SUMMARY OF SHORELINE SITUATION REPORTS FOR VIRGINIA'S TIDEWATER LOCALITIES

by

Carl H. Hobbs, III
Dennis W. Owen
Lynne C. Morgan

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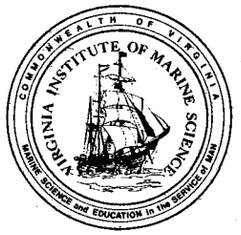

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PART 1: SUMMARY OF THE REPORTS

This summary report marks the completion of the Shoreline Situation Report project. For over six years project team members with the Department of Geological Oceanography at the Virginia Institute of Marine Science have inventoried over 5,000 miles of shoreline in Tidewater Virginia. The methodology was developed and evaluated with funding through the Chesapeake Research Consortium, Inc. from the Research Applied to National Needs (RANN) program of the National Science Foundation. After preliminary evaluation as to its worth, the project became part of Virginia's Coastal Resources Management Program, supported by the Office of Commerce and Resources with funds provided by the Office of Coastal Zone Management, National Oceanographic and Atmospheric Administration, U.S. Department of Commerce.

Excluding this summary, 27 separate reports covering the 34 counties and cities bordering on Virginia's tidal waters have been produced. These reports, particularly when used with Byrne and Anderson's Shoreline Erosion in Tidewater Virginia and the Tidal Wetlands Inventories, provide shoreline managers and scientists with useful information on the status of the shoreline. Additionally the many thousands of low altitude, oblique, color slides of the shore which were taken during the course of the research are filed and catalogued at VIMS and provide a valuable record of the shore's condition.

Although the specific form of the reports has evolved and been altered somewhat through the several years, the nature or character of the reports has not. An example of the evolution is the change from a single measurement of shoreline length in the earlier reports to the separate measurements of the fastland-shore and shore-water interfaces in the more recent reports. The purposes and goals of the individual reports and the project as a whole have been stated, as follows, at the beginning of each report.

It is the objective of this report to supply an assessment, and at least a partial integration, of these 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 such a manner 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 effectively. 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.

The internal organization of the reports has been consistent. Chapters 1 and 2, "Introduction" and "Approach Used and Elements Considered" are repeated from report to report. Chapter 3, "The Present Shoreline Situation" is a general description of the shoreline in the particular locality. Its separate sections include discussions of the general nature of the shore, shoreline erosion, and either suggestions of potential differing land uses or a discussion of those factors which might limit or prohibit different land uses. Chapter 3 also includes a collection of photographs representative of the shore, a series of small-scale maps depicting the county-wide distribution of various shoreline characteristics, and a summary table of shorelands physiography, fastland use and ownership. Chapter 4 basically repeats the same information but with more detail, allowing the reader a "closer look" at the shore. Chapter 4 contains more detailed tables of the shoreline parameters, outline type descriptions of each of the shoreline segments or subsegments, and larger scale maps of some of the shoreline parameters.

PART 2. TABLES AND GRAPHS

The information presented in the following three sets of tables has been extracted from the complete series of Shoreline Situation Reports. Table 1 is a state-wide summary of shoreline localities, arranged alphabetically, showing the various shoreline parameters. The other two tables present the same information except that the counties are grouped first by river basin and then by planning district. Data for the individual river basins is also presented in the form of bar graphs.

FIGURE 1. COUNTIES IN SHORELINE SITUATION REPORT STUDY AREA

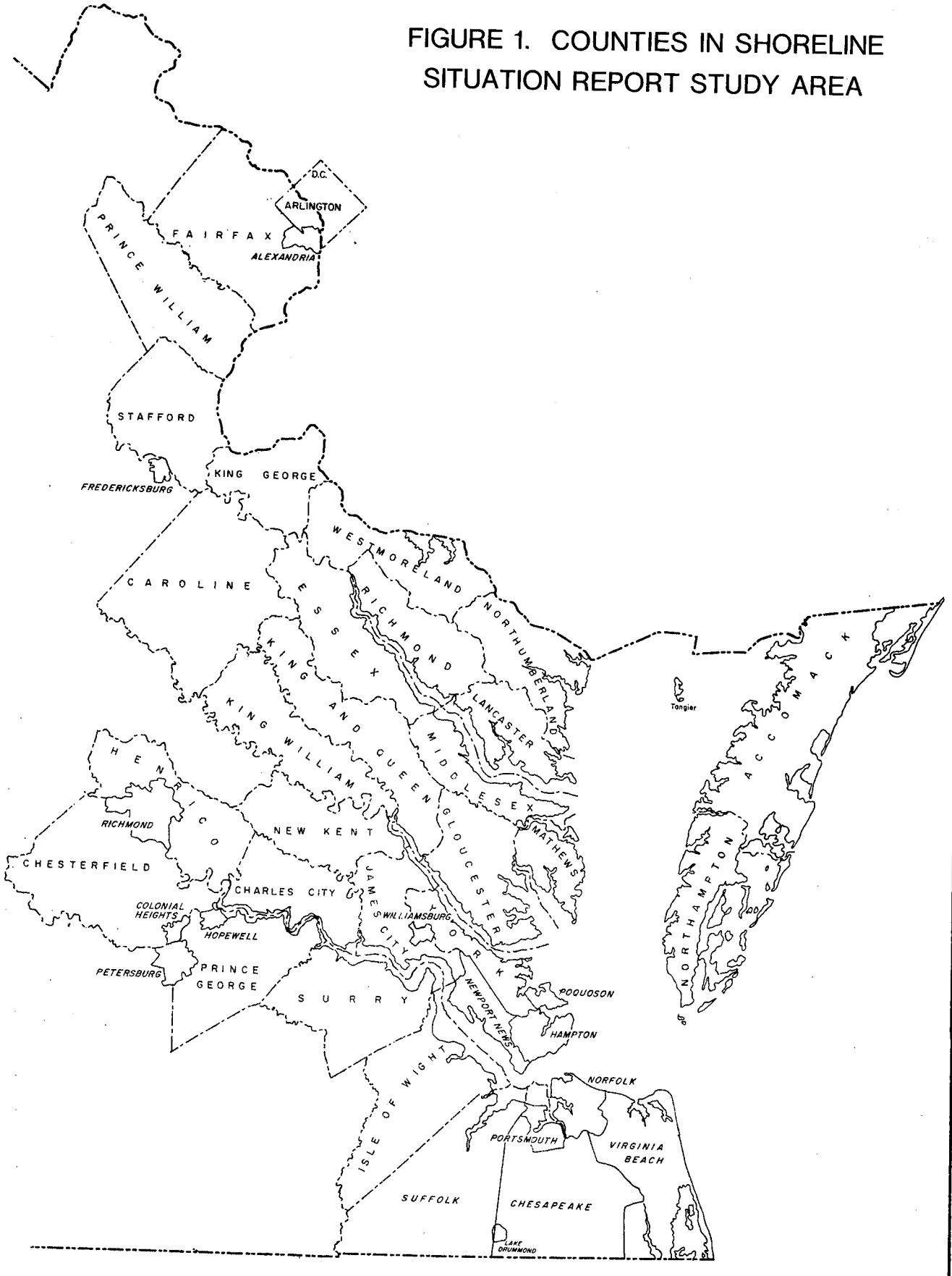


TABLE 1. SUMMARY OF SHORELINE PARAMETERS FOR VIRGINIA'S TIDEWATER COUNTIES (STATUTE MILES)

CLASSIFICATION / COUNTY OR CITY	TOTAL MILES		FASTLAND PHYSIOGRAPHIC TYPE										FASTLAND USE								FASTLAND OWNERSHIP				SHORELANDS TYPE					NEARSHORE WIDTH			PERCENT TOTALS	
	FASTLAND	SHORE	ARTIFICIAL FILL	DUNES	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	AGRICULTURAL	COMMERCIAL	GOVERNMENTAL	INDUSTRIAL	PRESERVED	RECREATIONAL	RESIDENTIAL	UNMANAGED, WOODED AND UNWOODED	PRIVATE	FEDERAL	STATE	COUNTY, TOWN OR CITY	ARTIFICIALLY STABILIZED	BEACH	FRINGE MARSH	EMBAYED MARSH	EXTENSIVE MARSH	NARROW	INTERMEDIATE	WIDE	% OF TOTAL FASTLAND	% OF TOTAL SHORE
ACCOMACK	482.1	489.8	1.4	57.5	416.7	2.5	0.3	3.5	0.2				130.7	12.8	10.0		60.9	21.2	68.3	178.2	399.1	82.7	0.1	0.2	7.6	93.6	114.6	21.0	253.0	32.3	41.0	172.9	8.9	9.6
CAROLINE	45.4	42.6			15.4		13.1	3.8	6.3	2.2	1.1	3.5	27.3			0.1		0.2	0.2	17.6	45.4				0.1	1.5	20.6	5.1	15.4	26.8	0.9	1.6	0.8	0.8
CHARLES CITY	137.0	121.2			61.1		67.7	0.2	3.1	1.8	2.7	0.4	44.3	0.1		0.4	11.2	0.9	3.0	77.1	125.8		11.2		1.5	18.3	32.6	52.3	16.6	33.6	15.2	3.1	2.5	2.4
CHESAPEAKE	129.1	114.0	18.4		110.7								22.3	1.7	3.1	19.2		6.5	56.7	19.6	118.0	4.5	1.3	5.3	22.7	2.5	60.6	28.3		21.4			2.4	2.2
CHESTERFIELD	43.6	45.2			26.3		6.6		3.5	1.0	1.5	4.7	17.0			2.5	3.8	0.2	2.1	18.0	39.6	4.0			0.9		26.2	0.6	17.5	32.3	1.4		0.8	0.9
ESSEX	159.3	150.8	1.0		104.8	7.3	23.3	5.4	6.0	0.6	7.7	3.2	91.4	1.9		1.7		0.2	15.5	48.6	158.0			1.2	7.6	16.5	38.2	49.3	39.2	11.8	7.9	20.2	2.9	2.9
FAIRFAX	99.8	98.0	3.2		41.5		34.8	5.0	3.9	0.3	4.6	6.3	0.6	0.6	20.7	9.8	12.5	29.6	17.0	9.0	32.0	41.3	12.0	14.6	13.7	20.1	39.2	18.6	6.3	10.8	1.5	0.4	1.8	1.9
GLOUCESTER	- 296.4 -				236.7	0.6	50.0	9.1					103.0	2.9	0.6			2.0	54.8	133.1	295.8		0.6		13.1	27.4	160.3	46.5	49.1	29.6	36.9	31.8	5.5	5.8
HAMPTON	- 63.6 -		3.7	5.5	54.5								5.8	3.9	15.2	0.4	5.6	1.8	23.5	7.4	42.2	14.6	0.1	6.8	23.4	7.8	20.9	7.3	4.2	3.7	4.8	5.7	1.2	1.2
HENRICO	31.5	35.0			17.7		7.5	0.5	0.8	2.7	0.4	1.7	19.3			1.0		0.1	1.9	9.3	31.4	0.1			0.2		26.1	1.6	7.1	24.8			0.6	0.7
ISLE OF WIGHT	129.6	79.6			87.1		34.4		4.4		1.4	2.3	67.4	3.2		2.0		0.7	18.9	37.4	128.9			0.7	1.9	13.0	14.0	23.9	26.8		8.4	11.2	2.4	1.6
JAMES CITY	- 152.0 -				126.7			13.4		4.9	7.1		12.6	1.6	2.6			21.0	5.9	108.3	127.6	20.6	3.8		4.7	13.7	58.1	24.6	50.9	3.2	22.2	1.4	2.8	3.0
KING AND QUEEN	95.3	71.1			74.8	1.0	10.7	4.1	1.7	1.4	0.4	1.2	25.7		2.2			0.2	5.5	61.7	93.1			2.2	0.1	3.2	25.5	16.2	26.1	35.2	11.0		1.8	1.4
KING GEORGE	160.1	131.3			79.4	2.6	47.4	5.9	14.9	2.0	4.1	3.7	50.0	0.3	24.7	0.8		1.4	7.5	75.4	135.4	24.7			5.4	22.0	43.3	43.7	17.0	34.6	11.5	10.9	3.0	2.6
KING WILLIAM	105.4	118.5			73.4	1.5	10.7	10.5	0.9	4.5	1.2	2.7	40.4	2.4	3.9	0.9			9.1	48.7	101.5	3.9			1.1		47.4	6.6	63.4	51.7			1.9	2.3
LANCASTER	288.9	276.9	1.3		153.6	9.5	86.0	23.9	11.3	3.4			57.9	3.7		0.8			80.6	143.6	288.9				14.0	25.7	191.0	33.6	12.3	36.8	28.7	1.9	5.3	5.4
MATHEWS	- 214.6 -				207.5	6.6		0.2		0.3			103.1	1.6				3.2	60.3	46.4	214.6				1.8	34.4	153.1	10.9	14.4	48.8	21.7	23.3	4.0	4.2
MIDDLESEX	213.1	186.5	2.8		80.3		100.7		17.3		12.0		43.4	9.9				2.4	50.7	106.6	213.1				28.3	32.8	92.8	24.2	8.4	92.4	27.9	12.2	3.9	3.6
NEW KENT	84.1	83.3			51.5	3.3	18.3	2.3	2.8		1.6	4.3	31.3					0.2	7.9	44.7	84.1				0.4	1.2	24.6	11.2	45.9	48.9	6.1		1.6	1.6
NEWPORT NEWS	- 46.5 -		4.3			20.8		21.4						0.6	19.8	4.2		3.6	18.3		24.6	19.2		2.7	7.1	6.3	10.3	11.1	11.0	0.7	4.7	16.6	0.9	0.9
NORFOLK	151.8	146.2	42.7		109.1								0.9	8.2	11.7	25.2		9.8	94.4	1.5	123.3	11.5	4.8	12.2	73.2	6.2	57.0	9.4	0.5	27.2	7.5	1.9	2.8	2.8
NORTHAMPTON	- 261.4 -		2.0	38.7	83.1	124.8		11.5		1.3			175.4	2.1	2.1	0.5	33.9	1.2	8.5	37.8	249.6	8.6	3.1	0.1	0.9	62.2	131.1	34.2	33.0	8.8	48.4	39.5	4.8	5.1
NORTHUMBERLAND	446.0	438.4	1.9	2.2	304.9	25.9	61.8	7.6	19.5	2.6	18.3	1.3	147.8	5.5		2.1		3.3	94.4	193.5	446.0				23.2	44.1	324.0	32.8	14.4	0.4	30.2	8.1	8.2	8.6
PORTSMOUTH	90.2	85.5	36.1		54.1								9.3	1.8	22.0	14.5		3.2	38.8	0.5	69.4	17.7		3.1	39.1	2.6	32.7	10.7		13.1	12.1	3.1	1.7	1.7
PRINCE GEORGE	111.9	92.5			29.3		53.0		8.9		20.3	0.4	25.3	1.4	2.6	9.1		1.4	7.7	64.4	108.9	2.6	0.2	0.2	1.8	16.4	19.3	48.1	6.8	11.4	12.5	5.7	2.1	1.8
PRINCE WILLIAM	44.7	57.4			16.2		14.3	0.4	6.9		5.5	1.8		1.1	12.2	5.2	1.5	0.5	5.2	18.9	29.1	13.7		1.9	5.8	11.7	10.4	20.8	8.8	4.8	1.6	6.2	0.8	1.1
RICHMOND CITY	7.1	7.1			5.4	0.7			0.1	0.7	0.1					7.1					5.1			2.0	0.5		6.6			7.1			0.1	0.1
RICHMOND COUNTY	178.5	141.9	0.1		118.5	1.7	38.7	0.2	11.6	0.1	4.9	2.7	70.6	1.4				0.4	8.4	97.7	178.5				4.4	21.0	35.4	56.1	24.9	5.6	19.4	5.2	3.3	2.8
STAFFORD	- 71.5 -				17.8		26.6	2.6	6.9	0.6	13.6	3.4	4.8	1.4	5.6				16.0	43.7	65.7	5.6		0.2	4.6	31.8	22.4	6.6	6.1	11.8	4.4	7.5	1.3	1.4
SUFFOLK	166.1	113.1			95.6	0.4	67.6	2.1	0.4				99.3	2.3	4.3	0.2		4.3	28.0	27.9	157.1	4.3	2.0	2.6	3.3	2.6	28.9	74.2	4.3	21.6	19.1	3.8	3.1	2.2
SURRY	84.6	66.0	0.1		22.9		21.2	5.3	5.4	9.3	1.4	19.1	10.8	0.2		1.3	14.8	2.7	5.3	49.5	70.3		14.3		0.7	24.9	10.1	26.0	4.3	4.6	12.9	10.3	1.6	1.3
VIRGINIA BEACH	346.4	378.0	51.9	38.5	251.7	1.5	0.8	1.5					25.8	8.1	16.3	1.4	9.5	25.4	205.1	54.4	293.3	25.4	23.0	4.6	64.8	42.9	148.1	23.6	98.1	34.7	9.0		6.4	7.4
WESTMORELAND	296.9	252.2			230.1	4.3	33.3	0.9	7.5	0.1	14.5	6.0	103.6	1.6		0.6		4.7	66.4	120.2	292.3	3.0	0.5	0.8	17.3	34.5	139.3	46.3	14.9	26.8	23.5	6.4	5.5	4.9
YORK	- 194.7 -				138.6	16.6		22.1		13.9		3.5		6.9	40.3	1.6	15.7	2.0	125.4	2.8	140.4	53.9		0.4	18.0	19.1	100.5	25.6	31.5	15.8	24.3	10.6	3.6	3.8
TOTAL	5429.2	5122.8	170.9	142.4	3497.0	231.6	828.8	163.4	144.3	53.7	124.4	72.2	1567.1	89.2	219.9	112.6	169.4	154.3	1211.3	1903.5	4928.1	361.9	77.0	61.8	413.2	660.2	2265.2	851.0	932.2	800.0	485.7	426.5	100.0	100.0
% TOTAL			3.1	2.7	64.4	4.3	15.3	3.0	2.7	1.0	2.3	1.3	28.9	1.6	4.0	2.1	3.2	3.4	21.7	35.1	90.8	6.7	1.4	1.1	8.1	12.9	44.8	15.9	18.4					

NOTE: NUMBERS HAVE BEEN ROUNDED.
THE EIGHT COUNTIES WITH ONE FASTLAND AND SHORE LENGTH WERE STUDIED PRIOR TO INITIATION OF SEPARATE MEASUREMENTS.
NEARSHORE WIDTH LIST DOES NOT INCLUDE THOSE MILES IN NARROW CREEKS OR RIVERS AND OTHER AREAS THAT DID NOT FIT THE CLASSIFICATION.

TABLE 2A. POTOMAC AND RAPPAHANNOCK RIVER BASIN SHORELINE PARAMETERS (STATUTE MILES)

WATER BODY	SHORELANDS PHYSIOGRAPHY																		FASTLANDS USE									OWNERSHIP				TOTAL MILES	
	FASTLAND										SHORELINE					NEARSHORE																	
	ARTIFICIAL FILL	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	DUNES	ARTIFICIALLY STABILIZED	BEACH	FRINGE MARSH	EMBAYED MARSH	EXTENSIVE MARSH	NARROW	INTERMEDIATE	WIDE	AGRICULTURAL	COMMERCIAL	GOVERNMENTAL	INDUSTRIAL	MILITARY	PRESERVED	RECREATIONAL	RESIDENTIAL	UNMANAGED, WOODED AND UNWOODED	PRIVATE	FEDERAL	STATE	CITY OR COUNTY	FASTLAND	SHORE
POTOMAC RIVER BASIN																																
Prince William		16.2		14.3	0.4	6.9		5.5	1.8		5.8	11.7	10.4	20.8	8.8	4.8	1.6	6.2		1.1	12.2	5.2		1.5	0.5	5.2	18.9	29.1	13.7		1.9	44.7	57.4
Stafford		17.8		26.6	2.6	6.9	0.6	13.6	3.4		4.6	31.8	22.4	6.6	6.1	11.8	4.4	7.5	4.8	1.4	5.6					16.0	43.7	65.7	5.6		0.2	71.5	71.5
King George		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	49.7	78.6	24.7			103.3	76.5
Westmoreland		206.1	4.1	32.9	0.8	7.5		11.6	4.4		17.3	34.5	128.6	37.4	3.6	14.1	21.9	6.4	84.6	1.6		0.6			4.4	66.2	110.6	263.5	3.0	0.5	0.5	267.7	221.3
Northumberland	0.8	135.0	22.0	34.1	6.6	10.2	1.3	6.0	1.4	1.1	14.6	22.5	149.2	18.9	2.9		18.5	2.5	80.0	2.2		0.7				55.9	79.7	218.5				218.5	208.1
Fairfax	3.2	41.5		34.8	5.0	3.9	0.3	4.6	6.3		13.7	20.1	39.2	18.6	6.3	10.8	1.5	0.4	0.6	0.6	20.7	9.8		12.5	29.6	17.0	9.0	32.0	41.3	12.0	14.6	99.8	98.0
TOTAL	4.0	474.9	28.7	169.6	19.2	40.7	3.4	43.3	20.5	1.1	61.3	142.2	366.1	134.9	28.5	47.7	57.2	33.9	189.5	7.2	38.5	16.7	24.7	14.0	35.9	167.6	311.6	687.4	88.3	12.5	17.2	805.5	732.8
% FASTLAND	T	59%	4%	21%	2%	5%	T	5%	3%	T									23%	1%	5%	2%	3%	2%	4%	21%	39%	85%	11%	2%	2%	100%	
% SHORELINE											8%	19%	50%	18%	4%	7%	8%	5%														100%
RAPPAHANNOCK RIVER BASIN																																
King George		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	25.7	56.8				56.8	54.8
Westmoreland		24.0	0.2	0.4	0.1		0.1	2.9	1.6				10.7	8.9	11.3	12.7	1.6		19.0						0.3	0.2	9.6	28.8			0.3	29.2	30.9
Richmond	0.1	118.5	1.7	38.7	0.2	11.6	0.1	4.9	2.7		4.4	21.0	35.4	56.1	24.9	5.6	19.4	5.2	70.6	1.4					0.4	8.4	97.7	178.5				178.5	141.9
Lancaster	1.1	89.1	8.7	86.0	23.9	11.3	3.4				10.4	18.5	136.4	33.2	6.6	29.3	18.7	1.7	27.7	2.7						67.3	124.0	223.4				223.4	205.4
Caroline		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	17.6	45.4				45.4	42.6
Essex	1.0	104.8	7.3	23.3	5.4	6.0	0.6	7.7	3.2		7.6	16.5	38.2	49.3	39.2	41.8	7.9	20.2	91.4	1.9		1.7			0.2	15.5	48.6	158.0			1.2	159.3	150.8
Middlesex	0.9	52.1		72.7		16.1		11.8			16.5	23.3	68.4	14.4	6.4	58.7	21.0	12.0	33.0	5.2					2.4	34.1	78.8	153.6				153.6	129.0
TOTAL	3.1	425.0	17.9	254.7	35.5	60.9	7.1	30.5	11.5		39.1	81.2	336.7	178.1	120.0	203.3	71.7	40.7	299.5	11.2		2.2			3.5	125.9	402.0	844.5			1.5	846.2	755.4
% FASTLAND	T	50%	2%	30%	4%	7%	1%	4%	1%										35%	1%		T			T	15%	48%	100%			T	100%	
% SHORELINE											5%	11%	45%	24%	16%	27%	9%	5%														100%

TABLE 2B. YORK RIVER BASIN SHORELINE PARAMETERS (STATUTE MILES)

WATER BODY	SHORELANDS PHYSIOGRAPHY																FASTLANDS USE									OWNERSHIP				TOTAL MILES	
	FASTLAND										SHORELINE					NEARSHORE																
	ARTIFICIAL FILL	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	DUNES	ARTIFICIALLY STABILIZED	BEACH	FRINGE MARSH	EMBAYED MARSH	EXTENSIVE MARSH	NARROW	INTERMEDIATE	WIDE	AGRICULTURAL	COMMERCIAL	GOVERNMENTAL	INDUSTRIAL	MILITARY	PRESERVED	RECREATIONAL	RESIDENTIAL	UNMANAGED, WOODED AND UNWOODED	PRIVATE	FEDERAL	STATE	CITY OR COUNTY	FASTLAND	SHORE
YORK RIVER BASIN																																
King and Queen		74.8	1.0	10.7	4.1	1.7	1.4	0.4	1.2		0.1	3.2	25.5	16.2	26.1	35.2	11.0		25.7		2.2				0.2	5.5	61.7	93.1			2.2	95.3	71.1
King William		73.4	1.5	10.7	10.5	0.9	4.5	1.2	2.7		1.1		47.4	6.6	63.4	51.7			40.4	2.4	3.9	0.9				9.1	48.7	101.5	3.9			105.4	118.5
New Kent		51.5	3.3	18.3	2.3	2.8		1.6	4.3		0.4	1.2	24.6	11.2	45.9	48.9	6.1		31.3						0.2	7.9	44.7	84.1				84.1	83.3
Gloucester		59.9		50.0	5.0						9.5	20.2	31.1	33.6	20.5	12.6	20.4	6.5	24.2	1.0	0.6					34.0	55.1	114.3		0.6		114.9	114.9
James City		9.4			3.9		1.2	2.6					8.2	8.8			8.0				2.6					1.0	13.4	10.6	2.6	3.8		17.0	17.0
York		1.0	16.6		17.3		13.9		3.5		8.7	4.4	12.6	25.6	1.0	7.0	13.5			1.2	40.3	1.2			2.0	7.6		12.0	39.9		0.4	52.3	52.3
TOTAL		270.0	22.4	89.7	43.1	5.4	21.0	5.8	11.7		19.8	29.0	149.4	102.0	156.9	155.4	59.0	6.5	121.6	4.6	49.6	2.1			2.4	65.1	223.6	415.6	46.4	4.4	2.6	469.0	457.1
% FASTLAND		58%	5%	19%	9%	1%	4%	1%	3%										26%	1%	11%	T			T	14%	48%	89%	10%	1%	T	100%	
% SHORELINE											4%	6%	33%	22%	34%	34%	13%	1%														100%

TABLE 2C. JAMES RIVER BASIN SHORELINE PARAMETERS (STATUTE MILES)

WATER BODY	SHORELANDS PHYSIOGRAPHY																		FASTLANDS USE									OWNERSHIP				TOTAL MILES	
	FASTLAND										SHORELINE					NEARSHORE																		
	ARTIFICIAL FILL	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	DUNES	ARTIFICIALLY STABILIZED	BEACH	FRINGE MARSH	EMBAYED MARSH	EXTENSIVE MARSH	NARROW	INTERMEDIATE	WIDE	AGRICULTURAL	COMMERCIAL	GOVERNMENTAL	INDUSTRIAL	MILITARY	PRESERVED	RECREATIONAL	RESIDENTIAL	UNMANAGED, WOODED AND UNWOODED	PRIVATE	FEDERAL	STATE	CITY OR COUNTY	FASTLAND	SHORE
JAMES RIVER BASIN																																	
Richmond City		5.4	0.7			0.1	0.7	0.1			0.5		6.6			7.1						7.1						5.1			2.0	7.1	7.1
Henrico		17.7		7.5	0.5	0.8	2.7	0.4	1.7		0.2		26.1	1.6	7.1	24.8			19.3			1.0			0.1	1.9	9.3	31.4	0.1			31.5	35.0
Chesterfield		26.3		6.6		3.5	1.0	1.5	4.7		0.9		26.2	0.6	17.5	32.3	1.4		17.0			2.5	3.8		0.2	2.1	18.0	39.6	4.0			43.6	45.2
Charles City		61.1		67.7	0.2	3.1	1.8	2.7	0.4		1.5	18.3	32.6	52.3	16.6	33.6	15.2	3.1	44.3	0.1		0.4	11.2		0.9	3.0	77.1	125.8		11.2		137.0	121.2
James City		117.3			9.5		3.7	4.5			4.7	13.7	49.9	42.1	24.6	3.2	14.2	1.4	12.6	1.6					21.0	4.9	94.9	117.0	18.0			135.0	135.0
Newport News	4.3		20.8		21.4						7.1	6.3	10.3	11.1	11.0	0.7	4.7	16.6		0.6	19.8	4.2			3.6	18.3		24.6	19.2		2.7	46.5	46.5
Hampton	1.5	21.8								0.8	15.1	0.9	7.4	0.2	0.5	1.4		4.7		3.2	6.0	0.4			0.4	14.0		17.7	6.0	0.1	0.4	24.1	24.1
Prince George		29.3		53.0		8.9		20.3	0.4		1.8	16.4	19.3	48.1	6.8	11.4	12.5	5.7	25.3	1.4	2.6	9.1			1.4	7.7	64.4	108.9	2.6	0.2	0.2	111.9	92.5
Surry	0.1	22.9		21.2	5.3	5.4	9.3	1.4	19.1		0.7	24.9	10.1	26.0	4.3	4.6	12.9	10.3	10.8	0.2		1.3	14.8		2.7	5.3	49.5	70.3		14.3		84.6	66.0
Isle of Wight		87.1		34.4		4.4		1.4	2.3		1.9	13.0	14.0	23.9	26.8		8.4	11.2	67.4	3.2		2.0			0.7	18.9	37.4	128.9			0.7	129.6	79.6
Suffolk		95.6	0.4	67.6	2.1	0.4					3.3	2.6	28.9	74.2	4.3	21.6	19.1	3.8	99.3	2.3	4.3	0.2			4.3	28.0	27.9	157.1	4.3	2.0	2.6	166.1	113.1
Portsmouth	36.1	54.1									39.1	2.6	32.7	10.7		13.1	12.1	3.1	9.3	1.8	22.0	14.5			3.2	38.8	0.5	69.4	17.7		3.1	90.2	85.5
Norfolk	42.7	109.1									73.2	6.2	57.0	9.4	0.5	27.2	7.5	1.9	0.9	8.2	11.7	25.2			9.8	94.4	1.5	123.3	11.5	4.8	12.2	151.8	146.2
Chesapeake	18.4	110.7									22.0	2.5	60.6	28.3		21.4			22.3	1.7	3.1	19.2			6.5	56.7	19.6	118.0	4.5	1.3	5.3	129.1	114.0
Virginia Beach	1.1	16.8									3.5		7.7	3.9					0.8	0.4		0.2			0.6	15.4	0.5	17.0			0.8	17.9	15.1
TOTAL	104.2	775.2	21.9	258.0	39.0	26.6	19.2	32.3	28.6	0.8	175.5	107.4	389.4	332.3	120.1	202.4	108.0	61.8	329.3	24.7	69.5	87.3	29.8	55.4	309.4	400.6	1154.2	87.9	33.9	30.0	1306.0	1126.1
% FASTLAND	8%	59%	2%	20%	3%	2%	1%	2%	2%	T									25%	2%	5%	6%	2%	4%	24%	31%	88%	7%	3%	2%	100%	
% SHORELINE											15%	10%	34%	30%	11%	18%	10%	6%														100%

TABLE 2D. CHESAPEAKE BAY WESTERN SHORE SHORELINE PARAMETERS (STATUTE MILES)

WATER BODY	SHORELANDS PHYSIOGRAPHY																		FASTLANDS USE									OWNERSHIP				TOTAL MILES	
	FASTLAND											SHORELINE					NEARSHORE																		
	ARTIFICIAL FILL	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	DUNES	ARTIFICIALLY STABILIZED	BEACH	FRINGE MARSH	EMBAYED MARSH	EXTENSIVE MARSH	NARROW	INTERMEDIATE	WIDE	AGRICULTURAL	COMMERCIAL	GOVERNMENTAL	INDUSTRIAL	MILITARY	PRESERVED	RECREATIONAL	RESIDENTIAL	UNMANAGED, WOODED AND UNWOODED	PRIVATE	FEDERAL	STATE	CITY OR COUNTY	FASTLAND	SHORE
CHESAPEAKE BAY WESTERN SHORE																																		
Northumberland	1.1	169.9	3.9	27.7	1.0	9.3	1.2	12.2		1.2	8.7	21.6	174.8	13.8	11.4	0.4	11.8	5.6	67.8	3.1		1.3			3.3	38.5	113.5	227.5				227.5	230.3
Lancaster	0.2	64.5	0.8								3.6	7.2	54.6	0.4	5.7	7.5	10.0	0.2	30.2	1.0		0.8				13.2	19.6	65.5				65.5	71.5
Middlesex	1.9	28.2		28.0		1.2		0.2			11.8	9.5	24.4	9.8	2.0	33.7	6.9	0.2	10.4	4.7						16.6	27.8	59.5				59.5	57.5
Mathews		207.5	6.6		0.2		0.3				1.8	34.4	153.1	10.9	14.4	48.8	21.7	23.3	103.1	1.6					3.2	60.3	46.4	214.6				214.6	214.6
Gloucester		176.8	0.6		4.1						3.6	7.2	129.2	12.9	28.6	17.0	16.5	25.3	78.8	1.9					2.0	20.8	78.0	181.5				181.5	181.5
York		137.6			4.8						9.3	14.7	87.9		30.5	8.8	10.8	10.6		5.7		0.4		15.7		117.8	2.8	128.4	14.0			142.4	142.4
Hampton	2.2	32.6								4.7	8.3	6.9	13.5	7.1	3.7	2.3	4.8	1.0	5.8	0.6	9.2			5.6	1.4	9.5	7.4	24.5	8.6		6.4	39.5	39.5
Norfolk	1.1	19.9									7.5	3.6	6.4	2.2		5.4	1.7			3.7		0.1			1.8	15.4		19.1			1.9	21.0	19.6
Virginia Beach	33.5	155.2	1.5	0.8	1.5		0.1	0.2	0.1	10.5	51.3	18.4	119.7	9.6		12.5	4.8		4.2	3.4		1.2	11.7		5.4	157.6	19.8	185.0	11.7	5.3	1.4	203.4	199.2
TOTAL	40.0	992.2	13.4	56.5	11.6	10.5	1.6	12.6	0.1	16.4	105.9	123.5	763.6	66.7	96.3	136.4	88.9	66.2	300.3	25.7	9.2	3.7	11.7	21.3	17.1	449.7	315.3	1105.6	34.3	5.3	9.7	1154.9	1156.1
% FASTLAND	3%	86%	1%	5%	1%	1%	T	1%	T	1%									26%	2%	1%	T	1%	2%	1%	39%	27%	96%	3%	T	1%	100%	.
% SHORELINE											9%	11%	66%	6%	8%	12%	8%	6%															100%

TABLE 2E. ATLANTIC OCEAN AND CHESAPEAKE BAY EASTERN SHORE SHORELINE PARAMETERS (STATUTE MILES)

WATER BODY	SHORELANDS PHYSIOGRAPHY																FASTLANDS USE									OWNERSHIP				TOTAL MILES	
	FASTLAND										SHORELINE					NEARSHORE																
	ARTIFICIAL FILL	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	DUNES	ARTIFICIALLY STABILIZED	BEACH	FRINGE MARSH	EMBAYED MARSH	EXTENSIVE MARSH	NARROW	INTERMEDIATE	WIDE	AGRICULTURAL	COMMERCIAL	GOVERNMENTAL	INDUSTRIAL	MILITARY	PRESERVED	RECREATIONAL	RESIDENTIAL	UNMANAGED, WOODED AND UNWOODED	PRIVATE	FEDERAL	STATE	CITY OR COUNTY	FASTLAND	SHORE
ATLANTIC OCEAN																																
Accomack	1.4	131.4		0.3		0.2				57.3	7.6	62.9	27.7	10.7	89.4	32.3	35.2	20.1	35.6	4.2	10.0			60.9	21.0	31.2	27.7	107.8	82.7	0.1		190.6	198.3
Northampton	0.2	39.7								27.8		28.0	5.7	2.5	25.6	6.2	29.8	25.8	13.8	0.9	2.1			27.8		0.6	22.5	62.5	2.1	3.1		67.7	67.7
Virginia Beach	17.3	79.7								28.0	10.0	24.5	20.7	10.1	98.1	22.2	4.2		20.8	4.3			4.6	9.5	19.4	32.1	34.1	91.2	13.7	17.7	2.4	125.1	163.7
TOTAL	18.9	250.8		0.3		0.2				113.1	17.6	115.4	54.1	23.3	213.1	60.7	69.2	45.9	70.2	9.4	12.1		4.6	97.2	40.4	63.9	84.3	261.5	98.5	20.9	2.4	383.4	429.7
% FASTLAND	5%	65%		T		T				29%									18%	2%	3%		1%	25%	11%	17%	22%	68%	26%	5%	1%	100%	
% SHORELINE											4%	27%	13%	5%	50%	14%	16%	11%														100%
CHESAPEAKE BAY EASTERN SHORE																																
Accomack		285.3	2.5		3.5					0.2		30.7	86.9	10.3	163.6		5.8	152.8	95.1	8.6					0.2	37.1	150.5	291.3			0.2	291.5	291.5
Northampton	1.8	43.4	124.8		11.5		1.3			10.9	0.9	34.2	125.4	31.7	1.5	2.6	18.6	13.7	161.6	1.2		0.5		6.1	1.2	7.9	15.3	187.1	6.5		0.1	193.7	193.7
TOTAL	1.8	328.7	127.3		15.0		1.3			11.1	0.9	64.9	212.3	42.0	165.1	2.6	24.4	166.5	256.7	9.8		0.5		6.1	1.4	45.0	165.8	478.4	6.5		0.3	485.2	485.2
% FASTLAND	T	68%	26%		3%		T			2%									53%	2%		T		1%	T	9%	34%	99%	1%		T	100%	
% SHORELINE											T	13%	44%	9%	34%	1%	5%	34%														100%

TABLE 3A. SHORELINE PARAMETERS FOR PLANNING DISTRICTS 8 AND 15 (STATUTE MILES)

PLANNING DISTRICT NUMBER	SHORELANDS PHYSIOGRAPHY: FASTLAND: ARTIFICIAL FILL	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	DUNES	SHORELINE: ARTIFICIALLY STABILIZED	BEACH	FRINGE MARSH	EMBAYED MARSH	EXTENSIVE MARSH	NEARSHORE: NARROW	INTERMEDIATE	WIDE	FASTLANDS USE: AGRICULTURAL	COMMERCIAL	GOVERNMENTAL	INDUSTRIAL	MILITARY	PRESERVED	RECREATIONAL	RESIDENTIAL	UNMANAGED, WOODED AND UNWOODED	OWNERSHIP: PRIVATE	FEDERAL	STATE	CITY OR COUNTY	TOTAL MILES: FASTLAND	SHORE
8																																	
Fairfax	3.2	41.5		34.8	5.0	3.9	0.3	4.6	6.3		13.7	20.1	39.2	18.6	6.3	10.8	1.5	0.4	0.6	0.6	20.7	9.8		12.5	29.6	17.0	9.0	32.0	41.3	12.0	14.6	99.8	98.0
Prince William		16.2		14.3	0.4	6.9		5.5	1.8		5.8	11.7	10.4	20.8	8.8	4.8	1.6	6.2		1.1	12.2	5.2		1.5	0.5	5.2	18.9	29.1	13.7		1.9	44.7	57.4
TOTAL	3.2	57.7		49.1	5.4	10.8	0.3	10.1	8.1		19.5	31.8	49.6	39.4	15.1	15.6	3.1	6.6	0.6	1.7	32.9	15.0		14.0	30.1	22.2	27.9	61.1	55.0	12.0	16.5	144.5	155.4
% FASTLAND	2%	40%		34%	4%	7%	1%	7%	6%										1%	1%	23%	10%		10%	21%	15%	19%	42%	38%	8%	11%	100%	
% SHORELINE											13%	20%	32%	25%	10%	10%	2%	4%															100%
15																																	
Richmond City		5.4	0.7			0.1	0.7	0.1			0.5		6.6			7.1						7.1						5.1			2.0	7.1	7.1
New Kent		51.5	3.3	18.3	2.3	2.8		1.6	4.3		0.4	1.2	24.6	11.2	45.9	48.9	6.1		31.3						0.2	7.9	44.7	84.1				84.1	83.3
Henrico		17.7		7.5	0.5	0.8	2.7	0.4	1.7		0.2		26.1	1.6	7.1	24.8			19.3			1.0			0.1	1.9	9.3	31.4	0.1			31.5	35.0
Chesterfield		26.3		6.6		3.5	1.0	1.5	4.7		0.9		26.2	0.6	17.5	32.3	1.4		17.0			2.5		3.8	0.2	2.1	18.0	39.6	4.0			43.6	45.2
Charles City		61.1		67.7	0.2	3.1	1.8	2.7	0.4		1.5	18.3	32.6	52.3	16.6	33.6	15.2	3.1	44.3	0.1		0.4		11.2	0.9	3.0	77.1	125.8		11.2		137.0	121.2
TOTAL		162.1	4.0	100.1	3.0	10.3	6.2	6.3	11.1		3.5	19.5	116.1	65.7	87.1	146.7	22.7	3.1	111.9	0.1		11.0		15.0	1.4	14.9	149.1	286.0	4.1	11.2	2.0	303.3	291.8
% FASTLAND		53%	1%	33%	1%	3%	2%	2%	4%										37%	1%		4%		5%	1%	5%	49%	94%	1%	4%	1%	100%	
% SHORELINE											1%	7%	40%	23%	30%	50%	8%	1%															100%

TABLE 3B. SHORELINE PARAMETERS FOR PLANNING DISTRICTS 16 AND 17 (STATUTE MILES)

PLANNING DISTRICT NUMBER	SHORELANDS PHYSIOGRAPHY																FASTLANDS USE									OWNERSHIP				TOTAL MILES	
	FASTLAND										SHORELINE					NEARSHORE																
	ARTIFICIAL FILL	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	DUNES	ARTIFICIALLY STABILIZED	BEACH	FRINGE MARSH	EMBAYED MARSH	EXTENSIVE MARSH	NARROW	INTERMEDIATE	WIDE	AGRICULTURAL	COMMERCIAL	GOVERNMENTAL	INDUSTRIAL	MILITARY	PRESERVED	RECREATIONAL	RESIDENTIAL	UNMANAGED, WOODED AND UNWOODED	PRIVATE	FEDERAL	STATE	CITY OR COUNTY	FASTLAND	SHORE
16																																
Stafford		17.8		26.6	2.6	6.9	0.6	13.6	3.4		4.6	31.8	22.4	6.6	6.1	11.8	4.4	7.5	4.8	1.4	5.6					16.0	43.7	65.7	5.6		0.2	71.5	71.5
King George		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	75.4	135.4	24.7			160.1	131.3
Caroline		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	17.6	45.4				45.4	42.6
TOTAL		112.6	2.6	87.1	12.3	28.1	4.8	18.8	10.6		10.1	55.3	86.3	55.4	38.5	73.2	16.8	20.0	82.1	1.7	5.6	0.9	24.7		1.6	23.7	136.7	246.5	30.3		0.2	277.0	245.4
% FASTLAND		41%	1%	31%	4%	10%	2%	7%	4%										30%	1%	2%	T	9%		1%	9%	49%	89%	11%		T	100%	
% SHORELINE											4%	23%	35%	23%	16%	30%	7%	8%														100%
17																																
Westmoreland		230.1	4.3	33.3	0.9	7.5	0.1	14.5	6.0		17.3	34.5	139.3	46.3	14.9	14.1	21.9	6.4	103.6	1.6		0.6			4.4	66.4	120.2	292.3	3.0	0.5	0.8	296.9	252.2
Northumberland	1.9	304.9	25.9	61.8	7.6	19.5	2.6	18.3	1.3	2.2	23.2	44.1	324.0	32.8	14.4	0.4	30.2	8.1	147.8	5.5		2.1			3.3	94.4	193.5	446.0				446.0	438.4
Richmond	0.1	118.5	1.7	38.7	0.2	11.6	0.1	4.9	2.7		4.4	21.0	35.4	56.1	24.9	5.6	19.4	5.2	70.6	1.4					0.4	8.4	97.7	178.5				178.5	141.9
Lancaster	1.3	153.6	9.5	86.0	23.9	11.3	3.4				14.0	25.7	191.0	33.6	12.3	36.8	28.7	1.9	57.9	3.7		0.8				80.6	143.6	288.9				288.9	276.9
TOTAL	3.1	807.1	41.4	219.8	32.6	49.9	6.1	37.7	10.4	2.2	58.9	125.3	689.7	168.8	66.5	56.9	100.2	21.6	380.2	12.2		3.5			8.1	249.8	555.0	1205.7	3.0	0.5	0.8	1210.3	1109.4
% FASTLAND	T	67%	3%	18%	3%	4%	T	3%	1%	T									31%	1%		T			1%	21%	46%	100%	T	T	T	100%	
% SHORELINE											5%	11%	62%	15%	6%	5%	9%	2%														100%

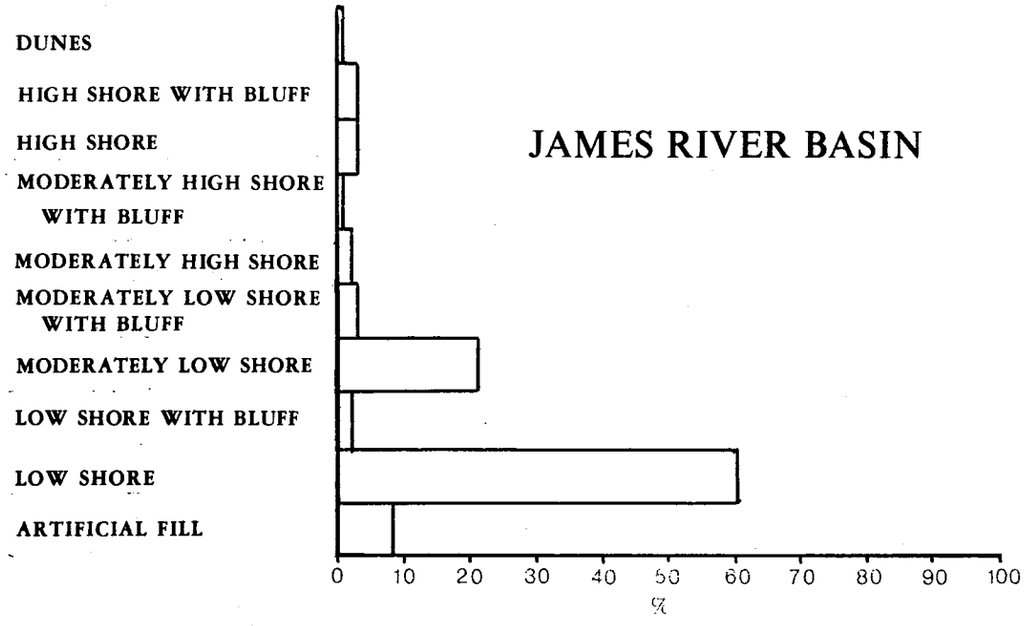
TABLE 3C. SHORELINE PARAMETERS FOR PLANNING DISTRICTS 18 AND 19 (STATUTE MILES)

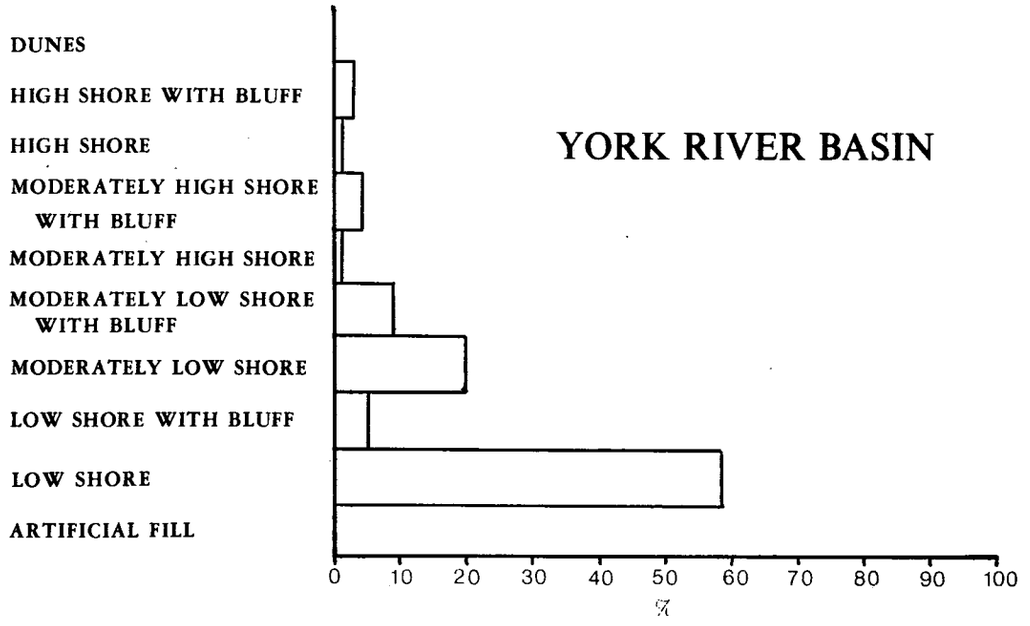
PLANNING DISTRICT NUMBER	SHORELANDS PHYSIOGRAPHY																		FASTLANDS USE									OWNERSHIP				TOTAL MILES	
	FASTLAND										SHORELINE					NEARSHORE																	
	ARTIFICIAL FILL	LOW SHORE	LOW SHORE WITH BLUFF	MODERATELY LOW SHORE	MODERATELY LOW SHORE WITH BLUFF	MODERATELY HIGH SHORE	MODERATELY HIGH SHORE WITH BLUFF	HIGH SHORE	HIGH SHORE WITH BLUFF	DUNES	ARTIFICIALLY STABILIZED	BEACH	FRINGE MARSH	EMBAYED MARSH	EXTENSIVE MARSH	NARROW	INTERMEDIATE	WIDE	AGRICULTURAL	COMMERCIAL	GOVERNMENTAL	INDUSTRIAL	MILITARY	PRESERVED	RECREATIONAL	RESIDENTIAL	UNMANAGED, WOODED AND UNWOODED	PRIVATE	FEDERAL	STATE	CITY OR COUNTY	FASTLAND	SHORE
18																																
Essex	1.0	104.8	7.3	23.3	5.4	6.0	0.6	7.7	3.2		7.6	16.5	38.2	49.3	39.2	41.8	7.9	20.2	91.4	1.9		1.7			0.2	15.5	48.6	158.0			1.2	159.3	150.8
Middlesex	2.8	80.3		100.7		17.3		12.0			28.3	32.8	92.8	24.2	8.4	92.4	27.9	12.2	43.4	9.9					2.4	50.7	106.6	213.1				213.1	186.5
Mathews		207.5	6.6		0.2		0.3				1.8	34.4	153.1	10.9	14.4	48.8	21.7	23.3	103.1	1.6					3.2	60.3	46.4	214.6				214.6	214.6
King William		73.4	1.5	10.7	10.5	0.9	4.5	1.2	2.7		1.1		47.4	6.6	63.4	51.7			40.4	2.4	3.9	0.9				9.1	48.7	101.5	3.9			105.4	118.5
King and Queen		74.8	1.0	10.7	4.1	1.7	1.4	0.4	1.2		0.1	3.2	25.5	16.2	26.1	35.2	11.0		25.7		2.2				0.2	5.5	61.7	93.1			2.2	95.3	71.1
Gloucester		236.7	0.6	50.0	9.1						13.1	27.4	160.3	46.5	49.1	29.6	36.9	31.8	103.0	2.9	0.6				2.0	54.8	133.1	295.8		0.6		296.4	296.4
TOTAL	3.8	777.5	17.0	195.4	29.3	25.9	6.8	21.3	7.1		52.0	114.3	517.3	153.7	200.6	299.5	105.4	87.5	407.0	18.7	6.7	2.6			8.0	195.9	445.1	1076.1	3.9	0.6	3.4	1084.1	1037.9
% FASTLAND	T	72%	1%	18%	3%	2%	1%	2%	1%										38%	2%	1%	T			1%	18%	41%	99%	T	T	T	100%	
% SHORELINE											5%	11%	50%	15%	19%	29%	10%	8%														100%
19																																
Prince George		29.3		53.0		8.9		20.3	0.4		1.8	16.4	19.3	48.1	6.8	11.4	12.5	5.7	25.3	1.4	2.6	9.1			1.4	7.7	64.4	108.9	2.6		0.4	111.9	92.5
Surry	0.1	22.9		21.2	5.3	5.4	9.3	1.4	19.1		0.7	24.9	10.1	26.0	4.3	4.6	12.9	10.3	10.8	0.2		1.3	14.8	2.7	5.3	49.5	70.3		14.3		84.6	66.0
TOTAL	0.1	52.2		74.2	5.3	14.3	9.3	21.7	19.5		2.5	41.3	29.4	74.1	11.1	16.0	25.4	16.0	36.1	1.6	2.6	10.4	14.8	4.1	13.0	113.9	179.2	2.6	14.3	0.4	196.5	158.5
% FASTLAND	1%	26%		38%	3%	7%	5%	11%	10%										18%	1%	1%	5%	8%	2%	7%	58%	91%	1%	7%	1%	100%	
% SHORELINE											2%	26%	18%	47%	7%	10%	16%	10%														100%

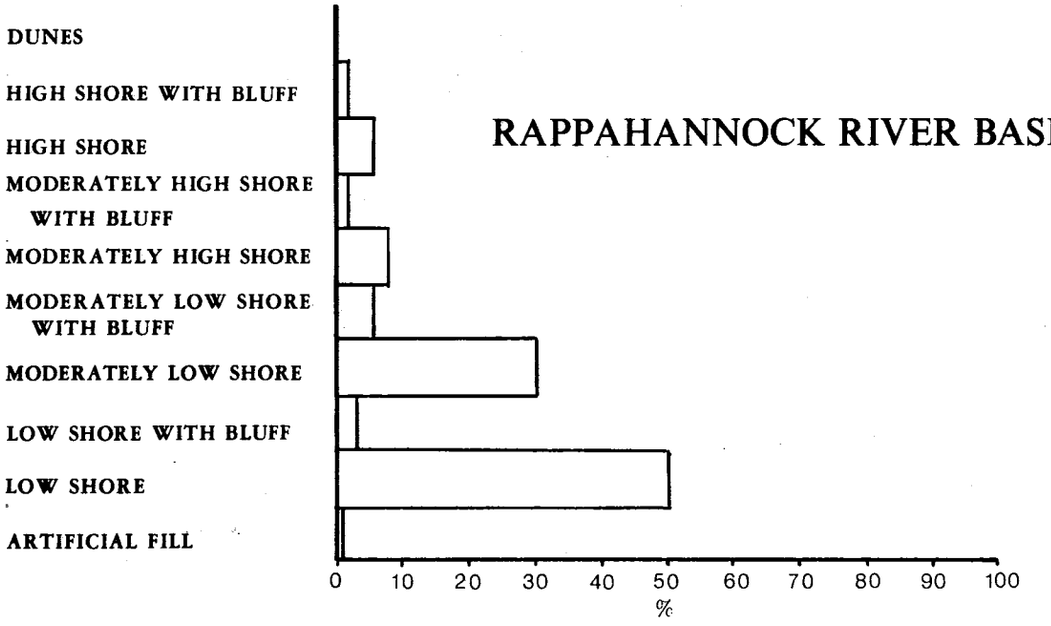
TABLE 3D. SHORELINE PARAMETERS FOR PLANNING DISTRICTS 20 AND 21 (STATUTE MILES)

PLANNING DISTRICT NUMBER	SHORELANDS PHYSIOGRAPHY: FASTLAND: ARTIFICIAL FILL	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	DUNES	SHORELINE: ARTIFICIALLY STABILIZED	BEACH	FRINGE MARSH	EMBAYED MARSH	EXTENSIVE MARSH	NEARSHORE: NARROW	INTERMEDIATE	WIDE	FASTLANDS USE: AGRICULTURAL	COMMERCIAL	GOVERNMENTAL	INDUSTRIAL	MILITARY	PRESERVED	RECREATIONAL	RESIDENTIAL	UNMANAGED, WOODED AND UNWOODED	OWNERSHIP: PRIVATE	FEDERAL	STATE	CITY OR COUNTY	TOTAL MILES: FASTLAND	SHORE
20																																	
Isle of Wight		87.1		34.4		4.4		1.4	2.3		1.9	13.0	14.0	23.9	26.8		8.4	11.2	67.4	3.2		2.0			0.7	18.9	37.4	128.9			0.7	129.6	79.6
Suffolk		95.6	0.4	67.6	2.1	0.4					3.3	2.6	28.9	74.2	4.3	21.6	19.1	3.8	99.3	2.3	4.3	0.2			4.3	28.0	27.9	157.1	4.3	2.0	2.6	166.1	113.1
Norfolk	42.7	109.1									73.2	6.2	57.0	9.4	0.5	27.2	7.5	1.9	0.9	8.2	11.7	5.2			9.8	94.4	1.5	123.3	11.5	4.8	12.2	151.8	146.2
Portsmouth	36.1	54.1									39.1	2.6	32.7	10.7		13.1	12.1	3.1	9.3	1.8	22.0	14.5			3.2	38.8	0.5	69.4	17.7		3.1	90.2	85.5
Chesapeake	18.4	110.7									22.7	2.5	60.6	28.3		21.4			22.3	1.7	3.1	19.2			6.5	56.7	19.6	118.0	4.5	1.3	5.3	129.1	114.0
Virginia Beach	51.9	251.7	1.5	0.8	1.5					38.5	64.8	42.9	148.1	23.6	98.1	34.7	9.0		25.8	8.1		1.4	16.3	9.5	25.4	205.1	54.4	293.3	25.4	23.0	4.6	346.4	378.0
TOTAL	149.1	708.3	1.9	102.8	3.6	4.8		1.4	2.3	38.5	205.0	69.8	341.3	170.1	129.7	118.0	56.1	20.1	225.0	25.3	41.1	42.5	16.3	9.5	49.9	441.9	141.9	890.0	63.4	31.1	28.5	1013.2	916.4
% FASTLAND	14%	70%	T	10%	T	T		T	T	4%									22%	3%	4%	5%	2%	1%	5%	44%	14%	88%	6%	3%	3%	100%	
% SHORELINE											22%	8%	37%	19%	14%	13%	6%	2%															100%
21																																	
York		138.6	16.6		22.1		13.9		3.5		18.0	19.1	100.5	25.6	31.5	15.8	24.3	10.6		6.9	40.3	1.6		15.7	2.0	125.4	2.8	140.4	53.9		0.4	194.7	194.7
James City		126.7			13.4		4.9	7.1			4.7	13.7	58.1	50.9	24.6	3.2	22.2	1.4	12.6	1.6	2.6				21.0	5.9	108.3	127.6	20.6	3.8		152.0	152.0
Hampton	3.7	54.5								5.5	23.4	7.8	20.9	7.3	4.2	3.7	4.8	5.7	5.8	3.9	15.2	0.4		5.6	1.8	23.5	7.4	42.2	14.6	0.1	6.8	63.6	63.6
Newport News	4.3		20.8		21.4						7.1	6.3	10.3	11.0	11.1	0.7	4.7	16.6		0.6	19.8	4.2			3,6	18.3		24.6	19.2		2.7	46.5	46.5
TOTAL	8.0	319.8	37.4		56.9		18.8	7.1	3.5	5.5	53.2	46.9	189.8	94.8	71.4	23.4	56.0	34.3	18.4	13.0	77.9	6.2		21.3	28.4	173.1	118.5	334.8	108.3	3.9	9.9	456.8	456.8
% FASTLAND	2%	70%	8%		12%		4%	2%	1%	1%									4%	3%	17%	1%		5%	6%	38%	26%	73%	24%	1%	2%	100%	
% SHORELINE											12%	10%	42%	21%	8%	5%	12%	8%															100%

FIGURE 2. FASTLAND TYPES BY DRAINAGE BASIN







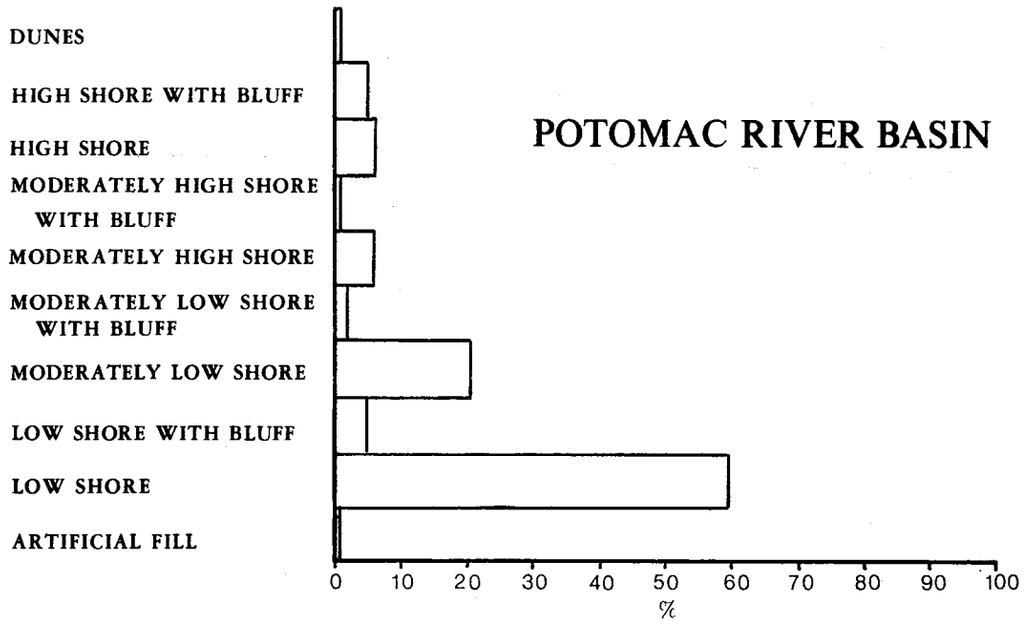
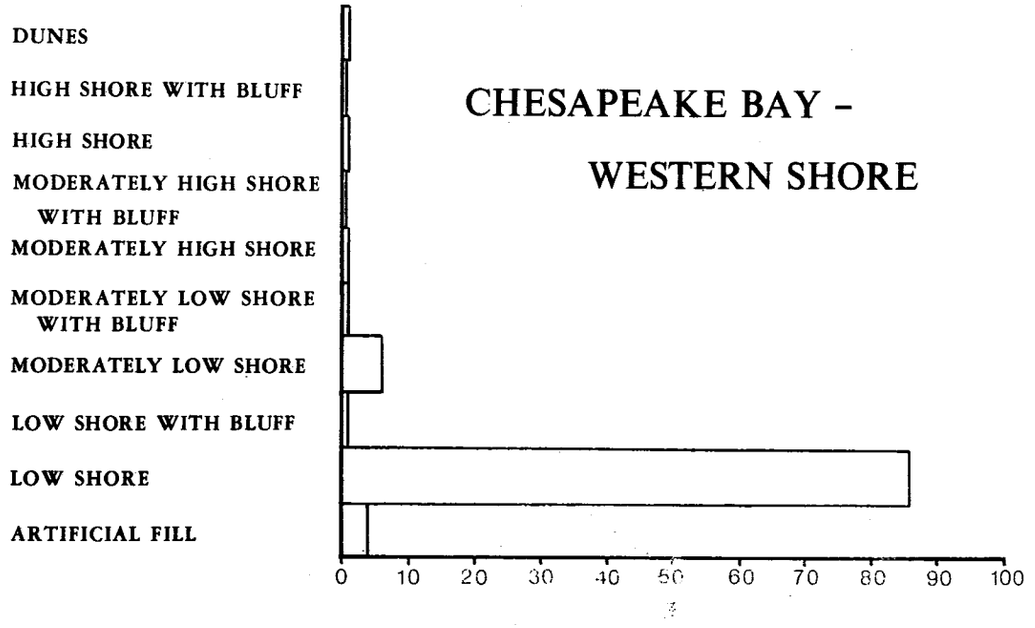
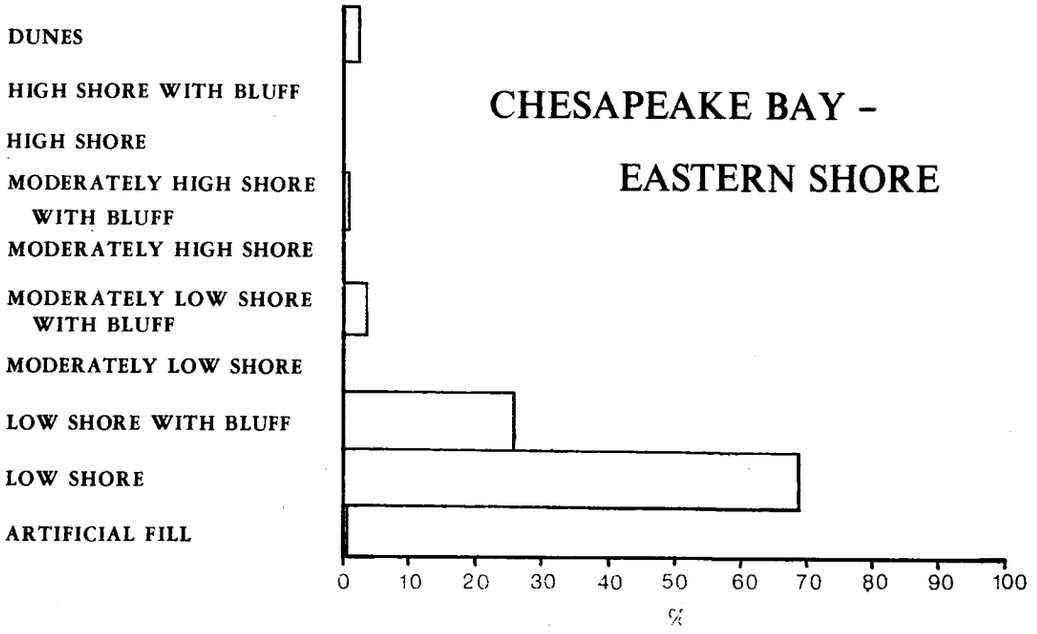


FIGURE 2 (CONT'D.)





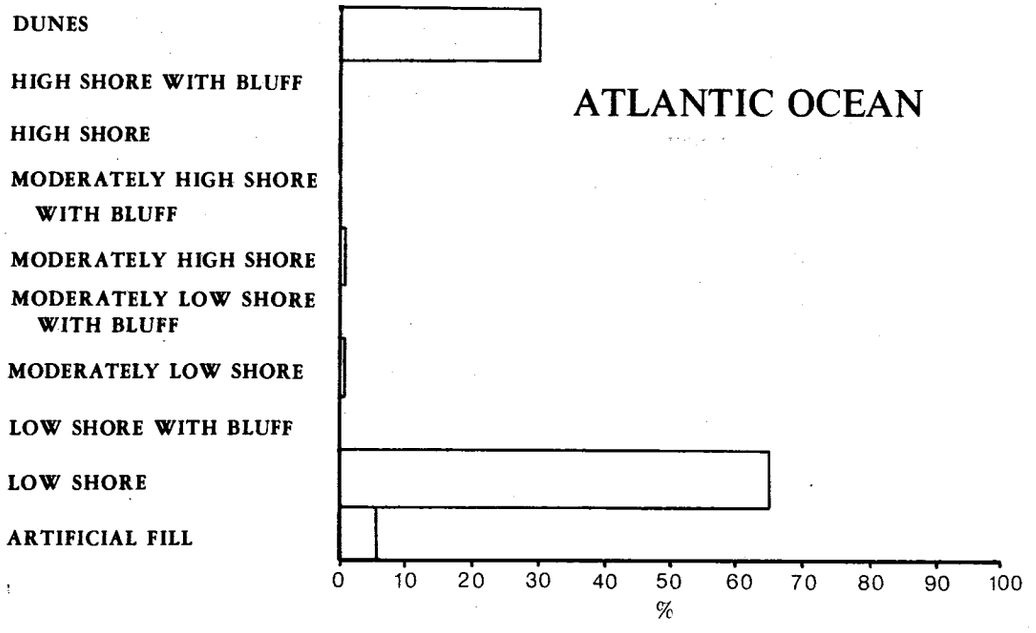


FIGURE 3. SHORE TYPES BY DRAINAGE BASIN

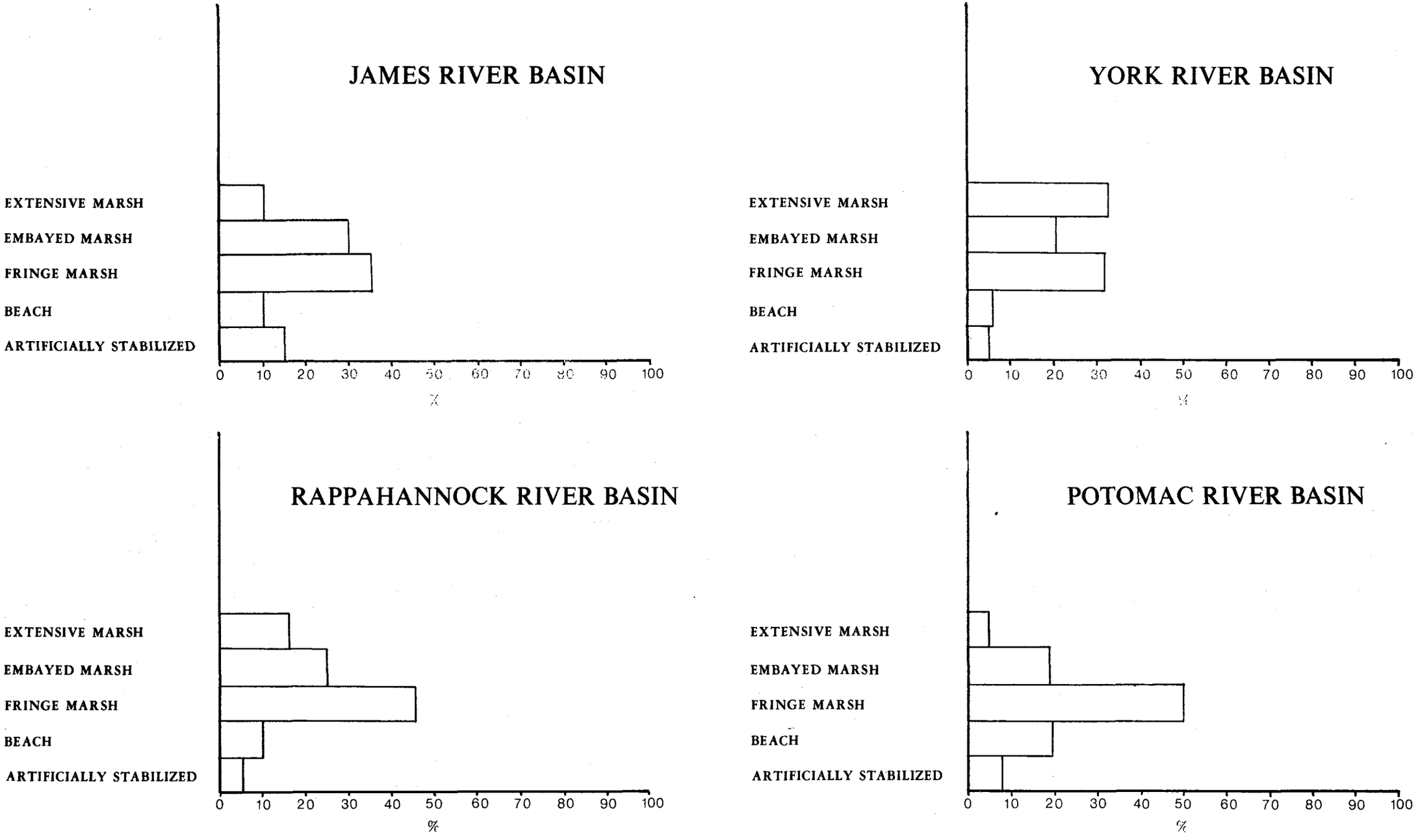
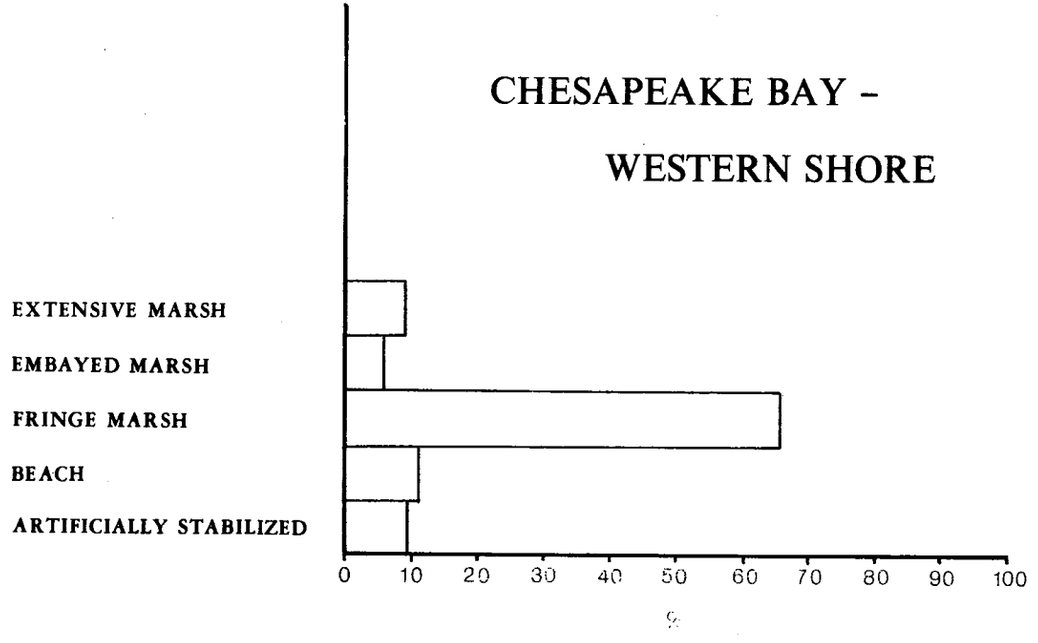
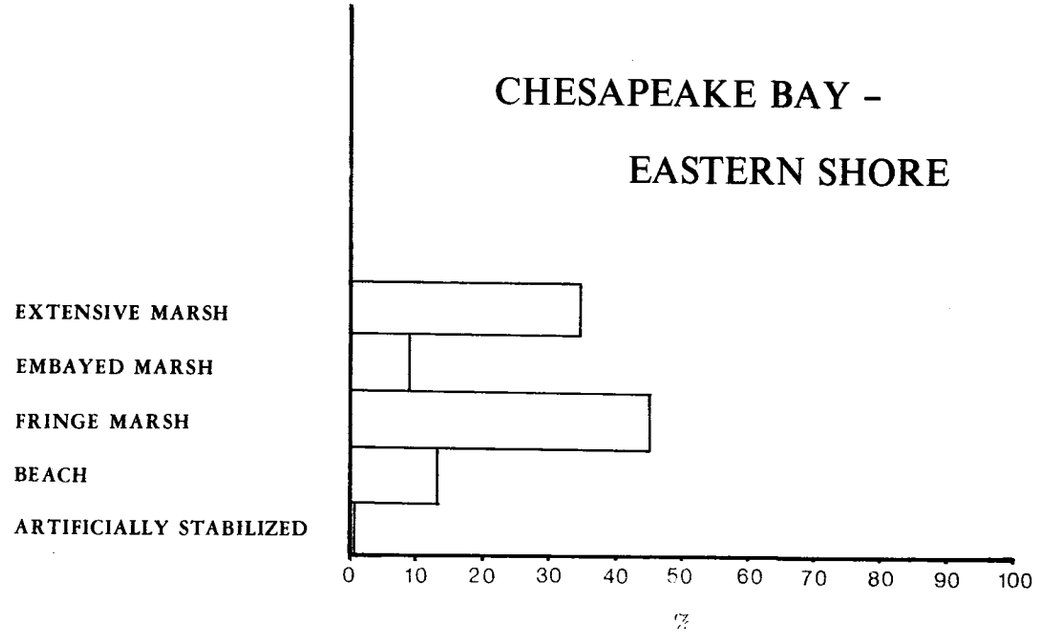


FIGURE 3 (CONT'D)





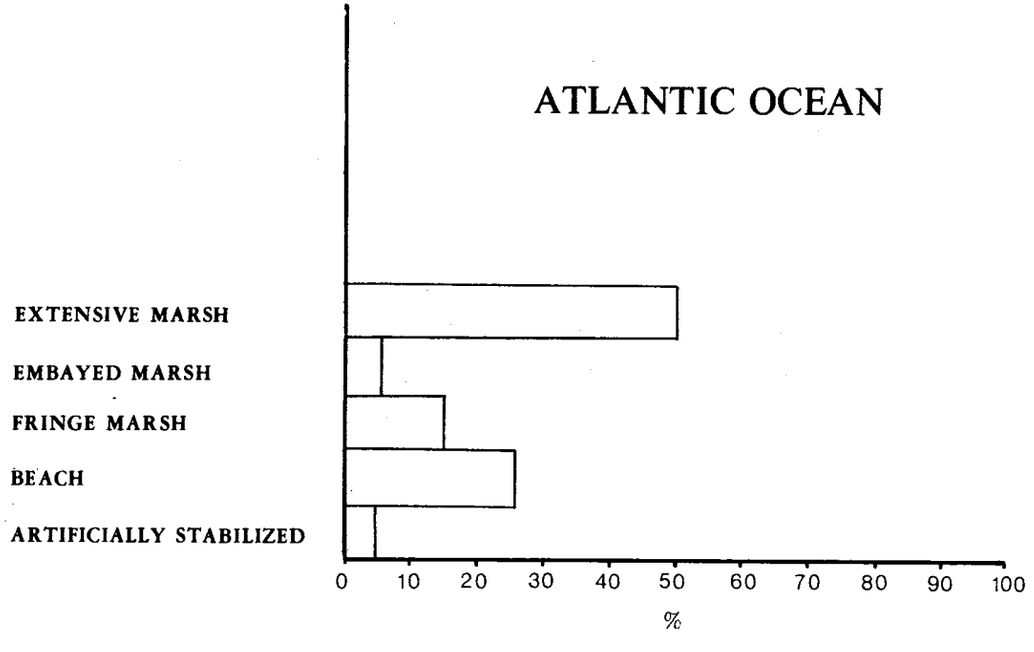
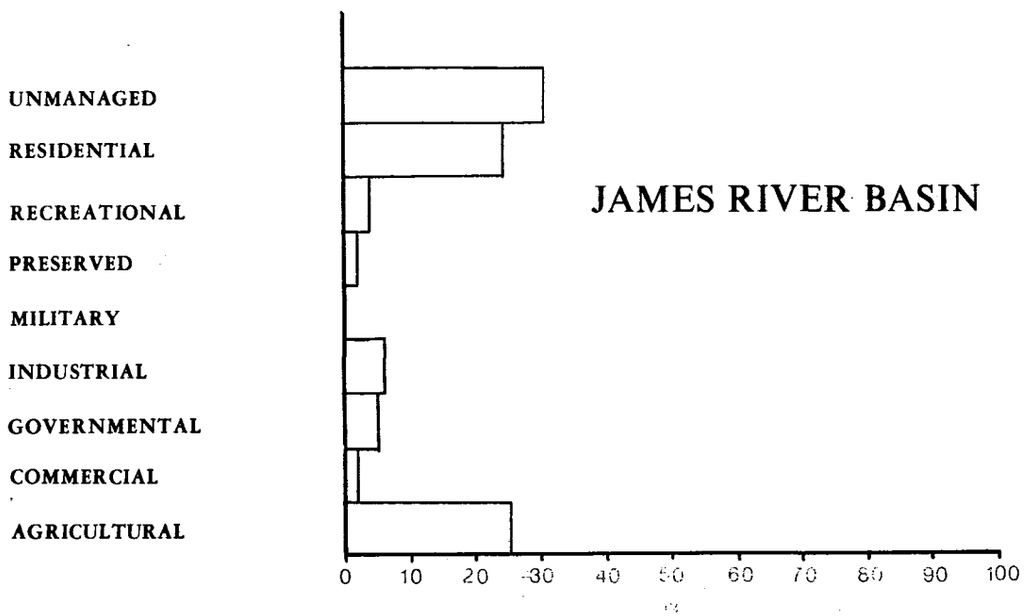
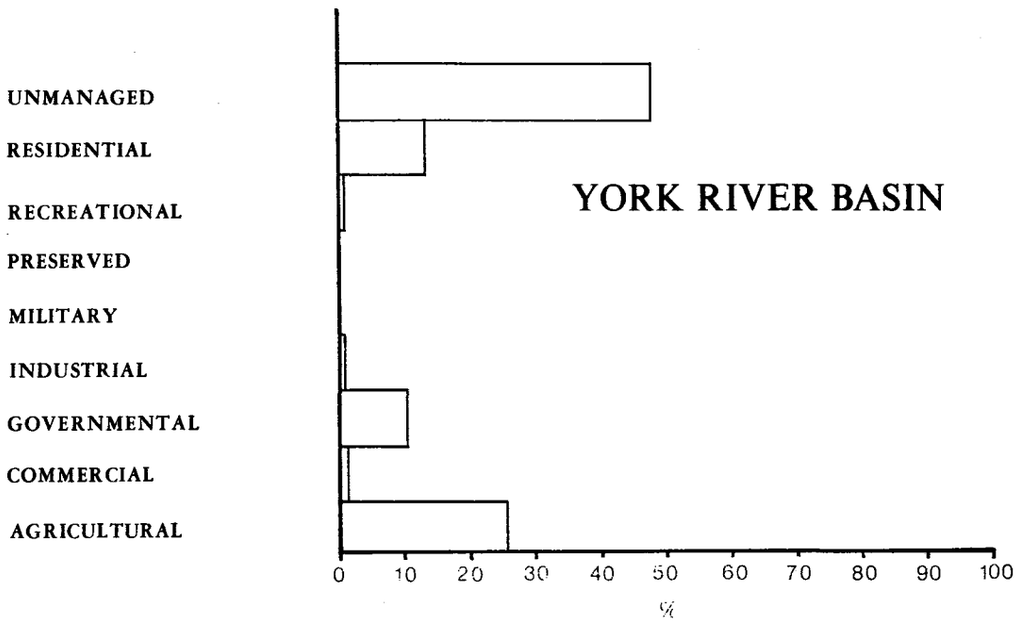
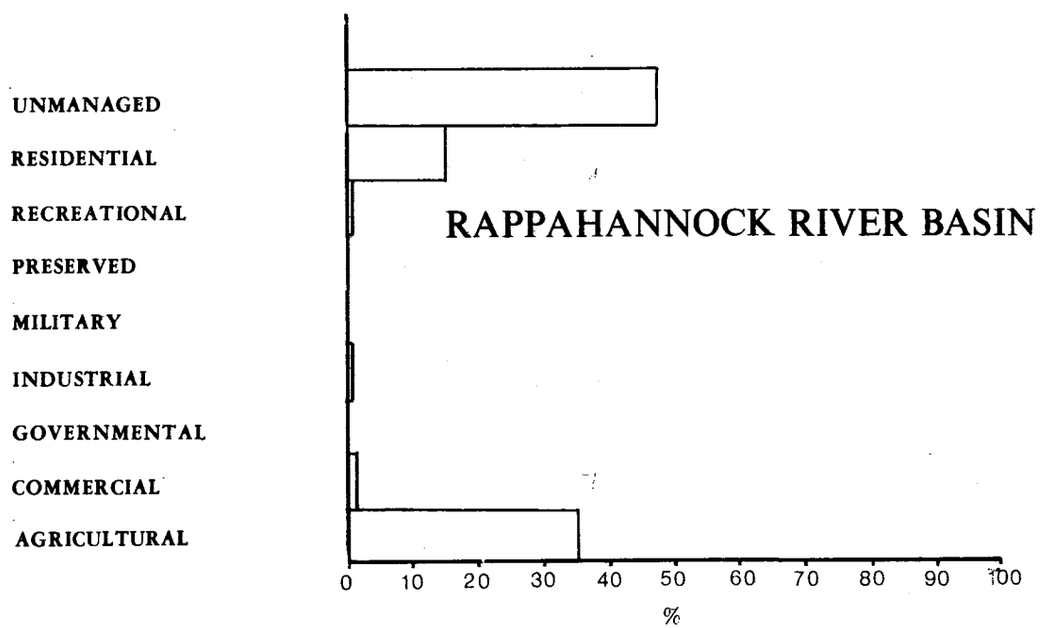


FIGURE 4. SHORELANDS USE BY DRAINAGE BASIN







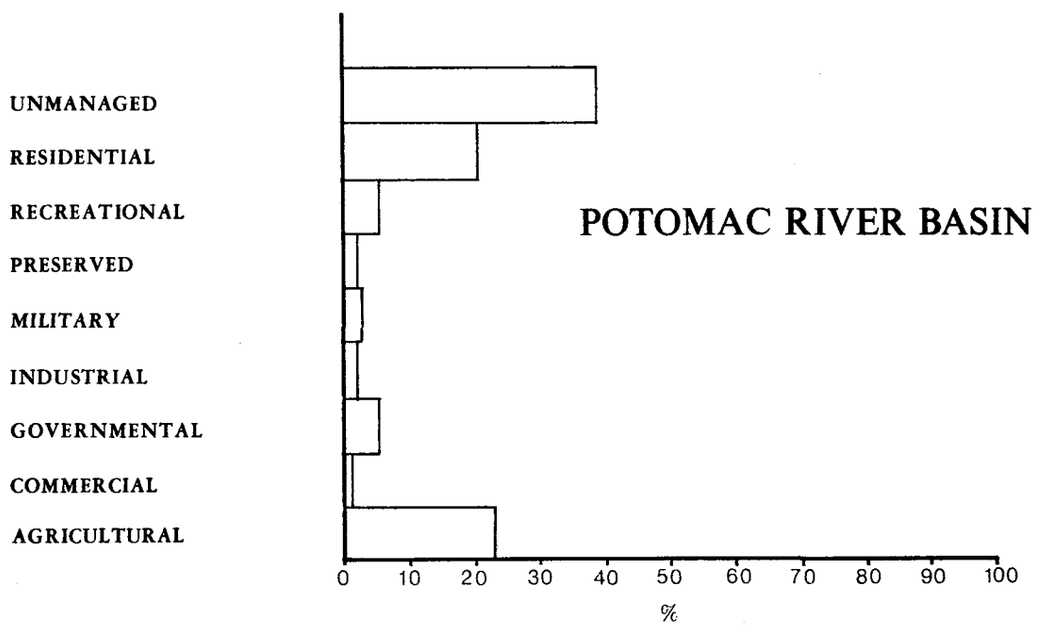
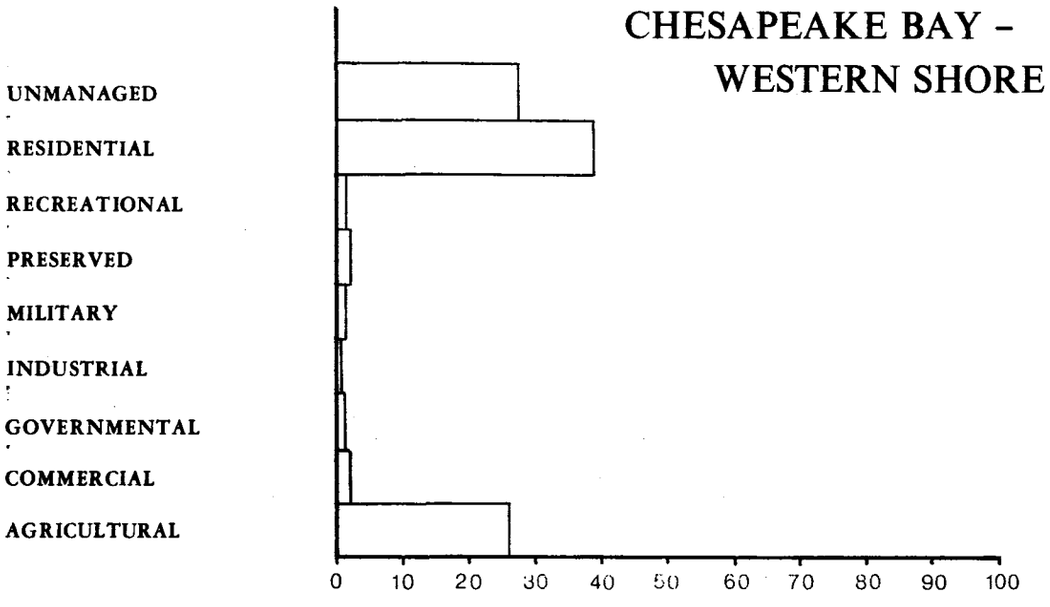
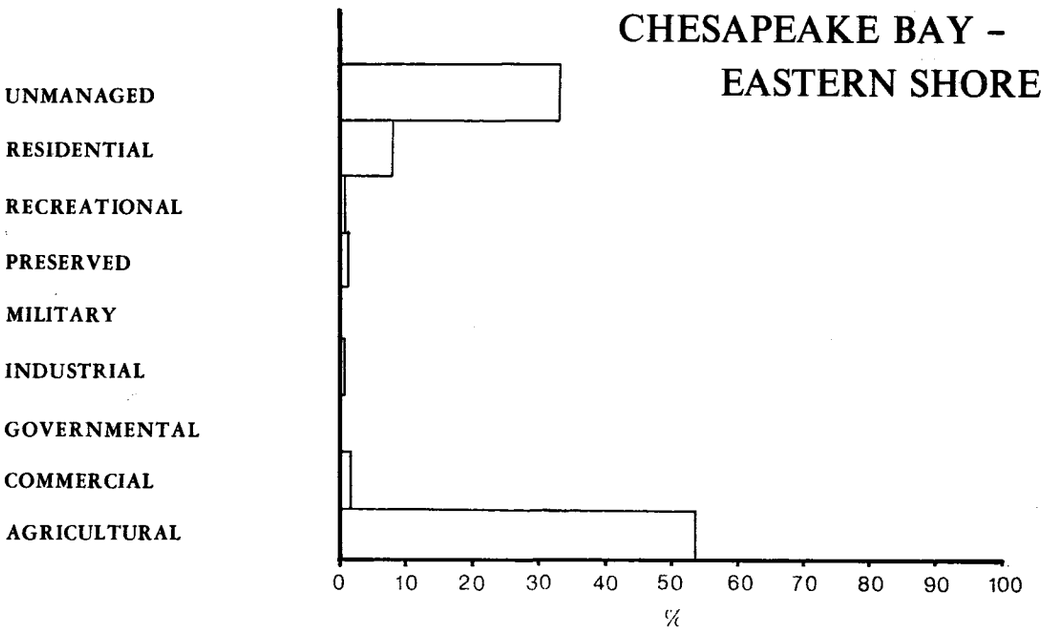


FIGURE 4 (CONT'D.)





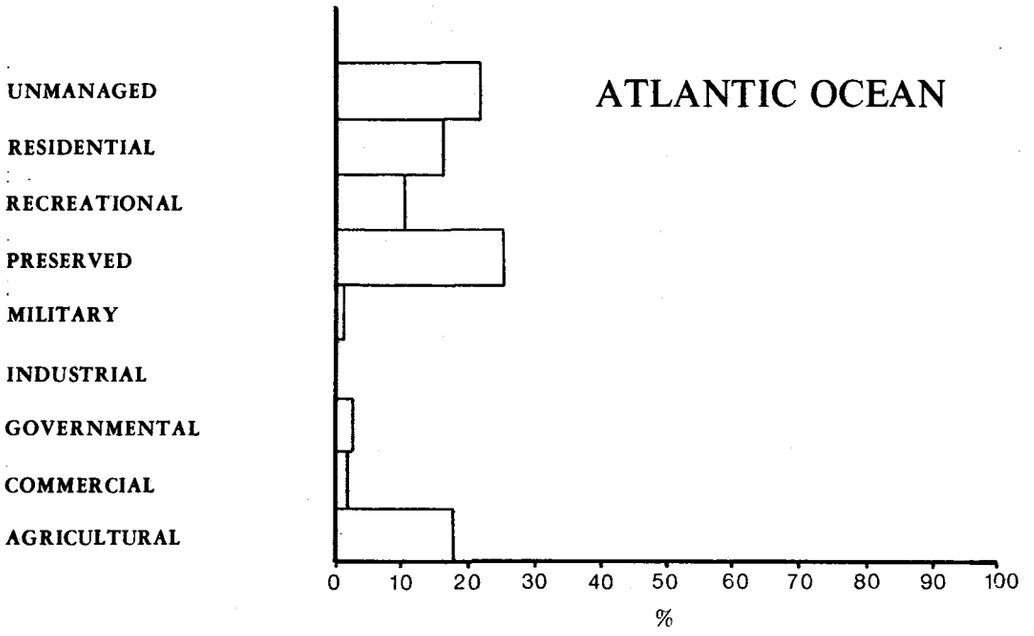
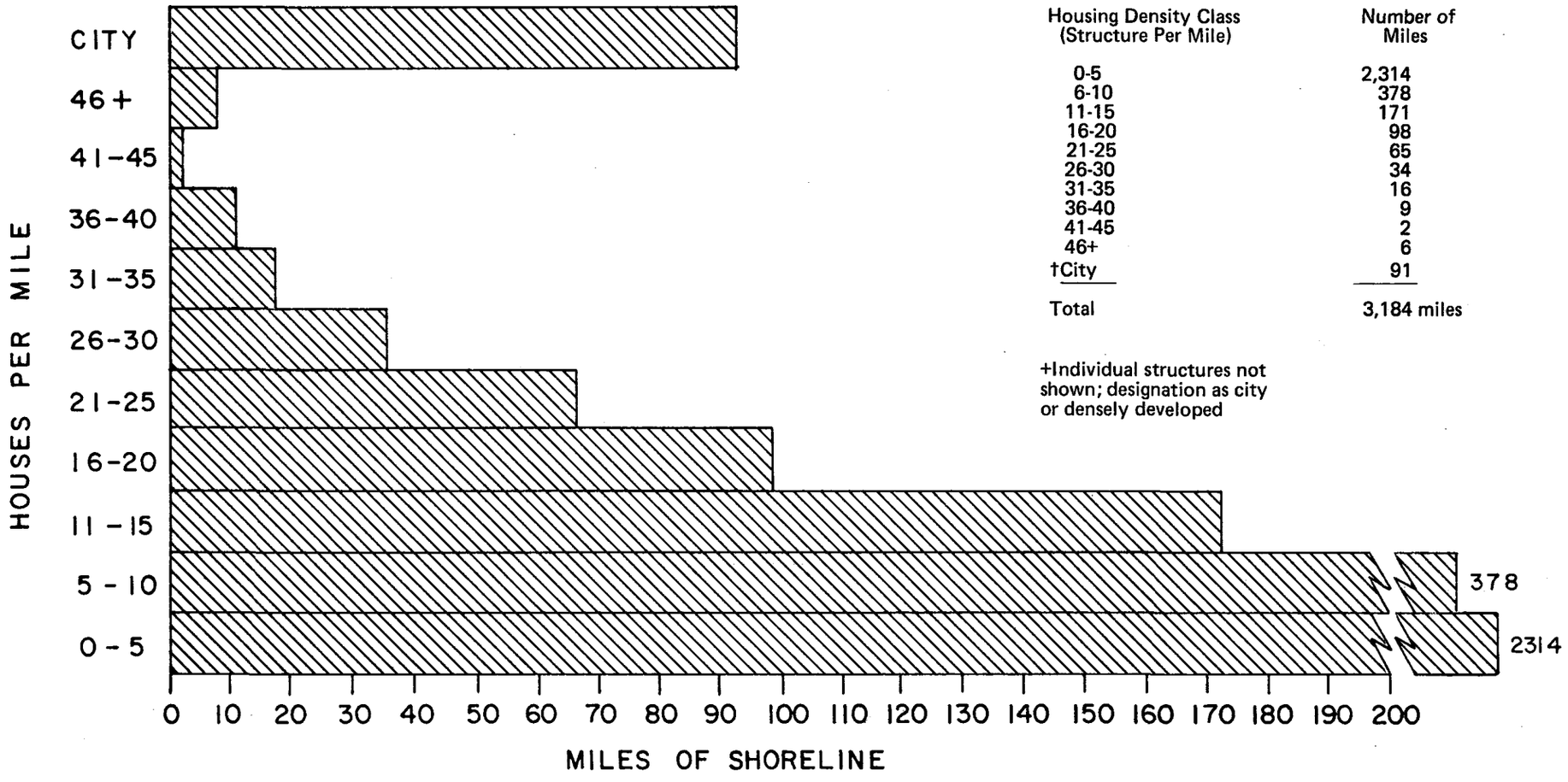


FIGURE 5

HOUSING DENSITY ALONG THE VIRGINIA CHESAPEAKE BAY SYSTEM SHORE



Housing Density Class (Structure Per Mile)	Number of Miles
0-5	2,314
6-10	378
11-15	171
16-20	98
21-25	65
26-30	34
31-35	16
36-40	9
41-45	2
46+	6
†City	91
Total	3,184 miles

+Individual structures not shown; designation as city or densely developed

(Data from U.S.G.S. 7.5 min. topographic sheets dated approximately 1968. Count is of house type structures within 200 feet of shoreline.)

APPENDICES

APPENDIX A. Shoreline Situation Reports Listing

APPENDIX B. Tidal Marsh Inventories Listing

APPENDIX C. Listing of Related Publications

APPENDIX D. Definitions of Terms

APPENDIX A

SHORELINE SITUATION REPORTS

Accomack County, Virginia. 1975.
by: Carl H. Hobbs, III, Peter Rosen, Margaret H. Peoples, Gary L. Anderson, Martha A. Patton, William D. Athearn
Project Supervisors: Robert J. Byrne, John M. Zeigler
[1]SRAMSOE 80 [2]CRC 14 190 p.

Charles City County, Virginia. 1976.
by: Dennis W. Owen, Lynne M. Rogers, Margaret H. Peoples
Project Supervisors: Robert J. Byrne, Carl H. Hobbs, III
SRAMSOE 115 CRC 49 56 p.

Cities of Chesapeake, Norfolk, Portsmouth. 1976.
by: Dennis W. Owen, Lynne M. Rogers, Margaret H. Peoples
Project Supervisors: Robert J. Byrne, Carl H. Hobbs, III
SRAMSOE 136 87 p.

Essex County, Virginia. 1976.
by: Lynne M. Rogers, Dennis W. Owen, Margaret H. Peoples
Project Supervisors: Robert J. Byrne, Carl H. Hobbs, III
SRAMSOE 135 67 p.

Fairfax County, Virginia. 1979.
by: Dennis W. Owen, Lynne C. Morgan, Nancy M. Sturm
Project Supervisors: Robert J. Byrne, Carl H. Hobbs, III
SRAMSOE 166 58 p.

Gloucester County, Virginia. 1976.
by: Gary L. Anderson, Gaynor B. Williams, Margaret H. Peoples, Lee Weishar
Project Supervisors: Robert J. Byrne, Carl H. Hobbs, III
SRAMSOE 83 CRC 17 71 p.

City of Hampton, Virginia. 1975.
by: Carl H. Hobbs, III, Gary L. Anderson, Robert J. Byrne, John M. Zeigler
Project Supervisors: Robert J. Byrne, John M. Zeigler
SRAMSOE 76 CRC 11 63 p.

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by: Dennis W. Owen, Margaret H. Peoples, Gary L. Anderson
Project Supervisors: Robert J. Byrne, Carl H. Hobbs, III
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Isle of Wight County, Virginia. 1975.
by: Dennis W. Owen, Gaynor B. Williams, Margaret H. Peoples, Gary L. Anderson, Carl H. Hobbs, III
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[1] SRAMSOE - Special Report in Applied Marine Science and Ocean Engineering, Virginia Institute of Marine Science
[2] CRC - Chesapeake Research Consortium

James City County, Virginia. 1975.
by: Carl H. Hobbs, III, Gary L. Anderson, Martha A. Patton, Peter Rosen
Project Supervisors: Robert J. Byrne, John M. Zeigler
SRAMSOE 81 CRC 15 62 p.

King George and Caroline Counties, Virginia. 1979.
by: Lynne C. Morgan, Dennis W. Owen, Nancy M. Sturm
Project Supervisors: Robert J. Byrne, Carl H. Hobbs, III
SRAMSOE 165 68 p.

Lancaster County, Virginia. 1978.
by: Lynne C. Morgan, Dennis W. Owen, Gaynor B. Williams, Nancy M. Sturm
Project Supervisors: Robert J. Byrne, Carl H. Hobbs, III
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Mathews County, Virginia. 1975.
by: Carl H. Hobbs, III, Gary L. Anderson, Robert J. Byrne, John M. Zeigler
Project Supervisors: Robert J. Byrne, John M. Zeigler
SRAMSOE 77 CRC 12 99 p.

Middlesex County, Virginia. 1975.
by: Natalie J. Whitcomb, Martha A. Patton, Margaret H. Peoples, Gary L. Anderson, Carl H. Hobbs, III
Project Supervisors: Robert J. Byrne, John M. Zeigler
SRAMSOE 100 CRC 48 65 p.

New Kent, King William, King and Queen Counties. 1975.
by: Carl H. Hobbs, III, Margaret H. Peoples, Gary L. Anderson, Peter Rosen
Project Supervisors: Robert J. Byrne, John M. Zeigler
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by: Carl H. Hobbs, III, Gary L. Anderson, William D. Athearn, Robert J. Byrne, John M. Zeigler
Project Supervisors: Robert J. Byrne, John M. Zeigler
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Northampton County, Virginia. 1975.
by: William D. Athearn, Gary L. Anderson, Robert J. Byrne, Carl H. Hobbs, III, John M. Zeigler
Project Supervisors: Robert J. Byrne, John M. Zeigler
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Northumberland County, Virginia. 1978.
by: Lynne C. Morgan, Dennis W. Owen, Margaret H. Peoples
Project Supervisors: Robert J. Byrne, Carl H. Hobbs, III
SRAMSOE 161 86 p.

Prince George County, Virginia. 1976.
by: Dennis W. Owen, Lynne M. Rogers, Margaret H. Peoples, David Byrd
Project Supervisors: Robert J. Byrne, Carl H. Hobbs, III
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Prince William County, Virginia. 1976.
by: Lynne M. Rogers, Dennis W. Owen, Margaret H. Peoples
Project Supervisors: Robert J. Byrne, Carl H. Hobbs, III
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Richmond County, Virginia. 1979.
by: Dennis W. Owen, Lynne C. Morgan, Nancy M. Sturm
Project Supervisors: Robert J. Byrne, Carl H. Hobbs, III
SRAMSOE 164 53 p.

Stafford County, Virginia. 1975.
by: Carl H. Hobbs, III, Gary L. Anderson, Dennis W. Owen, Peter Rosen
Project Supervisors: Robert J. Byrne, John M. Zeigler
SRAMSOE 79 CRC 13 55 p.

City of Suffolk, Virginia. 1976.
by: Lynne M. Rogers, Dennis W. Owen, Margaret H. Peoples
Project Supervisors: Robert J. Byrne, Carl H. Hobbs, III
SRAMSOE 116 55 p.

Surry County, Virginia. 1976.
by: Dennis W. Owen, Lynne M. Rogers, Margaret H. Peoples, Gary L. Anderson
Project Supervisors: Robert J. Byrne, Carl H. Hobbs, III
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Virginia Beach, Virginia. 1978.
by: Dennis W. Owen, Lynne C. Morgan, Nancy M. Sturm
Project Supervisors: Robert J. Byrne, Carl H. Hobbs, III
SRAMSOE 163 91 p.

Westmoreland County, Virginia. 1978.
by: Lynne C. Morgan, Dennis W. Owen, Nancy M. Sturm
Project Supervisors: Robert J. Byrne, Carl H. Hobbs, III
SRAMSOE 162 76 p.

York County, Virginia. 1975.
by: Gary L. Anderson, Gaynor B. Williams, Margaret H. Peoples, Peter Rosen, Carl H. Hobbs, III
Project Supervisors: Robert J. Byrne, John M. Zeigler
SRAMSOE 82 CRC 16 62 p.

APPENDIX B

TIDAL MARSH INVENTORIES

Accomack County, Virginia. 1977.
by: Gene M. Silberhorn, Arthur F. Harris
Project Leader: Gene M. Silberhorn
SRAMSOE 138 106 p.

Essex County, Virginia. (to be published)
by: Damon Doumlele
Project Leader: Gene M. Silberhorn
SRAMSOE 207

Fairfax County, Virginia. 1976.
by: Damon Doumlele
Project Leader: Gene M. Silberhorn
SRAMSOE 108 60 p.

Gloucester County, Virginia. 1976.
by: Kenneth A. Moore
Project Leader: Gene M. Silberhorn
SRAMSOE 64 104 p.

City of Hampton, Virginia. 1975.
by: Thomas A. Barnard, Jr.
Project Leader: Gene M. Silberhorn
SRAMSOE 60 66 p.

James City County, Virginia. (to be published)
by: Kenneth A. Moore
Project Leader: Gene M. Silberhorn
SRAMSOE 188

King George, Virginia. 1975.
by: Kenneth A. Moore
Project Leader: Gene M. Silberhorn
SRAMSOE 68 57 p.

Lancaster County, Virginia. 1973.
by: Gene M. Silberhorn
Project Leader: Gene M. Silberhorn
SRAMSOE 45 92 p.

Mathews County, Virginia. 1974.
by: Gene M. Silberhorn
Project Leader: Gene M. Silberhorn
SRAMSOE 47 102 p.

New Kent County, Virginia. (to be published)
by: Damon Doumlele
Project Leader: Gene M. Silberhorn
SRAMSOE 208

City of Newport News and Fort Eustis, Virginia. 1977.
by: Kenneth A. Moore
Project Leader: Gene M. Silberhorn
SRAMSOE 137 60 p.

Northampton County, Virginia. 1977.
by: Kenneth A. Moore
Project Leader: Gene M. Silberhorn
SRAMSOE 139 123 p.

Northumberland County, Virginia. 1975.
by: Gene M. Silberhorn
Project Leader: Gene M. Silberhorn
SRAMSOE 58 96 p.

Prince William County, Virginia. 1975.
by: Kenneth A. Moore
Project Leader: Gene M. Silberhorn
SRAMSOE 78 38 p.

Spotsylvania, Caroline Counties, City of Fredericksburg, Virginia. 1979.
by: Arthur F. Harris, Joseph C. Mizell
Project Leader: Gene M. Silberhorn
SRAMSOE 167 48 p.

Stafford County, Virginia. 1975.
by: Kenneth A. Moore
Project Leader: Gene M. Silberhorn
SRAMSOE 62 44 p.

Surry County, Virginia. (to be published)
by: Kenneth A. Moore
Project Leader: Gene M. Silberhorn
SRAMSOE 187

City of Virginia Beach, Virginia. Vol. 1 - North Landing River and Tributaries. 1976.
by: Damon Doumlele
Project Leader: Gene M. Silberhorn
SRAMSOE 118 49 p.

Westmoreland County, Virginia. 1978.
by: James L. Mercer
Project Leader: Gene M. Silberhorn
SRAMSOE 59 108 p.

York County, Town of Poquoson, Virginia. 1974.
by: Gene M. Silberhorn
Project Leader: Gene M. Silberhorn
SRAMSOE 53 67 p.

APPENDIX C

RELATED PUBLICATIONS

Coastal Wetlands of Virginia. Interim Report No. 2. 1972.
by: Kenneth L. Marcellus
SRAMSOE 27 27 p.

Coastal Wetlands of Virginia. Interim Report No. 3. 1974.
by: Gene M. Silberhorn, George M. Dawes, Thomas A. Barnard, Jr.
SRAMSOE 46 52 p.

Local Management of Wetlands: Environmental Considerations. 1973.
by: Kenneth L. Marcellus, George M. Dawes, Gene M. Silberhorn
SRAMSOE 35 94 p.

Shoreline Erosion in Tidewater Virginia. 1977.
by: Robert J. Byrne, Gary L. Anderson
SRAMSOE 111 102 p.

Shoreline Erosion in the Commonwealth of Virginia: Problems, Practices and Possibilities. (to be published)
by: Robert J. Byrne, Carl H. Hobbs, III, N. Bartlett Theberge, Waldon R. Kerns, Mary Langeland, Janet Scheid, Neil J. Barber, Randy J. Olthof
SRAMSOE

Tidal Wetland Plants of Virginia. 1976.
by: Gene M. Silberhorn, Mary Warinner
86 p.

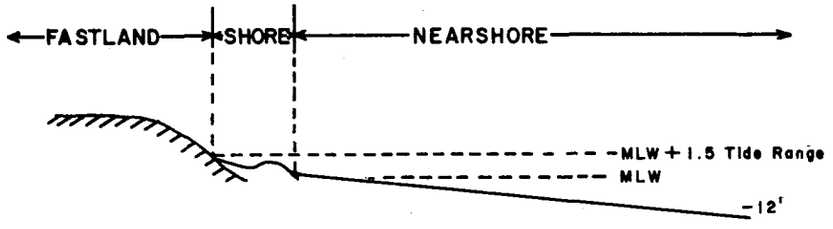
APPENDIX D

DEFINITIONS OF TERMS

Shore Zone: The zone of beaches and marshes. It is a buffer zone between the water body and the fastland.

Fastland Zone: The zone extending inland from the landward limit of the shore zone. The fastland is relatively stable and is the site of most material development.

Nearshore Zone: The zone extending 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.



A profile of the three shorelands types.

Fastland Physiographic Types (within 400 feet (122 m) of the fastland - shore boundary):

Artificial Fill: Areas where man has placed soil, concrete, or other materials to increase the fastland area along the shoreline. An example would be filled marshes.

Dunes: Small hummocks or hills of wind-blown sand located just landward of the beach.

Low Shore: 20 feet (6 m) or less of relief, with or without bluffs.

Moderately Low Shore: 20 to 40 feet (6 to 12 m) of relief, with or without bluffs.

Moderately High Shore: 40 to 60 feet (12 to 18 m) of relief, with or without bluffs.

High Shore: 60 feet (18 m) or more of relief, with or without bluffs.

Shore Physiographic Types:

Beach: For the purposes of the Shoreline Situation Reports, any shore which is neither marsh nor artificial fill.

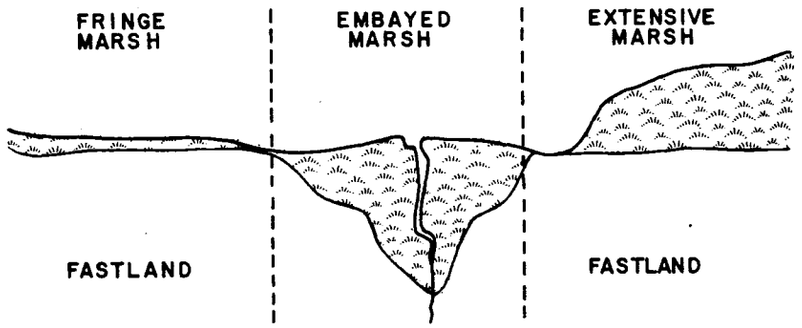
Marsh:

Fringe Marsh: Marsh which is less than 400 feet in width and which runs in a band parallel to the shore.

Extensive Marsh: Marsh which has extensive acreage projecting into an estuary or river.

Marsh (cont'd.)

Embayed Marsh: Marsh which occupies a reentrant or drowned creek valley.



A plan view of the three marsh types.

Artificially Stabilized: Shore which has a manmade structure designed to either retain fill, to protect the fastland from wind and wave damage, or to trap sediments. The most common types of artificial stabilization are bulkheads, riprap, or groins. These may be used by themselves or in conjunction with one another.

Nearshore Physiographic Types:

Narrow: 12-foot (3.7 m) isobath located less than 400 yards from shore.

Intermediate: 12-foot (3.7 m) isobath located 400 to 1,400 yards from shore.

Wide: 12-foot (3.7 m) isobath located more than 1,400 yards from shore.

Fastland Use Classification:

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

Commercial: Includes buildings, parking areas, and other land directly related to retail and wholesale trade and business.

Industrial: Includes all industrial and associated areas.

Governmental: Includes lands whose usage is specifically controlled, restricted, or regulated by governmental organizations.

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.

Recreational: Includes designated outdoor recreation lands and miscellaneous open spaces.

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.

Fastland Use Classification (cont'd.):

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

Open: Brush land, dune areas, wastelands: less than 40% tree cover.

Wooded: More than 40% tree cover.