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STAFFORD COUNTY

SHORELINE AREA MANAGEMENT PLAN

COASTAL ZONE

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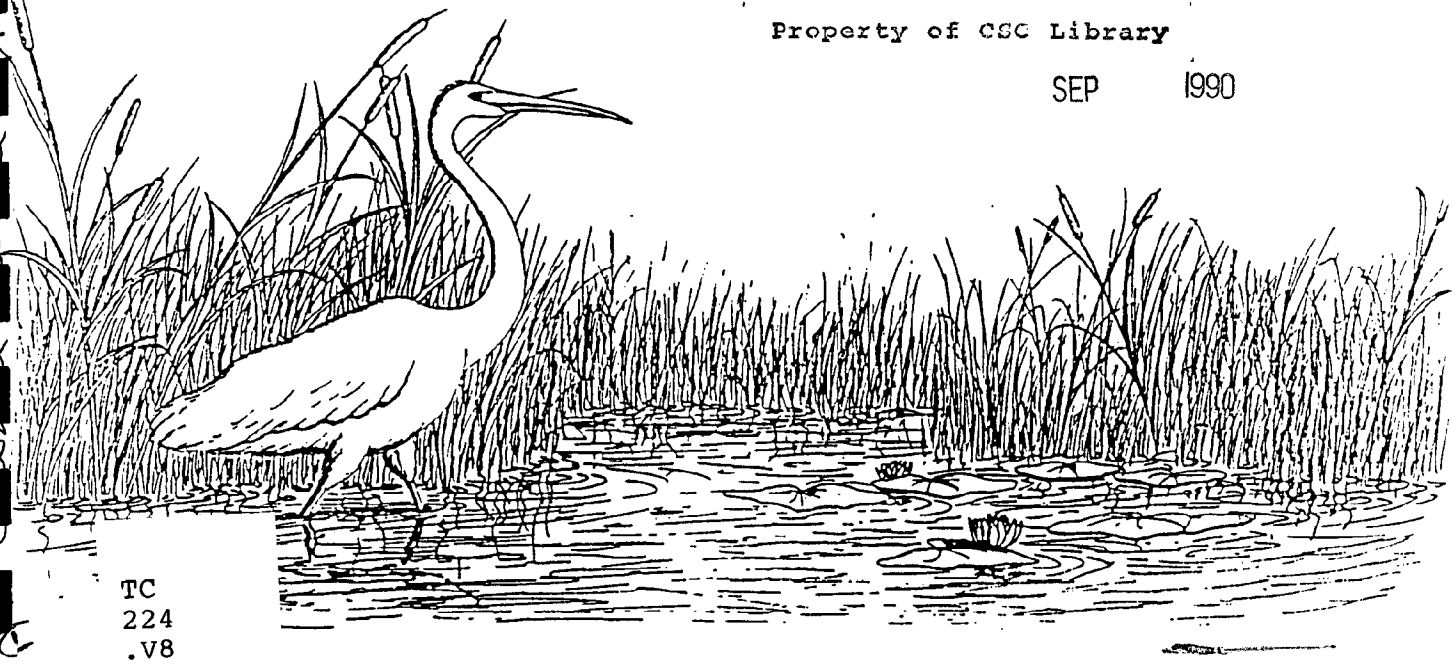

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R90-567(R)

BOARD OF SUPERVISORS
COUNTY OF STAFFORD
STAFFORD, VIRGINIA

RESOLUTION

At a regular meeting of the Stafford County Board of Supervisors held in the Board Chambers, Stafford County Administration Center (Rowser Building), Stafford, Virginia, on the 4th day of September, 1990:

MEMBERS:	VOTE:
Ferris M. Belman, Sr., Chairman	Yes
John M. Porter, Vice Chairman	Yes
Alvin Y. Bandy	No
Ralph A. Marceron	No
James F. Persinger	Yes
Lyle Ray Smith	Yes
E. C. "Bill" Williams, Jr.	Yes

On motion of Mr. Williams, seconded by Mr. Smith, which carried by a vote of 5 to 2, the following was adopted:

A RESOLUTION WHICH ADOPTS THE SHORELINE AREA MANAGEMENT PLAN AS AN ELEMENT OF THE COMPREHENSIVE PLAN

WHEREAS, the Shoreline Area Management Plan has been developed to further the environmental protection goals stated in the Comprehensive Land Use Plan (1988) and implement the Chesapeake Bay Preservation Act Requirements; and

WHEREAS, the Comprehensive Plan Committee has reviewed the Shoreline Area Management Plan and has forwarded it to the Stafford County Planning Commission for its approval; and

WHEREAS, the Planning Commission has carefully considered the recommendations of the Committee and the testimony received at the public hearing; and

WHEREAS, the Planning Commission has unanimously recommended the Shoreline Area Management Plan for adoption by the Stafford County Board of Supervisors with only a minor revision; and

WHEREAS, the Stafford County Board of Supervisors has carefully considered the recommendations of the Planning Commission, staff and the testimony received at the public hearing;

NOW, THEREFORE, BE IT RESOLVED by the Stafford County Board of Supervisors on this the 4th day of September, 1990, that the Shoreline Area Management Plan, dated August 15, 1990, be and it hereby is adopted as an element of the Comprehensive Plan with the following amendments:

1. Any references to the septic system pump-out every three (3) years, be revised to read every five (5) years; and

2. Any references to additional buffer requirements greater than 100 feet in width, be removed.

A Copy, teste:

C. M. Williams, Jr.
County Administrator

CMWJr:WCS:ek

PREPARED FOR THE STAFFORD COUNTY BOARD OF SUPERVISORS
BY
THE SHORELINE AREA MANAGEMENT PLAN COMMITTEE AND
THE STAFFORD COUNTY PLANNING COMMISSION

Board of Supervisors

Ferris M. Belman, Sr., Chairman
John M. Porter, Vice Chairman
Alvin Y. Bandy
Ralph A. Marceron
James F. Persinger
Lyle Ray Smith
E.C. "Bill" Williams, Jr.
Former Members: Rebecca L. Reed, Philip E. Hornung

Shoreline Area Management Plan Committee

The Honorable E.C. "Bill" Williams, Jr., Board of Supervisors
The Honorable James F. Persinger, Board of Supervisors
Robert Gibbons, Planning Commission
Warren Gnegy
Jack Hodge
Sam Mason
George Newman
Karen Snavely
Elizabeth Topel
Fred Vanous

Planning Commission

Robert Gibbons, Chairman
John Vance, Vice Chairman
John Anderson
Charles Barcus
Thomas Bjerke
Ken Chandler
Steve Eirman
Gay Goad
John Harris
Linda Musselman
Roger Pilcher
Daniel Poppen
R. Lee Simmons
Dennis Springer

STAFF

C. M. Williams, Jr., County Administrator

William C. Shelly, Director of Planning
Ricky Barker, Senior Planner
Kevin Nelson, Senior Planner
Philip Thompson, Planner
Blake Smith, Planner

OTHER PARTICIPATING AGENCIES AND ORGANIZATIONS

Chesapeake Bay Foundation
Chesapeake Bay Local Assistance Department
Friends of the Rappahannock
National Oceanic and Atmospheric Administration
Rappahannock Area Development Commission
Rogers, Golden, and Halpern
Soil and Water Conservation Service
Stafford County Comprehensive Plan Committee
Stafford County Wetlands Board
Virginia Chapter of Izaak Walton League
Virginia Council on the Environment
Virginia Institute of Marine Science
Virginia Marine Resources Commission

SHORELINE AREA MANAGEMENT PLAN

OUTLINE

SECTION

I. Introduction

II. Background

III. Inventory Analysis

IV. Existing Opportunities and Constraints

V. Goals and Objectives

VI. Shoreline Management

VII. Recommended Development Guidelines

VIII. Implementation

IX. Conclusion

GLOSSARY OF TERMS

Agricultural Lands - those lands used for the planting and harvesting of crops or plant growth of any kind in the open; pasture; horticulture; dairying; floriculture; or raising of poultry or livestock.

Best Management Practices - a practice, or a combination of practices, that is determined by a State or area-wide planning agency to be the most effective, practical means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals.

Buffer Area - an area of natural or established vegetation managed to protect other components of the Critical Resource Protection Area and State waters from significant degradation due to land disturbances.

Critical Resource Protection Area - sensitive land areas near the shoreline which play a vital role in preserving the County's water quality. Development, if allowed within this area, will have a direct negative impact on shoreline resources and water quality. These areas are coincidental with the Resource Protection Areas of the Chesapeake Bay Preservation Act.

Erodible Soils - soils that have a high potential for erosion based on their component makeup and other land characteristics that may promote erosion, such as steep slopes. These soils are identified by a K-factor of greater than 0.26 or an erodibility index of greater than 8.

Floodplain - these are lands that would be inundated by flood water as a result of a storm event of a 100-year return interval as defined by the Federal Emergency Management Agency (FEMA).

Impervious Cover - a surface composed of any material that significantly impedes or prevents natural infiltration of water into the soil. Impervious surfaces include, but are not limited to: roofs, buildings, streets, parking areas, and any concrete, asphalt, or compacted gravel surface.

Intensely Developed Area - that portion of the County where development is concentrated and little of the natural environment remains. These areas must meet certain guidelines as defined by this Plan.

Land/Resource Management Area - land areas that, if developed improperly, have a potential for polluting the waters of Stafford County and diminishing the functional value of

Critical and Sensitive Resource Protection Areas. All of the County, outside of Critical and Sensitive Resource Protection Areas, is included in this area. These areas are associated with Resource Management Areas in the Chesapeake Bay Act.

Nonpoint Source Pollution - pollution consisting of constituents, such as sediment, nutrients, and organic and toxic substances derived from a variety of mediums, including runoff from agricultural and urban land development and use.

Nontidal Wetlands - wetlands, other than tidal wetlands, that are inundated or saturated by surface or ground water at a frequency or duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions, as defined by the U.S. Environmental Protection Agency.

Permeable Soils - areas where the soils have a permeability equal to or greater than 6 inches of water movement per hour in any part of the soil profile to a depth of 72 inches as found in the "National Soils Handbook of 1983".

Redevelopment - process of developing land that is or has been previously developed.

Sensitive Resource Protection Area - sensitive land features that, if developed with any residential density, or commercial or industrial intensity, will have a direct negative impact on shoreline resources and water quality. Certain land uses, such as active park areas, are considered appropriate in these areas so long as construction is limited. These areas are associated with the Resource Management Areas in the Chesapeake Bay Act with further development restrictions applied.

Severe Slopes - slopes with a grade differential of between 10 and 25%.

Steep Slopes - slopes with a grade differential of greater than 25%.

Tidal Shore - land contiguous to a tidal body of water between the mean low water level and the mean high water level.

Tidal Wetlands - vegetated and nonvegetated wetlands as defined in Section 62.1-13.2 of the Code of Virginia.

Tributary Stream - any perennial stream that is so depicted on the most recent U.S.G.S. 7 1/2 minute topographic quadrangle map (scale 1:24000).

Water dependent facility - a development of land that cannot exist outside of a Critical or Sensitive Resource Protection Area and must be located on the shoreline by reason of the intrinsic nature of its operation.

I. INTRODUCTION

In the past decade, Stafford County has experienced a tremendous amount of growth and development. This has resulted in the urbanization of many rural areas of the County. The rapid shift in land use from rural to urban uses has accelerated the processes of soil erosion and sedimentation, as well as adding to nonpoint sources of pollution. This has heightened the County's need to effectively manage growth and development in a way that minimized the impact on valuable environmental resources.

In September 1987, the County began its progress toward developing a management tool to address growth and development's impact on water quality through the protection of environmental resources. The first proposal was to develop an additional element of the Comprehensive Plan that would further expand on adopted County environmental goals and objectives.

With the adoption of the Chesapeake Bay Preservation Act by the General Assembly in July 1988, the County expanded its first proposal to include provisions for implementing the Act. The Act established a cooperative state and local government program to protect water quality in the Chesapeake Bay and its tributaries through improved land use management.

The final proposal resulted in the development of the Shoreline Area Management Plan. The Shoreline Plan has been designed to address County issues and concerns with environmental protection as well as address State regulations, including the Chesapeake Bay Preservation Act, dealing with the protection of water quality.

Relationship to the Land Use Plan (1988)

The Comprehensive Land Use Plan (July 1988) provided a solid environmental protection foundation for the Shoreline Area Management Plan. The Shoreline Plan endorses environmental protection standards established in the Land Use Plan and also expands on these standards to provide for greater protection of environmental resources. The Chesapeake Bay Preservation Act and Regulations provide an enhanced legal basis for the protection of environmental resources, especially those resources that are critical for water quality.

The Land Use Plan has established a Resource Protection Area which includes environmental land features which need to protected from any development other than water dependent uses in order to maintain water quality. Within these Resource Protection Areas are land features that are critical for water quality (rivers, streams, wetlands etc.).

For this reason, the Shoreline Plan has divided the Resource Protection Areas into two protection areas. The first area is a Critical Resource Protection Area which includes those crucial land features that are to be protected from development as required by the Chesapeake Bay Preservation Act Regulations Resource Protection Area requirements. This area is to be left completely undisturbed excepted for water-dependent uses, public infrastructure and uses allowed in cases of hardship.

The second area is a Sensitive Resource Protection Area which includes the floodplain areas not included in the Critical Resource Protection Area and adjacent steep slopes. These areas are not to be used for development; however, active recreation and active agriculture (properly managed) is allowed. This area is a category of the Resource Management Area of the Chesapeake Bay Preservation Act Regulations with more stringent development requirements recommended.

The Shoreline Plan has also established a Land/Resource Management Area which includes the remainder of the County not included in the two protection areas mentioned above. These areas may be developed; however, Best Management Practices (BMP's) must be implemented to ensure the protection of water quality. This builds and expands upon the Land Management Areas established in the Land Use Plan (1988).

In summary, the Resource Protection and Land Management Areas established in the Land Use Plan (1988) have been refined and expanded in order to effectively carry out the goals and objectives of the Shoreline Plan. Definitions established in the Shoreline Plan relative to Critical and Sensitive Resource Protection and Land/Resource Management Areas should be considered to replace Resource Protection and Land Management Areas in the Land Use Plan. The Shoreline Plan has also been developed to implement the Chesapeake Bay Preservation Act and Regulations dealing with water quality.

Purpose

The primary purpose of the Stafford County Shoreline Area Management Plan is to protect and enhance the wise use of shoreline area resources through the management of possible future growth and development. In order to accomplish this end, the following objectives were set:

1. An inventory of present conditions - land use, land cover, shoreline conditions, wetlands, soils, ownership patterns, and other pertinent factors.

2. Identification of existing and potential opportunities for shoreline protection, wetlands preservation, protection of scenic and historic values, water quality enhancement; and protection of plant and animal resources, and other related issues.

3. Development of goals and objectives for shoreline development and preservation.

4. Development of a management plan for the shoreline.

5. Development of guidelines for business and residential development on or near the shoreline.

6. Identification and recommendation for changes in the County's Zoning Ordinance, Subdivision Ordinance and Wetlands Ordinance and other appropriate measures necessary to implement the Plan.

Planning Process

The six (6) Objectives set for the Plan became the basis for the shoreline planning process. Through carrying out this planning process, the Plan intends to reveal answers to the following questions:

What is contained within the area to be studied?

What are the opportunities and constraints of the area?

What are the goals and objectives for the area which will enhance the opportunities and address the constraints?

How can these goals and objectives be implemented?

In an effort to involve interested agencies, groups, and individuals in the Plan's development, the Stafford County Board of Supervisors appointed a Shoreline Area Management Plan Advisory Committee. The Committee has guided the staff throughout the development of the Plan and is composed of representatives from the Planning Commission, the Comprehensive Plan Committee, the Wetlands Board, the Friends of the Rappahannock, the Rappahannock Area Development Commission, the development community, the Board of Supervisors, and shoreline property owners.

The Virginia Marine Resources Commission, the Virginia Institute of Marine Science, the Chesapeake Bay Local Assistance Board, the Council on the Environment, the Soil and Water Conservation Service and the Chesapeake Bay Foundation have also been requested for their involvement in the Plan's development. The County feels that the success of the Plan will depend largely upon the participation of representatives of agencies, County departments, and others that will be affected by the Plan. Participation of these representatives may also provide valuable insight on issues related to the Plan.

In order to adequately carry out the objectives of the Plan, an environmental consulting firm, Rogers, Golden, and Halpern (RGH), was retained to provide technical assistance and guidance in preparing the Plan. RGH assisted the County with the extensive data collection and analysis, the development of goals and objectives, mapping of shoreline preservation areas and development of implementation measures. The results of RGH's work on the Plan were reviewed and revised by the County staff, the Advisory Committee, and various agencies.

Study Area

The study area for the Shoreline Area Management Plan is county-wide. The County contains two major rivers, four major creeks, and an extensive amount of intermittent streams. These rivers, creeks, and streams were examined closely because they are the major water resources in the County and their protection is crucial to preserve the water quality throughout the County and ultimately the surrounding region.

The remainder of the County was also examined to determine its general environmental characteristics and its interrelationship to the major water resources. An inventory of environmentally sensitive lands throughout the County was developed by representatives at Virginia Tech through the use of the Virginia Geographic Information System (VirGIS).

This inventory produced 1 inch to 2,000 feet scale USGS overlay maps which depicted lands with highly erodible soils, high soil permeability, hydric soils and water table depth from 0 to 36 inches. The percent of the County containing these environmentally sensitive lands was conservatively estimated at seventy-three percent (73%).

These figures reveal that in order to adequately address the protection of water quality and water resources, the Shoreline Plan needs to develop guidelines for protection of the entire County.

Using the Plan

The Shoreline Area Management Plan, a proposed element of the Comprehensive Plan, contains goals and objectives which have been specifically developed to assist in carrying out the overall goals and objectives of the County's Comprehensive Plan. These goals and objectives are directed toward the overall protection and preservation of environmentally sensitive resources.

The development of the Plan has produced an inventory of present conditions, resource maps depicting shoreline preservation areas, and guidelines for possible development in shoreline areas. The inventory and resource maps will assist in making sound environmental decisions, while guidelines for development will help reduce the negative impacts of possible development on shoreline areas.

In conclusion, the Plan will assist the County's land use planning and management authority and its capability to protect and enhance the wise use of shoreline area resources. The adoption of the Plan as an element of the Comprehensive Plan will be a major step toward protecting shoreline resources and effectively managing future growth and development.

II. BACKGROUND

The Need for the Plan

Stafford County is located in the northeastern section of Virginia. Approximately twenty (20) miles of the Potomac River and thirty (30) miles of the Rappahannock River make up the County's eastern and southern boundaries respectively. The County is bordered by Prince William County on the north, the City of Fredericksburg, Spotsylvania and King George Counties on the south, the State of Maryland on the east and Fauquier and Culpeper Counties on the west (see Figure 1). The County lies 56 miles north of Richmond, and 40 miles south of Washington, D. C.

In recent years, the County has experienced a rapid growth rate and is presently the second fastest growing county in the State. Based on estimates from the Center for Public Services, from 1980 and 1986, the County grew over twenty-three percent (23%) compared to a Statewide growth of eight percent (8%). The County's 1990 population is estimated at 68,304 - up from 40,470 in 1980 and 24,587 in 1970.

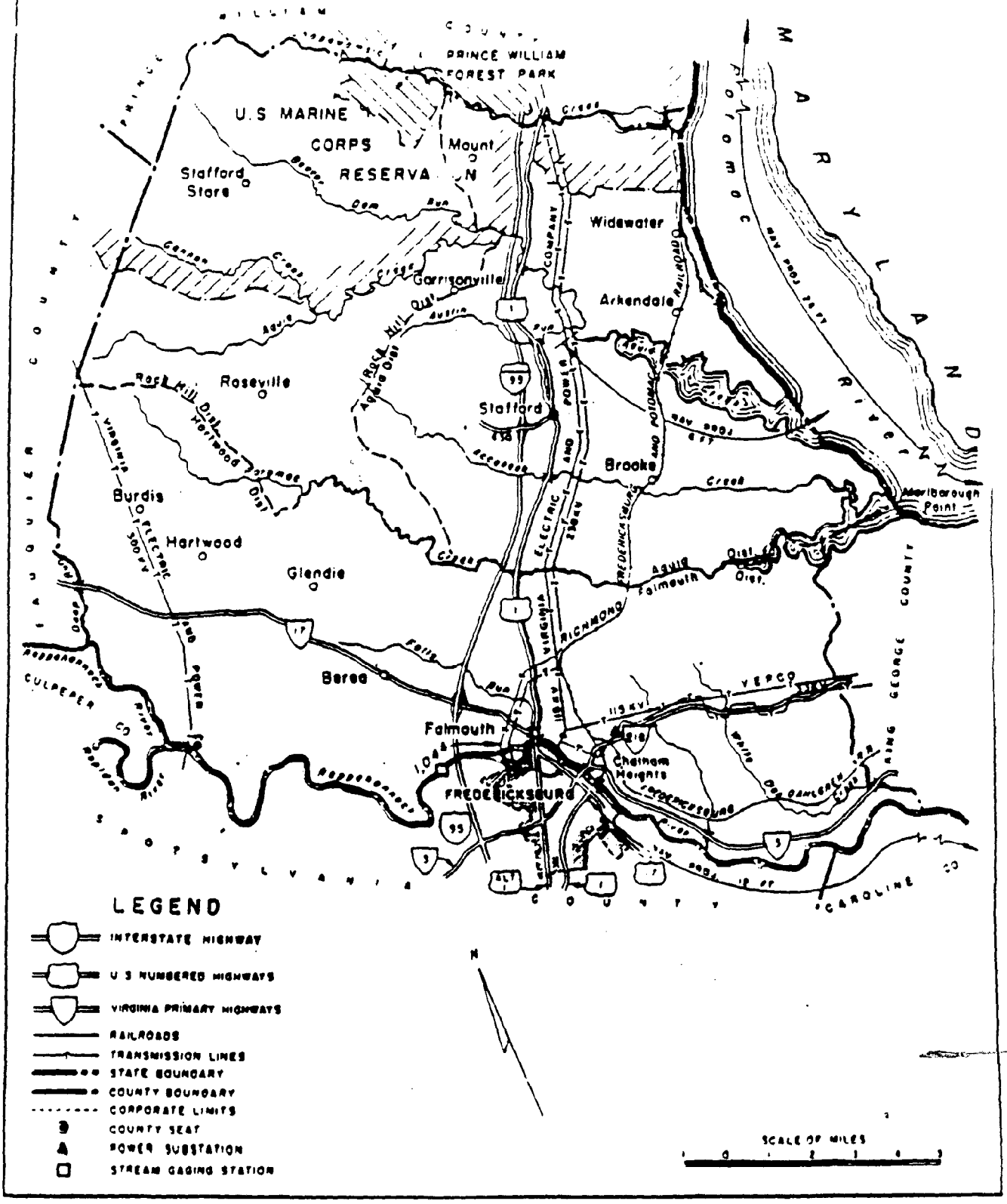
Much of this growth correlates directly to the growth of the Washington metropolitan area. The County's close proximity and access to the metropolitan area, lower prices and attractive setting continue to make it a desirable location for housing. It is predicted that growth within the County will continue to increase.

The majority of this growth is reflected in residential development. During the period between 1980 and the present, over 6,000 new dwelling units were built and occupied. Although most of the residential development has occurred in the more urbanized areas of the County, the pressure for development of outlying areas is increasing. Some of these outlying areas comprise environmentally and economically valuable undeveloped shoreline properties along the Potomac and Rappahannock Rivers and their tributaries. Projected increases in growth and development clearly indicate that the existing comprehensive planning program and development guidance controls must be improved to meet growth pressures in shoreline areas.

Stafford County's coastal shoreline areas, including the Potomac and Rappahannock Rivers and their tributaries, provide many valuable environmental and economic assets to the County, along with serving as major drainage areas for the Chesapeake Bay.

FIGURE 1

STAFFORD COUNTY, VIRGINIA



In addition to having significant watershed areas, the County contains valuable wetlands resources. A total of 1,337 acres of tidal wetlands are located mainly along the Potomac River and its tributaries, the Potomac, Accokeek, and Aquia Creeks. These wetlands provide á vital spawning and nursery area for juvenile fishes and are essential elements in the marine food network supporting the major commercial fisheries of the State. Wetlands also function to provide soil erosion control, flood buffering, absorption of silt and pollutants, and habitats for many forms of wildlife.

The scenic and aesthetic qualities and environmental resources of the Rappahannock and Potomac Rivers make them highly desirable environments for recreation, marinas, and various types of residential, commercial, and industrial development. Presently these shoreline areas are relatively undeveloped; however, the potential for development is strong. Many large undeveloped parcels exist adjacent to the shoreline. The size of the parcels, along with the limited number of owners, make these areas prime for future developments.

Development pressures in shoreline areas have heightened the County's need to ensure that projects are designed, located and constructed to minimize their effect on environmentally valuable shoreline resources. The Shoreline Plan is designed to effectively protect and manage the County's shoreline resources and address utilities, roads, public access, and necessary community services.

A Shoreline Area Management Plan component of the Comprehensive Plan will attempt to address and reduce the damaging effects of development on the shoreline (e.g. soil erosion, sedimentation, nonpoint source pollution) and to achieve a balance between accommodating growth and protecting shoreline resources and water quality.

Impacts of the Plan

Rapid growth in the past decade has resulted in the urbanization of many rural areas of the County. The rapid shift in land use from agricultural to urban uses has accelerated the processes of soil erosion and sedimentation, as well as adding to nonpoint sources of pollution. Controlling urbanization and its effects through proper planning and consideration of the long range implications of development can be accomplished through the implementation of the Shoreline Area Management Plan.

The Shoreline Area Management Plan attempts to guide the design, location, and construction of future development in shoreline areas. The Plan directs the location of future development to areas that are less environmentally sensitive and away from environmentally significant areas, such as wetlands. It also require the use of Best Management Practices (BMPs), either structural or nonstructural, to mitigate the impact on the surrounding environment. This, in turn, will help protect and maintain the integrity of the County's extensive shoreline areas through preservation of ecologically significant wetlands, reduction of soil erosion and sedimentation, control of nonpoint and point source pollutants, and the conservation of shorelines.

Immediacy of the Plan

The protection and management of the County's shoreline area needs immediate attention. The limited availability of suitable shoreline areas to accommodate anticipated waterfront development in the region and the pressure brought about to develop it, makes it essential that waterfront development be managed as effectively as possible.

The timing of implementing the Shoreline Area Management Plan is almost as important as the Plan itself. To be effective, the Shoreline Plan needs to be in place prior to the growth and development of coastal shoreline areas. Should major developments proceed in advance of sufficient comprehensive planning for shoreline areas, the County will have a more difficult time controlling future development.

Conclusion

The completion of the Shoreline Area Management Plan is an important step toward enhancing the County's ability to adequately plan for future growth and development in shoreline areas. Development pressures in shoreline areas have heightened the County's need to effectively manage environmentally valuable shoreline resources. It is imperative that the County complete the Shoreline Area Management Plan prior to the development of these shoreline resources. The Plan will be designed to allow the County to act instead of react to future development and allow issues to be addressed before they evolve into potential problems.

III. INVENTORY OF EXISTING CONDITIONS

The first step in preparing a shoreline management plan for Stafford County involved an inventory of existing conditions for the County. This inventory provides a needed data base to assist in determining potential opportunities and constraints for possible shoreline development.

Two (2) mapping projects were performed to inventory existing conditions within the County for the Shoreline Plan. The first mapping project included an extensive inventory of existing conditions within a shoreline planning area which consisted of stream corridors along the tidal portion of the Potomac and Rappahannock Rivers, the tidal portion of tributaries to the Potomac River, and the nontidal portions of selected tributaries to the Potomac River. The shoreline planning area studied under this study was limited due to funding constraints. This mapping project (completed in April, 1989) does provide good environmental resource maps; however, because it was limited to mainly tidal areas, it does not provide a complete inventory needed for the Plan.

A secondary objective of the first mapping project was to ensure that the mapping resources that were produced for the Plan would also satisfy the requirements set forth in the Chesapeake Bay Preservation Act (1988) and subsequent regulations. At the time the study areas were delineated for the Shoreline Area Management Plan, preservation areas for the Chesapeake Bay Preservation Act had not been determined. A 1000-foot band was selected along tidal rivers and streams in hopes of insuring that the shoreline planning area was broad enough to cover areas designated for protection in the Chesapeake Bay Preservation Act.

Unfortunately, the 1000-foot shoreline planning area established adjacent to the County's tidal shoreline did not offer the flexibility which was needed to develop resource based maps pursuant to the proposed Chesapeake Bay Preservation Area Designation and Management Regulations. This has resulted in a planning area that may be broader than necessary in some areas and not broad enough in other areas. In order to assure a comprehensive assessment of shoreline resources, a second mapping project was performed.

The second mapping project (completed in May, 1990) produced environmental resource maps which delineated Countywide shoreline preservation areas. This mapping project expanded the environmental resource map inventory produced earlier in the project to include the entire County. However, this project was narrow in scope and produced maps which depicted only those environmental resources that were critical to water quality, protection of shoreline area resources and

compiled with the requirements of the Chesapeake Bay Preservation Act Designation and Management Regulations.

The remainder of this Section and the following Section, Existing Opportunities and Constraints, deals only with the first mapping project. The second mapping project will be discussed in detail in Section VI, Shoreline Management.

Shoreline Planning Area

The shoreline planning area for the first mapping project was delineated by a two step process. First, the shoreline boundary was delineated, and, then, a stream corridor was defined at a specified distance landward of the shoreline boundary. For tidal areas, the shoreline boundary was defined by the extent of the tidal wetlands identified by the U.S. Fish and Wildlife Service on the National Wetland Inventory Maps.

Tidal Wetlands were those identified as estuarine and riverine and palustrine wetlands identified as having a tidal water regime. This planning area encompasses economic assets as well as environmental factors, particularly those related to the preservation of water quality.

The tidal marsh inventory prepared by the Virginia Institute of Marine Science (1975) did not identify tidal areas along the Chopawamsic Creek and the Rappahannock River and was not used for mapping purposes. A 1000-foot shoreline planning area band was delineated parallel to the tidal shoreline along the Potomac and Rappahannock Rivers and up the tidal limits of the Chopawamsic, Aquia, Accokeek and Potomac Creeks. The limit of tidal influence was defined by the National Wetland Inventory Maps for Stafford County.

The width of the planning area is based on the area required to ensure that an effective environmental buffer is present to minimize the contamination of surface and ground water that may flow toward the Potomac and Rappahannock Rivers. The planning area is also intended to protect plant and animal species dependent on habitats near the water. The shoreline planning area was extended to include adjacent steep slopes greater than 25% where the steep slope would drain directly into the shoreline planning area. Sensitive habitats, including threatened and endangered species, were also identified and the recommended buffer for habitat protection has been delineated.

The Aquia, Accokeek and Potomac Creeks were selected to extend the shoreline planning area upstream from the tidal reach into nontidal areas. The shoreline planning area for those streams is also 1000-feet wide and was delineated as a 500-foot band along both sides of each of these streams and its perennial tributaries, as shown on the U.S.G.S. quads.

The 500-foot band begins at the stream edge or at the edge of nontidal wetlands found immediately adjacent to the stream. Locations of perennial streams in the shoreline planning areas of these three creeks were transferred to the Stafford County Tax Base Maps.

Mapping Approach

The County Assessor's Tax Maps (1"=600' scale) were selected as the base map for analysis of both the existing conditions and opportunities and constraints. These maps were selected so that the information could be used for planning and project review purposes.

The shoreline planning area covers 22 tax maps, 9 along the Rappahannock River, 10 along the tidal reaches of the Potomac River and selected tributaries, and 3 along the nontidal portions of the Aquia, Accokeek and Potomac Creeks.

A series of nine (9) overlay maps were created for the shoreline planning area including six (6) overlay maps for the inventory of existing conditions and three (3) overlay maps for opportunities and constraints which will be discussed in Section III.

Overlay Maps - Existing Conditions

Overlay Number One: Land Use/Land Cover

Land use/land cover categories are based on the Anderson (1976) classification scheme and were interpreted from aerial photographs (1"=1000') flown by Air Photographics, Inc. in March, 1983. The categories identified are listed in Table 1. Residential categories are based on Stafford County residential zoning codes. The principle land use/cover identified in the shoreline planning area was forested land, followed by agricultural and rural residential uses. Forested lands were identified on all overlays of the shoreline planning area. The Aquia Creek and Rappahannock River watersheds constitute the two most densely developed areas of the shoreline planning area.

The location of piers provided an indication of shoreline activity. These structures were identified from the aerial photographs. Historic sites were identified from an Inventory of Historic Features provided by the Stafford County Department of Planning and Community Development (1985).

Overlay Number Two: Tidal and Nontidal Wetlands

Tidal and nontidal wetlands were mapped based on National Wetland Inventory Maps from the U.S. Fish and Wildlife Service (1972-1977). These maps provided a detailed

Table 1
Land Use/Land Cover Categories for the Shoreline Management Study Area

Urban or Built-up Land
- 111 Rural Residential 1 DU/Acre (3-Acre Minimum)
- 112 Single-Family Residential ≤ 3 DU/Acre
- 113 Medium-Density Residential ≤ 7 DU/Acre
- 114 High-Density Residential ≤15 DU/Acre
- 115 Mobile Homes
- 121 General Commercial
- 122 Institutional
- 13 General Industrial
- 17 Vacant, Undeveloped Land
- 18 Recreational

Agricultural Land
- 211 Cropland
- 212 Pasture
- 22 Horticulture or Silviculture

Forest Land
- 40 Forest Land

Water
- 51 Streams and Rivers
- 52 Lakes and Ponds
- 53 Reservoirs
- 54 Bays and Estuaries

Wetlands
- 62 Nonforested Wetland

Barren Land
- 72 Beaches
- 75 Stripmines, Quarries and Gravel Pits
- 76 Transitional Areas: Areas which are currently undergoing transition such as construction of roads. Also includes areas where prior or future use cannot be determined.

description of wetland types. National Wetland Inventory Maps are based on aerial interpretation and field surveys. Tidal wetlands, by definition, are found below the lower boundary of the 1000-foot shoreline planning area boundary. Nontidal wetlands were identified within the shoreline planning area boundaries for both the tidal and nontidal shoreline planning areas. In tidal portions of the shoreline planning area, the nontidal wetlands are isolated from the tidal shoreline. Tidal and nontidal wetlands identified in the shoreline planning area for Stafford County are listed in Tables 2 and 3 respectively.

Wetland types identified include: estuarine wetlands, which are tidal; palustrine wetlands, which can be open water or dominated by trees, shrubs, persistent emergents, emergent mosses; riverine wetlands, which are wetlands and deep water habitats contained within a channel; and lacustrine wetlands, which include habitats situated in a topographic depression such as a lake or a dammed river channel. Lacustrine, palustrine and riverine wetlands may have tidal or nontidal regimes. All estuarine wetlands are tidal.

The most frequently encountered tidal wetland type was estuarine open water. Estuarine emergent wetlands were frequently identified along the tidal shoreline. Palustrine forested wetlands predominated in nontidal wetlands.

Overlay Number Three: Shoreline Conditions Map

The shoreline conditions map identifies steep slopes, beaches, floodplains, soil erosion problem areas and shorefront protection structures within the shoreline planning area.

Steep Slopes were identified from Environmental Assessment Maps (1"=600') prepared for Stafford County by the Cox Company (1986). Three categories of slopes were identified:

- moderate, less than 10%
- severe, 10-25%
- steep, greater than 25%

The Environmental Assessment maps corresponding to tax map 13, 14, 21, and 23 were missing data on steep slopes; subsequently, this information is missing from these Overlay Maps.

Beaches are not common along shoreline areas in Stafford County. Only one small beach along the Potomac River was identified from aerial photographs and USGS quads. Much of the shoreline is characterized by steep slopes.

Table 2
Tidal Wetlands Identified in the Shoreline Management Study Area

E1OWL6	Estuarine, subtidal, open water, subtidal, oligohaline water regime.
E2EMP6	Estuarine, intertidal, emergent, irregular, oligohaline water regime.
R1OWV	Riverine, tidal, open water, permanent tidal water regime.
R1FLN	Riverine, tidal, flat, regular tidal water regime.
R1EM/FLN	Riverine, tidal, emergent/flat, regular tidal water regime.
R1EMN	Riverine, tidal, emergent, regular tidal water regime.
PEMR	Palustrine, emergent, seasonal tidal water regime.
PEMRs	Palustrine, emergent, seasonal tidal water regime, spoil.
PSS1/EMR	Palustrine, scrub/shrub, broad-leaved deciduous, emergent, seasonal tidal water regime.
PSS1R	Palustrine, scrub/shrub, broad-leaved deciduous, seasonal tidal water regime.
PFO/SS1R	Palustrine, forested/scrub,shrub, broad-leaved deciduous, seasonal tidal water regime.
PFO1R	Palustrine, forested, broad-leaved deciduous, seasonal tidal water regime.
PFO1S	Palustrine, forested, broad-leaved deciduous, temporary tidal water regime.

Table 3
Nontidal Wetlands Identified in the Shoreline Management Study Area

Nontidal Wetlands	
POWZ	Palustrine, open water, intermittently exposed/permanent nontidal water regime
POWZh	Palustrine, open water, intermittently exposed/permanent nontidal water regime,diked/impounded
POWZx	Palustrine, open water, intermittently exposed/ permanent nontidal water regime, excavated.
PSS1C	Palustrine, scrub/shrub, broad-leaved deciduous, seasonal nontidal water regime.
PSS1E	Palustrine, scrub/shrub, broad-leaved deciduous, seasonal saturated nontidal water regime.
PSS1/EME	Palustrine, scrub/shrub, broad-leaved deciduous, emergent, seasonal saturated nontidal water regime.
PFO/SS1E	Palustrine, forested, scrub/shrub, broad-leaved deciduous, seasonal saturated nontidal water regime.
PFO1A	Palustrine, forested, broad-leaved deciduous, temporary nontidal water regime.
PFO1C	Palustrine, forested, broad-leaved deciduous, seasonal nontidal water regime.
PFO1E	Palustrine, forested, broad-leaved deciduous, seasonal saturated nontidal water regime.
L1OWHh	Lacustrine, limnetic, open water, permanent nontidal water regime, diked/impounded.
R2OWH	Riverine, lower perennial, open water, permanent nontidal water regime.
R3OWH	Riverine, upper perennial, open water, permanent nontidal water regime.

Areas of the One-hundred (100) - Year Flood Zone were transferred from the Stafford County Environmental Overlay Maps. In a few cases the area of the 100-year flood zone was omitted from these maps. Floodplain information was supplemented with Flood Insurance Rate Maps for Stafford County (1980). There were no Coastal Flood Hazard Areas identified within Stafford County.

Erosion Problem Areas were identified from the Shoreline Situation Report, prepared by the Virginia Institute of Marine Science (1975). Erosion rates identified in the VIMS (1975) report for the shoreline area are:

- slight, or less than one foot per year
- moderate, or one to three feet per year
- high, or greater than three feet per year

Moderate and high erosion rates were noted along the Potomac River in the vicinity of Quantico, south of Brent Marsh and in tidal areas of the Aquia and Potomac Creeks. Significant erosion rates were not reported along the shoreline of the Rappahannock River.

Shorefront structures such as jetties, groins and bulkheads were also identified in the Shoreline Situation Report prepared by the Virginia Institute of Marine Science, and from aerial photographs. Groinfields and bulkheads were identified along the shoreline of the Potomac in the vicinity of Quantico, and along most residential shoreline areas. In the tidal areas of Aquia, Accokeek and Potomac Creeks, groinfields and bulkheads were identified. There are no shoreline structures along the shoreline of the Rappahannock River.

Overlay Number Four: Ownership Map

Parcels greater than 100 acres in size or contiguous parcels under the same ownership totalling 100 acres in size were identified by using the tax maps and a list provided by the Commissioner of the Revenue (Kordich 1989). These parcels were identified provided at least fifty percent of the parcel occurred within the shoreline planning area.

In the tidal portion of the shoreline planning area large parcels were identified along the Potomac River south of Brent Marsh, along the Rappahannock River and along the shorelines of Aquia and Potomac Creeks. Large parcels were identified in the nontidal shoreline planning areas of the Accokeek and Potomac Creek watersheds on Maps 41, 47, and 48.

Overlay Number Five: Soil Map

The soils were delineated for the shoreline planning area from Environmental Maps prepared for Stafford County (1"=600') which were based on the Soil Conservation Survey for Stafford County (1986). The following soils were identified as soils with development constraints:

- Erodible Soils
- Hydric Soils
- Highly Permeable Soils
- Prime Farmland Soils

Constrained soils were identified by information provided by the Soil Conservation Service (SCS). Special symbols identify these soils on this overlay. Soils identified for each of these categories are found in Table 4.

Erodible soils were identified based on their K value. The threshold value for erodible soils in Stafford County is reported as having a K value of approximately 0.24-0.28 (Wisniewski, 1988). The midpoint value of 0.26 was selected as the threshold value for identifying erodible soils. Therefore, all soils with a K value of 0.26 or greater were identified as erodible soils. A large number of soils within the shoreline planning area were identified as being within this category.

Permeable soils were identified on the basis of reported permeability, depth to seasonal high water table and soil texture. Soils between the surface and the seasonal high water table with a permeability equal to or greater than 2 inches per hour were included in this category (SCS, 1974).

Hydric soils were identified by the Stafford County Soil Conservation Service (Wisniewski, 1988). Prime Farmland soils were identified by the State Soil Conservation Service office in Richmond, Virginia (Stoneman, 1989).

Overlay Number Six: Sensitive Habitats

Habitats for rare and endangered species, champion trees and valuable productive habitat areas were designated for inclusion on Overlay Number Six. A database search was conducted by the Virginia Natural Heritage Program of the Department of Conservation and Historic Resources for rare species and unique natural communities that have been documented in Stafford County (Perry, 1988).

Table 4
Soils with Development Constraints in the Shoreline Management Study Area

Erodible Soils		Hydric Soils	Permeable Soils	Prime Farmland Soils
AvB	LgB	Ae	Ad	AfA
AvC2	MaD	BaA	Ae	AfB
AvD2	MaE	Bb	AsD	AlB
AvE2	MdB	Bd	AsE	AnB
Bd	MdC2	BmA	AsF	AtA
BmA	MdD2	Ce	BrD	AtB
BmB	MdE2	Cn	BrE	BaA
BmC2	Me	Eb	Ce	CaB2
BnB	MlC3	Fd	ClB	CfB2
BnC2	NaB	Fs	GsD	CgB2
BoB	NaC2	Iu	GsE	CrA
BoC2	NaC3	LgA	GsF	CrB
BrD	OrA	LgB	MaD	CuB2
BrE	OrB	Me	MaE	DoA
CaB2	OrC2	OrA	Sn	DoB
CaC2	Ro	Po	WlB	ElB2
CaD2	SfA	Ro	WlD2	FaB
CcC3	SfB	Sn	WlE2	Fd
CcD3	SfC2	SuC	WnA	Iu*
CfB2	SfD2	TeA	WnB	KeA
CfC2	SfE2	Tm	WnC	KeB
ChC3	Sn	Wh		MdB
ClB	SuC	Wr		Me
CmB	TeA			MkB2
CrA	TeB			SfA
CrB	TeC2			SfB
CuB2	TuB			Sn
CuC2	TuC2			TeA
CvC3	Wa			TeB
DoA	WgD			TuA
DoB	WgE			TuB
Eb	WlB			WmA
ElB2	WlD2			WmB
ElC2	WlE2			WoA
EmC3	WoA			WoB
FaB	WoB			
Fd	Wr			
KfB	ZlB			
KfC2	ZlC2			
KfD2				
LgA				

* Prime farmland soil when drained.

The sites identified by the database were reviewed by the Natural Heritage Program staff in order to delineate buffer areas around sites with reported occurrences of rare species. Known species habitats, a high potential for a habitat, or areas that were thought to be necessary now or in the future for the continued existence of rare species or natural community were designated. Staff scientists emphasized that their interpretation of rare species habitat was broad. Sensitive habitats were delineated by Natural Heritage Program staff on USGS quads (1"=2000').

Six areas were identified in Stafford County as sensitive habitats. Four of these areas are habitats for rare, threatened and endangered species and their delineation included protective buffers. The species identified in those four areas are:

Common Name, Scientific Name

Bald Eagle, Haliaeetus leucocephalus
American Frog's Bit, Limnobium spongia
Bladderwort, Utricularia vulgaris
Chickahominy Water Hyssop, Bacopa simulans

Two sites were identified as potential habitat for candidate species which are very rare and susceptible to becoming endangered. The species associated with these two sites have not been field verified. These species are:

Common Name, Scientific Name

Cattail, Typha domingensis
Sensitive Joint-Vetch, Aeschynomene virginica

Sensitive habitat information provide by the Natural Heritage Program does not identify the particular species associated with an individual site in order to protect these sensitive species. The six sensitive habitats identified by the Natural Heritage Program were identified on the overlay map by a bold dashed line. In cases where the sensitive habitat extends beyond the designated shoreline planning area, the entire sensitive area was designated although it is not included in the shoreline planning area. Overlays for tax maps 13, 14, 40, 41, 48 and 49 delineate sensitive habitats that extend beyond the current Shoreline Management Study Area Boundary. There were no champion trees identified in the shoreline planning area.

Table 5
Summary of Resource Inventory Maps for the Shoreline Management Study Area

Map #	Land Use	Wetlands	Shoreline Conditions	Ownership	Soils	Sensitive Habitats
13	X	X	X		X	X
14	X	X	X		X	X
21	X	X	X		X	X
23	X	X	X		X	X
30	X	X	X		X	X
31	X	X	X	X	X	X
32	X	X	X		X	X
40	X	X	X	X	X	X
41	X	X	X	X	X	X
47	X	X	X	X	X	
48	X	X	X	X	X	X
49	X	X	X	X	X	X
50	X	X	X		X	
53	X	X	X		X	
54	X	X	X		X	
58	X	X	X	X	X	
59	X	X	X		X	
60	X	X	X		X	
61	X	X	X		X	
62	X	X	X		X	
63	X	X	X	X	X	
64	X	X	X		X	

Summary

Analysis of the inventory of existing conditions of the Shoreline Planning Area resulted in the development of 113 overlays (See Table 5). Also, three additional overlay maps, which will be discussed in the following section, were created to define opportunities and constraints. The resource overlays were further analyzed for their potential impact on surface water quality to assist in determining areas for opportunities and constraints.

IV. EXISTING OPPORTUNITIES AND CONSTRAINTS

The existing opportunities and constraints for resource protection and land development allows evaluation of the study area in terms of economic and environmental issues. Specifically, the Chesapeake Bay Preservation Act (1988) recognizes that significant negative impacts on water quality and living resources are associated with population growth and development in the Chesapeake Bay Watershed. Evaluation of opportunities for resource protection and land development options are expressed as a series of existing opportunities and constraints overlay maps. The overlay maps address the future relationship between land use activities in the Stafford County Shoreline Area Management Plan study area and their potential consequences on water quality and living resources.

Most human activities are associated with land uses that degrade water quality. These activities include clearing of vegetation, installation of impervious surfaces, wastewater treatment, use of pesticides and fertilizers, and release of toxic materials. The extent of degradation depends on many factors which include proximity to the Chesapeake Bay and tributaries, type of activity and the characteristics of the disturbed land.

Overlay Maps - Opportunities and Constraints

Within the shoreline planning area, land uses can be divided into two basic categories: those that protect the Chesapeake Bay waters and living resources, and those that cause them to deteriorate. Forests, vegetated fields, and wetlands protect water quality by acting as barriers and filters for runoff from land surfaces, and as principle habitats for living resources.

Opportunities where development could occur as well as where development should be constrained or prohibited are presented in the three sets of overlays that identify:

- Environmental resources, where development should not be allowed due to their sensitivity or value, including wetlands, rare and endangered species habitats and steep slopes;
- Environmentally constrained areas where conditions should be imposed on development to avoid or reduce negative impacts on water quality habitats;
- Areas suitable for development due to the absence of constraints or the presence of urban infrastructure.

These overlays were developed as composite overlays from the Inventory of Existing Conditions presented in the previous series of overlays, and from information on water and sewer infrastructure, marinas and public recreational areas.

Overlay Number One: Environmental Resources to be Protected

Land development produces three major types of pollutants: sediments, nutrients, and toxics. Development is also responsible for changes in the natural flow of water over the land and into water courses. The impact of development on sensitive resources can be significant. Three resources were identified as areas to be protected from the impact of development because of their direct relation to water quality or their value as important habitats. These resources are:

- o tidal and nontidal wetlands;
- o sensitive habitats;
- o steep slopes greater than 25%.

Wetlands adjacent to streams and rivers are valued resources because of their capacity to act as natural sediment traps, which intercept nutrient and sediment inputs from upland sources, and because of their capacity to provide stormwater management by absorbing and slowly releasing large volumes of stormwater. Wetlands also function as groundwater recharge areas and provide habitat for diversity of plant and animal species.

Aquatic and terrestrial plants and animals are integral elements of the Chesapeake Bay estuarine system. Plant and animal communities play essential roles in maintaining the quality of water in the system and are valued resources in their own right.

Rare and endangered species present a special problem in that their preservation often precludes any alteration of their habitats, and in some instances may require large areas for preservation.

Development on steep slopes greater than 25% results in the increased introduction of sediments into the Chesapeake Bay. Preservation of forests and other types of natural vegetation are critical to prevent soil erosion from steep slopes.

These environmental resources to be protected have been identified on the first overlay of this series as blackened areas. These areas were transferred from overlays number two, three and six of the Inventory of Existing Conditions.

Overlay Number Two: Environmentally Constrained Areas

Development on environmentally constrained areas has been identified as having the potential to cause adverse impacts on water quality and habitats of the Chesapeake Bay. These areas are identified on this overlay as:

- forest land
- floodplains
- slopes 10-25%
- beaches and dunes
- eroding areas
- erodible soils
- highly permeable soils
- hydric soils
- historic sites

Conditions can be imposed on development in environmentally constrained areas to avoid or reduce negative impacts on water quality and habitats.

Cutting of forest land can lead to water quality and habitat degradation by disturbing the soil and removing vegetation. A large portion of the study area is identified as forest land.

Development on floodplains can lead to increased runoff of toxics, nutrients and sediments during storm events. Agricultural activities in floodplains can carry pesticides, nutrients from fertilizers and sediments into surface waters. Undeveloped floodplains allow stormwater to spread out and slow down. They allow suspended materials washed from upland areas to settle out rather than enter the waterway.

Eroding shorelines (greater than 3 feet/year), beaches and dunes, and erodible soils are sources of sediment carried by runoff. Any new development in these areas and on slopes of 10-25% should be conditional on implementation of measures to limit soil erosion and sediment transport.

Hydric soils and permeable soils are identified as environmentally constrained because of their hydrologic connection to the Chesapeake Bay. Runoff contaminated with certain nutrients and toxic materials can be transported quickly into the estuarine environment.

Historic sites were also identified on this overlay to acknowledge that the surrounding natural environment is important to the historic context of the site.

All maps in the Shoreline Management Protection area contained areas designated as environmentally constrained. Forest land and steep slopes are the most frequently identified mapping units found on this overlay. Mapping resources for environmentally constrained resources were obtained from inventory overlay numbers one, three and five.

Designation of areas as environmental resources to be protected in t first area preempted these areas for consideration as environmentally constrained. Environmental constraints are best viewed by first overlaying the tax map with the study area map, then the resources to be protected overlay, followed by the overlay showing environmentally constrained areas.

Boundaries between adjacent environmentally constrained mapping units were dissolved to present these areas as a single unit. Environmentally constrained areas are displayed as clear polygons on this overlay. Areas where no environmental constraints were identified are displayed as shaded areas.

Overlay Number Three: Potentially Developable Areas

Opportunities for development were identified by the presence of infrastructure or locational assets that make them attractive for water dependent uses. Areas identified on this overlay are:

- water and sewer service build-out areas
- marinas and public recreational areas
- developed urban and suburban areas

The designation of water and sewer service build-out areas (Camp Dresser & McKee, 1988) includes both existing service and planned improvements.

Marinas were identified from a list provided by the Stafford County Department of Planning and Community Development (1988), a Stafford County Street Map identifying marinas and boat ramps, and from aerial photographs.

Public recreational areas were identified from a list provided by the Stafford County Department of Planning and Community Development (1989).

Developed urban and suburban areas are taken from the urban categories of the Land use/land cover overlay:

- Single-Family Residential;
- Medium-Density Residential;
- High-Density Residential;
- Mobile Homes;
- General Commercial;
- Institutional;
- General Industrial;
- Vacant, Undeveloped Land; and
- Recreational.

Urban and suburban land areas included on the Potentially Developable Areas overlay do not include small isolated residential development or rural residential categories. Urban and suburban areas are identified as striped areas on this overlay.

Potentially Developable Areas are found on 11 study area maps and are shown independently of the first two overlays in this series.

The analysis of existing opportunities and constraints for the Shoreline Management Area resulted in the creation of 49 maps to be used in conjunction with the Inventory of Existing Maps to serve as the spatial basis for the development of the land use plan for Stafford County's Shoreline.

Table 6

Summary of Opportunity Maps for the Shoreline Management Study Area

Map	Resource Protection	Development Constraints	Development Potential
13	X	X	
14	X	X	
21	X	X	X
23	X	X	X
30	X	X	X
31	X	X	X
32	X	X	X
40	X	X	
41	X	X	X
47	X	X	X
48	X	X	
49	X	X	X
50		X	
53		X	X
54		X	X
58	X	X	X
59	X	X	
60	X	X	
61		X	
62		X	
63	X	X	
64	X	X	

V. GOALS AND OBJECTIVES

Goals

* **Direct Possible Growth so that Water Quality is Maintained and Improved in Tributaries of the Chesapeake Bay Within Stafford County.**

* **Maintain and Improve Water Quality in Tributaries to the Chesapeake Bay Whenever Development Occurs.**

  Protect and Maintain the Scenic Quality of the Shoreline Area.

* **Protect Resource-Based Industries.**

* **Improve Land Management Practices to Reduce the Adverse Impacts of Development.**

The above goals will provide the foundation of the Shoreline Area Management Plan. They are designed to supplement and coordinate with the adopted goals of the County's Comprehensive Plan and to assist the County in complying with the Chesapeake Bay Preservation Act regulations.

As defined in the Comprehensive Plan, a goal is a "broad policy toward which the planning effort is directed, usually focused on a perpetual concern which can be divided into a number of objectives. An objective is a strategy for achieving some fraction of a goal." The goals of the Shoreline Area Management Plan are in direct support of Goals Two, Three, Four and Five of the Comprehensive Plan:

- Goal Two: Preserve natural resources such as drinking water supplies, rivers, riverfronts, open space, forested land and streams; preserve historical properties and sites; and promote agricultural uses.

- Goal Three: Improve and protect the quality of the man-made environments.

- Goal Four: Continue emphasis on the Growth Area concept and on the preservation of a rural character in areas outside of the Growth Areas Boundaries.

- Goal Five: Maximize the use of existing utilities and community facilities, and plan for their logical expansion.

The goals and objectives of the Shoreline Area Management Plan also serve to guide Stafford County in development of a program which will comply with the requirements in the Code of Virginia Section 10.1-2000 for local governments to establish programs under the Chesapeake Bay Preservation Act. The goals of such programs are designed to encourage and promote the following:

- Protection of existing high quality state waters and restoration of all other state waters to a condition or quality that will permit all reasonable public uses and will support the propagation and growth of all aquatic life, including game fish, which might reasonably be expected to inhabit them;
- Safeguarding the clean waters of the Commonwealth from pollution;
- Prevention of any increase in pollution;
- Reduction of existing pollution; and
- Promotion of water resource conservation in order to provide for the health, safety and welfare of the present and future citizens of the Commonwealth.

The Shoreline Area Management Plan goals fall into three categories:

- Those which are directly targeted at protecting water quality and have objectives emphasizing measures to protect water quality.
- Those which protect other significant natural resources such as habitats or scenic quality, and which may or may not provide water quality protection as a secondary benefit.
- Those which provide for suitable development in appropriate areas.

Basic land use strategies that provide the philosophy behind the goals and objectives of the Shoreline Area Management Plan are to:

- Concentrate development so it can be more efficiently served by infrastructure technologies that are less damaging to the Chesapeake Bay on a per person basis;

- Increase the distance between pollution sources and surface waters so physical and biological processes can act to prevent water pollution;

- Protect and restore natural vegetation that can serve as a filtering mechanism between pollutant sources and surface waters; and

- Eliminate or decrease the intensity of polluting activities.

Goal One

Direct Possible Growth so that Water Quality is Maintained and Improved in Tributaries of the Chesapeake Bay Within Stafford County.

This goal can be implemented through the land use element of the Plan so that development occurs in areas and in such a manner that results in the greatest protection of the County's "Most Sensitive Areas" (as identified in the 1986 Environmental Analysis) and the least impact to the Bay's water quality and living resources. In general, development should be located within or adjacent to established Growth Areas, and in areas with adequate, planned infrastructure. The following objectives provide a strategy for achieving this goal.

Objectives:

Direct Possible Growth in Environmentally Suitable Areas Where Infrastructure Exist and Can be Expanded.

Growth should be concentrated in environmentally suitable areas with adequate sewer, roads, and water supply. Areas served by sewage collection and treatment systems have a lower release of sewage nutrients and BOD to the Bay than rural hard-to-manage package treatment plants.

Water use per capita is lower in urban areas, resulting in less impact to regional water supplies. Growth in areas with inadequate roads will require new or expanded roads whose construction will destroy natural vegetation and generate sediment, and whose use will generate vehicular pollutants and excess runoff. In addition to the lower pollution potential of urban infrastructure, the costs of providing it are lower in the long term than infrastructure built to serve scattered development in rural areas.

In shoreline areas, infrastructure should be expanded only if land use impacts to water quality and natural vegetation in shoreline areas can be avoided.

Consider Infill Development in Established Growth Areas

By flavoring development and redevelopment in areas already partially developed, growth pressure on natural resources in rural areas is reduced. Redevelopment can be used as an opportunity to retrofit the infrastructure with water pollution abatement devices and clean up wastes. Opportunity for redevelopment of underutilized or abandoned land in urban areas which are environmentally suitable should be identified and incentives provided for their redevelopment.

Allow Water-Dependent Uses On the Shoreline in Environmentally Suitable Areas

Land along appropriate sections of the waterfront should be reserved for land uses that must be near water to accomplish their basic purposes. All other uses, including water-enhanced uses and those ancillary to water-dependent uses, should be set back from the waterfront.

Allow Possible Growth in Rural Areas Only if it will have Minimal Adverse Impact on Water Quality and Natural Vegetation

In rural areas, locating growth adjacent to existing development will prevent excessive loss of rural resources due to haphazard sprawl. Where new development cannot be served by extension of sewers, that development should be directed to areas with soils suitable for on-site septic systems.

Provide Prime Resources for Resource-Dependent Uses

Prime farmland, productive forests, economically valuable mineral deposits, and select waterfront locations should be provided for the production of food, fiber, and minerals which are essential for human settlement. Prime resources include those identified by criteria adopted by state and federal agencies such as the Soil Conservation Service, the Department of Forestry, and the Division of Mineral Resources. Development should not remove rural lands from production nor ruin its productive potential, if other land not suitable for these uses by natural character or location is available for development. Growth in rural areas should only provide for housing and other uses that are essential to the economic success of resource-based uses. Growth and development in rural areas should occur in a manner that improves or has the least adverse impact on environmentally sensitive areas.

Protect Habitats from the Adverse Effects of Land Development

Habitats and the corridors that connect them can be sensitive to direct and indirect impacts of adjacent land use. Habitats, especially those of threatened and endangered species and those supporting natural resource-based industries should be protected from adverse impacts resulting from land use. For example: wetlands serve as important habitats for spawning shellfish, finfish, birds, and other animals. Wetlands should be protected from the adverse impacts of land uses which would impair their function as habitats for plant and animal resources.

Goal Two

Maintain and Improve Water Quality in Tributaries to the Chesapeake Bay wherever Development Occurs

Once appropriate areas for changes in land use activities have been identified, the next step is to ensure that site development occurs in an environmentally sensitive fashion that will not have an adverse impact on water quality.

Objectives:

Prevent Runoff from Developed Sites from Entering Surface Water

As water moves across developed areas it dissolves and suspends many water pollutants that accumulate on developed surfaces from a variety of human activities; these include pollutants such as metals, gasoline, oil and grease, and winter de-icing agents. During storms these pollutants are carried over the land, into storm sewers and streams. Runoff from developed sites, particularly roads, parking lots, and commercial/industrial storage and loading areas, contains large amounts of pollutants. These are several site design principals concerning impervious surface, site layout, erosion potential, and sediment and nutrient management that can be applied to site design.

Minimize Erosion Potential of Development Through Proper Site Design

Proper site design that minimizes the disturbance of sensitive areas is effective in reducing erosion. When erosion is not controlled, sediment is moved across a site and into nearby surface waters. Over time, the eroded sediment may have far-reaching impacts as it is redeposited further downstream.

Keep Sediment On-Site

When it is not possible to prevent sediments from being generated during construction, the effects of erosion and sedimentation can be minimized by preventing sediment from leaving the site and entering nearby water bodies.

Regulations and enforcement of erosion and sedimentation control should be evaluated to protect water quality.

Manage Nutrients to Minimize Water Pollution

Many of the Chesapeake Bay tributaries are enriched with nutrients. In developed areas, major sources of nutrients are sewage disposal and fertilization of lawns and plants. It is important to control nutrients from these sources since Bay research indicates a strong correlation between nutrient enrichment and the decline in fishery resources. Nutrients stimulate excessive growth of algae which eventually die, decay, and consume oxygen that is critical to the survival of various species of shellfish and finfish. Excessive algal growth also interferes with the growth of submerged aquatic vegetation which provides critical fish spawning and nursery habitat. Before development, measures such as siting septic systems and sewer interceptor lines in suitable soils and away from the water's edge can reduce possibility of nutrient release.

Manage Strict Control of the Use and Storage of Toxic Substances

Toxic substances may be released during or after construction or agricultural activities. During construction or agricultural activities, for example, foundation waterproofing, chemicals, glues, pesticides, and herbicides may be used. These materials are toxic to humans and the environment. Care must be exercised to ensure that these materials do not find their way into surface or groundwater which can result in sensitive populations being inadvertently exposed.

Protect Sensitive Resources in Rural Areas

When growth is allowed in rural areas, the site should be designed to concentrate structures on the least sensitive areas of the site and away from wetlands, surface waters, steep slopes, soils and high water table, highly permeable soils, and riparian plant and wildlife habitat. Clustering is a way to minimize development impacts to the environment.

Encourage Redevelopment to Reduce Water Quality Impacts

Developed areas may contain an excessive amount of impervious area; lack vegetative buffers and adequate stormwater management; have malfunctioning septic systems, or leaking storm and sanitary sewers; and have vegetation with high water and fertilization requirements. These factors may cause stream channel erosion and contribute contaminants to the Bay and its tributaries. Redeveloping land that is or has been developed provides an opportunity to clean up contaminated sites, reduce the quantity of pollutants generated at the source, and reduce the amount that actually reach the water body.

Goal Three

Protect Sensitive and Valuable Natural Resources Before, During, and After Development

Natural resources often are affected directly or indirectly by land development and associated activities. Steps should be taken to ensure that inadvertent loss of resources does not occur. Natural resources that should be protected from the impacts of development include aquatic and terrestrial flora and flauna and wildlife, especially threatened and endangered species; habitats of those living resources (e.g. wetlands, estuarine and riverine habitats, and forest buffers); and mineral and soil resources (Water quality and habitat protection shall take precedence when developing these resources).

Objectives:

Protect the Natural Environmental of the Shoreline

Vegetated land at the shoreline provides a natural buffer that protects aquatic vegetation and fishery resources. This land protects water quality and aquatic resources from sediment, nutrients and other pollutants generated during and after land development. The shoreline also contains a high proportion of sensitive and valuable resources such as waterfowl habitats, wetlands, threatened and endangered species. Natural vegetation on the shoreline can be destroyed by clearing or by wave action from boating. The recent expansions and potential new development of marinas can potentially result in increased erosion and habitat disturbance. As the result, additional no-wake zones and stricter regulations and enforcement should be considered. Development of an inventory of rare and threatened species habitats is recommended to more fully implement protection measures.

Protect tree species, plant communities, and isolated ecosystems that provide an enhanced and protected Shoreline Area for all environmental resources.

Trees and plant communities provide a valuable buffer for environmentally sensitive shoreline resources by filtering nonpoint source pollutants and sediments from runoff. These resources are also important factors in enhancing water quality, especially trees and plant communities that have been established over a period of time.

Protect Sensitive and Valuable Environments in the Shoreline Areas

Sensitive and valuable environments include areas that contain special plants, animals and habitats, and sensitive or unique geologic, hydrologic or soil features. These areas are recommended for protection because of their individual importance as habitat for rare or threatened species, their relationship with other components of the ecosystem, or their economic value. Such areas shall be protected from uses on adjacent lands by buffers and other land use mitigation practices.

Goal Four

Protect and Maintain the Scenic Quality of the Shoreline Area

One of the great resources of the shoreline areas in Stafford County is their scenic quality. Stewardship of this resource involves the preservation of the scenic quality of the natural environment and the enhancement of the visual quality of the built environment. In some instances, this resource is enhanced by historic structures. The scenic quality of the shoreline is a great asset to the value of the Bay area as an economic resource in the tourism and recreation industries. The visual perspective from the land and the water is important. A visual survey of the County's shoreline should be conducted prior to adopting specific regulations concerning the county's visual resources.

Objectives:

The following objectives which support protection of scenic quality, are either supportive or neutral to the water quality protection objectives of Goals 1 and 2. Where they encourage vegetative cover and maintenance of the natural landscape they will also provide water quality protection. They should be used in making decisions regarding not only the types of areas, but also to establish guidelines for how development should be sited.

Maintain High Quality Views and Unique Vistas

Views and their sight lines are particularly important where roadways (especially arterials and collectors) cross shoreline areas. These roads provide excellent opportunities for public viewing access to the water. However, they also provide development opportunities to vulnerable areas. These two attributes should be reconciled to allow appropriate development to enhance the visual quality of the surroundings and maintain water quality. Rivers provide recreational opportunities for boating activities. The visual quality of shoreline development as perceived from the water should be considered equally with the perspective from land.

Encourage Site Design which is Compatible with the Natural Visual Character of the Surroundings

The visual impact of a development depends on its location and its compatibility with the physical surroundings. This compatibility can be assessed through a development review process which encourages innovative and creative site design.

Ensure the Preservation and Protection of Important Historic Shoreline Features and Structures

Historic properties offer opportunities to preserve segments of the shoreline and to provide public access to the shoreline, particularly if they are publicly owned. Parcels adjacent to such properties should be developed in a sensitive manner which recognizes the character of the area. Provide Opportunities to Increase Public Awareness About the Importance of the Bay by Establishing Either Passive or Active Education Areas.

Areas could be established along shorelines as recreation/education areas where the public learns about the intricate ecology of the Bay and what is being done to restore and preserve it. Educational facilities could provide either self-guided trails and tours or be manned by guides.

Goal Five

Protect Resource-Base Industries

It is often overlooked that man is a component of ecological systems. Man contributes to natural systems by using available resources in ways that do not disrupt other environmental components, and by recycling wastes in ways that further the productivity of the system as a whole. Resource-based industries are an important aspect of the Chesapeake Bay drainage area, and should be protected from the adverse impacts of population growth and development. At the same time, care must be taken so that possible development of these resource-based industries do not cause environmental harm.

Objectives:

Protect Resource-Based Industries Insofar as They are Compatible with Water Quality and Resource Protection Requirements

Resource-based industries include the following: fishing, agriculture, mining, silviculture, and aquaculture.

Minimize Alterations to and Degradation of Water Quality and Aquatic Habitats

All resource-based activities must be conducted in ways that respect the function and integrity of water habitats for their hydrologic and biologic role in maintaining water quality and supporting the aquatic wed of life. Critical aquatic resources such as water bodies, erodible shorelines, wetlands, and submerged aquatic vegetation should be identified and protected from direct and indirect disturbance by resource-based activities.

Separate Incompatible Land Uses from Resource-Based Industries

Normal resource-based activities, which are part of everyday life to those related by tradition and occupation to rural areas, are often viewed as nuisances by new residents of rural subdivisions. This conflict escalates as more housing development in rural areas occurs and contributes to the decline of resource-based land uses. To avoid these conflicts, growth should be concentrated away from farm districts, forestry operations, fish processing industries, and mineral extraction activities. Minimum distances and vegetative screening should separate new residential areas from resource-based land and water uses.

Goal Six

Improve Land Management Practices to Reduce the Adverse Impact of Development

In developed areas, proper land management is needed to prevent adverse water quality impacts. Examples include substitution of non-toxic materials for toxic ones, proper timing and application rates of materials released to the environment, and maintenance of vegetated areas that filter runoff leaving developed areas.

Objectives:

Maintain Stormwater Controls that Intercept Runoff from Impervious Surfaces

Both natural and man-made stormwater control systems that intercept runoff before it enters surface waters require

periodic maintenance to ensure effectiveness. Vegetative buffers must be maintained to prevent siltation, while constructed systems must be cleaned regularly. Maintenance must not be overlooked or water quality may be degraded.

Develop Small (200-400 ac), Subwatershed Stormwater Management Strategies to Correct Cumulative Damage to Water Quality from Site Specific Stormwater Management Decisions.

Consolidating stormwater management structures may result in a greater level of treatment for the watershed. This subregional approach can have the following advantages:

- Reduction in capital costs for Best Management Practice (BMP) facilities
- Reduction in maintenance costs for BMP facilities
- Increased opportunities for recreational uses
- Increased opportunities for land development
- Improved peak flow control

Implementing subwatershed stormwater BMP's will require a greater level of research and planning for these public facilities to design and locate them properly.

Reduce Nutrient Loads

Nutrient loads from fertilized lawns, recreation areas, and developed areas can be reduced by improved land management. Although the contribution of nutrients from an individual home or development site may not be significant, the cumulative impact of incremental amounts of nutrients is substantial. Existing stormwater control mechanisms should be upgraded for increased nutrient removal to counter the water quality impacts of population growth.

Other potential nutrient sources such as sewage from recreation boats should be identified and contained for proper treatment.

Install or Improve the Pollutant Removal Capacity of Water Pollution Control Systems in Developed Areas

Developed areas should be retrofitted to reduce the amount of nutrients, sediments and toxics that enter surface water bodies from stormwater runoff and septic systems. Depending on the severity of localized water quality problems, installation of stormwater management controls and septic system renovations could be targeted toward the following:

- All developed areas
- Redeveloping areas
- Areas with documented flooding, erosion and sedimentation problems or malfunctioning septic systems that drain to the Bay or its tributaries
- Areas that drain to parts of the Bay or its tributaries with degraded water quality and aquatic habitats

Minimize or Eliminate the Use of Toxic Chemicals

It is difficult to prevent careless use and disposal of toxic materials that are used by commercial establishments and households. These chemicals include pesticides, paints, household cleaners, septic tank maintenance chemicals, road salt, motor fuels, and lubricants. In fact, some toxic materials (e.g., road salt and pesticides) are intended to be released into the environment. The only way to control these chemicals effectively is source-control: limiting or otherwise controlling the way they are used.

Source control may include substitution of non-toxic substances if available; guidance or restrictions on the timing and application rates of toxic substances; and requirements for proper disposal. It may also include prohibition of the use of specific chemicals above certain concentrations an at especially sensitive locations or times of year.

VI. SHORELINE MANAGEMENT

A primary objective of the Shoreline Area Management Plan is to manage future growth and development in a way that minimizes its effect on environmentally valuable shoreline resources. Growth and development that is not properly managed may cause soil erosion, sedimentation, and other forms of nonpoint source pollution which will have a negative impact on shoreline area resources. This Plan proposes guidelines to reduce the damaging effects of development in shoreline areas while achieving a balance between development and the protection of shoreline resources and water quality.

Presently shoreline areas in the County are relatively undeveloped; however, these areas have experienced development pressures due to their valuable scenic and aesthetic qualities and environmental resources which make them highly desirable environments for recreation, marinas, and various types of residential, commercial, and industrial development. These development pressures have heightened the County's need to ensure proper design, location, and construction of future development in shoreline areas to minimize its effect on environmentally valuable shoreline resources.

In July, 1988, the Board of Supervisors adopted the Stafford County Land Use Plan which set forth overall goals and objectives and a plan for future land uses throughout the County. One of the underlying goals of the Land Use Plan is the protection of environmental resources. This is evident through the designation of Resource Protection and Land Management overlay areas throughout the County.

The Resource Protection and Land Management Areas established in the Land Use Plan (1988) have been refined and expanded in order to effectively carry out the goals and objectives of the Shoreline Plan. Definitions established in the Shoreline Plan relative to Critical and Sensitive Resource Protection and Land/Resource Management Areas should be considered to replace Resource Protection and Land Management Areas in the Land Use Plan. The Shoreline Plan has also been developed to implement the Chesapeake Bay Preservation Act and Regulations dealing with water quality. The following excerpt from the Land Use Plan describes the Resource Protection and Land Management overlay areas:

> "**Resource Protection:** The Land Use Plan designates rivers, major runs, perennial streams, floodplains, wetlands, and steep slopes along these areas as conservation areas unsuitable for development. These areas encompass the most environmental[ly] sensitive areas and are limited naturally in their ability to support development. The development and/or ~~filling~~ of these areas can create adverse flooding effects on other properties. The Plan recommends that these areas remain as they are and that development density be shifted to other areas of a property." (Page 25)

> "**Land Management Overlay:** The Land Use Plan has designated in this land use overlay category environmentally sensitive areas which should be protected from the potentially detrimental effects of development through the enactment [implementation] of Best Management Practices (BMP's). The following natural resources are to be protected under this Land Use Overlay category: watersheds; groundwater recharge areas; severe slopes; areas with poor soils; floodplains, drainage basin runs, and perennial streams (as indicated on maps produced by the United States Geological Survey and National Ocean Survey at a scale of 1:24000); and waterfront and lakefronts." (Page 24-25)

The adopted Land Use Plan provides a solid foundation for carrying out the goals and objectives of the Shoreline Plan. The Shoreline Plan uses existing Resource Protection and Land Management Areas as depicted in the Land Use Plan, as areas where development should occur in a sensitive manner in order to preserve valuable shoreline resources and water quality. The development of this Plan has resulted in identifying additional areas, including those areas identified within the Chesapeake Bay Preservation Act, not included in the Land Use Plan's Resource Protection and Land Management Areas which are also important for the protection of shoreline resources and water quality.

In addition, provisions of the Chesapeake Bay Preservation Act have been addressed within the Plan, through the incorporation of Critical Resource Protection Areas. The incorporation of all available resources (Land Use Plan, Chesapeake Bay Preservation Act) has resulted in a Shoreline Area Management Plan that addresses County concerns with environmental protection and State regulations for the protection of water quality.

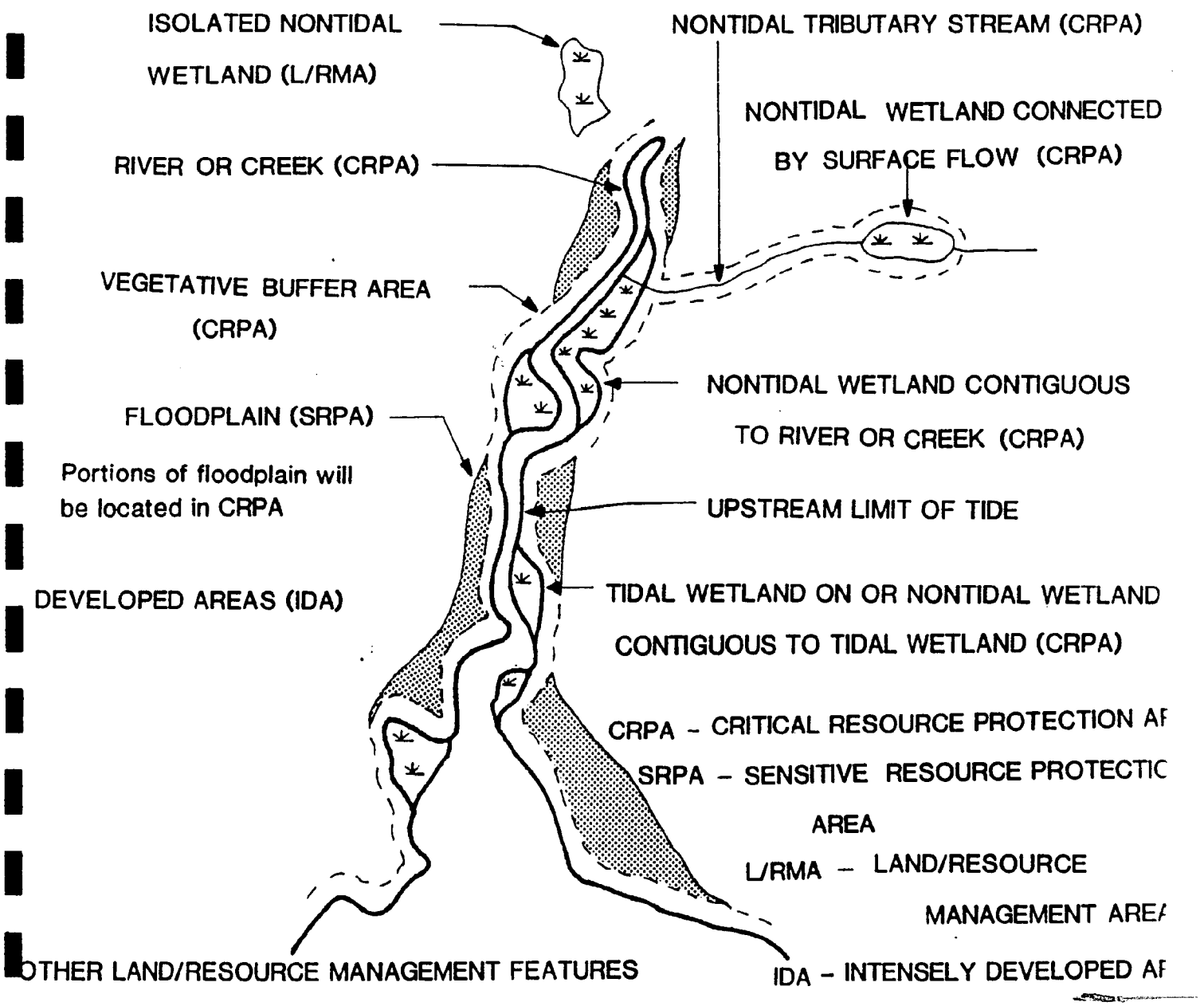
Shoreline Management Areas

The Shoreline Plan proposes to create a "Shoreline Management Area" which contains environmentally sensitive land features that are valuable environmental resources and play a vital role in preserving water quality (See Figure 2). The Shoreline Management Area is separated into four distinct Areas; Critical Resource Protection, Sensitive Resource Protection, Land/Resource Management, and Intensely Developed Areas.

Critical Resource Protection Areas contain land features which must be protected, to the greatest extent possible, in their natural state. These Areas contain the vital land features that are the most sensitive to the negative effects of development and contain ecologically significant resources which play a significant role in maintaining environmental quality (e.g. Wetlands). Critical Resource Protection Areas are coincidental with Resource Protection Areas defined by the Chesapeake Bay Preservation Act.

Figure 2

SHORELINE MANAGEMENT AREA



Sensitive Resource Protection Areas also contain land features that must be protected, to the greatest extent possible, in their natural state; however, although these areas contain land features that are sensitive to the negative effects of development, the Areas will continue to function effectively when limited uses are allowed to be developed.

Land/Resource Management Areas contain environmentally sensitive land features which need to be protected from the potentially negative effects of development through sound environmental management. Development may occur in these Areas; however, it must meet specific performance standards designed to mitigate its detrimental impact on the environment.

Intensely Developed Areas are lands that are included in Critical and Sensitive Resource Protection Areas and Land/Resource Management Areas which are already developed and for which public utilities are available. These Areas are delineated by a set of specific criteria. Areas that meet these criteria should meet established criteria whenever it is possible; except that, all redevelopment should meet established goals for stormwater management.

The following subsections will describe the land features contained within each of the Areas and list the land use activities which are allowed in the Shoreline Management Area.

Critical Resource Protection Area

Critical Resource Protection Areas consist of sensitive lands near the shoreline which play a vital role in preserving the County's water quality. Development, if allowed within the Critical Resource Protection Area will have a direct negative impact on the shoreline resources and water quality. The Critical Resource Protection Area includes rivers, tidal shores, tidal wetlands, tributary streams, and nontidal wetlands connected by surface flow to a tributary stream or river. A buffer area adjacent to, and on the landward side of the limits of these resource features is also included in the Critical Resource Protection Area in order to provide additional protection of these resources.

In their natural condition, these lands features provide for removal, reduction, or assimilation of sediments, nutrients, and potentially harmful or toxic substances in runoff from entering the waters of the County. Listed below is a description of the land categories in the County's Critical Resource Protection Area:

Rivers and Creeks - These are natural streams of water of considerable volume and include the Rappahannock and Potomac Rivers, and Aquia, Accokeek, Chopowamsic, and Potomac Creeks.

Tidal Shore - These are lands contiguous to a tidal body of water between the mean low water mark and the mean high water mark. This is a very sensitive land component since it is the last link in the nonpoint source pollution pathway in tidal waters, and if disturbed it can act as a source of pollution to water bodies.

Tidal Wetlands - These are vegetated and non-vegetated wetlands as defined in Section 62.1-13.2 of the Code of Virginia. Tidal wetlands are principally sensitive as receptors of nonpoint source pollutants from land use activities. Disrupting tidal wetlands limits their ability to filter sediments and other nonpoint source pollutants from the surface water.

Nontidal Wetlands - These are wetlands other than tidal wetlands that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Nontidal Wetlands are considered part of the Critical Resource Protection Area only when they are connected to a river or a tributary stream by surface flow or are contiguous to tidal wetlands and tributary streams. Nontidal wetlands not connected by a surface flow or contiguous to tidal wetlands or tributary streams will be part of the Land/Resource Management Area.

Tributary Streams - These are perennial streams depicted on the most recent U.S. Geological 7 1/2 minute topographic quadrangle map (scale 1:24,000). Stafford County contains a significant number of these tributary streams.

Buffer Areas - These are one hundred (100) foot wide vegetated areas which make up the boundary of the Critical Resource Protection Area. Buffer areas are to be retained if present and established where they do not not exist, to the extent practical. The buffer area may be modified in residential, commercial and industrial areas when strict application of the buffer would result in the creation of an unbuildable lot, or in agricultural areas where buffer areas may be reduced if Best Management Practices (e.g. detention ponds, silt fences, etc..) are utilized.

The intent of this buffer area is to provide a nonpoint source pollution filter area to protect sensitive resources in the Critical Resource Protection Area.

In May, 1990, the County completed a mapping project which produced a complete set of mylar overlay maps to the County tax maps displaying Critical Resource Protection Areas (See Figure 3). These maps, available in the Department of Planning and Community Development, are resource maps which will be used to assist the County in preventing development from occurring in these critical environmentally sensitive areas.

Sensitive Resource Protection Area

Sensitive Resource Protection Areas include environmentally sensitive land features that, if developed with any residential density or commercial and industrial intensity, will have a direct negative impact on shoreline resources and water quality; however, certain uses are appropriate in these areas so long as construction is limited. The Sensitive Resource Protection Area includes the 100 year flood plain and adjacent slopes of greater than 25%.

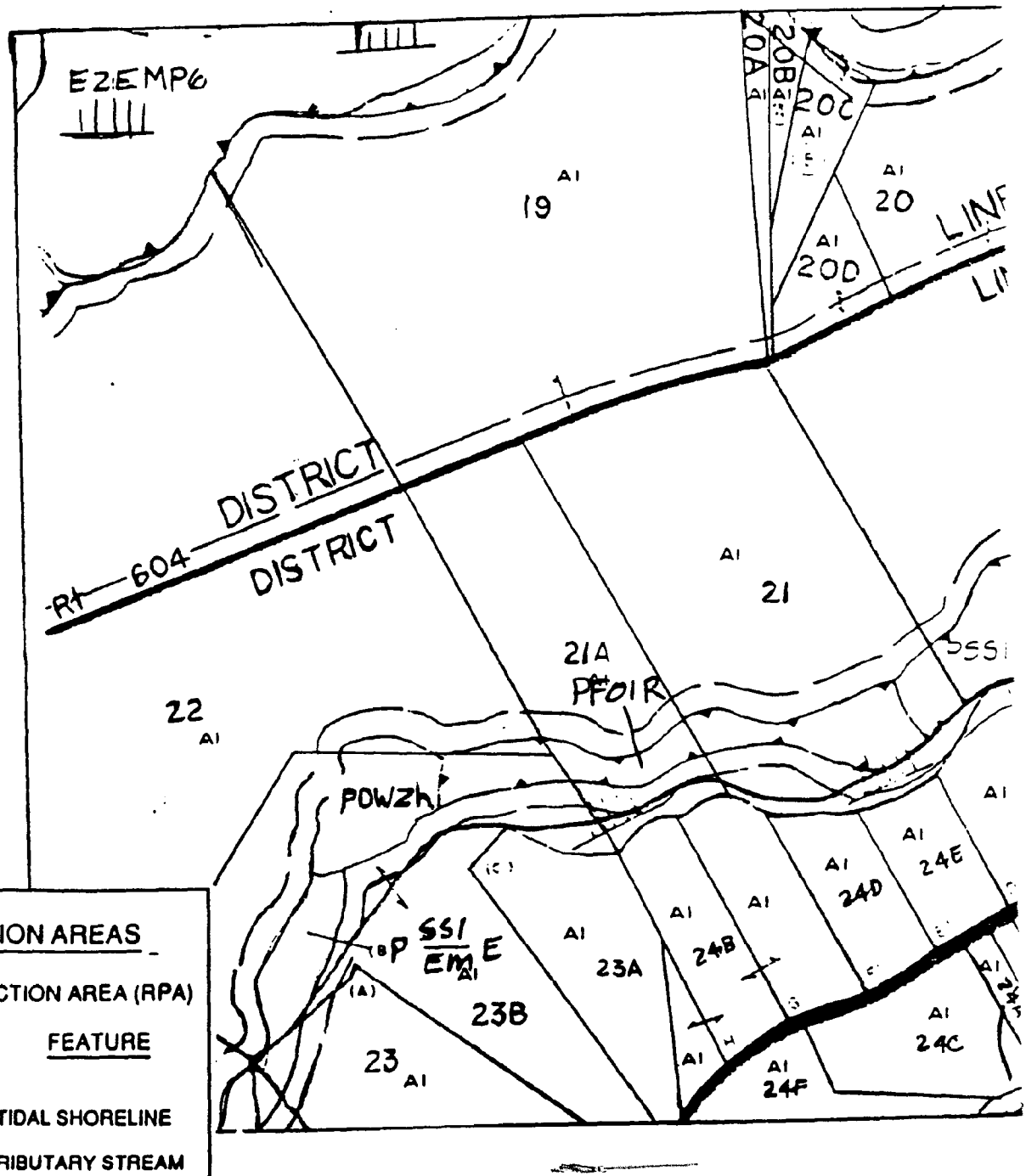
Floodplains - Theses are lands that would be inundated by flood water as a result of a storm event of a 100-year return interval as defined by the Federal Emergency Management Agency (FEMA). Floodplains are an important link in the drainage pathway to surface water bodies.

Steep Slopes - Only those slopes greater than 25% which are adjacent to the floodplain are considered Sensitive Resource Protection Areas.

Land/Resource Management Area

Land/Resource Management Areas include land features that if developed improperly, have a potential for polluting the waters of Stafford County and diminishing the functional value of Resource Protection Areas. Land/Resource Management Areas are to be provided contiguous to the entire inland boundary of Resource Protection Areas and include the following land features: 1) highly erodible areas; 2) highly permeable areas; 3) steep/severe slopes, and 4) nontidal wetlands not in the Critical Resource Protection Area.

CRITICAL RESOURCE PROTECTION AREAS



PRESERVATION AREAS

RESOURCE PROTECTION AREA (RPA)

SYMBOL	FEATURE
	TIDAL SHORELINE
	TRIBUTARY STREAM
E2EMP6	WETLANDS* (HYDROLOGICALLY CONNECTED)
	LIMITS OF 100-FOOT BUFFER AND RPA

Highly Erodible Soils - These are soils with an erodibility index (EI) greater than eight (8) as determined in the "Food Security Act Manual", August 1988 (this is a section of the United States Department of Agriculture's (USDA) "Field Office Technical Guide"). These soils, when disturbed, may lead to severe soil erosion and sedimentation if Best Management Practices (e.g. detention ponds, silt fences, etc.) are not used.

Highly Permeable Areas - These are areas where soils have a permeability equal to or greater than six (6) inches of water movement per hour in any part of the soil profile to a depth of seventy-two (72) inches as found in the "National Soils Handbook of 1983 (this is a section in the USDA "Field Office Technical Guide"). These soils must be protected to ensure the protection of ground water recharge areas.

Steep Slopes/Severe Slopes - These are slopes which have a grade greater than ten (10) percent and when disturbed, these slopes are easily eroded. Fertilizers and pesticides applied on slopes greater than ten (10) percent can easily be washed down into the waterways. Slopes greater than 25% and adjacent to flood plains are considered Sensitive Resource Protection Areas.

Nontidal Wetlands - These are wetlands that are not included in the Critical Resource Protection Area because they are not connected to a river, creek, or tributary stream by a surface flow. These isolated wetlands are located throughout the County.

An inventory of the above mentioned environmentally sensitive lands throughout the County was performed by representatives at Virginia Tech through the use of the Virginia Geographic Information System (VirGIS). This inventory produced 1 inch to 2,000 feet USGS overlay maps and revealed that the area in the County containing these environmentally sensitive land is conservatively estimated at seventy-three percent (73%).

These figures reveal that in order to adequately address the protection of water quality and water resources, the Shoreline Plan needs to place the remainder of the County not included in Critical or Sensitive Resource Protection Areas into the Land/Resource Management Area.

Intensely Developed Areas

Intensely Developed Areas are lands within Stafford County's Resource Protection and Land/Resource Management Areas where development has already occurred and public utilities are available. These Intensely Developed Areas are recommended to overlay the Resource Protection and Land/Resource Management Areas where two or more of the following exist:

1. The developed area contains greater than fifty (50) percent impervious surface;

2. The area is served by water and sewer by the adoption date of these regulations;

3. Where the predominant land use is residential, the housing density is equaled to or greater than four dwelling units per acre.

VII. RECOMMENDED DEVELOPMENT GUIDELINES

In order to carry out the goals and objectives of the Shoreline Plan, guidelines need to be developed to lay the foundation for changes in existing County ordinances. The guidelines recommended in this Plan deal mainly with possible development that may occur in the Shoreline Management Area.

Development includes agricultural uses as well as residential, commercial, and industrial uses. Each of these land uses can be characterized by a set of activities which have the potential to release or generate nonpoint sources of water pollution. Some activities, such as clearing vegetation, occur during the construction phase of land development and are common to a wide range of land uses. Other activities, such as impervious surface runoff and septic system discharge, are ongoing post development nonpoint source pollution activities associated with most land uses.

The concern of this Plan is activities that occur in the Shoreline Management Area. Recommended development guidelines will address existing activities allowed and those uses that are planned for in the Land Use Plan. The recommended guidelines will also address possible future changes in the Land Use Plan for incorporation of the Shoreline Management Area.

Stafford County Land Use Plan

The Stafford County Land Use Plan (1988) represents a guide for the location and type of future land uses throughout the County. A majority of the Shoreline Management Area is designated for either Resource Protection or rural-type development (Agriculture, three acre lot residential) and are outside the designated Growth Area in the Land Use Plan.

These land use activities are somewhat compatible with Shoreline Management Areas as they, in most cases, do not produce the amount or type of nonpoint source pollution sources as the more urban land use activities; however, these uses still need to be managed to ensure water quality throughout the County.

The Shoreline Management Area included in the designated Growth Area of the Land Use Plan has existing and proposed land uses that need to be managed appropriately to maintain the environmental quality of the Shoreline Management Area.

Land Use Activities Allowed in Critical Resource Protection Areas

Only certain land use activities are recommended to be permitted in Critical Resource Protection Areas due to the importance of these areas for protection of shoreline resources and water quality. Below is a list of land use activities permitted within Critical Resource Protection Areas when developed under specific guidelines:

Rivers or Creeks, Tidal Shores, Tidal and Nontidal Wetlands, and Tributary Streams

- Any of the Water Dependent Uses listed below:

  1. Marinas;

  2. Docks;

  3. Intake and outfall structures of power plants, sewage treatment plants, water treatment plants, and storm sewers;

  4. Public water-oriented recreation areas;

  5. Fisheries or marine resources facilities.

  6. Regional stormwater management facilities.

- Shoreline erosion control projects, such as construction bulkheads or revetments and the removal of vegetation to stabilize the shoreline in accordance with the best available technical advice, subject to obtaining all applicable Federal, State and Local permits.

- Access Roads (See guidelines for specific land use activities - creation of impervious surfaces).

- Vegetation Clearing (See guidelines for specific land use activities - vegetation clearing).

- Public Utility Infrastructure, provided construction, installation, and maintenance of these facilities is performed in a manner that meets the intent of the recommended development guidelines.

Buffer Area

- All uses permitted in above portion of Critical Resource Protection Area should be permitted in the buffer area.

- In order to maintain the functional value of the buffer area, indigenous vegetation may be removed only to provide for reasonable sight lines, access paths, general wood lot management, and best management practices.

- When application of the buffer area would result in the creation of an unbuildable residential, commercial or industrial lot, a modification is recommended to be allowed in accordance with the following guidelines:

  a. Modification shall be minimal to achieve reasonable buildable areas.

  b. Where possible, an equal area to the area encroaching in the buffer area will be established elsewhere on the lot.

  c. In no case will the reduced buffer be less than 50 feet.

- Modification of the buffer area in areas adjacent to active agricultural lands is recommended to be allowed with the following guidelines:

  a. A fifty (50) foot buffer area may be established when the land is part of a federal, state or locally funded agricultural BMP program.

  b. A twenty-five (25) foot buffer area may be established upon implementation of a soil and water conservation plan approved by the Soil and Water Conservation District.

Land Use Activities Allowed in Sensitive Resource Protection Areas

Only certain land use activities are recommended to be permitted in Sensitive Resource Protection Areas due to the valuable function these Areas contribute to shoreline resources and water quality. Below is a list of land use activities permitted within Sensitive Resource Protection Areas when developed under specific guidelines:

Floodplains and Adjacent Steep Slopes Greater Than 25%

- All land uses permitted in the Critical Resource Protection Area.

- Active recreational facilities and ancillary uses.

  1. Access Roads/Parking Facilities (See guidelines for specific land use activities - creation of impervious surfaces).

  2. Vegetation Clearing (See guidelines for specific land use activities - vegetation clearing).

- Agricultural Uses (See guidelines for specific land use activities - cultivation/tillage, pasture and fertilizers and pesticides).

Overall Development Guidelines

The location and type of land use activities allowed in the Shoreline Management Area is that which is allowed with the existing zoning of the property provided that use can meet the performance criteria set forth in this Plan. For example a property zoned for Industrial in a Shoreline Management Area, may be developed for a industrial use provided that certain performance criteria are met. These performance criteria are derived from development guidelines established for these uses.

Recommended development guidelines have been formulated for all land use activities that occur in the Shoreline Management Area. These guidelines are directly related to the following goals of the Shoreline Plan:

Goals

* **Direct Possible Growth so that Water Quality is Maintained and Improved in Tributaries of the Chesapeake Bay Within Stafford County.**

* **Maintain and Improve Water Quality in Tributaries to the Chesapeake Bay Wherever Development Occurs.**

* **Protect Sensitive and Valuable Natural Resource Before, During, and After Development.**

* **Protect and Maintain the Scenic Quality of the Shoreline Area.**

* **Protect Resource-Based Industries.**

* **Improve Land Management Practices to Reduce the Adverse Impacts of Development.**

Recommended Guidelines:

- Disturb no more land than is necessary to provide for the desired use or development.

- Preserve indigenous vegetation to the maximum extent possible during any type of construction.

- Utilize Best Management Practices in all developments.

- Require a erosion and sediment control plan for land use activities that exceed 2,500 square feet of land disturbance.

- Require any land disturbing activity that exceeds an area of 2,500 square feet (including construction of all single family houses, septic tanks and drainfields) to comply with the requirements of Stafford County's Erosion and Sediment Control Ordinance.

  (uses considered usual and customary, such as gardens, that serve individual families are exempt from the aforementioned 2,500 square foot provisions)

- Require no net increase in nonpoint source pollution runoff in new developments based on average land cover conditions.

- Require no net increase in nonpoint source pollution runoff from redevelopment currently utilizing BMP's.

- Require a ten (10) percent reduction in nonpoint source pollution runoff from redevelopment not currently utilizing BMP's.

- Develop alternative on-site sewage treatment systems, including the use of flow diversion systems (systems which periodically switch the flow of waste to the reserve drainfields, thus allowing the other drainfield to recover).

- Promote area-wide planning for public and private access to shoreline areas.

- Promote area-wide planning for the construction of community docks and piers to limit the construction of numerous individual docks and piers.

- Minimize the amount of impervious cover to be consistent with the use or development allowed.

- Require on-site sewage treatment systems to be pumped out every five years and provide a reserve sewage disposal site with the same capacity as the primary site.

- Develop a Regional Stormwater Management Plan for the County.

- Require agricultural activities have a soil and water conservation plan.

Guidelines for Specific Land Use Activities

The activities listed below are the activities that would generate or release the most nonpoint source pollutants in Stafford County. Any of the land activities listed below are recommended to follow the guidelines set forth in this section and the Overall Development Guidelines (listed above).

Cultivation/Tillage

Conventional cropping practices can leave disturbed soils exposed without vegetation for periods during which stormwater can cause soil erosion and sedimentation.

- Prohibit these activities in tidal shores, tidal and nontidal wetlands, steep slopes, and buffer area.

- Require Agricultural Conservation Plans approved by the Soil and Water Conservation District to specify the management techniques to be utilized for cultivation/tillage in floodplain and highly permeable and erodible soil areas to assist in preventing the transmittal of pollutants to surface and groundwater.

Pasture

Pasture areas can be an asset to water quality if they are properly managed and maintained with a vegetated cover; however, where large numbers of animals are allowed in streams or on steep slopes, they can cause erosion and lower water quality.

- Allow pasture activities in buffer areas where pasture vegetation already exists.

- Require Agricultural Conservation Plans to indicate the techniques required for maintaining vegetation in the buffer area in a state which allows it to function as intended.

Dairies and Feedlots

Dairies and Feedlots involve high concentrations of animals, most often cattle, which produce large quantities of waste. They are often located on large expanses of either impervious surface or exposed soils. These operations can increase stormwater flows, and increase nutrients and sediment levels delivered to water bodies.

- Prohibit these uses from all components except highly permeable and erodible soil areas.

- Regulate the concentration of animals in order to limit the animal concentrations and nutrient-rich runoff in highly permeable and erodible soil areas.

Fertilizers and Pesticides

Fertilizers and Pesticides applied in the wrong concentration, at the wrong time, or too close to water bodies, may result in pollution of water bodies and severely impact water quality. Improper storage and handling of these substances can also result in their release into water bodies with harmful effects to water quality.

- Prohibit these activities in tidal shore, tidal wetland, and nontidal wetland areas.

- Limit the application of these substances in the floodplain to that absolutely necessary for agricultural activities and also use application techniques which will minimize the threat of water pollution.

- Limit the application of these substances in areas other than floodplains to amounts that are necessary to maintain a thick vegetative cover, but performed in a manner so that none leave the site.

Vegetation Clearing

The clearing of vegetation is needed for a variety of land uses. Land development includes clearing of vegetation in preparation for construction. Exposed soils are subject to soil erosion resulting in sedimentation of water bodies.

- Allow vegetated clearing only after the proper permits have been obtained, if necessary, from either the Stafford County Wetlands Board, Virginia Marine Resources Commission (VMRC), or Army Corps of Engineers.

- Disturb no more land than is necessary to provide for the approved development or use.

- Preserve indigenous vegetation to the maximum extent possible consistent with use and development allowed.

- Allow clearing in highly permeable soil areas provided that the disturbed area is replanted as soon as possible.

- Require any vegetative clearing follow BMP's to enhance the quality of stormwater runoff.

Soil Grading/Dredging and Filling

These activities are combined because they each involve disrupting areas of soil and sediment and exposing them to erosion. They each can lead to pollutants in water bodies, the disruption of habitat, and, where dredging is involved, the resuspension of previously deposited nutrients and toxic materials.

- Permit dredging and filling only after the proper permits have been obtained, if necessary, from either the Stafford County Wetlands Board, Virginia Marine Resources Commission (VMRC), or Army Corps of Engineers.

- Disturb no more land than is necessary to provide for the approved development or use.

- Prohibit these activities in tidal and nontidal wetlands, on slopes greater than twenty five (25) percent, and within buffer areas.

- Require dredging/filling to use appropriate BMPs.

Mining

The principal mining operations of direct concern to water quality are sand and gravel operations which recover materials along streams and rivers or from abandoned river terraces and benches. The sand and gravel are removed, sorted, and washed creating a potential for releasing large amounts of fine particles to surface waters.

- Prohibit mining from the tidal shore, tidal and nontidal wetland and buffer areas.

- Require mining to utilize appropriate BMPs to prevent the degradation of water quality.

- Require disturbed areas to be reclaimed so that they are permanently stabilized by grading and planting or seeding with indigenous vegetation.

- Regulate mining activities in highly permeable soil areas, such as sand gravel deposits, so that pollutants from machinery cannot be infiltrated into the groundwater.

- Require mining activities in highly erodible soil areas to use appropriate BMPs which will protect against off-site erosion.

Creation Of Impervious Surface

Most land development results in the creation of impervious surfaces such as rooftops, sidewalks, roads, and parking areas. These areas inhibit the infiltration of stormwater into the ground. Resulting increases in surface flows during storms erode soils and change stream profiles. Roads and parking areas accumulate toxic substances and nutrients which are carried by stormwater into water bodies.

- Minimize impervious cover needed for the uses or developments allowed.

- Limit the impervious surfaces to those absolutely required for the development (i.e. road lengths should be shortened and structure footprints kept as small as possible).

- Develop alternative parking lot designs that limit impervious surfaces, but whose quality is comparable to more conventional impervious surfaces.

- Require the use of pervious surfaces which accomplish improvements in water quality and perform the intended function of conventional impervious surfaces whenever possible.

- Allow structure footprints to be reduced by increasing the number of stories in the structure, provided that the structure height complies with the maximum allowed in that zone.

- Recommend clustering in developments to the extent possible.

- Prohibit impervious surfaces in tidal or nontidal wetlands, on steep slopes, or in buffer areas (unless a hardship exist); except uses in Resource Protection Areas and necessary roadways that comply with other provisions listed herein.

- Allow minimal impervious surfaces in tidal shore areas where they are associated with water dependent uses.

- Design developments so that runoff from impervious surfaces in the floodplain is recharged close to where it occurs.

- Prohibit stormwater from contaminated surfaces to be directed for infiltration to highly permeable soil areas where it is determined that groundwater contamination could occur.

- Prevent runoff from impervious areas to be directed onto highly erodible soil areas where it can be avoided. If unavoidable, limit runoff to erodible areas to sheet flows onto vegetated areas.

On-site Wastewater Treatment

All types of individual, or community on-site wastewater treatment techniques can potentially impact water quality. Even well-designed, properly installed septic systems can release nutrients, primarily nitrates, to groundwater which makes its way to surface waters of streams and rivers.

- Require that on-site wastewater treatment facilities be designed to reduce their negative impact on water quality.

- Require on-site sewage treatment systems to be pumped out every five years and provide a one hundred percent reserve sewage disposal site with the same capacity as the primary site.

Solid Waste Disposal

This activity is intended to include all types of solid waste disposal, including but not limited to landfills. Surface water quality problems associated with solid waste disposal can occur directly and indirectly. Wastes discharged directly into water bodies (including wastes from ships and boats) have a negative impact on water quality if they contain nutrients, and toxic materials. Wastes disposed of on land can directly affect surface water quality if washed into water bodies or they can reach surface waters indirectly through groundwater.

- Prohibit solid wastes disposal in the Shoreline Management Area, except in appropriately designated areas including public landfills.

Toxic Substance Storage/Disposal

When toxic substances are released into the environment, they have the potential for degrading water quality. Normal usage of these materials involves releases into the environment. Mishandling these products during normal usage can damage environmentally sensitive areas. Areas where they are disposed of or stored are particularly vulnerable to releases due to the concentrations of materials involved.

- Prohibit toxic material storage in Resource Protection Areas with the exception of gasoline and other support substances needed for water dependent uses (i.e. marinas), provided that the storage of such substances meet standards according to the latest edition of the National Fire and Protection Association (NFPA) Automotive and Marine Service Station Code.

- Prohibit toxic material storage and dispensing in Shoreline Management Areas through the standards set forth in the latest edition of the NFPA Automotive and Marine Service Station Code.

VIII. IMPLEMENTATION

This Plan establishes Critical and Sensitive Resource Protection Areas and Land/Resource Management Areas and sets forth recommendations for development that occurs within these Areas. Many of these requirements have been taken from the Chesapeake Bay Preservation Act Final Regulations, while others were developed to implement specific County objectives for shoreline protection. Implementation of these recommendations will require several steps, the most important of which is the development of ordinance amendments within the County Code, including Zoning, Subdivision and Erosion and Sediment Control Ordinances.

There is also a need to establish a procedure for individual lot owners outside of subdivisions to construct a home or accessory structure on their land in accordance with the guidelines set forth in this Plan, but without imposing a financial hardship. In addition to the increased subdivision development within the County, large numbers of individual lots outside of subdivisions continue to be constructed upon. A procedure that will allow for the development of these isolated lots by individuals, in an environmentally sensitive manner without placing a financial burden on the landowner is recommended.

The development of a procedure that will ensure compliance with the requirement for on-site sewage treatment systems to be pumped out every five (5) years is also recommended and should include enforcement recommendations from the Rate Management Commission.

It is further recommended that specific standards for determining pollutant loadings of various land covers within minor watersheds be developed, as opposed to utilization of standard default figures for land covers throughout the County.

As development is established near the shoreline, area-wide planning for public and private access to the shoreline area and for the location of docks and piers should be encouraged. There is a public need for adequate access to the shoreline area; however, promoting construction of public and private access paths, docks and piers solely for individual use will be detrimental to the aesthetic environment and water quality. Area-wide coordination, including the utilization of Homeowners Associations to establish area-wide programs, of these features will provide opportunities for public and private access and establish docks and piers as necessary.

V. CONCLUSION

The Shoreline Area Management Plan has included an inventory of existing conditions; the identification of existing opportunities and constraints; the establishment of goals and objectives and Shoreline Management Areas; recommended development guidelines; and recommendations for implementing the Shoreline Plan recommendations. The inventory of existing conditions has analyzed and mapped a variety of environmental features. These features were further analyzed to determine the opportunities and constraints of the shoreline area.

Goals and objectives were developed to assist in carrying out the primary purpose of the plan, to protect and enhance the wise use of shoreline area resources through the management of future growth and development. These goals and objectives were designed to supplement and coordinate with the adopted goals of the County's Comprehensive Plan and to assist the County in complying with the Chesapeake Bay Preservation Act regulations.

The establishment of Shoreline Management Areas were developed from already established areas depicted in the Stafford County Land Use Plan (Resource Protection and Land Management Overlay Districts). Additional mapping was performed which delineated the limits of Critical Resource Protection Areas that require protection in order to ensure protection of shoreline resources and water quality. In addition, the provisions of the Chesapeake Bay Preservation Act have been incorporated into this Plan.

Recommended development guidelines were formulated to carry out the goals and objectives of the Shoreline Plan. These guidelines address existing activities presently allowed and those uses planned for in the Land Use Plan and future amendments to it. Overall development guidelines were developed which applied to all land use activities throughout the Shoreline Management Area. In addition, guidelines for specific land use activities which create nonpoint source pollution were developed.

The development guidelines laid the foundation for recommendations for implementing the Shoreline Plan. The adoption of amendments to County Ordinances will provide the "teeth" of the Plan and will implement the regulations necessary to protect and enhance the wise use of our shoreline area resources.

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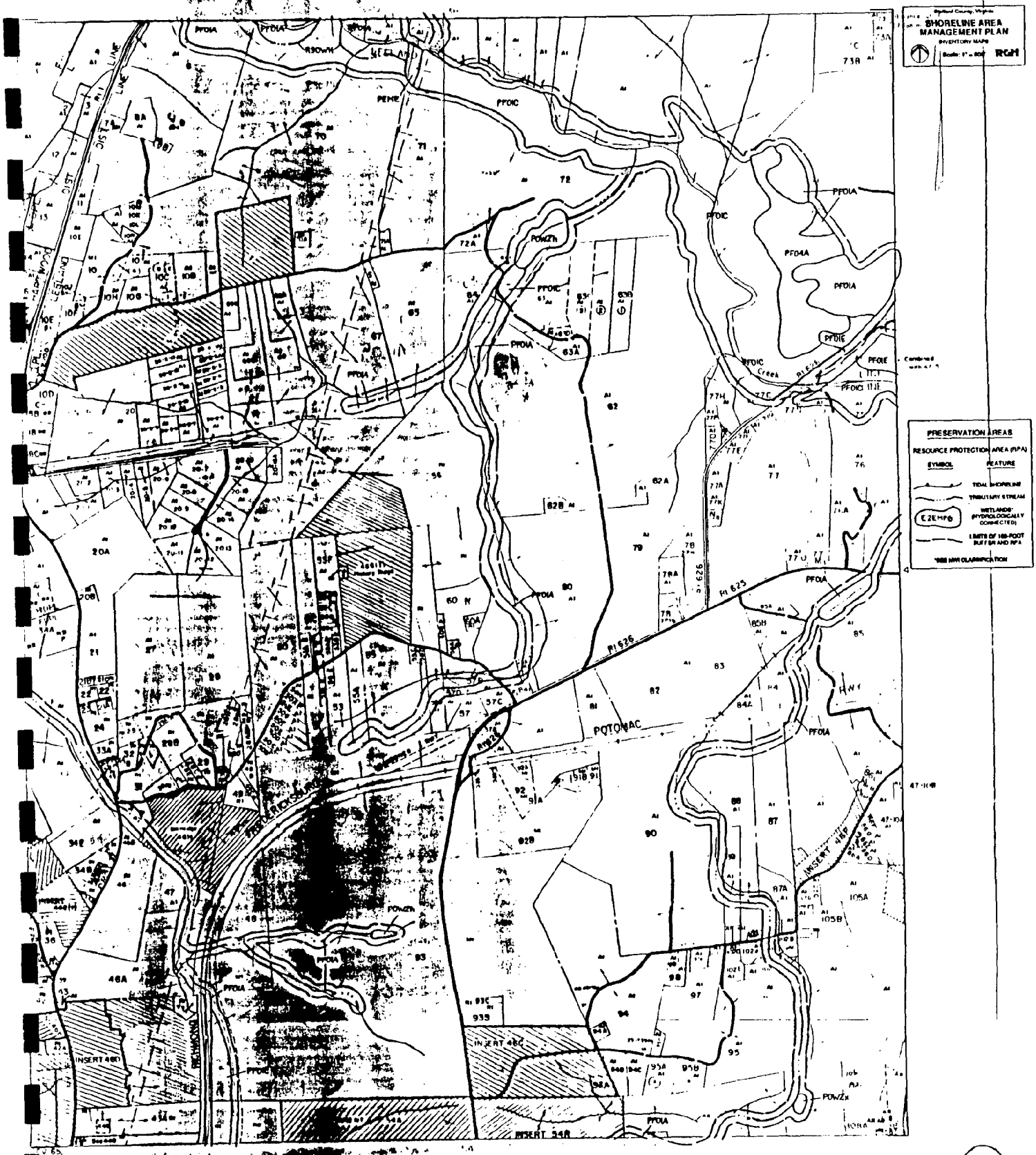

Attachment 3

STAFFORD COUNTY

CHESAPEAKE BAY PRESERVATION AREAS

Mapping Methodology

Introduction

As part of the First Year Program, Resource Protection Areas have been mapped for Stafford County on a mylar overlay to the County tax base map (1"=600'). Resource Management Areas, however, have not been mapped at this time. A review of VIRGIS resource maps revealed that 80 to 85 percent of the County soils would be classified as Resource Management Areas.

The County should decide whether it is practical to delineate these areas or to identify the balance of the County as a Resource Management Area. This report of the mapping methodology, therefore, refers only to those resources delineated as Resource Protection Areas. Portions of the County that occur within the boundaries of the Quantico Military Base have not been included in the study area.

Resource Protection Areas are lands at or near the shoreline which are critical for water quality protection because they act as physical and biological filters of stormwater runoff, provide natural storage of flood waters and prevent stream channel erosion. Resource Protection Areas include the following resources:

- o tidal wetlands
- o tidal shores
- o non-tidal wetlands connected by surface flow and contiguous to tidal wetlands or tributary streams
- o a vegetated buffer adjacent to and landward of other resources and along both sides of tributary stream

- other lands that fall within the definition of Resource Protection Areas necessary to protect water quality

Resource Management Areas are located landward of Resource Protection Areas and include the following features and resources:

- floodplains
- highly erodible soils, including steep slopes
- highly permeable soils
- non-tidal wetlands not included in Resource Protection Areas; and
- other lands needed to protect quality of state waters

Mapping Sources

Tidal Wetlands

Tidal wetlands were mapped based on the National Wetland Inventory (NWI) maps (1'=2000') developed by the U.S. Fish and Wildlife Service (1972-1977). NWI maps were enlarged to the County tax base map scale of 1"=600'. The enlarged NWI maps were then registered to the tax base map features such as road intersections and County boundaries.

The NWI maps provide a detailed description of wetland types. Tidal wetlands are (listed in Table 1) are represented in Stafford County by three wetland systems: Estuarine, Riverine and Palustrine.

Tidal Shoreline

The tidal shoreline was mapped as the landward boundary of the tidal wetlands delineated by the National Wetland Inventory. This boundary has been designated with a symbol on the Preservation Areas overlay.

Tributary Streams

Tributary Streams draining to tidal wetlands are defined as perennial streams as they appear on the US Geological Survey 7.5 minute topographic maps (solid blue line).

Non-Tidal Wetlands

Non-tidal wetlands, hydrologically connected to the perennial streams and contiguous to tidal wetlands or tributary streams have been taken from the National Wetland Inventory maps. Each non-tidal wetland in Stafford County was delineated with its wetland code. Non-tidal wetlands identified by the criteria for inclusion in Preservation Areas are listed in Table 2. These non-tidal wetlands include three wetland systems: Palustrine, Lacustrine and Riverine.

Buffer

A 100-foot buffer was mapped landward of tidal wetlands, tidal shores, non-tidal wetlands hydrologically connected to tidal wetlands and along both sides of tributary streams.

No other lands were designated by Stafford County for inclusion in the Resource Protection Areas.

OVERLAYS

The Resource Protection Areas are included in a series of nine overlays developed for Stafford County's Shoreline Management Program. Under the Shoreline Management Program natural resources and opportunities for resource protection and development were identified in shoreline areas for 22 of the County tax maps.

Overlays for each tax map of the Shoreline Management Program are pin-bar registered to each other and registered to the tax base map by corner registration marks. The Preservation Areas overlay replaces the wetland overlay of the Shoreline Management Program and provides the opportunity to extend the identification of resources to the remainder of the County.

Table 1. Tidal Wetlands Identified in Resource Protection Areas

E1OWL6	Estuarine, subtidal, open water, subtidal, oligohaline water regime.
E2EMP6	Estuarine, intertidal, emergent, irregular, oligohaline water regime.
R1OWV	Riverine, tidal, open water, permanent tidal water regime.
R1FLN	Riverine, tidal, flat, regular tidal water regime.
R1EM/FLN	Riverine, tidal, emergent/flat, regular tidal water regime.
R1EMN	Riverine, tidal, emergent, regular tidal water regime.
PEMR	Palustrine, emergent, seasonal tidal water regime.
PEMRs	Palustrine, emergent, seasonal tidal water regime, spoil.
PSS1/EMR	Palustrine, scrub/shrub, broad-leaved deciduous, emergent, seasonal tidal water regime.
PSS1R	Palustrine, scrub/shrub, broad-leaved deciduous, seasonal tidal water regime.
PFO/SS1R	Palustrine, forested/scrub,shrub, broad-leaved deciduous, seasonal tidal water regime.
PFO1R	Palustrine, forested, broad-leaved deciduous, seasonal tidal water regime.
PFO1S	Palustrine, forested, broad-leaved deciduous, temporary tidal water regime.

Table 2. Non-tidal Wetlands Identified in Resource Protection Areas

PEMA	Palustrine, emergent, temporary non-tidal water regime.
PEMC	Palustrine, emergent, seasonal non-tidal water regime.
PEMEb	Palustrine, emergent, seasonal saturated seasonal non-tidal water regime, beaver.
PEMFb	Palustrine, emegent, semipermanent non-tidal water regime, beaver.
PEMY	Palustrine, emergent, saturated/semipermanent, seasonal non-tidal water regime.
PFO1x	Palustrine, forested, broad-leaved deciduous, excavated.
POWFb	Palustrine, open water, semipermanent non-tidal water regime, beaver.
POWZ	Palustrine, open water, intermittently exposed /permanent non-tidal water regime.
POWZb	Palustrine, open water, intermittently exposed/permanent non-tidal water regime, beaver.
POWZh	Palustrine, open water, intermittently exposed/permanent non-tidal water regime,diked/impounded.
POWZx	Palustrine, open water, intermittently exposed/ permanent non-tidal water regime, excavated.
PSS1A	Palustrine, scrub/shrub, broad-leaved deciduous, temporary non-tidal water regime.
PSS1C	Palustrine, scrub/shrub, broad-leaved deciduous, seasonal non-tidal water regime.
PSS1E	Palustrine, scrub/shrub, broad-leaved deciduous, seasonal saturated non-tidal water regime.
PSS1/EME	Palustrine, scrub/shrub, broad-leaved deciduous, emergent, seasonal saturated non-tidal water regime.

PSS1Fb	Palustrine, scrub/shrub, broad-leaved deciduous emergent, semipermanent non-tidal water regime, beaver.
PFO/SS1E	Palustrine, forested, scrub/shrub, broad-leaved deciduous, seasonal saturated non-tidal water regime.
PFO1A	Palustrine, forested, broad-leaved deciduous, temporary non-tidal water regime.
PFO1C	Palustrine, forested, broad-leaved deciduous, seasonal non-tidal water regime.
PFO1E	Palustrine, forested, broad-leaved deciduous, seasonal saturated non-tidal water regime.
L1OWHh	Lacustrine, limnetic, open water, permanent non-tidal water regime, diked/impounded.
R2OWH	Riverine, lower perennial, open water, permanent non-tidal water regime.
R3OWH	Riverine, upper perennial, open water, permanent non-tidal water regime.

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