Shoreline Situation Report

KING GEORGE AND CAROLINE COUNTIES

Prepared and Published With Funds Provided to the Commonwealth by the Office of Coastal Zone Management,

National Oceanic and Atmospheric Administration, Grant Nos. 04–8–MO1–309 and 03–4–043–357

Special Report In Applied Marine Science and Ocean Engineering Number 165 of the

VIRGINIA INSTITUTE OF MARINE SCIENCE

Gloucester Point, Virginia 23062

1979

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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 number 04-7-158-44041. 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

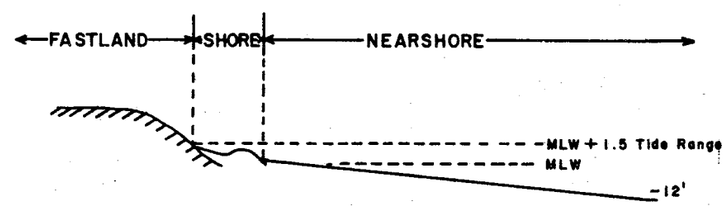


Figure 1

A profile of the three shorelands types.

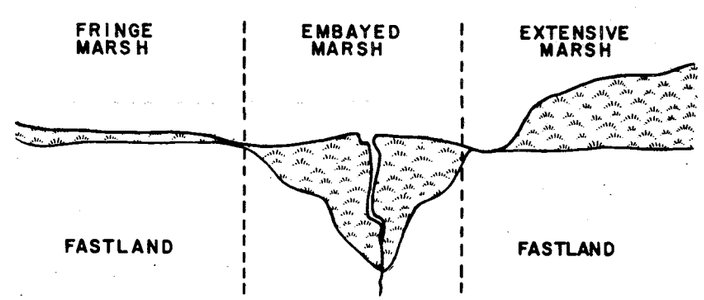


Figure 2

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 wildfowl 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 Enginners 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 CAROLINE AND KING GEORGE COUNTIES

3.1 THE SHORELANDS OF CAROLINE AND KING GEORGE COUNTIES

The Rappahannock River forms a common boundary between Caroline and King George Counties. Caroline is bounded by Spotsylvania County to the west, Essex County to the east, and the Rappahannock River to the north. King George is bounded by the Rappahannock River to the south, Westmoreland County to the east, Stafford County to the west, and the Potomac River to the north. For the purposes of this report, the two counties are divided into three sections:

1) Caroline County - the southern bank of the Rappahannock River,
2) King George County - the northern bank of the Rappahannock River, and
3) King George County - the southern bank of the Potomac River.

Since both counties share basically the same section of the Rappahannock River, several nearshore parameters are combined in this chapter.

3.11 CAROLINE COUNTY SHORELINE SITUATION - RAPPAHANNOCK RIVER

There are 42.6 miles of measured shoreline along the Rappahannock River in Caroline County. The county contains 45.4 miles of fastland. The shorelands range from low shore to high shore with bluff, with approximately one-third of the shorelands being low shore, one-third moderately low shore, and the other third divided between moderately high and high shore. Twenty-one percent of the shorelands are bluffed. Marshes, including fringe, embayed, and extensive marshes, comprise ninety-six percent of the shoreline. The other four percent of the shoreline is beach, with less than one percent artificially stabilized. Sixty-nine percent of the shoreline borders on the Rappahannock River, the rest of the shoreline being located on various tributary and marsh creeks.

The use of the shorelands reflects the rural nature of the county. Ninety-nine percent of the shorelands are either used for agriculture, are wooded, or are unused open areas. Residential, recreational, and industrial concerns account for only one percent of the shorelands of Caroline County.

Caroline County is located near the fall line of the Rappahannock River. As the river here is generally quite narrow, there are no significant fetches which affect the shorelands. The shorelands of the county are not susceptible to severe tidal flooding and no structures are endangered.

This section of the Rappahannock River has poor water quality, according to the State Water Control Board's 305(b)(1)(B) Report. Degradation of this part of the river is mainly due to several upstream discharges in the Fredericksburg area. Also, the river receives direct discharges from several sand and gravel operations. According to the report, this section of the Rappahannock River is not expected to meet water quality standards for quite some time.

3.12 KING GEORGE COUNTY SHORELINE SITUATION - RAPPAHANNOCK RIVER

The Rappahannock River portion of King George County contains 54.8 measured miles of shoreline, 56.8 measured miles of fastland. The fastland statistics compare closely with those of Caroline County. Thirty-seven percent of the shorelands are low shore, forty percent moderately low shore, and the remaining twenty-three percent either moderately high or high shore. Six percent of the shorelands are bluff areas. Marshes comprise ninety-nine percent of the shoreline, with forty-nine percent being fringe marsh and fifty percent either embayed or extensive marsh. One percent of the shoreline is beach and less than one percent is artificially stabilized. Fifty-six percent of the shoreline directly borders the river, the remaining shoreline being found in several tributary creeks.

As in Caroline County, this section of King George County remains predominantly rural, with less than one percent of the shorelands being used for industrial or residential purposes. Fifty-four percent of the shorelands are used for agriculture.

Flooding is not generally a problem along this section of the Rappahannock River, as the shorelands are usually of sufficient height to withstand high water. The only areas which are susceptible to flooding are Goat Island and the fastland behind Cleve Marsh. No structures are endangered by floods.

As stated in Section 3.11, this section of the Rappahannock River does not meet the State Water Control Board's 305(b)(1)(B) criteria.

3.13 KING GEORGE COUNTY SHORELINE SITUATION- POTOMAC RIVER

The Potomac River portion of King George County (Segments KG-2 thru 6) contains 76.5 measured miles of shoreline and 103.3 measured miles of fastland. The shorelands physiography of this section of the county contrasts sharply with that of the Rappahannock River. Fifty-nine percent of the shorelands are low shore, thirty percent moderately low shore, and only eleven percent either moderately high or high shore. Bluffs account for eleven percent of the total shoreland's measurement. Seven percent of the shoreline is artificially stabilized and twenty-eight percent is beach. The remaining sixty-five percent of the shoreline is marsh, either fringe, embayed, or extensive. Eight percent of the nearshore is narrow, twelve percent is intermediate, and fourteen percent is wide. The remaining sixty-six percent of the shoreline is located along several tributary creeks, namely Rosier, Upper Machodoc, Gambo, Chotank, and Potomac Creek. These creeks are too narrow and shallow for classification.

The presence of the military facility at Dahlgren has a major impact on the use statistics of this section of the county. The Dahlgren Weapons Laboratory, located at the mouth of Upper Machodoc Creek, controls twenty-four percent of the shorelands. The laboratory is largely responsible for the residential buildup on nearby Williams Creek. Residential development accounts for seven percent of the Potomac River shoreline in King George County. Commercial, industrial, and recreational use amount to only two percent of the shorelands. The remaining sixty-seven percent of the shorelands are either wooded, unmanaged open areas, or are used for agriculture.

Although fifty-nine percent of the shorelands are classified as low shore, elevations generally reach 10 to 20 feet relatively near the shore. Flooding, therefore, is not considered to be a critical problem for the area. No structures are endangered by high water.

The main stream of the Potomac River is owned by Maryland, thus no water quality data is presented. The tributary creeks, owned by Virginia, are mostly closed to the taking of shellfish. Small areas at the mouth of Rosier and Upper Machodoc Creeks are open to the taking of shellfish.

3.2 SHORE EROSION SITUATION

Erosion, and its severity, is dependent upon several variables, any number of which can be involved in the loss of shorelands in any particular area. In the Chesapeake Bay system, storm induced waves are a major cause of shoreline retreat. 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. The width of the water body is also important in determining erosion patterns for a given area.

Another important cause of erosion is downhill rain runoff. Rain runoff erosion affects bluff areas along the shoreline, loosening surface sediments and usually causing the cliff face to slump. If the bluff is wooded, the erosion is often compounded. The surface erosion can eventually undermine trees, causing them to fall. The trees carry with them large amounts of sediments trapped by their root systems.

A third cause of erosion prevalent in narrow upstream sections is meander erosion. In narrow, meandering channels, the current is fastest on the outside of the meanders and is much less on the inside. As a result, the outside bends erode while the inside bends accrete. Figure 3 is a drawing of a typical river meander.

3.21 RAPPAHANNOCK RIVER

Erosion along this section of the Rappahannock River is generally not a critical problem. The river this far toward the head is a relatively low energy water body and is fairly narrow (from less than 0.2 nautical miles at Skinkers Neck to approximately 0.8 nautical miles near Port Royal. Nanzatico and Portabago Bays are quite wide.). The only active erosion forces along this section of the Rappahannock River are currents in the meanders and downhill rain runoff. In Caroline County, two hundred feet of wooden bulkhead north of Portobago Bay have been flanked and are now ineffective. One road opposite Goat Island is very close to the eroding shoreline and is endangered by continued shoreline retreat. Some minor erosion is occurring on the outside of meanders, with accompanying accretion on the inside bends.

The King George section of the Rappahannock River is subject to many of the same erosive forces as the Caroline shoreline. However, King George County is on the north bank of the river, Caroline County is on the south bank. Since strong winds are predominantly from the northwest and northeast, the south bank of the river generally has more erosion than the north bank. The only significant erosion in King George County is from Greenlow Wharf to Jetts Creek, which has an average historical erosion rate of 1.1 feet per year. A section of road west of Nanzatico Bay is endangered by continued erosion. Another road just north of Corbins Neck is on a 40-foot bluff and would be endangered by continued erosion.

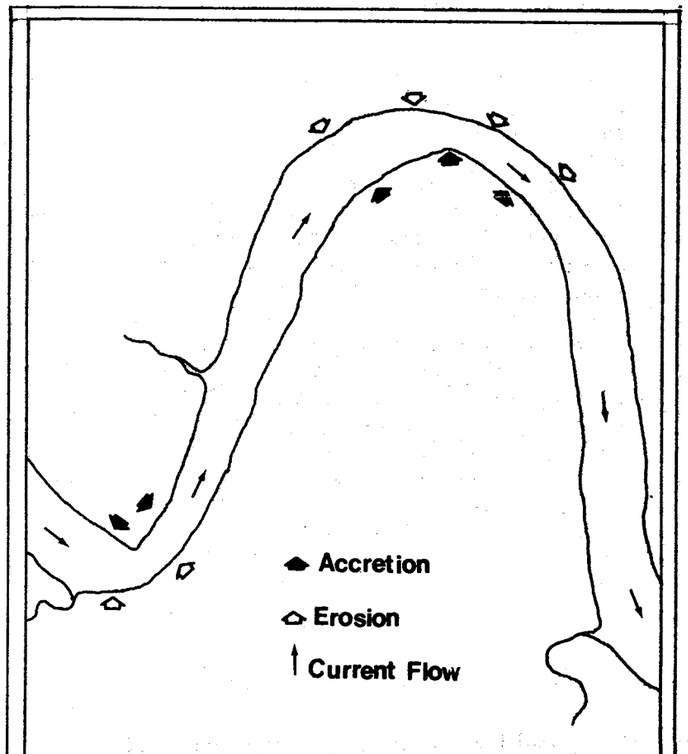


FIGURE 3. A TYPICAL RIVER MEANDER

3.22 POTOMAC RIVER

Unlike the Rappahannock River, the Potomac River along King George County's shoreline is still relatively wide, allowing significant fetches to affect several areas. Historical erosion data is available for the river-fronting shoreline from Mathias Point west to the county line. 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), King George County has lost an average of 1.5 feet per year (averaged over the last century), or a net shoreline loss of 5,226,000 cubic yards of material. However, no structures are endangered by erosion.

Although the Potomac River is fairly wide in King George County, longest fetches are from the southeast or the northwest. Although there is some chronic erosion caused by wind waves and wind driven current, much of the erosion is due to simple downslope weathering of the shoreline and to currents in the river bends.

The many bluffs along the shoreline in King George County are very susceptible to erosion from rain runoff. These bluffs, many with elevations in excess of 100 feet, are generally unstable shoreline features.

Approximately 5.3 miles of shoreline are artificially stabilized in King George County. The structures vary from rubble riprap, to wooden bulkhead, to concrete culverts placed to act like bulkhead. Groins have been employed in several areas, either by themselves or in conjunction with bulkhead, in an effort to re-establish buffer beaches in front of residences. Most structures appear to be effective.

For several portions of the Potomac River in King George not studied by Byrne and Anderson (1977), a comparison of recent (1967 base) topographic maps and 1937 photographs indicated there was little change in the erosion regime. Although all the areas spot checked had erosion, none suffered severe erosion and no structures appeared to be endangered.

3.3 SHORE USE LIMITATIONS

Caroline and King George Counties are very similar, in that they both are still rural. There are no major population centers along the shorelines of either county. The only center of formal land use in either county is the Dahlgren area in King George, which is a military weapons laboratory. The town of Dahlgren borders the base. Elsewhere, there are several small sections of shoreline used for residential purposes. (Less than one percent of Caroline and five percent of King George are used for residential purposes.) The remaining shorelands in both counties are either used for agriculture or are unused. There is little industrial or commercial development.

Given the lack of present development, either residential, industrial, or commercial, there seems to be little demand to develop the shoreline. Also, ongoing erosion along much of the shorelands, though currently minor, could be a serious problem should development occur.

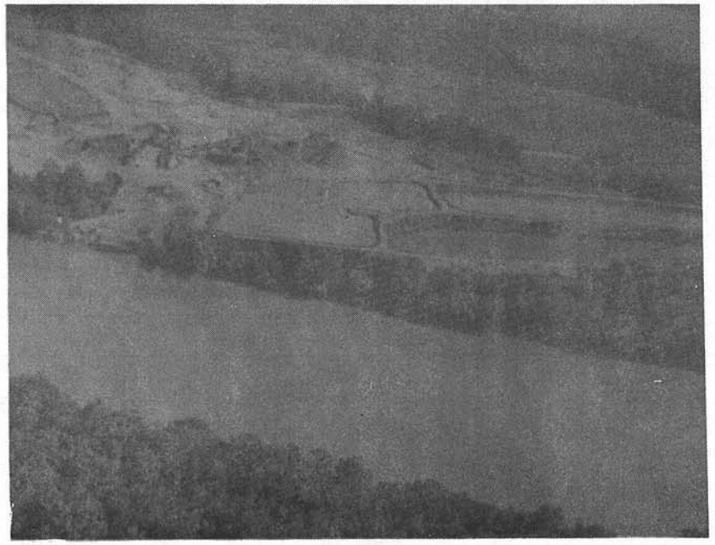


FIGURE 4

FIGURE 5

FIGURE 4: Gravel pit near Lambs Creek, Subsegment KG-1C. This is one of the few industrial sites along the Rappahannock River in King George County.

FIGURE 5: King George Point, Segment KG-2. The bluff area in front of the house has riprap protecting the toe. Erosion is continuing along the bluff area to the right of the riprap.

FIGURE 6: North of King George Point, Segment KG-2. The bluffs are unstable, as wave runup and downhill rain runoff continue to erode the shoreline. As the bluffs front agricultural lands, the cost of artificial stabilization here would probably be prohibitive.

FIGURE 7: Near the mouth of Upper Machodoc Creek, Segment KG-3. This area is part of the Dahlgren Weapons Laboratory. The sand spit in this photo has probably formed due to a submerged obstruction, such as an outfall pipe.

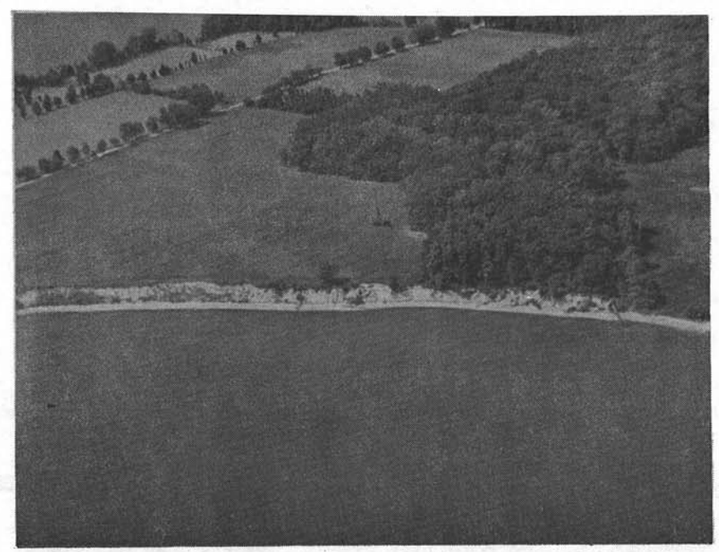


FIGURE 6

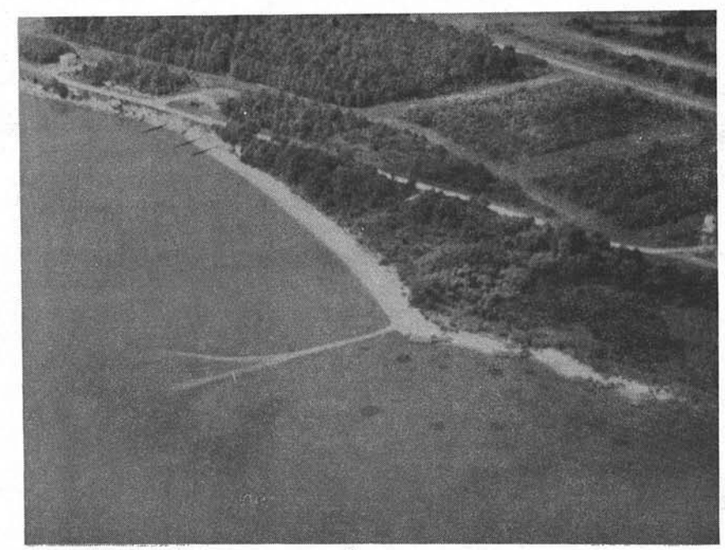


FIGURE 7

FIGURE 8: Mathias Point Neck, Segment KG-4. Part of the shoreline is bulkhead with several fairly effective groins. Notice the fillets of sand trapped by the structures.

FIGURE 9: Mathias Point, Segment KG-4. The structure at the base of the eroding bluff is made of vertically placed concrete culverts. It is of little use at protecting the toe of the cliff.

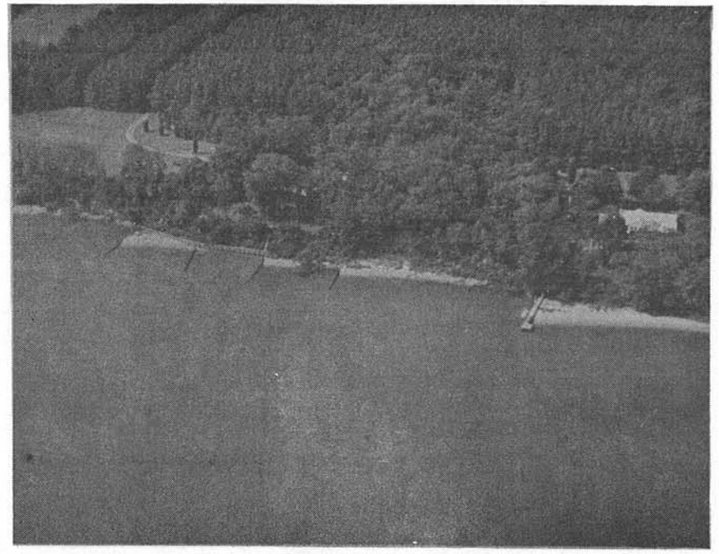


FIGURE 8

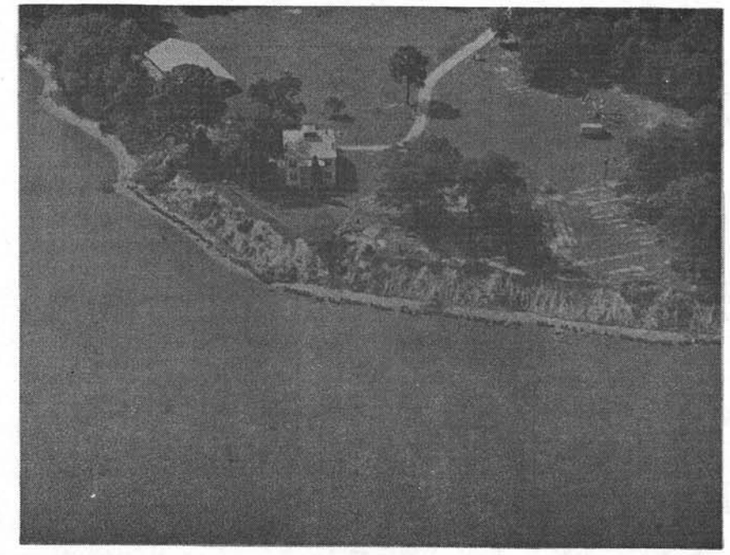


FIGURE 9

FIGURE 10: Belvedere Beach, Segment KG-6. This facility appears to be abandoned. Notice the erosion behind the failed bulkhead directly in front of the large building.

FIGURE 11: Bull Bluff, Segment KG-6. This area has rubble acting as riprap at the base of the bluffs.

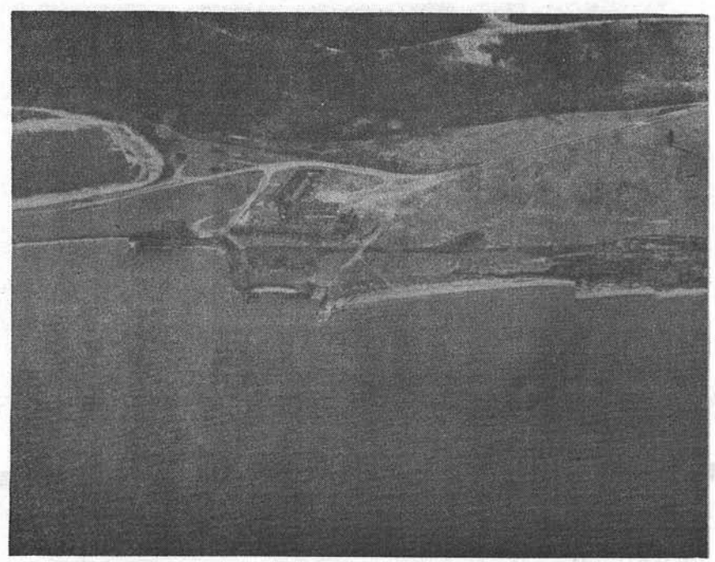


FIGURE 10

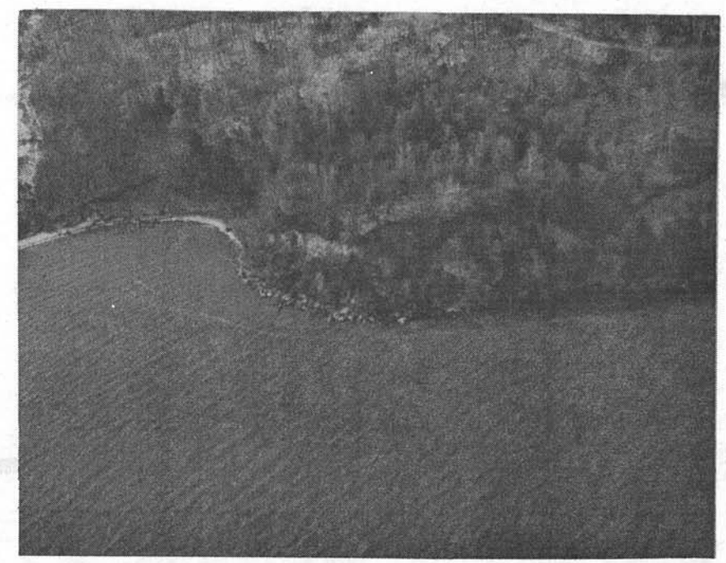


FIGURE 11

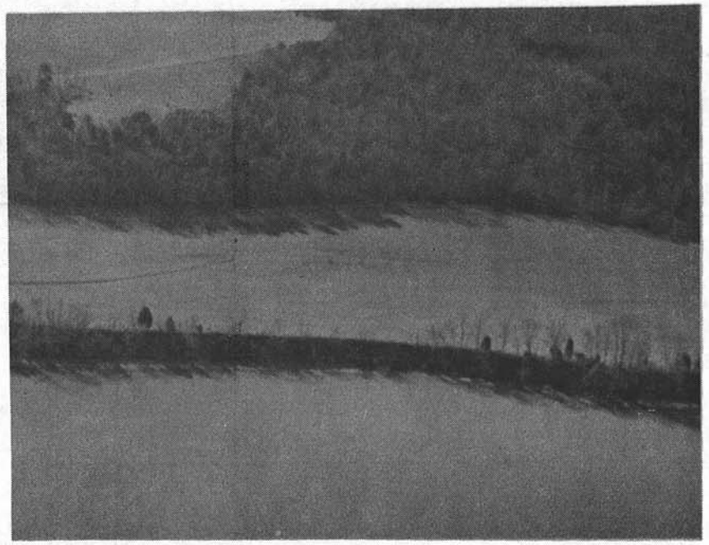


FIGURE 12

FIGURE 13

FIGURE 12: Along Portobago Bay, Subsegment CA-1A. These bluffs fronting the agricultural area are continuing to erode due to downhill rain runoff.

FIGURE 13: Port Royal, Subsegment CA-1A. This is the largest residential area along the Rappahannock River in Caroline County.

FIGURE 14

FIGURE 15

FIGURE 14: Bluffs east of Moons Mount Wharf, Subsegment CA-1B. Typical view of the high bluff areas along this section of the Rappahannock River.

FIGURE 15: Skinkers Neck overview, Subsegment CA-1C. The marsh areas should be protected.

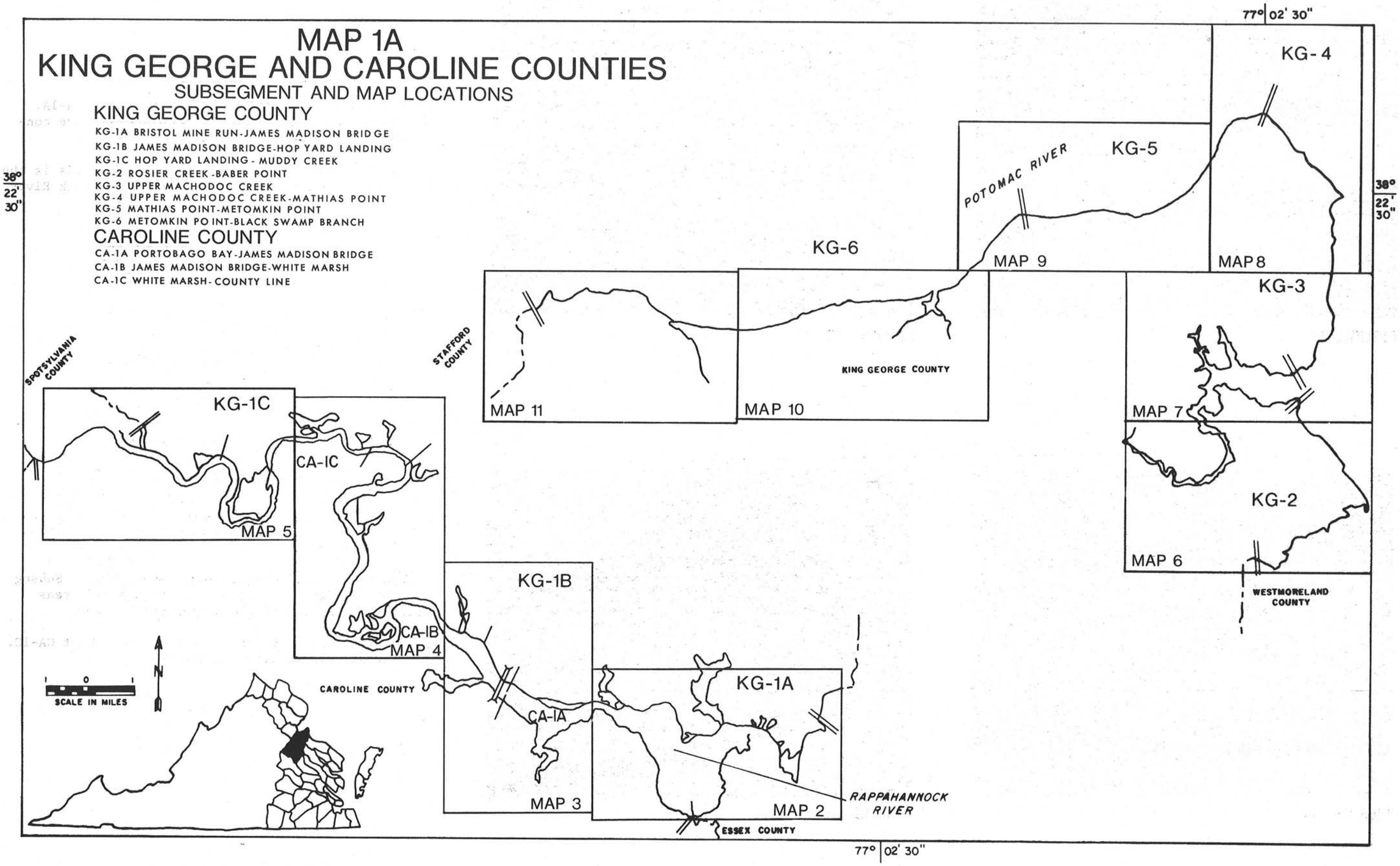
MAP 1A
KING GEORGE AND CAROLINE COUNTIES
SUBSEGMENT AND MAP LOCATIONS

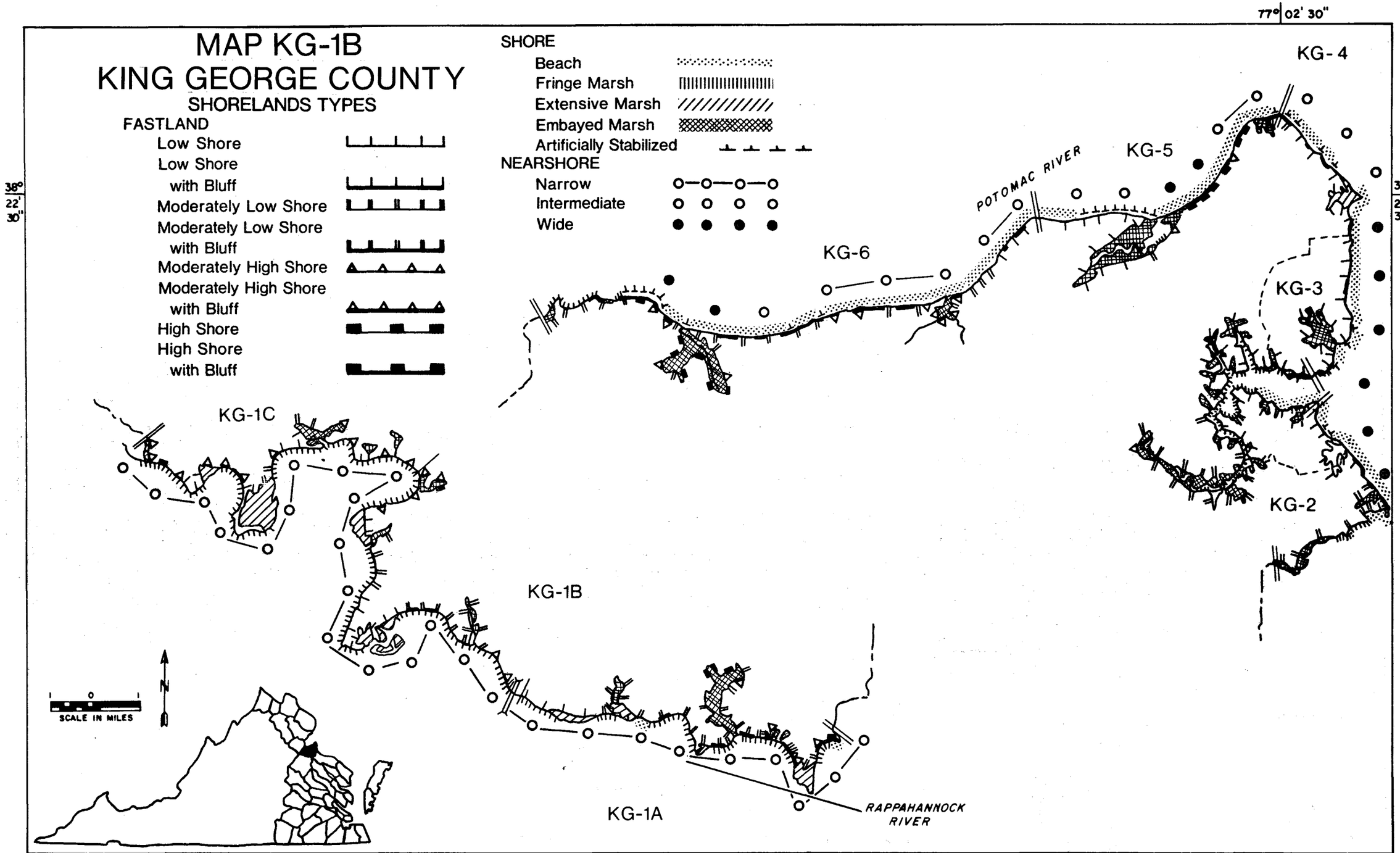
KING GEORGE COUNTY

KG-1A BRISTOL MINE RUN-JAMES MADISON BRIDGE
KG-1B JAMES MADISON BRIDGE-HOP YARD LANDING
KG-1C HOP YARD LANDING - MUDDY CREEK
KG-2 ROSIER CREEK-BABER POINT
KG-3 UPPER MACHODOC CREEK
KG-4 UPPER MACHODOC CREEK-MATHIAS POINT
KG-5 MATHIAS POINT-METOMKIN POINT
KG-6 METOMKIN POINT-BLACK SWAMP BRANCH

CAROLINE COUNTY

CA-1A PORTOBAGO BAY-JAMES MADISON BRIDGE
CA-1B JAMES MADISON BRIDGE-WHITE MARSH
CA-1C WHITE MARSH-COUNTY LINE




MAP KG-1B
KING GEORGE COUNTY
SHORELANDS TYPES
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
SHORE
Beach
Fringe Marsh
Extensive Marsh
Embayed Marsh
Artificially Stabilized
NEARSHORE
Narrow
Intermediate
Wide
77° 02' 30"
38° 22' 30"
KG-4
KG-5
POTOMAC RIVER
KG-6
KG-3
KG-2
KG-1C
KG-1B
KG-1A
RAPPAHANNOCK RIVER
SCALE IN MILES
N

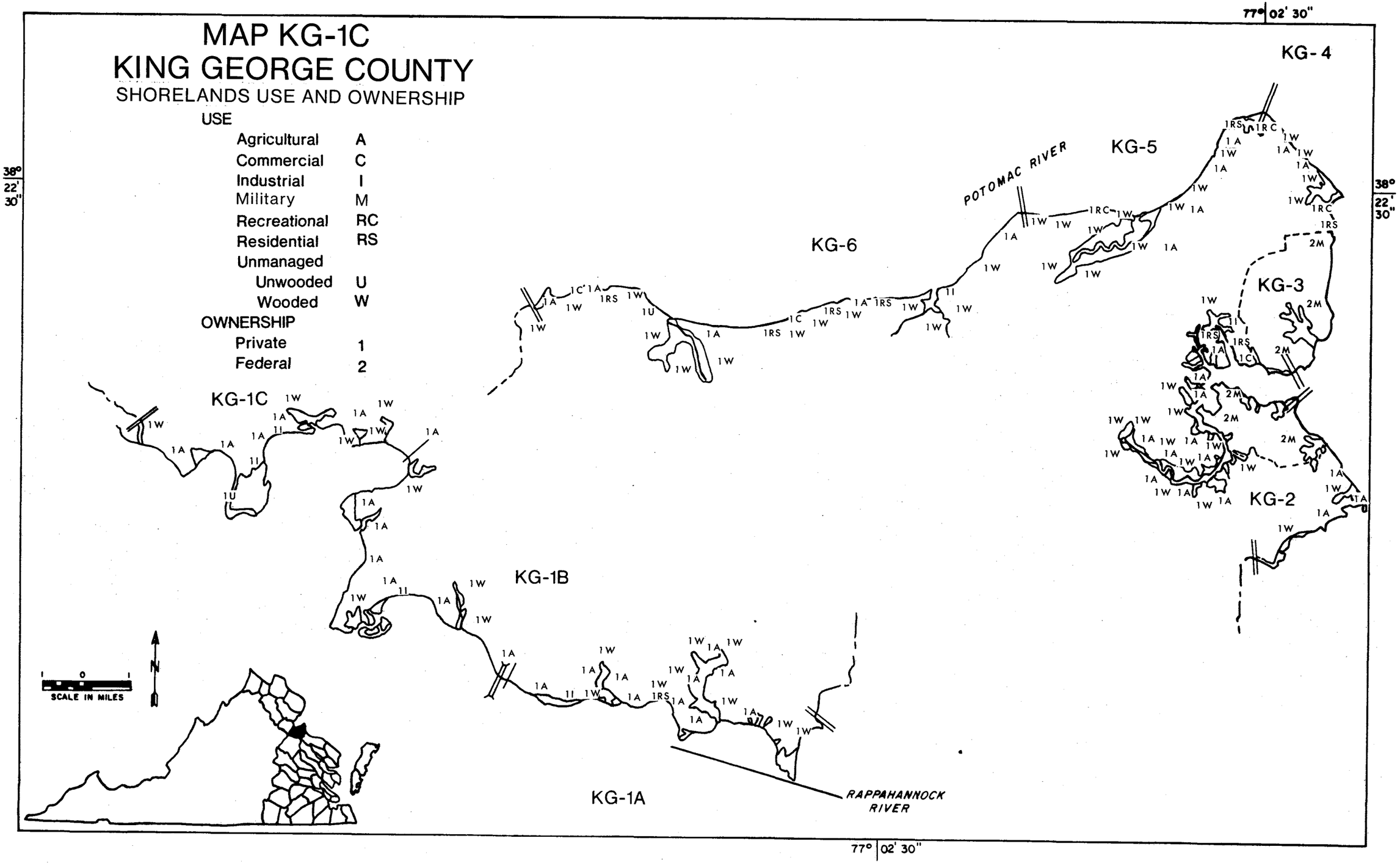
MAP KG-1C
KING GEORGE COUNTY
SHORELANDS USE AND OWNERSHIP

USE

Agricultural	A
Commercial	C
Industrial	I
Military	M
Recreational	RC
Residential	RS
Unmanaged	
Unwooded	U
Wooded	W

OWNERSHIP

Private	1
Federal	2



MAP KG-1D
KING GEORGE COUNTY
EROSION AND SHELLFISH AREAS

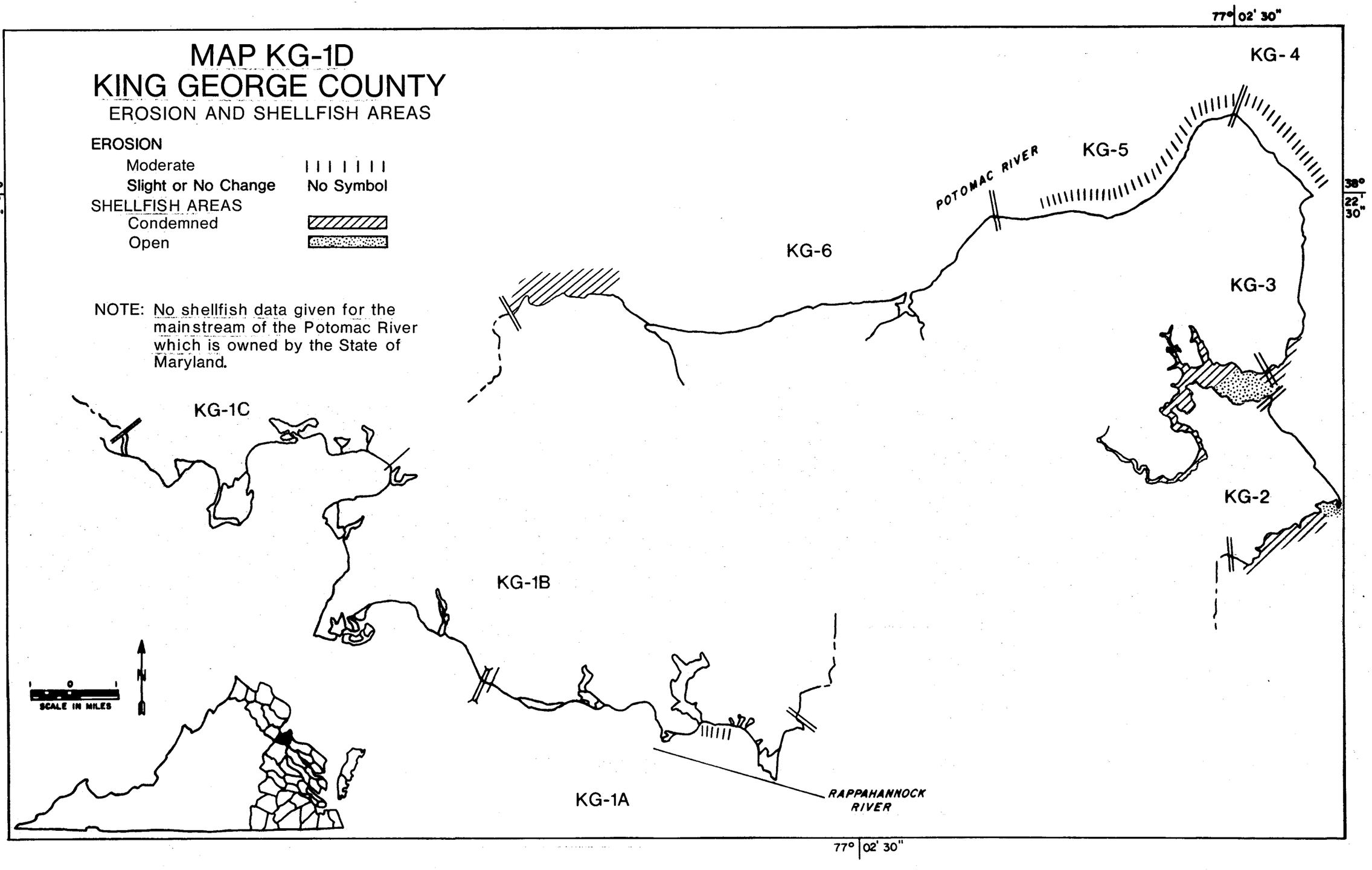
EROSION

Moderate	|||||||
Slight or No Change	No Symbol

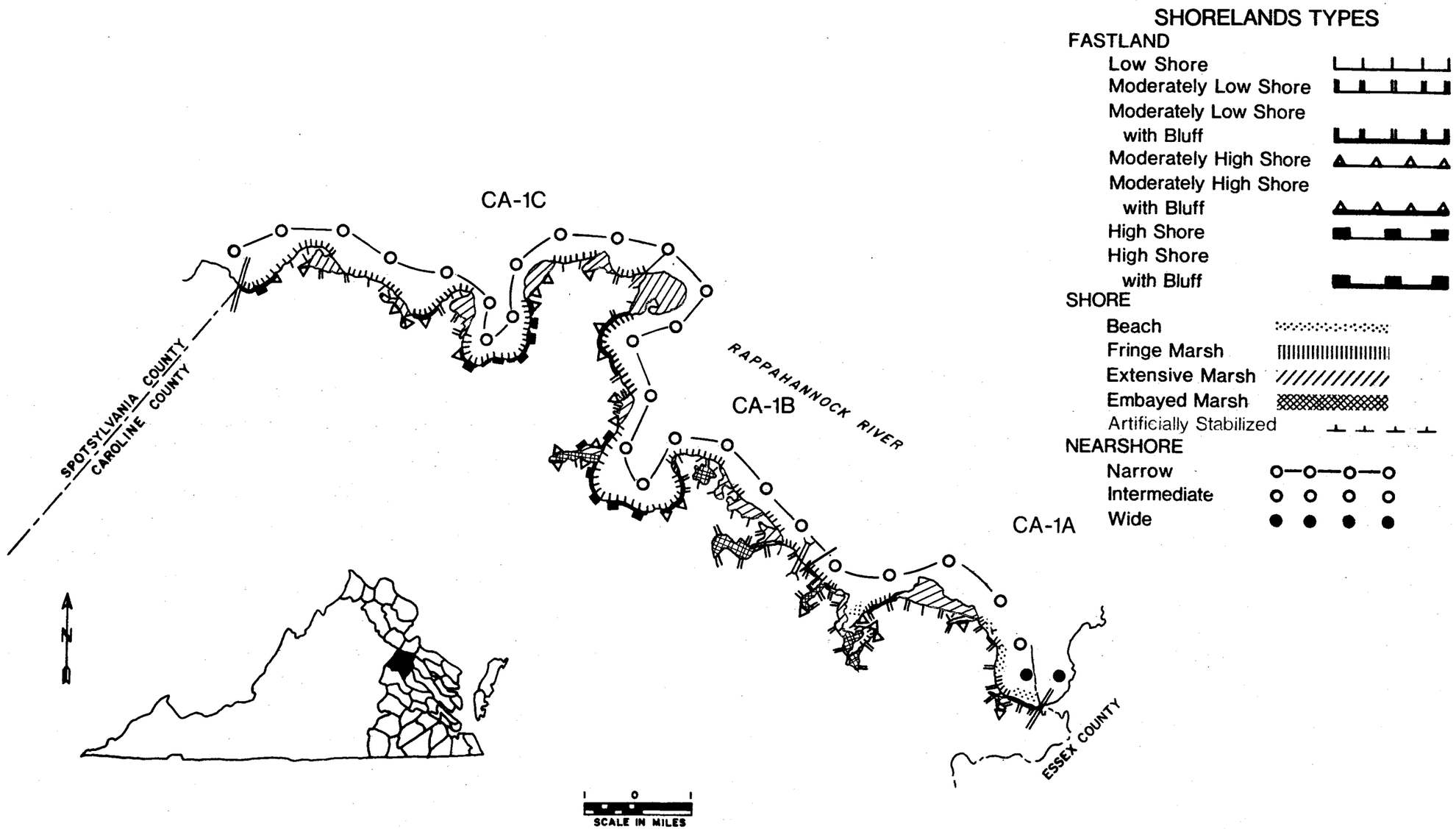
SHELLFISH AREAS

Condemned	
Open	

NOTE: No shellfish data given for the mainstream of the Potomac River which is owned by the State of Maryland.



CAROLINE COUNTY
MAP CA-1B



CAROLINE COUNTY
MAP CA-1C

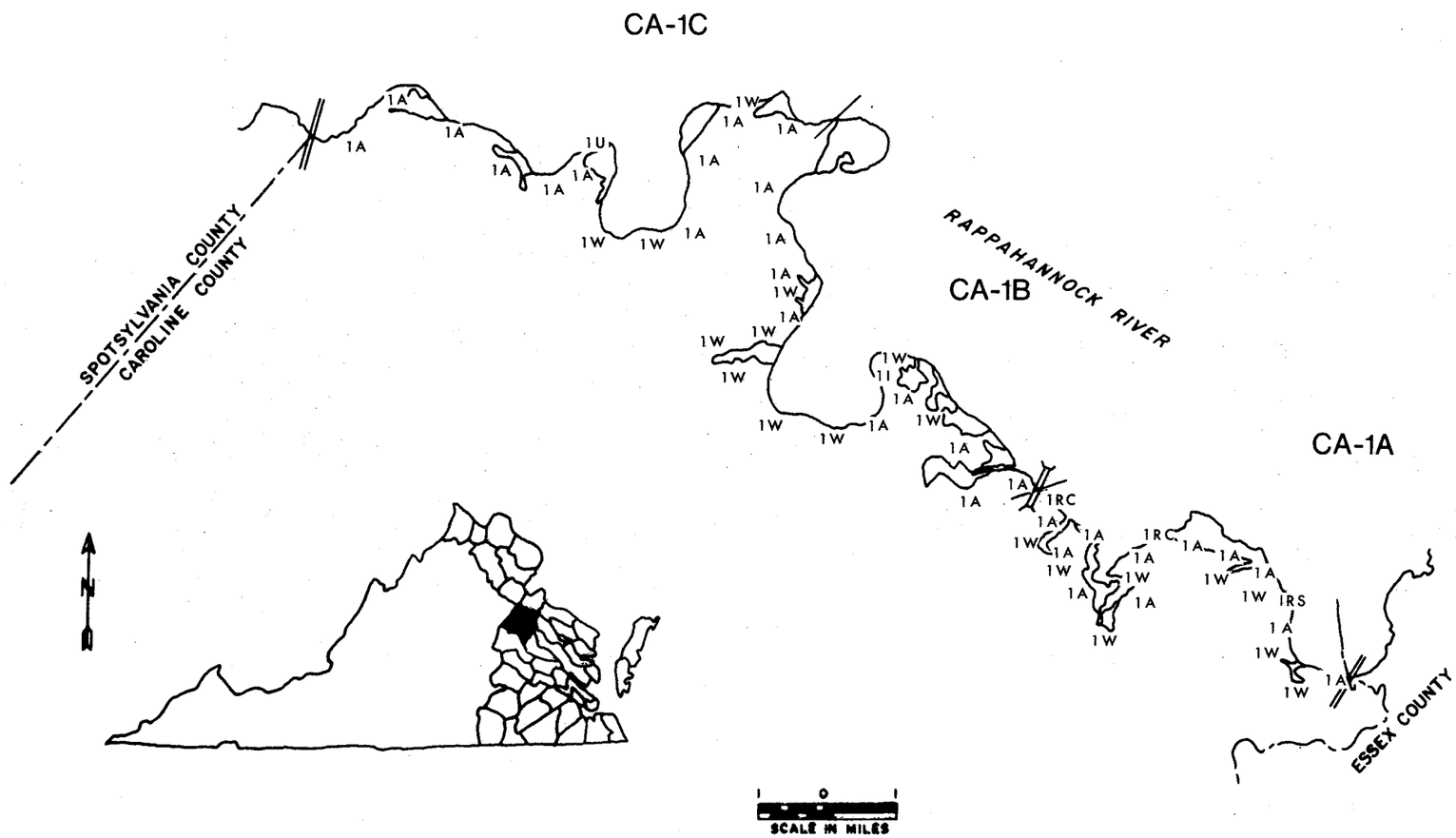
FASTLAND USE AND OWNERSHIP

USE

Agricultural	A
Industrial	I
Recreational	RC
Residential	RS
Unmanaged	
Unwooded	U
Wooded	W

OWNERSHIP

Private	1



CAROLINE COUNTY
MAP CA-1D

EROSION

Moderate	|||||||
Slight or No Change	No Symbol
Accretional	+ + + +

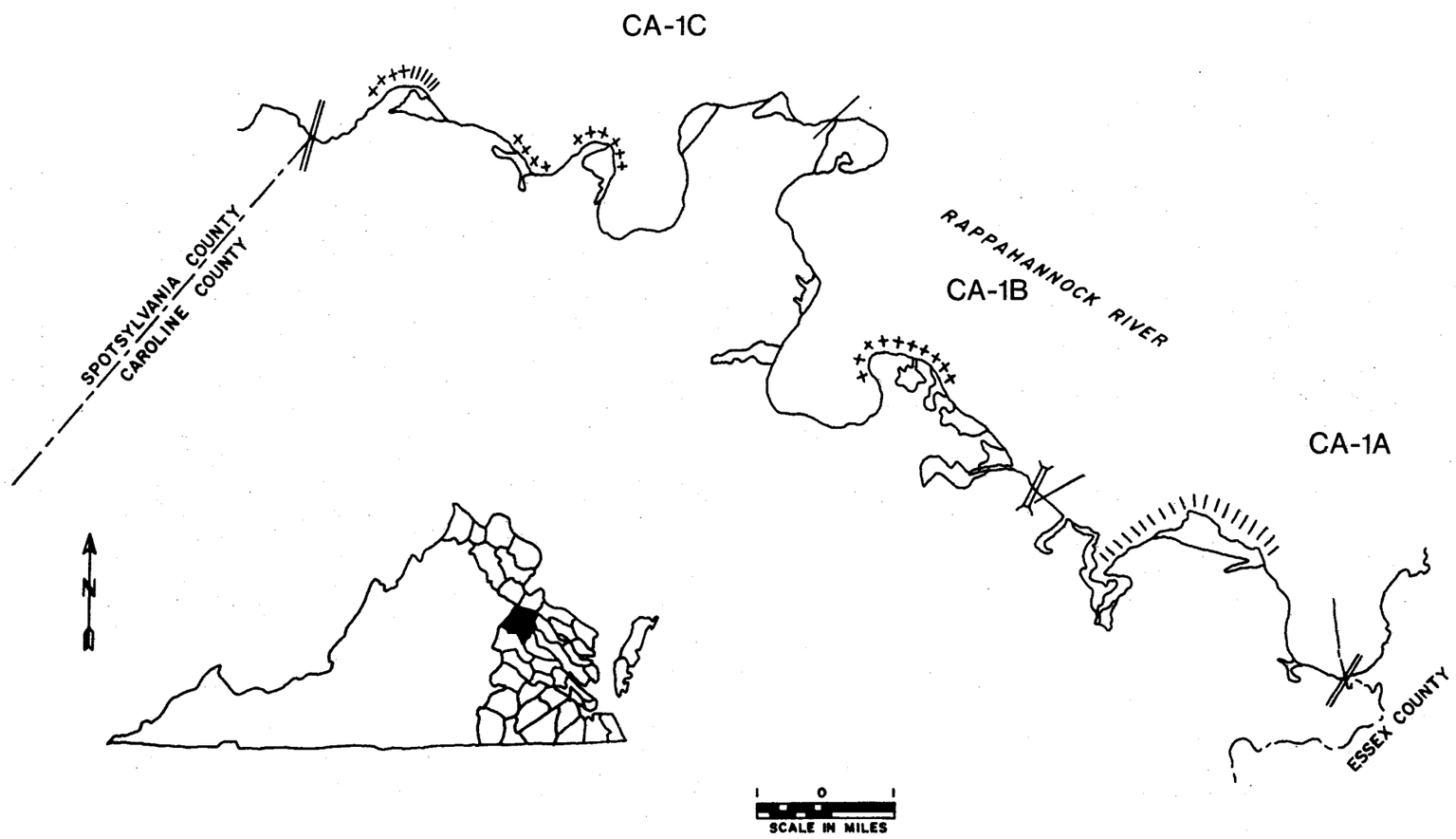


TABLE 1A. KING GEORGE COUNTY, VIRGINIA SHORELANDS PHYSIOGRAPHY, FASTLANDS USE, OWNERSHIP (STATUTE MILES)

Physiographic, use, and ownership classification / Subsegment	SHORELANDS PHYSIOGRAPHY																FASTLAND USE								OWNERSHIP		TOTAL MILES	
	FASTLAND								SHORE					NEARSHORE														
	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	AGRICULTURAL	COMMERCIAL	INDUSTRIAL	MILITARY	RECREATIONAL	RESIDENTIAL	UNMANAGED, WOODED	UNMANAGED, UNWOODED	PRIVATE	FEDERAL	SHORE	FASTLAND
RAPPAHANNOCK																												
KG-1A	2.7		12.1	1.6	1.6	0.4	1.2	0.5	0.1	0.4	8.5	7.1	3.0	8.1	2.2		11.3		0.2			0.2	8.4		20.1		19.0	20.1
KG-1B	9.6		5.8	0.5	4.1		0.1		0.1		10.6	1.2	7.6	10.8			8.9		0.1				11.2		20.2		19.5	20.2
KG-1C	8.8		2.6		3.9	0.4	0.8				7.9	2.8	5.6	9.5			10.3		0.1				2.9	3.2	16.5		16.3	16.5
SUBTOTAL MILES	21.1		20.5	2.1	9.6	0.8	2.1	0.5	0.1	0.4	27.0	11.1	16.2	28.4	2.2		30.5		0.4			0.2	22.5	3.2	56.8		54.8	56.8
POTOMAC																												
KG-2	6.4	0.5	4.0	0.4	0.2	0.3			0.5	3.5	1.1	4.1				3.1	3.8			3.7			3.9	0.5	8.2	3.7	9.3	11.9
KG-3	28.1		13.9		2.1		0.2		0.4	1.1	11.0	16.8		C R E E K			10.3	0.1	0.4	10.1		3.3	20.1		34.2	10.1	29.3	44.3
KG-4	14.3	1.6	0.1	0.2					1.0	4.9	1.6	4.0	0.8		3.9	3.3	0.3			10.9	0.2	1.3	2.7	0.8	5.3	10.9	12.2	16.2
KG-5	6.7		2.0	0.5	0.9	0.1		2.1	2.0	4.3	0.5	5.8		2.2	2.7	1.8	0.6				1.0	1.1	9.6		12.3		12.6	12.3
KG-6	2.8	0.5	6.9	2.7	2.1	0.8	1.8	1.1	1.4	7.8	2.1	1.9		4.0	2.7	2.7	4.5	0.2			0.2	1.6	11.3	0.8	18.6		13.1	18.6
SUBTOTAL MILES	58.3	2.6	26.9	3.8	5.3	1.2	2.0	3.2	5.3	21.6	16.3	32.6	0.8	6.2	9.3	10.9	19.5	0.3	0.4	24.7	1.4	7.3	47.6	2.1	78.6	24.7	76.5	103.3
TOTAL	79.4	2.6	47.4	5.9	14.9	2.0	4.1	3.7	5.4	22.0	43.3	43.7	17.0	34.6	11.5	10.9	50.0	0.3	0.8	24.7	1.4	7.5	70.1	5.3	135.4	24.7	131.3	160.1
% of FASTLAND	50%	1%	30%	4%	9%	1%	3%	2%									31%	1%	1%	15%	1%	5%	44%	3%	85%	15%		100%
% of SHORE									4%	17%	33%	33%	13%	26%	9%	8%											100%	

TABLE 1B. CAROLINE COUNTY, VIRGINIA SHORELANDS PHYSIOGRAPHY, FASTLANDS USE, OWNERSHIP (STATUTE MILES)

Physiographic, use, and ownership classification / Subsegment	SHORELANDS PHYSIOGRAPHY															FASTLAND USE						OWNERSHIP	TOTAL MILES	
	FASTLAND							SHORE					NEARSHORE											
	LOW SHORE	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	AGRICULTURAL	INDUSTRIAL	RECREATIONAL	RESIDENTIAL	UNMANAGED, WOODED	UNMANAGED, UNWOODED	PRIVATE	SHORE	FASTLAND
CA-1A	1.8	7.8	2.5	1.2				0.1	1.5	4.3	3.0	3.8	3.9	0.9	1.6	7.1		0.2	0.2	5.8		13.3	12.6	13.3
CA-1B	6.8	3.0	1.1	2.0	1.1	0.8	1.6	0.1		8.2	2.1	6.1	11.7			8.1	0.1			8.3		16.5	16.4	16.5
CA-1C	6.8	2.3	0.2	3.1	1.1	0.3	1.9			8.1		5.5	11.2			12.1				2.5	1.0	15.6	13.6	15.6
TOTAL	15.4	13.1	3.8	6.3	2.2	1.1	3.5	0.1	1.5	20.6	5.1	15.4	26.8	0.9	1.6	27.3	0.1	0.2	0.2	16.6	1.0	45.4	42.6	45.4
% of FASTLAND	34%	29%	8%	14%	5%	2%	8%									60%	1%	1%	1%	37%	2%	100%		100%
% of SHORE								1%	4%	48%	12%	36%	63%	2%	4%								100%	

CHAPTER 4

4.1 Table of Subsegment Summaries
4.2 Segment and Subsegment Descriptions
4.3 Segment and Subsegment Maps

TABLE 2A. SHORELINE SITUATION SITUATION REPORT SUBSEGMENT SUMMARY FOR KING GEORGE COUNTY, VIRGINIA

SUBSEGMENT	SHORELANDS TYPE	SHORELANDS USE	OWNERSHIP	FLOOD HAZARD	WATER QUALITY	BEACH QUALITY	SHORE EROSION SITUATION	ALTERNATE SHORE USE
KG-1A BRISTOL MINE RUN TO JAMES MADISON BRIDGE RAPPAHANNOCK RIVER 19.0 miles (20.1 miles of fastland)	FASTLAND: Low shore 14%, moderately low shore 60%, moderately low shore with bluff 8%, moderately high shore 8%, moderately high shore with bluff 2%, high shore 5%, and high shore with bluff 3%. SHORE: Artificially stabilized <1%, beach 2%, fringe marsh 45%, embayed marsh 38%, and extensive marsh 16%. NEARSHORE: Narrow 42% and intermediate 12%.	FASTLAND: Agricultural 56%, industrial 1%, residential 1%, and unmanaged, wooded 42%. SHORE: Some industrial use at the gravel pits, but mostly unused. NEARSHORE: Commercial shipping, 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.	Unsatisfactory. This portion of the Rappahannock River does not meet the State Water Control Board's 305(b) (1)(B) criteria.	Poor. There are only narrow, strip beaches located in Nanzatico Bay.	Slight or no change to moderate, critical. A section of road just west of Nanzatico Bay could be endangered by continued erosion unless some precaution is taken in the near future. There is a small section of stabilized shoreline under the new bridge next to the James Madison Bridge.	Low. Although there are some large areas of land available for alternate use there seems little demand to change the rural nature of the subsegment.
KG-1B JAMES MADISON BRIDGE TO HOP YARD LANDING RAPPAHANNOCK RIVER 19.5 miles (20.1 miles of fastland)	FASTLAND: Low shore 48%, moderately low shore 29%, moderately low shore with bluff 3%, moderately high shore 20%, and high shore <1%. SHORE: Artificially stabilized <1%, fringe marsh 55%, embayed marsh 6%, and extensive marsh 39%. NEARSHORE: Narrow 55%.	FASTLAND: Agricultural 44%, industrial <1%, and unmanaged, wooded 56%. SHORE: Mostly unused except by the gravel pits just east of Cleve Marsh. NEARSHORE: Commercial traffic, sport boating and fishing.	Private.	Low for most of the subsegment. The only areas susceptible to flooding are Goat Island and the fastland behind Cleve Marsh.	Unsatisfactory. This portion of the Rappahannock River does not meet the State Water Control Board's 305(b) (1)(B) criteria.	There are no beaches in this subsegment.	Slight or no change. There is probably a minor amount of erosion on the outside edge of the meanders.	Low. The majority of the subsegment is already used for agricultural purposes. Due to the poor water quality there seems little desire for water-related recreational facilities.
KG-1C HOP YARD LANDING TO MUDDY CREEK RAPPAHANNOCK RIVER 16.3 miles (16.5 miles of fastland)	FASTLAND: Low shore 53%, moderately low shore 15%, moderately high shore 24%, moderately high shore with bluff 3%, and high shore 5%. SHORE: Fringe marsh 49%, embayed marsh 17%, and extensive marsh 34%. NEARSHORE: Narrow 58%.	FASTLAND: Agricultural 62%, industrial 1%, unmanaged, wooded 18%, and unmanaged, unwooded 19%. SHORE: Mostly unused except at the gravel pits just north of Corbins Neck. NEARSHORE: Commercial traffic, sport boating and fishing.	Private.	Low, noncritical. The majority of the shoreline has elevations of at least 40 feet and is not subject to flooding.	Unsatisfactory. This portion of the Rappahannock River does not meet the State Water Control Board's 305(b) (1)(B) criteria.	There are no beaches in this subsegment.	Slight or no change. A road located on a 40-foot bluff just north of Corbins Neck could be endangered by continued erosion unless some form of protective structure is employed in the near future.	Low. Due to the rural nature of the area there seems to be little demand for public recreational facilities.
KG-2 ROSIER CREEK TO BABER POINT POTOMAC RIVER 9.3 miles (11.9 miles of fastland)	FASTLAND: Low shore 54%, low shore with bluff 4%, moderately low shore 34%, moderately low shore with bluff 3%, moderately high shore 2%, and moderately high shore with bluff 3%. SHORE: Artificially stabilized 6%, beach 37%, fringe marsh 12%, and embayed marsh 44%. NEARSHORE: Wide 34%.	FASTLAND: Agricultural 32%, military 31%, unmanaged, wooded 33%, and unmanaged, unwooded 4%. SHORE: Mostly unused. NEARSHORE: Some commercial traffic, sport boating and fishing.	Private 69% and federal 31%.	Low, noncritical. The majority of the shoreline has elevations of at least 10 to 20 feet.	Rosier Creek is closed to the taking of shellfish, except at the mouth which is conditionally open.	Fair to good. The river-fronting portion of the segment generally has good, clean beaches.	No data. There is some slight erosion along the bluffs near Rosier Creek. There are approximately 2,900 feet of artificially stabilized shoreline in the segment, most of which is rubble riprap. Groins have been used in conjunction with the riprap in several areas. All structures appear to be effective.	Low. There seems to be little demand to develop the privately owned lands of this segment.
KG-3 UPPER MACHODOC CREEK POTOMAC RIVER 29.3 miles (44.3 miles of fastland)	FASTLAND: Low shore 63%, moderately low shore 31%, moderately high shore 5%, and high shore <1%. SHORE: Artificially stabilized 1%, beach 4%, fringe marsh 38%, and embayed marsh 57%. NEARSHORE: Too narrow and shallow for classification.	FASTLAND: Agricultural 23%, commercial <1%, industrial 1%, military 23%, residential 7%, and unmanaged, wooded 45%. SHORE: Some commercial use (marina) but mostly unused. NEARSHORE: Sport boating and fishing.	Private 77% and federal 23%.	Low. Most of the shoreline has elevations of 10 feet.	Unsatisfactory. The entire creek is closed to the taking of shellfish, except for a small area at the creek mouth.	Poor to fair. There are mostly narrow, strip beaches in the segment.	No data. The area appears to be stable. There are approximately 2,000 feet of cosmetic bulkhead in the segment.	Low. There seems to be little pressure to develop this area.
KG-4 UPPER MACHODOC CREEK TO MATHIAS POINT POTOMAC RIVER 12.2 miles (16.2 miles of fastland)	FASTLAND: Low shore 88%, low shore with bluff 10%, moderately low shore <1%, and moderately low shore with bluff 1%. SHORE: Artificially stabilized 8%, beach 40%, fringe marsh 13%, embayed marsh 33%, and extensive marsh 6%. NEARSHORE: Intermediate 32% and wide 27%.	FASTLAND: Agricultural 2%, military 67%, recreational 1%, residential 8%, unmanaged, wooded 17%, and unmanaged, unwooded 5%. SHORE: Mostly unused. NEARSHORE: Commercial shipping, sport boating and fishing.	Private 33% and federal 67%.	Low. The majority of the shoreline has elevations of 10 to 20 feet and is not subject to flooding.	No data. The main stream of the Potomac River is owned by the state of Maryland.	Fair. This segment has wide, vegetated beaches.	The area from Mathias Point to Persimmon Point has an average historical erosion rate of 1.2 feet per year. There are approximately 5,400 feet of artificially stabilized shoreline in the segment, most of which is riprap. Concrete culverts at Mathias Point are basically ineffective at combatting the erosion.	Low. There is little river-fronting land available for development.

TABLE 2A (CONT'D)

SUBSEGMENT	SHORELANDS TYPE	SHORELANDS USE	OWNERSHIP	FLOOD HAZARD	WATER QUALITY	BEACH QUALITY	SHORE EROSION SITUATION	ALTERNATE SHORE USE
KG-5 MATHIAS POINT TO METOMKIN POINT POTOMAC RIVER 12.6 miles (12.3 miles of fastland)	FASTLAND: Low shore 54%, moderately low shore 16%, moderately low shore with bluff 4%, moderately high shore 8%, moderately high shore with bluff 1%, and high shore with bluff 17%. SHORE: Artificially stabilized 16%, beach 34%, fringe marsh 4%, and embayed marsh 46%. NEARSHORE: Narrow 17%, intermediate 21%, and wide 15%.	FASTLAND: Agricultural 5%, recreational 8%, residential 9%, and unmanaged, wooded 78%. SHORE: Mostly unused. NEARSHORE: Commercial shipping, sport boating and fishing.	Private.	Low, noncritical. Although some flooding could occur between Chotank Creek and Metomkin Point, no structures would be endangered.	No data for the Potomac River. All the tributaries owned by Virginia in this segment are closed to the taking of shellfish.	Fair. The beaches in this segment are clean, but fairly narrow.	Moderate, noncritical. The segment has an average historical erosion rate of 1.2 to 2.2 feet per year. There are approximately 10,600 feet of artificially stabilized shoreline in the segment, most of which is rubble riprap located at Stuart Point.	Low. There seems to be little demand to develop this area.
KG-6 METOMKIN POINT TO BLACK SWAMP BRANCH POTOMAC RIVER 13.1 miles (18.6 miles of fastland)	FASTLAND: Low shore 15%, low shore with bluff 3%, moderately low shore 37%, moderately low shore with bluff 14%, moderately high shore 11%, moderately high shore with bluff 4%, high shore 9%, and high shore with bluff 6%. SHORE: Artificially stabilized 10%, beach 59%, fringe marsh 16%, and embayed marsh 14%. NEARSHORE: Narrow 31%, intermediate 20%, and wide 20%.	FASTLAND: Agricultural 24%, commercial 1%, recreational 1%, residential 8%, unmanaged, wooded 61%, and unmanaged, unwooded 4%. SHORE: Mostly unused. NEARSHORE: Commercial shipping, sport boating and fishing.	Private.	Low. Although several areas have elevations of less than 10 feet, no flooding would occur in this segment.	No data for the Potomac River. All the tributaries owned by Virginia in this segment are closed to the taking of shellfish.	Poor to fair. The only good beach is at Belvedere Beach. The remainder of the segment has narrow, strip beaches.	No data. There is some slight erosion along several sections of the shoreline, especially near Passapatanzy Creek and at Fairview Beach. There are approximately 7,200 feet of artificially stabilized shoreline in the segment, of which 2,400 feet is bulkhead and the remainder riprap.	Low. Some continued development is expected at the Fairview Beach area. There seems to be little demand to alter the remaining shoreline at the present time.

TABLE 2B. SHORELINE SITUATION REPORT SUBSEGMENT SUMMARY FOR CAROLINE COUNTY, VIRGINIA

SUBSEGMENT	SHORELANDS TYPE	SHORELANDS USE	OWNERSHIP	FLOOD HAZARD	WATER QUALITY	BEACH QUALITY	SHORE EROSION SITUATION	ALTERNATE SHORE USE
CA-1A PORTOBAGO CREEK TO JAMES MADISON BRIDGE RAPPAHANNOCK RIVER 12.6 miles (13.3 miles of fastland)	FASTLAND: Low shore 14%, moderately low shore 59%, moderately low shore with bluff 19%, and moderately high shore 9%. SHORE: Artificially stabilized <1%, beach 11%, fringe marsh 34%, embayed marsh 24%, and extensive marsh 30%. NEARSHORE: Narrow 31%, intermediate 7%, and wide 13%.	FASTLAND: Agricultural 53%, recreational 2%, residential 1%, and unmanaged, wooded 44%. SHORE: Mostly unused. NEARSHORE: Commercial shipping, sport boating and fishing.	Private.	Low. The majority of the shoreline has elevations of 20 to 40 feet and is not subject to flooding.	Unsatisfactory. This portion of the Rappahannock River does not meet the State Water Control Board's 305(b)(1)(B) criteria.	Fair. There are several areas of narrow, strip beach located in the Portobago Bay area.	Slight or no change to moderate, noncritical. The shoreline from the marsh north of Portobago Bay to Mill Creek has an average historical erosion rate of 1.5 feet per year. There are approximately 200 feet of wooden bulkhead at the base of a cliff just north of Portobago Bay. This structure has been flanked and is basically ineffective.	Low. As this area is still basically rural in nature, there seems to be little demand for public recreational facilities. Any new development must take care not to destroy the marshes or further degrade the water quality.
CA-1B JAMES MADISON BRIDGE TO WHITE MARSH RAPPAHANNOCK RIVER 16.4 miles (16.5 miles of fastland)	FASTLAND: Low shore 41%, moderately low shore 18%, moderately low shore with bluff 6%, moderately high shore 12%, moderately high shore with bluff 7%, high shore 5%, and high shore with bluff 10%. SHORE: Artificially stabilized <1%, fringe marsh 50%, embayed marsh 13%, and extensive marsh 37%. NEARSHORE: Narrow 71%.	FASTLAND: Agricultural 49%, industrial <1%, and unmanaged, wooded 50%. SHORE: Mostly unused. NEARSHORE: Commercial traffic, sport boating and fishing.	Private.	Low. Most of the shoreline has elevations of at least 30 feet. The fastland directly behind the marshes could be flooded during periods of abnormally high water.	Unsatisfactory. This portion of the Rappahannock River does not meet the State Water Control Board's 305(b)(1)(B) criteria.	There are no beaches in this subsegment.	Slight or no change. The marsh area opposite Cleve Marsh has an average historical accretion rate of 2.9 feet per year. There is some artificial stabilization at the base of the James Madison Bridge.	Low. There seems to be little demand for public recreational facilities in this area.
CA-1C WHITE MARSH TO COUNTY LINE RAPPAHANNOCK RIVER 13.6 miles (15.6 miles of fastland)	FASTLAND: Low shore 43%, moderately low shore 14%, moderately low shore with bluff 1%, moderately high shore 20%, moderately high shore with bluff 7%, high shore 2%, and high shore with bluff 12%. SHORE: Fringe marsh 60% and extensive marsh 40%. NEARSHORE: Narrow 83%.	FASTLAND: Agricultural 77%, unmanaged, wooded 16%, and unmanaged, unwooded 6%. SHORE· Mostly unused. NEARSHORE: Commercial traffic, sport boating and fishing.	Private.	Low. The majority of the shoreline is high enough to withstand flooding.	Unsatisfactory. This section of the Rappahannock River does not meet the State Water Control Board's 305(b)(1)(B) criteria.	There are no beaches in this subsegment.	Slight or no change to moderate, noncritical. Skinkers and Moss Necks are experiencing historical accretion rates of up to 2.0 feet per year.	Low. Any residential development should take care not to further degrade the water quality of this area.

SUBSEGMENT KG-1A

BRISTOL MINE RUN TO JAMES MADISON BRIDGE

Maps 2 and 3

EXTENT: 100,300 feet (19.0 mi.) of shoreline along the Rappahannock River, from Bristol Mine Run to the James Madison Memorial Bridge, including Jetts and other marsh creeks. The subsegment also contains 106,000 feet (20.1 mi.) of fastland.

SHORELANDS TYPE
FASTLAND: Low shore 14% (2.7 mi.), moderately low shore 60% (12.1 mi.), moderately low shore with bluff 8% (1.6 mi.), moderately high shore 8% (1.6 mi.), moderately high shore with bluff 2% (0.4 mi.), high shore 5% (1.2 mi.), and high shore with bluff 3% (0.5 mi.).
SHORE: Artificially stabilized <1% (0.1 mi.), beach 2% (0.4 mi.), fringe marsh 45% (8.5 mi.), embayed marsh 38% (7.1 mi.), and extensive marsh 16% (3.0 mi.).
NEARSHORE: Narrow 42% and intermediate 12%.

SHORELANDS USE
FASTLAND: Agricultural 56% (11.3 mi.), industrial 1% (0.2 mi.), residential 1% (0.2 mi.), and unmanaged, wooded 42% (8.4 mi.).
SHORE: Some industrial use at the gravel pits, but mostly unused.
NEARSHORE: Commercial shipping, sport boating and fishing.

SHORELINE TREND: The shoreline of this subsegment trends basically E - W, through a series of large meanders.

OWNERSHIP: Private.

FLOOD HAZARD: Low, noncritical. The majority of the shoreline has elevations of at least 20 feet and is not subject to flooding.

WATER QUALITY: Unsatisfactory. The upper portion of the Rappahannock River has been degraded by two major discharges; the City of Fredericksburg Sewage Treatment Plant and the American Viscose Division of FMC's industrial wastewater. Several sand and gravel mining operations along the shoreline discharge into the river also. It is not expected that this portion of the Rappahannock River will meet the 305(b)(1)(B) criteria for quite some time.

BEACH QUALITY: Poor. There is only a narrow, strip beach located in Nanzatico Bay.

PRESENT SHORE EROSION SITUATION
EROSION RATE: Slight or no change to moderate, critical. The portion of shoreline from Greenlaw Wharf to Jetts Creek has an average historical erosion rate of 1.1 feet per year.
ENDANGERED STRUCTURES: A section of road just west of Nanzatico Bay could be endangered by continued erosion unless some action is taken.
SHORE PROTECTIVE STRUCTURES: There is a small portion of artificially protected shoreline located at the base of the new bridge.

OTHER SHORE STRUCTURES: There is a new bridge under construction next to the James Madison Bridge.

SHORE USE LIMITATIONS: The majority of the subsegment is already used for agricultural purposes, and any development here would be at the sacrifice of these farmlands. The upper portion of the Rappahannock River has some very valuable marsh areas used by many varieties of fish and waterfowl as spawning and nursery grounds. All these marshes should be left in their natural state. Due to the water quality there seems little desire to locate recreational facilities or residential developments along the shoreline.

ALTERNATE SHORE USE: Low. Although there are some large areas of land available for alternate use, there seems little demand to change the rural character of the subsegment.

MAPS: USGS, 7.5 Min.Ser. (Topo.), ROLLINS FORK Quadr., 1968;
USGS, 7.5 Min.Ser. (Topo.), PORT ROYAL Quadr., 1968.
NOS# 12237 (605-SC), 1:20,000 scale, RAPPAHANNOCK RIVER, Corrotoman River to Fredericksburg, VA, 12th ed., 1975.

PHOTOS: Aerial-VIMS 19Aug77 KG-1A/171-255.

SUBSEGMENT KG-1B

JAMES MADISON BRIDGE TO HOP YARD LANDING

Maps 3 and 4

EXTENT: 103,000 feet (19.5 mi.) of shoreline along the Rappahannock River from the James Madison Memorial Bridge to Hop Yard Landing, including the tributaries to the River. The subsegment also contains 106,500 feet (20.1 mi.) of fastland.

SHORELANDS TYPE
FASTLAND: Low shore 48% (9.6 mi.), moderately low shore 29% (5.8 mi.), moderately low shore with bluff 3% (0.5 mi.), moderately high shore 20% (4.1 mi.), and high shore <1% (0.1 mi.).
SHORE: Artificially stabilized <1% (0.1 mi.), fringe marsh 55% (10.6 mi.), embayed marsh 6% (1.2 mi.), and extensive marsh 39% (7.6 mi.).
NEARSHORE: Narrow 55%. The remainder of the nearshore zone is located along marsh creeks which are too narrow and shallow for classification.

SHORELANDS USE
FASTLAND: Agricultural 44% (8.9 mi.), industrial <1% (0.1 mi.), and unmanaged, wooded 56% (11.2 mi.).
SHORE: Mostly unused except at the gravel pits just east of Cleve Marsh.
NEARSHORE: Commercial traffic, sport boating and fishing.

SHORELINE TREND: The shoreline in this subsegment trends basically SE - NW from the James Madison Bridge to Cleve Marsh, then S - N to Hop Yard Landing, through a series of meanders.

OWNERSHIP: Private.

FLOOD HAZARD: Low for the majority of the subsegment. The only areas susceptible to flooding are Goat Island and the fastland behind Cleve Marsh. No structures are endangered in these areas.

WATER QUALITY: Unsatisfactory. This portion of the Rappahannock River is experiencing poor water quality and does not currently meet the State Water Control Board's 305(b)(1)(B) criteria.

BEACH QUALITY: There are no beaches in this subsegment.

PRESENT SHORE EROSION SITUATION
EROSION RATE: Slight or no change. There is probably a minor amount of erosion on the outside edge of the meanders, especially at cliff bases.
ENDANGERED STRUCTURES: None.
SHORE PROTECTIVE STRUCTURES: The only area of artificial stabilization in the subsegment is located at the base of the James Madison Bridge.

OTHER SHORE STRUCTURES: The James Madison Memorial Bridge is located in this subsegment.

SHORE USE LIMITATIONS: The majority of the shoreline is already used for agricultural purposes. Much of the shoreline has elevations of 40 feet or more, making access to the water difficult. This portion of the Rappahannock River has some extensive marsh systems which are valuable as spawning and nursery grounds for a variety of fish and wildlife. Any development must take care not to destroy these marshes.

ALTERNATE SHORE USE: Low. As already stated, most of this area is used for farming, and any development would be at the sacrifice of these agricultural fields. Due to the water quality, there seems little desire for water related recreational facilities.

MAPS: USGS, 7.5 Min.Ser. (Topo.), PORT ROYAL Quadr., 1968;
USGS, 7.5 Min.Ser. (Topo.), RAPPAHANNOCK ACADEMY Quadr., 1969.
NOS# 12237 (605-SC), 1:20,000 scale, RAPPAHANNOCK RIVER, Corrotoman River to Fredericksburg, VA, 12th ed., 1975.

PHOTOS: Aerial-VIMS 19Aug77 KG-1B/76-170.

SUBSEGMENT KG-1C

HOP YARD LANDING TO MUDDY CREEK

Maps 4 and 5

EXTENT: 85,800 feet (16.3 mi.) of shoreline along the Rappahannock River from Hop Yard Landing to Muddy Creek. The subsegment includes 87,300 feet (16.5 mi.) of fastland.

SHORELANDS TYPE
FASTLAND: Low shore 53% (8.8 mi.), moderately low shore 15% (2.6 mi.), moderately high shore 24% (3.9 mi.), moderately high shore with bluff 3% (0.4 mi.), and high shore 5% (0.8 mi.).
SHORE: Fringe marsh 49% (7.9 mi.), embayed marsh 17% (2.8 mi.), and extensive marsh 34% (5.6 mi.).
NEARSHORE: Narrow 58%. The remainder of the nearshore zone is located along marsh creeks which are too narrow and shallow for classification.

SHORELANDS USE
FASTLAND: Agricultural 62% (10.3 mi.), industrial 1% (0.1 mi.), unmanaged, wooded 18% (2.9 mi.), and unmanaged, unwooded 19% (3.2 mi.).
SHORE: Mostly unused except at the gravel pits just north of Corbins Neck.
NEARSHORE: Commercial traffic, sport boating and fishing.

SHORELINE TREND: The shoreline of this subsegment trends basically E - W through a series of large meanders.

OWNERSHIP: Private.

FLOOD HAZARD: Low, noncritical. The majority of the shoreline has elevations of at least 40 feet and is not subject to flooding. The fastland immediately surrounding some of the extensive marshes could be flooded during periods of abnormally high water.

WATER QUALITY: Unsatisfactory. This portion of the Rappahannock River does not meet the State Water Control Board's 305(b)(1)(B) criteria.

BEACH QUALITY: There are no beaches in this subsegment.

PRESENT SHORE EROSION SITUATION
EROSION RATE: Slight or no change. There is some minor erosion on the outside of the meanders, especially in the area just north of Corbins Neck.
ENDANGERED STRUCTURES: A road located on a 40-foot bluff just north of Corbins Neck could be endangered by erosion unless some form of shore protection is employed.
SHORE PROTECTIVE STRUCTURES: None.

OTHER SHORE STRUCTURES: None.

SHORE USE LIMITATIONS: The majority of the shoreline is already used for agricultural purposes, and any development here would be at the sacrifice of these farmlands. Most of the shoreline has either high bluffs, making access to the water difficult, or is marsh, which should be left in its natural state.

ALTERNATE SHORE USE: Low. Because of the rural nature of the area there seems to be little demand for public recreational facilities. Any residential development must take care to maintain the marshes and not further degrade the water quality.

MAPS: USGS, 7.5 Min.Ser. (Topo.), PORT ROYAL Quadr., 1968;
USGS, 7.5 Min.Ser. (Topo.), RAPPAHANNOCK ACADEMY Quadr., 1969
USGS, 7.5 Min.Ser. (Topo.), PASSAPATANZY Quadr., 1966.
NOS# 12237 (605-SC), 1:20,000 scale, RAPPAHANNOCK RIVER, Corrotoman River to Fredericksburg, VA, 12th ed., 1975.

PHOTOS: Aerial-VIMS 19Aug77 KG-1C/1-75.

SEGMENT KG-2

ROSIER CREEK TO BABER POINT

Maps 6 and 7

EXTENT: 48,900 feet (9.3 mi.) of shoreline along the Potomac River from the Route 205 bridge at the head of Rosier Creek to Baber Point, including Rosier Creek. The segment includes 62,600 feet (11.9 mi.) of fastland.

SHORELANDS TYPE
FASTLAND: Low shore 54% (6.4 mi.), low shore with bluff 4% (0.5 mi.), moderately low shore 34% (4.0 mi.), moderately low shore with bluff 3% (0.4 mi.), moderately high shore 2% (0.2 mi.), and moderately high shore with bluff 3% (0.3 mi.).
SHORE: Artificially stabilized 6% (0.5 mi.), beach 37% (3.5 mi.), fringe marsh 12% (1.1 mi.), and embayed marsh 44% (4.1 mi.).
NEARSHORE: Wide 34%. The rest of the shoreline is located on Rosier Creek, which is too narrow and shallow for classification.

SHORELANDS USE
FASTLAND: Agricultural 32% (3.8 mi.), military 31% (3.7 mi.), unmanaged, wooded 33% (3.9 mi.), and unmanaged, unwooded 4% (0.5 mi.).
SHORE: Mostly unused; some waterfowl hunting in the marshes in Rosier Creek.
NEARSHORE: Sport boating and fishing; some commercial shipping to the Washington, D.C. area.

WIND AND SEA EXPOSURE: Rosier Creek trends basically SW - NE. The river-fronting shoreline trends SE - NW. Fetches at Black Marsh are SE - 33 nautical miles and N - 5.8 nautical miles.

OWNERSHIP: Private 69% and federal 31%.

FLOOD HAZARD: Low, noncritical. Although fifty-four percent of the shorelands are classified as low shore, most areas have 10 to 20-foot elevations relatively close to the shoreline. No structures are located in flood prone areas.

WATER QUALITY: Most of Rosier Creek is closed to the taking of shellfish. The area at the creek mouth to the Virginia - Maryland line is conditionally approved for the taking of shellfish. The main body of the Potomac River is owned by Maryland.

BEACH QUALITY: Fair to good. The river-fronting portion of this segment generally has good clean beaches, although some are partially vegetated.

PRESENT SHORE EROSION SITUATION
EROSION RATE: No data. Recent field investigations reveal slight erosion is occurring along the bluffs near Rosier Creek.
ENDANGERED STRUCTURES: None.
SHORE PROTECTIVE STRUCTURES: There are approximately 2,900 feet of artificially stabilized shoreline in this segment, most of which is rubble riprap. Groins are often used in conjunction with the riprap in an effort to trap buffer beaches. The structures appear to be effective at stopping erosion.

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

SHORE USE LIMITATIONS: Thirty-one percent of the shorelands are part of the federally owned Dahlgren Weapons Laboratory. The rest of the segment is rural, either unused or used for agriculture.

ALTERNATE SHORE USE: Low. The privately held lands in the segment will probably continue to be rural in nature, as there is no pressure to develop in the area. No alternate use can be contemplated for the Dahlgren Weapons Lab unless the military relinquishes control of the area.

MAPS: USGS, 7.5 Min.Ser. (Topo.), DAHLGREN Quadr., 1968.
NOS# 12084 (558), 1:40,000 scale, POTOMAC RIVER, Piney Point to Lower Cedar Point, VA-MD, 15th ed., 1973.

PHOTOS: Aerial-VIMS 4Aug77 KG-2/257-290.

SEGMENT KG-3

UPPER MACHODOC CREEK

Maps 6 and 7

EXTENT: 154,800 feet (29.3 mi.) of shoreline along Upper Machodoc Creek and its several tributary creeks. The segment includes 234,000 feet (44.3 mi.) of fastland.

SHORELANDS TYPE
FASTLAND: Low shore 63% (28.1 mi.), moderately low shore 31% (13.9 mi.), moderately high shore 5% (2.1 mi.), and high shore <1% (0.2 mi.).
SHORE: Artificially stabilized 1% (0.4 mi.), beach 4% (1.1 mi.), fringe marsh 38% (11.0 mi.), and embayed marsh 57% (16.8 mi.).
NEARSHORE: Upper Machodoc Creek is too shallow for classification.

SHORELANDS USE
FASTLAND: Agricultural 23% (10.3 mi.), commercial <1% (0.1 mi.), industrial 1% (0.4 mi.), military 23% (10.1 mi.), residential 7% (3.3 mi.), and unmanaged, wooded 45% (20.1 mi.).
SHORE: Mostly unused; access to the water at various locations, especially at the marina at Dahlgren Weapons Laboratory.
NEARSHORE: Sport boating and fishing in Upper Machodoc Creek.

WIND AND SEA EXPOSURE: The mouth of Upper Machodoc Creek is oriented E - W. The main creek then trends southwest through several meanders. The creek shorelands are not exposed to significant fetches.

OWNERSHIP: Private 77% and federal 23%.

FLOOD HAZARD: Low, noncritical. The shorelands generally have 10-foot elevations close to the shoreline.

WATER QUALITY: Unsatisfactory. Except for one small area at the creek mouth, the entire creek is closed to the taking of shellfish.

BEACH QUALITY: Poor to fair. There are mostly narrow strip beaches in the segment.

PRESENT SHORE EROSION SITUATION
EROSION RATE: No data. 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, all of which is bulkhead. The structures seem to be for cosmetic purposes rather than for erosion protection.

OTHER SHORE STRUCTURES: There are numerous piers on Williams Creek and many docks at the marina facility at the weapons lab and the private marina at Williams Creek.

SHORE USE LIMITATIONS: Twenty-three percent of the shorelands are part of the federally owned Dahlgren Weapons Laboratory. Nine percent of the shorelands are already developed. The remaining sixty-eight percent of the segment is either unused or used for agriculture. The creek is generally shallow in the meanders, making navigation difficult.

ALTERNATE SHORE USE: Low. The only private development in the segment is at the town of Dahlgren, which borders on the weapons lab. There seems to be little pressure to develop other sections of the segment.

MAPS: USGS, 7.5 Min.Ser. (Topo.), DAHLGREN Quadr., 1968.
NOS# 12084 (558), 1:40,000 scale, POTOMAC RIVER, Piney Point to Lower Cedar Point, VA-MD, 15th ed., 1973.

PHOTOS: Aerial-VIMS 4Aug77 KG-3/291-323; 23Dec77 KG-3/525-531.

SEGMENT KG-4

UPPER MACHODOC CREEK TO MATHIAS POINT

Maps 7 and 8

EXTENT: 64,200 feet (12.2 mi.) of shoreline along the Potomac River from the mouth of Upper Machodoc Creek to Mathias Point. The segment includes 85,400 feet (16.2 mi.) of fastland.

SHORELANDS TYPE
FASTLAND: Low shore 88% (14.3 mi.), low shore with bluff 10% (1.6 mi.), moderately low shore <1% (0.1 mi.), and moderately low shore with bluff 1% (0.2 mi.).
SHORE: Artificially stabilized 8% (1.0 mi.), beach 40% (4.9 mi.), fringe marsh 13% (1.6 mi.), embayed marsh 33% (4.0 mi.), and extensive marsh 6% (0.8 mi.).
NEARSHORE: Intermediate 32% and wide 27%. The remainder of the shoreline is located on Gambo Creek, which is too narrow and shallow for classification.

SHORELANDS USE
FASTLAND: Agricultural 2% (0.3 mi.), military 67% (10.9 mi.), recreational 1% (0.2 mi.), residential 8% (1.3 mi.), unmanaged, wooded 17% (2.7 mi.), and unmanaged, unwooded 5% (0.8 mi.).
SHORE: Mostly unused.
NEARSHORE: Sport boating and fishing; commercial shipping to the Washington, D.C. area.

WIND AND SEA EXPOSURE: The shoreline trends basically S - N, then SE - NW in the segment. The fetch at Persimmon Point is SE - 25.2 nautical miles.

OWNERSHIP: Private 33% and federal 67%.

FLOOD HAZARD: Low, noncritical. Although eighty-eight percent of the segment is low shore, most areas have 10 to 20-foot elevations very close to the shore. No structures are endangered.

WATER QUALITY: No data. The main body of the Potomac River is owned by the state of Maryland.

BEACH QUALITY: Fair. The beaches are usually of fair width in the segment, though they are often partially vegetated.

PRESENT SHORE EROSION SITUATION
EROSION RATE: No data for the southern section of the segment. The area from Mathias Point to Persimmon Point has an average historical erosion rate of 1.2 feet per year. Recent field investigations show that in several sections erosion is continuing.
ENDANGERED STRUCTURES: None.
SHORE PROTECTIVE STRUCTURES: There are approximately 5,400 feet of artificially stabilized shoreline in the segment, the majority of which is riprap. There are several small areas of bulkhead and several groin fields. Most structures appear to be effective at stopping erosion. However, concrete culverts placed to act like bulkhead at Mathias Point are not effective at halting erosion.

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

SHORE USE LIMITATIONS: Sixty-seven percent of the segment is controlled by the military, which effectively limits other use. Another nine percent of the segment is already developed. Much of the remaining shorelands are fronted by an extensive marsh, which should be preserved.

ALTERNATE SHORE USE: Low. There is little river-fronting shorelands which are available for development. There seems to be little pressure to develop the area.

MAPS: USGS, 7.5 Min.Ser. (Topo.), DAHLGREN Quadr., 1968;
USGS, 7.5 Min.Ser. (Topo.), MATHIAS POINT Quadr., 1968.
NOS# 12084 (558), 1:40,000 scale, POTOMAC RIVER, Piney Point to Lower Cedar Point, VA-MD, 15th ed., 1973;
NOS# 12288 (559), 1:40,000 scale, POTOMAC RIVER, Lower Cedar Point to Mattawoman Creek, VA-MD, 9th ed., 1971.

PHOTOS: Aerial-VIMS 4Aug77 KG-4/324-395.

SEGMENT KG-5

MATHIAS POINT TO METOMKIN POINT

Maps 8 and 9

EXTENT: 66,700 feet (12.6 mi.) of shoreline along the Potomac River from Mathias Point to Metomkin Point, including Chotank Creek. The segment includes 65,000 feet (12.3 mi.) of fastland.

SHORELANDS TYPE
FASTLAND: Low shore 54% (6.7 mi.), moderately low shore 16% (2.0 mi.), moderately low shore with bluff 4% (0.5 mi.), moderately high shore 8% (0.9 mi.), moderately high shore with bluff 1% (0.1 mi.), and high shore with bluff 17% (2.1 mi.).
SHORE: Artificially stabilized 16% (2.0 mi.), beach 34% (4.3 mi.), fringe marsh 4% (0.5 mi.), and embayed marsh 46% (5.8 mi.).
NEARSHORE: Narrow 17%, intermediate 21%, and wide 15%. The remainder of the shoreline is located along Chotank Creek, which is too narrow and shallow for classification.

SHORELANDS USE
FASTLAND: Agricultural 5% (0.6 mi.), recreational 8% (1.0 mi.), residential 9% (1.1 mi.), and unmanaged, wooded 78% (9.6 mi.).
SHORE: Mostly unused.
NEARSHORE: Sport boating and fishing; commercial shipping to the Washington, D.C. area.

WIND AND SEA EXPOSURE: The segment trends basically NE - SW. Fetches at Metomkin Point are NE - 7.2 nautical miles and WSW - 6.6 nautical miles.

OWNERSHIP: Private.

FLOOD HAZARD: Low, noncritical. Though some flooding could occur from Chotank Creek to Metomkin Point during a severe storm, no structures would be endangered.

WATER QUALITY: No data for the Potomac River, which is owned by Maryland. All of the Virginia tributaries to the Potomac River in this segment are closed to the taking of shellfish.

BEACH QUALITY: Fair. The beaches in this segment are clean, but fairly narrow.

PRESENT SHORE EROSION SITUATION
EROSION RATE: Moderate, noncritical. This section has an average historical erosion rate ranging from 1.2 to 2.2 feet per year. The area of most change has been around Stuart Point.
ENDANGERED STRUCTURES: None.
SHORE PROTECTIVE STRUCTURES: There are approximately 10,600 feet of artificially stabilized shoreline in the segment, most of which is rubble riprap located along the Stuart Point shoreline. All structures seem to be effective.

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

SHORE USE LIMITATIONS: This segment remains predominantly rural, with seventy-eight percent of the shorelands being unmanaged woods. There are several residential areas on Mathias Point Neck. Much of the land is actively controlled, as in the case of Stuart Point. The entire shoreline has been artificially stabilized, although most of the land is classified as unmanaged woods. Such lands are not readily available for public development.

ALTERNATE SHORE USE: Low. There seems to be little pressure or reason to develop this area.

MAPS: USGS, 7.5 Min.Ser. (Topo.), MATHIAS POINT Quadr., 1968;
USGS, 7.5 Min.Ser. (Topo.), DAHLGREN Quadr., 1968;
USGS, 7.5 Min.Ser. (Topo.), KING GEORGE Quadr., 1968.
NOS# 12093 (559), 1:40,000 scale, POTOMAC RIVER, Lower Cedar Point to Mattawoman Creek, VA-MD, 9th ed., 1971.

PHOTOS: Aerial-VIMS 4Aug77 KG-5/396-448.

SEGMENT KG-6

METOMKIN POINT TO BLACK SWAMP BRANCH

Maps 9, 10, and 11

EXTENT: 69,400 feet (13.1 mi.) of shoreline along the Potomac River from Metomkin Point to the county line on Black Swamp Branch, including part of Potomac Creek and several other smaller creeks. The segment includes 98,100 feet (18.6 mi.) of fastland.

SHORELANDS TYPE

FASTLAND: Low shore 15% (2.8 mi.), low shore with bluff 3% (0.5 mi.), moderately low shore 37% (6.9 mi.), moderately low shore with bluff 14% (2.7 mi.), moderately high shore 11% (2.1 mi.), moderately high shore with bluff 4% (0.8 mi.), high shore 9% (1.8 mi.), and high shore with bluff 6% (1.1 mi.).

SHORE: Artificially stabilized 10% (1.4 mi.), beach 59% (7.8 mi.), fringe marsh 16% (2.1 mi.), and embayed marsh 14% (1.9 mi.).

NEARSHORE: Narrow 31%, intermediate 20%, and wide 20%. The remainder of the shoreline is located on Potomac Creek, which is too shallow for classification.

SHORELANDS USE

FASTLAND: Agricultural 24% (4.5 mi.), commercial 1% (0.2 mi.), recreational 1% (0.2 mi.), residential 8% (1.6 mi.), unmanaged, wooded 61% (11.3 mi.), and unmanaged, unwooded 4% (0.8 mi.).

SHORE: Mostly unused; some access to the water at residential areas.

NEARSHORE: Sport boating and fishing; commercial shipping to the Washington, D.C. area.

WIND AND SEA EXPOSURE: The river shoreline trends basically ENE - WSW to Bull Bluff. Potomac Creek trends basically E - W. Fetches at Passapatanzy Creek are N - 11 nautical miles and NE - 25.2 nautical miles.

OWNERSHIP: Private.

FLOOD HAZARD: Low, noncritical. Although several areas have elevations less than 10 feet, little flooding would occur in the segment and no structures are endangered.

WATER QUALITY: No data for the Potomac River. All of the Virginia tributaries to the Potomac River in this segment are closed to the taking of shellfish.

BEACH QUALITY: Poor to fair. The beaches in this segment are generally narrow fringes along the shore. The only fair beach is at Belvedere Beach, which is now unused.

PRESENT SHORE EROSION SITUATION

EROSION RATE: No data. Recent field investigations reveal that slight to moderate erosion is occurring along several sections of the segment, especially near Passapatanzy Creek and at Fairview Beach. Natural slumping of the bluffs along this section of the county is mostly due to downhill rain runoff.

ENDANGERED STRUCTURES: None.

SHORE PROTECTIVE STRUCTURES: There are approximately 7,200 feet of artificially stabilized shoreline in the segment, of which 2,400 feet are bulkhead and the rest riprap. The 4,800 feet of riprap is found at the base of Bull Bluff. Aerial photography of the area shows stone rubble at the cliff base. However, this may be due to natural causes rather than man's efforts.

OTHER SHORE STRUCTURES: There are many docks at the two marinas located in the segment. Numerous piers and several launching ramps are also located in the segment.

SHORE USE LIMITATIONS: Twenty-seven percent of the shorelands (almost fifty percent of the river-fronting shorelands) are bluff areas, which inhibits access to the water. The segment continues to be basically rural in nature, with sixty-five percent of the shorelands unused and twenty-four percent used for agriculture.

ALTERNATE SHORE USE: Low. Some continued development is expected at the Fairview Beach area. However, there seems to be little pressure to develop other sections of the shoreline at the present time.

MAPS: USGS, 7.5 Min.Ser. (Topo.), PASSAPATANZY Quadr., 1966;
USGS, 7.5 Min.Ser. (Topo.), KING GEORGE Quadr., 1968.

NOS# 12288 (559), 1:40,000 scale, POTOMAC RIVER, Lower Cedar Point to Mattawoman Creek, VA-MD, 9th ed., 1971.

PHOTOS: Aerial-VIMS 4Aug77 KG-6/449-478;
28Dec77 KG-6/479-523.

SUBSEGMENT CA-1A

PORTOBAGO CREEK TO THE JAMES MADISON BRIDGE

Maps 2 and 3

EXTENT: 66,700 feet (12.6 mi.) of shoreline along the Rappahannock River from Portobago Creek to the James Madison Memorial Bridge, including Mill Creek. The subsegment has a fastland measurement of 70,200 feet (13.3 mi.).

SHORELANDS TYPE
FASTLAND: Low shore 14% (1.8 mi.), moderately low shore 59% (7.8 mi.), moderately low shore with bluff 19% (2.5 mi.), and moderately high shore 9% (1.2 mi.).
SHORE: Artificially stabilized <1% (0.1 mi.), beach 11% (1.5 mi.), fringe marsh 34% (4.3 mi.), embayed marsh 24% (3.0 mi.), and extensive marsh 30% (3.8 mi.).
NEARSHORE: Narrow 31%, intermediate 7%, and wide 13%. The remainder of the nearshore zone is located along marsh creeks which are too narrow and shallow for classification.

SHORELANDS USE
FASTLAND: Agricultural 53% (7.1 mi.), recreational 2% (0.2 mi.), residential 1% (0.2 mi.), and unmanaged, wooded 44% (5.8 mi.).
SHORE: Mostly unused.
NEARSHORE: Commercial shipping, sport boating and fishing.

SHORELINE TREND: The shoreline in this subsegment trends basically SE - NW through a series of large meanders.

OWNERSHIP: Private.

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

WATER QUALITY: Unsatisfactory. This portion of the Rappahannock River does not meet the State Water Control Board's 305(b)(1)(B) criteria.

BEACH QUALITY: Fair. There are several areas of narrow, strip beaches, mostly found in the Portobago Bay area.

PRESENT SHORE EROSION SITUATION
EROSION RATE: Slight or no change to moderate, noncritical. The stretch of shoreline from the marsh north of Portobago Bay to Mill Creek has an average historical erosion rate of 1.5 feet per year.
ENDANGERED STRUCTURES: None.
SHORE PROTECTIVE STRUCTURES: There are approximately 200 feet of wooden bulkhead located at the base of a cliff just north of Portobago Bay. This structure appears to be mostly ineffective, as it has now been flanked and erosion is continuing.

OTHER SHORE STRUCTURES: There are several piers and two graded sand launching ramps in the subsegment.

SHORE USE LIMITATIONS: Most of the shoreline is farmed, and any development would be at the loss of these agricultural lands. The extensive marshes in the upper Rappahannock River are very valuable as spawning and nursery grounds for a variety of fish and wildlife, and should be left in their natural state. The area looses some of its water-related value for the residential development because of the poor water quality.

ALTERNATE SHORE USE: Low. As this area is still rural in nature there seems little demand for public recreational facilities. Any residential development should take care not to destroy the marshes or further degrade the water quality.

MAPS: USGS, 7.5 Min.Ser. (Topo.), ROLLINS FORK Quadr., 1968;
USGS, 7.5 Min.Ser. (Topo.), PORT ROYAL Quadr., 1968.
NOS# 12237 (605-SC), 1:20,000 scale, RAPPAHANNOCK RIVER, Corrotoman River to Fredericksburg, VA, 12th ed., 1975.

PHOTOS: Aerial-VIMS 15Jan76 CA-1A/01-46.

SUBSEGMENT CA-1B

JAMES MADISON BRIDGE TO WHITE MARSH

Maps 3 and 4

EXTENT: 86,600 feet (16.4 mi.) of shoreline along the Rappahannock River from the James Madison Memorial Bridge to White Marsh. The subsegment also contains 87,000 feet (16.5 mi.) of fastland.

SHORELANDS TYPE
FASTLAND: Low shore 41% (6.8 mi.), moderately low shore 18% (3.0 mi.), moderately low shore with bluff 6% (1.1 mi.), moderately high shore 12% (2.0 mi.), moderately high shore with bluff 7% (1.1 mi.), high shore 5% (0.8 mi.), and high shore with bluff 10% (1.6 mi.).
SHORE: Artificially stabilized <1% (0.1 mi.), fringe marsh 50% (8.2 mi.), embayed marsh 13% (2.1 mi.), and extensive marsh 37% (6.1 mi.).
NEARSHORE: Narrow 71%. The remainder of the nearshore zone is located along marsh creeks which are too narrow and shallow for classification.

SHORELANDS USE
FASTLAND: Agricultural 49% (8.1 mi.), industrial <1% (0.1 mi.), and unmanaged, wooded 50% (8.3 mi.).
SHORE: Mostly unused except for the gravel pits opposite Goat Island.
NEARSHORE: Commercial traffic, sport boating and fishing.

SHORELINE TREND: The shoreline of this subsegment trends basically SE - NW from the James Madison Bridge to the Cleve Marsh area, then S - N to White Marsh, through a series of meanders.

OWNERSHIP: Private.

FLOOD HAZARD: Low. Most of the shoreline has elevations of 30 feet or higher and is not subject to flooding. The fastland located directly behind the marshes could be flooded during periods of abnormally high water.

WATER QUALITY: Unsatisfactory. This portion of the Rappahannock River does not meet the State Water Control Board's 305(b)(1)(B) criteria.

BEACH QUALITY: There are no beaches in this subsegment.

PRESENT SHORE EROSION SITUATION
EROSION RATE: Slight or no change. There is some slight erosion on the outside bend of the meanders, especially at the base of the cliffs. The marsh area opposite Cleve Marsh has an average historical accretion rate of 2.9 feet per year.
ENDANGERED STRUCTURES: A road opposite Goat Island is endangered by erosion and some form of protective structure should be employed in the near future.
SHORE PROTECTIVE STRUCTURES: There is some artificial stabilization located at the base of the James Madison Bridge.

OTHER SHORE STRUCTURES: The James Madison Memorial Bridge is located in this subsegment.

SHORE USE LIMITATIONS: The only area not used for agriculture is around Moons Mount Wharf. There elevations reach 150 feet and make access to the water difficult. The upper Rappahannock River has some extensive marsh systems used as spawning and nursery grounds by a variety of fish and wildlife. These marshes should be left in their natural state.

ALTERNATE SHORE USE: Low. There seems little demand for public recreational facilities in this area as it is still very rural in nature. Any residential development must take care to maintain the marshes and not further degrade the water quality in this area.

MAPS: USGS, 7.5 Min.Ser. (Topo.), PORT ROYAL Quadr., 1968;
USGS, 7.5 Min.Ser. (Topo.), RAPPAHANNOCK ACADEMY Quadr., 1969.
NOS# 12237 (605-SC), 1:20,000 scale, RAPPAHANNOCK RIVER, Corrotoman River to Fredericksburg, VA, 12th ed., 1975.

PHOTOS: Aerial-VIMS 15Jan76 CA-1B/47-136.

SUBSEGMENT CA-1C

WHITE MARSH TO COUNTY LINE

Maps 4 and 5

EXTENT: 71,800 feet (13.6 mi.) of shoreline along the Rappahannock River from White Marsh to the county line. The subsegment also contains 82,500 feet (15.6 mi.) of fastland.

SHORELANDS TYPE
FASTLAND: Low shore 43% (6.8 mi.), moderately low shore 14% (2.3 mi.), moderately low shore with bluff 1% (0.2 mi.), moderately high shore 20% (3.1 mi.), moderately high shore with bluff 7% (1.1 mi.), high shore 2% (0.3 mi.), and high shore with bluff 12% (1.9 mi.).
SHORE: Fringe marsh 60% (8.1 mi.) and extensive marsh 40% (5.5 mi.).
NEARSHORE: Narrow 83%. The remainder of the nearshore zone is located along marsh creeks which are too narrow and shallow for classification.

SHORELANDS USE
FASTLAND: Agricultural 77% (12.1 mi.), unmanaged, wooded 16% (2.5 mi.), and unmanaged, unwooded 6% (1.0 mi.).
SHORE: Mostly unused.
NEARSHORE: Commercial traffic, sport boating and fishing.

SHORELINE TREND: The shoreline of this subsegment trends basically E - W through a series of meanders.

OWNERSHIP: Private.

FLOOD HAZARD: Low. The majority of the fastland is high enough to withstand flooding. Only the fastland directly behind the marshes could be flooded during periods of abnormally high water.

WATER QUALITY: Unsatisfactory. This section of the Rappahannock River does not meet the State Water Control Board's 305(b)(1)(B) criteria.

BEACH QUALITY: There are no beaches in this subsegment.

PRESENT SHORE EROSION SITUATION
EROSION RATE: Slight or no change to moderate, noncritical. Most of the erosion is taking place on the outside bends of the meanders. Areas like Skinkers and Moss Necks are experiencing accretion rates of up to 2.0 feet per year.
ENDANGERED STRUCTURES: None.
SHORE PROTECTIVE STRUCTURES: None.

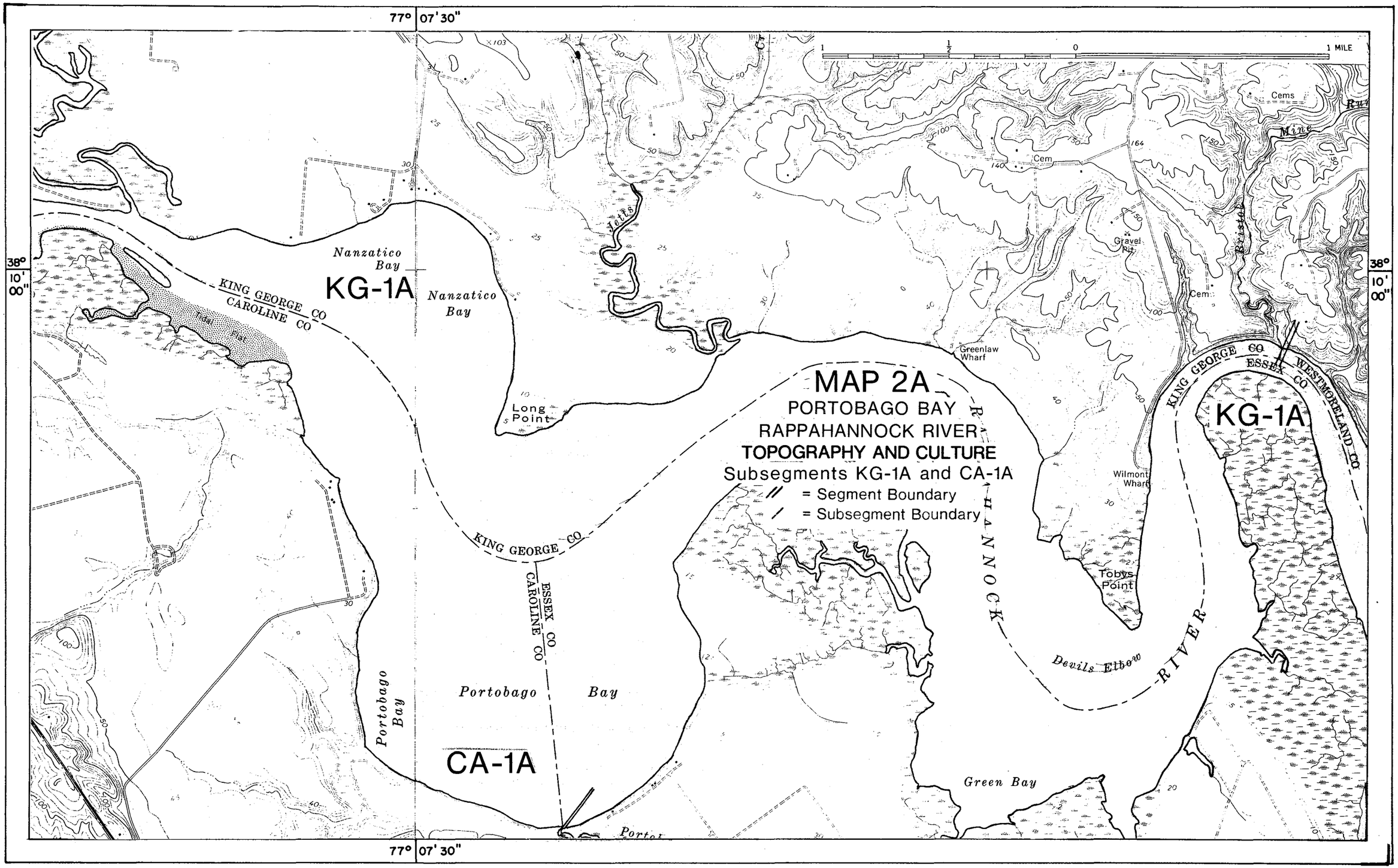
OTHER SHORE STRUCTURES: There is one pier located just to the west of Skinkers Marsh.

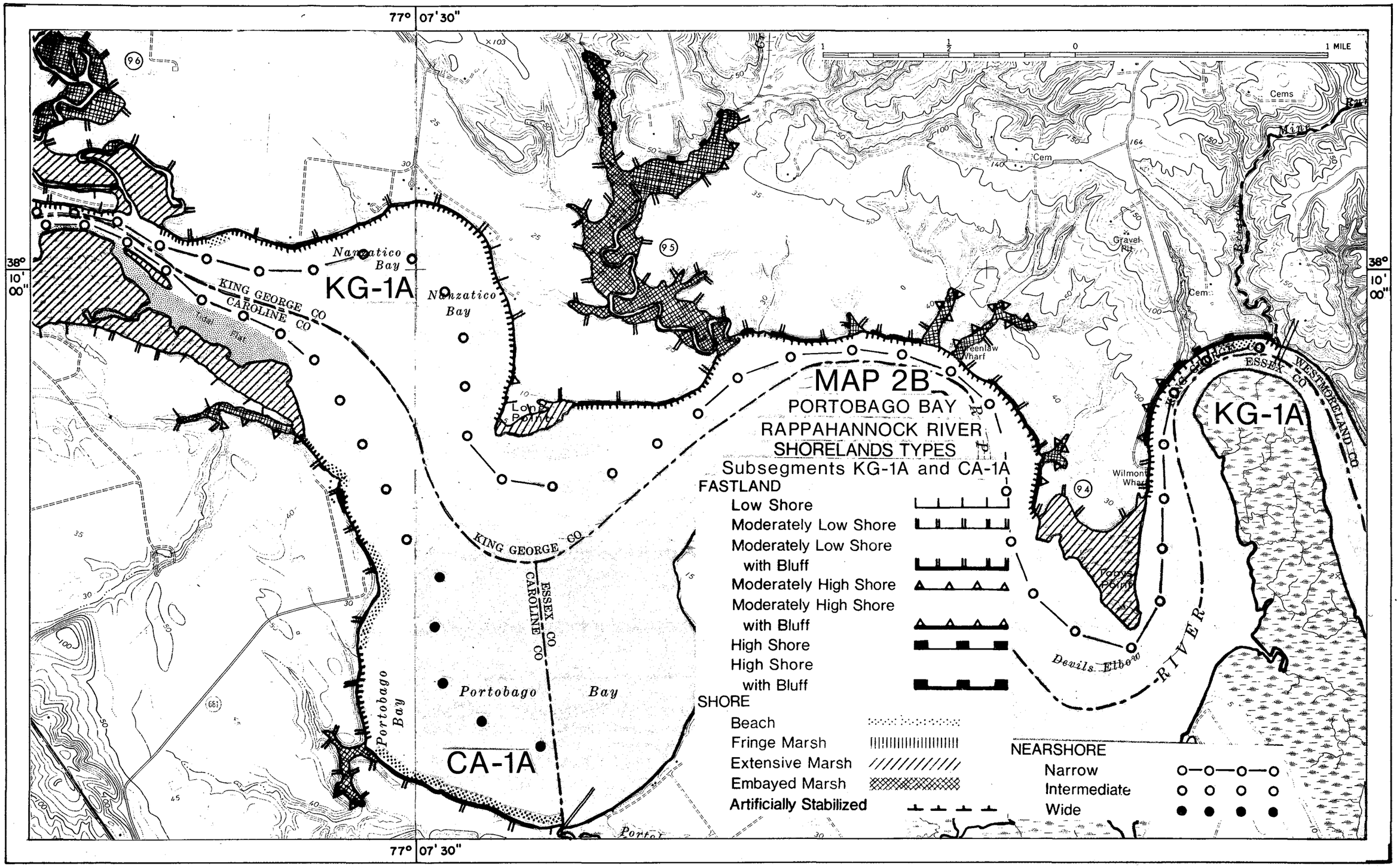
SHORE USE LIMITATIONS: Most of the shorelands are already used for agricultural purposes. The only unused section of land, opposite Corbins Neck, has elevations of 100 feet or more, making access to the water difficult. The upper portion of the Rappahannock River has some valuable marsh systems used by a variety of fish and wildlife as spawning and nursery grounds. These marshes should be left in their natural state.

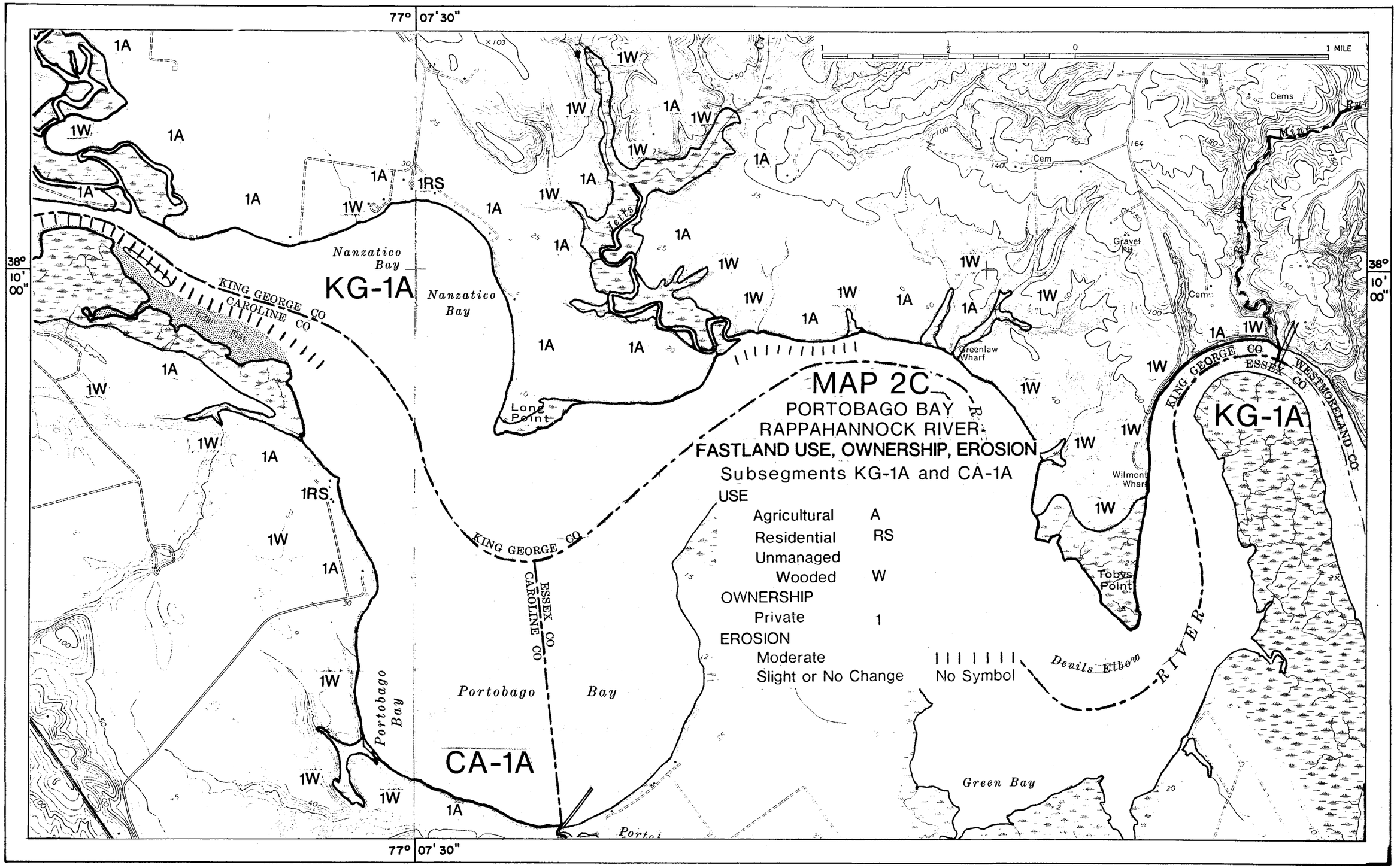
ALTERNATE SHORE USE: Low. As this county is still very rural in nature there seems to be little demand for public recreational facilities. Any residential development should take care not to further degrade the water quality of this area.

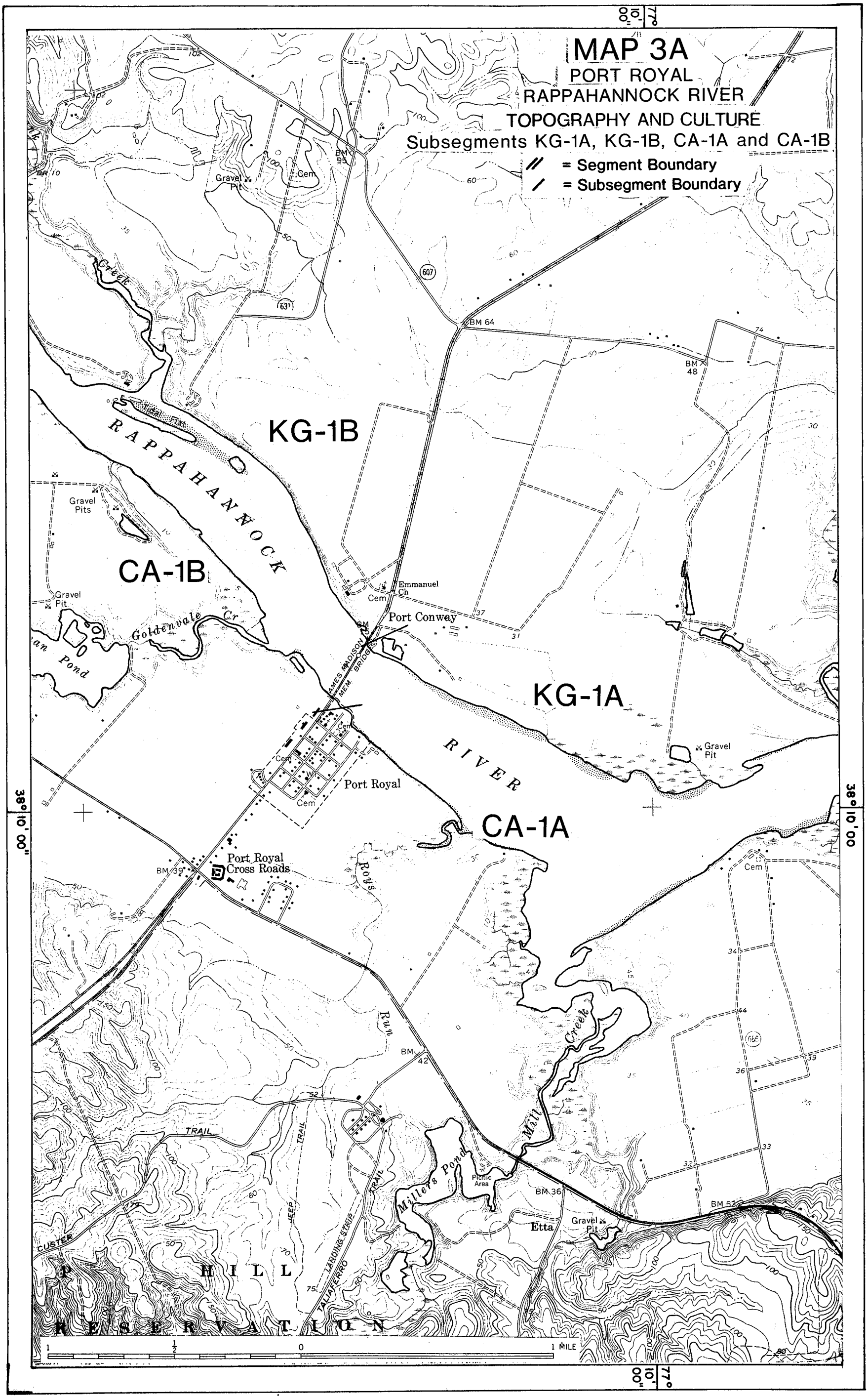
MAPS: USGS, 7.5 Min.Ser. (Topo.), PORT ROYAL Quadr., 1968;
USGS, 7.5 Min.Ser. (Topo.), RAPPAHANNOCK ACADEMY Quadr., 1969;
USGS, 7.5 Min.Ser. (Topo.), PASSAPATANZY Quadr., 1966.
NOS# 12237 (605-SC), 1:20,000 scale, RAPPAHANNOCK RIVER, Corrotoman River to Fredericksburg, VA, 12th ed., 1975.

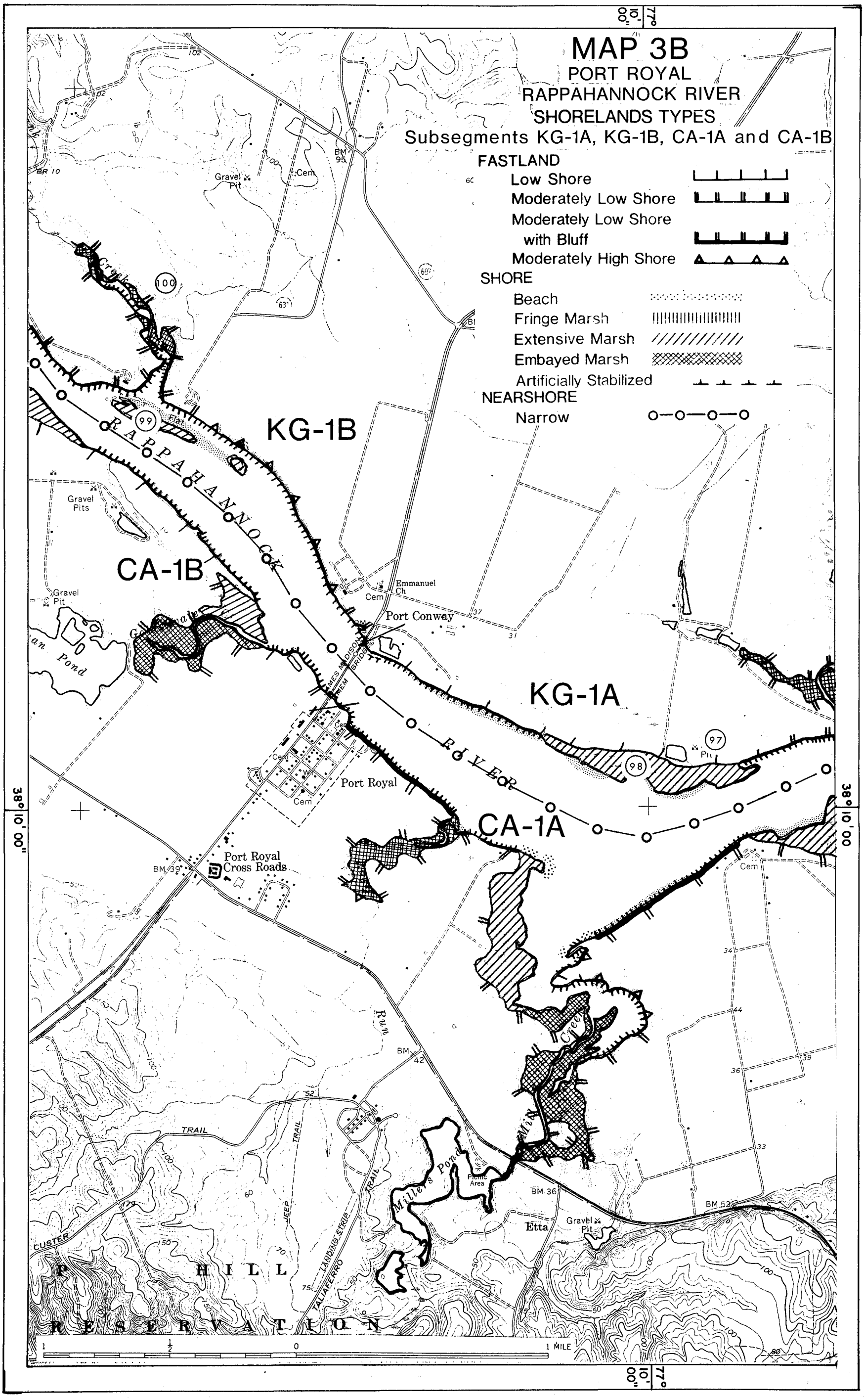
PHOTOS: Aerial-VIMS 15Jan76 CA-1C/137-156;
19Jul77 CA-1C/157-196.

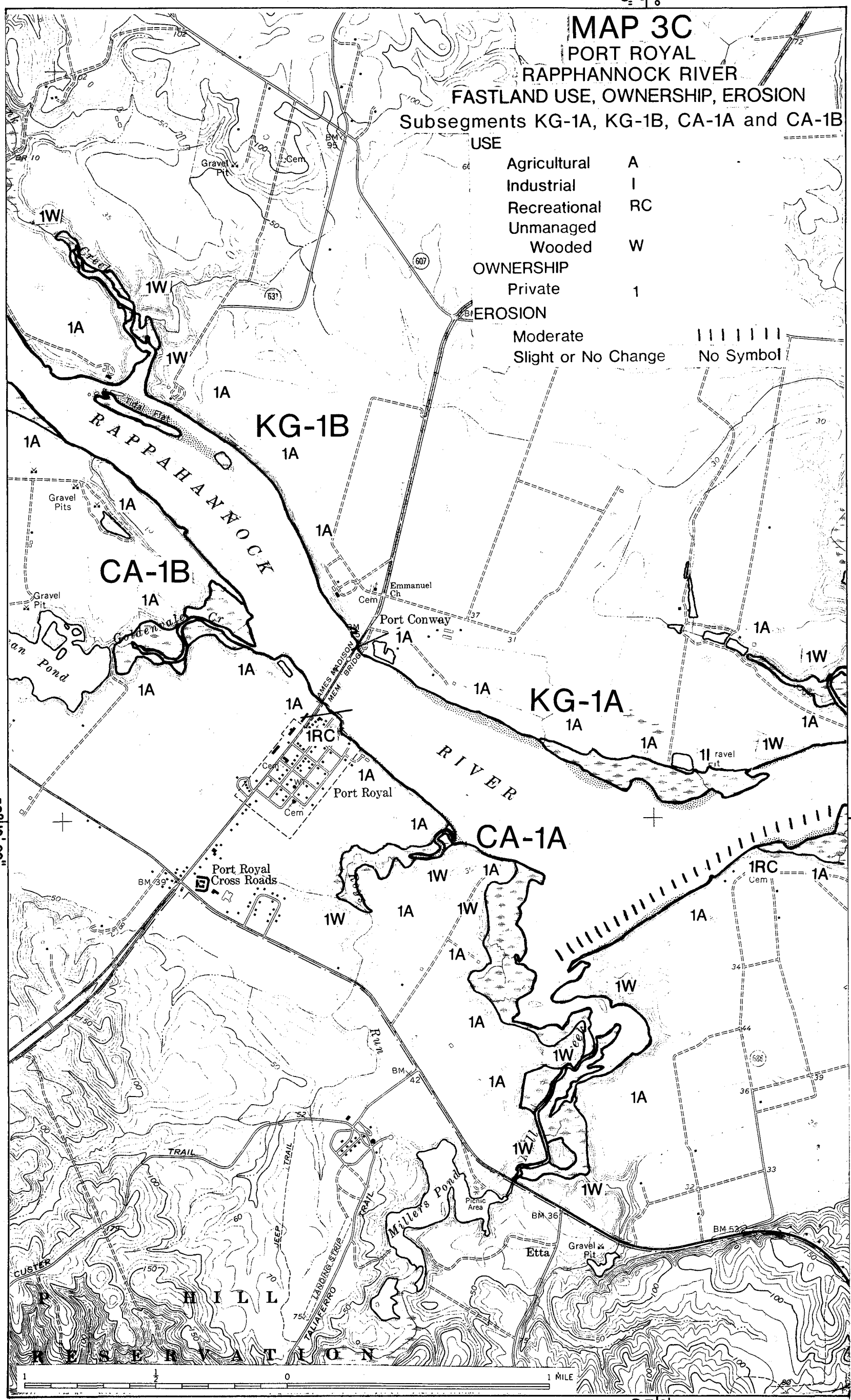

MAP 2A
PORTOBAGO BAY
RAPPAHANNOCK RIVER
TOPOGRAPHY AND CULTURE
Subsegments KG-1A and CA-1A
= Segment Boundary
= Subsegment Boundary
KG-1A
CA-1A
Nanzatico Bay
Nanzatico Bay
Portobago Bay
Portobago Bay
Green Bay
Devils Elbow
RIVER
RAPPAHANNOCK
KING GEORGE CO
CAROLINE CO
ESSEX CO
WESTMORELAND CO
Long Point
Greenlaw Wharf
Wilmont Wharf
Tobys Point
Gravel Pit
Cem
Cems
Mine
Tidal Flat
77° 07' 30"
38° 10' 00"
1 MILE

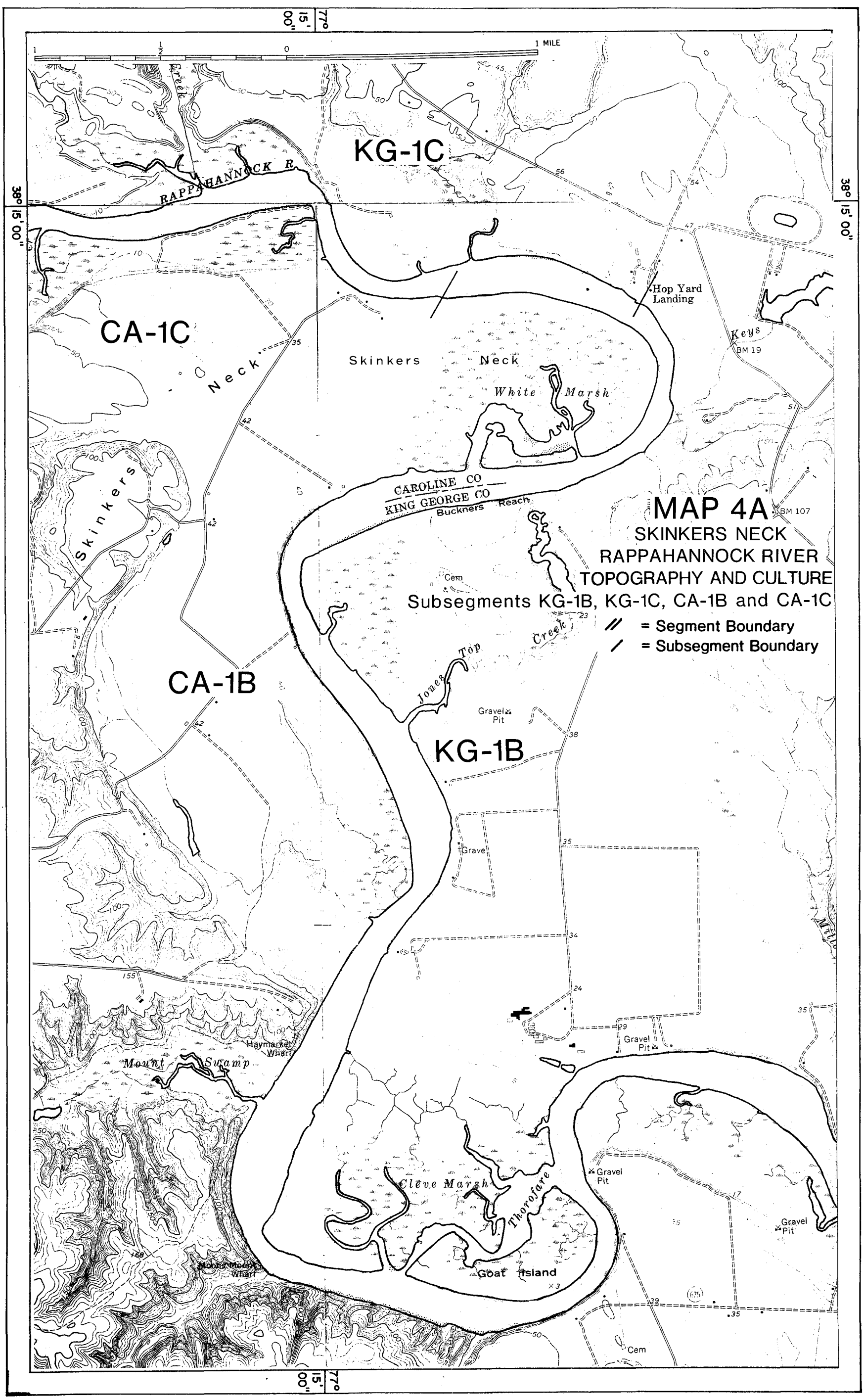

77° 07'30"
38° 10' 00"
1 MILE
KG-1A
KING GEORGE CO
CAROLINE CO
Nanzatico Bay
Portobago Bay
CA-1A
ESSEX CO
Devils Elbow
RIVER
Wilmont Wharf
Greenlaw Wharf
Cems
Cem
Gravel Pit
MAP 2B
PORTOBAGO BAY
RAPPAHANNOCK RIVER
SHORELANDS TYPES
Subsegments KG-1A and CA-1A
FASTLAND
Low Shore
Moderately Low Shore
Moderately Low Shore with Bluff
Moderately High Shore
Moderately High Shore with Bluff
High Shore
High Shore with Bluff
SHORE
Beach
Fringe Marsh
Extensive Marsh
Embayed Marsh
Artificially Stabilized
NEARSHORE
Narrow
Intermediate
Wide

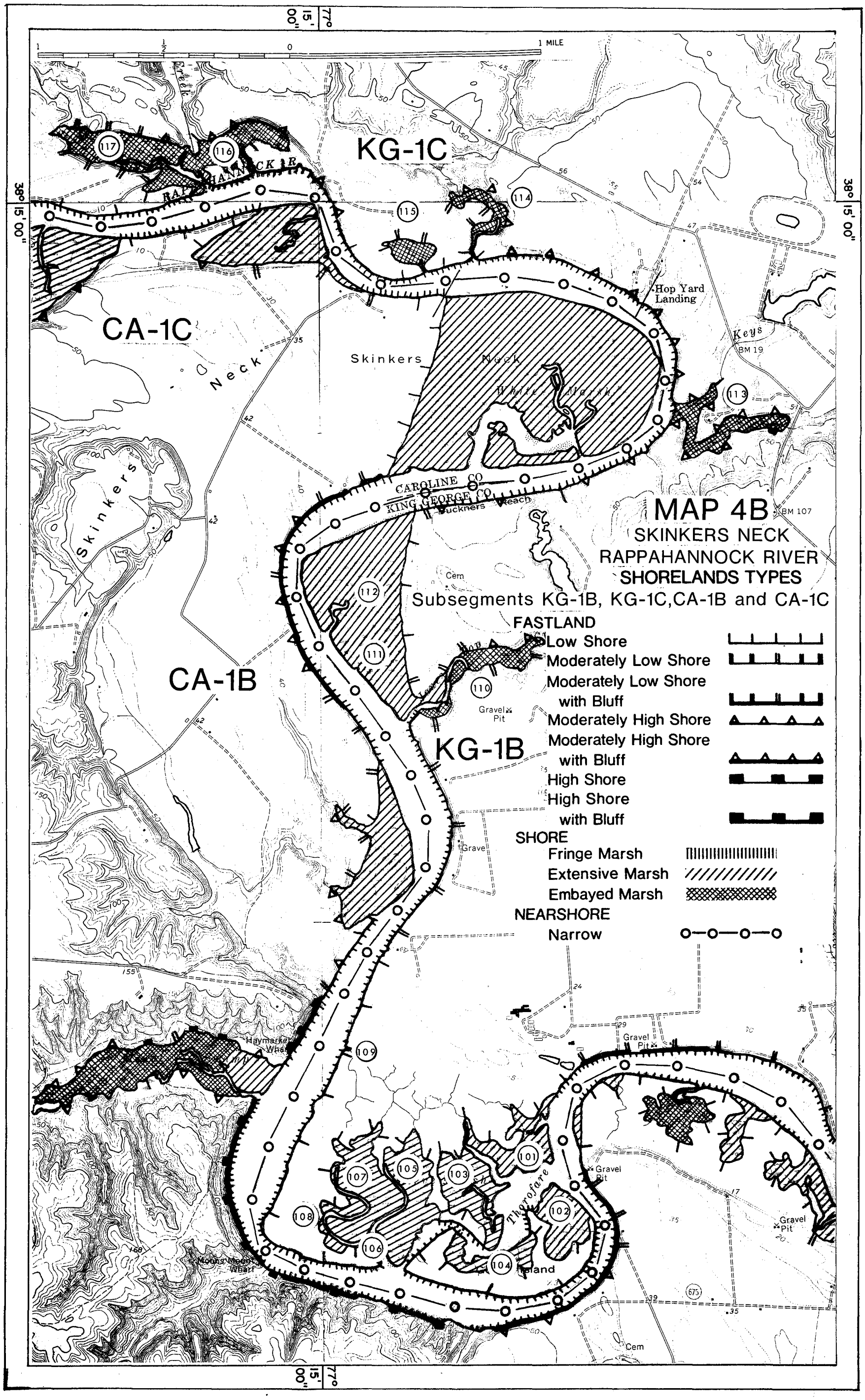

MAP 2C
PORTOBAGO BAY
RAPPAHANNOCK RIVER
FASTLAND USE, OWNERSHIP, EROSION
Subsegments KG-1A and CA-1A
USE
Agricultural A
Residential RS
Unmanaged
Wooded W
OWNERSHIP
Private 1
EROSION
Moderate
Slight or No Change No Symbol
KG-1A
CA-1A
Nanzatico Bay
Portobago Bay
Green Bay
Devils Elbow
RIVER
KING GEORGE CO
CAROLINE CO
ESSEX CO
WESTMORELAND CO
Long Point
Tobys Point
Greenlaw Wharf
Wilmont Wharf
Gravel Pit
Cem
Cems
77° 07' 30"
38° 10' 00"
1 MILE

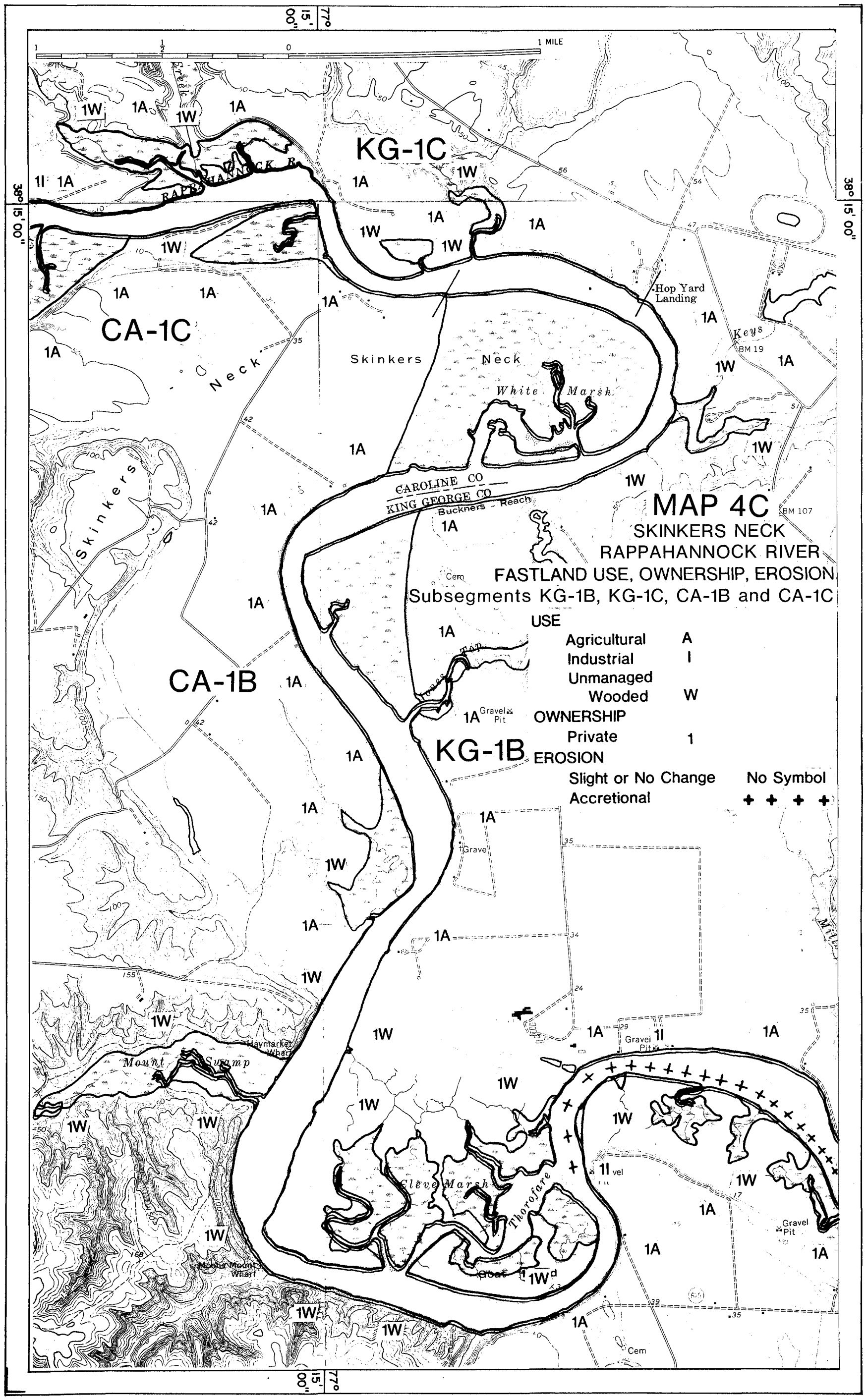

MAP 3A
PORT ROYAL
RAPPAHANNOCK RIVER
TOPOGRAPHY AND CULTURE
Subsegments KG-1A, KG-1B, CA-1A and CA-1B
// = Segment Boundary
/ = Subsegment Boundary
KG-1B
CA-1B
KG-1A
CA-1A
RAPPAHANNOCK
RIVER
Tidal Flat
Gravel Pit
Gravel Pits
Cem
BM 95
BM 64
BM 48
BM 39
BM 42
BM 36
Emmanuel Ch
Port Conway
JAMES MADISON MEM. BRIDGE
Goldenvale Cr
Pond
Port Royal
Port Royal Cross Roads
Roys Run
Mill Creek
Millers Pond
Picnic Area
Etta
TRAIL
JEEP TRAIL
TALIAFERRO LANDING STRIP
CUSTER
P H I L L
R E S E R V A T I O N
1 ½ 0 1 MILE
38° 10' 00"
77° 10' 00"

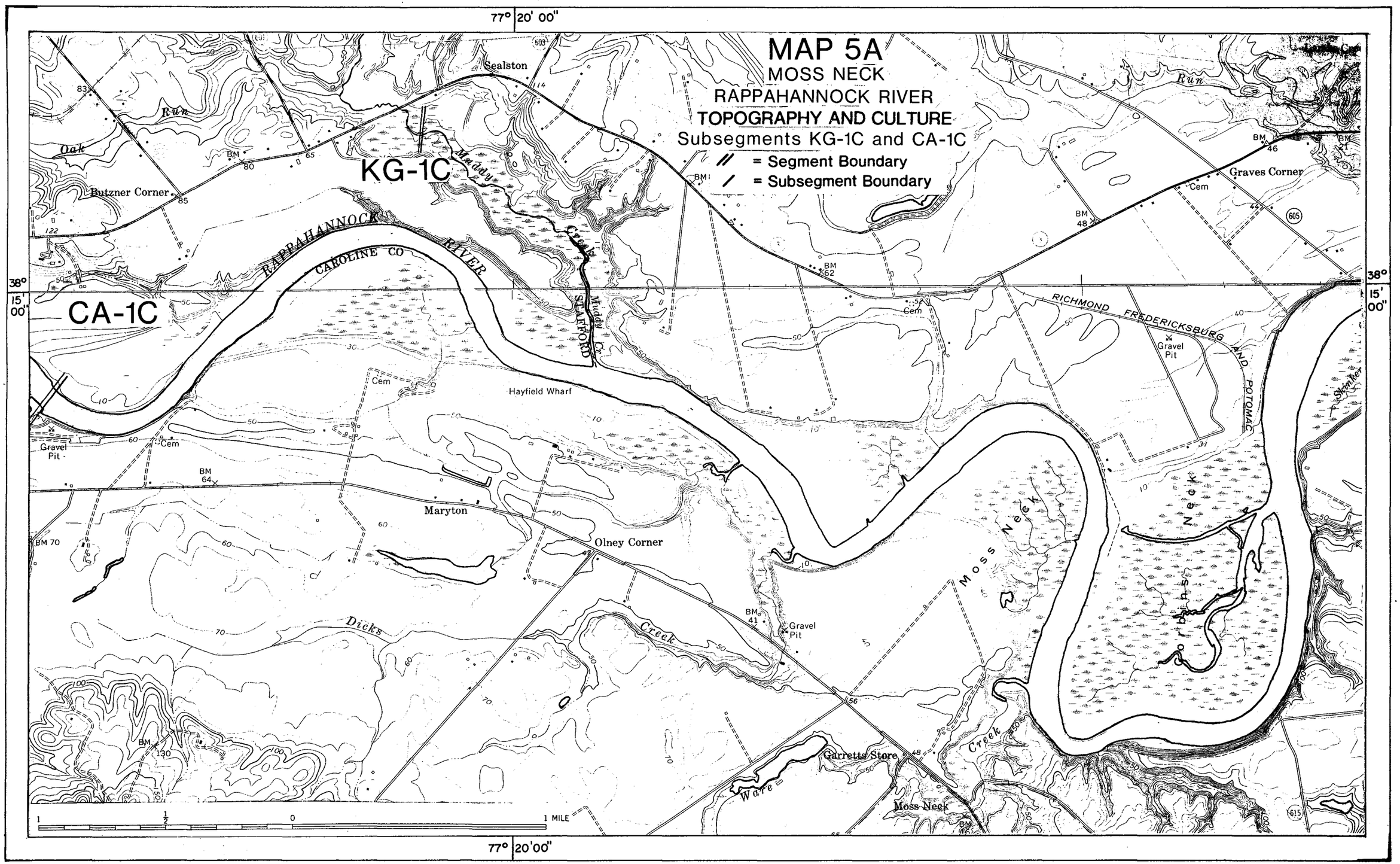

MAP 3B
PORT ROYAL
RAPPAHANNOCK RIVER
SHORELANDS TYPES
Subsegments KG-1A, KG-1B, CA-1A and CA-1B
FASTLAND
Low Shore
Moderately Low Shore
Moderately Low Shore with Bluff
Moderately High Shore
SHORE
Beach
Fringe Marsh
Extensive Marsh
Embayed Marsh
Artificially Stabilized
NEARSHORE
Narrow
KG-1B
CA-1B
KG-1A
CA-1A
RAPPAHANNOCK RIVER
Port Conway
Port Royal
Port Royal Cross Roads
Emmanuel Ch
Etta
Millers Pond
Picnic Area
Gravel Pit
Gravel Pits
Cem
BM 95
BM 39
BM 42
BM 36
BM 53
TRAIL
JEEP TRAIL
LANDING STRIP
TALIAFERRO
CUSTER
HILL
RESERVATION
1 MILE
38° 10' 00"
77° 10' 00"

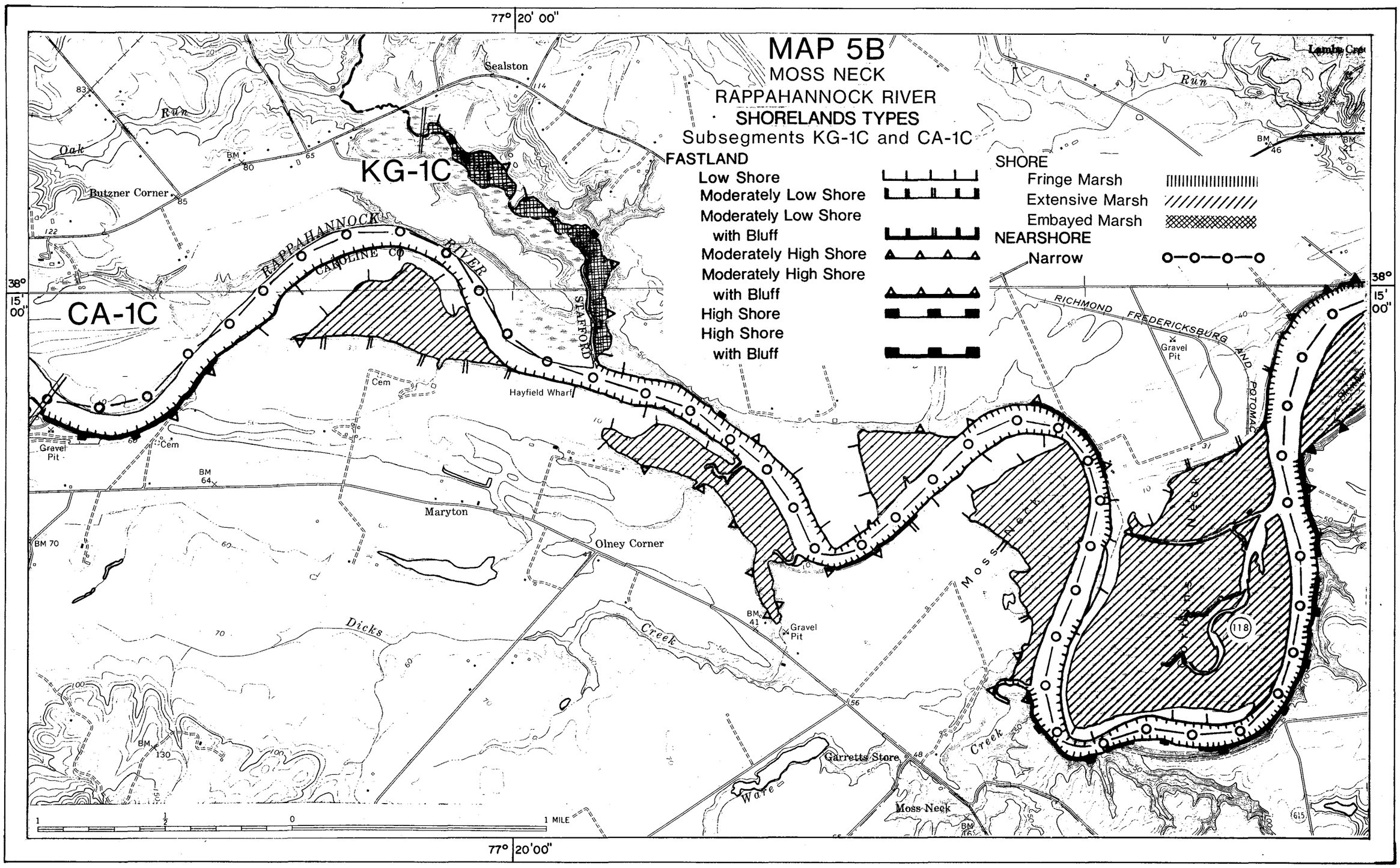

MAP 3C
PORT ROYAL
RAPPHANNOCK RIVER
FASTLAND USE, OWNERSHIP, EROSION
Subsegments KG-1A, KG-1B, CA-1A and CA-1B
USE
Agricultural A
Industrial I
Recreational RC
Unmanaged
Wooded W
OWNERSHIP
Private 1
EROSION
Moderate
Slight or No Change No Symbol
KG-1B
CA-1B
KG-1A
CA-1A
RAPPAHANNOCK
RIVER
Port Conway
Port Royal
Port Royal Cross Roads
Emmanuel Ch
Gravel Pit
Gravel Pits
Millers Pond
Picnic Area
Etta
P I L L
R E S E R V A T I O N
TRAIL
JEEP
LANDING STRIP
TALIAFERRO
CUSTER
JAMES MADISON MEM BRIDGE
38° 10' 00"
77° 10' 00"
1 MILE

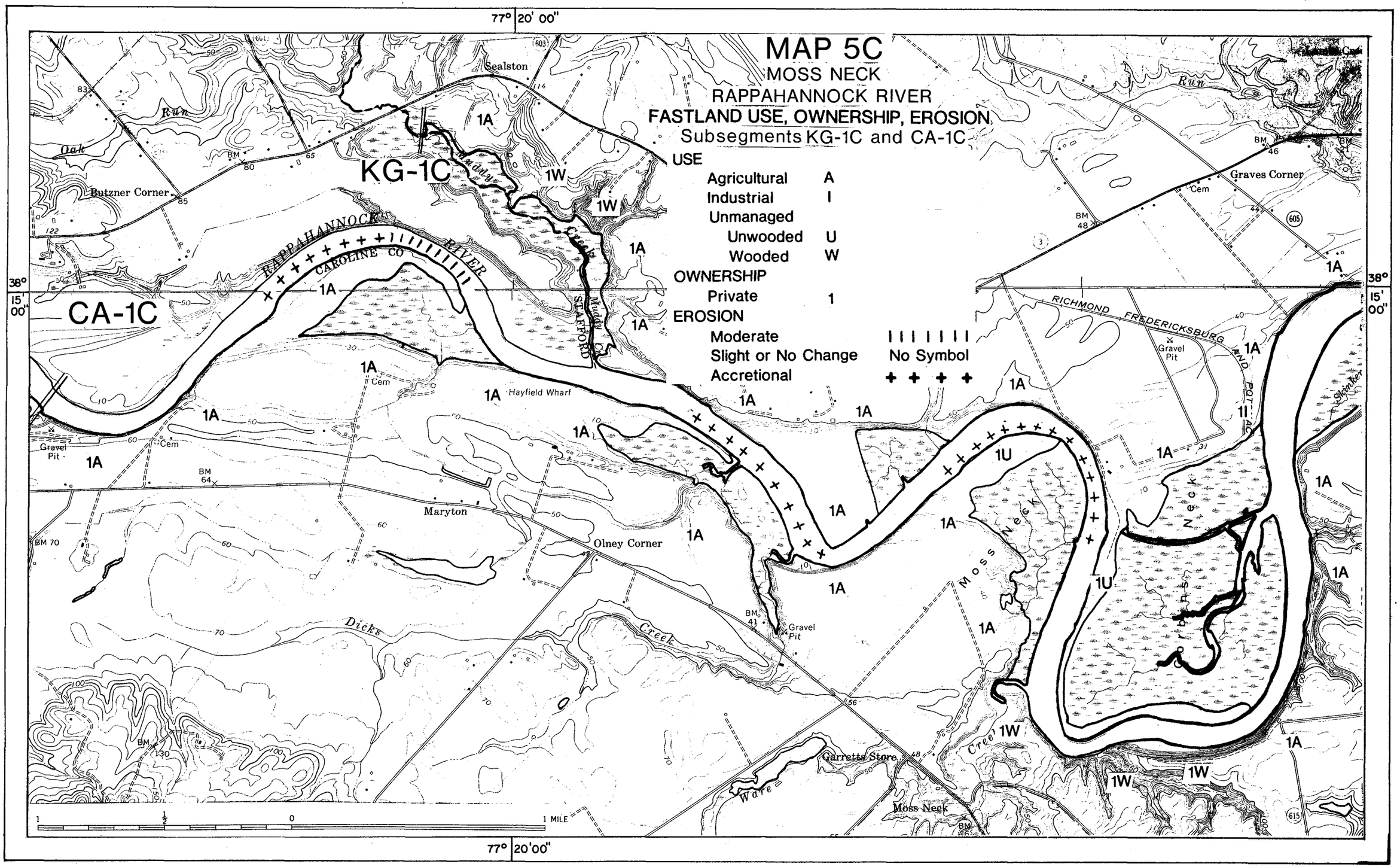

MAP 4A
SKINKERS NECK
RAPPAHANNOCK RIVER
TOPOGRAPHY AND CULTURE
Subsegments KG-1B, KG-1C, CA-1B and CA-1C
// = Segment Boundary
/ = Subsegment Boundary
KG-1C
CA-1C
CA-1B
KG-1B
RAPPAHANNOCK R
Skinkers Neck
White Marsh
Hop Yard Landing
Keys
BM 19
BM 107
CAROLINE CO
KING GEORGE CO
Buckners Reach
Cem
Jones Top Creek
Gravel Pit
Grave
Haymarket Wharf
Mount Swamp
Moons Mount Wharf
Cleve Marsh
Thorofare
Goat Island
1 MILE
38° 15' 00"
77° 15' 00"

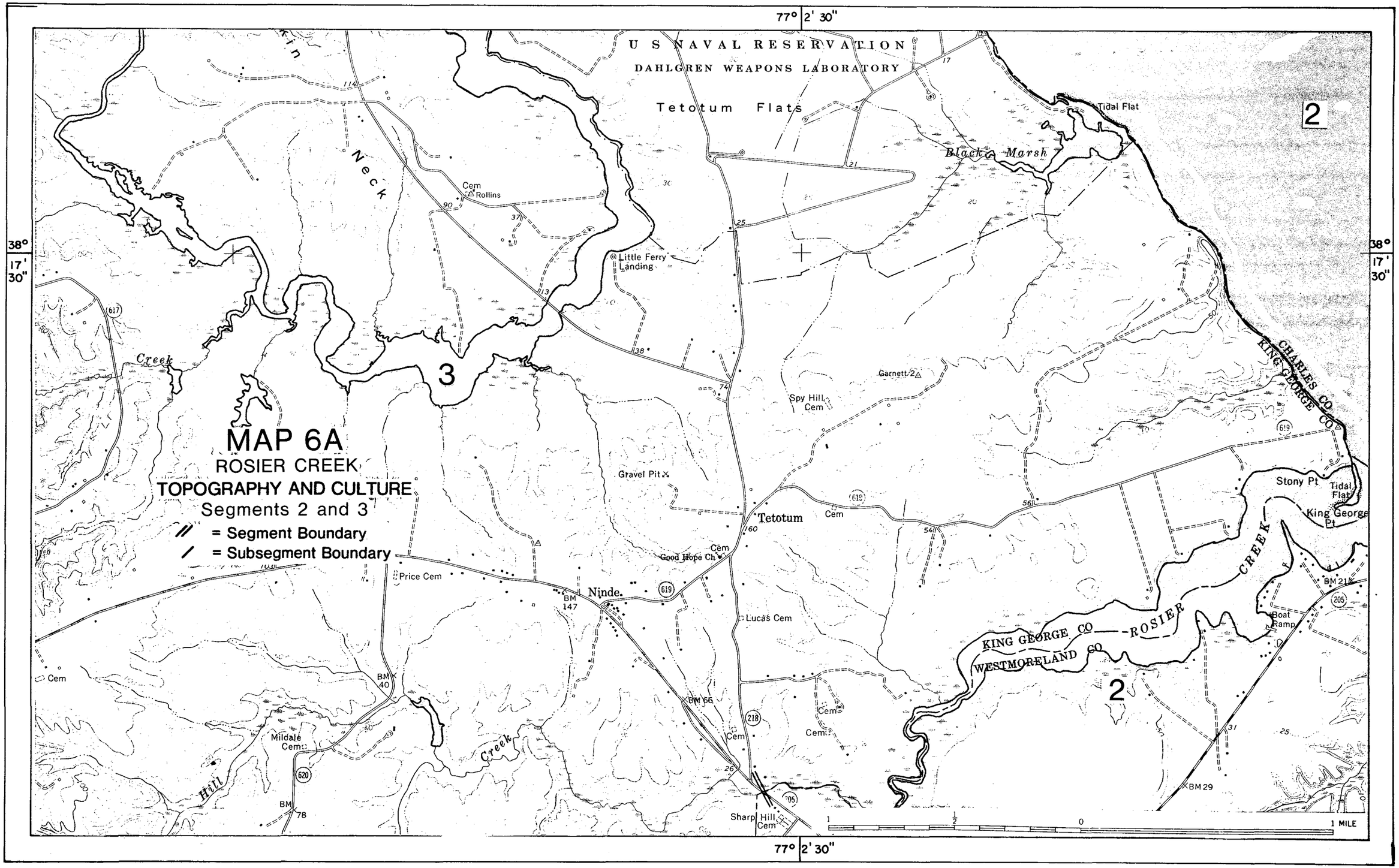

MAP 4B
SKINKERS NECK
RAPPAHANNOCK RIVER
SHORELANDS TYPES
Subsegments KG-1B, KG-1C, CA-1B and CA-1C
FASTLAND
Low Shore
Moderately Low Shore
Moderately Low Shore with Bluff
Moderately High Shore
Moderately High Shore with Bluff
High Shore
High Shore with Bluff
SHORE
Fringe Marsh
Extensive Marsh
Embayed Marsh
NEARSHORE
Narrow
KG-1C
CA-1C
CA-1B
KG-1B
Skinkers Neck
Hop Yard Landing
Keys
BM 19
BM 107
CAROLINE CO
KING GEORGE CO
Buckners Reach
Gravel Pit
Cem
Haymarket Wharf
Moons Mount Wharf
Thorofare
Island
1 MILE
77° 15' 00"
38° 15' 00"

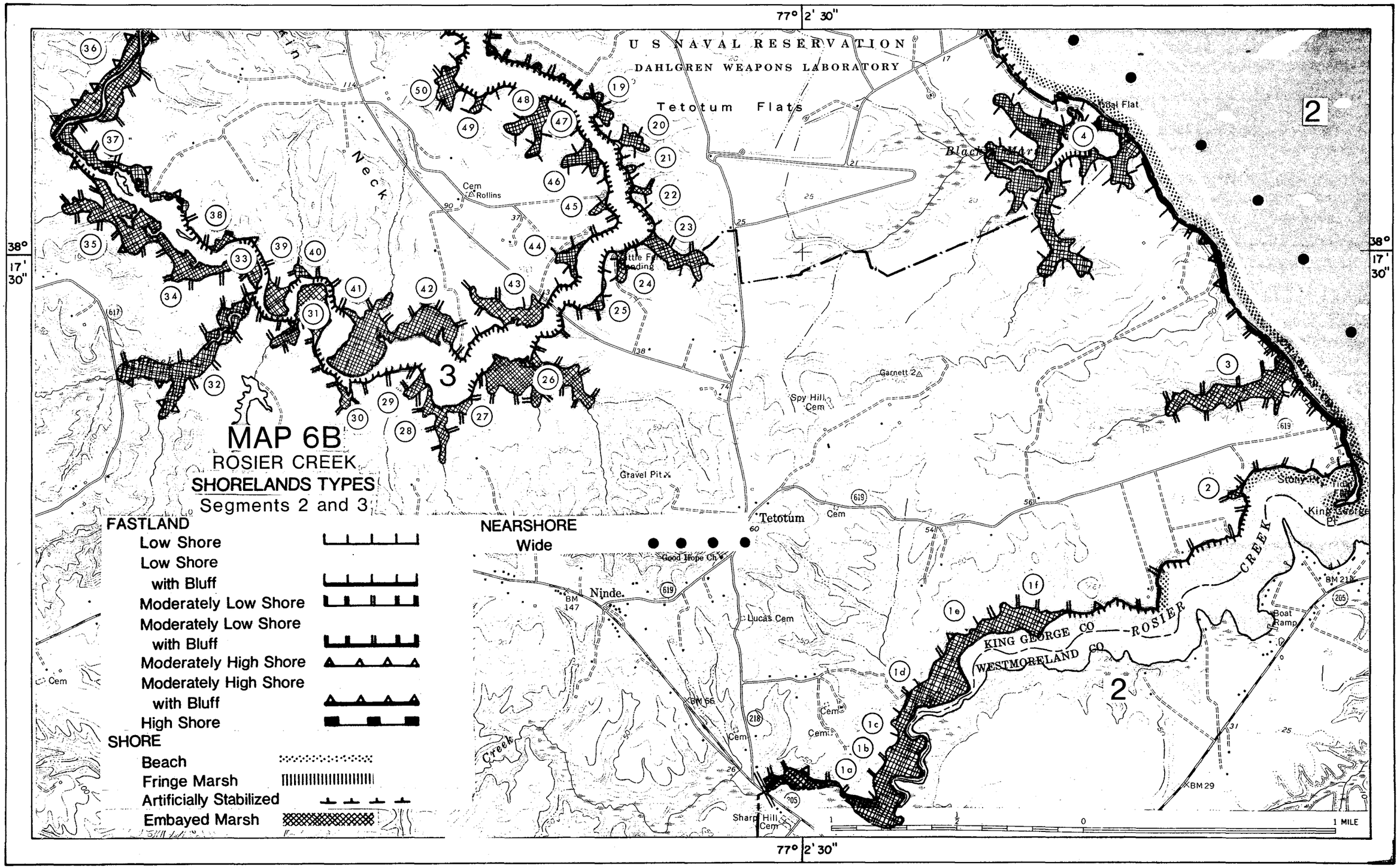

MAP 4C
SKINKERS NECK
RAPPAHANNOCK RIVER
FASTLAND USE, OWNERSHIP, EROSION
Subsegments KG-1B, KG-1C, CA-1B and CA-1C
USE
Agricultural A
Industrial I
Unmanaged Wooded W
OWNERSHIP
Private 1
EROSION
Slight or No Change No Symbol
Accretional + + + +
KG-1C
CA-1C
CA-1B
KG-1B
Skinkers Neck
White Marsh
Hop Yard Landing
Keys
CAROLINE CO
KING GEORGE CO
Buckners Reach
Mount Swamp
Haymarket Wharf
Cleve Marsh
Thorofare
Gravel Pit
Cem
1 MILE
77° 15' 00"
38° 15' 00"

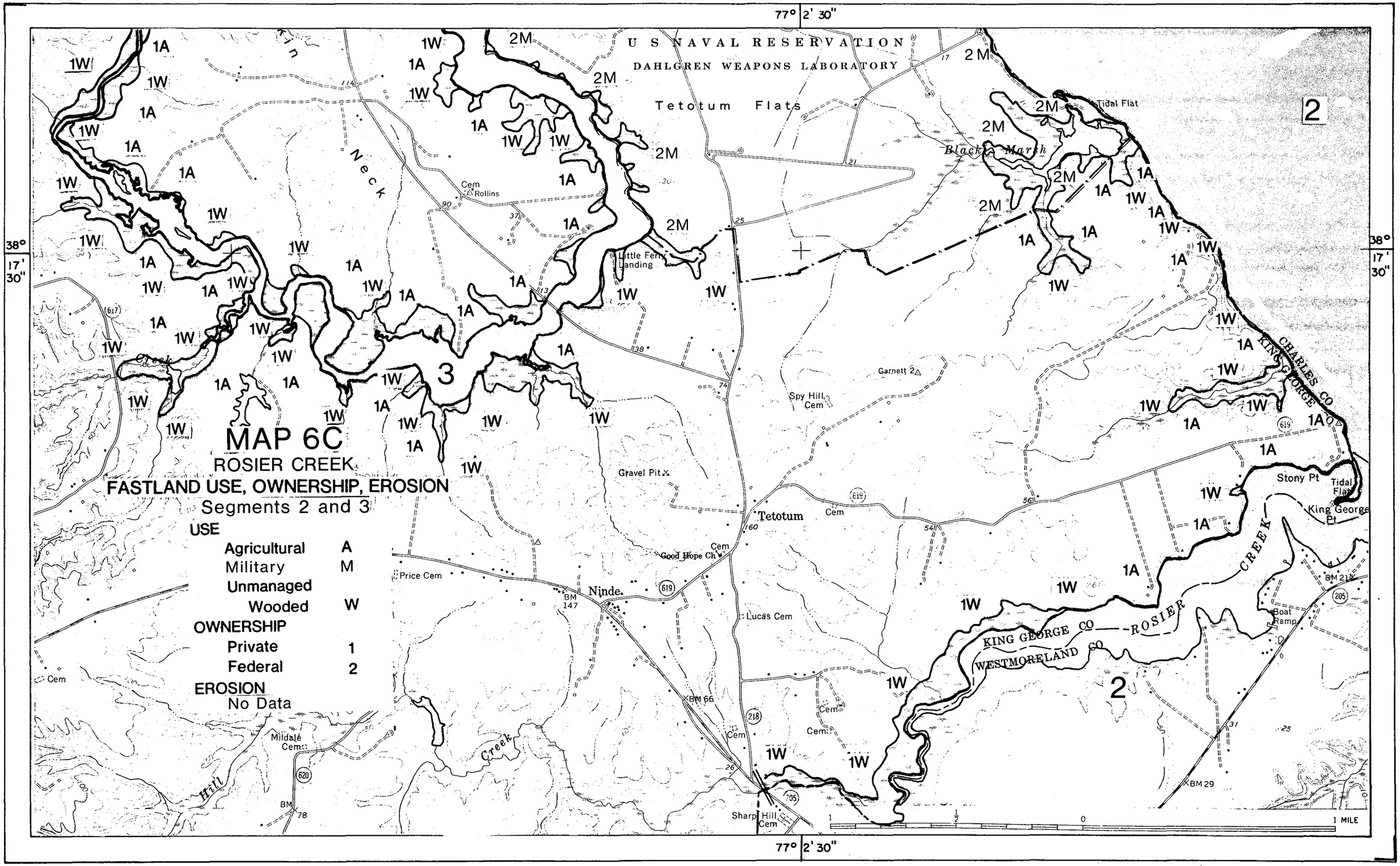

MAP 5A
MOSS NECK
RAPPAHANNOCK RIVER
TOPOGRAPHY AND CULTURE
Subsegments KG-1C and CA-1C
// = Segment Boundary
/ = Subsegment Boundary
KG-1C
CA-1C
77° 20' 00"
38° 15' 00"
Sealston
Butzner Corner
Oak Run
Madden Creek
RAPPAHANNOCK RIVER
CAROLINE CO
STAFFORD
Muddy Cr
Graves Corner
Cem
Gravel Pit
RICHMOND FREDERICKSBURG AND POTOMAC
Hayfield Wharf
Maryton
Olney Corner
Dicks Creek
Garretts Store
Moss Neck
Moss Neck Creek
Ware Creek
Run
1 MILE

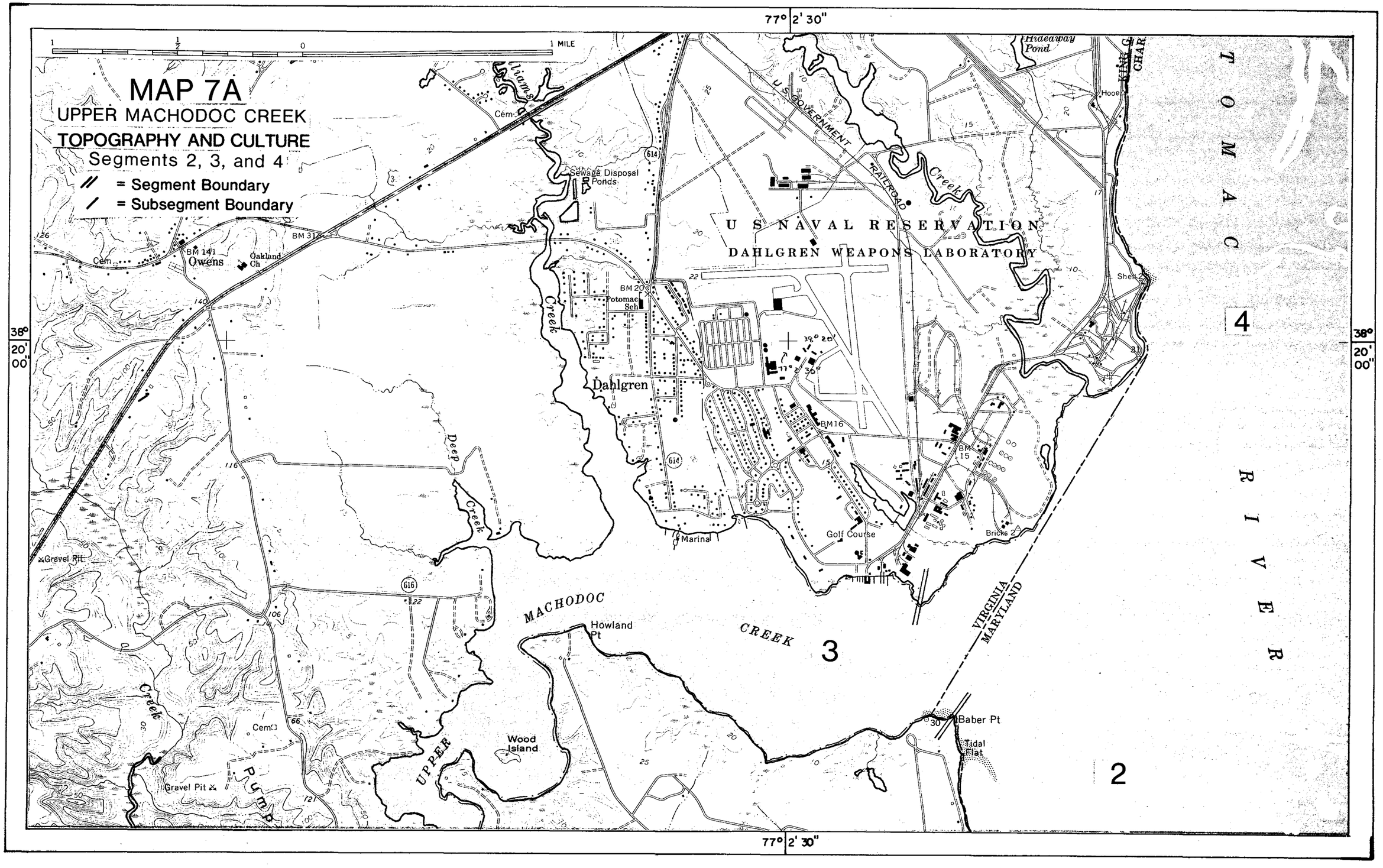

MAP 5B
MOSS NECK
RAPPAHANNOCK RIVER
SHORELANDS TYPES
Subsegments KG-1C and CA-1C
FASTLAND
Low Shore
Moderately Low Shore
Moderately Low Shore with Bluff
Moderately High Shore
Moderately High Shore with Bluff
High Shore
High Shore with Bluff
SHORE
Fringe Marsh
Extensive Marsh
Embayed Marsh
NEARSHORE
Narrow
KG-1C
CA-1C
77° 20' 00"
38° 15' 00"
Sealston
Butzner Corner
Oak Run
Run
RAPPAHANNOCK RIVER
CAROLINE CO
STAFFORD
Hayfield Wharf
Cem
Gravel Pit
Maryton
Olney Corner
Dicks Creek
Garretts Store
Moss Neck
Moss Neck Creek
Ware
RICHMOND FREDERICKSBURG AND POTOMAC
118
1 MILE

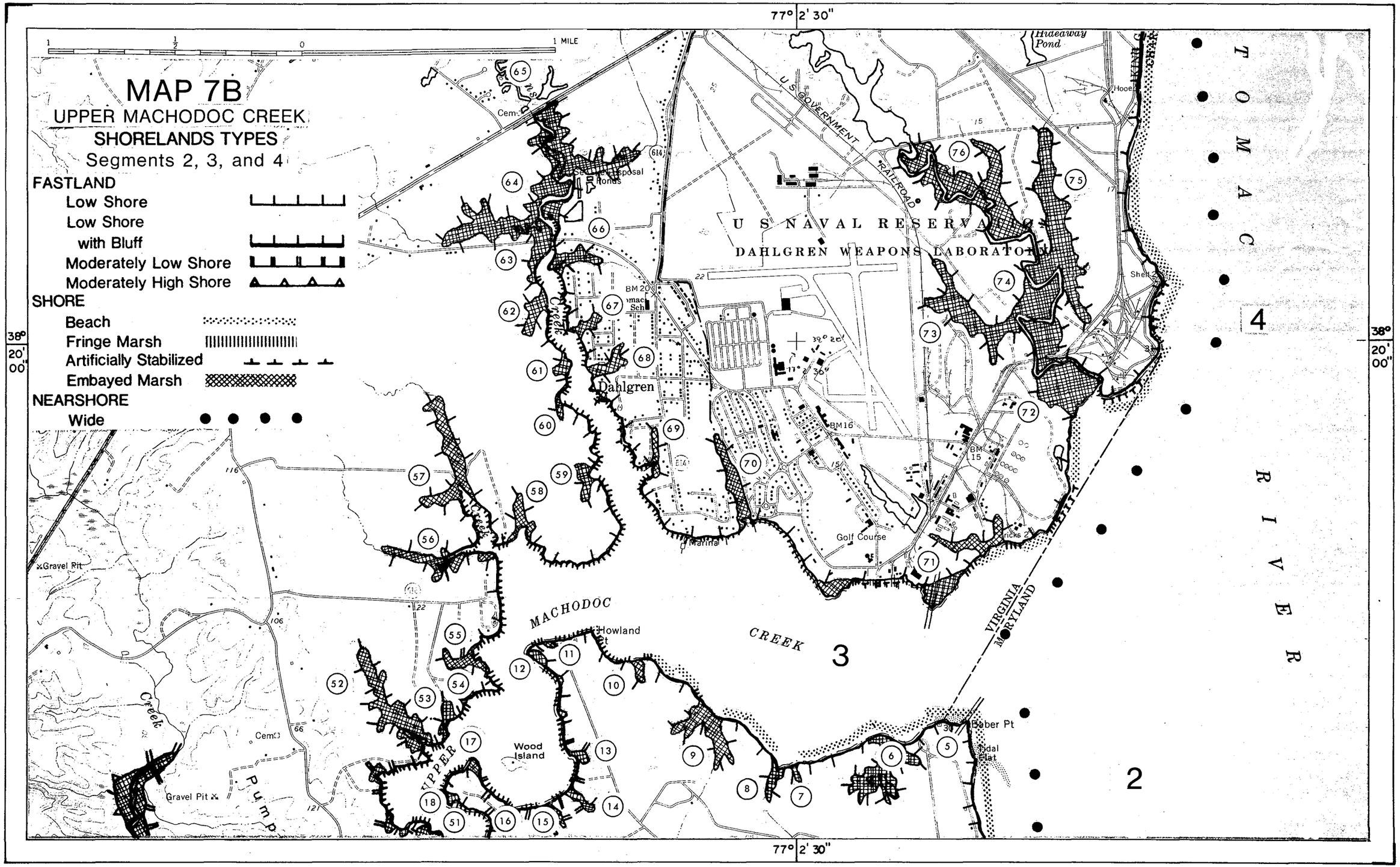

MAP 5C
MOSS NECK
RAPPAHANNOCK RIVER
FASTLAND USE, OWNERSHIP, EROSION
Subsegments KG-1C and CA-1C
USE
Agricultural A
Industrial I
Unmanaged
Unwooded U
Wooded W
OWNERSHIP
Private 1
EROSION
Moderate
Slight or No Change No Symbol
Accretional
77° 20' 00"
38° 15' 00"
KG-1C
CA-1C
RAPPAHANNOCK RIVER
CAROLINE CO
STAFFORD
Sealston
Butzner Corner
Oak Run
Mill Creek
Graves Corner
RICHMOND FREDERICKSBURG AND POT
Gravel Pit
Hayfield Wharf
Maryton
Olney Corner
Dicks Creek
Garretts Store
Moss Neck
Moss Neck Creek
Ware Creek
1A
1W
1U
1I
1 MILE

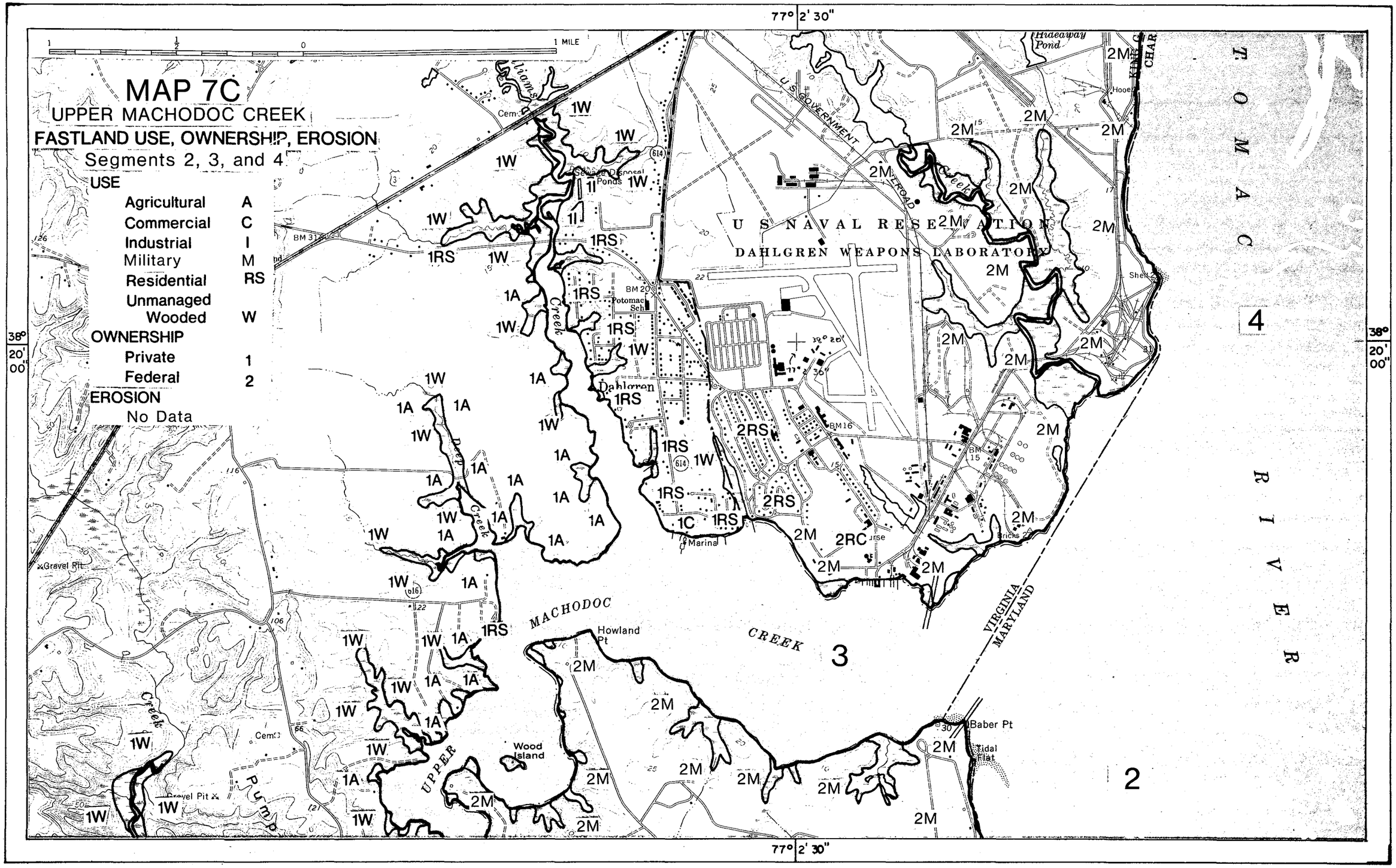

77° 2' 30"
38° 17' 30"
U S NAVAL RESERVATION
DAHLGREN WEAPONS LABORATORY
Tetotum Flats
Tidal Flat
Black Marsh
2
Neck
Cem
Rollins
Little Ferry Landing
3
Creek
Garnett 2
Spy Hill Cem
CHARLES CO
KING GEORGE CO
MAP 6A
ROSIER CREEK
TOPOGRAPHY AND CULTURE
Segments 2 and 3
= Segment Boundary
= Subsegment Boundary
Gravel Pit
Tetotum
Cem
Stony Pt
Tidal Flat
King George Pt
Good Hope Ch
Price Cem
Ninde
BM 147
Lucas Cem
KING GEORGE CO
ROSIER CREEK
WESTMORELAND CO
Boat Ramp
BM 21
BM 40
BM 66
Mildale Cem
Hill
Creek
BM 78
Sharp Hill Cem
BM 29
1 MILE


77° 2' 30"
38° 17' 30"
U S NAVAL RESERVATION
DAHLGREN WEAPONS LABORATORY
Tetotum Flats
Neck
Cem
Rollins
Little Fr
Landing
Tobal Flat
Blackwater
Garnett 2
Spy Hill Cem
Gravel Pit
Tetotum
Cem
Good Hope Ch
Ninde.
BM 147
Lucas Cem
Cem
Cem
Cem
Sharp Hill Cem
Stony Pt
King George Pt
BM 21
Boat Ramp
KING GEORGE CO
WESTMORELAND CO
ROSIER CREEK
BM 29
1 MILE
2
3
MAP 6B
ROSIER CREEK
SHORELANDS TYPES
Segments 2 and 3
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
SHORE
Beach
Fringe Marsh
Artificially Stabilized
Embayed Marsh
NEARSHORE
Wide


MAP 6C
ROSIER CREEK
FASTLAND USE, OWNERSHIP, EROSION
Segments 2 and 3
USE
Agricultural A
Military M
Unmanaged
Wooded W
OWNERSHIP
Private 1
Federal 2
EROSION
No Data
77° 2' 30"
38° 17' 30"
U S NAVAL RESERVATION
DAHLGREN WEAPONS LABORATORY
Tetotum Flats
Tidal Flat
Blackiston Marsh
Neck
Cem
Rollins
Little Ferry Landing
Garnett 2
Spy Hill Cem
Gravel Pit
Tetotum
Cem
Good Hope Ch
Price Cem
Ninde
BM 147
Lucas Cem
BM 66
Cem
Sharp Hill Cem
Mildale Cem
BM 78
Hill
Creek
Stony Pt
Tidal Flats
King George Pt
BM 21
Boat Ramp
BM 29
KING GEORGE CO
WESTMORELAND CO
ROSIER CREEK
CHARLES CO
KING GEORGE CO
1 MILE


MAP 7A
UPPER MACHODOC CREEK
TOPOGRAPHY AND CULTURE
Segments 2, 3, and 4
// = Segment Boundary
/ = Subsegment Boundary
1 MILE
77° 2' 30"
38° 20' 00"
U S NAVAL RESERVATION
DAHLGREN WEAPONS LABORATORY
U S GOVERNMENT RAILROAD
Hideaway Pond
Sewage Disposal Ponds
Williams Creek
Deep Creek
Dahlgren
Potomac Sch
Owens
Oakland Ch
Marina
Golf Course
Bricks
Gravel Pit
MACHODOC CREEK
Howland Pt
Wood Island
UPPER PUMP Creek
Baber Pt
Tidal Flat
VIRGINIA
MARYLAND
TOMAC RIVER
4
3
2

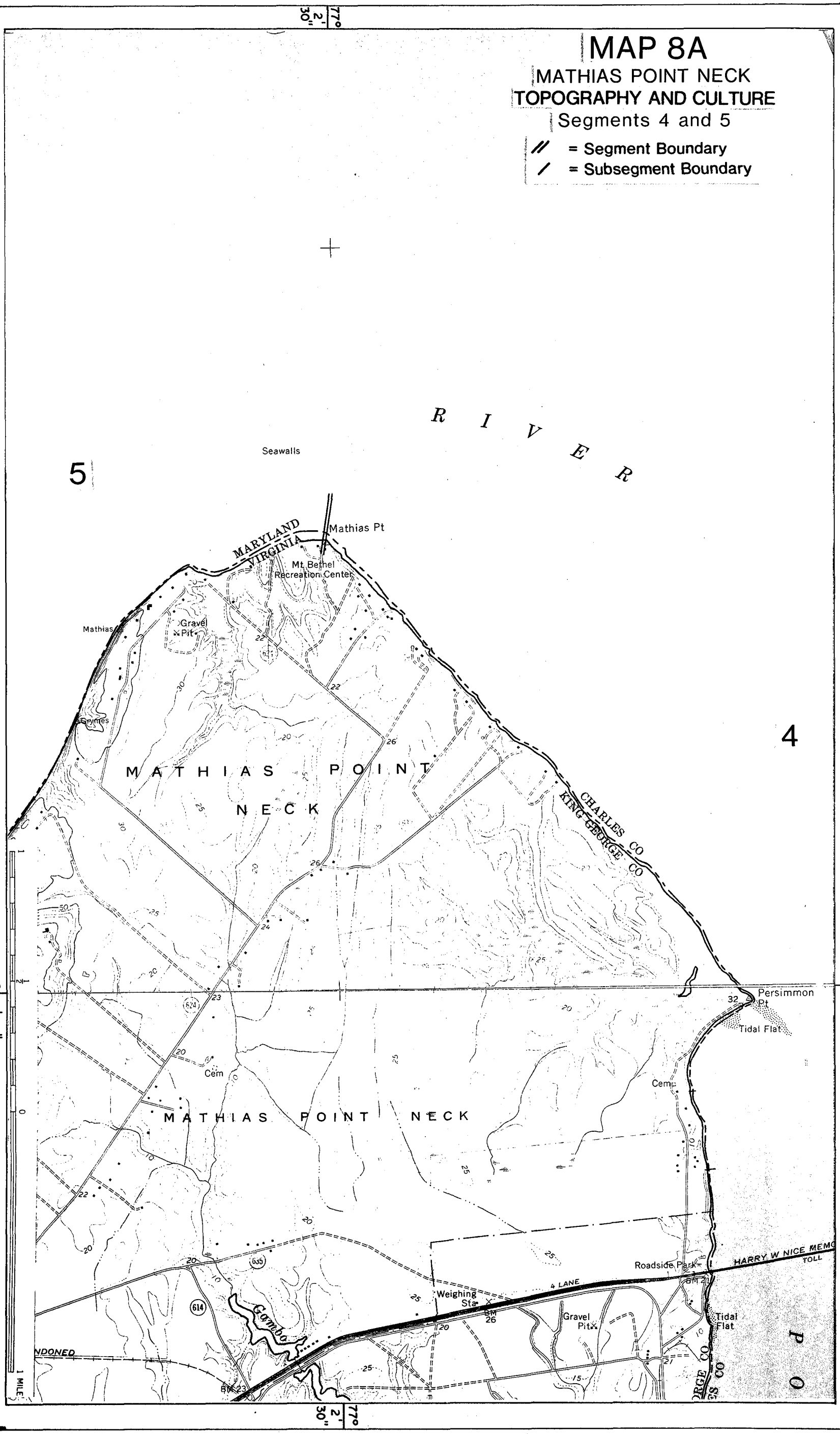

MAP 7B
UPPER MACHODOC CREEK
SHORELANDS TYPES
Segments 2, 3, and 4
FASTLAND
Low Shore
Low Shore with Bluff
Moderately Low Shore
Moderately High Shore
SHORE
Beach
Fringe Marsh
Artificially Stabilized
Embayed Marsh
NEARSHORE
Wide
1 MILE
77° 2' 30"
38° 20' 00"
U S NAVAL RESERVATION
DAHLGREN WEAPONS LABORATORY
U S GOVERNMENT RAILROAD
Hideaway Pond
Dahlgren
Marina
Golf Course
Gravel Pit
MACHODOC CREEK
Howland Pt
Wood Island
UPPER
Pump Creek
Cem
Baber Pt
Tidal Flat
VIRGINIA
MARYLAND
POTOMAC RIVER
4
3
2


MAP 7C
UPPER MACHODOC CREEK
FASTLAND USE, OWNERSHIP, EROSION
Segments 2, 3, and 4
USE
Agricultural A
Commercial C
Industrial I
Military M
Residential RS
Unmanaged Wooded W
OWNERSHIP
Private 1
Federal 2
EROSION
No Data
1 MILE
77° 2' 30"
38° 20' 00"
U S NAVAL RESERVATION
DAHLGREN WEAPONS LABORATORY
U S GOVERNMENT
MACHODOC CREEK
UPPER MACHODOC CREEK
Howland Pt
Wood Island
Baber Pt
Tidal Flat
VIRGINIA
MARYLAND
TOMAC RIVER
Dahlgren
Potomac Sch
Marina
Gravel Pit
Sewage Disposal Ponds
Hideaway Pond
Pump Creek
4
3
2

MAP 8A

MATHIAS POINT NECK
TOPOGRAPHY AND CULTURE
Segments 4 and 5

// = Segment Boundary
/ = Subsegment Boundary



MAP 8B

MATHIAS POINT NECK

SHORELANDS TYPES

Segments 4 and 5

FASTLAND

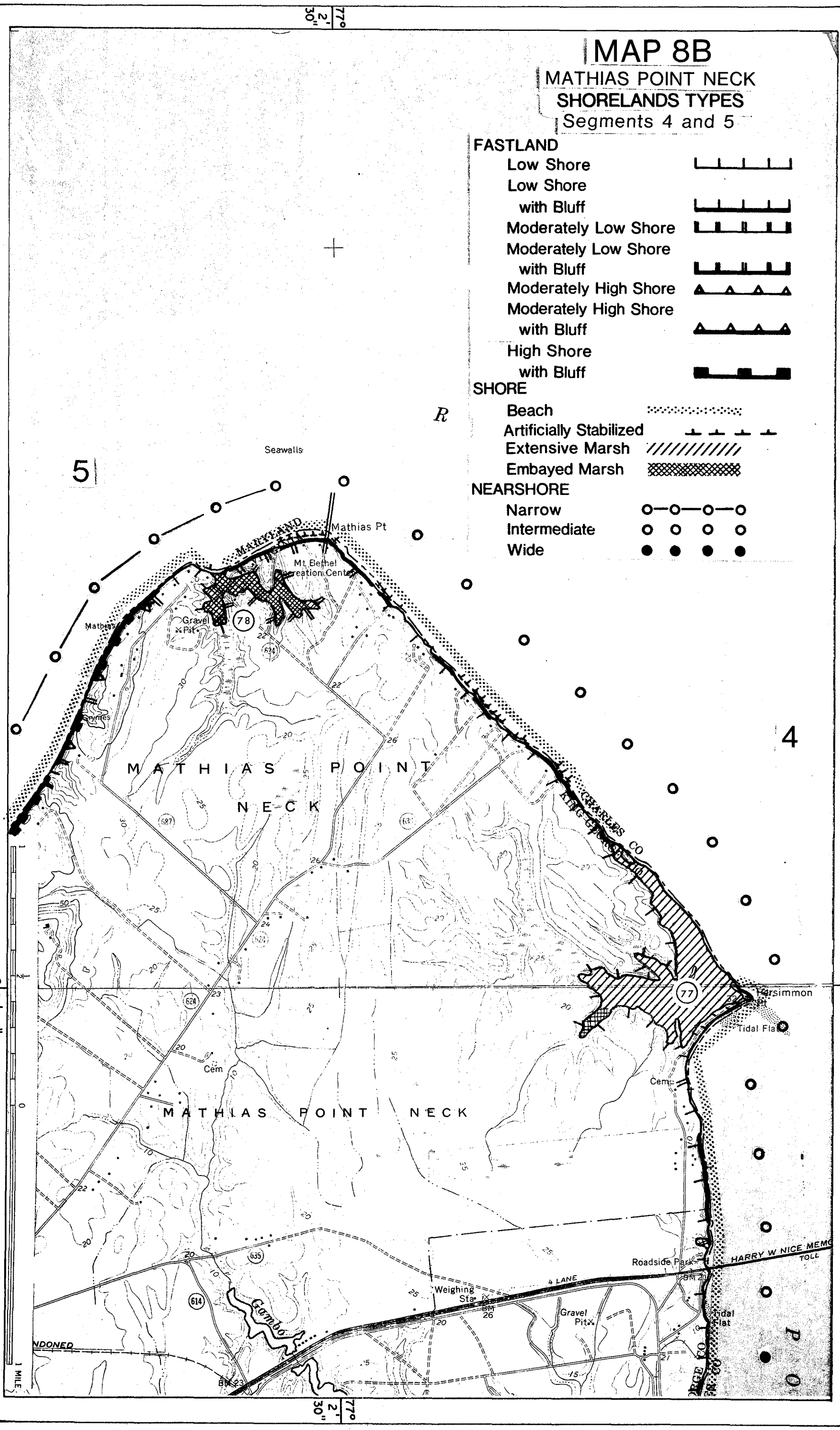
- Low Shore
- Low Shore with Bluff
- Moderately Low Shore
- Moderately Low Shore with Bluff
- Moderately High Shore
- Moderately High Shore with Bluff
- High Shore with Bluff

SHORE

- Beach
- Artificially Stabilized
- Extensive Marsh
- Embayed Marsh

NEARSHORE

- Narrow
- Intermediate
- Wide



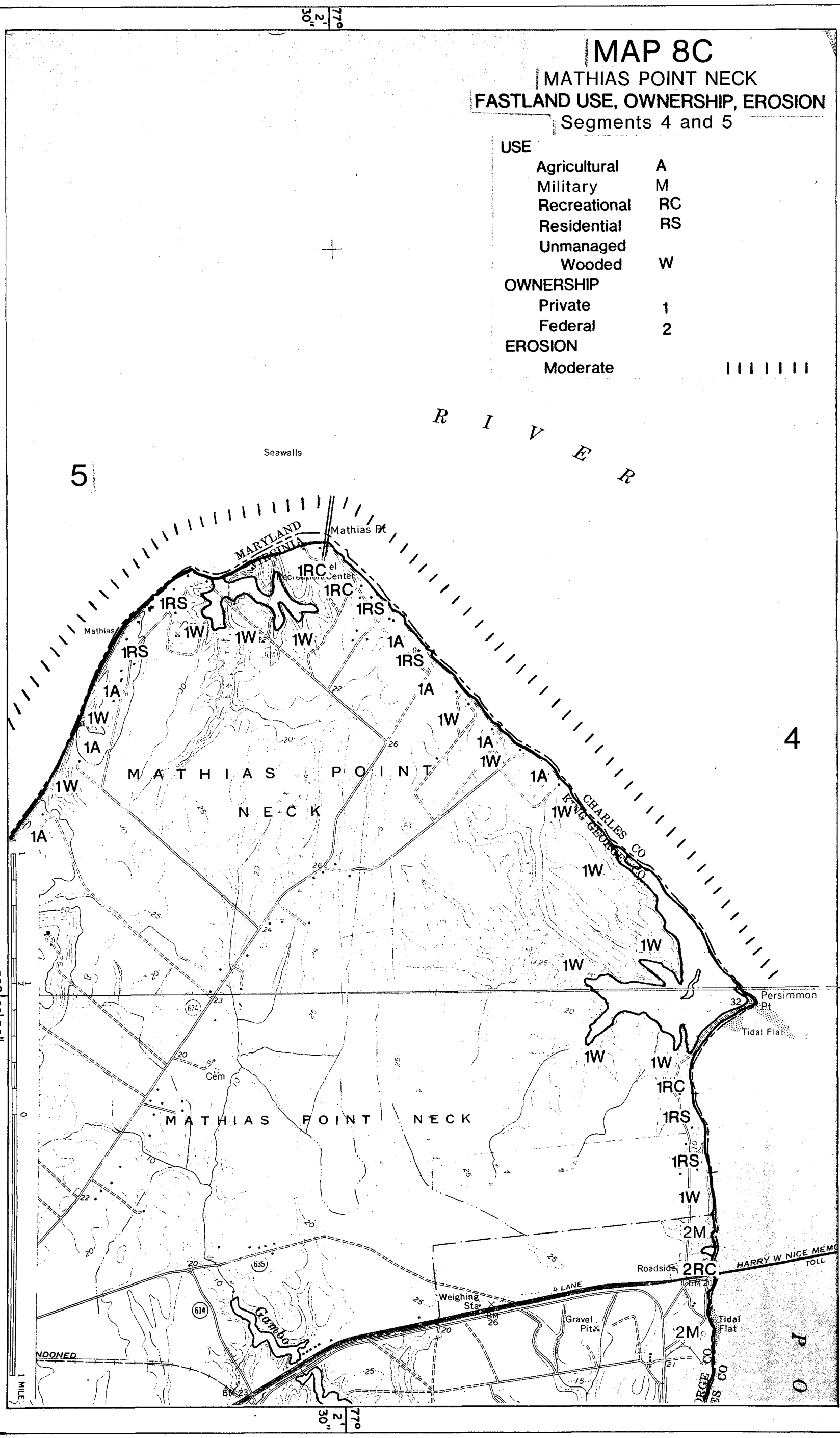
MAP 8C

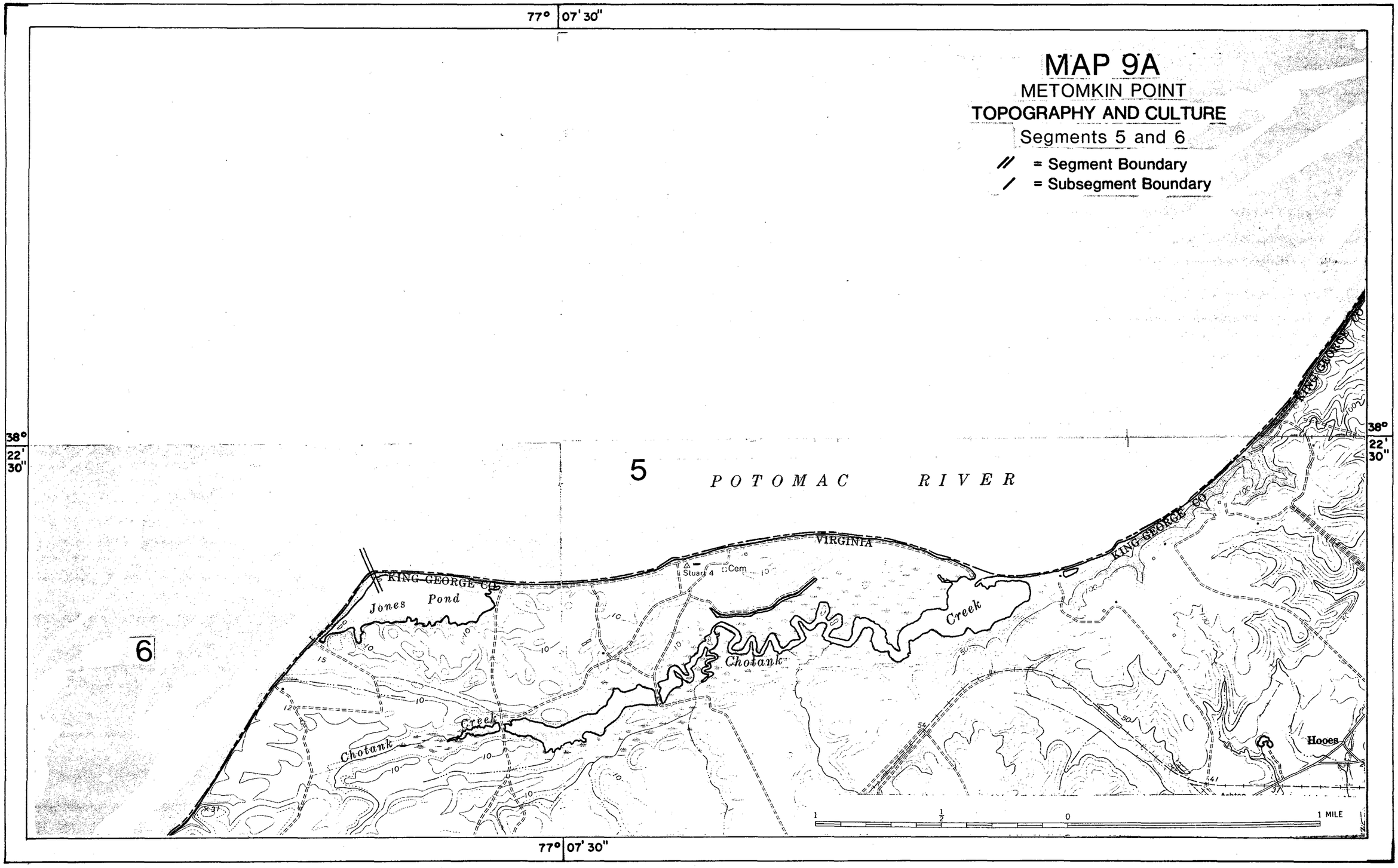
MATHIAS POINT NECK

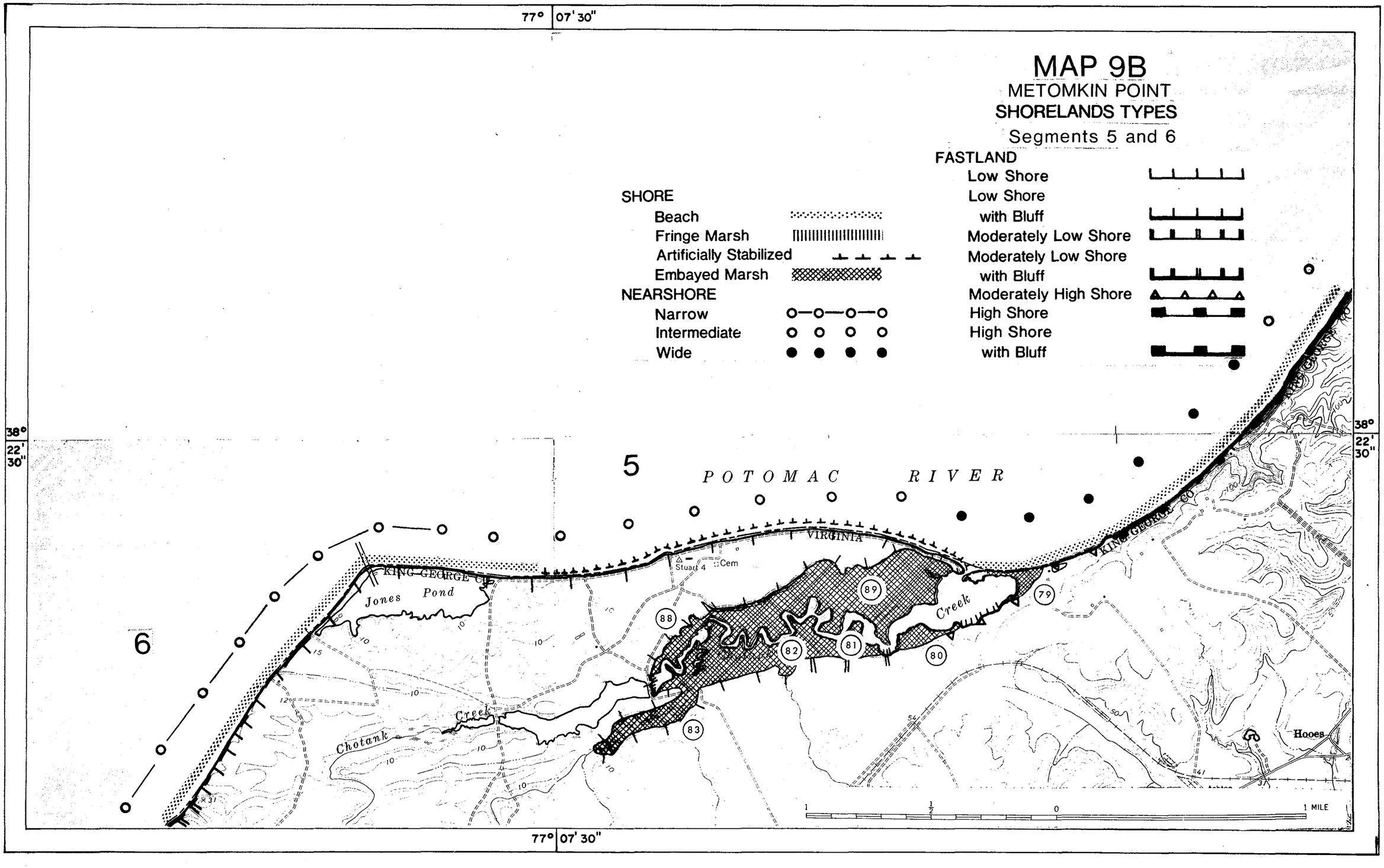
FASTLAND USE, OWNERSHIP, EROSION

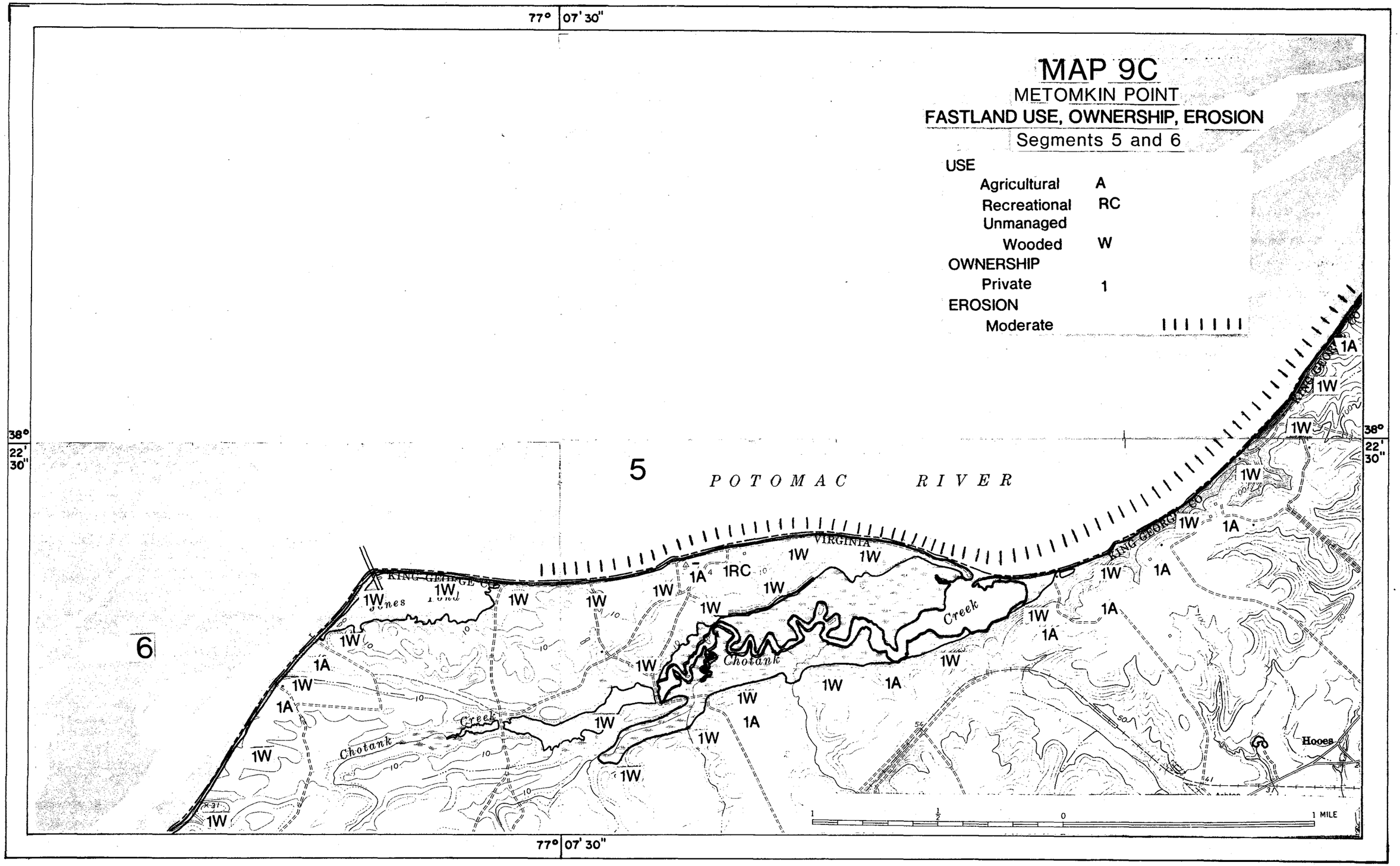
Segments 4 and 5

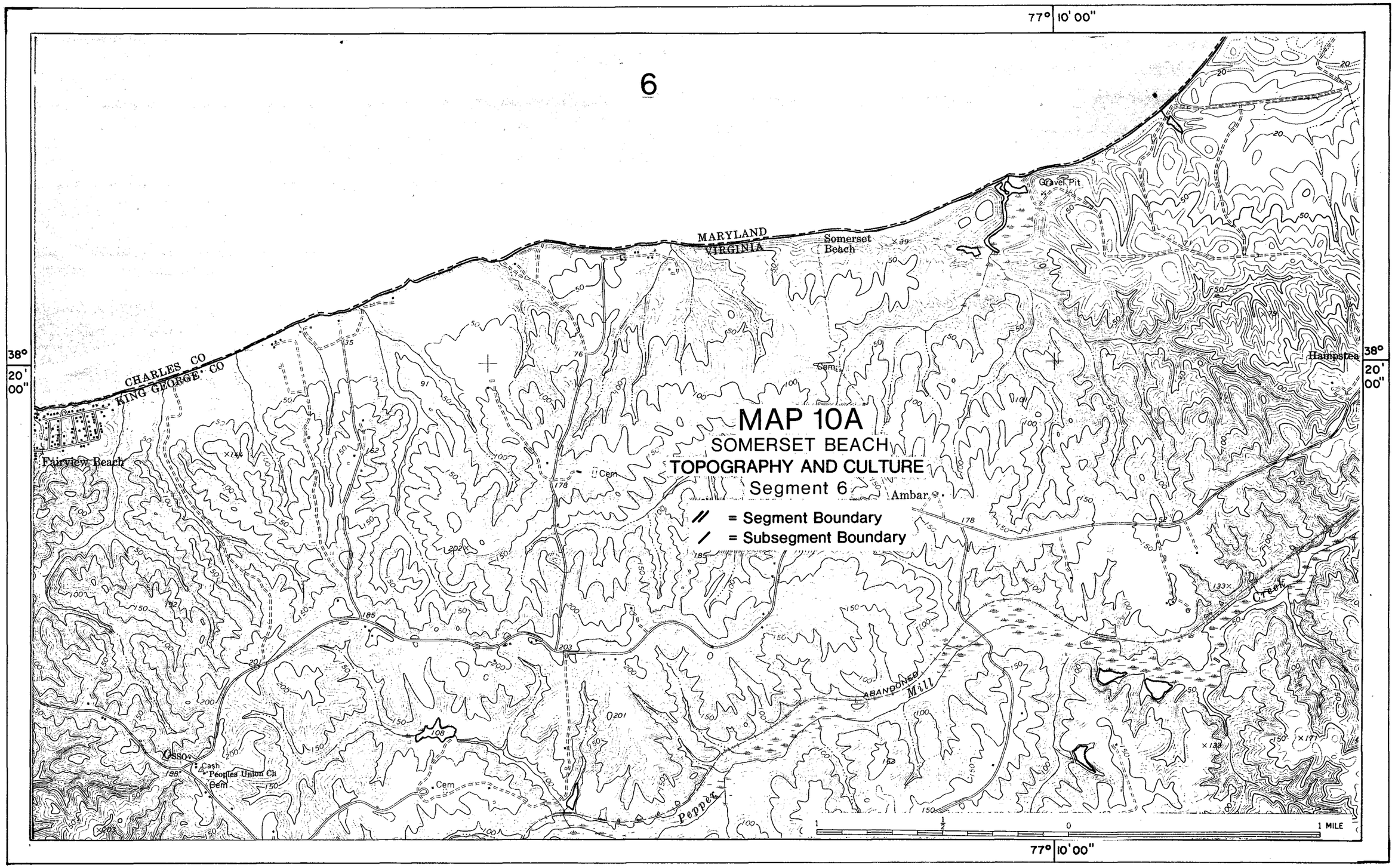
USE	
Agricultural	A
Military	M
Recreational	RC
Residential	RS
Unmanaged Wooded	W
OWNERSHIP	
Private	1
Federal	2
EROSION	
Moderate						

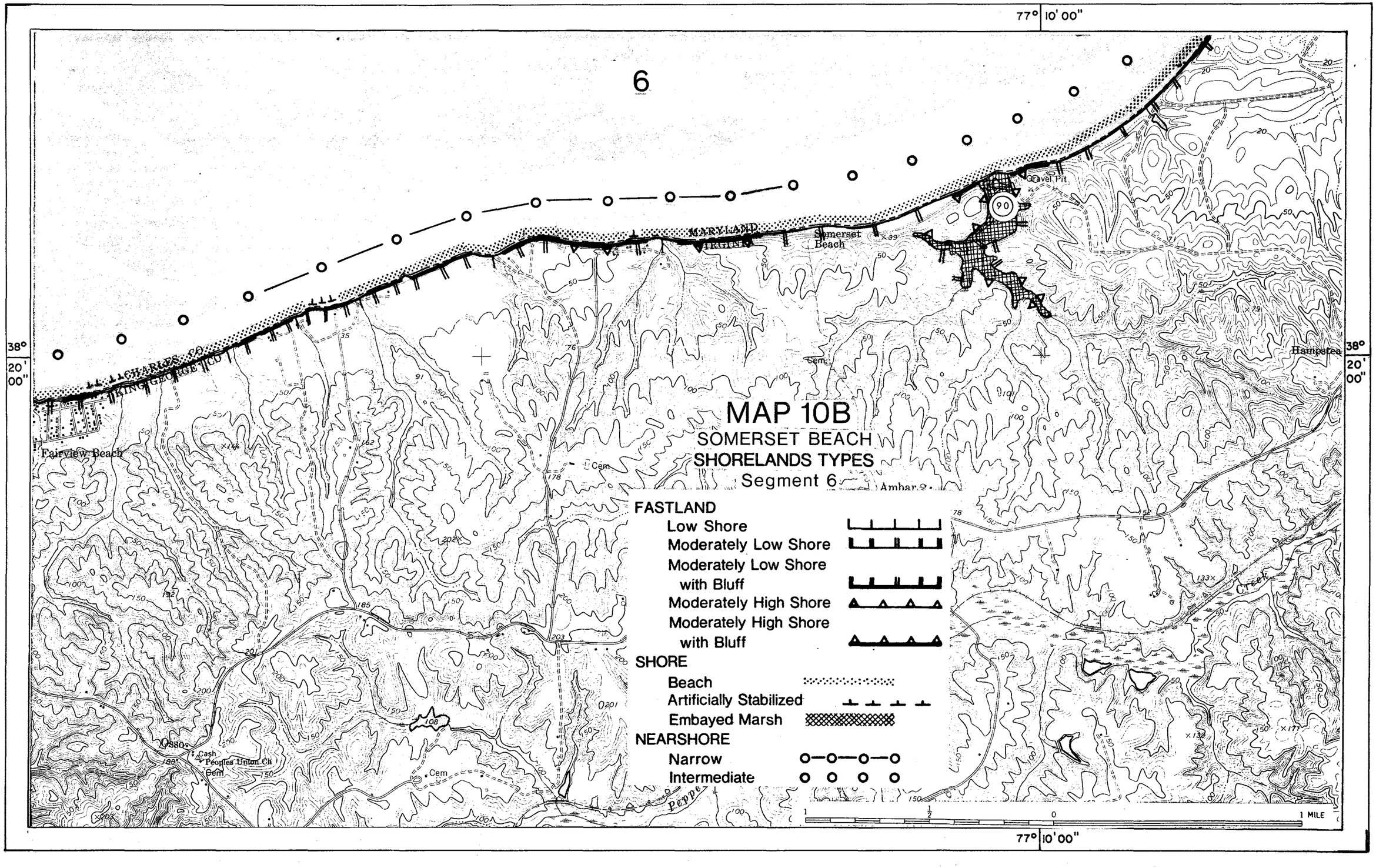


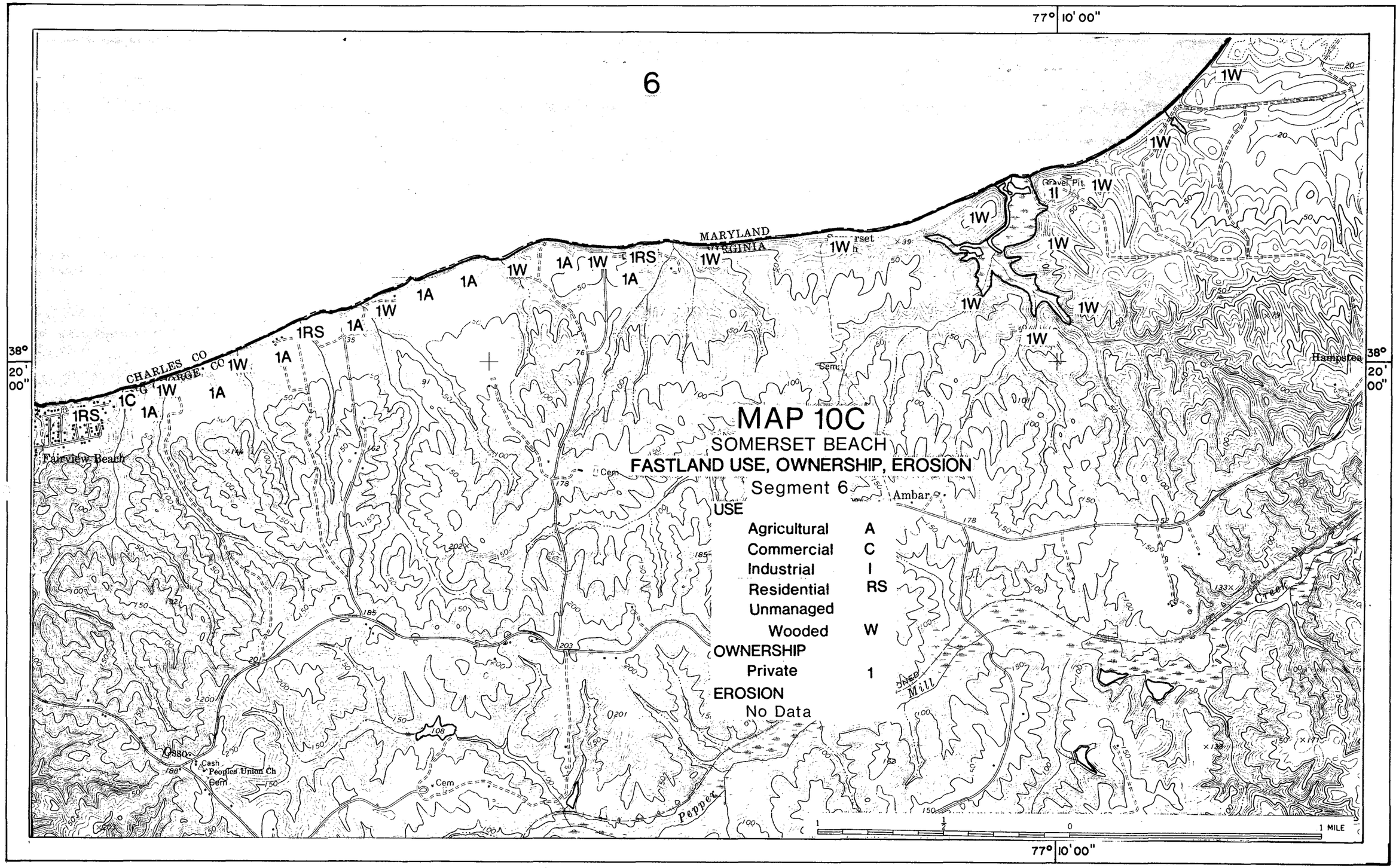

MAP 9A
METOMKIN POINT
TOPOGRAPHY AND CULTURE
Segments 5 and 6
// = Segment Boundary
/ = Subsegment Boundary
77° 07' 30"
38° 22' 30"
5
6
POTOMAC RIVER
VIRGINIA
KING GEORGE CO.
Jones Pond
Chotank Creek
Stuart 4
Cem
Hooes
1 MILE

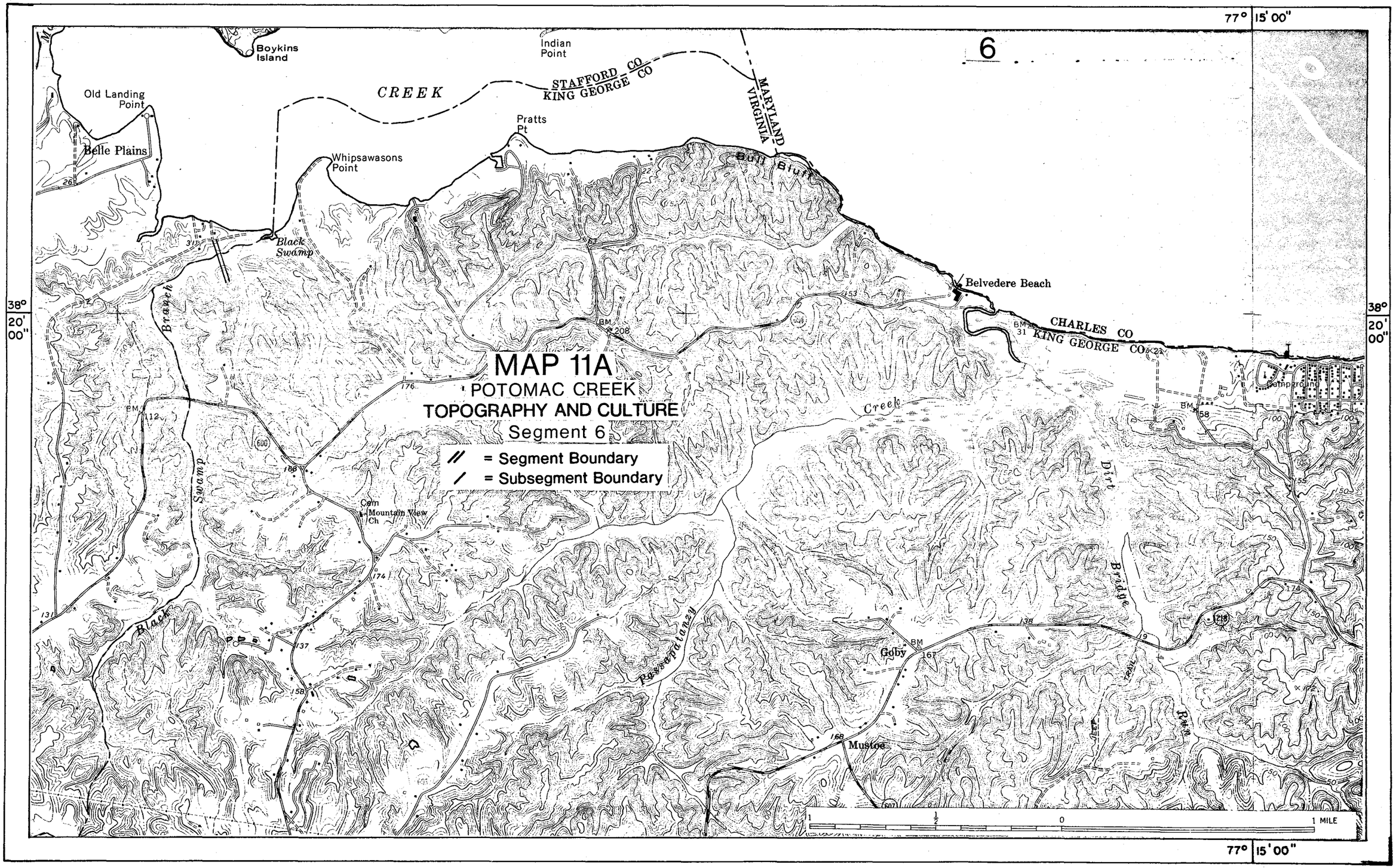

MAP 9B
METOMKIN POINT
SHORELANDS TYPES
Segments 5 and 6
SHORE
Beach
Fringe Marsh
Artificially Stabilized
Embayed Marsh
NEARSHORE
Narrow
Intermediate
Wide
FASTLAND
Low Shore
Low Shore with Bluff
Moderately Low Shore
Moderately Low Shore with Bluff
Moderately High Shore
High Shore
High Shore with Bluff
77° 07' 30"
38° 22' 30"
5
6
POTOMAC RIVER
VIRGINIA
KING GEORGE CO
Jones Pond
Chotank Creek
Creek
Stuart 4
Cem
Hooes
88
89
82
81
80
79
83
1 MILE

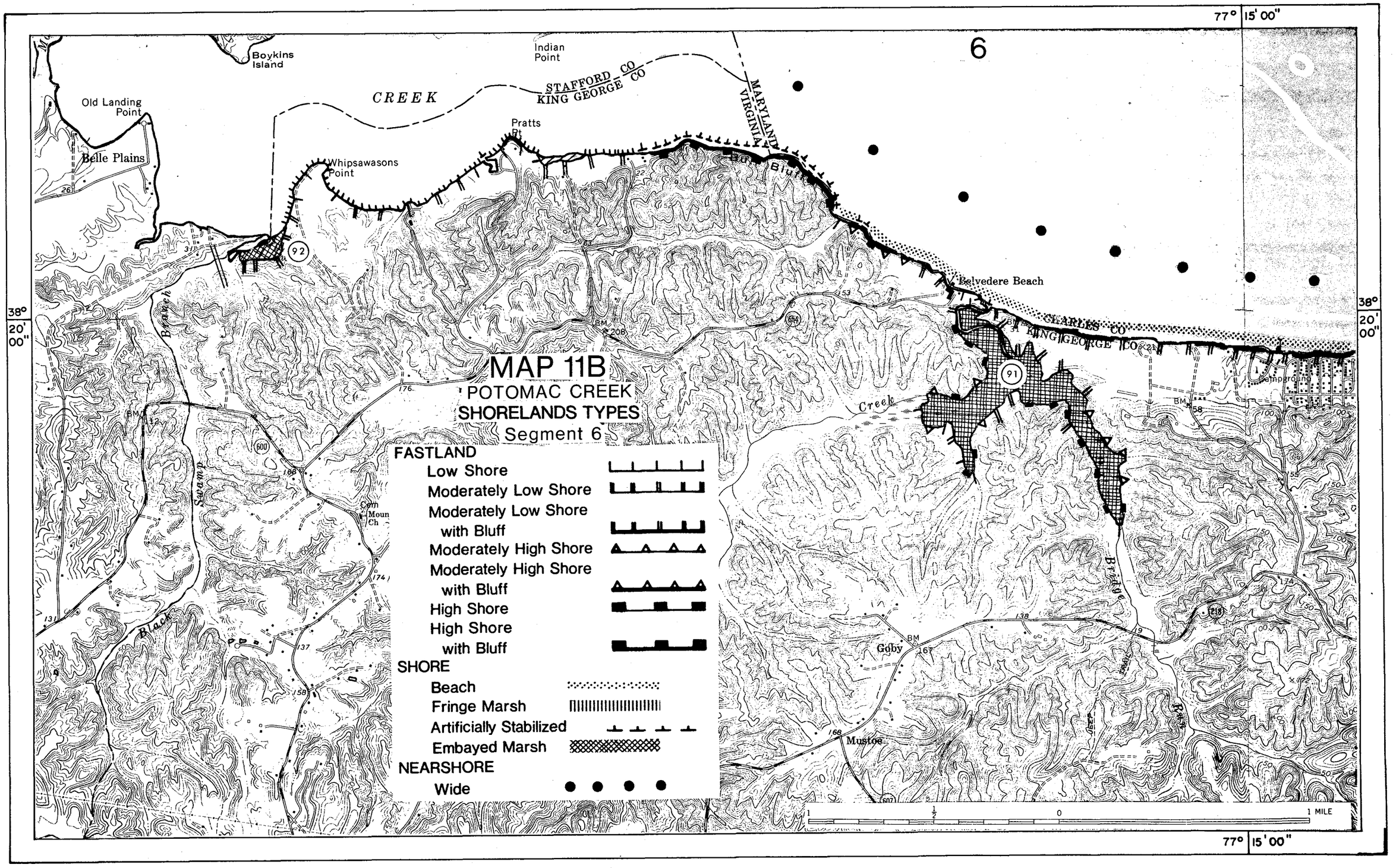

MAP 9C
METOMKIN POINT
FASTLAND USE, OWNERSHIP, EROSION
Segments 5 and 6
USE
Agricultural A
Recreational RC
Unmanaged
Wooded W
OWNERSHIP
Private 1
EROSION
Moderate
77° 07' 30"
38° 22' 30"
5
6
POTOMAC RIVER
VIRGINIA
KING GEORGE CO.
Chotank Creek
Hooes
1 MILE

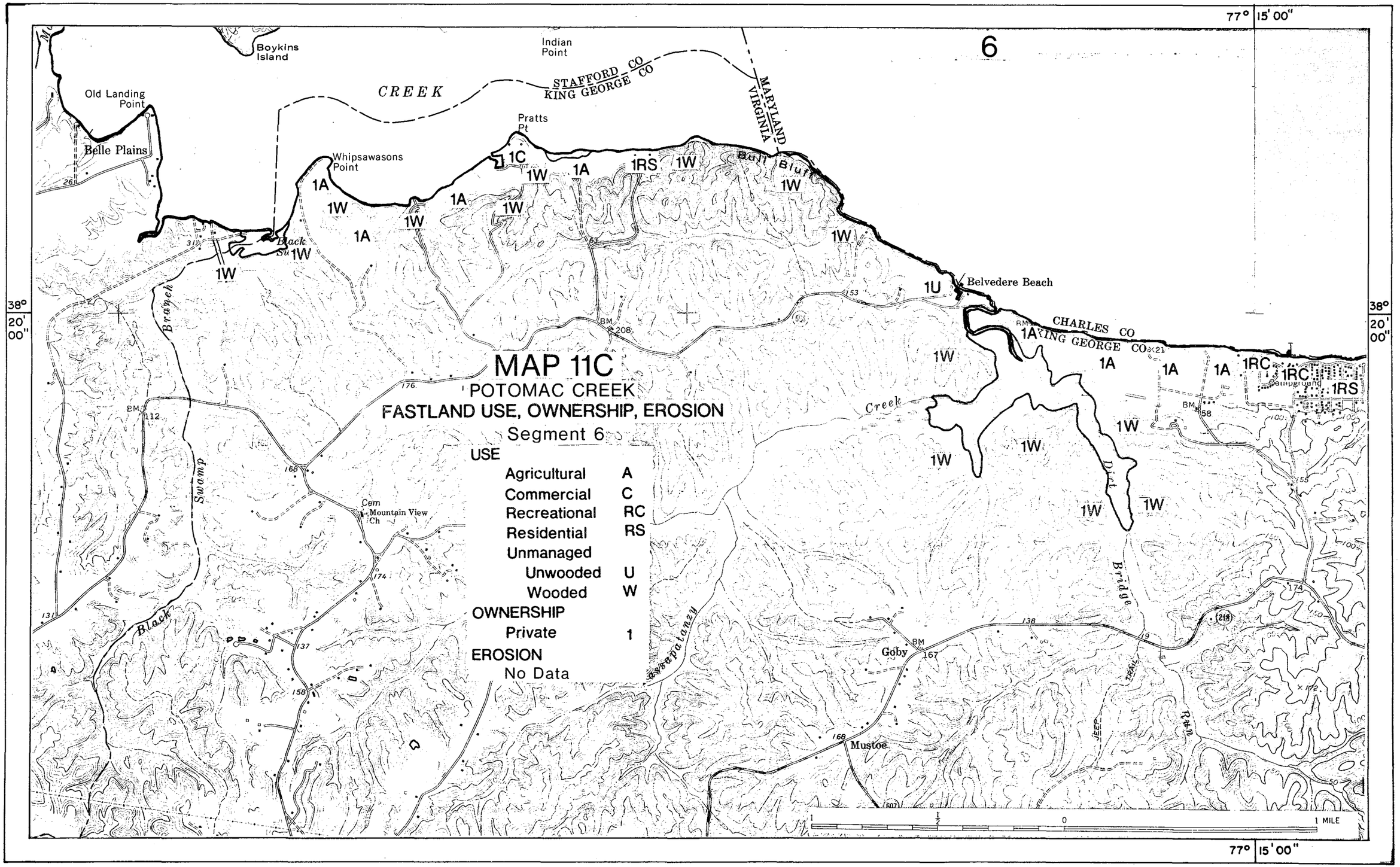

6
77° 10' 00"
38° 20' 00"
MAP 10A
SOMERSET BEACH
TOPOGRAPHY AND CULTURE
Segment 6
// = Segment Boundary
/ = Subsegment Boundary
MARYLAND
VIRGINIA
CHARLES CO
KING GEORGE CO
Somerset Beach
Gravel Pit
Hampstea
Fairview Beach
Ambar
Cem
Osso
Cash
Peoples Union Ch
Pepper
Creek
Mill
ABANDONED
1 MILE


6
MAP 10B
SOMERSET BEACH
SHORELANDS TYPES
Segment 6
FASTLAND
Low Shore
Moderately Low Shore
Moderately Low Shore with Bluff
Moderately High Shore
Moderately High Shore with Bluff
SHORE
Beach
Artificially Stabilized
Embayed Marsh
NEARSHORE
Narrow
Intermediate
77° 10' 00"
38° 20' 00"
MARYLAND
VIRGINIA
Somerset Beach
Gravel Pit
Hampstead
Fairview Beach
Osso
Cash
Peoples Union Ch
Cem
Pepper Creek
1 MILE


6
MAP 10C
SOMERSET BEACH
FASTLAND USE, OWNERSHIP, EROSION
Segment 6
USE
Agricultural A
Commercial C
Industrial I
Residential RS
Unmanaged
Wooded W
OWNERSHIP
Private 1
EROSION
No Data
MARYLAND
VIRGINIA
CHARLES CO
ST. GEORGE CO
Fairview Beach
Hampstead
Ambar
Cash
Peoples Union Ch
Cem
Gravel Pit
Mill
Pepper
Creek
1 MILE
77° 10' 00"
38° 20' 00"


MAP 11A
POTOMAC CREEK
TOPOGRAPHY AND CULTURE
Segment 6
// = Segment Boundary
/ = Subsegment Boundary
6
77° 15' 00"
38° 20' 00"
Boykins Island
Indian Point
Old Landing Point
Belle Plains
CREEK
STAFFORD CO
KING GEORGE CO
MARYLAND
VIRGINIA
Pratts Pt
Whipsawasons Point
Bull Bluff
Black Swamp
Belvedere Beach
CHARLES CO
KING GEORGE CO
Branch
Swamp
Black
Cem
Mountain View Ch
Creek
Dirt
Bridge
Passapatanzy
Goby
Mustoe
Campground
1 ½ 0 1 MILE


6
77° 15' 00"
38° 20' 00"
Boykins Island
Indian Point
CREEK
STAFFORD CO
KING GEORGE CO
MARYLAND
VIRGINIA
Old Landing Point
Belle Plains
Pratts Pt
Whipsawasons Point
Belvedere Beach
CHARLES CO
KING GEORGE CO
Black Swamp
Branch
Creek
Brave
Goby
Mustoe
MAP 11B
POTOMAC CREEK
SHORELANDS TYPES
Segment 6
FASTLAND
Low Shore
Moderately Low Shore
Moderately Low Shore with Bluff
Moderately High Shore
Moderately High Shore with Bluff
High Shore
High Shore with Bluff
SHORE
Beach
Fringe Marsh
Artificially Stabilized
Embayed Marsh
NEARSHORE
Wide
1 ½ 0 1 MILE


6
77° 15' 00"
38° 20' 00"
Boykins Island
Indian Point
Old Landing Point
Belle Plains
CREEK
STAFFORD CO
KING GEORGE CO
MARYLAND
VIRGINIA
Pratts Pt
Whipsawasons Point
Bull Bluff
Belvedere Beach
CHARLES CO
KING GEORGE CO
Black Swamp
Branch
Mountain View Ch
Cem
Goby
Mustoe
Rapp
Bridge
Dirt
Creek
Rappahannock
JEEP TRAIL
1A
1W
1C
1RS
1U
1RC
Campground
MAP 11C
POTOMAC CREEK
LANDUSE, OWNERSHIP, EROSION
Segment 6
USE
Agricultural A
Commercial C
Recreational RC
Residential RS
Unmanaged
Unwooded U
Wooded W
OWNERSHIP
Private 1
EROSION
No Data
1 ½ 0 1 MILE