. The purpose in delineating these marsh types is that the effectiveness of the various functions of the marsh will, in part, be determined by type of exposure to the estuarine system. A fringe marsh may, for example, have maximum value as a buffer to wave erosion of the fastland. An extensive marsh, on the other hand, is likely a more efficient transporter of detritus and other food chain materials due to its greater drainage density than an embayed marsh. The central point is that planners, in the light of ongoing and future research, will desire to weight various functions of marshes and the physiographic delineation aids their decision making by denoting where the various types exist. The classification used is:

Beach

Marsh

Fringe marsh, < 400 ft. (122 m) in width along shores

Extensive marsh

Embayed marsh, occupying a drowned valley or reentrant

Artificially stabilized

Fastland Zone

The zone extending from the landward limit of the shore zone is termed the fastland. The fastland is relatively stable and is the site of most material development or construction. The

physiographic classification of the fastland is based upon the average slope of the land within 400 feet (122 m) of the fastland - shore boundary. The general classification is:

- Low shore, 20 ft. (6 m) or less of relief; with or without cliff
- Moderately low shore, 20-40 ft. (6-12 m) of relief; with or without cliff
- Moderately high shore, 40-60 ft. (12-18 m) of relief; with or without cliff
- High shore, 60 ft. (18 m) or more of relief; with or without cliff.

Two specially classified exceptions are sand dunes and areas of artificial fill.

Nearshore Zone

The nearshore zone extends from the shore zone to the 12-foot (MLW datum) contour. In the smaller tidal rivers the 6-foot depth is taken as the reference depth. The 12-foot depth is probably the maximum depth of significant sand transport by waves in the Chesapeake Bay area. Also, the distinct drop-off into the river channels begins roughly at the 12-foot depth. The nearshore zone includes any tidal flats.

The class limits for the nearshore zone classifications were chosen following a simple statistical study. The distance to the 12-foot underwater contour (isobath) was measured on the appropriate charts at one-mile intervals along the shorelines of Chesapeake Bay and the James, York, Rappahannock, and Potomac Rivers. Means and standard deviations for each of the separate regions and for the entire combined system were calculated and compared. Although the distributions were non-normal, they were generally comparable, allowing the data for the entire combined system to determine the class limits.

The calculated mean was 919 yards with a standard deviation of 1,003 yards. As our aim was to determine general, serviceable class limits, these calculated numbers were rounded to 900 and 1,000 yards respectively. The class limits were set at half the standard deviation (500 yards) each side of the mean. Using this procedure a narrow nearshore zone is one 0-400 yards in width, intermediate 400-1,400, and wide greater than 1,400.

The following definitions have no legal significance and were constructed for our classification

purposes:

- Narrow, 12-ft. (3.7 m) isobath located < 400 yards from shore
- Intermediate, 12-ft. (3.7 m) isobath 400-1,400 yards from shore
- Wide, 12-ft. (3.7 m) isobath > 1,400 yards from shore

Subclasses: with or without bars
with or without tidal flats
with or without submerged vegetation

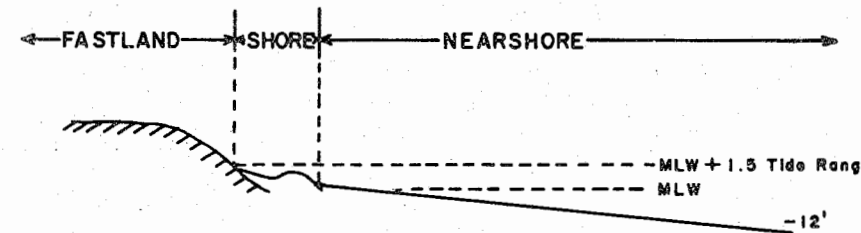


Figure 1

A profile of the three shorelands types.

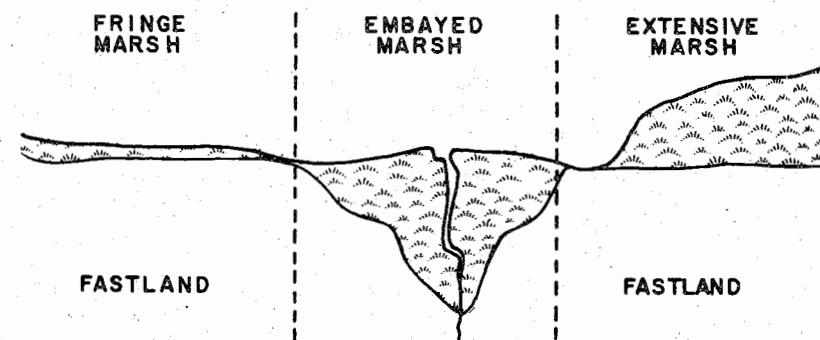


Figure 2

A plan view of the three marsh types.

b) Shorelands Use Classification

Fastland Zone

Residential

Includes all forms of residential use with the exception of farms and other isolated dwellings. In general, a residential area consists of four or more residential buildings adjacent to one another. Schools, churches, and isolated businesses may be included in a residential area.

Commercial

Includes buildings, parking areas, and other land directly related to retail and wholesale trade and business. This category includes small industry and other anomalous areas within the general commercial context. Marinas are considered commercial shore use.

Industrial

Includes all industrial and associated areas. Examples: warehouses, refineries, shipyards, power plants, railyards.

Governmental

Includes lands whose usage is specifically controlled, restricted, or regulated by governmental organizations: e.g., Camp Peary, Fort Story. Where applicable, the Governmental use category is modified to indicate the specific character of the use, e.g., residential, direct military, and so forth.

Recreational and Other Public Open Spaces

Includes designated outdoor recreation lands and miscellaneous open spaces. Examples: golf courses, tennis clubs, amusement parks, public beaches, race tracks, cemeteries, parks.

Preserved

Includes lands preserved or regulated for

environmental reasons, such as wildlife or wild-fowl sanctuaries, fish and shellfish conservation grounds, or other uses that would preclude development.

Agricultural

Includes fields, pastures, croplands, and other agricultural areas.

Unmanaged

Includes all open or wooded lands not included in other classifications:

- a) Open: brush land, dune areas, wastelands; less than 40% tree cover.
- b) Wooded: more than 40% tree cover.

The shoreland use classification applies to the general usage of the fastland area to an arbitrary distance of half mile from the shore or beach zone or to some less distant, logical barrier. In multi-usage areas one must make a subjective selection as to the primary or controlling type of usage. For simplicity and convenience, managed woodlands are classified as "unmanaged, wooded" areas.

Shore Zone

Bathing
Boat launching
Bird watching
Waterfowl hunting

Nearshore Zone

Pound net fishing
Shellfishing
Sport fishing
Extraction of non-living resources
Boating
Water sports

c) Shorelands Ownership Classification

The shorelands ownership classification used has two main subdivisions, private and governmental, with the governmental further divided into

federal, state, county, and town or city. Application of the classification is restricted to fastlands alone since the Virginia fastlands ownership extends to mean low water. All bottoms below mean low water are in State ownership.

d) Water Quality

The water quality sections of this report are based upon data abstracted from Virginia State Water Control Board's publication Water Quality Standards (November, 1974) and Water Quality Inventory (305 (b) Report) (April, 1976).

Additionally, where applicable, Virginia Bureau of Shellfish Sanitation data is used to assign ratings of satisfactory, intermediate, or unsatisfactory. These ratings are defined primarily in regard to number of coliform bacteria. For a rating of satisfactory the maximum limit is an MPN (Most Probable Number) of 70 per 100 ml. The upper limit for fecal coliforms is an MPN of 23. Usually any count above these limits results in an unsatisfactory rating, and, from the Bureau's standpoint, results in restricting the waters from the taking of shellfish for direct sale to the consumer.

There are instances however, when the total coliform MPN may exceed 70, although the fecal MPN does not exceed 23, and other conditions are acceptable. In these cases an intermediate rating may be assigned temporarily, and the area will be permitted to remain open pending an improvement in conditions.

Although the shellfish standards are somewhat more stringent than most of the other water quality standards, they are included because of the economic and ecological impacts of shellfish ground closures. Special care should be taken not to endanger the water quality in existing "satisfactory" areas.

e) Zoning

In cases where zoning regulations have been established the existing information pertaining to the shorelands has been included in the report.

f) Shore Erosion and Shoreline Defenses

The following ratings are used for shore erosion:

- slight or none - less than 1 foot per year
- moderate - - - - 1 to 3 feet per year
- severe - - - - - greater than 3 feet per year

The locations with moderate and severe ratings are further specified as being critical or non-critical. The erosion is considered critical if buildings, roads, or other such structures are endangered.

The degree of erosion was determined by several means. In most locations the long term trend was determined using map comparisons of shoreline positions between the 1850's and the 1940's. In addition, aerial photographs of the late 1930's and recent years were utilized for an assessment of more recent conditions. Finally, in those areas experiencing severe erosion field inspections and interviews were held with local inhabitants.

The existing shoreline defenses were evaluated as to their effectiveness. In some cases repetitive visits were made to monitor the effectiveness of recent installations. In instances where existing structures are inadequate, we have given recommendations for alternate approaches. Furthermore, recommendations are given for defenses in those areas where none currently exist. The primary emphasis is placed on expected effectiveness with secondary consideration to cost.

g) Limitations to Shore Use and Potential or Alternate Shore Uses

In this section we point out specific factors which may impose significant limits on the type or extent of shoreline development. This may result in a restatement of other factors from elsewhere in the report, e.g., flood hazard or erosion, or this may be a discussion of some other factor pertaining to the particular area.

Also we have placed particular attention on the recreational potential of the shore zone. The possible development of artificial beach, erosion protection, etc., influence the evaluation of an area's potential. Similarly, potential alternate shore uses are occasionally noted.

h) Distribution of Marshes

The acreage and physiographic type of the marshes in each subsegment is listed. These estimates of acreages were obtained from topographic maps and should be considered only as approximations. Detailed county inventories of the wetlands are being conducted by the Virginia Institute of Marine Science under the authorization of the Virginia Wetlands Act of 1972 (Code of Virginia 62.1-13.4). These surveys include detailed acreages of the grass species composition within individual marsh systems. In Shoreline Situation Reports of counties that have had marsh inventories, the marsh number is indicated, thus allowing the user of the Shoreline Situation Report to key back to the formal marsh inventory for additional data. The independent material in this report is provided to indicate the physiographic type of marsh land and to serve as a rough guide to marsh distribution, pending a formal inventory. Additional information on wetlands characteristics may be found in Coastal Wetlands of Virginia: Interim Report No. 3, by G.M. Silberhorn, G.M. Dawes, and T.A. Barnard, Jr., SRAMSOE No. 46, 1974, and in other VIMS publications.

i) Flood Hazard Levels

The assessment of tidal flooding hazard for the whole of the Virginia tidal shoreland is still incomplete. However, the United States Army Corps of Engineers has prepared reports for a number of localities which were used in this report. Two tidal flood levels are customarily used to portray the hazard. The Intermediate Regional Flood is that flood with an average recurrence time of about 100 years. An analysis of past tidal floods indicates it to have an elevation of approximately 8 feet above mean water level in the Chesapeake Bay area. The Standard Project Flood level is established for land planning purposes which is placed at the highest probable flood level.

j) Shellfish Leases and Public Grounds

The data in this report show the leased and public shellfish grounds as portrayed in the Virginia State Water Control Board publication "Shellfish growing areas in the Commonwealth of Virginia: Public, leased and condemned,"

November, 1971, and as periodically updated in other similar reports. Since the condemnation areas change with time they are not to be taken as definitive. However, some insight to the conditions at the date of the report are available by a comparison between the shellfish grounds maps and the water quality maps for which water quality standards for shellfish were used.

k) Beach Quality

Beach quality is a subjective judgment based upon considerations such as the nature of the beach material, the length and width of the beach area, and the general aesthetic appeal of the beach setting.

CHAPTER 3
Present Shorelands Situation

CHAPTER 3

PRESENT SHORELINE SITUATION OF WESTMORELAND COUNTY

3.1 THE SHORELANDS OF WESTMORELAND COUNTY

Westmoreland County has shorelands on both the Potomac and the Rappahannock Rivers. The county is bounded on the Potomac River by Northumberland County to the east and by King George County to the west. On the Rappahannock River, Westmoreland County is bounded by King George County to the west and Richmond County to the east. The shorelands along the two rivers differ in both physiographic and use classification.

Westmoreland has 30.9 measured miles of shoreline along the Rappahannock River, 29.2 measured miles of fastland. While eighty-two percent of the fastland is low shore, fifteen percent is high shore. The entire shore is marsh, either fringe, embayed, or extensive. Development has not been active along the Rappahannock River shoreline of the county, as ninety-eight percent of the shorelands are either used for agriculture or are wooded. One percent of the shorelands are used for residential purposes and one percent are county owned boat ramp areas.

Along the Potomac River, Westmoreland County has 221.3 measured miles of shoreline, 267.7 measured miles of fastland. The shorelands range from low shore to high shore with bluff, with seventy-seven percent being low shore. Only six percent of the shorelands are high shore. The remaining seventeen percent range from low shore with bluff to moderately high shore, with twelve percent being moderately low shore.

Marshes, including fringe, embayed, and extensive marshes, account for seventy-six percent of the shoreline (a tidal marsh inventory for Westmoreland County is forthcoming). Sixteen percent of the shoreline is beach and eight percent is artificially stabilized.

The Potomac River portion of Westmoreland County, though still primarily rural, has several areas of population concentration, the largest being the Town of Colonial Beach. Twenty-five percent of the shorelands are used for residential purposes, two percent for recreation, and less than two percent

for commercial and industrial purposes. The remaining shorelands are either used for agriculture or are unmanaged, wooded or open areas. There are several public areas along this section of the Potomac River: Westmoreland State Park, George Washington National Monument Park, and several county owned areas for boat launching. All of these public sites are used for recreational purposes.

Flooding is generally not a problem along the Westmoreland section of the Rappahannock River, as shoreline elevations are usually greater than 10 feet. The shoreline from Brockenbrough Creek to just west of Peedee Creek has elevations of around 5 feet and could be flooded. However, no structures would be endangered. Many sections of shoreline on the Potomac River are susceptible to flooding which would endanger numerous structures. Most of the residential development along Westmoreland's shoreline has taken place along the low-lying shorelands.

The Rappahannock River generally has good water quality, according to the Virginia State Water Control Board's 305(b)(1)(B) Report. As the main stream of the Potomac River is in Maryland, the report does not include data on its water quality. The tributary creeks are owned by Virginia. Though many of the creeks have good water quality, several areas do not meet the state water quality standards. Among areas currently not meeting water quality standards are the lower portion of Lower Machodoc Creek, part of Nomini Creek, part of Mattox Creek, all of Popes Creek and Monroe Bay, and part of Rosier Creek. These areas are all closed to the taking of shellfish. For a more accurate description of shellfish closures, refer to Map 1E, page 19.

3.2 PRESENT SHORE EROSION SITUATION

Shoreline erosion is not generally a problem along the Rappahannock River section of Westmoreland County. The only area showing an historical erosion trend is from Peedee Creek west to Ledestown, which has an historical erosion rate of from 0.6 to 1.2 feet per year. Erosion is due to the river currents in the meanders and to downhill rain runoff. The river current is fastest on the outside bends of the meander, causing erosion to those bends while the inside bends accrete. Along bluff areas, rain runoff causes weathering of the cliff face, which causes the bluff to slump. Trees on or near the bluff eventually are undermined and fall, carrying with them large amounts of sediments trapped in their root systems. Downhill rain runoff can be abated by planting grasses or other surface-rooted vegetation on the affected area.

Along the Potomac River, erosion is not so easy to describe, as the magnitude of the processes vary from area to area and time to time. Generally, erosion is primarily due to waves attacking the shore. The height and growth of waves is dependent upon four major factors: the overwater distance across which the wind blows (the fetch), the velocity of the wind, the duration of time that the wind blows, and the depth of the water. Downhill rain runoff is also an important erosion agent along the Potomac River.

According to Byrne and Anderson (1977, Shoreline Erosion in Tidewater Virginia, Special Report Number 111 in Applied Marine Science and Ocean Engineering, Virginia Institute of Marine Science, 102 pages), the Potomac River shoreline in Westmoreland County has retreated 1.3 feet per year, averaged along the entire shoreline length for the past 100 years. In all, Westmoreland County has lost 1,167 acres by erosion during the past century. Recent field investigations show that erosion is a continuing problem along many sections of the county's shoreline.

The most critical area of erosion in Westmoreland County is probably at Colonial Beach. Though most of the shoreline has been artificially stabilized, several areas are experiencing continued erosion. Along the southern section of the town, south of the concrete seawall and groins, erosion has already destroyed the boat ramp and a section

of Irving Avenue is endangered. Rubble has been dumped along the shoreline, but erosion is continuing. Several other small sections of Colonial Beach's shoreline are eroding, though no structures are endangered. Elsewhere in the county, erosion is continuing especially along areas used for agriculture. No structures are endangered.

There are approximately 17.3 miles of artificially stabilized shoreline along the Potomac River in Westmoreland County, including bulkhead, riprap, and groins. Groins have been used in conjunction with bulkhead in several locations. Though most structures in the county appear to be effective, some groins have not been able to capture buffer beaches.

3.3 SHORE USE LIMITATIONS

There are many factors which tend to determine development patterns along a section of shoreline; the flood hazard, erosion rate, physiographic considerations such as fastland, shore, and nearshore type, existing development in the vicinity, and the availability of inland access, to name a few. An area with high bluffs along the shore would not be as appealing to most people as an area with easy access to the water. Likewise, an area that is relatively stable is preferable to one with active erosion. This section is a discussion of these factors as they apply to Westmoreland County.

Along the Rappahannock River, eighty-two percent of the shorelands are low shore. Several sections are prone to flooding during periods of abnormally high water. There are no existing population centers in this part of the county. As the shorelands are generally used for agriculture or are wooded, development would be at the sacrifice of these lands. A major limiting factor is the lack of good inland access from the shore. Construction of roads to the shoreline would be a costly proposition. Though some isolated construction will continue to take place, no strong pressure to develop this section of the shoreline is evident at present.

The Potomac River shorelands of Westmoreland County differ greatly from the Rappahannock River portion. The majority (77%) of the shorelands are low shore, several sections of which are susceptible to flooding. However, twenty-five percent of the shorelands are either already used for residential purposes or are in the process of being so developed. These developments are usually strips of houses along the shore, most of which are probably second or vacation homes. The Town of Colonial Beach is located along the shore. There are several areas for public recreation. However, as the residential sections of the county expand, there will be a need for more public recreation areas, especially open space for parks. Despite the apparent residential buildup, the county is still basically rural, as the housing developments are usually backed by agricultural lands. It is expected that some continued strip development will occur near existing residential areas, but that the overall use patterns will remain nearly constant.



FIGURE 3

FIGURE 3: Lynch Point area, Segment 3. Notice the eroding shoreline. The entire area has been bulkheaded since the photograph was taken.



FIGURE 4

FIGURE 4: Bottom Creek overview, Segment 4. The rip-rap jetties at the creek mouth seem to be effective at keeping the creek entrance open. Notice the sand build-up at the landward end of the long jetty.



FIGURE 5

FIGURE 5: Mouth of Gardner Creek, Segment 4. The peninsula has average elevations of five feet. Abnormally high water could cause flooding here, damaging the structures. Notice the fillets of sand trapped by the groin system.

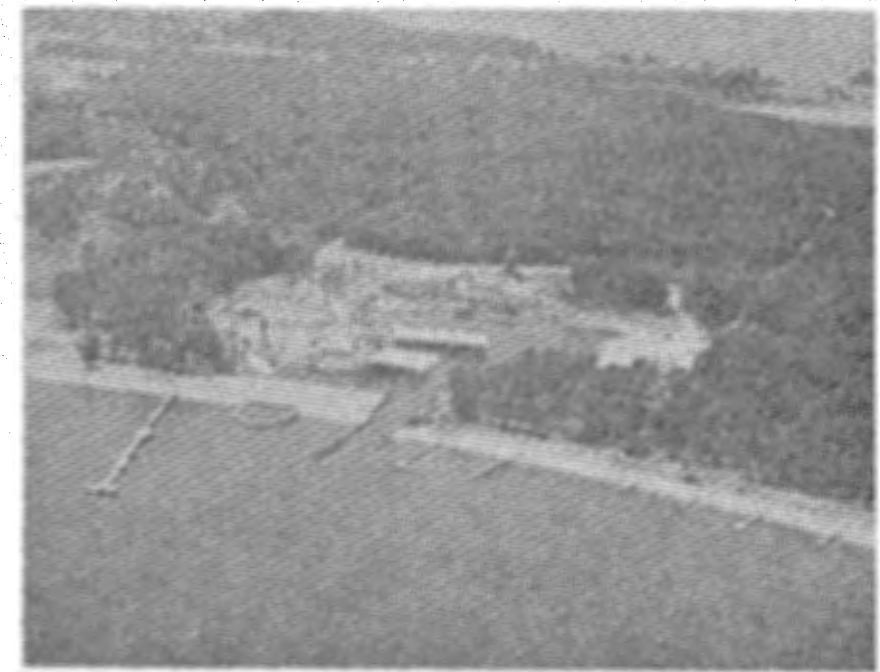


FIGURE 6

FIGURE 6: Marina at Ragged Point Beach, Segment 4. The dredged and bulkheaded opening to the marina is fairly recent. Notice the sand beaches along the shoreline.

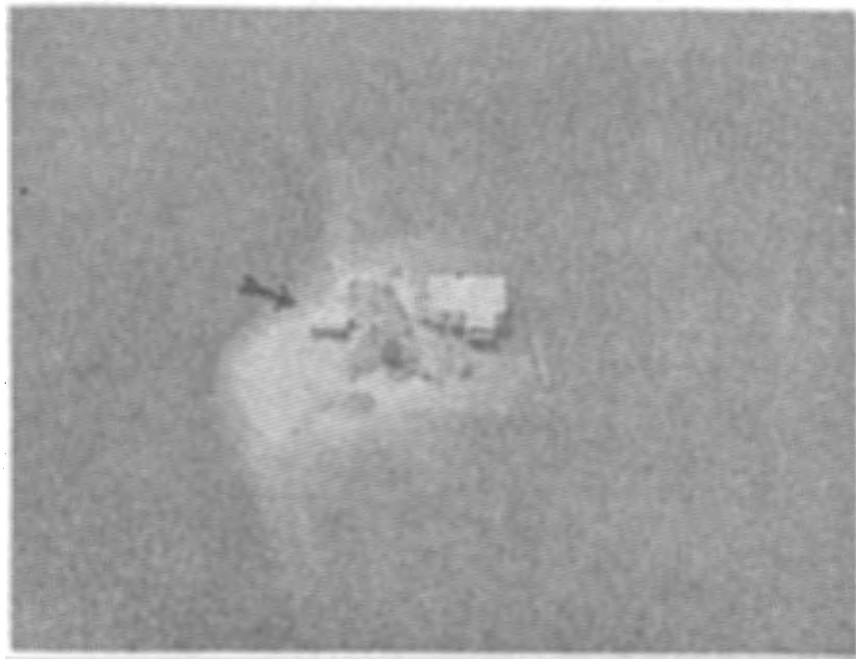


FIGURE 7



FIGURE 8

FIGURE 7: Island off of Matthews Point, Subsegment 8B. Man-made from dredge spoil, the island has been shifting in recent years. The arrow points to a boat house, which once had alongside depths of 9 feet. The house is mostly over water now.

FIGURE 8: Horsehead Cliffs, Segment 9. The cliffs reach elevations up to 150 feet. Erosion due to downhill rain runoff is a problem in this area.

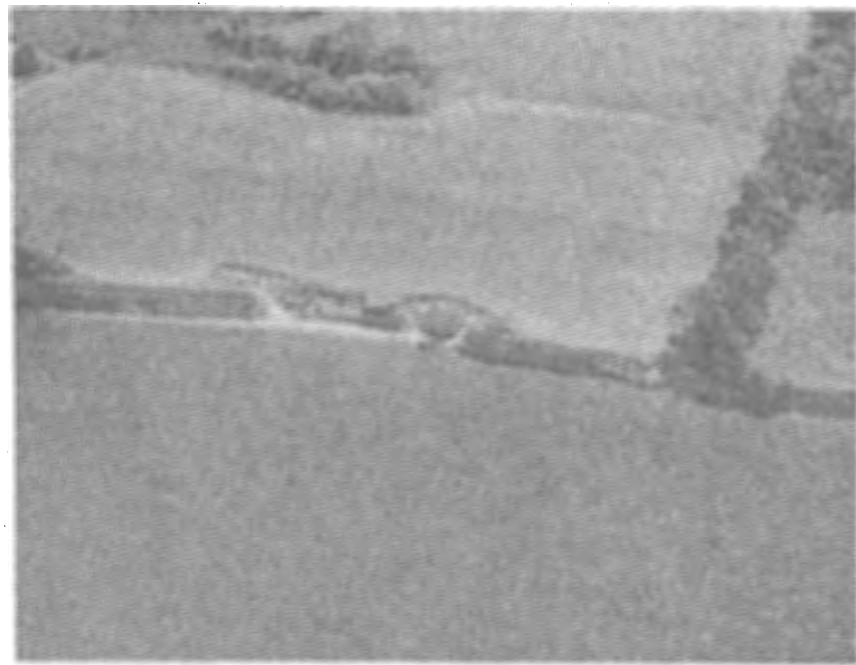


FIGURE 9



FIGURE 10

FIGURES 9 and 10: Near Church Point, Segment 10. These agricultural areas experience continuing erosion; however it would be a very costly proposition to try to stabilize them.

FIGURE 11: Along the south bank of Mattox Creek, Segment 11. This new housing development is not typical of most along Westmoreland's shoreline, as the development extends inland for several thousand feet instead of concentrating along the shoreline. Notice the wide sand beach.



FIGURE 11

FIGURE 12: South of Monroe Bay, Segment 11. Erosion is very evident here, as stabilized areas protrude into the water.



FIGURE 12

FIGURE 13: Colonial Beach, Segment 12. The shoreline is protected by concrete slabs acting as a seawall.

FIGURE 14: Colonial Beach, Segment 12, ground view. The bluff in the foreground is eroding due to downhill rain runoff. The groins are of concrete bags.

FIGURE 15: Colonial Beach, Segment 12, ground view. Closeup of concrete bag groins and concrete slab seawall.



FIGURE 13

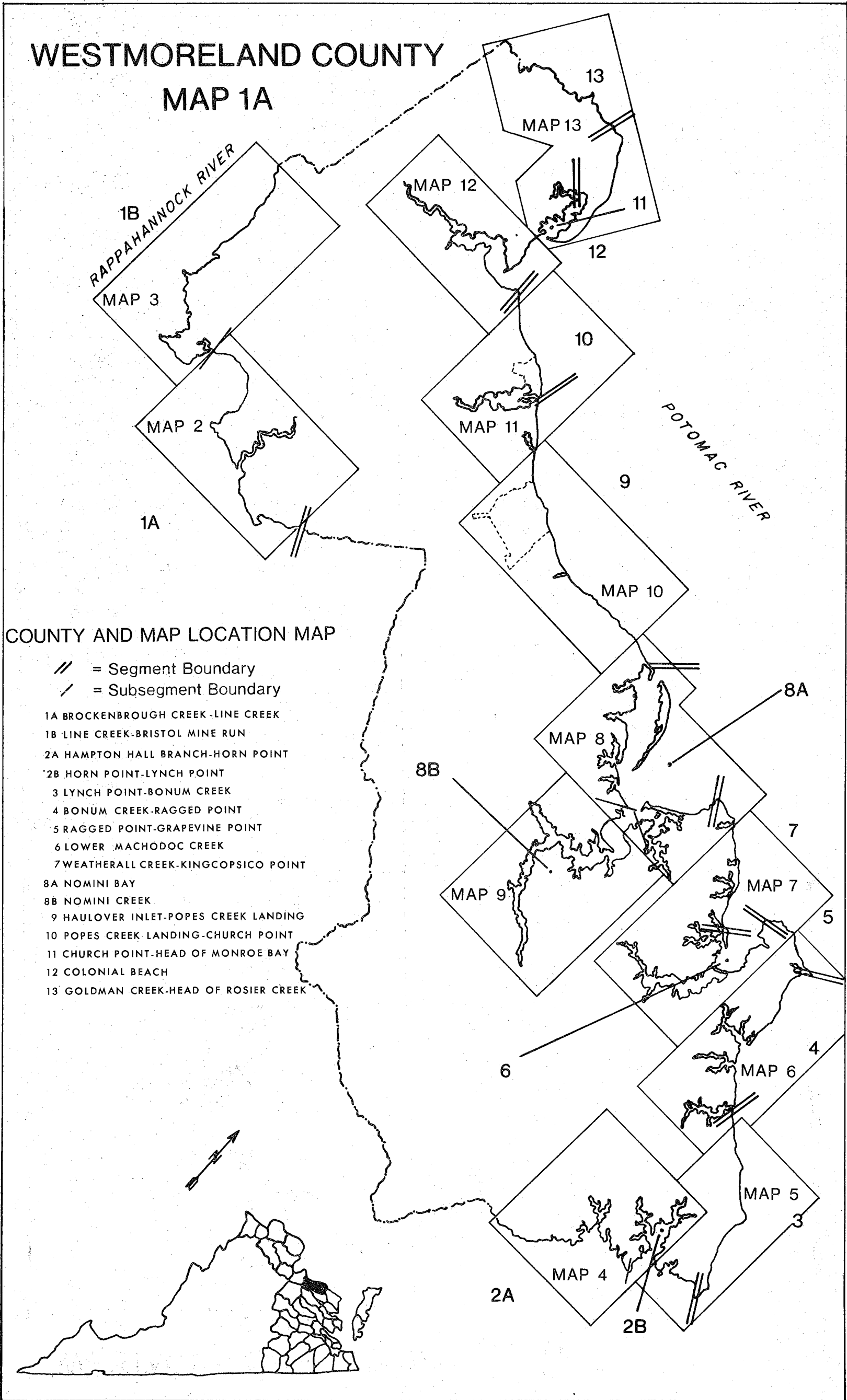


FIGURE 14

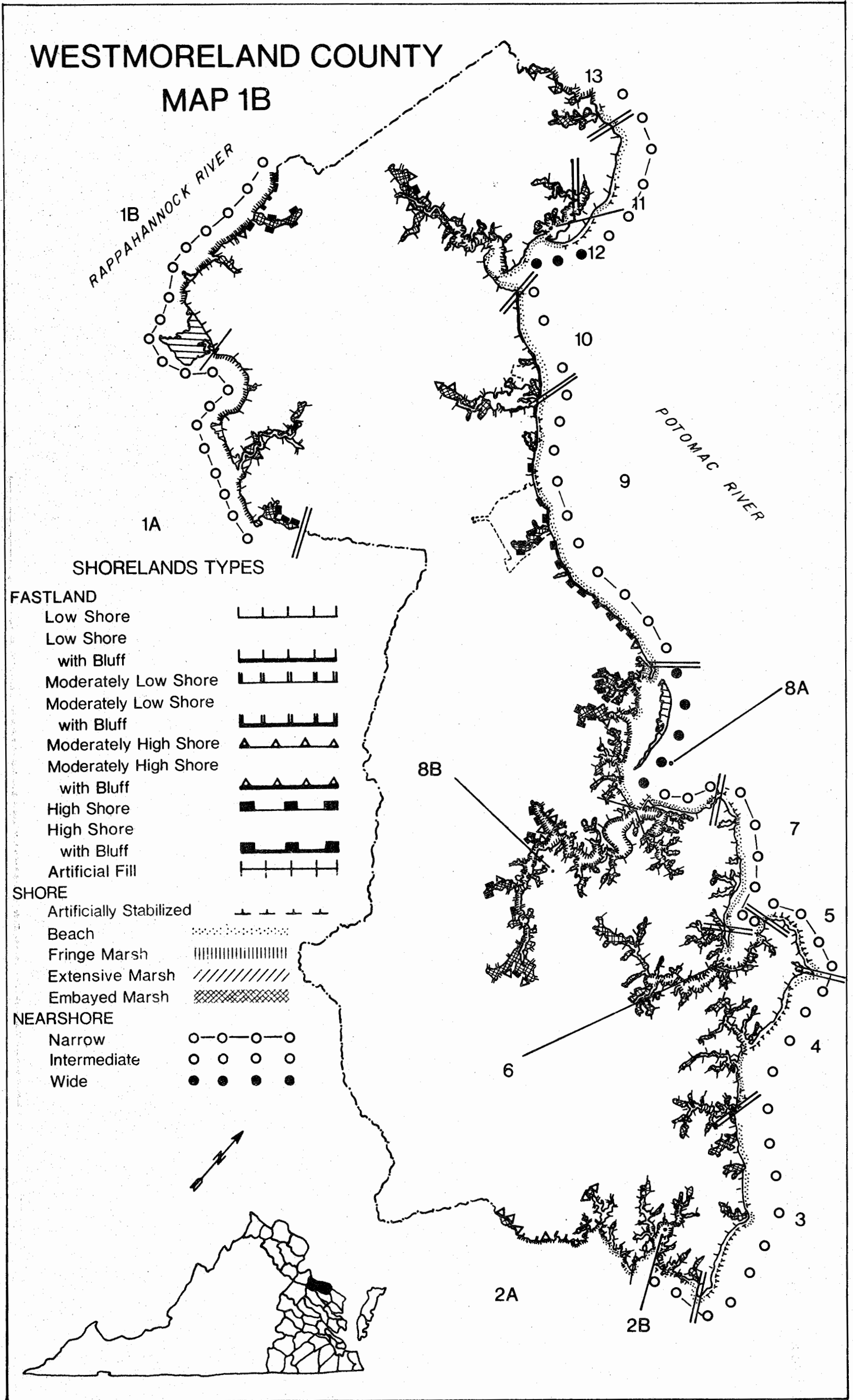


FIGURE 15

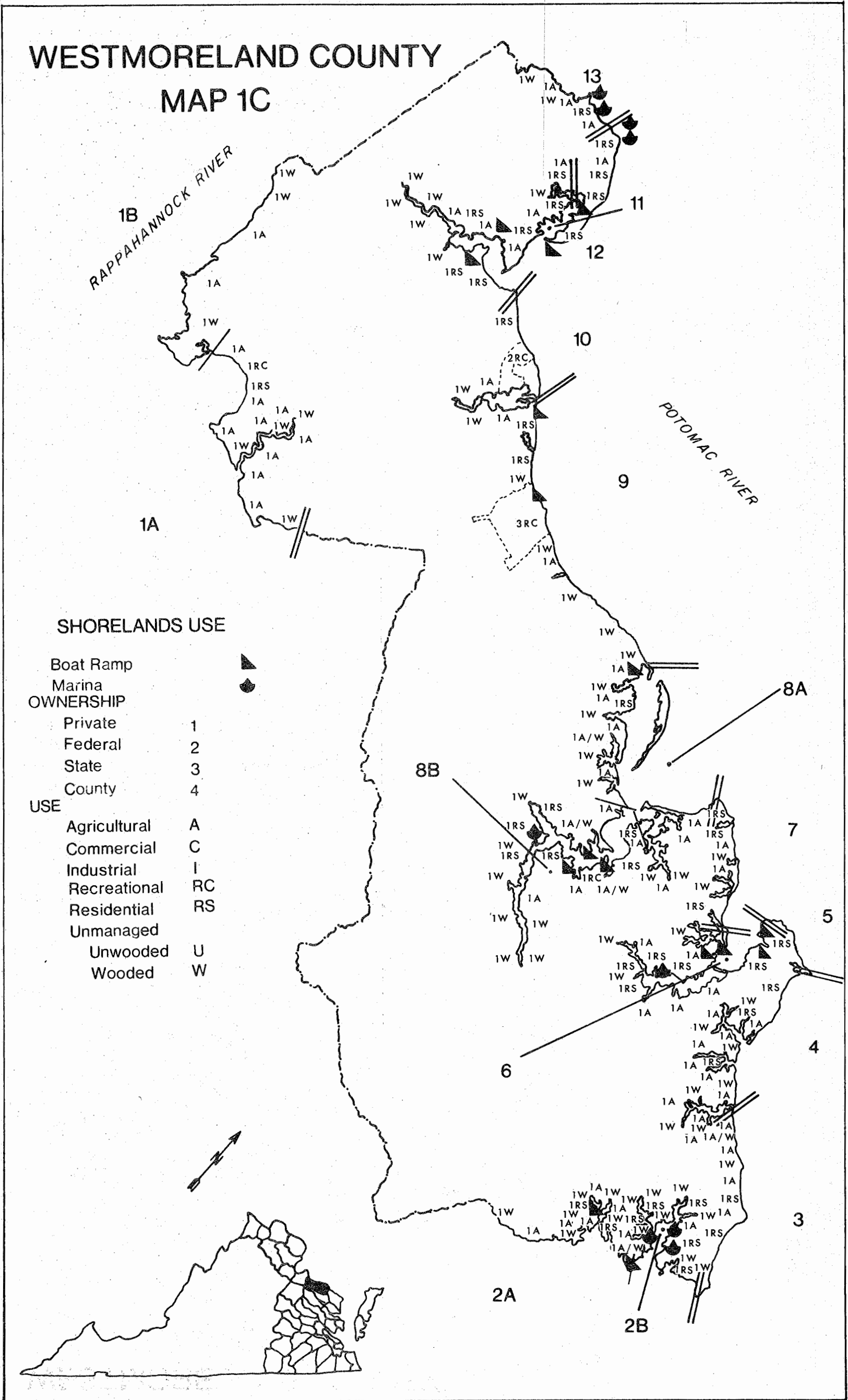
WESTMORELAND COUNTY MAP 1A



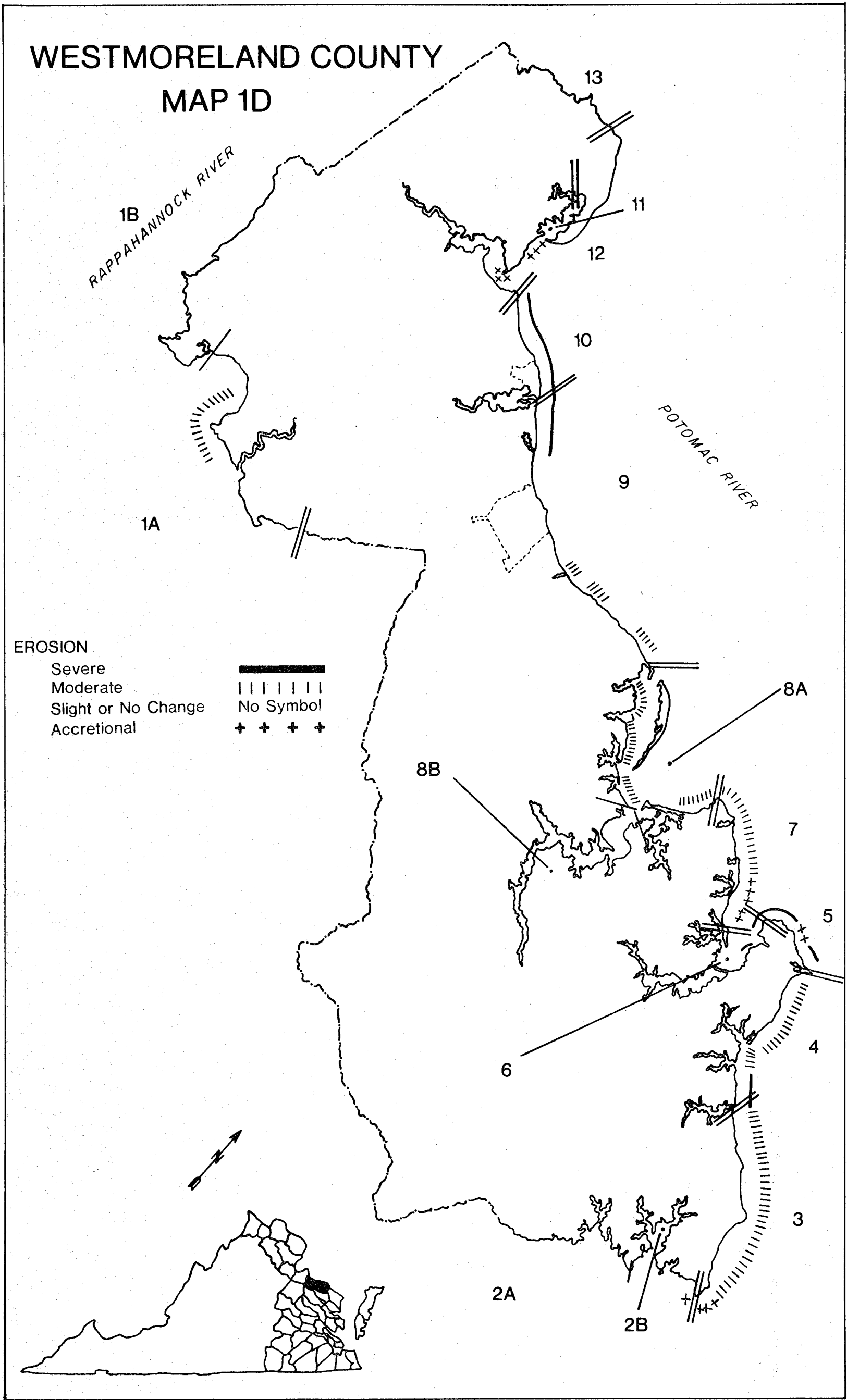
WESTMORELAND COUNTY MAP 1B



WESTMORELAND COUNTY MAP 1C



WESTMORELAND COUNTY MAP 1D



WESTMORELAND COUNTY MAP 1E

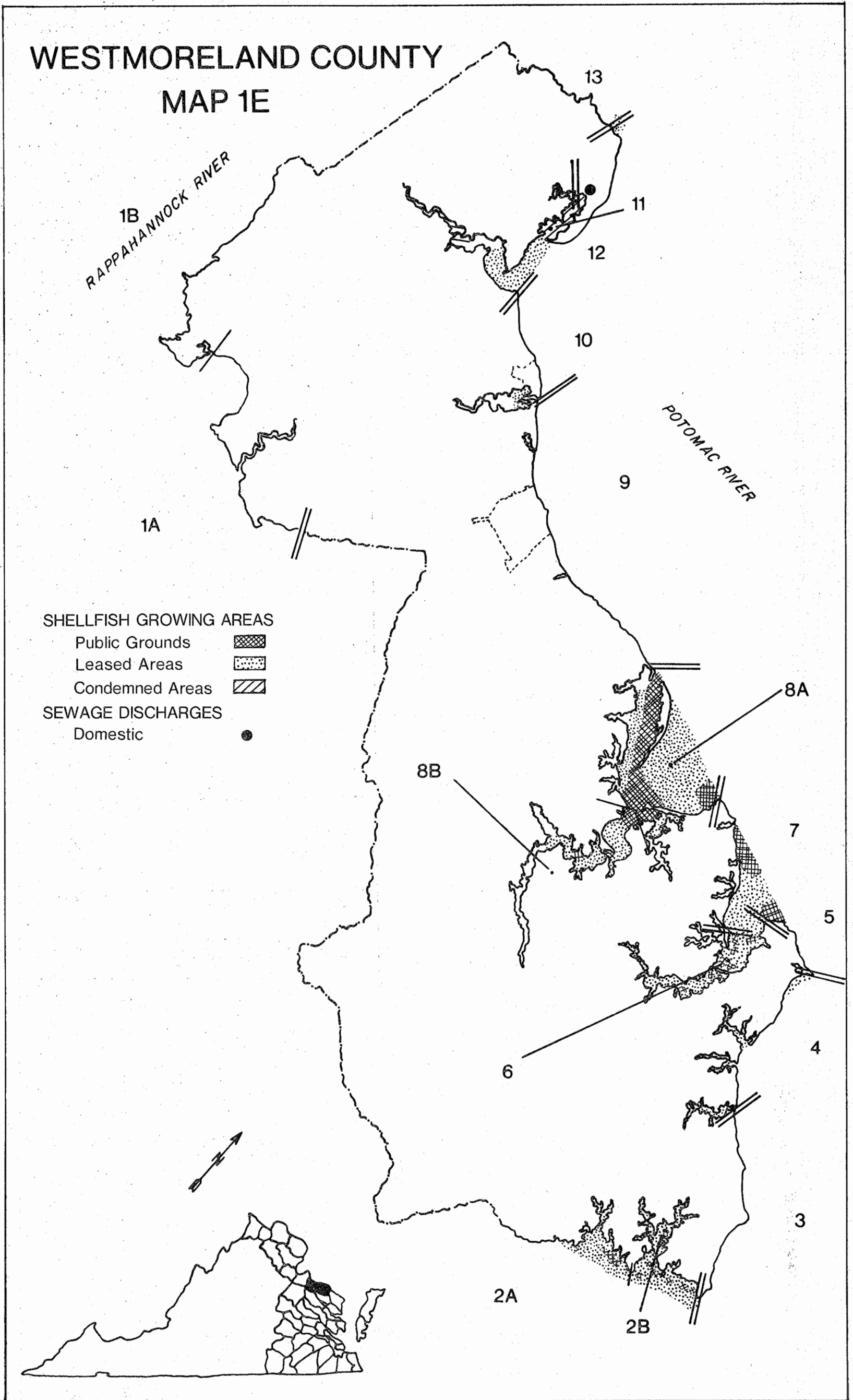


TABLE 1. SUMMARY OF WESTMORELAND COUNTY SHORELANDS PHYSIOGRAPHY, FASTLAND USE AND OWNERSHIP (STATUTE MILES)

SEGMENT	SHORELANDS PHYSIOGRAPHY									FASTLAND USE								OWNERSHIP				TOTAL MILES									
	FASTLAND				SHORE				NEARSHORE			AGRICULTURAL	COMMERCIAL	INDUSTRIAL	RECREATIONAL	RESIDENTIAL	UNMANAGED, WOODED	UNMANAGED, UNWOODED	PRIVATE	FEDERAL	STATE	COUNTY	SHORE	FASTLAND							
	LOW SHORE	LOW SHORE WITH BLUFF	MODERATELY LOW SHORE	MODERATELY LOW SHORE WITH BLUFF	MODERATELY HIGH SHORE	MODERATELY HIGH SHORE WITH BLUFF	HIGH SHORE	HIGH SHORE WITH BLUFF	ARTIFICIALLY STABILIZED	BEACH	FRINGE MARSH														EMBAYED MARSH	EXTENSIVE MARSH	NARROW	INTERMEDIATE	WIDE		
1A	18.6		0.4				0.6	0.2			6.4	8.3	3.2	5.7				14.0			0.3	0.2	5.3			19.5			0.3	17.9	19.8
1B	5.4	0.2		0.1		0.1	2.3	1.4			4.3	0.6	8.1	7.0	1.6			5.0					4.3			9.3				13.0	9.4
2A	4.1		6.3		1.3				0.3	0.7	8.4	1.3						2.2	0.5			1.6	7.3			11.6				10.7	11.7
*2B	20.2								1.3	1.9	12.4	1.3			1.7			1.6	0.3		0.2	8.0	9.6	0.6		20.3				16.9	20.3
3	10.4								2.4	2.6	0.1	0.4			5.5			2.7				1.9	5.5	0.4		10.4				5.5	10.4
*4	27.9								2.4	2.8	16.1	2.5			4.7			8.6		0.1		6.1	13.3			28.0				23.8	28.0
5	3.8								1.7	0.5	1.3	0.1		2.3								2.8	0.9			3.8				3.5	3.8
6	34.2								1.5	1.3	19.0	2.9			0.5			14.2	0.2			14.8	5.0			34.2				24.7	34.2
7	9.3								0.7	2.6	5.1	0.1	0.7	2.6	1.0			2.4			0.1	1.1	5.8			9.3				9.2	9.3
8A	31.5	0.2	6.3	0.2	0.9		3.9		0.7	6.5	24.0	4.7	2.9	1.9	0.3	4.0		22.5			0.1	3.6	13.7	3.1		42.9		0.1		38.8	43.0
8B	15.5		15.2	0.3	2.6		3.3		0.8	0.1	21.4	6.1						13.1		0.3		4.9	18.7			36.9				28.4	36.9
9	2.1	0.6			0.1		4.2	4.4	1.3	6.4		0.2		2.7	5.2			0.4			0.5	1.6	8.8			10.9		0.5		7.9	11.4
10	8.0	2.4	2.0	0.3	0.2				0.1	2.7	4.5	5.0		3.0				6.5			3.2	0.2	3.1			9.8	3.0		0.1	12.3	13.0
11	25.5	0.3	2.4		0.7		0.2		1.3	3.0	11.4	10.4				1.5		8.0	0.1	0.1	0.1	10.7	9.3	0.9		29.0		0.1		26.1	29.1
12	6.6	0.6							2.4	3.0	1.8	0.1		1.6	2.1	0.9		0.5	0.5			6.3				7.2				7.3	7.2
13	7.0		0.7		1.7				0.4	0.4	3.1	2.3			0.9			1.9		0.1	0.2	2.6	4.6			9.2		0.2		6.2	9.4
TOTAL	230.1	4.3	33.3	0.9	7.5	0.1	14.5	6.0	17.3	34.5	139.3	46.3	14.9	26.8	23.5	6.4		103.6	1.6	0.6	4.7	66.4	115.2	5.0		292.3	3.0	0.5	0.8	252.2	296.9
% OF FASTLAND	78%	1%	11%	1%	2%	<1%	5%	2%										35%	1%	1%	1%	22%	39%	2%		98%	1%	1%	1%		100%
% OF SHORE									7%	14%	55%	18%	6%	11%	9%	3%															100%

*NOTE: Artificial fill comprises less than 1% of the total fastland measurement.

CHAPTER 4

4.1 Table of Subsegment Summaries

4.2 Segment and Subsegment Descriptions

4.3 Segment and Subsegment Maps

TABLE 2. SUBSEGMENT SUMMARIES, WESTMORELAND COUNTY VIRGINIA

SEGMENT	SHORELANDS TYPE	SHORELANDS USE	OWNERSHIP	FLOOD HAZARD	WATER QUALITY	BEACH QUALITY	SHORE EROSION SITUATION	ALTERNATE SHORE USE
1A BROCKENBROUGH CREEK TO LINE CREEK 17.9 miles (19.8 miles of fastland)	FASTLAND: Low shore 94%, moderately low shore 2%, high shore 3%, and high shore with bluff 1%. SHORE: Fringe marsh 36%, embayed marsh 46%, and extensive marsh 18%. NEARSHORE: Narrow 32%.	FASTLAND: Agricultural 71%, recreational 1%, residential <1%, and unmanaged, wooded 27%. SHORE: Mostly unused. NEARSHORE: Some commercial traffic, sport boating and fishing.	Private 98% and county 2%.	Low to moderate, noncritical. The only stretch of shoreline susceptible to flooding is from Brockenbrough Creek to just west of Peedee Creek.	Good. The Rappahannock River generally has good water quality.	There are no beaches in this subsegment.	Slight or no change to moderate, noncritical. The area from Peedee Creek to Leedstown has a moderate historical erosion rate.	Low. As this area is still basically rural in nature, there seems little demand for public recreational facilities.
1B LINE CREEK TO BRISTOL MINE RUN 13.0 miles (9.4 miles of fastland)	FASTLAND: Low shore 57%, low shore with bluff 2%, moderately low shore with bluff 1%, moderately high shore with bluff <1%, high shore 24%, and high shore with bluff 15%. SHORE: Fringe marsh 33%, embayed marsh 4%, and extensive marsh 63%. NEARSHORE: Narrow 54% and intermediate 12%.	FASTLAND: Agricultural 54% and unmanaged, wooded 46%. SHORE: Mostly unused. NEARSHORE: Some commercial traffic, sport boating and fishing.	Private.	Low, noncritical. The majority of the shoreline has elevations of at least 20 feet, and is not subject to flooding.	Good. The Rappahannock River generally has good water quality.	There are no beaches in this subsegment.	Slight or no change. There are no endangered or shore protective structures.	Low. Due to the rural nature of this area, there seems little demand for public recreational facilities.
2A HAMPTON HALL BRANCH TO HORN POINT 10.7 miles (11.7 miles of fastland)	FASTLAND: Low shore 35%, moderately low shore 54%, and moderately high shore 11%. SHORE: Artificially stabilized 11%, beach 7%, fringe marsh 78%, and embayed marsh 12%. NEARSHORE: The West Yeocomico River has average depths of 6 to 10 feet.	FASTLAND: Agricultural 19%, commercial 5%, residential 14%, and unmanaged, wooded 62%. SHORE: Some private recreational use, but mostly unused. NEARSHORE: Sport boating, fishing, and shellfishing.	Private.	Low, noncritical. The entire subsegment has elevations of at least 10 feet and is not subject to flooding.	Good. The West Yeocomico River generally has good water quality.	Poor. There are only narrow, strip beaches in this subsegment.	Slight or no change. There are approximately 1,600 feet of artificially stabilized shoreline in the subsegment, most of which is for cosmetic purposes.	Moderate. The Kinsale area will probably expand in the future, bringing about the need for recreational facilities such as launching ramps and picnic areas.
2B HORN POINT TO LYNCH POINT 16.9 miles (20.3 miles of fastland)	FASTLAND: Artificial fill <1% and low shore 99%. SHORE: Artificially stabilized 8%, beach 11%, fringe marsh 73%, and embayed marsh 8%. NEARSHORE: Intermediate 10%.	FASTLAND: Agricultural 8%, commercial 1%, recreational 1%, residential 39%, unmanaged, wooded 47%, and unmanaged, unwooded 3%. SHORE: Some recreational use, but mostly unused. NEARSHORE: Sport boating, fishing, and shellfishing.	Private.	Moderate to high, critical. The majority of the shoreline is susceptible to flooding. Some structures on the Northwest Yeocomico River and at Lynch Point are built below 5-foot elevations and could be flooded.	The Yeocomico River has good water quality with some excellent shellfish grounds.	Poor to good. The areas just north of Horn Point and at Lynch Point have wide beaches with some vegetation.	No data; the area appears to be stable. The Lynch Point spit is accreting at an average annual rate of 1.9 feet per year. There are approximately 6,800 feet of artificially stabilized shoreline in the subsegment, most of which is for retaining fill.	Moderate. Due to the increase in residential buildup, there is a need for public recreational facilities such as launching ramps, picnic areas, and other open space sites.
3 LYNCH POINT TO BONUM CREEK 5.5 miles (10.4 miles of fastland)	FASTLAND: Entirely low shore. SHORE: Artificially stabilized 43%, beach 48%, fringe marsh 1%, and embayed marsh 8%. NEARSHORE: Intermediate.	FASTLAND: Agricultural 25%, residential 18%, unmanaged, wooded 53%, and unmanaged, unwooded 4%. SHORE: Some private recreational use, but mostly unused. NEARSHORE: Commercial traffic, sport boating and fishing.	Private.	Low to moderate, critical. The Lynch Point and Sandy Point areas could be flooded during abnormally high water, inundating all the structures located along the shoreline.	Good. The Potomac River generally has good water quality.	Good. Almost the entire length of shoreline has a wide, clean beach.	Moderate, noncritical. The shoreline from Lynch Point to Bonum Creek has been eroding at an average historical rate of 2.7 feet per year. Most of the shoreline is now artificially stabilized.	Low. As this section of shoreline is still basically rural, there seems little demand for public recreational facilities.
4 BONUM CREEK TO RAGGED POINT 23.8 miles (28.0 miles of fastland)	FASTLAND: Artificial fill <1% and low shore 100%. SHORE: Artificially stabilized 10%, beach 12%, fringe marsh 68%, and embayed marsh 10%. NEARSHORE: Intermediate 20%.	FASTLAND: Agricultural 31%, industrial <1%, residential 22%, and unmanaged, wooded 47%. SHORE: Private recreational use along the residential areas. NEARSHORE: Some commercial traffic, sport boating, fishing, and shellfishing.	Private.	Moderate to high, critical. Numerous structures on the north bank of Gardner Creek and along Ragged Point Beach would be inundated during abnormally high water.	Good. The Potomac River, Bonum, Jackson, and Gardner Creeks all have excellent water quality.	Poor to good. Ragged Point Beach has a wide clean beach with some vegetation.	Moderate to severe, noncritical. The shoreline from Bonum Creek to Jackson Creek is experiencing an average annual retreat of 4.2 feet per year; from Jackson Creek to Cherry Grove Creek 1.5 feet per year; and from Cherry Grove Creek to Ragged Point 2.8 feet per year. Groins have been used in conjunction with bulkhead along several stretches of shoreline to stop the retreat.	Low. There seems to be little demand to change the predominantly rural nature of the segment.

TABLE 2 (Cont'd)

SEGMENT	SHORELANDS TYPE	SHORELANDS USE	OWNERSHIP	FLOOD HAZARD	WATER QUALITY	BEACH QUALITY	SHORE EROSION SITUATION	ALTERNATE SHORE USE
5 RAGGED POINT TO GRAPEVINE POINT 3.5 miles (3.8 miles of fastland)	FASTLAND: Entirely low shore. SHORE: Artificially stabilized 49%, beach 14%, fringe marsh 36%, and embayed marsh <1%. NEARSHORE: Narrow 64%.	FASTLAND: Residential 75% and unmanaged, wooded 25%. SHORE: Mostly private recreational use. NEARSHORE: Commercial and sport boating and fishing.	Private.	Low, noncritical. The majority of the shoreline has elevations of at least 10 to 15 feet and is not subject to flooding.	Satisfactory. The Potomac River generally has good water quality.	Poor. There are only narrow, strip beaches in the segment.	Slight or no change to severe, noncritical. The shoreline along Ragged Point Beach and from Coles Point to Grapevine Point have average historical erosion rates of 3.4 feet and 3.6 feet per year respectively. There are approximately 9,100 feet of artificially stabilized shoreline in the segment.	Moderate. As this segment and the surrounding areas are fairly heavily developed, there is a need for public recreational facilities.
6 LOWER MACHODOC CREEK 24.7 miles (34.2 miles of fastland)	FASTLAND: Entirely low shore. SHORE: Artificially stabilized 6%, beach 5%, fringe marsh 77%, and embayed marsh 12%. NEARSHORE: Intermediate 2%.	FASTLAND: Agricultural 42%, commercial <1%, residential 43%, and unmanaged, wooded 15%. SHORE: Mostly unused. NEARSHORE: Sport boating and fishing.	Private.	Low to moderate, noncritical. A few isolated areas (Grannys Bar, Narrows Beach and Drum Bay) have structures built below 5-foot elevations and could be flooded during abnormally high water.	Poor to fair. The lower portion of the Lower Machodoc Creek is currently closed to the taking of shellfish.	Poor to fair. Some groin fields have trapped good fillets of sand.	Slight or no change to severe, noncritical. The shoreline from Branson Cove to Grannys Bar has been experiencing an average historical retreat of 4.9 feet per year. There are approximately 7,900 feet of artificially stabilized shoreline, most of which is effective.	Moderate. There is already a great deal of residential activity along this shoreline. There is a need for public recreational facilities such as camping and hiking areas, and launching ramps.
7 WEATHERALL CREEK TO KINGCOPSICO POINT 9.2 miles (9.3 miles of fastland)	FASTLAND: Entirely low shore. SHORE: Artificially stabilized 8%, beach 28%, fringe marsh 55%, embayed marsh 1%, and extensive marsh 8%. NEARSHORE: Narrow 28% and intermediate 11%.	FASTLAND: Agricultural 25%, recreational <1%, residential 11%, and unmanaged, wooded 62%. SHORE: Mostly unused. NEARSHORE: Commercial and sport boating and fishing.	Private.	Low, noncritical. The majority of the shoreline has elevations of 10 to 15 feet and is not subject to flooding.	Satisfactory. This portion of the Potomac River generally has excellent water quality.	Poor to good. There are several wide, clean beaches in the segment.	Moderate, noncritical. This section of shoreline has an average historical erosion rate of 2.7 feet per year. There are approximately 3,700 feet of artificially stabilized shoreline in the segment, most of which is effective.	Moderate. A well maintained public recreational park that blends with the rural surroundings of the area is possible here.
8A NOMINI BAY 38.8 miles (43.0 miles of fastland)	FASTLAND: Low shore 73%, low shore with bluff <1%, moderately low shore 15%, moderately low shore with bluff <1%, moderately high shore 2%, and high shore 9%. SHORE: Artificially stabilized 2%, beach 17%, fringe marsh 62%, embayed marsh 12%, and extensive marsh 7%. NEARSHORE: Narrow 5%, intermediate <1%, and wide 10%.	FASTLAND: Agricultural 52%, recreational <1%, residential 8%, unmanaged, wooded 32%, and unmanaged, unwooded 7%. SHORE: Mostly unused. NEARSHORE: Sport boating, fishing, and shellfishing.	Private 99% and county <1%.	Moderate to high, critical. Several areas in North Prong and Buckner Creek could be flooded during abnormally high water, endangering several structures.	Satisfactory. Nomini Bay has good water quality and some excellent shellfish grounds.	Fair. The beach at White Point is wide with good vegetation. Groins along White Point Spit are helping maintain a beach.	Slight or no change to moderate, noncritical. The area of highest erosion is from Kingcopsico Point to White Point Spit, which is experiencing an average historical retreat of 2.8 feet per year. The groin field at White Point Spit has trapped good fillets of sand.	Low. As this area is still basically rural, there seems little demand for recreational facilities.
8B NOMINI CREEK 28.4 miles (36.9 miles of fastland)	FASTLAND: Low shore 42%, moderately low shore 41%, moderately low shore with bluff 1%, moderately high shore 7%, and high shore 9%. SHORE: Artificially stabilized 3%, beach <1%, fringe marsh 75%, and embayed marsh 22%. NEARSHORE: Nomini Creek has depths of 3 to 10 feet.	FASTLAND: Agricultural 36%, industrial <1%, residential 13%, and unmanaged, wooded 51%. SHORE: Mostly unused. NEARSHORE: Sport boating and fishing.	Private.	Low, noncritical. The majority of the shoreline has elevations of 20 to 40 feet and is not subject to flooding.	Unsatisfactory. The lower portion of Nomini Creek is currently closed to the taking of shellfish.	Poor. There is only a small section of narrow, strip beach in the subsegment.	Slight or no change. The shoreline appears to be stable. There are approximately 4,300 feet of artificially stabilized shoreline in the subsegment, most of which is for cosmetic purposes.	Low. There appears to be little demand for public recreational facilities in this area.
9 HAULOVER INLET TO POPES CREEK LANDING 7.9 miles (11.4 miles of fastland)	FASTLAND: Low shore 19%, low shore with bluff 5%, moderately high shore 1%, high shore 37%, and high shore with bluff 38%. SHORE: Artificially stabilized 16%, beach 81%, and embayed marsh 3%. NEARSHORE: Narrow 34% and intermediate 66%.	FASTLAND: Agricultural 4%, recreational 4%, residential 14%, and unmanaged, wooded 78%. SHORE: The Westmoreland State Park provides recreational facilities for the public. NEARSHORE: Commercial shipping, sport boating and fishing.	Private 96% and state 4%.	Low, noncritical. The majority of the shoreline is fronted by bluff and is not subject to flooding.	Satisfactory. The Potomac River generally has good water quality.	Fair. This segment has fairly wide, clean beaches.	Slight or no change to severe, noncritical. The Mount Airy Triangulation area has an average historical erosion rate of 2.1 feet per year; Clifton Hill area 1.7 feet per year; Nomini Cliffs 1.5 feet per year; and Horsehead Cliffs to Church Point 3.5 feet per year. There are approximately 6,900 feet of wooden bulkhead used in conjunction with groins in the segment. The groins appear to be effective in trapping sand.	Low. The Westmoreland State Park is located in this segment, providing a variety of recreational facilities for the general public.

TABLE 2 (Cont'd)

SEGMENT	SHORELANDS TYPE	SHORELANDS USE	OWNERSHIP	FLOOD HAZARD	WATER QUALITY	BEACH QUALITY	SHORE EROSION SITUATION	ALTERNATE SHORE USE
10 POPES CREEK LANDING TO CHURCH POINT 12.3 miles (13.0 miles of fastland)	FASTLAND: Low shore 62%, low shore with bluff 19%, moderately low shore 15%, moderately low shore with bluff 2%, and moderately high shore 2%. SHORE: Artificially stabilized <1%, beach 22%, fringe marsh 37%, and embayed marsh 41%. NEARSHORE: Narrow 24%.	FASTLAND: Agricultural 50%, recreational 25%, residential 1%, and unmanaged, wooded 24%. SHORE: The George Washington National Monument Park provides a variety of recreational facilities for the general public. NEARSHORE: Commercial shipping, sport boating and fishing.	Private 76%, federal 23%, and county <1%.	Low, noncritical. The majority of the shoreline has elevations of 10 feet and is not subject to flooding.	Popes Creek is currently closed for the taking of shellfish. The Potomac River generally has good water quality.	Poor to fair. The majority of the shoreline has narrow, strip beaches.	Severe, noncritical. The entire river-fronting shoreline has an average historical erosion rate of 3.5 feet per year. There is approximately 200 feet of wooden bulkhead at the mouth of Popes Creek. This structure has now been flanked and is basically ineffective at stopping erosion.	Low. The George Washington National Monument Park provides recreational facilities for the public. There seems little demand to alter any of the remaining shoreline.
11 CHURCH POINT TO HEAD OF MONROE BAY 26.1 miles (29.1 miles of fastland)	FASTLAND: Low shore 87%, low shore with bluff 1%, moderately low shore 8%, moderately high shore 3%, and high shore 1%. SHORE: Artificially stabilized 5%, beach 12%, fringe marsh 44%, and embayed marsh 39%. NEARSHORE: Wide 6%. Mattox Creek has average depths of 3 to 5 feet and Monroe Bay has depths to 7 feet.	FASTLAND: Agricultural 27%, commercial <1%, industrial <1%, recreational <1%, residential 37%, unmanaged, wooded 32%, and unmanaged, unwooded 3%. SHORE: Some limited public recreational use at the marina and private use along the residential sections. NEARSHORE: Sport boating and fishing.	Private 99% and county <1%.	Low, noncritical for most of the segment. The Sebastian Point area could be flooded during periods of abnormally high water, endangering the structures built there.	Unsatisfactory. The lower portion of Mattox Creek and all of Monroe Bay are closed for the taking of shellfish.	Fair to good. The majority of the segment has only narrow, strip beaches. The area between Church Point and Sheep Point has a very wide, clean beach.	There is no significant erosion in this area. Sebastian Point and Paynes Point have average historical accretion rates of 1.6 and 0.4 feet per year respectively.	Low. Because of the poor water quality, there seems little desire for public recreational facilities in the area.
12 COLONIAL BEACH 7.2 miles (7.2 miles of fastland)	FASTLAND: Low shore 91% and low shore with bluff 9%. SHORE: Artificially stabilized 33%, beach 41%, fringe marsh 25%, and embayed marsh 1%. NEARSHORE: Narrow 22%, intermediate 30%, and wide 12%.	FASTLAND: Agricultural 6%, commercial 7%, and residential 87%. SHORE: Commercial use (marinas) and private recreational use. NEARSHORE: Commercial shipping, sport boating and fishing.	Private.	High, critical. Several sections of Colonial Beach have elevations below 7 feet and could be flooded during periods of abnormally high water.	Unsatisfactory for Monroe Bay, which is closed for the taking of shellfish. The Potomac River generally has good water quality.	Fair. Gum Bar Point has a wide, clean beach with vegetation. Several other areas in the segment have fairly wide beaches.	Slight or no change. Most of the shoreline has been artificially stabilized, effectively combatting any erosion. This stabilization includes a variety of structures such as concrete bulkhead, wooden bulkhead, stone riprap, and groins.	Low. The entire segment is already used.
13 GOLDMAN CREEK TO HEAD OF ROSIER CREEK 6.2 miles (9.4 miles of fastland)	FASTLAND: Low shore 75%, moderately low shore 7%, and moderately high shore 18%. SHORE: Artificially stabilized 6%, beach 6%, fringe marsh 50%, and embayed marsh 38%. NEARSHORE: Intermediate 15%. Rosier Creek has average depths of 3 feet.	FASTLAND: Agricultural 20%, industrial 1%, recreational 2%, residential 28%, and unmanaged, wooded 49%. SHORE: Some private recreational use, but mostly unused. NEARSHORE: Sport boating and fishing.	Private 98% and county 2%.	Low, noncritical for most of the segment. Some structures at the mouth of Goldman Creek are built below 5-foot elevations and could be inundated during periods of abnormally high water.	Satisfactory. Rosier Creek generally has good water quality.	Poor. The majority of the segment has only narrow, strip beaches.	Slight or no change, noncritical. The area appears to be stable. There are approximately 2,000 feet of artificially stabilized shoreline in the segment, most of which is for cosmetic purposes or for retaining fill.	Moderate. A well maintained public recreational park is possible in this segment.

SUBSEGMENT 1A

BROCKENBROUGH CREEK TO LINE CREEK

Map 2

EXTENT: 94,600 feet (17.9 mi.) of shoreline along the Rappahannock River, from Brockenbrough Creek to Line Creek, including Peedee Creek. The subsegment has a fastland measurement of 104,600 feet (19.8 mi.).

SHORELANDS TYPE

FASTLAND: Low shore 94% (18.6 mi.), moderately low shore 2% (0.4 mi.), high shore 3% (0.6 mi.), and high shore with bluff 1% (0.2 mi.).

SHORE: Fringe marsh 36% (6.4 mi.), embayed marsh 46% (8.3 mi.), and extensive marsh 18% (3.2 mi.).

NEARSHORE: Narrow 32%. The remainder of the nearshore zone is located along creeks which are too narrow and shallow for classification.

SHORELANDS USE

FASTLAND: Agricultural 71% (14.0 mi.), recreational 1% (0.3 mi.), residential <1% (0.2 mi.), and unmanaged, wooded 27% (5.3 mi.).

SHORE: Some water related activities at the campground at Leestown, but mostly unused.

NEARSHORE: Commercial traffic to Fredericksburg, sport boating and fishing.

WIND AND SEA EXPOSURE: The shoreline trends basically SE - NW, through a series of large meanders. There are no significant fetches affecting this area.

OWNERSHIP: Private 98% and county 2%.

FLOOD HAZARD: Low to moderate, noncritical. The majority of the shoreline has elevations of at least 10 feet. The stretch of shoreline from Brockenbrough Creek to just west of Peedee Creek is very low, with average elevations of 5 feet, and could be flooded during abnormally high water.

WATER QUALITY: This portion of the Rappahannock River generally has good water quality. Some pollution does exist due to rain runoff from the agricultural fields. To combat this soil erosion, a vegetated buffer zone of reasonable width should be left along the shoreline.

BEACH QUALITY: There are no beaches in this subsegment.

PRESENT SHORE EROSION SITUATION

EROSION RATE: Slight or no change to moderate, noncritical. The area from Peedee Creek west to Leedstown has an average historical erosion rate of 1.2 feet per year. The Leedstown area has an average rate of 0.6 feet per year.

SHORE PROTECTIVE STRUCTURES: None.

OTHER SHORE STRUCTURES: There are a few piers and a boat landing in the subsegment.

SHORE USE LIMITATIONS: Most of this subsegment has either very low shore, with the possibility of flooding, or bluffs along the shoreline making access to the water difficult. Much of the low shore is fronted by marsh systems, which should be left in their natural state. The entire subsegment is already actively used for agricultural purposes, and any development would be at the sacrifice of these farmlands.

ALTERNATE SHORE USE: As there is no major community in the area and since the area is still very rural, there is little demand for public recreational facilities. Any development would have to ensure the maintenance of the marshes and the good water quality of this subsegment.

MAPS: USGS, 7.5 Min.Ser. (Topo.), CHAMPLAIN Quadr., 1968, pr. 1973;
USGS, 7.5 Min.Ser. (Topo.), LORETTO Quadr., 1968, pr. 1972.
NOS# 12237 (605-SC), 1:40,000 scale, RAPPAHANNOCK RIVER, Corrotoman River to Fredericksburg, VA, 12th ed., 1975.

PHOTOS: Aerial-VIMS 19Jul77 WM-1A/868-917.

SUBSEGMENT 1B

LINE CREEK TO BRISTOL MINE RUN

Map 3

EXTENT: 68,500 feet (13.0 mi.) of shoreline along the Rappahannock River from Line Creek to Bristol Mine Run, including Troy Creek. The subsegment also contains 49,400 feet (9.4 mi.) of fastland.

SHORELANDS TYPE

FASTLAND: Low shore 57% (5.4 mi.), low shore with bluff 2% (0.2 mi.), moderately low shore with bluff 1% (0.1 mi.), moderately high shore with bluff <1% (0.1 mi.), high shore 24% (2.3 mi.), and high shore with bluff 15% (1.4 mi.).

SHORE: Fringe marsh 33% (4.3 mi.), embayed marsh 4% (0.6 mi.), and extensive marsh 63% (8.1 mi.).

NEARSHORE: Narrow 54% and intermediate 12%. The remainder of the nearshore zone is located along Troy Creek and the many marsh creeks which are too narrow and shallow for classification.

SHORELANDS USE

FASTLAND: Agricultural 54% (5.0 mi.) and unmanaged, wooded 46% (4.3 mi.).

SHORE: Mostly unused.

NEARSHORE: Some commercial traffic to Fredericksburg, sport boating and fishing.

WIND AND SEA EXPOSURE: The main portion of the subsegment trends basically S - N. There are no significant fetches affecting this area.

OWNERSHIP: Private.

FLOOD HAZARD: Low, noncritical. The majority of the shoreline has elevations exceeding 20 feet and is not subject to flooding. The fastland behind Drakes Marsh is fairly low and could be flooded during periods of abnormally high water.

WATER QUALITY: This portion of the Rappahannock River generally has good water quality, although some pollution does exist due to soil erosion of the agricultural fields.

BEACH QUALITY: There are no beaches in this

subsegment.

PRESENT SHORE EROSION SITUATION

EROSION RATE: Slight or no change.

ENDANGERED STRUCTURES: None.

SHORE PROTECTIVE STRUCTURES: None.

OTHER SHORE STRUCTURES: None.

SHORE USE LIMITATIONS: The majority of the shoreline is fronted by cliffs ranging from 20 feet to 100 feet high, limiting access to the water. A great amount of the land is still heavily wooded, and combined with the fact that there are no major highways in the area, development of the shoreline would be a costly proposition.

ALTERNATE SHORE USE: The only portion of the subsegment that is easily accessible is behind Drakes Marsh. This area is already used for agricultural purposes. Due to the rural nature of the area there is little demand for public recreational facilities at present. Any residential development would have to take care to maintain the marshes and the good water quality of the subsegment.

MAPS: USGS, 7.5 Min.Ser. (Topo.), LORETTO
Quadr., 1968, pr. 1972;
USGS, 7.5 Min.Ser. (Topo.), ROLLINS FORK
Quadr., 1968.
NOS# 12237 (605-SC), 1:40,000 scale,
RAPPAHANNOCK RIVER, Corrotoman River to
Fredericksburg, VA, 12th ed., 1975.

PHOTOS: Aerial-VIMS 19Jul77 WM-1B/801-876.

SUBSEGMENT 2A

HAMPTON HALL BRANCH TO HORN POINT

Map 4

EXTENT: 56,800 feet (10.7 mi.) of shoreline along the West Yeocomico River, from the head of Hampton Hall Branch to Horn Point. The subsegment also includes 61,500 feet (11.7 mi.) of fastland.

SHORELANDS TYPE

FASTLAND: Low shore 35% (4.1 mi.), moderately low shore 54% (6.3 mi.), and moderately high shore 11% (1.3 mi.).

SHORE: Artificially stabilized 3% (0.3 mi.), beach 7% (0.7 mi.), fringe marsh 78% (8.4 mi.), and embayed marsh 12% (1.3 mi.).

NEARSHORE: The West Yeocomico River has average depths of 6 to 10 feet.

SHORELANDS USE

FASTLAND: Agricultural 19% (2.2 mi.), commercial 5% (0.5 mi.), residential 14% (1.6 mi.), and unmanaged, wooded 62% (7.3 mi.).

SHORE: Some private recreational and commercial use (marina), but mostly unused.

NEARSHORE: Sport boating, fishing and shell-fishing.

WIND AND SEA EXPOSURE: Hampton Hall Branch trends basically SW - NE, while the remainder of the subsegment runs generally W - E. The shoreline in this subsegment is not exposed to any significant fetches.

OWNERSHIP: Private.

FLOOD HAZARD: Low, noncritical. The entire shoreline has elevations of 10 feet or higher and is not prone to flooding.

WATER QUALITY: The West Yeocomico River generally has good water quality. Some non-point source pollution may exist due to agricultural runoff.

BEACH QUALITY: Poor. There are only narrow, strip beaches in this subsegment.

PRESENT SHORE EROSION SITUATION

EROSION RATE: Slight or no change.

ENDANGERED STRUCTURES: None.

SHORE PROTECTIVE STRUCTURES: There are approx-

imately 1,600 feet of artificially stabilized shoreline in the subsegment, most of which is for retaining fill or cosmetic purposes.

OTHER SHORE STRUCTURES: There are numerous piers and boat sheds in the subsegment. Two bridges are also located in the subsegment, one in Hampton Hall Branch and the other in Kinsale Branch.

SHORE USE LIMITATIONS: The shoreline of Hampton Hall Branch has elevations of up to 50 feet, which makes access to the water difficult. Most of the fastland behind the shore zone is used for agricultural purposes. The fastland along the West Yeocomico River is basically unused, wooded lands, with a few scattered residences. This area has potential for future development, although it seems that most development will center around Kinsale.

ALTERNATE SHORE USE: Moderate. The Kinsale area will probably expand in the future, bringing about the need for public recreational facilities such as launching ramps and picnic areas. To retain the overall natural beauty of the area, the remainder of the shoreline would be best left rural.

MAPS: USGS, 7.5 Min.Ser. (Topo.), KINSALE Quadr., 1968.
NOS# 12233 (557), 1:40,000 scale,
POTOMAC RIVER, Chesapeake Bay to Piney Point, VA and MD, 18th ed., 1973.

PHOTOS: Aerial-VIMS 1Dec76 WM-2A/001-47.

SUBSEGMENT 2B

HORN POINT TO LYNCH POINT

Maps 4 and 5

EXTENT: 89,500 feet (16.9 mi.) of shoreline along the Yeocomico River from Horn Point to Lynch Point, including the Northwest Yeocomico River. The subsegment also contains 107,200 feet (20.3 mi.) of fastland.

SHORELANDS TYPE

FASTLAND: Artificial fill <1% (0.1 mi.) and low shore 99% (20.2 mi.).

SHORE: Artificially stabilized 8% (1.3 mi.), beach 11% (1.9 mi.), fringe marsh 73% (12.4 mi.), and embayed marsh 8% (1.3 mi.).

NEARSHORE: Intermediate 10%. The remainder of the nearshore zone is too narrow and shallow for classification.

SHORELANDS USE

FASTLAND: Agricultural 8% (1.6 mi.), commercial 1% (0.3 mi.), recreational 1% (0.2 mi.), residential 39% (8.0 mi.), unmanaged, wooded 47% (9.6 mi.), and unmanaged, unwooded 3% (0.6 mi.).

SHORE: Some public recreational use at the marina and campground, but mostly unused.

NEARSHORE: Sport boating, fishing and shell-fishing.

WIND AND SEA EXPOSURE: The Northwest Yeocomico River trends basically NW - SE. The remainder of the subsegment runs SW - NE. Fetches at Horn Point are NE - 10 nautical miles and E - unlimited across the Bay.

OWNERSHIP: Private.

FLOOD HAZARD: Moderate to high, critical. The majority of the shoreline has elevations of 10 feet or less. Some structures in the Northwest Yeocomico River and at Lynch Point are built below 5-foot elevations and could be flooded during periods of abnormally high water.

WATER QUALITY: The Yeocomico River has good water quality with some excellent shellfishing grounds in the area.

BEACH QUALITY: Poor to good. Most of the subsegment has narrow, strip beaches. The areas just north of Horn Point and at Lynch Point have wide beaches with some vegetation.

PRESENT SHORE EROSION SITUATION

EROSION RATE: No data for most of the subsegment, although it appears to be stable. The spit at Lynch Point is accreting at an average historical rate of 1.9 feet per year.

ENDANGERED STRUCTURES: None.

SHORE PROTECTIVE STRUCTURES: There are approximately 6,800 feet of artificially stabilized shoreline in the subsegment, most of which is for retaining fill or for cosmetic purposes.

OTHER SHORE STRUCTURES: There are several private piers in the subsegment. The marinas have tie-up slips and launching ramps.

SHORE USE LIMITATIONS: Most of the shoreline along the east bank of the Northwest Yeocomico River around to Lynch Point is already developed. Some new residential development is taking place along White Point Creek. The remainder of the subsegment is mostly wooded. Any new development should take care to maintain the good water quality of the river.

ALTERNATE SHORE USE: Moderate. Due to the increase in residential buildup there is a need for public recreational facilities such as a launching ramp and picnic areas. The remainder of the subsegment is best left in its natural state to preserve the rural beauty of the area.

MAPS: USGS, 7.5 Min.Ser. (Topo.), KINSALE
Quadr., 1968.
NOS# 12233 (557), 1:40,000 scale,
POTOMAC RIVER, Chesapeake Bay to Piney
Point, VA and MD, 18th ed., 1973.

PHOTOS: Aerial-VIMS 1Dec76 WM-2B/48-81;
22Dec76 WM-2B/82-115.

SEGMENT 3

LYNCH POINT TO BONUM CREEK

Maps 5 and 6

EXTENT: 28,900 feet (5.5 mi.) of shoreline along the Potomac River, from Lynch Point to Bonum Creek. The segment also includes 55,100 feet (10.4 mi.) of fastland.

SHORELANDS TYPE

FASTLAND: Entirely low shore.

SHORE: Artificially stabilized 43% (2.4 mi.), beach 48% (2.6 mi.), fringe marsh 1% (0.1 mi.), and embayed marsh 8% (0.4 mi.).

NEARSHORE: Intermediate.

SHORELANDS USE

FASTLAND: Agricultural 25% (2.7 mi.), residential 18% (1.9 mi.), unmanaged, wooded 53% (5.5 mi.), and unmanaged, unwooded 4% (0.4 mi.).

SHORE: Some private recreational use, but mostly unused.

NEARSHORE: Commercial traffic in the shipping lanes, sport boating and fishing.

WIND AND SEA EXPOSURE: The shoreline from Lynch Point to Sandy Point trends basically SSE - NNW, and from Sandy Point to Bonum Creek the trend is SE - NW. Fetches at Lynch Point are E - 11 nautical miles and NE - 9 nautical miles. The fetch at Sandy Point is E - 9 nautical miles.

OWNERSHIP: Private.

FLOOD HAZARD: Low to moderate, critical. The Lynch Point and Sandy Point areas have elevations of 5 feet or less, and would be flooded during periods of abnormally high water, along with the numerous structures built on the shoreline. The remainder of the shoreline has elevations of at least 10 feet and is not subject to flooding.

WATER QUALITY: The Potomac River generally has excellent water quality.

BEACH QUALITY: Good. Almost the entire length of shoreline in this segment is fronted by wide, clean beaches.

PRESENT SHORE EROSION SITUATION

EROSION RATE: Moderate, noncritical. The shoreline from Lynch Point to Bonum Creek had been eroding at an average historical rate of 2.7 feet per year. However, much of this area has now been artificially stabilized. The spit at Lynch Point has an historical accretion rate of 1.9 feet per year.

ENDANGERED STRUCTURES: None.

SHORE PROTECTIVE STRUCTURES: Most of the shoreline from Lynch Point to Sandy Point is artificially stabilized with bulkhead or riprap. Previous attempts to stabilize the Lynch Point area have failed and a considerable amount of erosion took place before the next structure could be installed. Groins have been used in conjunction with bulkhead along the Sandy Point area. Most of these structures have been successful in trapping sand and combatting erosion.

OTHER SHORE STRUCTURES: There are numerous piers in the segment.

SHORE USE LIMITATIONS: The shoreline from just north of Lynch Point to Sandy Point already has strip development along it. The Lynch Point area itself is highly susceptible to flooding. The remainder of the shoreline, from Sandy Point to Bonum Creek, is used for agriculture or is unused. The wooded, unused areas have potential for residential buildup, although clearing access roads and building lots would probably be a costly proposition.

ALTERNATE SHORE USE: Low. As this section of shoreline is still rural, there seems to be little demand for public recreational facilities. Any major development should take care to retain the natural beauty of the area, as well as the good water quality.

MAPS: USGS, 7.5 Min.Ser. (Topo.), KINSALE Quadr., 1968.
NOS# 12233 (557), 1:40,000 scale,
POTOMAC RIVER, Chesapeake Bay to Piney Point, VA and MD, 18th ed., 1973.

PHOTOS: Aerial-VIMS 22Dec76 WM-3/116-214.

SEGMENT 4

BONUM CREEK TO RAGGED POINT

Map 6

EXTENT: 125,700 feet (23.8 mi.) of shoreline along the Potomac River from Bonum Creek to Ragged Point, including Bonum, Jackson and Gardner Creeks. The segment has a fastland measurement of 148,100 feet (28.0 mi.).

SHORELANDS TYPE

FASTLAND: Artificial fill <1% (0.1 mi.) and low shore 99.7% (27.9 mi.).
SHORE: Artificially stabilized 10% (2.4 mi.), beach 12% (2.8 mi.), fringe marsh 68% (16.1 mi.), and embayed marsh 10% (2.5 mi.).
NEARSHORE: Intermediate 20%. The remainder of the nearshore zone is too narrow and shallow for classification.

SHORELANDS USE

FASTLAND: Agricultural 31% (8.6 mi.), industrial <1% (0.1 mi.), residential 22% (6.1 mi.), and unmanaged, wooded 47% (13.3 mi.).
SHORE: Private recreational use along the residential areas.
NEARSHORE: Commercial traffic in the shipping lanes, sport boating, fishing and shellfishing closer to shore and in the creeks.

WIND AND SEA EXPOSURE: The river-fronting shoreline trends basically SSE - NNW. Bonum and Jackson Creeks run SW - NE from the head to the mouth, and Gardner Creek runs W - E. Fetches at Ragged Point are E - 4 nautical miles and SE - unlimited through the mouth of the Potomac River.

OWNERSHIP: Private.

FLOOD HAZARD: Moderate to high, critical. Several areas on the north bank of Gardner Creek and along Ragged Point Beach have elevations of 5 feet or less. Numerous structures located in these areas would be inundated during periods of abnormally high water. The remainder of the segment has elevations of at least 10 feet and is not subject to flooding.

WATER QUALITY: The Potomac River generally has

good water quality. Bonum, Jackson and Gardner Creeks have excellent water quality and contain extensive shellfishing grounds.

BEACH QUALITY: Poor to good. The southern section of the segment has only narrow, strip beaches. Ragged Point Beach has a wide, clean beach with some vegetation behind.

PRESENT SHORE EROSION SITUATION

EROSION RATE: Moderate to severe, noncritical. The shoreline from Bonum Creek to Jackson Creek has an average historical retreat of 4.2 feet per year; from Jackson Creek to Cherry Grove Creek, 1.5 feet per year; and from Cherry Grove Creek to Ragged Point, 2.8 feet per year. Almost the entire shoreline from Gardner Creek to Long Pond has now been artificially stabilized, effectively combatting the erosion.

ENDANGERED STRUCTURES: None.

SHORE PROTECTIVE STRUCTURES: There are approximately 12,900 feet of artificially stabilized shoreline in the segment. Most of the bulkhead located in the creeks is for retaining fill or for cosmetic purposes. Groins have been used in conjunction with bulkhead in several areas along the river-fronting shoreline. These structures have been effective in trapping sand.

OTHER SHORE STRUCTURES: There are two riprap jetties at the mouth of Bonum Creek, and numerous piers throughout the rest of the segment.

SHORE USE LIMITATIONS: The shoreline from Gardner Creek to Ragged Point is already used for residential purposes. The majority of the remaining shoreline is farmed, and any development here would be at the sacrifice of these agricultural lands. Small scale development could take place in some areas, however, care must be taken to maintain the excellent water quality of this area.

ALTERNATE SHORE USE: Low. The northern half of the segment is already developed. The shoreline from Bonum Creek to Gardner Creek should probably be left in its natural, rural state to maintain a good balance with the rest of the segment.

MAPS: USGS, 7.5 Min.Ser. (Topo.), KINSALE Quadr., 1968;

USGS, 7.5 Min.Ser. (Topo.), PINEY POINT Quadr., 1968.
NOS# 12286 (558), 1:40,000 scale,
POTOMAC RIVER, Piney Point to Lower Cedar Point, VA and MD, 13th ed., 1971.

PHOTOS: Aerial-VIMS 17May77 WM-4/215-274.

SEGMENT 5

RAGGED POINT TO GRAPEVINE POINT

Maps 6 and 7

EXTENT: 18,700 feet (3.5 mi.) of shoreline along the Potomac River from Ragged Point to Grapevine Point. The segment also includes 19,800 feet (3.8 mi.) of fastland.

SHORELANDS TYPE

FASTLAND: Entirely low shore.

SHORE: Artificially stabilized 49% (1.7 mi.), beach 14% (0.5 mi.), fringe marsh 36% (1.3 mi.), and embayed marsh <1% (0.1 mi.).

NEARSHORE: Narrow 64%. The remainder of the nearshore zone is located in Blackbeard Pond, which is too narrow and shallow for classification.

SHORELANDS USE

FASTLAND: Residential 75% (2.8 mi.) and unmanaged, wooded 25% (0.9 mi.).

SHORE: Mostly private recreational use.

NEARSHORE: Commercial and sport boating and fishing.

WIND AND SEA EXPOSURE: The shoreline in this segment trends basically E - W. The fetches at Ragged Point are N - 5 nautical miles and SE - unlimited through the mouth of the Potomac.

OWNERSHIP: Private.

FLOOD HAZARD: Low, noncritical. The majority of the shoreline has elevations of at least 10 to 15 feet and is not subject to flooding.

WATER QUALITY: The Potomac River generally has good water quality.

BEACH QUALITY: Poor. There are only narrow, strip beaches in the segment.

PRESENT SHORE EROSION SITUATION

EROSION RATE: Slight or no change to severe, noncritical. The areas of shoreline along Ragged Point Beach and from Coles Point to Grapevine Point had average historical erosion rates of 3.4 and 3.6 feet per year respectively. However, most of this stretch of shoreline has

now been artificially stabilized.

ENDANGERED STRUCTURES: None.

SHORE PROTECTIVE STRUCTURES: There are approximately 9,100 feet of wooden bulkhead in the segment. In several sections groins have been used in conjunction with the bulkhead, and have been fairly successful in trapping sand.

OTHER SHORE STRUCTURES: There are numerous piers located in the segment.

SHORE USE LIMITATIONS: The Potomac River-fronting shoreline is already used for strip residential development. Any further development would require the sacrifice of the few remaining undeveloped wooded areas of the segment.

ALTERNATE SHORE USE: Moderate. As this segment and the surrounding areas are fairly heavily developed, there could be a need for public related facilities such as picnic areas and launching ramps. Care should be taken to maintain the good water quality of the area.

MAPS: USGS, 7.5 Min.Ser. (Topo.), PINEY POINT Quadr., 1968;
USGS, 7.5 Min.Ser. (Topo.), ST. CLEMENTS ISLAND Quadr., 1968, pr. 1973.
NOS# 12286 (558), 1:40,000 scale,
POTOMAC RIVER, Piney Point to Lower Cedar Point, VA and MD, 13th ed., 1971.

PHOTOS: Aerial-VIMS 17May77 WM-5/275-293.

SEGMENT 6

LOWER MACHODOC CREEK

Map 7

EXTENT: 130,400 feet (24.7 mi.) of shoreline along Lower Machodoc Creek from Grapevine Point to Weatherall Creek, including all the creeks and coves located in Lower Machodoc Creek. The segment has a fastland measurement of 180,700 feet (34.2 mi.).

SHORELANDS TYPE

FASTLAND: Entirely low shore.

SHORE: Artificially stabilized 6% (1.5 mi.), beach 5% (1.3 mi.), fringe marsh 77% (19.0 mi.), and embayed marsh 12% (2.9 mi.).

NEARSHORE: Intermediate 2%. The remainder of the nearshore zone along Lower Machodoc Creek is too narrow and shallow for classification.

SHORELANDS USE

FASTLAND: Agricultural 42% (14.2 mi.), commercial <1% (0.2 mi.), residential 43% (14.8 mi.), and unmanaged, wooded 15% (5.0 mi.).

SHORE: Some private recreational use and limited public use at the marina, but mostly unused.

NEARSHORE: Sport boating and fishing.

WIND AND SEA EXPOSURE: Lower Machodoc Creek trends basically N - S. The fetch at Grapevine Point is NW - 9 nautical miles.

OWNERSHIP: Private.

FLOOD HAZARD: Low to moderate, noncritical. The majority of the segment has elevations of at least 10 feet and is not susceptible to flooding. A few isolated areas (Grannys Bar, Narrows Beach and Drum Bay) have structures built below 5-foot elevations that could be flooded during periods of abnormally high water.

WATER QUALITY: Poor to fair. The majority of Lower Machodoc Creek has good water quality. However, the lower portion is currently closed to the taking of shellfish.

BEACH QUALITY: Poor to fair. Most of the shoreline has only narrow, strip beaches, although

some groin fields have trapped good fillets of sand.

PRESENT SHORE EROSION SITUATION

EROSION RATE: Slight or no change to severe, noncritical. The shoreline from Branson Cove to Grannys Bar has experienced an average annual retreat of 4.9 feet per year. However, most of this area is now artificially stabilized. The remainder of the shoreline appears to be stable.
ENDANGERED STRUCTURES: None.

SHORE PROTECTIVE STRUCTURES: There are approximately 7,900 feet of artificially stabilized shoreline in the segment. There are several groin fields included in this measurement, most of which have been effective in trapping sand.

OTHER SHORE STRUCTURES: There are numerous piers and boat sheds in this segment, and some privately owned boat ramps.

SHORE USE LIMITATIONS: The majority of the shoreline is already used for residential purposes or is farmed. Any new development in this area should take care not to add any pollutants to the water.

ALTERNATE SHORE USE: Moderate. There is already a great deal of residential activity along the shoreline, and any new communities would be at the sacrifice of the agricultural lands. Public recreational facilities, i.e., picnic areas, launching ramps and playing fields, are necessary in such a populated area.

MAPS: USGS, 7.5 Min.Ser. (Topo.), ST. CLEMENTS ISLAND Quadr., 1968, pr. 1973;
USGS, 7.5 Min.Ser. (Topo.), MACHODOC Quadr., 1968.
NOS# 12286 (558), 1:40,000 scale,
POTOMAC RIVER, Piney Point to Lower Cedar Point, VA and MD, 13th ed., 1971.

PHOTOS: Aerial-VIMS 17May77 WM-6/294-371.

SEGMENT 7

WEATHERALL CREEK TO KINGCOPSICO POINT

Maps 7 and 8

EXTENT: 48,800 feet (9.2 mi.) of shoreline along the Potomac River from Weatherall Creek to Kingcopsico Point, including Cabin Point Creek. The segment has a fastland measurement of 49,100 feet (9.3 mi.).

SHORELANDS TYPE

FASTLAND: Entirely low shore.

SHORE: Artificially stabilized 8% (0.7 mi.), beach 28% (2.6 mi.), fringe marsh 55% (5.1 mi.), embayed marsh 1% (0.1 mi.), and extensive marsh 8% (0.7 mi.).

NEARSHORE: Narrow 28% and intermediate 11%. The rest of the shoreline is located in Cabin Point Creek, which is too narrow and shallow for classification.

SHORELANDS USE

FASTLAND: Agricultural 25% (2.4 mi.), recreational <1% (0.1 mi.), residential 11% (1.1 mi.), and unmanaged, wooded 62% (5.8 mi.).

SHORE: Private recreational use in the populated areas, but mostly unused.

NEARSHORE: Commercial and sport boating and fishing.

WIND AND SEA EXPOSURE: The shoreline of this segment trends basically SE - NW from Weatherall Creek to Herring Pond, then E - W to Kingcopsico Point. The fetch at Kingcopsico Point is E - 8 nautical miles. There is also a significant fetch from the northwest down the Potomac River.

OWNERSHIP: Private.

FLOOD HAZARD: Low, noncritical. The majority of the shoreline has elevations of 10 to 15 feet and is not subject to flooding.

WATER QUALITY: Good. This portion of the Potomac River generally has excellent water quality.

BEACH QUALITY: Fair to good. There are several areas with wide, clean beaches in the segment.

PRESENT SHORE EROSION SITUATION

EROSION RATE: Moderate, noncritical. This

section of shoreline has an average historical erosion rate of 2.7 feet per year. However, several areas of shoreline have now been artificially stabilized.

ENDANGERED STRUCTURES: None.

SHORE PROTECTIVE STRUCTURES: There are approximately 3,700 feet of artificially stabilized shoreline in the segment, most of which appears to be effective. There are several groin fields included in this measurement, the majority of which seem to be trapping good fillets of sand.

OTHER SHORE STRUCTURES: There are several piers in the segment.

SHORE USE LIMITATIONS: The shoreline along Weatherall Creek and from Herring Pond to Kingcopsico Point is already developed for residential purposes. Most of the remaining shoreline is farmed, and any construction here would be at the sacrifice of the agricultural fields. The portion of land to the west of Bettys Pond is unused at present, and should probably remain so if the rural nature of the area is to be maintained.

ALTERNATE SHORE USE: Moderate. Although the Machodoc Neck area appears to be mostly rural, there is some residential development in the section. A well maintained public recreational park that blends in with the rural surroundings of the area is possible here.

MAPS: USGS, 7.5 Min.Ser. (Topo.), ST. CLEMENTS ISLAND Quadr., 1968, pr. 1973.
NOS# 12286 (558), 1:40,000 scale,
POTOMAC RIVER, Piney Point to Lower Cedar Point, VA and MD, 13th ed., 1971.

PHOTOS: Aerial-VIMS 17May77 WM-7/372-395.

SUBSEGMENT 8A

NOMINI BAY

Map 8

EXTENT: 205,200 feet (38.8 mi.) of shoreline in Nomini Bay from Kingcopsico Point to Icehouse Point and from Matthews Point to Haulover Inlet. The shoreline measurement includes North Prong and Buckner Creek on the east side of the Bay, and Smarts, Poor Jack, Currioman and Harbor Creeks and Hollis Marsh Island on the west side. The subsegment has a fastland measurement of 226,900 feet (43.0 mi.).

SHORELANDS TYPE

FASTLAND: Low shore 73% (31.5 mi.), low shore with bluff <1% (0.2 mi.), moderately low shore 15% (6.3 mi.), moderately low shore with bluff <1% (0.2 mi.), moderately high shore 2% (0.9 mi.), and high shore 9% (3.9 mi.).

SHORE: Artificially stabilized 2% (0.7 mi.), beach 17% (6.5 mi.), fringe marsh 62% (24.0 mi.), embayed marsh 12% (4.7 mi.), and extensive marsh 7% (2.9 mi.).

NEARSHORE: Narrow 5%, intermediate <1%, and wide 10%. The rest of the shoreline is located on the several creeks in the subsegment.

SHORELANDS USE

FASTLAND: Agricultural 52% (22.5 mi.), recreational <1% (0.1 mi.), residential 8% (3.6 mi.), unmanaged, wooded 32% (13.7 mi.), and unmanaged, unwooded 7% (3.1 mi.).

SHORE: Some private recreational use and public use of the Currioman Landing, but mostly unused.

NEARSHORE: Sport boating, fishing and shell-fishing.

WIND AND SEA EXPOSURE: The subsegment trends basically NE - SW from Kingcopsico Point to Icehouse Point, then ESE - WNW from Matthews Point to Haulover Inlet. The fetch at Smarts Creek is NE - 8 nautical miles. The spit fronting North Prong and Buckner Creek is exposed to significant fetches from the northwest down the Potomac River. Hollis Marsh protects most of the shoreline within Currioman Bay from winds and waves from the northeast.

OWNERSHIP: Private 99% and county <1%.

FLOOD HAZARD: Moderate to high, critical. Although the majority of the shoreline is fronted with 15 to 20-foot elevations, several areas, especially in North Prong and Buckner Creek, have only 5-foot elevations. These areas could be flooded during periods of abnormally high water, endangering several structures located along the shoreline.

WATER QUALITY: The water quality in this area is good, with some excellent shellfishing grounds located in Nomini Bay and its tributaries.

BEACH QUALITY: Fair. Most of the subsegment has narrow, strip beaches. The beach at White Point is wide with good vegetation. Several groins along White Point Spit are helping to maintain the beach.

PRESENT SHORE EROSION SITUATION

EROSION RATE: Slight or no change to moderate, noncritical. The shoreline from Kingcopsico Point to the beginning of White Point Spit has an average annual retreat of 2.8 feet per year. Several other areas in Currioman Bay have erosion rates of 1.0 to 2.3 feet per year, while some sections have accretion rates of up to 1.7 feet per year.

ENDANGERED STRUCTURES: None.

SHORE PROTECTIVE STRUCTURES: There are several areas of bulkhead used in conjunction with groins for retaining fill and trapping sand. The groin field at White Point Spit has trapped good fillets of sand.

OTHER SHORE STRUCTURES: There is a riprap jetty at White Point, and numerous piers located throughout the subsegment.

SHORE USE LIMITATIONS: The majority of the shorelands in this subsegment are used for agricultural purposes, and development here would be at the sacrifice of these farmlands. White Point Spit, North Prong, and Buckner Creek areas are prone to flooding. The fastland behind Currioman Bay shoreline has very high elevations and is wooded, making construction here a costly proposition.

ALTERNATE SHORE USE: Low. As this area is still basically rural, there seems little demand for

public recreational facilities.

MAPS: USGS, 7.5 Min.Ser. (Topo.), ST. CLEMENTS ISLAND Quadr., 1968, pr. 1973;
USGS, 7.5 Min.Ser. (Topo.), STRATFORD HALL Quadr., 1968, pr. 1973.
NOS# 12286 (558), 1:40,000 scale,
POTOMAC RIVER, Piney Point to Lower Cedar Point, VA and MD, 13th ed., 1971.

PHOTOS: Aerial-VIMS 17May77 WM-8A/396-416;
525-561.

SUBSEGMENT 8B

NOMINI CREEK

Maps 8 and 9

EXTENT: 150,200 feet (28.4 mi.) of shoreline along Nomini Creek, including all its tributaries. The subsegment contains 194,800 feet (36.9 mi.) of fastland.

SHORELANDS TYPE

FASTLAND: Low shore 42% (15.5 mi.), moderately low shore 41% (15.2 mi.), moderately high shore with bluff 1% (0.3 mi.), moderately high shore 7% (2.6 mi.), and high shore 9% (3.3 mi.).

SHORE: Artificially stabilized 3% (0.8 mi.), beach <1% (0.1 mi.), fringe marsh 75% (21.4 mi.), and embayed marsh 22% (6.1 mi.).

NEARSHORE: Nomini Creek has average depths of 3 to 10 feet.

SHORELANDS USE

FASTLAND: Agricultural 36% (13.1 mi.), industrial <1% (0.3 mi.), residential 13% (4.9 mi.), and unmanaged, wooded 51% (18.7 mi.).

SHORE: Some private recreational use, but mostly unused.

NEARSHORE: Sport boating and fishing.

WIND AND SEA EXPOSURE: Nomini Creek trends basically N - S through a series of large meanders. There are no significant fetches affecting this area.

OWNERSHIP: Private.

FLOOD HAZARD: Low, noncritical. The majority of the shoreline has 20 to 40-foot elevations and is not subject to flooding.

WATER QUALITY: Poor. The lower portion of Nomini Creek is currently closed to the taking of shellfish.

BEACH QUALITY: Poor. There is only a small section of narrow, strip beach in the subsegment.

PRESENT SHORE EROSION SITUATION

EROSION RATE: Slight or no change. The shoreline along Nomini Creek appears to be stable.

ENDANGERED STRUCTURES: None.

SHORE PROTECTIVE STRUCTURES: There are approximately 4,300 feet of artificial stabilization in the subsegment, most of which is for retaining fill or for cosmetic purposes.

OTHER SHORE STRUCTURES: There are numerous piers and boat sheds located in the subsegment.

SHORE USE LIMITATIONS: The majority of the east bank of the creek is used for agricultural purposes, with some scattered residential development. The lower portion of the creek has very high elevations and is mostly wooded. The creek is fairly heavily polluted, thus losing much of the water related value of the area.

ALTERNATE SHORE USE: Low. There appears to be little demand for public related facilities in this area. Any new development should take care not to further pollute the creek.

MAPS: USGS, 7.5 Min.Ser. (Topo.), ST. CLEMENTS ISLAND Quadr., 1968, pr. 1973;
USGS, 7.5 Min.Ser. (Topo.), MACHODOC Quadr., 1968.
NOS# 12286 (558), 1:40,000 scale,
POTOMAC RIVER, Piney Point to Lower Cedar Point, VA and MD, 13th ed., 1971.

PHOTOS: Aerial-VIMS 17May77 WM-8B/417-524.

SEGMENT 9

HAULOVER INLET TO POPES CREEK LANDING

Maps 8, 10, and 11

EXTENT: 42,000 feet (7.9 mi.) of shoreline along the Potomac River from Haulover Inlet to Popes Creek Landing. The segment also includes 60,100 feet (11.4 mi.) of fastland.

SHORELANDS TYPE

FASTLAND: Low shore 19% (2.1 mi.), low shore with bluff 5% (0.6 mi.), moderately high shore 1% (0.1 mi.), high shore 37% (4.2 mi.), and high shore with bluff 38% (4.4 mi.).

SHORE: Artificially stabilized 16% (1.3 mi.), beach 81% (6.4 mi.), and embayed marsh 3% (0.2 mi.).

NEARSHORE: Narrow 34% and intermediate 66%.

SHORELANDS USE

FASTLAND: Agricultural 4% (0.4 mi.), recreational 4% (0.5 mi.), residential 14% (1.6 mi.), and unmanaged, wooded 78% (8.8 mi.).

SHORE: The Westmoreland State Park provides a variety of shoreline activities for the public. The remainder of the shoreline is mostly unused.

NEARSHORE: Commercial traffic in the shipping lanes, sport boating and fishing closer to shore.

WIND AND SEA EXPOSURE: The shoreline of this segment trends basically E - W. The entire shoreline is exposed to a significant fetch from the northwest down the Potomac River.

OWNERSHIP: Private 96% and state 4%.

FLOOD HAZARD: Low, noncritical. The majority of the shoreline is fronted by bluffs and is not susceptible to flooding.

WATER QUALITY: Satisfactory. This portion of the Potomac River generally has excellent water quality.

BEACH QUALITY: Fair to good. This segment has fairly wide, clean beaches.

PRESENT SHORE EROSION SITUATION

EROSION RATE: Slight or no change to severe,

noncritical. Average historical erosion rates for the segment are: the Mount Airy triangulation area 2.1 feet per year; Clifton Hill area 1.7 feet per year; Nomini Cliffs 1.5 feet per year; and Horsehead Cliffs to Church Point 3.5 feet per year.

ENDANGERED STRUCTURES: None.

SHORE PROTECTIVE STRUCTURES: There are approximately 6,900 feet of artificially stabilized shoreline in the segment, most of which is wooden bulkhead used in conjunction with groins. The groins appear to be effective at trapping sand.

OTHER SHORE STRUCTURES: There is a boat ramp at the Westmoreland State Park, and several piers throughout the rest of the segment.

SHORE USE LIMITATIONS: Approximately twenty-one percent (1.7 mi.) of the shoreline is used by the Westmoreland State Park. The majority of the remaining shoreline is wooded and has high cliffs, making access to the water difficult. The few low lying areas are already developed.

ALTERNATE SHORE USE: Low. The Westmoreland State Park is located in this segment, providing a variety of recreational facilities for many surrounding communities.

MAPS: USGS, 7.5 Min.Ser. (Topo.), STRATFORD HALL Quadr., 1968, pr. 1973;
USGS, 7.5 Min.Ser. (Topo.), COLONIAL BEACH SOUTH Quadr., 1968.
NOS# 12286 (558), 1:40,000 scale,
POTOMAC RIVER, Piney Point to Lower Cedar Point, VA and MD, 13th ed., 1971.

PHOTOS: Aerial-VIMS 17May77 WM-9/562-627.

SEGMENT 10

POPE'S CREEK LANDING TO CHURCH POINT

Maps 11 and 12

EXTENT: 65,100 feet (12.3 mi.) of shoreline along the Potomac River from Popes Creek Landing to Church Point, including Popes Creek. The segment contains 68,500 feet (13.0 mi.) of fastland.

SHORELANDS TYPE

FASTLAND: Low shore 62% (8.0 mi.), low shore with bluff 19% (2.4 mi.), moderately low shore 15% (2.0 mi.), moderately low shore with bluff 2% (0.3 mi.), and moderately high shore 2% (0.2 mi.).

SHORE: Artificially stabilized <1% (0.1 mi.), beach 22% (2.7 mi.), fringe marsh 37% (4.5 mi.), and embayed marsh 41% (5.0 mi.).

NEARSHORE: Narrow 24%. The remainder of the nearshore zone is too narrow and shallow for classification.

SHORELANDS USE

FASTLAND: Agricultural 50% (6.5 mi.), recreational 25% (3.2 mi.), residential 1% (0.2 mi.), and unmanaged, wooded 24% (3.1 mi.).

SHORE: The George Washington National Monument Park provides some recreational activities along the shoreline for the public. The remainder of the shoreline is mostly unused.

NEARSHORE: Sport boating and fishing. Commercial traffic in the shipping lanes.

WIND AND SEA EXPOSURE: The shoreline of this segment trends basically SE - NW. Fetches at Church Point are NE - 9 nautical miles and N - 8 nautical miles.

OWNERSHIP: Private 76%, federal 23%, and county <1%.

FLOOD HAZARD: Low, noncritical. The majority of the shoreline is fronted by 10-foot elevations and is not subject to flooding.

WATER QUALITY: The Potomac River generally has good water quality. Popes Creek, however, is currently closed to the taking of shellfish.

BEACH QUALITY: Poor to fair. The majority of the

shoreline has only narrow, strip beaches.

PRESENT SHORE EROSION SITUATION

EROSION RATE: Severe, noncritical. The entire river-fronting shoreline has an average historical erosion rate of 3.5 feet per year.

ENDANGERED STRUCTURES: None.

SHORE PROTECTIVE STRUCTURES: There is approximately 200 feet of wooden bulkhead located at the mouth of Popes Creek. This structure has now been flanked and is basically ineffective at stopping erosion. Some fallen trees are acting as groins in this area and are effectively trapping sand.

OTHER SHORE STRUCTURES: There are a few piers in Popes Creek.

SHORE USE LIMITATIONS: Twenty-five percent of the segment is a national park, eliminating any other development there. The shoreline of Popes Creek loses much of its water related value because of the poor water quality there. There are also some large marsh systems in Popes Creek, which should be left in their natural state as a habitat for fish and wildlife.

ALTERNATE SHORE USE: Low. George Washington National Monument Park provides recreational facilities for the public. There seems to be little demand to alter any of the remaining shoreline at present.

MAPS: USGS, 7.5 Min.Ser. (Topo.), COLONIAL BEACH SOUTH Quadr., 1968.
NOS# 12286 (558), 1:40,000 scale,
POTOMAC RIVER, Piney Point to Lower Cedar Point, VA and MD, 13th ed., 1971.

PHOTOS: Aerial-VIMS 17May77 WM-10/628-654.

SEGMENT 11

CHURCH POINT TO HEAD OF MONROE BAY

Maps 12 and 13

EXTENT: 138,000 feet (26.1 mi.) of shoreline from Church Point to the head of Monroe Bay, including Mattox Creek. The segment also contains 154,100 feet (29.1 mi.) of fastland.

SHORELANDS TYPE

FASTLAND: Low shore 87% (25.5 mi.), low shore with bluff 1% (0.3 mi.), moderately low shore 8% (2.4 mi.), moderately high shore 3% (0.7 mi.), and high shore 1% (0.2 mi.).

SHORE: Artificially stabilized 5% (1.3 mi.), beach 12% (3.0 mi.), fringe marsh 44% (11.4 mi.), and embayed marsh 39% (10.4 mi.).

NEARSHORE: Wide 6%. Mattox Creek has average depths of 3 to 5 feet, and Monroe Bay has depths to 7 feet.

SHORELANDS USE

FASTLAND: Agricultural 27% (8.0 mi.), commercial <1% (0.1 mi.), industrial <1% (0.1 mi.), recreational <1% (0.1 mi.), residential 37% (10.7 mi.), unmanaged, wooded 32% (9.3 mi.), and unmanaged, unwooded 3% (0.9 mi.).

SHORE: Some limited public recreational use at the marina, and private use along the residential sections. The remainder of the shoreline is mostly unused.

NEARSHORE: Sport boating and fishing.

WIND AND SEA EXPOSURE: Mattox Creek trends basically E - W. The shoreline from Paynes Point to the head of Monroe Bay trends S - N. Fetches at Paynes Point are NE - 6 nautical miles and E - 18 nautical miles.

OWNERSHIP: Private 99% and county <1%.

FLOOD HAZARD: Low, noncritical with the exception of the Sebastian Point area, where numerous structures are built below 5-foot elevations and would be flooded during abnormally high water.

WATER QUALITY: Unsatisfactory. The lower portion of Mattox Creek and all of Monroe Bay are closed to the taking of shellfish. The Town of Colonial Beach sewage treatment plant discharges

into Monroe Bay, and although a secondary treatment plant was installed in June 1976, the water quality does not meet the Virginia Department of Health standards for the marketing of shellfish.

BEACH QUALITY: Fair to good. The majority of the segment has only narrow, strip beaches. The area between Church Point and Sheep Point has a very wide, clean beach.

PRESENT SHORE EROSION SITUATION

EROSION RATE: There is no significant erosion in this area. Sebastian Point and Paynes Point have average historical accretion rates of 1.6 and 0.4 feet per year respectively.

ENDANGERED STRUCTURES: None.

SHORE PROTECTIVE STRUCTURES: There are approximately 6,900 feet of artificial stabilization in the segment, most of which is for cosmetic purposes or for retaining fill.

OTHER SHORE STRUCTURES: There are numerous piers, boat sheds and private boat ramps throughout the segment.

SHORE USE LIMITATIONS: The majority of the shoreline is already used for residential and agricultural purposes. Much of the water related value of the area is lost because of the poor water quality. Any new development must take care not to further degrade the water.

ALTERNATE SHORE USE: Low. Because of the poor water quality there seems little desire for public recreational facilities in the area.

MAPS: USGS, 7.5 Min.Ser. (Topo.), ROLLINS FORK Quadr., 1968;
USGS, 7.5 Min.Ser. (Topo.), COLONIAL BEACH SOUTH Quadr., 1968;
USGS, 7.5 Min.Ser. (Topo.), COLONIAL BEACH NORTH Quadr., 1968.
NOS# 12286 (558), 1:40,000 scale,
POTOMAC RIVER, Piney Point to Lower Cedar Point, VA and MD, 13th ed., 1971.

PHOTOS: Aerial-VIMS 17May77 WM-11/655-724.

SEGMENT 12

COLONIAL BEACH

Map 13

EXTENT: 38,200 feet (7.2 mi.) of shoreline along the Potomac River, from the head of Monroe Bay to just east of Goldman Creek. The segment also contains 38,300 feet (7.2 mi.) of fastland.

SHORELANDS TYPE

FASTLAND: Low shore 91% (6.6 mi.) and low shore with bluff 9% (0.6 mi.).

SHORE: Artificially stabilized 33% (2.4 mi.), beach 41% (3.0 mi.), fringe marsh 25% (1.8 mi.), and embayed marsh 1% (0.1 mi.).

NEARSHORE: Narrow 22%, intermediate 30%, and wide 12%. The remainder of the nearshore zone is too narrow and shallow for classification.

SHORELANDS USE

FASTLAND: Agricultural 6% (0.5 mi.), commercial 7% (0.5 mi.), and residential 87% (6.3 mi.).

SHORE: Commercial use at the marinas, and private recreational use along the residential areas.

NEARSHORE: Commercial traffic in the shipping lanes, sport boating and fishing closer to shore.

WIND AND SEA EXPOSURE: The shoreline of this segment trends basically N - S from the head of Monroe Bay to Gum Bar Point, then S - N to White Point, then SE - NW from White Point to Bluff Point. Fetches at White Point are E - 6 nautical miles and NE - 3 nautical miles.

OWNERSHIP: Private.

FLOOD HAZARD: High, critical. Several sections of Colonial Beach have elevations below 7 feet and could be flooded during periods of abnormally high water.

WATER QUALITY: Unsatisfactory for Monroe Bay, which is closed for the marketing of shellfish due to sewage discharge from the Town of Colonial Beach. The Potomac River generally has good water quality.

BEACH QUALITY: Fair. Gum Bar Point has a wide, clean beach with vegetation. Several other

areas of the segment have fairly wide beaches.

PRESENT SHORE EROSION SITUATION

EROSION RATE: Slight or no change. Most of the shoreline has been artificially stabilized, effectively combatting any erosion.

ENDANGERED STRUCTURES: None.

SHORE PROTECTIVE STRUCTURES: There are approximately 12,700 feet of artificially stabilized shoreline in the segment. Colonial Beach employs a variety of structures, including concrete bulkhead, wooden bulkhead, stone riprap, and groins. Most structures appear to be effective.

OTHER SHORE STRUCTURES: There are numerous piers, boat sheds, and boat ramps throughout the segment.

SHORE USE LIMITATIONS: The entire shoreline is already actively used for residential, commercial, and agricultural purposes. Any new development would be at the sacrifice of the farmlands, destroying the only rural section of the segment.

ALTERNATE SHORE USE: Low. As already stated, the entire segment is used.

MAPS: USGS, 7.5 Min.Ser. (Topo.), COLONIAL BEACH SOUTH Quadr., 1968;
USGS, 7.5 Min.Ser. (Topo.), COLONIAL BEACH NORTH Quadr., 1968.
NOS# 12286 (558), 1:40,000 scale,
POTOMAC RIVER, Piney Point to Lower Cedar Point, VA and MD, 13th ed., 1971.

PHOTOS: Aerial-VIMS 17May77 WM-12/725-780.

Ground-VIMS 26Ju177 WM-98/ 1- 31.

SEGMENT 13

GOLDMAN CREEK TO HEAD OF ROSIER CREEK

Map 13

EXTENT: 32,800 feet (6.2 mi.) of shoreline from Goldman Creek to the county line at the head of Rosier Creek. The segment also includes 49,800 feet (9.4 mi.) of fastland.

SHORELANDS TYPE

FASTLAND: Low shore 75% (7.0 mi.), moderately low shore 7% (0.7 mi.), and moderately high shore 18% (1.7 mi.).
SHORE: Artificially stabilized 6% (0.4 mi.), beach 6% (0.4 mi.), fringe marsh 50% (3.1 mi.), and embayed marsh 38% (2.3 mi.).
NEARSHORE: Intermediate 15%. Rosier Creek has average depths of 3 feet.

SHORELANDS USE

FASTLAND: Agricultural 20% (1.9 mi.), industrial 1% (0.1 mi.), recreational 2% (0.2 mi.), residential 28% (2.6 mi.), and unmanaged, wooded 49% (4.6 mi.).
SHORE: Some private recreational use along the residential sections, but mostly unused.
NEARSHORE: Sport boating and fishing.

WIND AND SEA EXPOSURE: The shoreline of this segment trends basically NE - SW. The fetch at the mouth of Goldman Creek is NE - 4 nautical miles. There is also a significant fetch from the north down the Potomac River.

OWNERSHIP: Private 98% and county 2%.

FLOOD HAZARD: Low, noncritical. The majority of the shoreline has elevations of 10 feet or more and is not subject to flooding. Some structures at the mouth of Goldman Creek are built below 5-foot elevations and might be inundated during periods of abnormally high water.

WATER QUALITY: Satisfactory. Rosier Creek generally has good water quality.

BEACH QUALITY: Poor. The majority of the segment has only narrow, strip beaches.

PRESENT SHORE EROSION SITUATION

EROSION RATE: Slight or no change. The area

appears to be stable.

ENDANGERED STRUCTURES: None.

SHORE PROTECTIVE STRUCTURES: There are approximately 2,000 feet of artificially stabilized shoreline in the segment, most of which is for cosmetic purposes or for retaining fill.

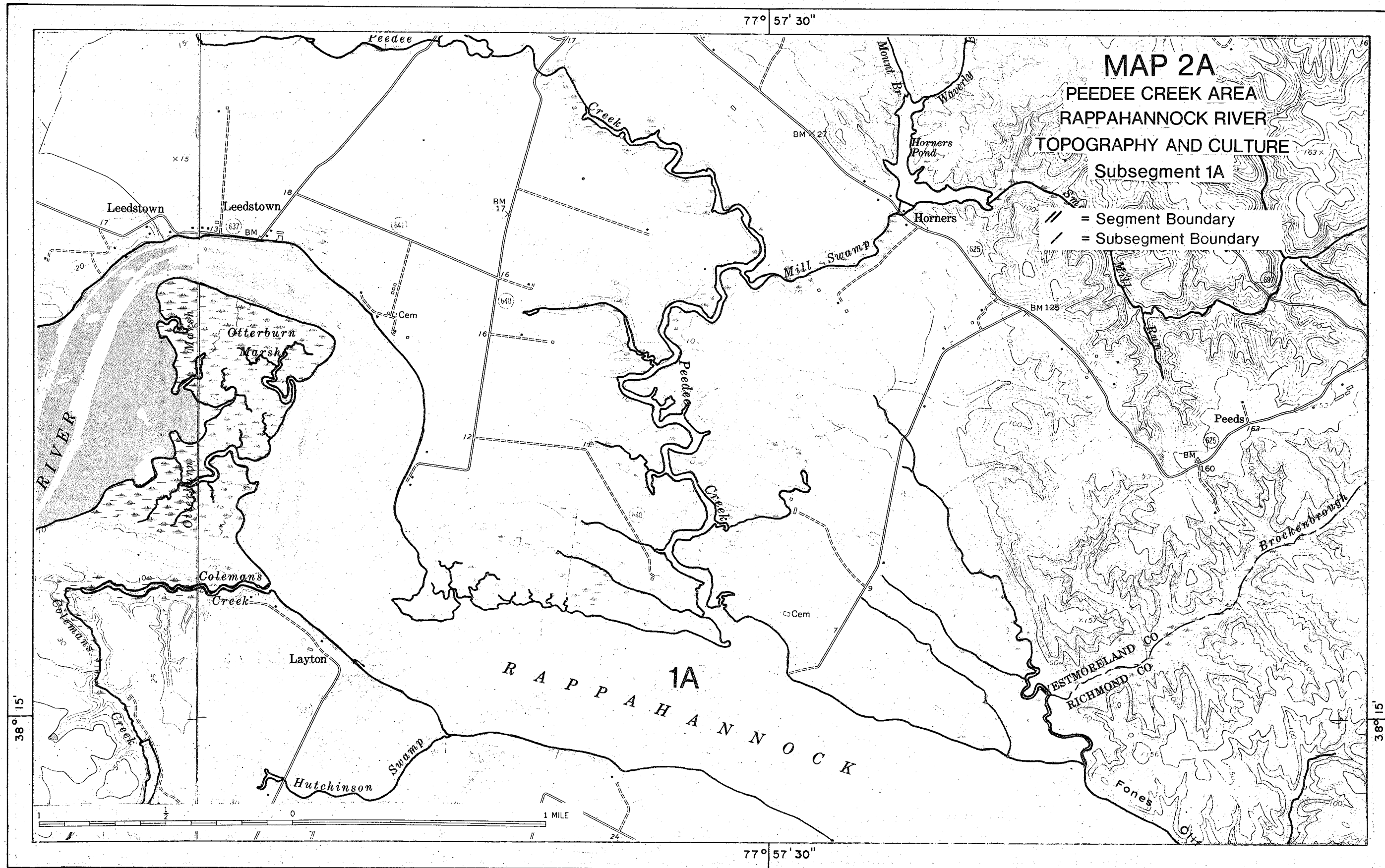
OTHER SHORE STRUCTURES: There are several piers and boat sheds in Rosier Creek.

SHORE USE LIMITATIONS: Although this segment does have potential for further development, it should be controlled so as not to degrade the rural atmosphere.

ALTERNATE SHORE USE: Moderate. A well maintained public recreational park is possible in this segment, serving Colonial Beach and other communities. This would also enhance the rural nature of the area.

MAPS: USGS, 7.5 Min.Ser. (Topo.), COLONIAL BEACH NORTH Quadr., 1968;
USGS, 7.5 Min.Ser. (Topo.), DAHLGREN Quadr., 1968.
NOS# 12286 (558), 1:40,000 scale,
POTOMAC RIVER, Piney Point to Lower Cedar Point, VA and MD, 13th ed., 1971.

PHOTOS: Aerial-VIMS 17May77 WM-13/781-800.



77° 57' 30"

MAP 2B

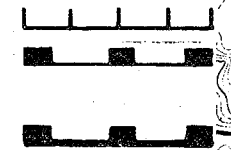
PEEDEE CREEK AREA RAPPAHANNOCK RIVER

Subsegment 1A

SHORELANDS TYPES

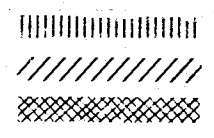
FASTLAND

- Low Shore
- High Shore
- High Shore with Bluff



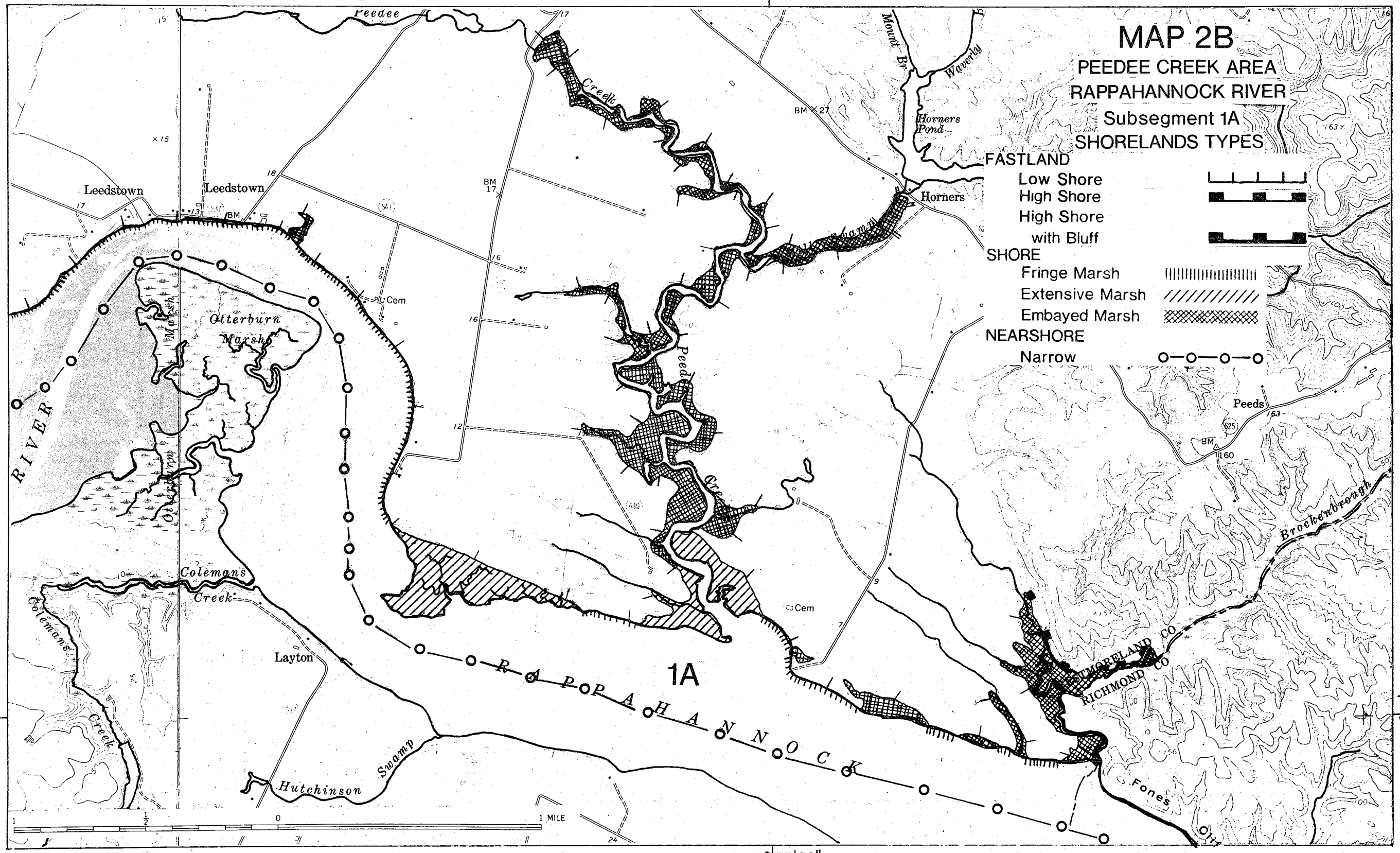
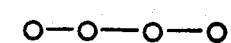
SHORE

- Fringe Marsh
- Extensive Marsh
- Embayed Marsh



NEARSHORE

- Narrow



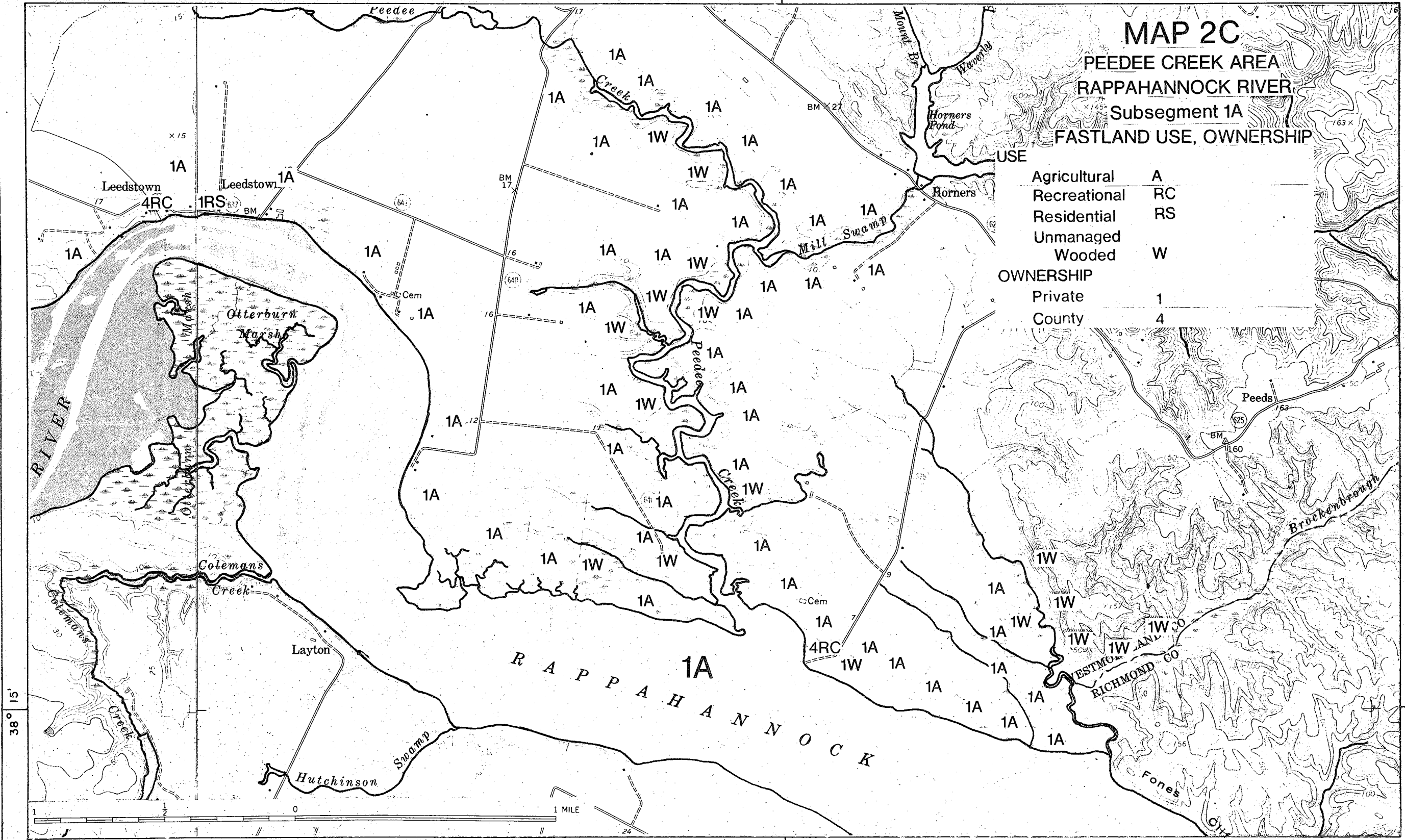
77° 57' 30"

77° 57' 30"

MAP 2C

PEEDEE CREEK AREA
RAPPAHANNOCK RIVER
Subsegment 1A
FASTLAND USE, OWNERSHIP

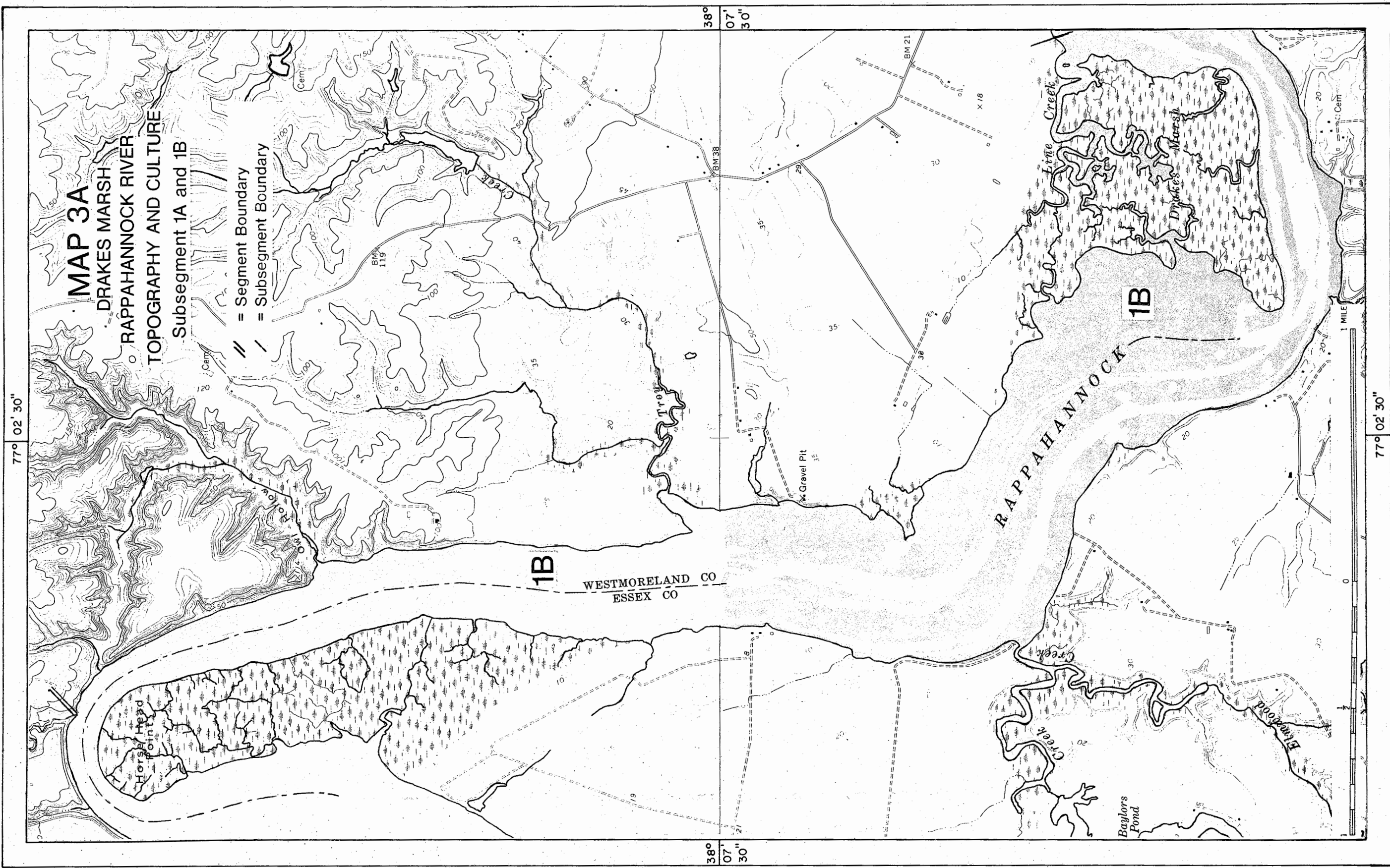
Agricultural	A
Recreational	RC
Residential	RS
Unmanaged	
Wooded	W
OWNERSHIP	
Private	1
County	4



38° 15'

38° 15'

77° 57' 30"



77° 02' 30"

MAP 3B

DRAKES MARSH

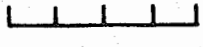
RAPPAHANNOCK RIVER

Subsegment 1A and 1B

SHORELANDS TYPES

FASTLAND

Low Shore



Low Shore



Moderately Low Shore



Moderately High Shore



High Shore



High Shore

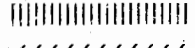


High Shore

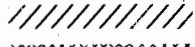
with Bluff

SHORE

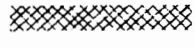
Fringe Marsh



Extensive Marsh

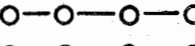


Embayed Marsh

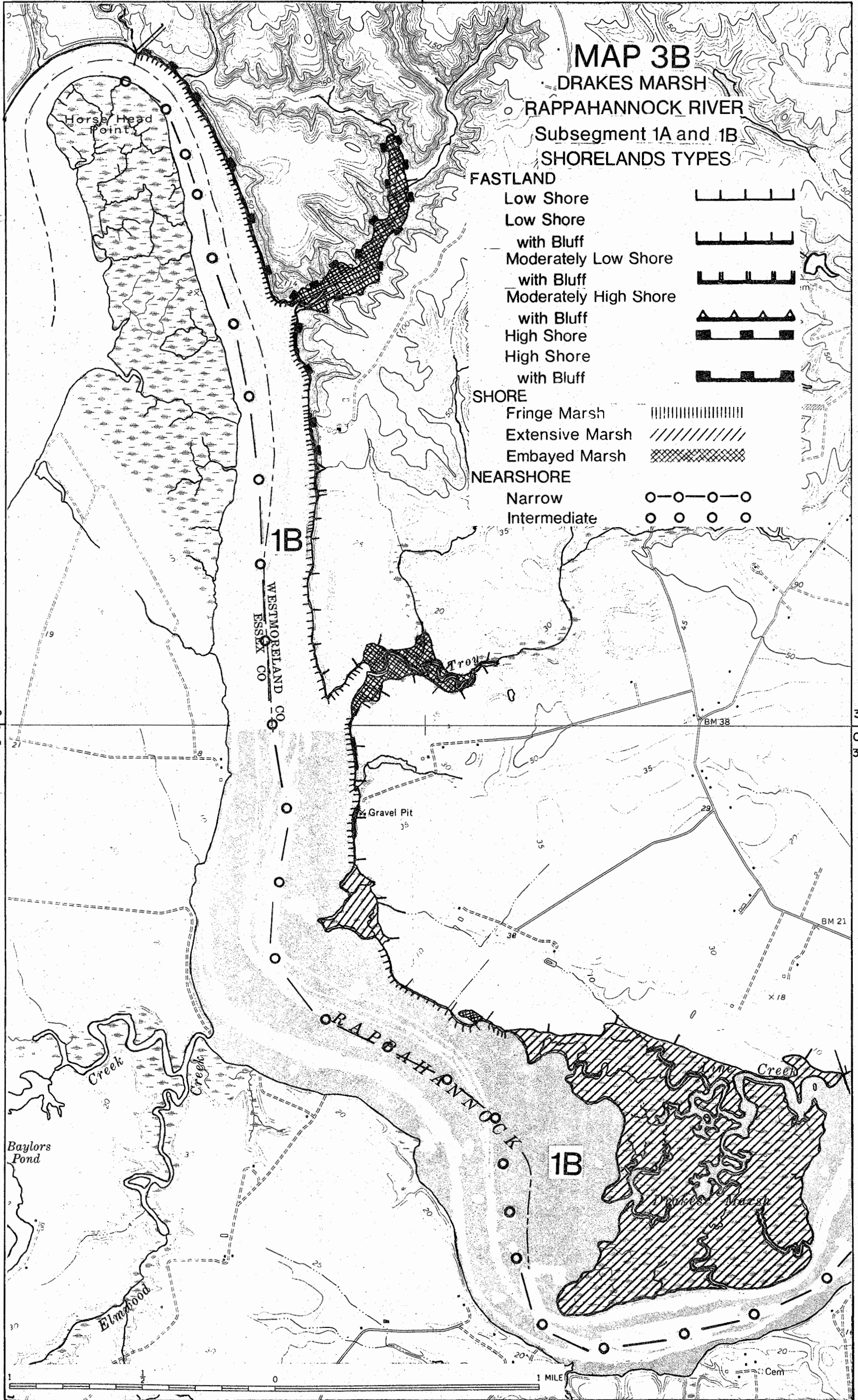


NEARSHORE

Narrow



Intermediate



77° 02' 30"

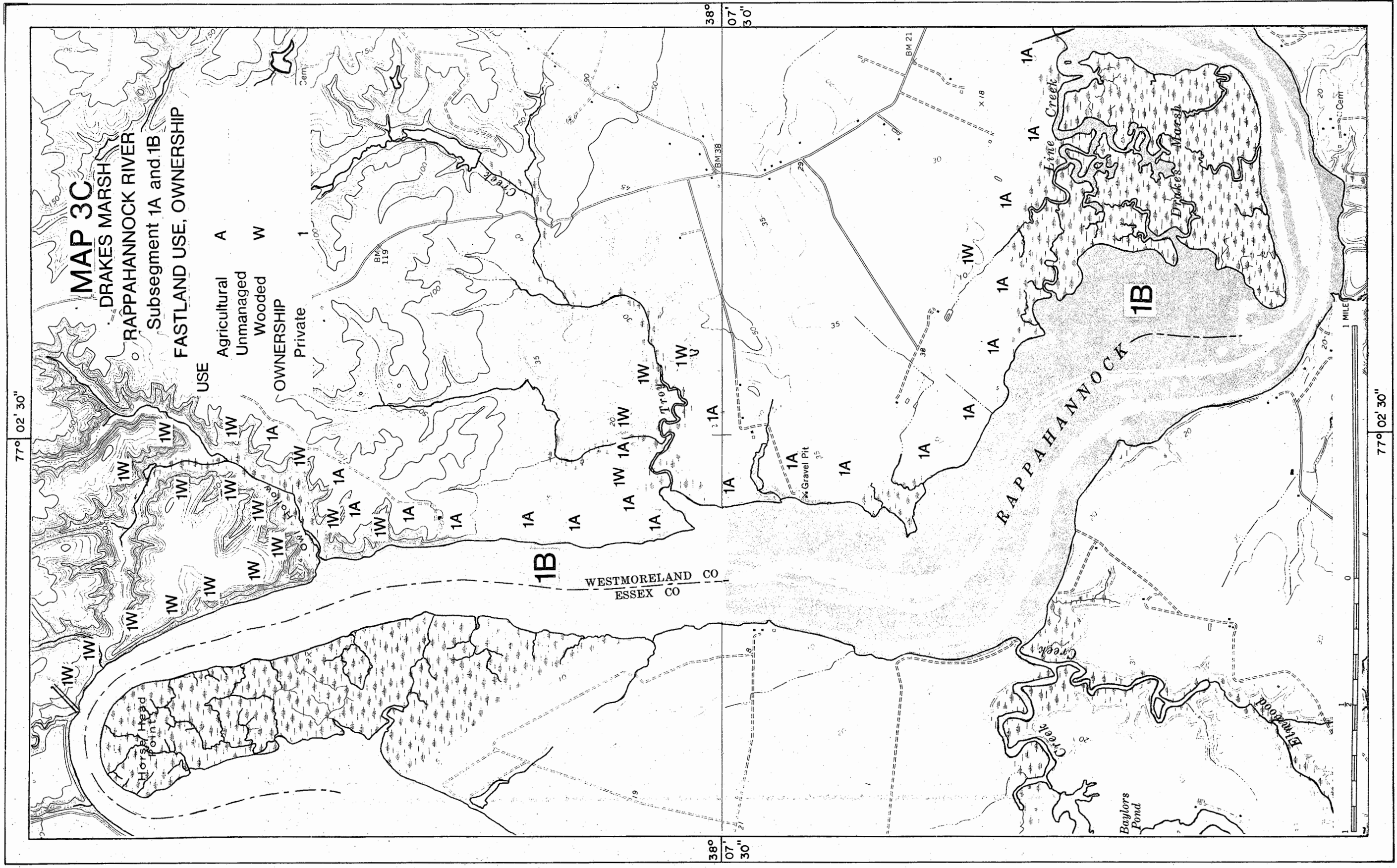
45

38° 07' 30"

38° 07' 30"

1B

1 MILE



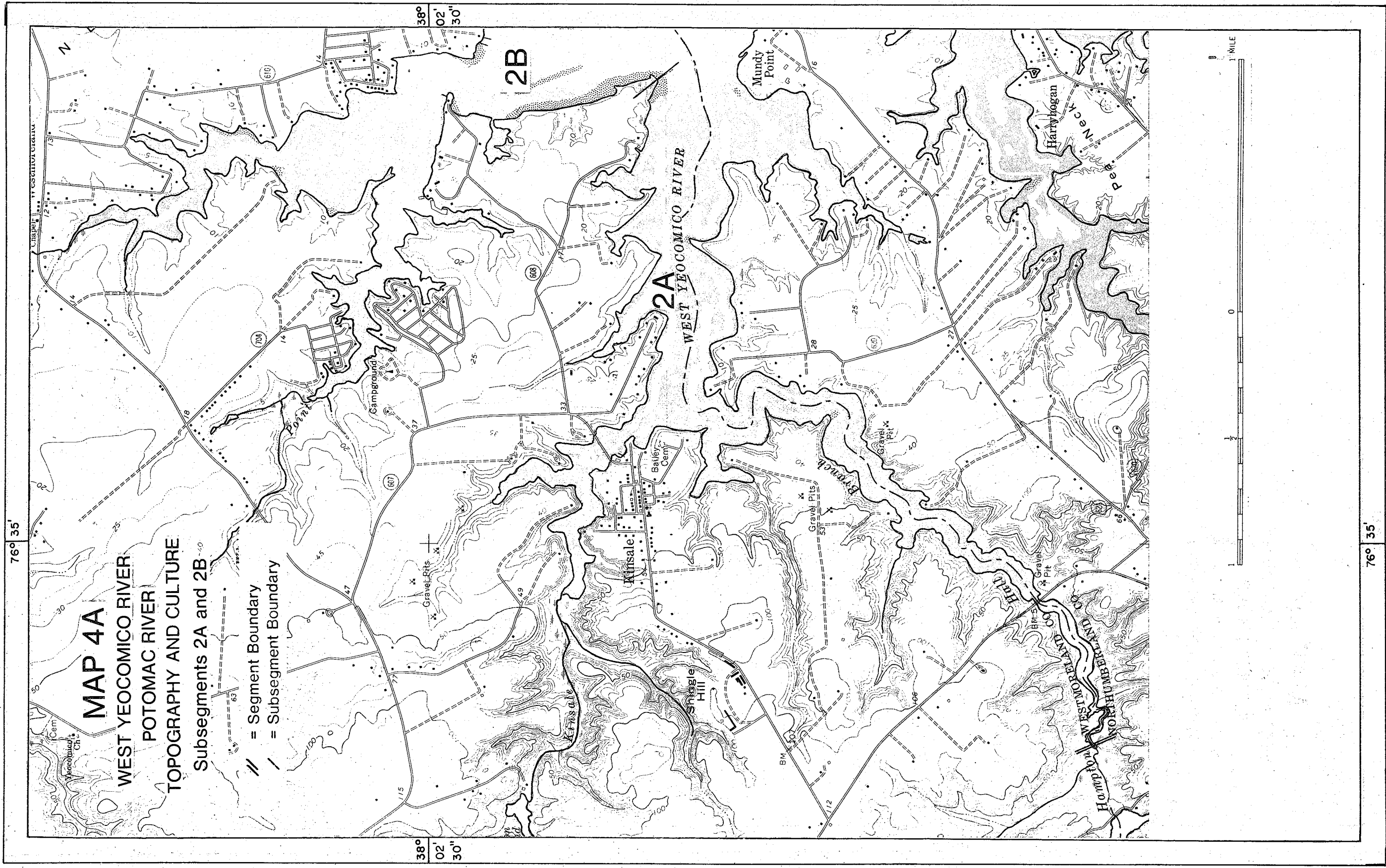
MAP 3C

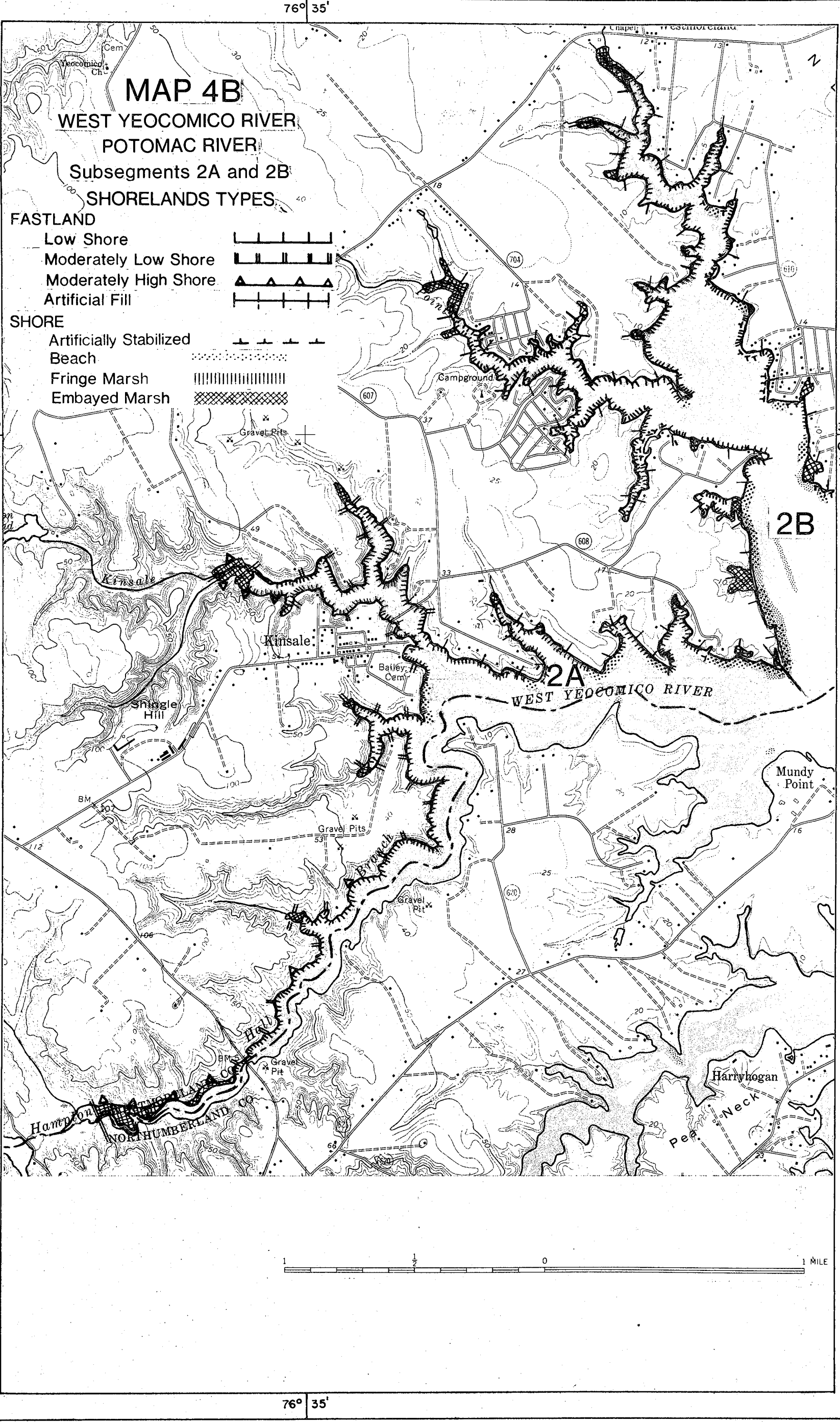
DRAKES MARSH
RAPPAHANNOCK RIVER
 Subsegment 1A and 1B
FASTLAND USE, OWNERSHIP

USE
 Agricultural A
 Unmanaged W
 Wooded
OWNERSHIP
 Private 1

1B
 WESTMORELAND CO
 ESSEX CO

RAPPAHANNOCK
1B





87

76° 35'

MAP 4C

WEST YEOCOMICO RIVER POTOMAC RIVER

Subsegments 2A and 2B FASTLAND USE, OWNERSHIP

USE

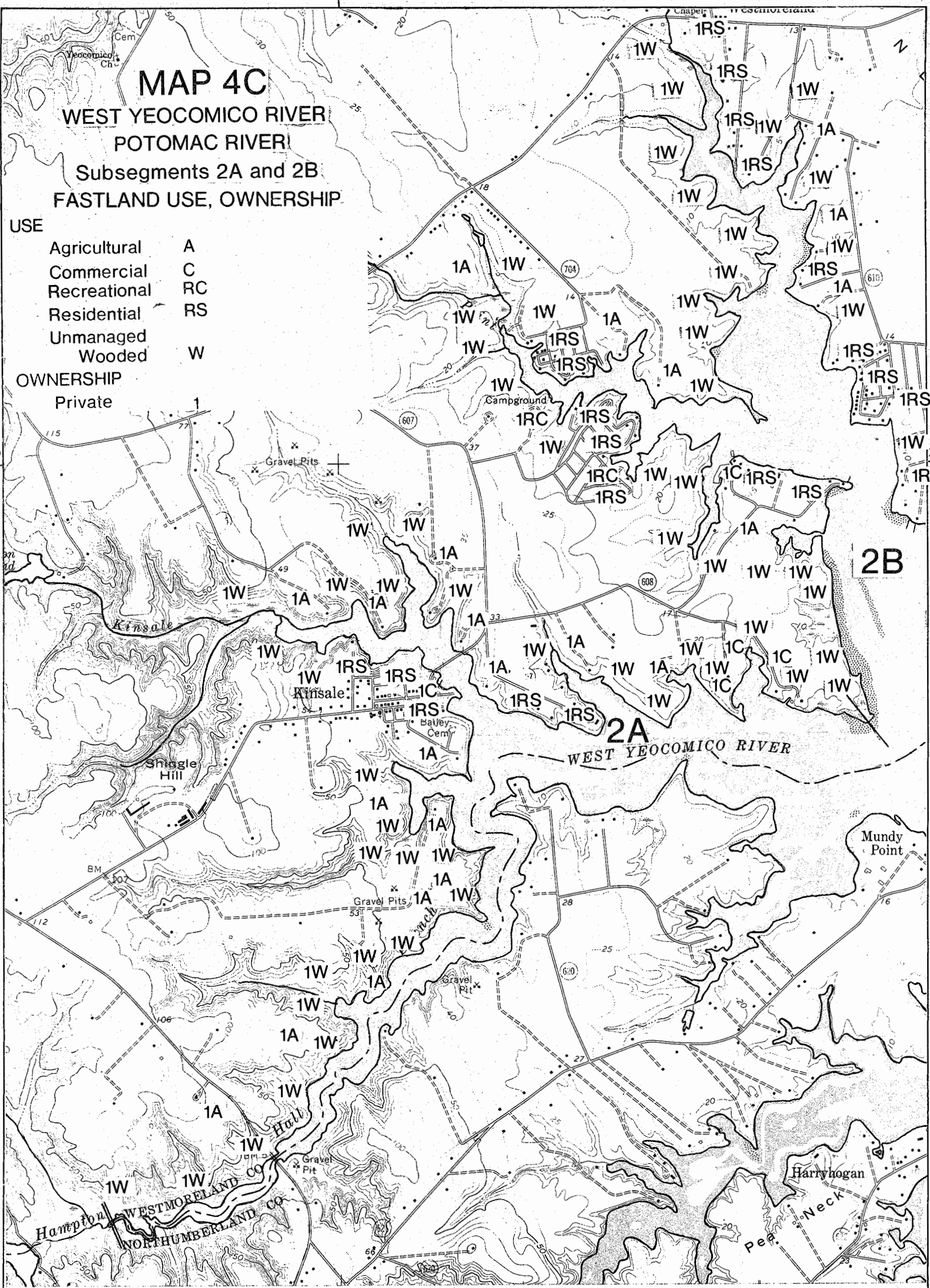
- Agricultural A
- Commercial C
- Recreational RC
- Residential RS
- Unmanaged W
- Wooded W

OWNERSHIP

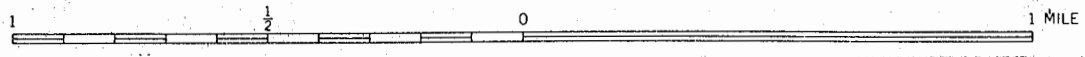
- Private 1

38° 02' 30"

38° 30"



67

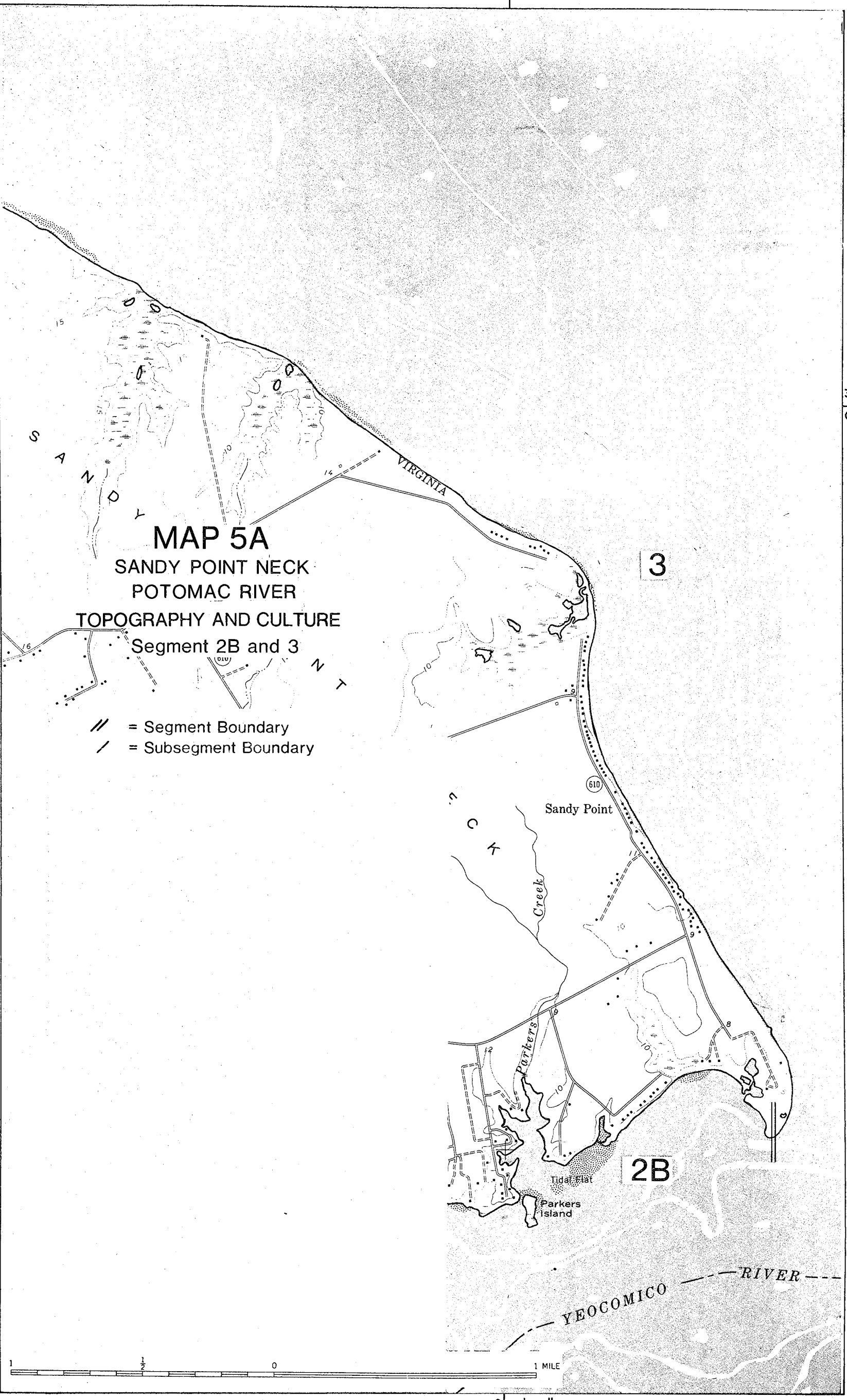


76° 35'

76° 32' 30"

38° 05'

38° 05'



MAP 5A

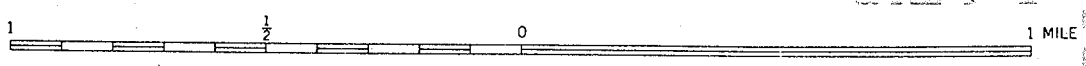
SANDY POINT NECK POTOMAC RIVER

TOPOGRAPHY AND CULTURE

Segment 2B and 3

- // = Segment Boundary
- / = Subsegment Boundary

50

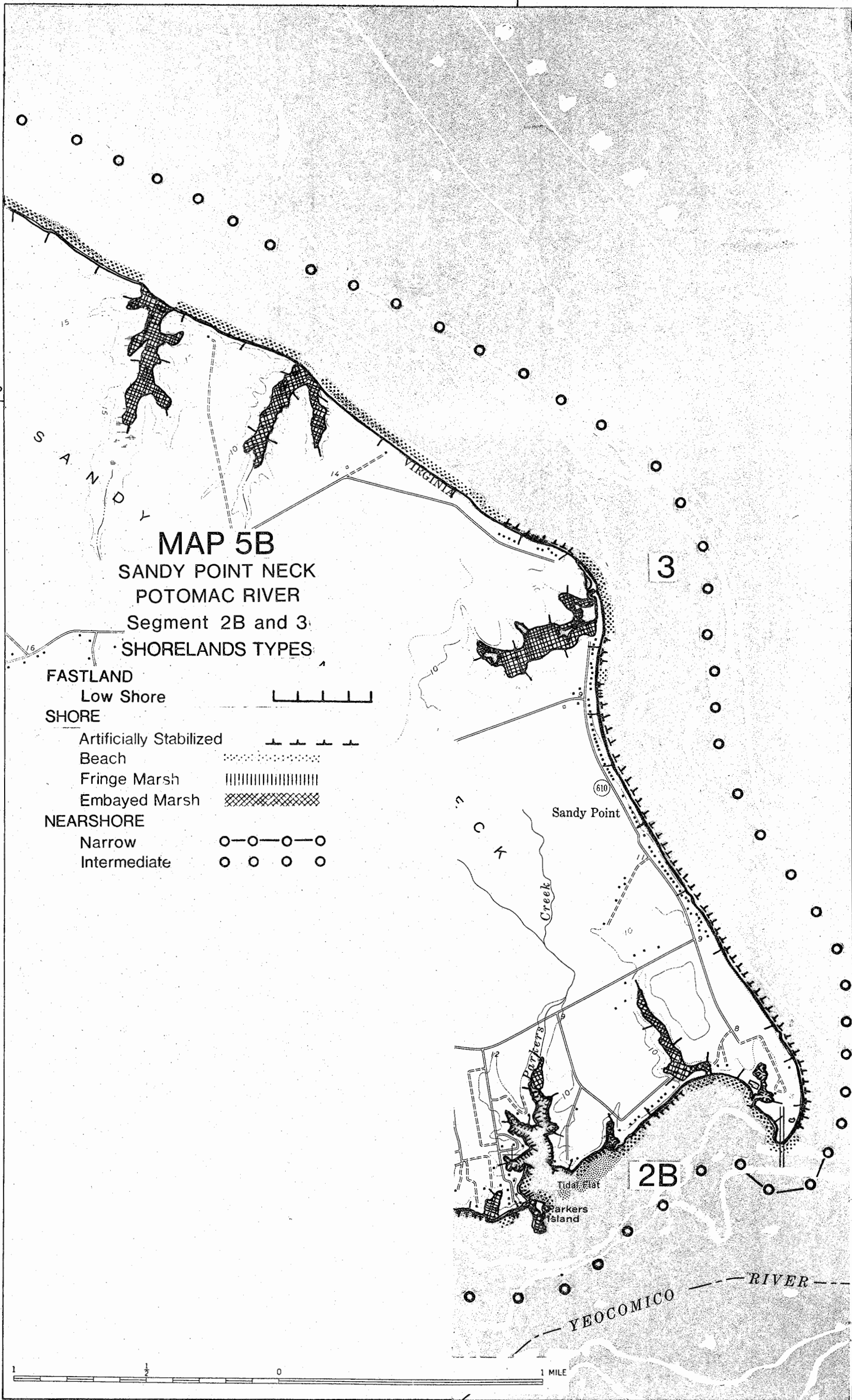


76° 32' 30"

76° 32' 30"

38° 05'

38° 05'



MAP 5B
 SANDY POINT NECK
 POTOMAC RIVER
 Segment 2B and 3.
 SHORELANDS TYPES

- FASTLAND
- Low Shore
- SHORE
- Artificially Stabilized
- Beach
- Fringe Marsh
- Embayed Marsh
- NEARSHORE
- Narrow
- Intermediate

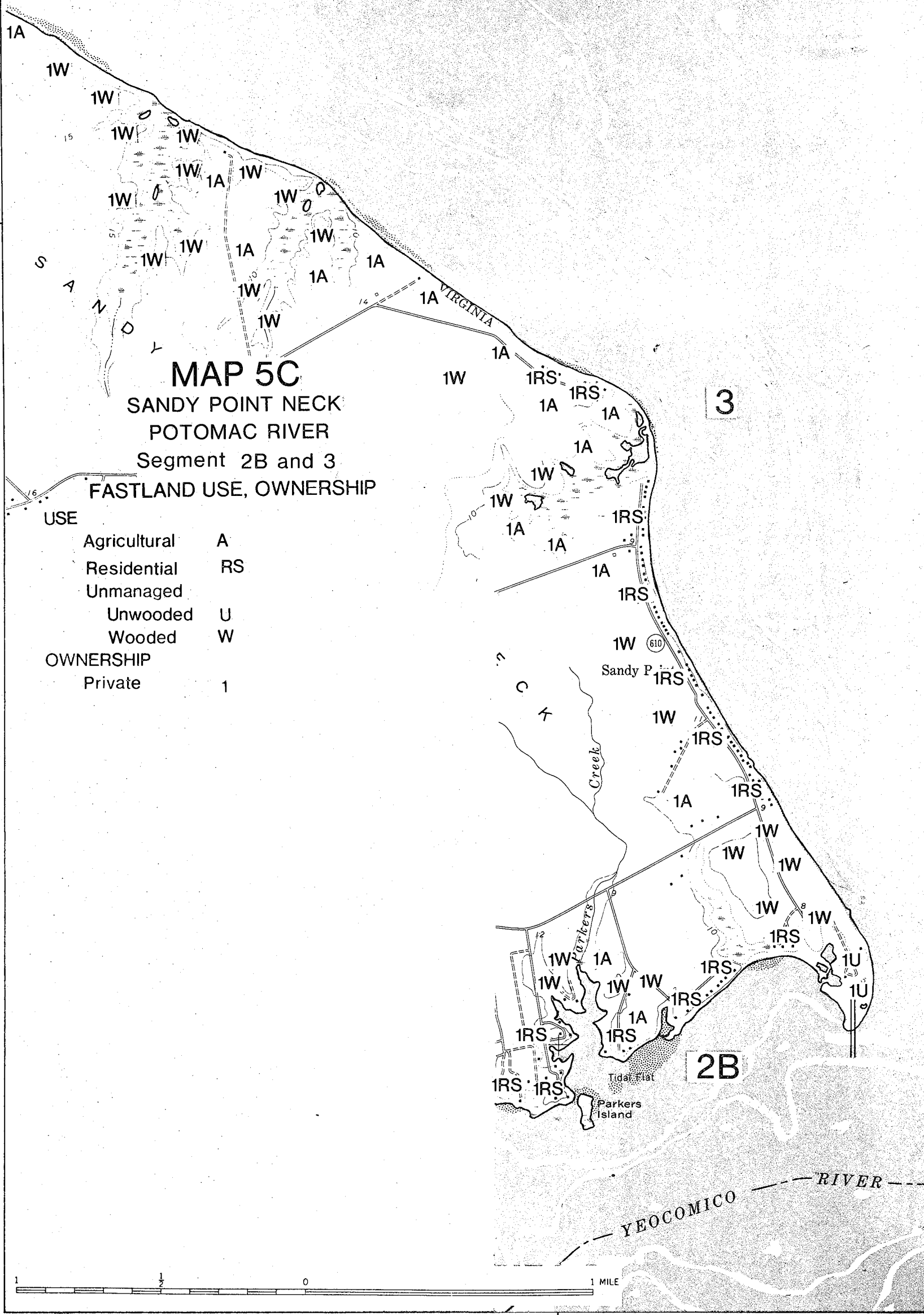
51

76° 32' 30"

76° 32' 30"

38° 05'

38° 05'

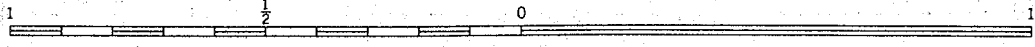


MAP 5C
SANDY POINT NECK
POTOMAC RIVER
 Segment 2B and 3
FASTLAND USE, OWNERSHIP

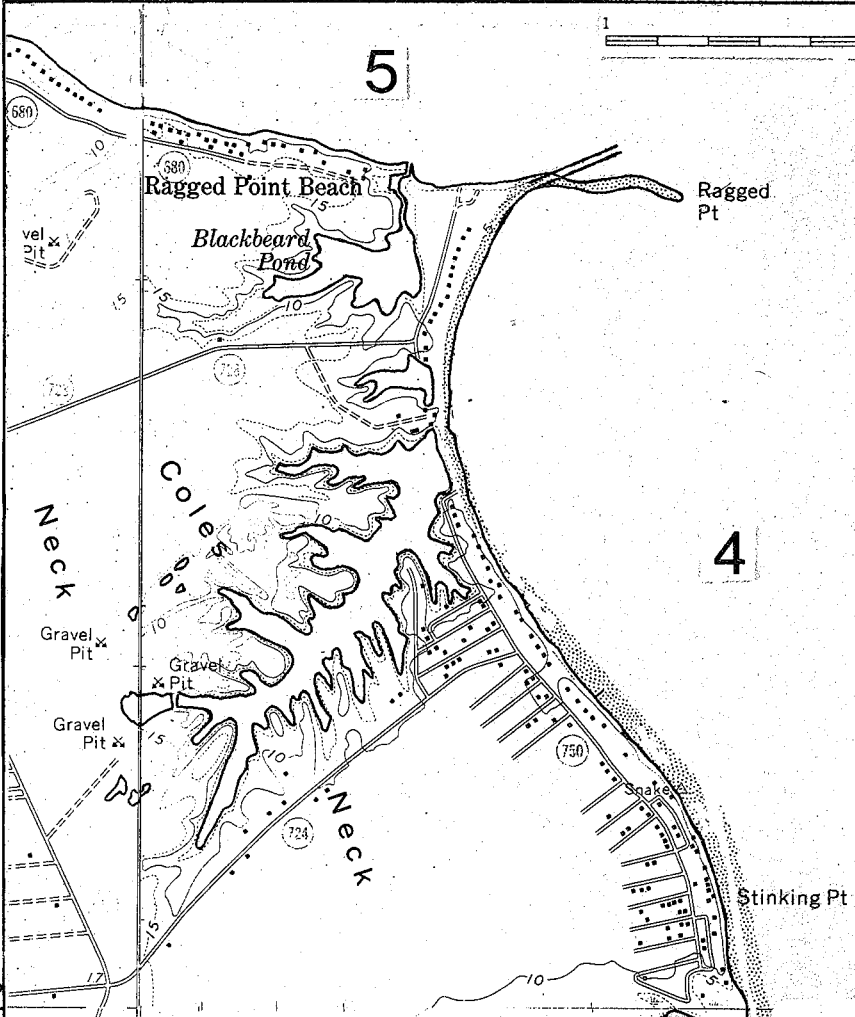
USE	
Agricultural	A
Residential	RS
Unmanaged	
Unwooded	U
Wooded	W
OWNERSHIP	
Private	1

76° 32' 30"

76° 35'



5



MAP 6A

COLES NECK

POTOMAC RIVER

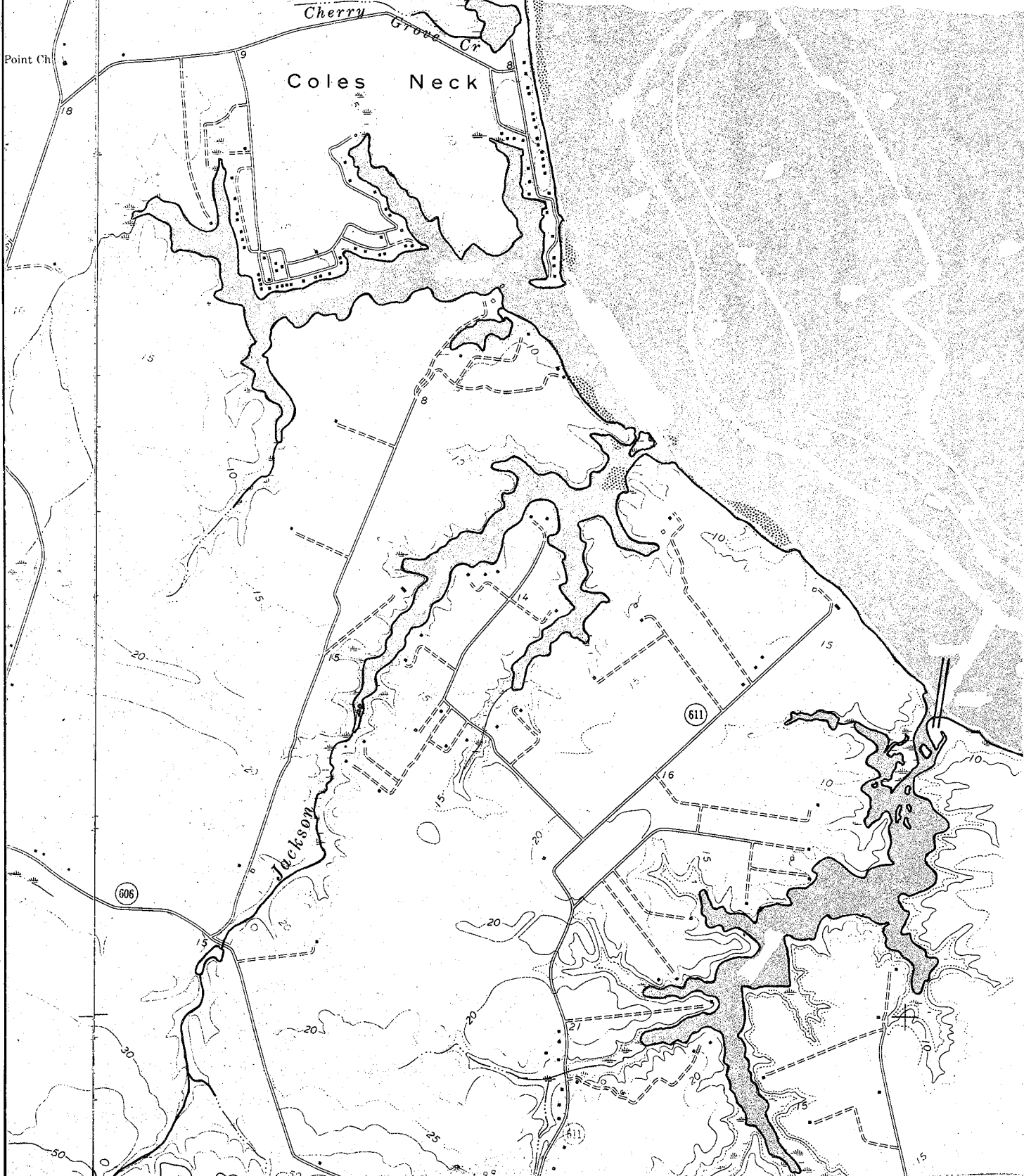
TOPOGRAPHY AND CULTURE

Segments 3, 4 and 5

- // = Segment Boundary
- / = Subsegment Boundary

4

38° 07' 30"

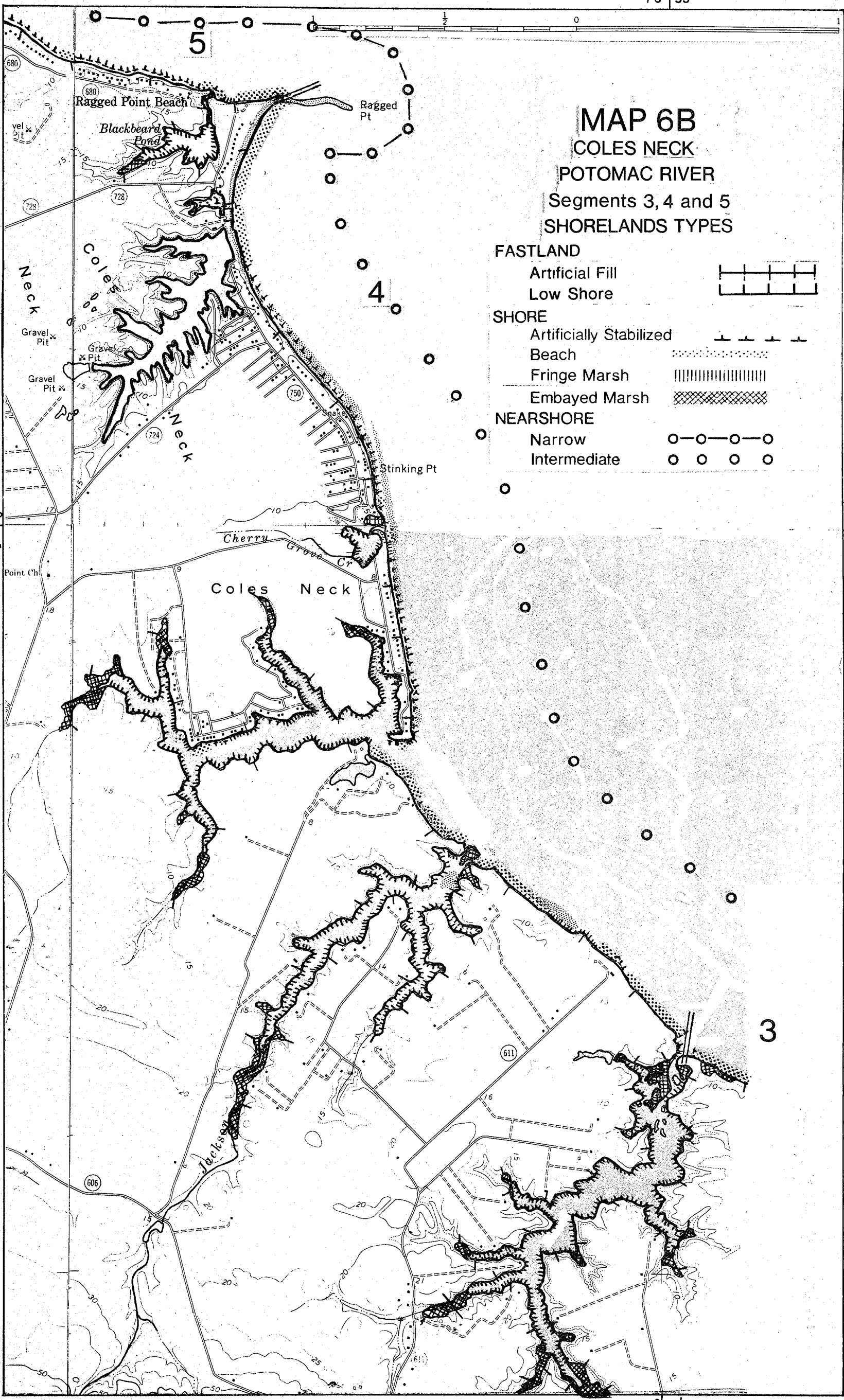


3

38° 07' 30"

76° 35'

76° 35'



MAP 6B

COLES NECK POTOMAC RIVER

Segments 3, 4 and 5 SHORELANDS TYPES

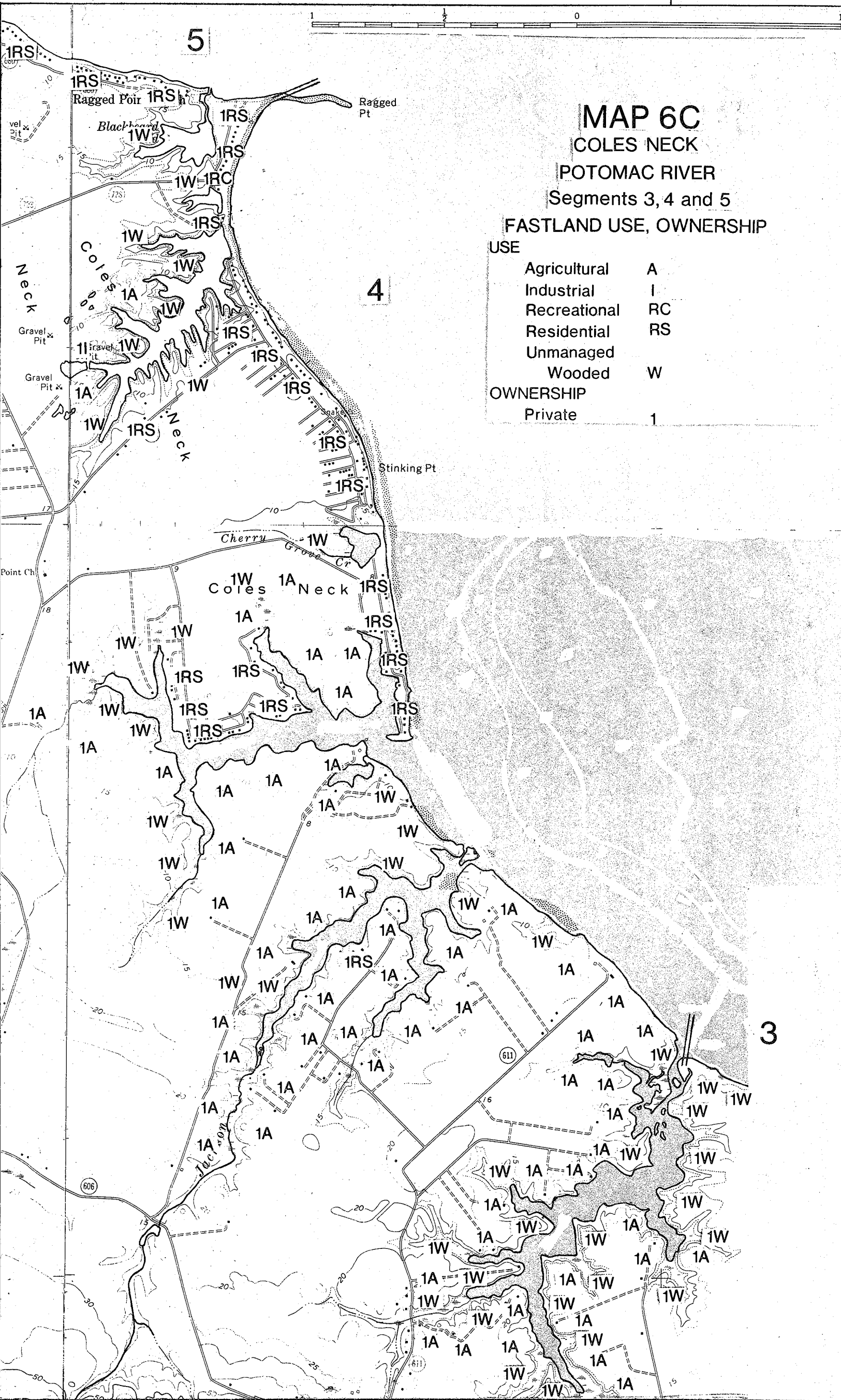
FASTLAND		
Artificial Fill		
Low Shore		
SHORE		
Artificially Stabilized		
Beach		
Fringe Marsh		
Embayed Marsh		
NEARSHORE		
Narrow		
Intermediate		

38° 07' 30"

38° 07' 30"

54

76° 35'



MAP 6C

COLES NECK

POTOMAC RIVER

Segments 3, 4 and 5

FASTLAND USE, OWNERSHIP

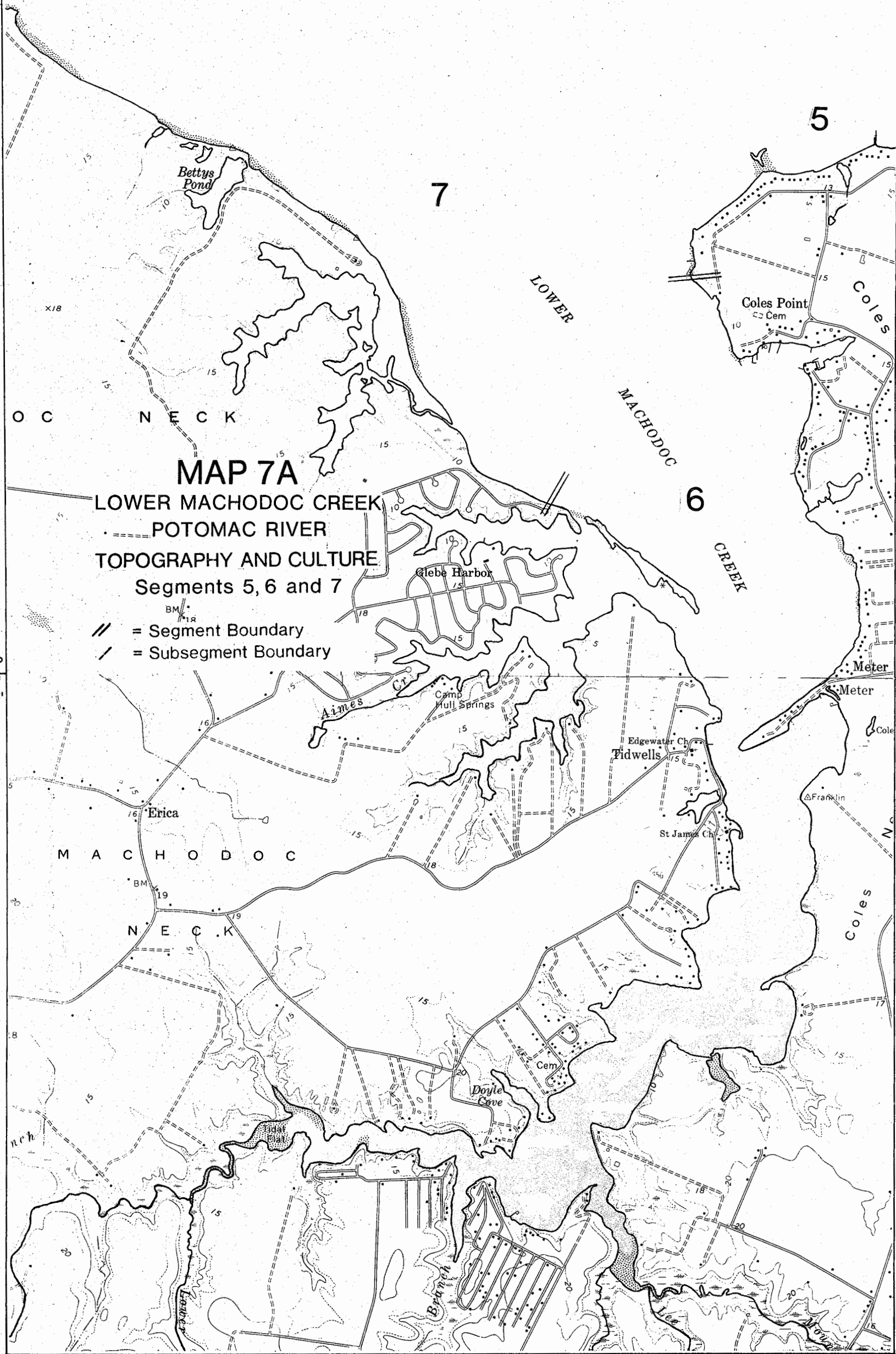
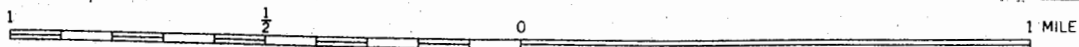
USE

- Agricultural A
- Industrial I
- Recreational RC
- Residential RS
- Unmanaged
- Wooded W

OWNERSHIP

- Private 1

76° 40'



MAP 7A

LOWER MACHODOC CREEK
POTOMAC RIVER
TOPOGRAPHY AND CULTURE
Segments 5, 6 and 7

- = Segment Boundary
- = Subsegment Boundary

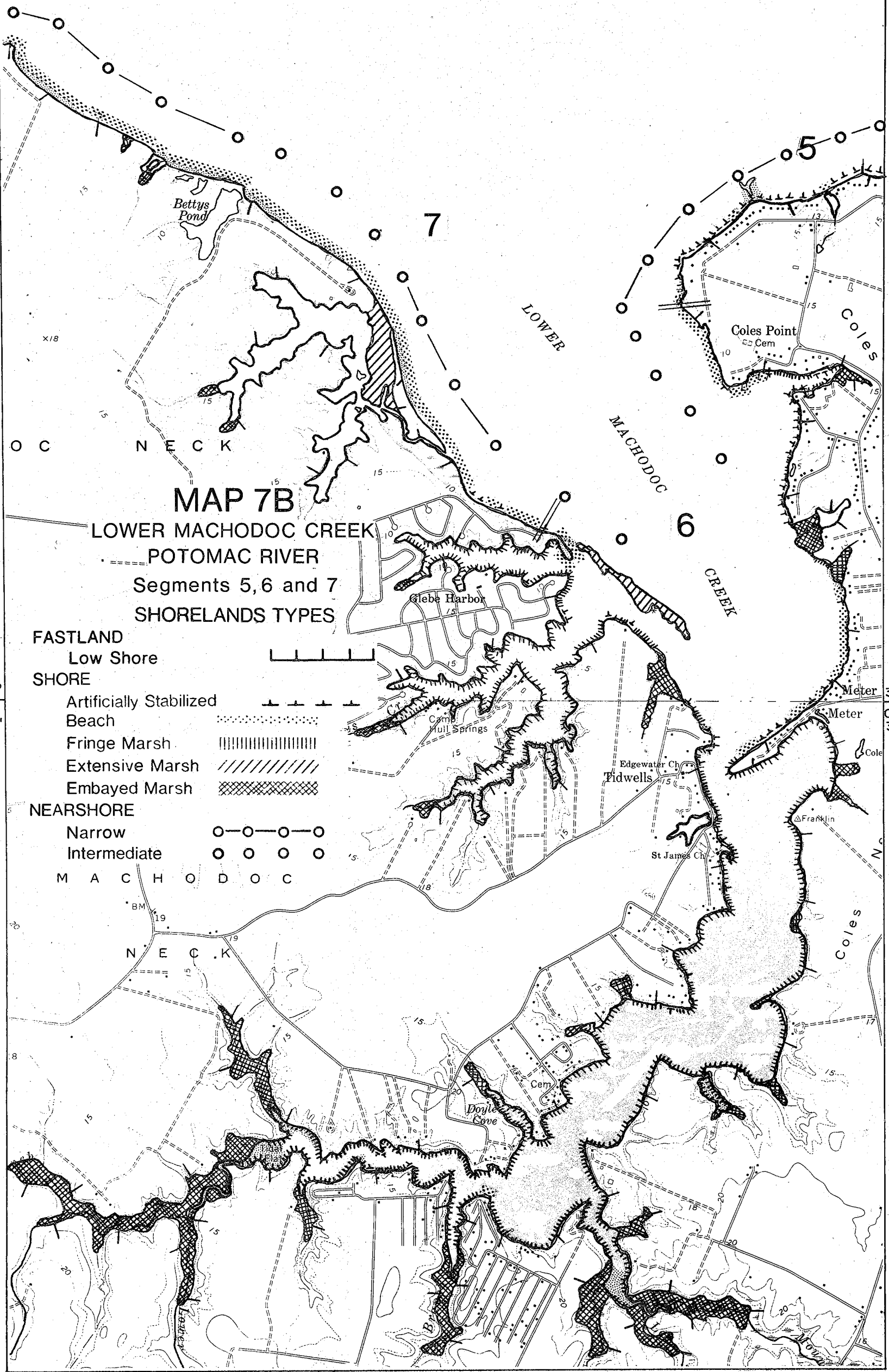
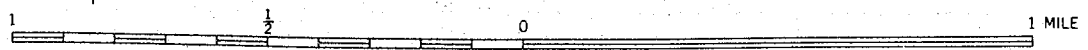
56

38° 07' 30"

38° 07' 30"

76° 40'

76° 40'



MAP 7B

LOWER MACHODOC CREEK
POTOMAC RIVER
Segments 5, 6 and 7
SHORELANDS TYPES

FASTLAND

Low Shore

SHORE

Artificially Stabilized

Beach

Fringe Marsh

Extensive Marsh

Embayed Marsh

NEARSHORE

Narrow

Intermediate

M A C H O D O C

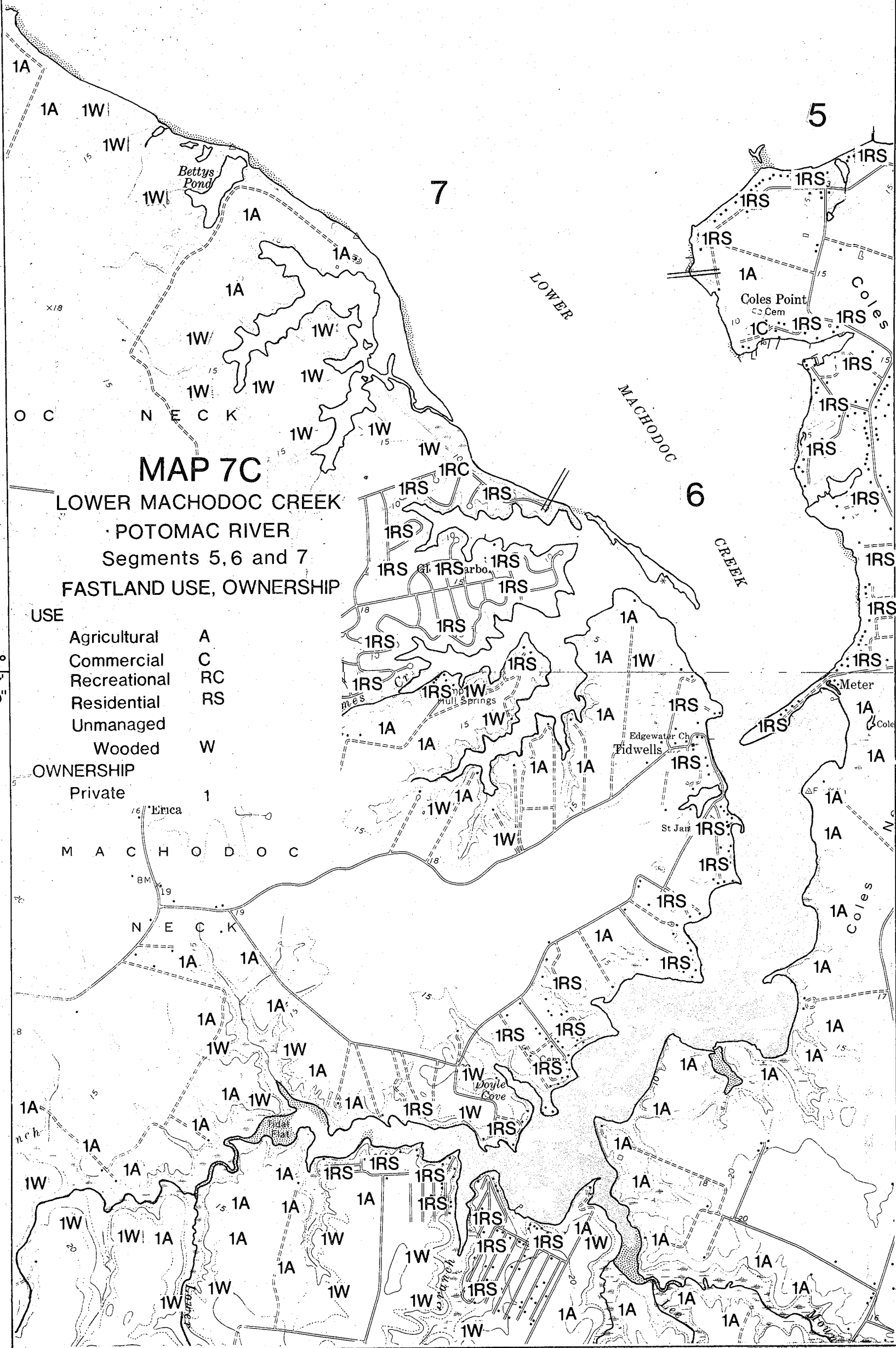
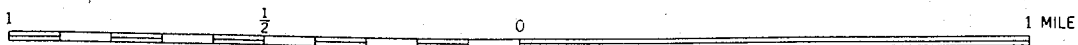
N E C K

76° 40'

38° 07' 30"

38° 07' 30"

76° 40'



MAP 7C

LOWER MACHODOC CREEK
POTOMAC RIVER
Segments 5, 6 and 7
FASTLAND USE, OWNERSHIP

USE

- Agricultural A
- Commercial C
- Recreational RC
- Residential RS
- Unmanaged
- Wooded W

OWNERSHIP

- Private 1

38° 07' 30"

38° 07' 30"

76° 40'

76° 45'

38° 10'

10'

MAP 8A
NOMINI BAY
POTOMAC RIVER
TOPOGRAPHY AND CULTURE
 Segments and Subsegments 7, 8A, 8B and 9

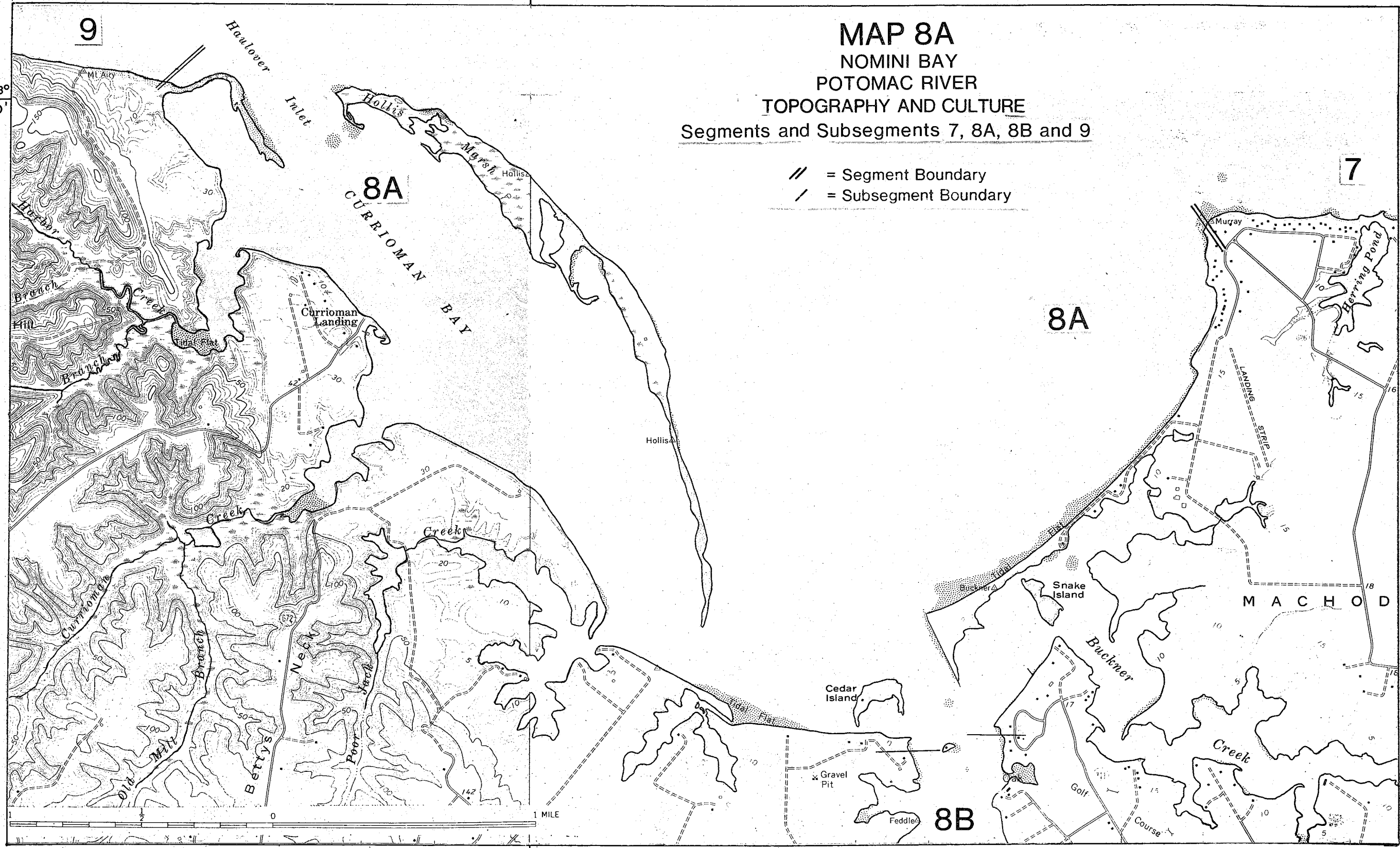
- // = Segment Boundary
- / = Subsegment Boundary

7

8A

8B

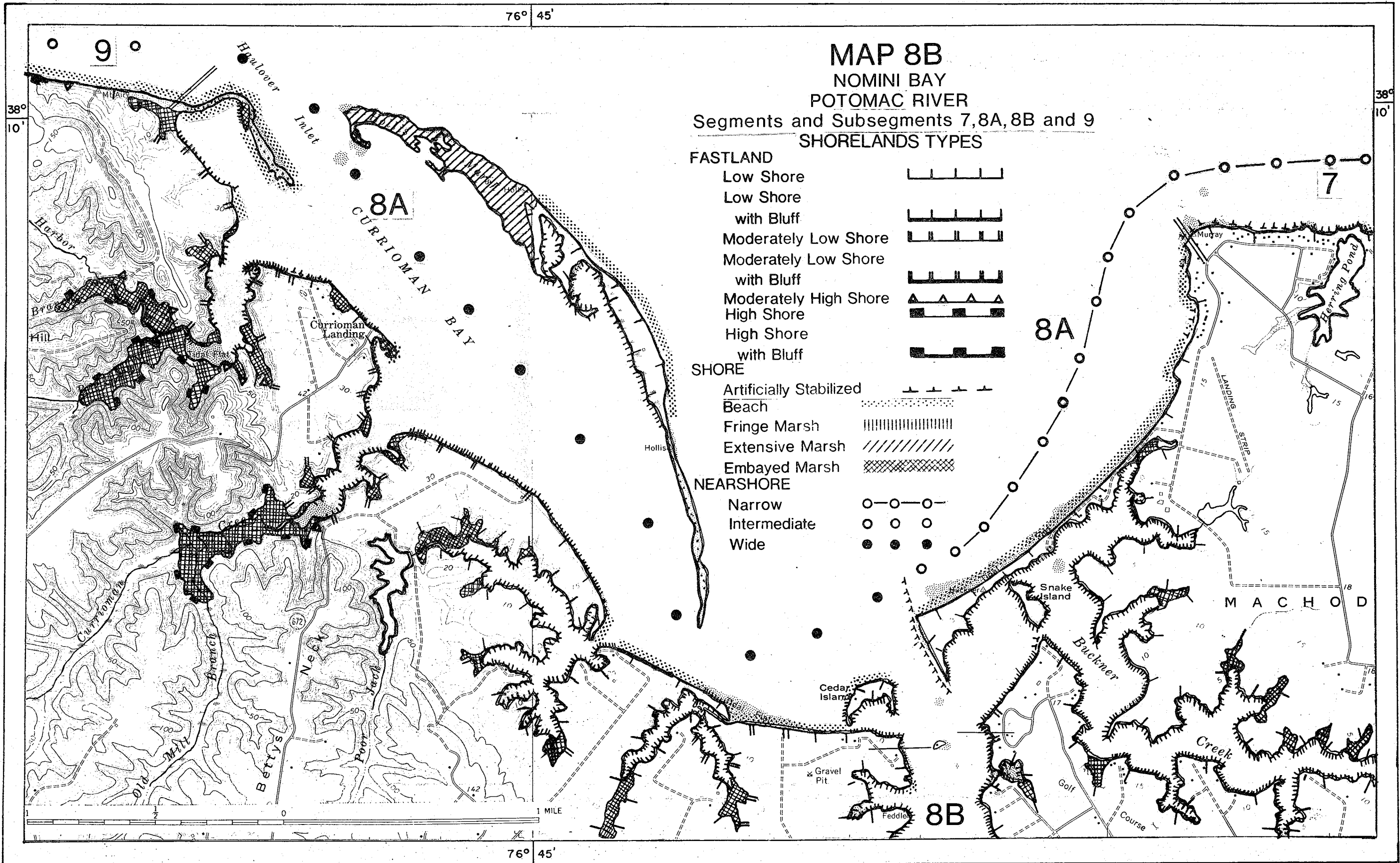
MACHOD

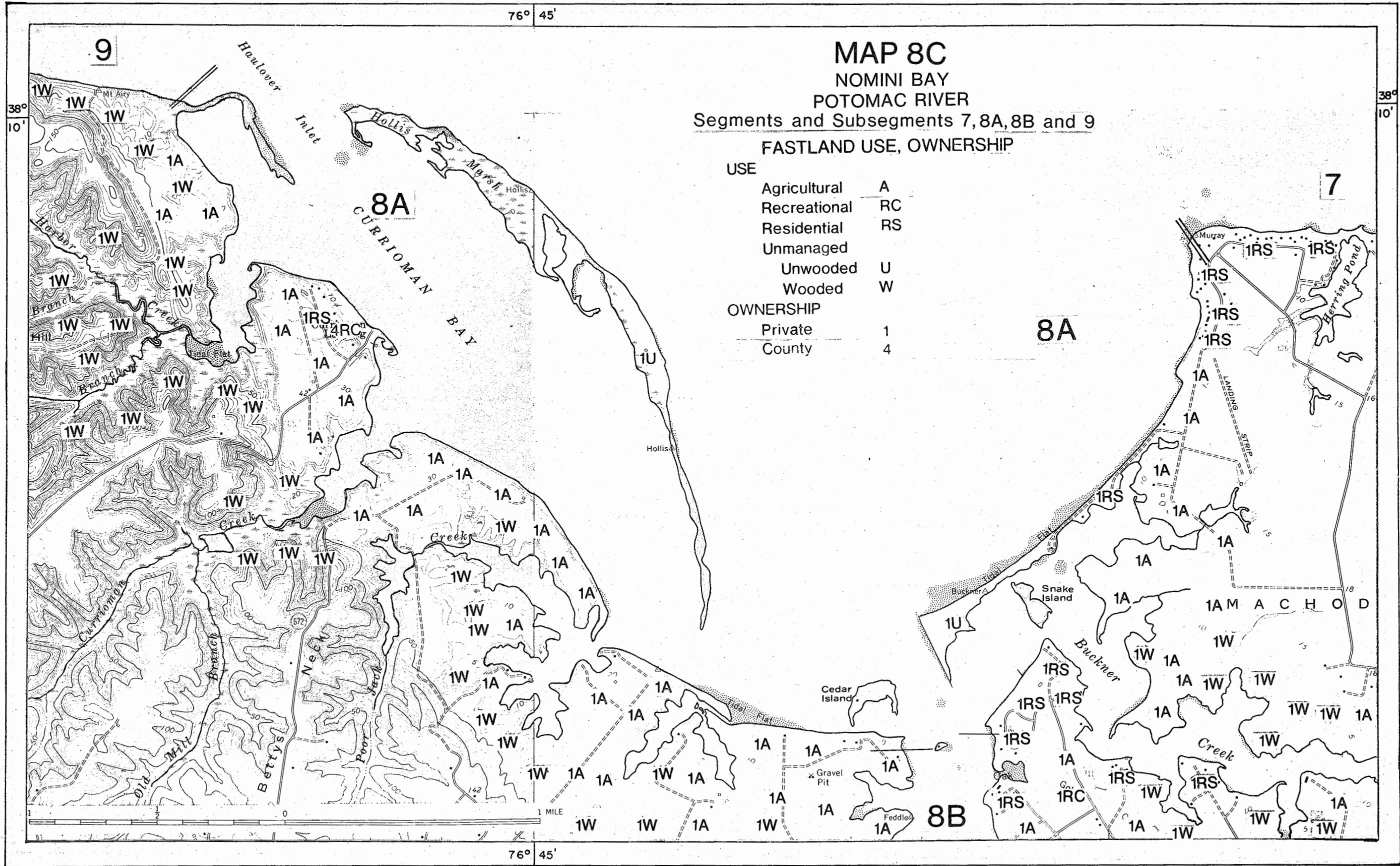


38° 10'

9

76° 45'





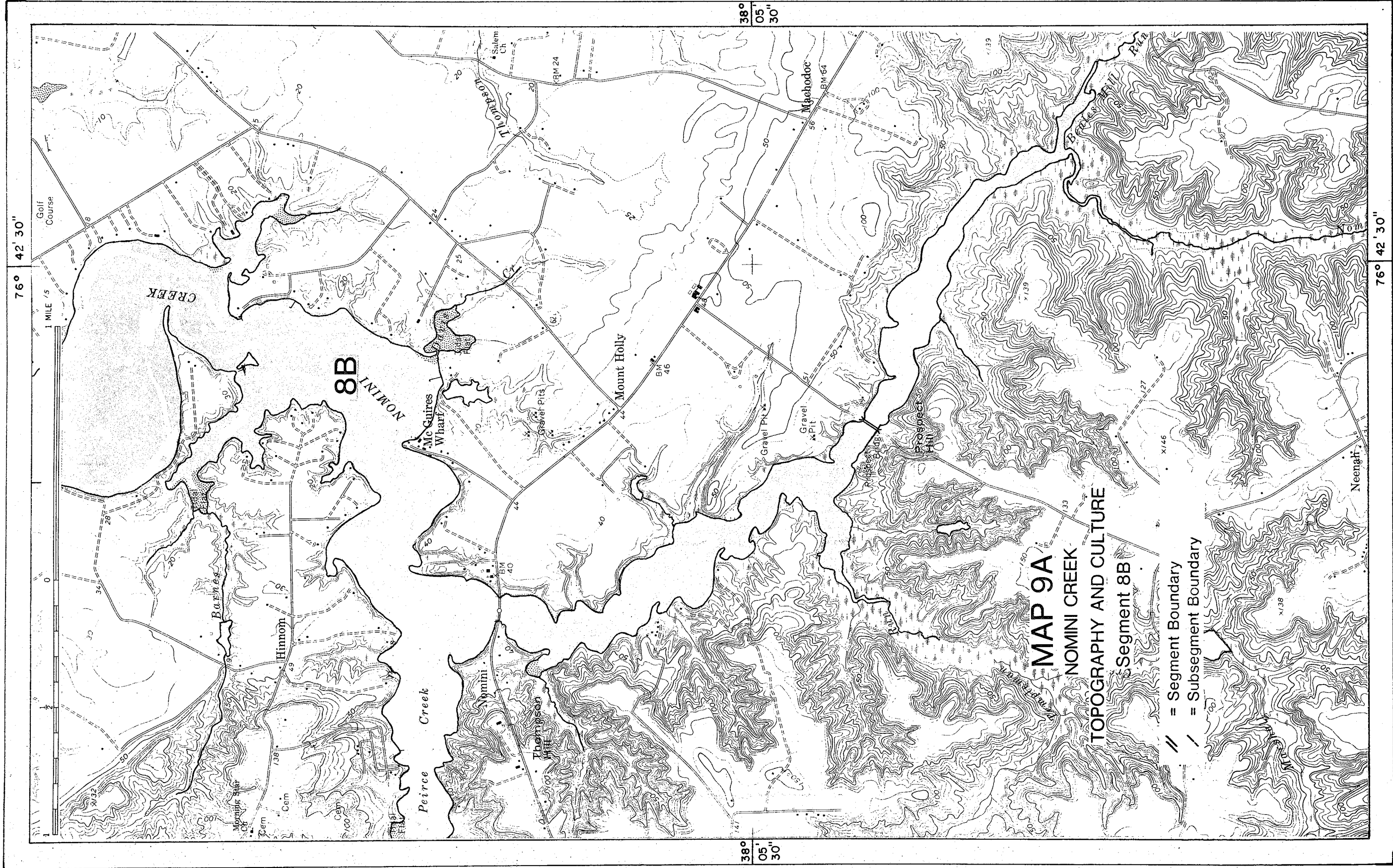
MAP 8C

NOMINI BAY POTOMAC RIVER

Segments and Subsegments 7, 8A, 8B and 9

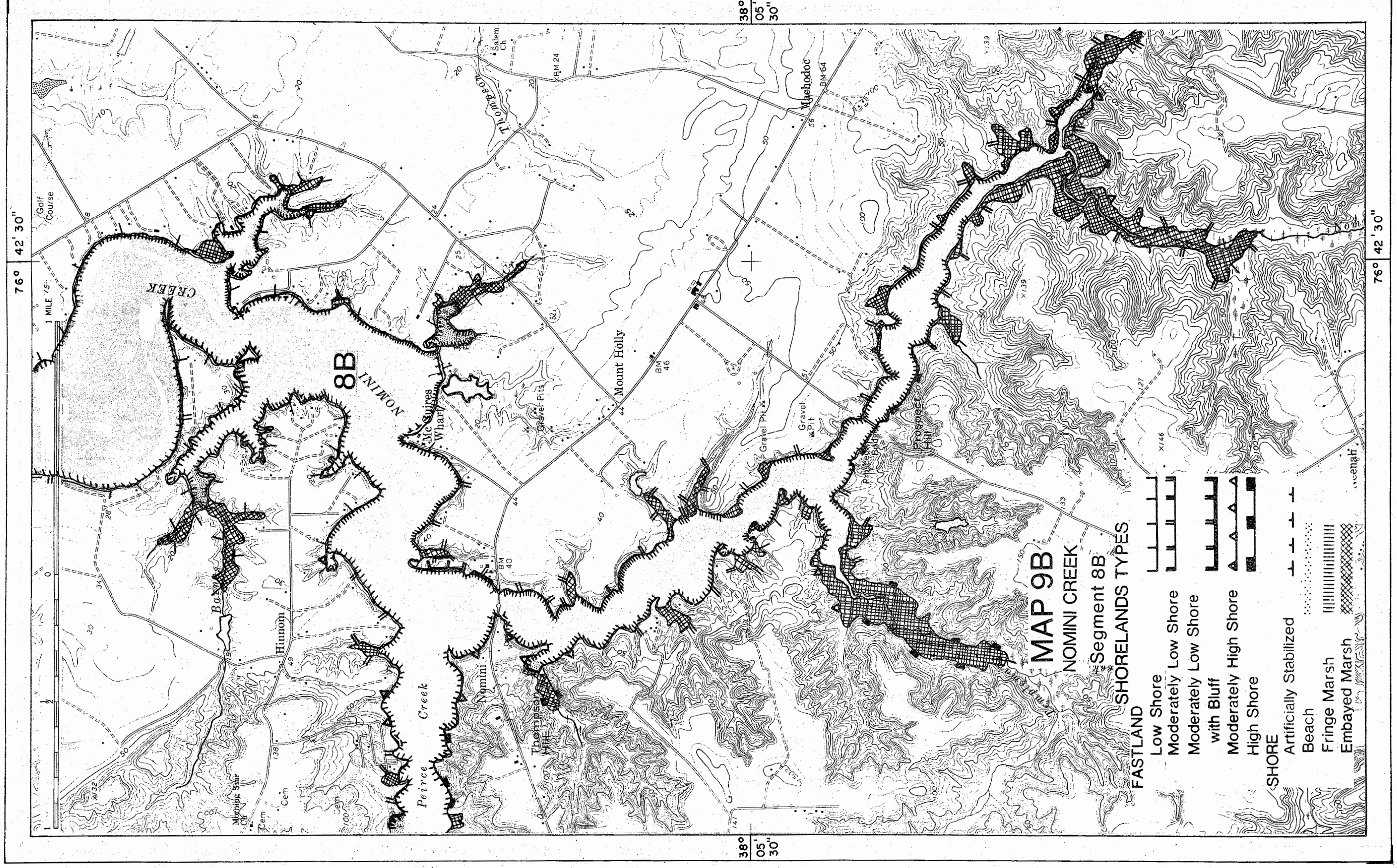
FASTLAND USE, OWNERSHIP

USE		
Agricultural	A	
Recreational	RC	
Residential	RS	
Unmanaged		
Unwooded	U	
Wooded	W	
OWNERSHIP		
Private	1	
County	4	



MAP 9A
NOMINI CREEK
TOPOGRAPHY AND CULTURE
Segment 8B

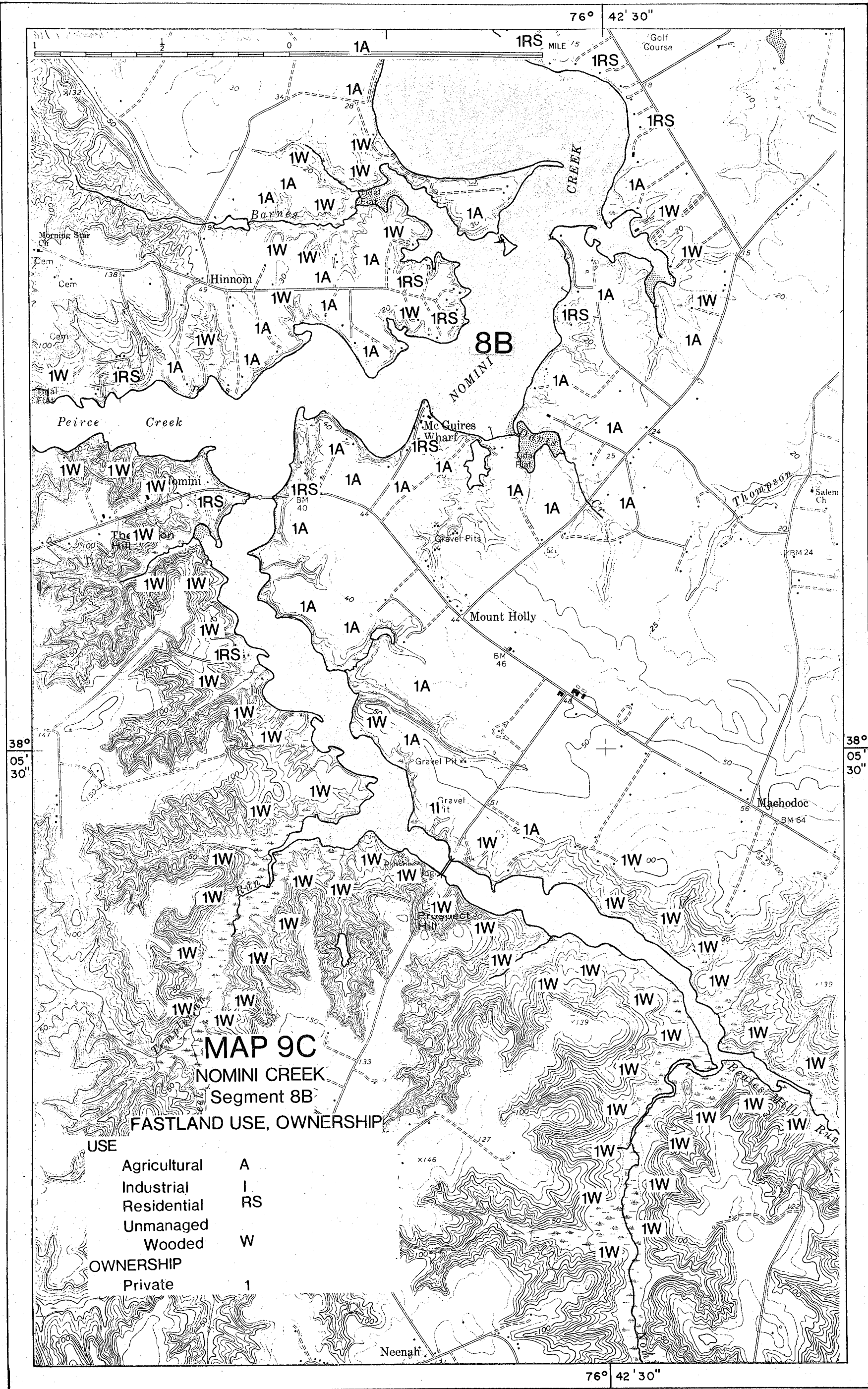
// = Segment Boundary
 / = Subsegment Boundary



MAP 9B
NOMINI CREEK
Segment 8B

SHORELANDS TYPES

- | | |
|---------------------------------|--|
| FASTLAND | |
| Low Shore | |
| Moderately Low Shore | |
| Moderately Low Shore with Bluff | |
| Moderately High Shore | |
| High Shore | |
| SHORE | |
| Artificially Stabilized | |
| Beach | |
| Fringe Marsh | |
| Embayed Marsh | |



76° 42' 30"

38° 05' 30"

38° 05' 30"

76° 42' 30"

MAP 9C

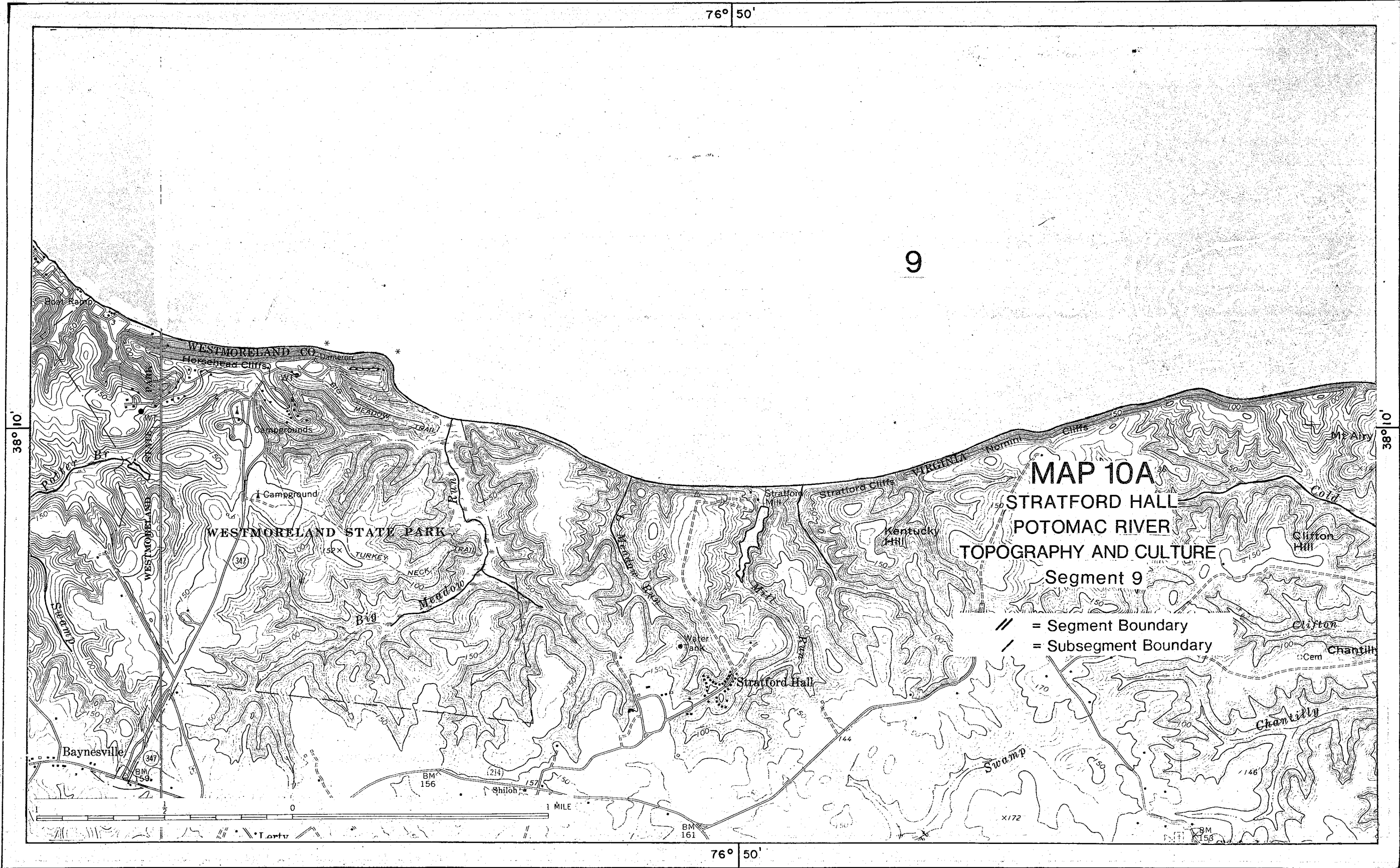
NOMINI CREEK
Segment 8B

FASTLAND USE, OWNERSHIP

USE	
Agricultural	A
Industrial	I
Residential	RS
Unmanaged Wooded	W
OWNERSHIP	
Private	1

76° 50'

9

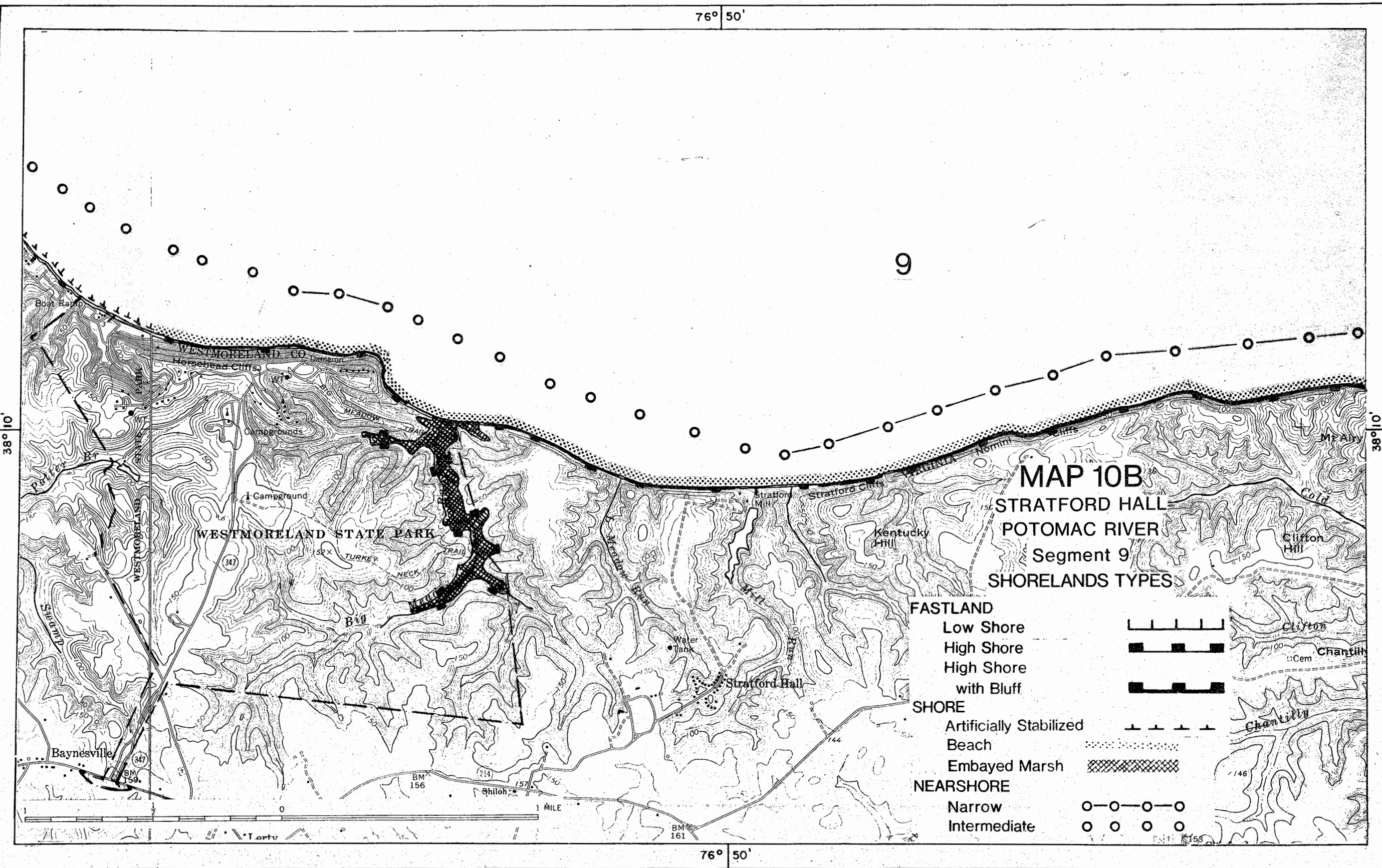


MAP 10A
STRATFORD HALL
POTOMAC RIVER
TOPOGRAPHY AND CULTURE
Segment 9

- // = Segment Boundary
- / = Subsegment Boundary

76° 50'

76° 50'



MAP 10B
STRATFORD HALL
POTOMAC RIVER
 Segment 9
SHORELANDS TYPES

- FASTLAND**
- Low Shore [Symbol]
 - High Shore [Symbol]
 - High Shore with Bluff [Symbol]
- SHORE**
- Artificially Stabilized Beach [Symbol]
 - Embayed Marsh [Symbol]
- NEARSHORE**
- Narrow [Symbol]
 - Intermediate [Symbol]

76° 50'

